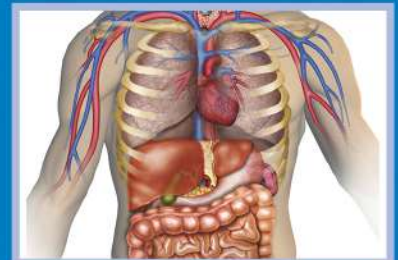
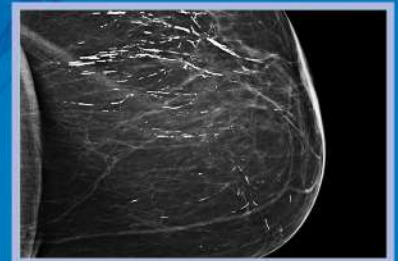
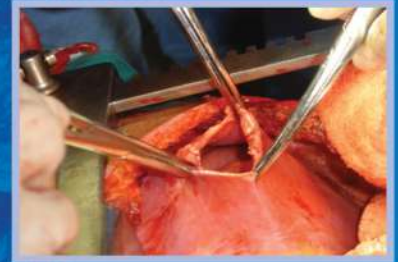


ANATOMY

REGIONAL, SURGICAL, & APPLIED



EDITED BY

QASSIM F. BAKER
& PHILIP J. ADDS

 CRC Press
Taylor & Francis Group

Anatomy

An easy-to-read book written by students for students, edited by senior clinicians and anatomy academics, with contributions from leading anatomists and clinicians. Anatomical facts are correlated with clinical settings, especially medical emergencies, and important points are highlighted with clear learning points. The text is supplemented by diagrams and images, which form an essential part of this book. It covers the students' learning objectives in undergraduate anatomy curricula and helps in preparing them for practical and written exams. It forms a solid foundation for future clinical exams based on the knowledge of anatomical facts in a clinical setting.

Key Features

- Presents a concise, accessible guide to regional and clinically applied anatomy, which clearly demonstrates to students the level of knowledge required for medical and healthcare-related curricula
- Uses high-quality clinical and intraoperative images integrated into the text to emphasize important topics through bullet points
- Features seven logically arranged sections, each devoted to a body region or system, which includes a self-test quiz, with the single best answer and spotter-style questions



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Anatomy

Regional, Surgical, & Applied

Edited by

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DEDICATIONS

To my mother, my first teacher, whom I lost during the preparation of this book, and to my wife, who has supported me all the way.

-Qassim F. Baker

To the students who have inspired me, and to my wife for supporting me.

-Philip J. Adds

CONTENTS

Foreword.....	vii
Preface.....	viii
Editors.....	ix
Contributors.....	x
Artists and Technical Support.....	xii
Acknowledgements (Clinicians Who Contributed Images).....	xiii
List of Abbreviations.....	xiv
1A Neuroanatomy: Anatomy of the Brain.....	1
<i>Reviewed by Richard Dyball</i>	
1B Neuroanatomy: Anatomy of the Spinal Cord.....	15
<i>Reviewed by Valentina Gnoni</i>	
2 Anatomy of the Head and Neck.....	33
<i>Reviewed by Qassim F. Baker, David Sunnucks, and Georga Longhurst</i>	
3 Anatomy of the Upper Limb.....	80
<i>Reviewed by Philip J. Adds and Joanna Tomlinson</i>	
4 Anatomy of the Thorax.....	109
<i>Reviewed by Qassim F. Baker and Mohammed Al Janabi</i>	
5 Anatomy of the Abdomen.....	149
<i>Reviewed by Qassim F. Baker and David Sunnucks</i>	
6 Anatomy of the Pelvis and Perineum.....	197
<i>Reviewed by Paul Carter, Qassim F. Baker, and Philip J. Adds</i>	
7 Anatomy of the Lower Limb.....	234
<i>Reviewed by Philip J. Adds and Joanna Tomlinson</i>	
Index.....	271

FOREWORD

“Anatomy ... teaches us a rational Method of curing Diseases ...” with these words, John Hunter, widely regarded as the “father of the scientific basis of surgery”, began his anatomy lectures in the late eighteenth century. Those sentiments have not changed significantly in the intervening years, although a modern surgeon’s clinical repertoire includes procedures that Hunter, who worked long before the introduction of anaesthesia, antisepsis, and technological advances such as functional MRI and robotic surgery, could not have anticipated.

Learning anatomy for the first time has always been a daunting task, possibly even more so in today’s overcrowded timetables: without appropriate guidance, undergraduate medical and dental students often struggle in a minefield of details while missing clinically relevant points. This user-friendly book, based on the undergraduate anatomy course taught at St. George’s, University of London, inhabits the middle ground between textbooks that are too basic and those that contain detail that is not required until the postgraduate level, and then only for specific groups of trainees.

The text is heavily informed by medical students at the sharp end of their anatomical learning, some of whom have taken an intercalated BSc in anatomy, and all of whom have been involved in near-peer anatomy teaching, demonstrating to students of medicine and related healthcare professions. Their experience is therefore very close to that of the intended audience; the tips that helped them grapple with anatomical “tiger territories” will be welcomed by their readers. The line drawings are by medical students, underlining the authors’ intention that this should be a book “BY students FOR students”, filled with tips, revision and spotter questions, clinical images, and labelled photos of cadaveric specimens. It deserves to be popular with all students learning clinically relevant anatomy.

Susan Standing

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PREFACE

It all began with a meeting of a small group of students and anatomy staff on 31 May 2017, in Room 1, Jenner Wing, St. George's, University of London (SGUL). The idea was simple: to put together an anatomy handbook containing all the anatomy that was taught to medical and other healthcare science students at SGUL, together with relevant clinical details. If the idea was simple, the challenge was anything but: to change the concept of anatomy from a massive and rather intimidating obstacle to a lively, energetic, engaging subject that constitutes a vital part of the medical curriculum and is practically applied within the surgical theatres and clinical setting. Who better to advise on this aspect but the students themselves, who are at the sharp end of anatomy curriculum, not only learning the subject but also helping as anatomy demonstrators in the DR, teaching junior students of medicine, biomedical science, physiotherapy, and paramedic science, among others. Our student collaborators, then, played a pivotal role in writing this book and became involved in putting the sections together, digging into references and further reading, to enable them to give their best input. As the book progressed, the number of student contributors grew, involving writers and artists from SGUL and other universities. Truly, we could not have done it without them.

We were also fortunate to have had the input of clinical colleagues from the UK and around the world, who supplied many of the images and gave helpful feedback on the text. Special thanks must go to Prof Stephen Carmichael and Associate Prof Stephanie Woodley for taking the time to review the book and giving valuable feedback, and to Prof Susan Standring for kindly agreeing to write the Foreword.

Many years ago, while a student myself, I remember being told “there is no such thing as the perfect anatomy book, so you will have to write your own”. It has taken 40 years, but we got there in the end.

So, is this the perfect anatomy book? Perhaps not, but we believe that it will fill a gap in the literature, and we hope that future generations of students will find it lively, interesting, and not too daunting!

Note: In each section, we have provided some exam-style revision questions and some self-test quiz questions – some without answers – to encourage readers to dig deeper and consolidate their understanding.

Qassim F. Baker and Philip J. Addis

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LIST OF ABBREVIATIONS

ABG	Arterial blood gas	JVP	Jugular venous pressure
ACA	Anterior cerebral artery	LAD	Left anterior descending
ACL	Anterior cruciate ligament	LD	Latissimus dorsi
ADH	Anti-diuretic hormone	LFT	Liver function test
AICA	Anterior inferior cerebellar artery	LSV	Long saphenous vein
ABPI	Ankle brachial pressure index	LOS	Lower oesophageal sphincter
ACL	Anterior cruciate ligament	LMN	Lower motor neuron
A&E	Accident and emergency	L	Lumbar
AF	Atrial fibrillation	MALT	Mucosa-associated lymphoid tissue
ARDS	Acute respiratory distress syndrome	MCA	Middle cerebral artery
ASD	Atrial septal defect	MI	Myocardial infarction
ASIS	Anterior superior iliac spine	MPD	Main pancreatic duct
C	Cervical	MPJ	Metacarpophalangeal joint
CABG	Coronary artery bypass graft	MRI	Magnetic resonance imaging
CBD	Common bile duct	MS	Multiple sclerosis
CCA	Common carotid artery	NICE	National Institute for Clinical Excellence
CMC	Carpometacarpal	OGD	Oesophagogastroduodenoscopy
CN	Cranial nerve, for example, CN X for vagus nerve, CN V for the trigeminal nerve, CN VI for the ophthalmic division, and so on	PCA	Posterior cerebral artery
CNS	Central nervous system	PCL	Posterior cruciate ligament
COPD	Chronic obstructive pulmonary disease	PE	Pulmonary embolism
COVID-19	Coronavirus disease 2019	PEG	Percutaneous endoscopic gastrostomy
CSF	Cerebrospinal fluid	PNS	Peripheral nervous system
CT	Computed tomography	PICA	Posterior inferior cerebellar artery
CXR	Chest X-ray	RLN	Recurrent laryngeal nerve
DIAP	Deep inferior epigastric perforator	S	Sacral
DVT	Deep venous thrombosis	SAN	Sinuatrial node
ECG/EKG	Electrocardiogram	SMA	Superior mesenteric artery
ERCP	Endoscopic retrograde cholangiopancreatography	STI	Sexually transmitted infection
ENT	Ear, nose, and throat	SVC	Superior vena cava
GCS	Glasgow Coma Scale	T	Thoracic
GIT	Gastrointestinal tract	TB	Tuberculosis
<i>H. pylori</i>	<i>Helicobacter pylori</i>	TIA	Transient ischaemic attack
HPV	Human papilloma virus	Triple A	Abdominal aortic aneurysm
IBS	Inflammatory bowel disease	TUR	Transurethral resection
ICA	Internal carotid artery	UMN	Upper motor neuron
ICP	Intracranial pressure	USS	Ultrasound scan
IJF	Internal jugular vein	UTI	Urinary tract infection
IMA	Inferior mesenteric artery	VF	Ventricular fibrillation
IVC	Inferior vena cava	VSD	Ventricular septal defect
		WBC	White blood cell

1A

NEUROANATOMY

Anatomy of the Brain

Reviewed by Richard Dyball

Learning Objectives

- Identify the major parts of the brain and their functions
- Understand the function and location of the diencephalon and its contents (thalamus, hypothalamus)
- Identify coverings of the brain and spinal cord (meninges) and their clinical significance
- Recall the blood supply of the brain and the spinal cord and its clinical significance
- Understand the function and location of the ventricular system and cerebrospinal fluid circulation

efferent fibres carry motor and secretory signals to the muscles and glands.

The brain is composed of three major structures: the cerebrum, cerebellum, and brainstem.

Embryology of the Brain

The CNS originates from the neural tube, which is derived from the dorsal ectoderm of the embryo. The process by which the CNS and PNS form (neurulation) is discussed in the spinal cord section.

Introduction

This section covers basic concepts in neuroanatomy and is not meant to be comprehensive. This section only emphasises the anatomy relevant to common clinical problems.

The nervous system is composed of the central nervous system (CNS) and the peripheral nervous system (PNS). The CNS is made up of the brain and the spinal cord. The PNS is composed of afferent sensory and efferent motor nerve fibres. The afferent fibres carry sensory information to the CNS, and the

Cerebrum

The cerebrum consists of two halves, termed cerebral hemispheres, separated by a space called the longitudinal fissure. Each hemisphere controls the opposite, or contralateral, side of the body. Each half can be divided into **four anatomical lobes**: frontal, parietal, temporal, and occipital, and one functional limbic lobe, (or limbic system), and consists of structures from the aforementioned four anatomical lobes (**Figure 1.1**). The functionality of these is detailed in **Table 1.1**.

TABLE 1.1: Lobes of the brain

Lobe	Functions of This Lobe	Important Functional Regions within This Lobe	Examples of Dysfunctions Related with This Lobe
Frontal	<ul style="list-style-type: none">• Cognitive reasoning• Planning and problem solving• Movement• Emotions and speech	<ul style="list-style-type: none">• Primary motor cortex (M1)• Broca's area (usually in the left hemisphere)	<ul style="list-style-type: none">• Non-fluent dysphasia (Broca's area)• Obsessive-compulsive disorder (orbitomedial prefrontal cortex)
Parietal	<ul style="list-style-type: none">• Perception of stimuli, e.g., temperature, pain, pressure• Visuospatial representation of objects in extra personal space• Praxes (initiation of semi-automatic motor sequences)	<ul style="list-style-type: none">• Primary somatosensory cortex (S1)	<ul style="list-style-type: none">• Attentional problems, e.g., hemisensory neglect syndrome, anosognosia• Apraxia (but can also be caused by frontal lobe or frontal-parietal lobe white matter connections)
Temporal	<ul style="list-style-type: none">• Hearing• Episodic memory and spatial navigation	<ul style="list-style-type: none">• Primary auditory cortex (transverse temporal gyrus of Heschl)• Wernicke's area (left hemisphere only)	<ul style="list-style-type: none">• Fluent dysphasia (Wernicke's aphasia)• Anterograde amnesia• Alzheimer's disease
Occipital	<ul style="list-style-type: none">• Vision	<ul style="list-style-type: none">• Primary visual cortex (found in calcarine sulcus)	<ul style="list-style-type: none">• Visual field defects, e.g., homonymous hemianopia with macular sparing

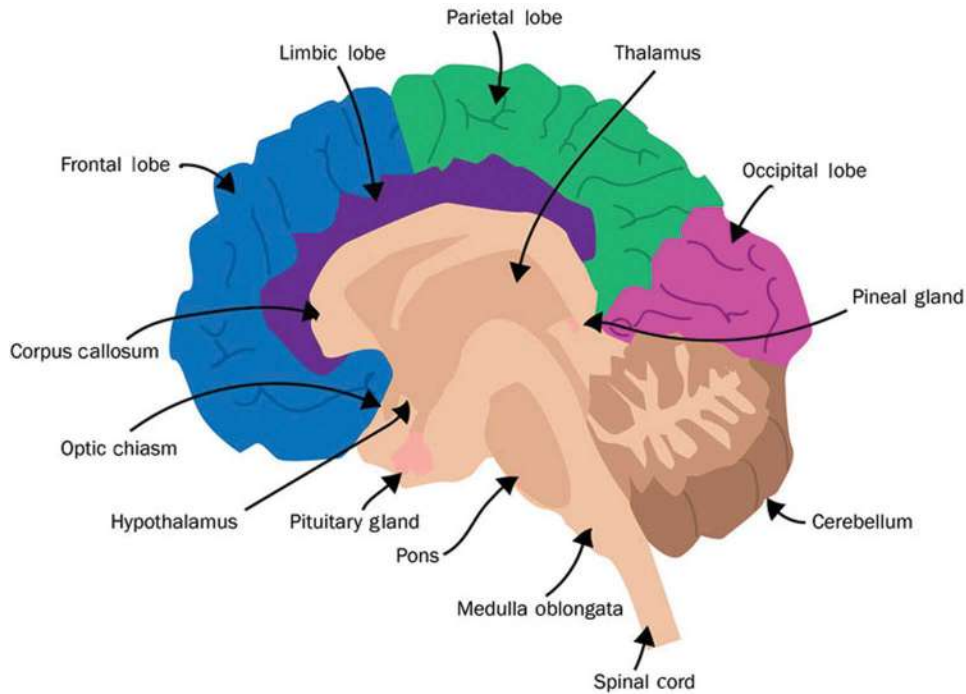


FIGURE 1.1 Sagittal view of the brain showing the positions of the major features. (Courtesy of Aditya Mavinkurve and John Ward.)

On the surface of each hemisphere, the folds of the brain are called **gyri** (singular is gyrus), and the grooves are called **sulci** (singular is sulcus). The lateral sulcus (also known commonly as the Sylvian fissure) separates the frontal, parietal, and temporal lobes. The central sulcus separates the frontal and parietal lobes as well as the M1 (primary motor cortex found in the precentral gyrus) and S1 (primary somatosensory cortex found in the postcentral

gyrus). The parieto-occipital sulcus lies between the parietal and occipital lobes, as its name suggests.

The two halves of the cerebrum are connected by the **corpus callosum**, a large bundle of fibres which cross the midline. The corpus callosum is described as having several subdivisions (from rostral to occipital): rostrum, genu, body, isthmus (the thinnest part), and splenium (**Figure 1.2**).

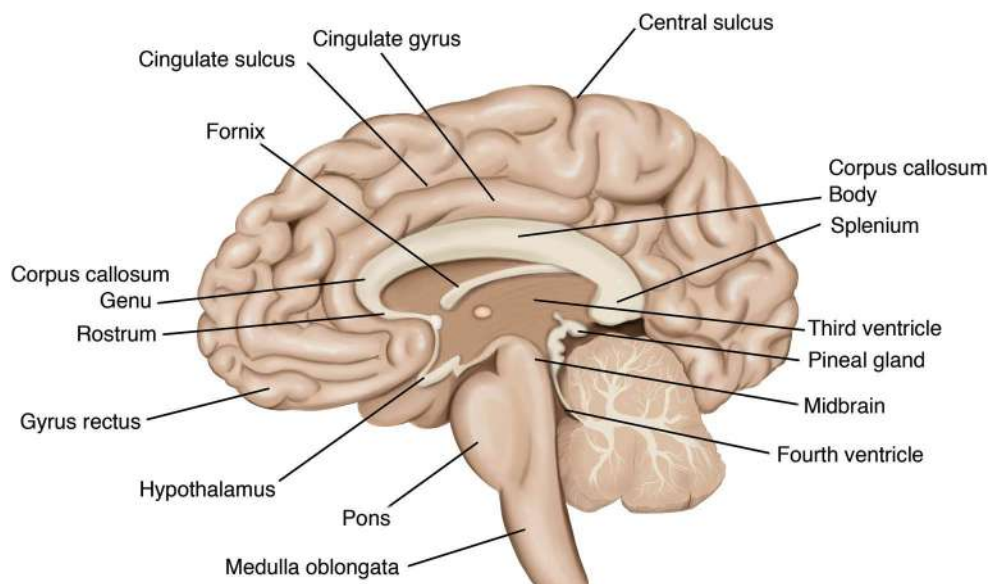


FIGURE 1.2 Sagittal section of the brain. (Courtesy of Kathryn DeMarre and John Ward.)

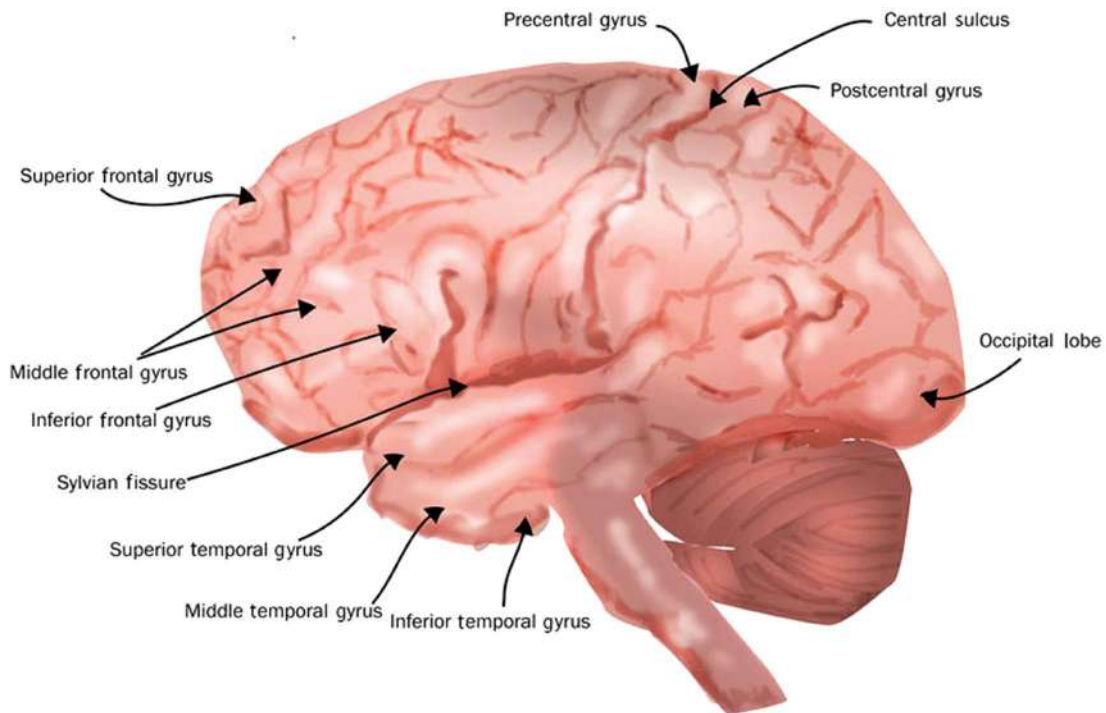


FIGURE 1.3 Lateral view of the cortex. (Courtesy of John Ward.)

Frontal Lobe

The frontal lobe is the anterior-most part of the cerebrum. The longitudinal gyri running parallel to the longitudinal fissure are termed superior, middle, and inferior frontal gyri. The **precentral gyrus**, found on the outer curvature of the brain at the posterior part of the frontal lobe, is responsible for the voluntary motor control of the body. The motor function of each body region is controlled by a corresponding area of this precentral gyrus. The lowest part controls the face, just above it is the region that controls the upper limb and hands, and the part that controls the feet and lower limb lies between the two hemispheres. Curiously, however, the face region is represented “the right way up”. **Broca’s area** is found in the posterior two-thirds of the inferior frontal gyrus (pars triangularis and pars opercularis), just superior to the Sylvian fissure. This is the centre for speech expression and is typically found in the left hemisphere (**Figure 1.3**).

CLINICAL NOTE

Broca’s (non-fluent) aphasia is a condition that results in patients being unable to form fluent sentences, although they can still understand speech and know what they want to say.

The inferior aspect of the frontal lobe, also known as the **orbitofrontal cortex**, is an area of the brain that contains the optic and olfactory regions. The **olfactory sulcus** divides the orbitofrontal cortex into an optic and an olfactory region. The optic region can be found lateral to the olfactory sulcus. The olfactory tract can be seen running in a posterior direction from the olfactory sulcus. The area medial to the olfactory tract is the gyrus rectus (Latin, “straight gyrus”).

The medial aspect of the frontal lobe is mostly responsible for motor control and personality. The dorsolateral prefrontal cortex can be found on the medial aspect superiorly. The medial prefrontal cortex can be found directly inferior to the dorsolateral prefrontal cortex. Lastly, the orbitofrontal cortex is found most inferiorly.

Temporal Lobe

The temporal lobe sits beneath the frontal lobe, separated from it by the lateral sulcus, or Sylvian fissure. It, like the frontal lobe, is divided into superior, middle, and inferior temporal gyri. It is the **main language centre of the brain**, allowing us not only to speak language but to also understand language from auditory cues.

In the posterior third of the superior temporal gyrus, in the left hemisphere, is **Wernicke’s area** which is considered to be the centre for language comprehension.

CLINICAL NOTE

Wernicke’s (“fluent/receptive”) aphasia is the inability to understand language. Patients with this condition can often speak fluently and at a good rate.

CLINICAL NOTE

Conduction aphasia is caused by a lesion in the **arcuate fasciculus** which connects Broca’s and Wernicke’s areas. This presents as an inability to listen to a sentence and repeat it back to the instructor.

Parietal Lobe

The parietal lobe contains the **primary sensory strip (post-central gyrus)** which lies parallel and just posterior to the pre-central gyrus. As the name suggests, the central sulcus divides these two gyri and marks the division between the frontal and parietal lobes. As with the motor cortex, the legs are represented superiorly and the upper limb inferiorly, although the face region is represented “the right way up” as it is in the motor cortex.

The parietal lobe is further divided into a superior and inferior parietal lobe. The superior parietal lobe is involved in spatial orientation, visual input, and sensory input from the hand. The inferior parietal lobe is involved in language, sensory analysis, and mathematical calculation.

Occipital Lobe

Located on the posterior aspect of the cerebrum, the occipital lobe contains the **primary visual cortex, responsible for visual perception**. The occipital lobe receives direct input from the eyes via the optic pathways (discussed in the eye subsection). **The primary visual cortex lies anatomically in the calcarine sulcus**. Interestingly, it is also the only functional area of the brain cortex which can be identified macroscopically because it contains the distinct stria of Gennari. (Figure 1.4).

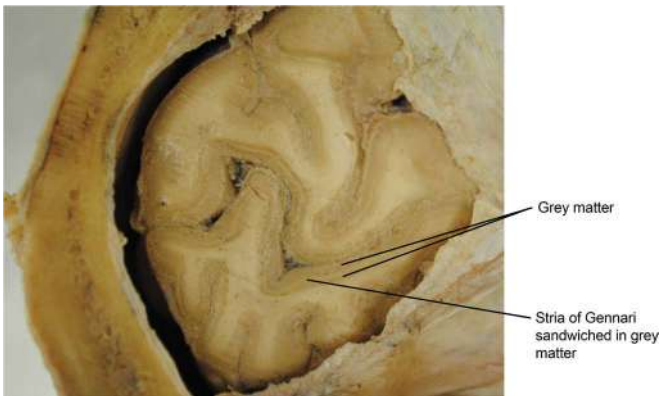


FIGURE 1.4 Stria of Gennari. (Courtesy of Department of Anatomical Sciences, SGUL.)

Limbic System

The limbic system is defined by common functions: behaviour, emotion, and memory. Anatomically, it is formed of two gyri: the cingulate and parahippocampal gyri. The cingulate gyrus surrounds the corpus callosum on the medial aspect of the sagittal brain. It is separated from the frontal lobe by the **cingulate sulcus**, which extends posteriorly and superiorly to form the pars marginalis (marginal sulcus). The central sulcus can be identified using the pars marginalis as a visual landmark, with the central sulcus being the first sulcus directly anterior to the marginal sulcus, running on the convex surface of the cerebral cortex down to the lateral sulcus. The cingulate gyrus continues inferior to the splenium of the corpus callosum as the **parahippocampal gyrus**, which is bordered by the collateral sulcus. The

parahippocampal gyrus forms a region known as the **uncus**, as it curves upwards in the shape of a hook.

The limbic system also comprises several important structures, including the **hippocampus** and **amygdala**. The former is responsible for spatial navigation and episodic memory. It sits deep in the temporal lobe on the floor of the temporal horn of the lateral ventricle. The amygdala is responsible for attention, emotional memory (e.g., fear conditioning), and memory consolidation. The amygdala (from the Greek word *amygdale* meaning “almond” or “tonsil”) is an almond-shaped structure found in the anterior temporal lobe on each side anterior to the hippocampus. The amygdala receives and projects pathways to the cortex, the thalamus, the hypothalamus, and the brainstem. The amygdala receives olfactory input and also has a central pathway of white matter called the **stria terminalis** which connects the amygdala to the brainstem. It has wide connections and seems to be important in the perception of emotions and the assessment of risks.

Cerebellum (Latin: “little brain”)

The cerebellum consists of **two cerebellar hemispheres and a central area, the vermis** (“worm-like”). It lies in the posterior cranial fossa below the tentorium cerebelli and at the back of the brainstem. It is important to remember that each lobe of the cerebellum controls coordination on the ipsilateral side (same side). The cerebellum is also involved in motor learning, in conjunction with the basal ganglia. The cerebellum contains more neurons than the rest of the brain. The cerebellum controls fine motor actions (*vide infra*, the basal ganglia). Cerebellar pathologies result in problems with gait, equilibrium, and speech.

The cerebellum can be divided into 3 anatomical lobes. The anterior and posterior lobes are separated by the primary fissure. The cerebellar tonsils are part of the posterior lobe, and they flank the medulla. The cerebellum also has 2 flocculi inferiorly, alongside a nodule of the vermis, which forms the flocculonodular lobe (Figure 1.5).

Learning Point

Cerebellar tonsillar herniation can occur due to increased intracranial pressure (ICP). This condition leads to cardio-respiratory arrest and death, as it compresses the vital centres (particularly vagal nuclei) of the medulla oblongata.

Looking at a sagittal section of the cerebellum, the dentate nucleus can be seen centrally within the white matter (provides the primary outflow tract of the cerebellum). The white matter is branched (sometimes, because of its shape, it is called the *arbor vitae* meaning “tree of life”). The cerebellum is attached to the brainstem (covered in detail later in this subsection) via three cerebellar peduncles:

- *Superior cerebellar peduncle*: attached to the midbrain (contains input and output fibres from the cerebellum)
- *Middle cerebellar peduncle*: attached to the pons (contains input fibres from the pontine nuclei)
- *Inferior cerebellar peduncle*: attached to the medulla (mostly contains input fibres from the spinal cord and vestibular systems)

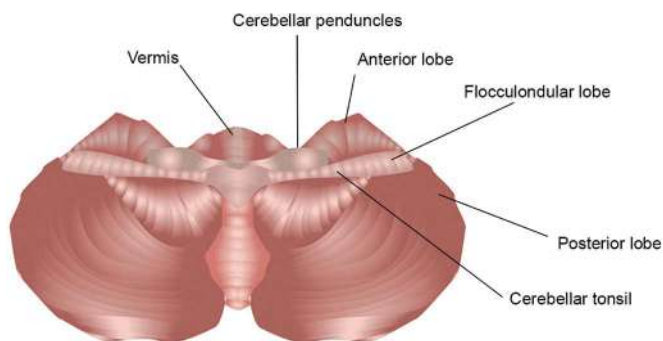


FIGURE 1.5 Anterior view of the cerebellum. (Courtesy of John Ward.)

Diencephalon

The diencephalon (“between brain”) includes the **thalamus**, **hypothalamus**, and **pineal gland**. These structures sit lateral to the third ventricle (discussed later). The diencephalon contains the links between the nervous system and the endocrine system.

The **thalamus** is located dorsally within the diencephalon. In simple terms, it regulates the inputs to the cerebral cortex and directs them to the correct areas of the cerebrum.

The **hypothalamus** acts as a central regulator of homeostasis, including regulation of temperature, thirst, and cardiorespiratory functions and control of the autonomic nervous system, circadian rhythm, and limbic system. Its nuclei secrete chemical messengers, “releasing factors”, that influence anterior pituitary (adenohypophysis) hormone secretion, in turn controlling growth, energy regulation, and reproductive function. Both the **supra-optic** and **paraventricular nuclei** produce anti-diuretic hormone (ADH) and oxytocin; these pass via axons in the pituitary stalk to be stored at the posterior pituitary gland (neurohypophysis).

The **pituitary gland** has anterior (adenohypophysis) and posterior (neurohypophysis) parts. Each has a different embryological origin. The pituitary gland is situated in the hypophyseal fossa (part of the sella turcica) (**Figure 1.6**). The posterior pituitary secretes ADH and oxytocin, produced by the hypothalamus. The anterior pituitary develops as an outpouching of the roof of the pharynx. It is controlled by hypothalamic releasing factors via the hypophyseal portal circulation and produces:

- **ACTH** (adrenocorticotrophic hormone) which acts on the adrenal cortex to produce cortisol, sex hormones, and mineralocorticoids (see **Section 5**)
- **FSH** (follicle-stimulating hormone) and **LH** (luteinising hormone) which are responsible for puberty, the menstrual cycle, menopause, and sexual drive
- **Melanocyte-stimulating hormone** which stimulates melanin synthesis in melanocytes in the skin
- **GH** (growth hormone)
- **TSH** (thyroid-stimulating hormone) which regulates the thyroid gland to produce T3 and T4
- **Dopamine** which inhibits prolactin; prolactin initiates lactation and promotes growth of mammary glands and reproductive organs
- **Somatostatin** which inhibits the release of GH and TSH; also referred to as growth hormone–inhibiting hormone

Learning Point

The **trans-sphenoidal** approach is the most commonly used approach to remove tumours of the pituitary gland via the sphenoid sinus. Pituitary adenomas may be classified according to their size as **macro-nodular** (above 10 mm in size) or **micro-nodular** (below 10 mm) and as **functional** or **non-functional**, depending on whether they oversecrete a particular pituitary hormone.

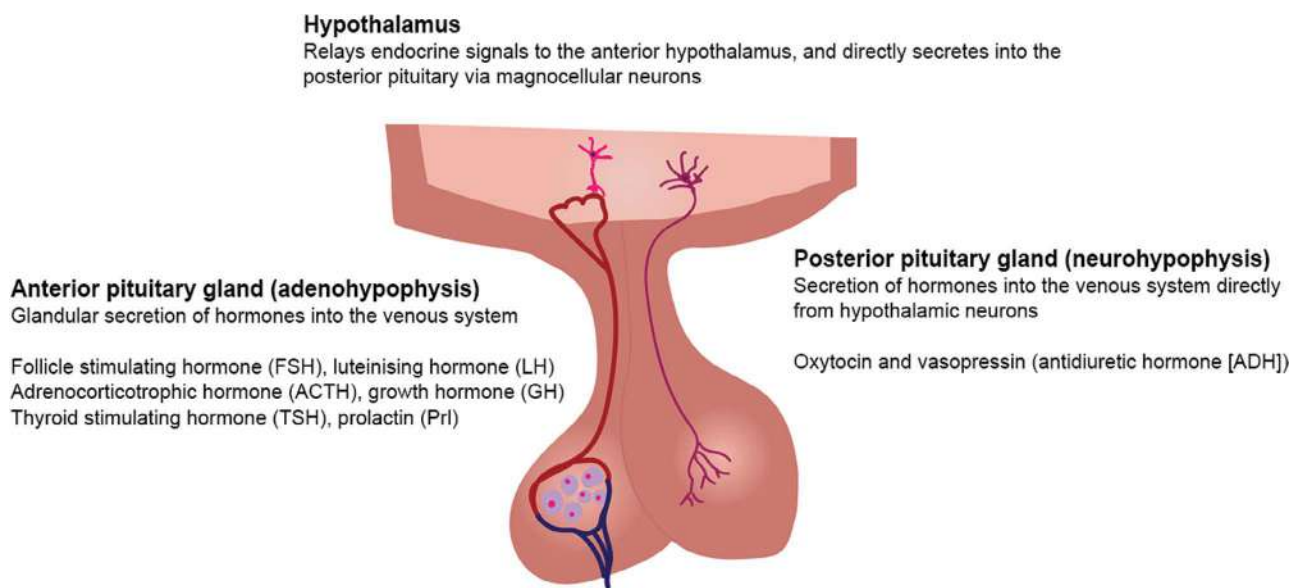


FIGURE 1.6 Diagrammatic representation of the hypothalamus, anterior pituitary, and posterior pituitary. (Courtesy of John Ward.)

Basal Ganglia

The basal ganglia are a group of nuclei (cell bodies) situated below the cortex of the cerebrum. Their main functions include motor control, cognition, and emotion.

Anatomically, the basal ganglia can be described as follows:

- The **lentiform nucleus** (shaped like a lens) is a cone-shaped structure which is divided into the putamen laterally and the globus pallidus (pale globe) medially. It sits just anterior to the thalamus. On a CT scan, the putamen appears dark, whereas the globus pallidus has a lighter tone. The globus pallidus may be subdivided into internal (globus pallidus internus) and external (globus pallidus externus) segments.
- The **caudate nucleus** is a C- or tadpole-shaped structure which curves over the lentiform nucleus. The caudate nucleus has a head (anterior), body, and tail (which sits near the hippocampus in the temporal lobe).
- The **subthalamic nucleus** sits, as its name suggests, inferior to the thalamus.
- The **internal capsule** is the name given to the bundles of white matter projection fibres that run between the basal ganglia nuclei. The **anterior limb** runs between the lentiform nucleus and caudate nucleus. The **genu**, or bend, sits at the point of the cone of the lentiform nucleus in line with the interventricular foramen of Monro (discussed later). The **posterior limb** runs between the lentiform nucleus and the thalamus, and notably contains descending motor fibres and ascending sensory fibres (Figure 1.7a).

Functionally, the basal ganglia form part of an extremely complex circuit of connections. Fibres project to the “input centres” of the basal ganglia, known as the **striatum**. This consists of the caudate

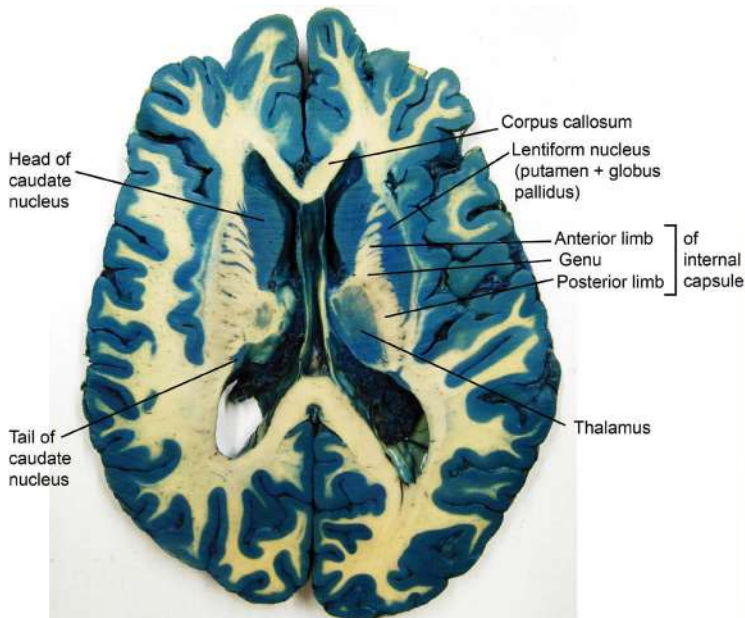
nucleus, **nucleus accumbens** (a small area where the putamen and caudate fuse inferior to the internal capsule), and putamen. They then project to the “output areas” of the basal ganglia, known as the pallidum. This consists of the globus pallidus internus and externus. The internal pallidus inhibits the thalamus, preventing uncontrolled movements and allowing for precision and fine motor control.

The key neurotransmitter needed for the motor basal ganglia loops is **dopamine**. This is supplied by the *substantia nigra* (“black substance” in Latin) in the midbrain (Figure 1.9b). Movement is initiated by the “direct pathway”, which involves disinhibition of the thalamus. The striatum stops pallidal inhibition of the thalamus, thereby increasing neuron firing from the thalamus. Movement is prevented by the “indirect pathway”, in which the subthalamic nucleus stimulates pallidal inhibition of the thalamus. It puts a foot down on the brakes, preventing thalamic neurons firing. This is shown in Figure 1.7b.

The dopaminergic supply to the emotion loops of the basal ganglia comes from the ventral tegmental area of the midbrain. This supplies the nucleus accumbens, among other structures. This “mesolimbic” pathway is responsible for reward-based learning, including gambling and addiction.

Learning Point

Pathologies of the basal ganglia include Parkinson's disease and Huntington's disease. Degeneration of the dopaminergic neurons from the substantia nigra, the nigrostriatal tract, is associated with Parkinson's disease. Loss of the function of the direct pathway leads to poor initiation of movement and bradykinesia. In Huntington's disease, the indirect pathway's action is reduced. This correlates with motor symptoms, including chorea (abnormal involuntary movements).



(a)

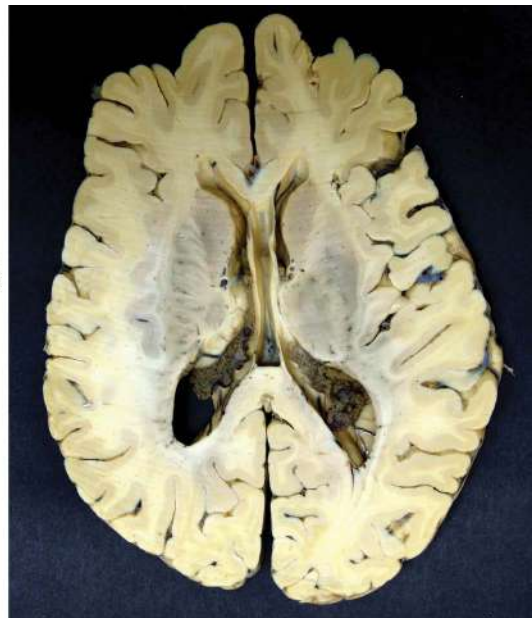


FIGURE 1.7a Transverse brain section showing basal ganglia, stained with Mulligan's stain (left); the unstained section is shown (right) for comparison. (Courtesy of Department of Anatomical Sciences, SGUL.)

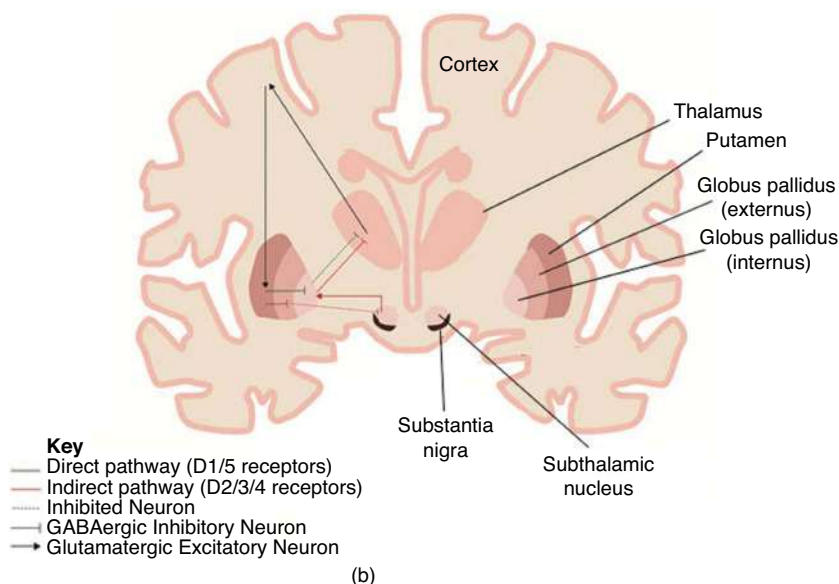


FIGURE 1.7b Coronal brain slice showing the basal ganglia and thalamocortical circuits. (Courtesy of John Ward.)

Brainstem

The brainstem connects the cerebrum to the spinal cord and contains many long tracts projecting up and down. These are discussed in detail in the spinal cord section. Cardiac and respiratory centres found within the brainstem are necessary to maintain life (Figure 1.8).

The brainstem consists of 3 parts: midbrain, pons, and medulla oblongata.

Between them lies a space, termed the **interpeduncular fossa**, within which sit two round structures: the **mammillary bodies**. On the posterior aspect of the midbrain lie the paired **superior** and **inferior colliculi**, often referred to as the tectal plate. The four colliculi (superior and inferior) are concerned with visual and auditory reflexes, respectively. **Remember: Sight before sound – superior colliculus above inferior colliculus.**

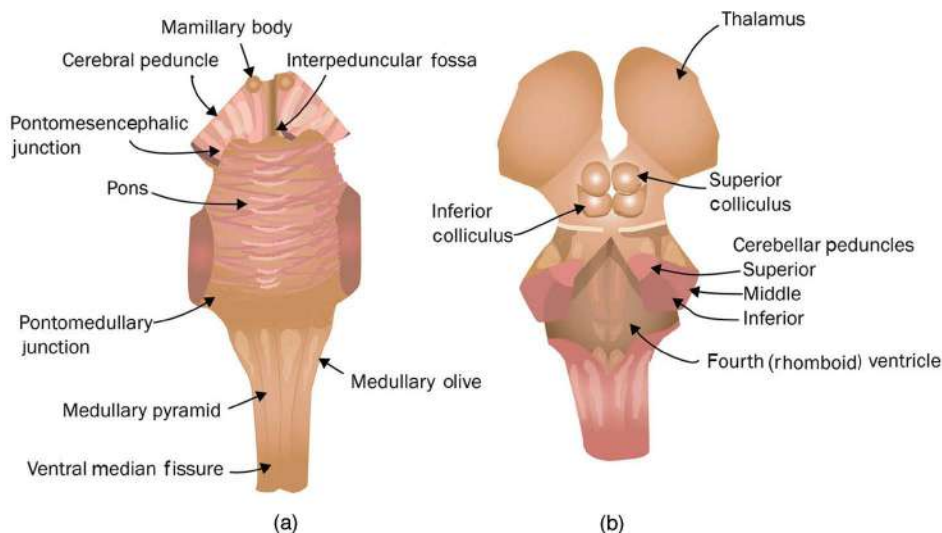


FIGURE 1.8 Brainstem (a) anterior (ventral) and (b) posterior (dorsal) view showing the main surface features. (Courtesy of John Ward.)

Midbrain

The midbrain is formed of two large cerebral peduncles anteriorly (*peduncle* is Latin for “small foot”). These contain descending nerve fibres responsible for motor control.

Looking at a transverse section of the midbrain, the area can be divided into 2 sections relative to the **cerebral aqueduct**, which runs within the midbrain on the dorsal side. The area dorsal to the cerebral aqueduct is known as the **tectum**. The tectum contains the four colliculi. The remaining area (ventral)

is known as the **tegmentum**. The tegmentum contains a large black band known as the **substantia nigra** (see above, “Basal Ganglia”) and the red nuclei, where fibres projecting up from the cerebellum synapse. Ventral to the substantia nigra lie the crura (singular: crus) cerebri which contain the descending motor fibres (Figure 1.9).

fissure. These contain the descending motor fibres (corticospinal and corticobulbar) that pass through the crus cerebri and anterior pons in turn. The **olives** are prominences which are located lateral to the pyramids. The medulla contains the vital centres for controlling blood pressure and oxygen and carbon dioxide saturation (see the baroreceptors, chemoreceptors and glossopharyngeal nerve, Head and Neck Section).

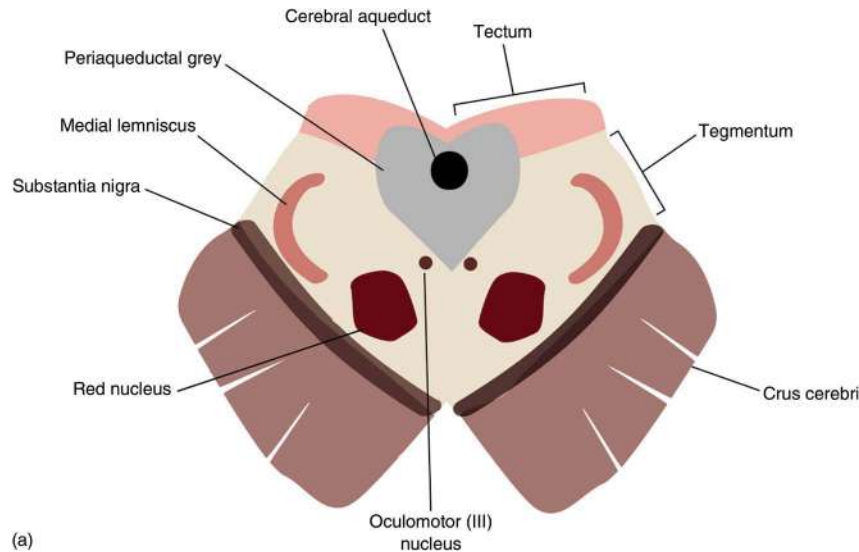


FIGURE 1.9 (a) Schematic cross-section of the brainstem at the level of the superior colliculi. (Courtesy of John Ward.) (b) Brainstem section shown for comparison; note the visible substantia nigra. (Courtesy of Department of Anatomical Sciences, SGUL.)

Pons

The pons contains fibres projecting vertically, as well as fibres crossing horizontally. The horizontal fibres decussate and enter the cerebellum via the middle cerebellar peduncle. This allows fibres from the left cerebrum to connect with the cerebellum on the right side and vice versa.

Medulla Oblongata

The medulla oblongata, or “medulla”, is a direct continuation of the spinal cord above the foramen magnum, and it is about 3 cm in length. Close to the midline on the anterior surface of the medulla lie two **pyramids**, separated by the ventral median

Cranial Nerves

Collectively, the cranial nerves supply sensation to the head, face, and neck. There are 12 cranial nerves, which are usually denoted by Roman numerals: CN I–CN XII. The function and path of the cranial nerves is summarised in Table 1.2.

CLINICAL NOTE

CN I and CN II arise from the cerebral hemispheres; the rest come from the brainstem (Figures 1.10 and 1.11). This will be discussed later in this subsection.

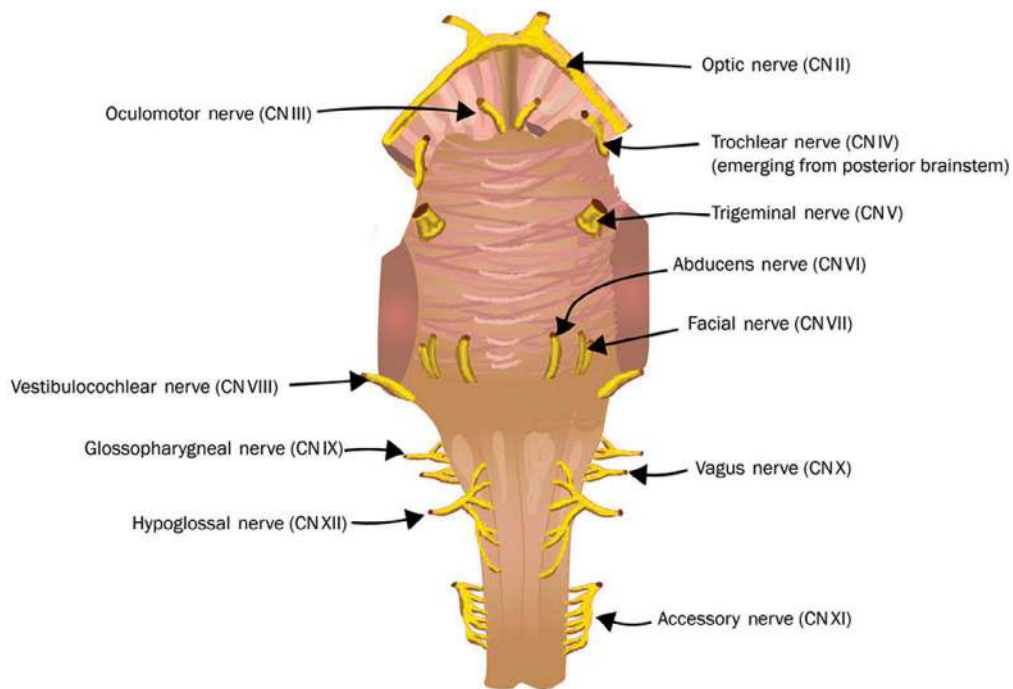


FIGURE 1.10 Cranial nerve roots II to XII emerging from the brainstem (ventral view). (Courtesy of John Ward.)

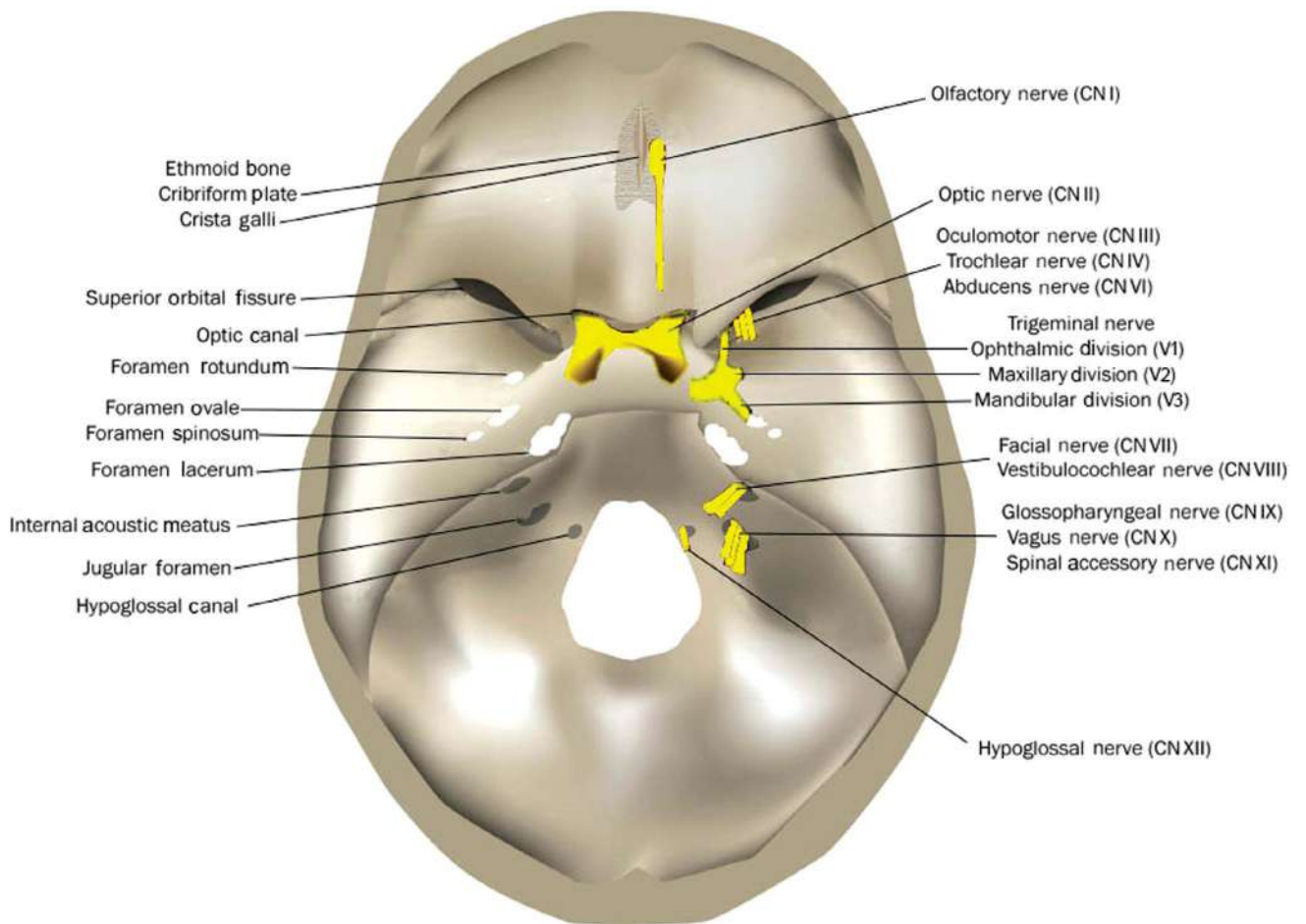


FIGURE 1.11 Internal view of the cranial cavity: the cranial nerves emerging through the skull base foramina. (Courtesy of John Ward.)

TABLE 1.2: Cranial nerves (2,3)

Cranial Nerve	Anatomical Path	Function
I. Olfactory	<ul style="list-style-type: none"> Nerve receptors in the nasal mucosa, filaments pass through the cribriform plate of the ethmoid to the olfactory bulbs and then to the olfactory tracts, which divide into medial and lateral striae The lateral stria connects to the olfactory cortex of the temporal lobe The medial stria is connected to the hypothalamus and brainstem The olfactory cortex is connected to the orbitofrontal cortex of the frontal lobe and to the amygdala 	<ul style="list-style-type: none"> Sensory – smell Trauma to the skull base can cause anosmia Other causes of anosmia include upper respiratory tract infections, Parkinson's disease, Alzheimer's disease, Huntington's disease, and COVID
II. Optic	<ul style="list-style-type: none"> Arises from the retina and runs posterior to the eyeball through the optic canal See further details in Section 2 	<ul style="list-style-type: none"> Sensory – vision Lesions at different points in the visual pathway cause different defects
III. Oculomotor	<ul style="list-style-type: none"> Arises from the interpeduncular fossa of the midbrain and exits the skull base through the superior orbital fissure 	<ul style="list-style-type: none"> Motor – superior/inferior/medial rectus, inferior oblique muscles, and levator palpebrae superioris (opens eyelids) Lesions cause the eye to look down and out Parasympathetic fibres of the short ciliary nerves are carried on the surface of the third cranial nerve to innervate the sphincter pupillae, causing pupil constriction and ciliary muscle contraction (responsible for accommodation)
IV. Trochlear	<ul style="list-style-type: none"> Arises from the posterior part of the midbrain, below the inferior colliculi, decussates, and exits the skull base through the superior orbital fissure 	<ul style="list-style-type: none"> Motor – superior oblique muscle Lesions cause the eyes to look upwards
V. Trigeminal	<ul style="list-style-type: none"> Arises from the angle of the pons and the middle cerebellar peduncle V1 (ophthalmic branch) exits through the superior orbital fissure, V2 (maxillary branch) through the foramen rotundum, and V3 (mandibular branch) through the foramen ovale 	<ul style="list-style-type: none"> Sensory – touch to the face. Motor – muscles of mastication
VI. Abducens	<ul style="list-style-type: none"> Arises from the junction of the pons and the medulla and exits through the superior orbital fissure 	<ul style="list-style-type: none"> Motor – lateral rectus muscle Lesions cause the eyes to deviate medially
VII. Facial	<ul style="list-style-type: none"> Arises from the cerebello-pontine angle, runs through the internal acoustic meatus, and exits the skull via the stylomastoid foramen 	<ul style="list-style-type: none"> Special sensory – taste from the anterior two-thirds of the tongue Motor – muscles of facial expression, stapedius, and the posterior belly of the digastric muscle Parasympathetic – supplies the submandibular and sublingual glands and the lacrimal and nasal mucosa to increase secretions
VIII. Vestibulocochlear	<ul style="list-style-type: none"> Arises with CN VII from the cerebello-pontine angle and passes through the internal acoustic meatus 	<ul style="list-style-type: none"> Sensory – balance (vestibular division) and hearing (cochlear division)
IX. Glossopharyngeal	<ul style="list-style-type: none"> Arises posterior to the olive of the medulla and passes through the jugular foramen of the skull base 	<ul style="list-style-type: none"> Sensory – taste from the posterior one-third of the tongue Parasympathetic – parotid salivary gland Motor – stylopharyngeus muscle Sensory innervation of carotid body and carotid sinus
X. Vagus	<ul style="list-style-type: none"> Arises posterior to the olive of the medulla and passes through the jugular foramen of the skull base 	<ul style="list-style-type: none"> Sensory and parasympathetic – larynx, aorta, thoracic, and abdominal viscera Sensory innervation also includes the aortic body chemoreceptors and aortic arch baroreceptors Motor innervation of pharynx, palatoglossus, larynx, oesophagus, and GIT down to the splenic flexure
XI. Accessory (spinal)	<ul style="list-style-type: none"> Arises posterior to the olive of the medulla and passes through the jugular foramen of the skull base 	<ul style="list-style-type: none"> Motor – sternocleidomastoid and trapezius muscles
XII. Hypoglossal	<ul style="list-style-type: none"> Arises anterior to the olive of the medulla and passes through the hypoglossal canal 	<ul style="list-style-type: none"> Motor – intrinsic muscles of the tongue, except palatoglossus, which is supplied by the vagus

Skull Base (See Head and Neck Section)

Meninges

The brain and spinal cord have 3 covering membranes. The outer membrane, the **dura mater**, is the toughest, and consists of 2 layers: a periosteal layer lining the inside of the skull, beneath which is the deep or meningeal layer. Key double folds of dura include:

- The **falx cerebri** (*falx*: latin, “sickle-shaped”): occupies the longitudinal fissure and separates the two cerebral hemispheres
- The **tentorium cerebelli** separates the occipital and temporal lobes from the cerebellum and brainstem. Its posterior margin is fixed to the occipital bone and contains the transverse venous sinus
- The **diaphragma sellae**: roofs the sella turcica of the sphenoid bone and is attached to the anterior and posterior clinoid processes. The pituitary stalk passes through it

The venous sinuses are spaces within the dura that collect blood from the brain. The anatomical layout of the sinuses is shown in **Figure 1.13**.

The second covering is the **arachnoid mater** (Greek: *arachne*, “spider”). It attaches to the inside of the dura. The innermost layer is the **pia mater**, which is a very thin layer that covers the brain and spinal cord. The space between the pia mater and the arachnoid mater is the **subarachnoid space** and is filled with cerebrospinal fluid (CSF).

Learning Point

Meningitis is inflammation of the meninges, which cover the brain and the spinal cord, which can be caused by bacteria, e.g., meningococci, or viruses such as Coxsackie. It can be a life-threatening condition. The diagnosis is based on interpretation of the symptoms (severe headache, fever, fits, and vomiting) and signs, such as neck rigidity, in addition to the spinal tap (CSF examination).

Intracranial bleeding is characterised by where the blood is collecting in relation to the dural layers (**Table 1.3**).

An **intracerebral aneurysm** is an artery supplying the brain that is dilated to more than 50% of its original diameter, often following the formation of atheromatous plaques that weaken the wall. It commonly occurs where arteries branch (especially due to hypertension) and in the circle of Willis (congenital berry aneurysms). They produce few symptoms until the artery eventually ruptures, which is a medical emergency.

CSF Circulation and the Ventricular System

The ventricular system comprises four chambers, or **ventricles** (**Figure 1.13**). CSF is formed from the **choroid plexus**, a vascular structure sitting within the lateral ventricles. The fluid then drains through the ventricular system and out into the subarachnoid space, where it bathes the brain. CSF drains

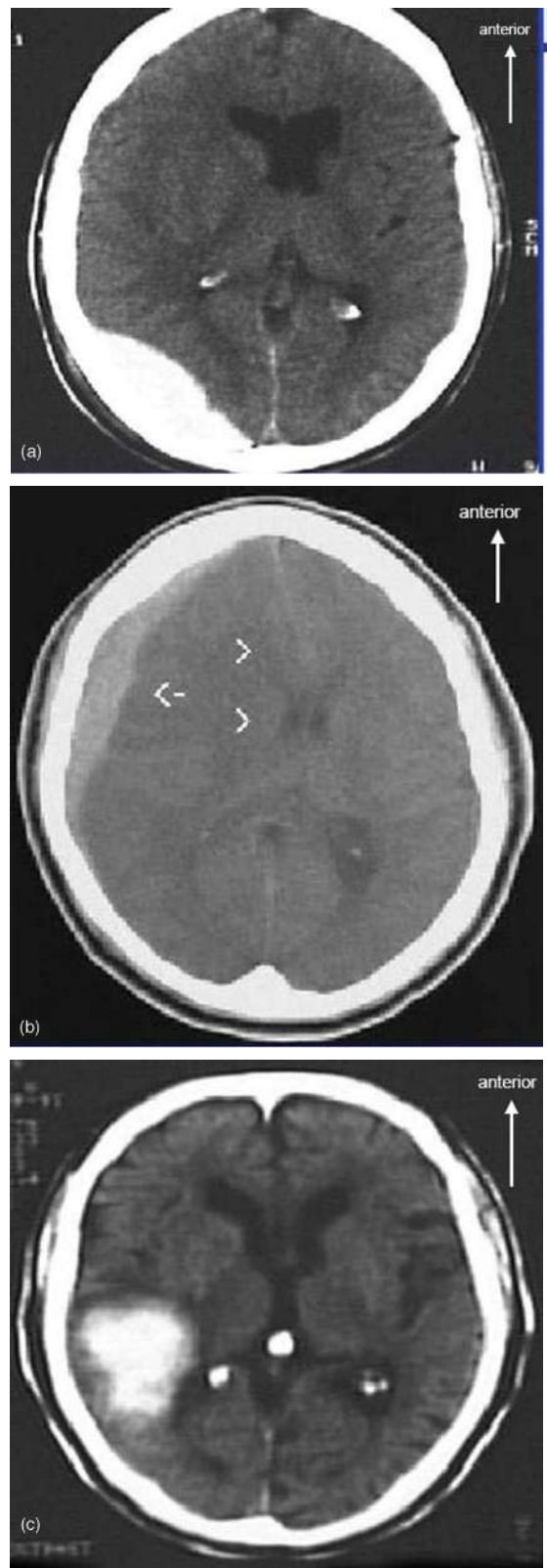


FIGURE 1.12 (a) CT scan of head showing an acute extradural haematoma caused by damage to a posterior branch of the middle meningeal artery. (b) CT scan of the head showing acute right subdural haematoma. There is significant mass effect and midline shift to the left. (c) CT scan of acute intra-parenchymal haemorrhage in left parietal lobe. (Courtesy of Abdel-Aziz Abdel-Ghany.)

TABLE 1.3: Types of intracranial bleed

Type of Bleed	Causes	Characteristic Presentation	Image
Extradural (between the dura and the inner table of the skull)	Trauma to pterion lacerates the middle meningeal artery	Loss of consciousness followed by a “lucid interval” (typically hours); remember the story of the footballer who collapsed in the changing room after being hit on the side of his head while playing.	See Figure 1.12a
Subdural (between dural and arachnoid)	Brain atrophy with age or alcoholism puts tension on the bridging veins, which then shear more easily upon the impact of a fall, for example	Disorientation, confusion, gradual loss of consciousness; can present acutely or chronically	See Figure 1.12b
Subarachnoid (between arachnoid and pia)	Ruptured arterial aneurysms, arteriovenous malformations, or trauma	Thunderclap headache, with a sudden decrease in consciousness	
Intracerebral (within the brain tissue)	Trauma or, commonly, hypertensive bleeds	Focal neurological symptoms of a haemorrhagic stroke	See Figure 1.12c

from the subarachnoid space through arachnoid granulations in the superior sagittal sinus, where it enters the venous system.

Paired lateral ventricles sit within each cerebral hemisphere. They extend into the hemispheres of the brain and are described as having frontal, temporal, and occipital horns. These horns join at the atrium. The CSF in the lateral ventricles drains into the **third ventricle** via the interventricular foramina of Monro. The third ventricle sits in the midline of the brain, between the hypothalami and thalami. It drains into the **fourth ventricle** via the cerebral aqueduct. The fourth ventricle sits posterior to the brainstem but anterior to the cerebellum. It has foramina through which CSF drains into the cisterna magna: the median foramen of Magendie and the two lateral foramina of Luschka.

CLINICAL NOTE

Hydrocephalus is an abnormal accumulation of CSF, which could be caused by obstruction of CSF flow due to pathologies such as infections and brain tumours.

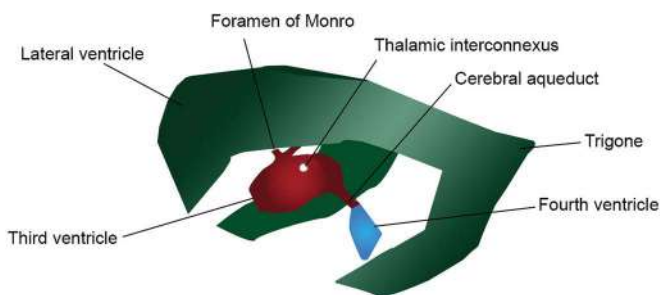


FIGURE 1.13 The isolated ventricular system. (Courtesy of John Ward.)

Arterial Vasculature of the Brain

The brain accounts for only 2.5% of body weight but requires one-sixth of the cardiac output.

The blood supply of the brain originates from two sets of paired arteries: the vertebral and internal carotid arteries on each side. They anastomose to form the **circle of Willis**, which gives branches to supply the brain ([Figures 1.14](#) and [1.15](#)).

The anterior circulation of the brain arises from the internal carotid arteries. The common carotid arteries branch from the brachiocephalic trunk and the arch of the aorta on the right and left, respectively. Each common carotid artery (CCA) travels up the neck in the carotid sheath with the internal jugular vein and the vagus nerve. It bifurcates into the internal and external carotid arteries at the level of the fourth cervical vertebra/upper border of thyroid cartilage (C4). The internal carotid arteries (ICAs) enter the cranium through the carotid canals in the temporal bone. They run in the cavernous sinus, with the cranial nerves coursing towards the orbital cavity, before turning upwards and backwards (a feature known as the carotid siphon). They terminate in the circle of Willis. The internal carotid artery has four parts:

- Cervical (within the carotid sheath)
- Petrous (within the petrous part of the temporal bone)
- Cavernous (at the lateral wall of the cavernous sinus with CN III, IV, V1, V2, and VI)
- Cerebral (within the cranial subarachnoid space)

The posterior circulation arises from the vertebral arteries. Each vertebral artery stems from the first part of the subclavian artery and travels up the neck in the transverse foramina of the cervical vertebrae (all but C7), entering the cranium via the foramen magnum. The two vertebral arteries unite to form the basilar artery. As the vertebral arteries ascend, they give off the paired posterior spinal artery, posterior inferior cerebellar artery (PICA), and singular anterior spinal artery. The basilar artery runs within the pontine cistern (within the central groove of the pons) and gives off the pontine arteries, anterior inferior cerebellar arteries (AICAs), and superior cerebellar arteries ([Figure 1.15](#)). The basilar artery divides into the posterior cerebral arteries, which form the posterior part of the circle of Willis and connect with the anterior

circulation via the posterior communicating arteries and supply the inferior surface of the brain and occipital lobes (Figure 1.14).

In the circle of Willis, the internal carotid artery on each side (anterior circulation) continues as the middle cerebral artery (MCA) (80% of blood flow), which supplies the lateral surface of each cerebral hemisphere. It also gives origin to the anterior cerebral artery (ACA), which supplies the medial parts of each hemisphere except the occipital lobes. Both ACAs are connected by the very short anterior communicating artery.

Learning Point

Stroke is when an area of the brain does not receive sufficient blood flow, resulting in the death of the cells in that area and neurological defects.

Common causes of stroke are:

- *Thrombosis*: occlusion from a locally formed blood clot.
- *Embolism*: occlusion from a distally formed blood clot that travelled to the arteries supplying the brain (often originating from a fibrillating left atrium to form a thrombosis).
- *Hypoperfusion*: brain doesn't receive adequate blood supply, e.g., low blood pressure while in shock.
- *Haemorrhage*: bleeding inside the cranial cavity, e.g., traumatic blow to the head ruptures blood vessels. The blood outside the vessels takes up space in the cranial cavity but outside the brain and so reduces the blood supply of the capillaries within the brain.

Approximately 85% of strokes are ischaemic strokes (thromboembolic, primary occlusion of intracerebral arteries), with the remaining 15% haemorrhagic strokes.

Learning Point

Symptoms of an MCA stroke include:

- **Sensory loss on the contralateral (opposite) side of the body**
- **Motor loss, hemiparesis, or hemiplegia of the muscles on the contralateral side of the body**
- **Visual loss as the optic radiations passes through the parietal, temporal, and frontal lobes**
- **Speech disturbance if the language-dominant hemisphere is affected**
- **Visuospatial disturbance, such as hemi-spatial neglect, if the non-language-dominant hemisphere is affected**

Venous Vasculature of the Brain

The dural venous sinuses carry venous blood and CSF away from the brain. They are located between the periosteal and meningeal layers of the dura mater, and unlike other veins, they are valveless (which allows bidirectional flow) and do not travel alongside any arteries.

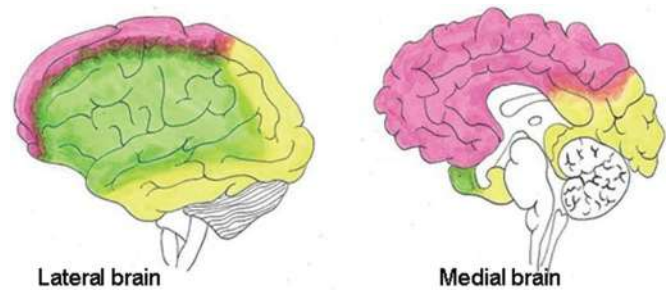


FIGURE 1.14 Arterial supply to the brain (Pink: anterior cerebral artery; Green: middle cerebral artery; Yellow: posterior cerebral artery). (Courtesy of Calum Harrington-Vogt.)

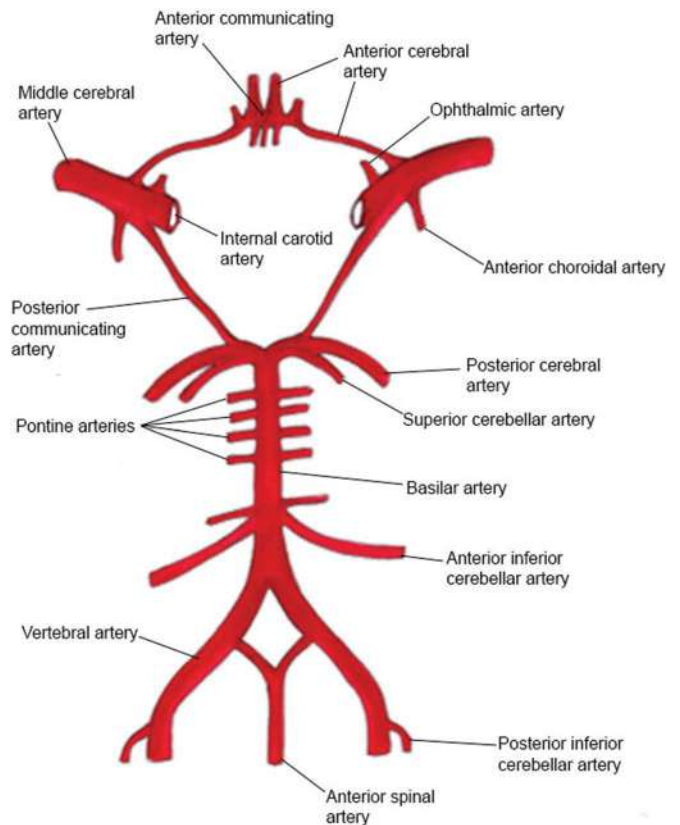


FIGURE 1.15 Circle of Willis; schematic view seen from anterior and inferior. (Courtesy of Calum Harrington-Vogt.)

The superior sagittal sinus (SSS) runs in the upper edge of the falx cerebri, while the inferior sagittal sinus runs within the lower edge. The great cerebral vein of Galen (from the deep structures of the brain) joins the inferior sagittal sinus to form the straight sinus. The SSS joins the straight sinus at the confluence of sinuses to form the transverse sinus, which continues as the sigmoid (S-shaped) sinus, and this finally becomes the internal jugular vein (IJV), which leaves the cranial cavity at the jugular foramen.

The cavernous sinus lies on either side of the sella turcica. Both ophthalmic veins drain into the anterior aspect of the cavernous sinuses. The internal carotid artery runs through the sinus (Figure 1.16).

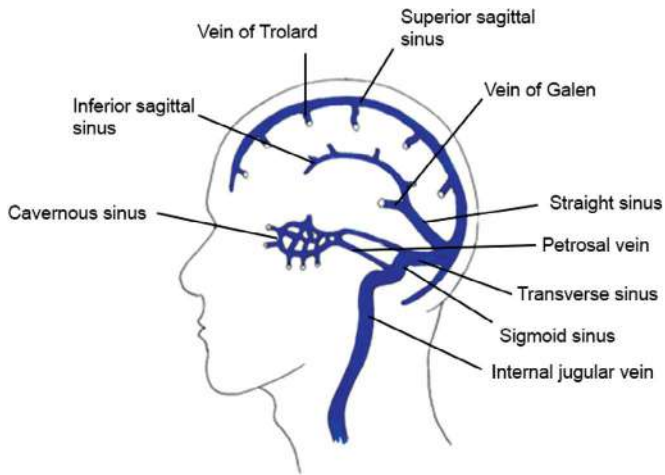


FIGURE 1.16 Venous drainage of brain, schematic lateral view. (Courtesy of Calum Harrington-Vogt.)

Learning Point

Cavernous sinus thrombosis can be caused by infections in the “dangerous triangle” of the face. Infection within the nose, ear, and face (which drain to the cavernous sinus) can spread to the cavernous sinus. The causative organism is usually *Staphylococcus aureus*. Cranial nerves III, IV, V1, and V2 and VI travel through the cavernous sinus and are therefore affected and potentially paralysed. This is characterised by severe systemic signs, periorbital swelling, and protrusion of the eyeball (exophthalmos). It should be urgently treated with IV antibiotics.

1B

NEUROANATOMY

Anatomy of the Spinal Cord

Reviewed by Valentina Gnoni

Introduction

The spinal cord is part of the central nervous system (CNS) and extends from the foramen magnum, as a continuation of the medulla oblongata, to the level of the first or second lumbar vertebra. This structure is contained within the spinal canal and acts as a conduit for multiple nerve pathways ascending and descending to or from the brain. This section sheds light upon the development, function, and clinical conditions associated with the spinal cord.

Learning Objectives

- Understand the development of the spinal cord and central nervous system
- Recall the gross anatomy of the spinal cord and its coverings
- Recall the important ascending tracts and descending tracts, their anatomy, and clinical relevance
- Recall the blood supply to the spinal cord
- Understand the anatomy and pathophysiology of common spinal cord pathologies

Development of the Spinal Cord

Early Development and Gastrulation

Development begins following the fusion of the male and female pronuclei to form the diploid zygote nucleus. The zygote undergoes a series of cellular divisions to form the blastocyst, a ball of cells that travel along the fallopian tube to implant in the lining of the uterine cavity.

The blastocyst is composed of an inner cell mass surrounded by a second group of cells called the trophoblast. Upon implantation, the inner cell mass differentiates into two layers of cells, epiblast and hypoblast, collectively referred to as the bilaminar disc.

The hypoblast layer forms the extraembryonic tissue, placenta, and placental cord (umbilical cord), which support the growing embryo. During the third week of development, the epiblast layer gives rise to three germ layers, ectoderm, mesoderm, and endoderm, in a process called gastrulation. These germ layers give rise to all the structures within the body, including the future CNS (Table 1.4).

Neural Tube

Neural tube formation, shown in Figure 1.17, follows gastrulation. The mesoderm layer gives rise to a rod-like structure called the notochord. Axial mesodermal cells within the notochord

cause a patch of ectodermal cells to differentiate into the neural plate (neuroectoderm) by releasing chemical mediators, including Sonic hedgehog protein. A groove forms within the neural plate to produce neural folds that fuse at the midline to form a hollow, fluid-filled neural tube. This tube gives rise to the CNS.

Fusion of the neural tube begins at the midline and continues in a zipper-like fashion in both rostral and caudal directions. Free edges, known as neuropores, are the last to close during this process.

Fusion of the neural folds also causes neural crest cells to disconnect from the epidermis. These cells migrate to their adult position to give rise to structures that form the peripheral nervous system. The hollow, fluid-filled cavity within the neural tube (neural canal) later forms the ventricular system of the brain. The notochord degenerates and persists as the nucleus pulposus of the intervertebral discs.

Alar and Basal Plates

The developing spinal cord consists of an alar plate and a basal plate, separated by a longitudinal groove known as the sulcus limitans. The basal plate forms the ventral aspect of the developing spinal cord, whilst the alar plate forms the dorsal dimension. This arrangement is modified in the brainstem, as the fourth ventricle displaces the alar plate region laterally, changing the direct dorsal-ventral arrangement. This is demonstrated by the distribution of sensory and motor cranial nerve nuclei in the floor of the fourth ventricle, the rhomboid fossa, as shown in Figure 1.18.

The basal plate consists of anterior horn cells, which develop into motor neurons. Axons project out of the basal plate to form the ventral nerve roots. In contrast, sensory neurons arise from the alar plate. Axons entering this region form the dorsal nerve roots.

TABLE 1.4: Anatomical structures within the adult that develop from the respective germ layers

Germ Layer	Adult Structures
Ectoderm	<ul style="list-style-type: none">• Epidermis• Nervous system
Mesoderm	<ul style="list-style-type: none">• Muscles• Dermis• Cartilage• Vertebral body plan• Blood vessels
Endoderm	<ul style="list-style-type: none">• Epithelial lining of the digestive tract and its associated organs, along with respiratory, urinary, and reproductive tracts• Glands (thymus, thyroid, and parathyroid glands)

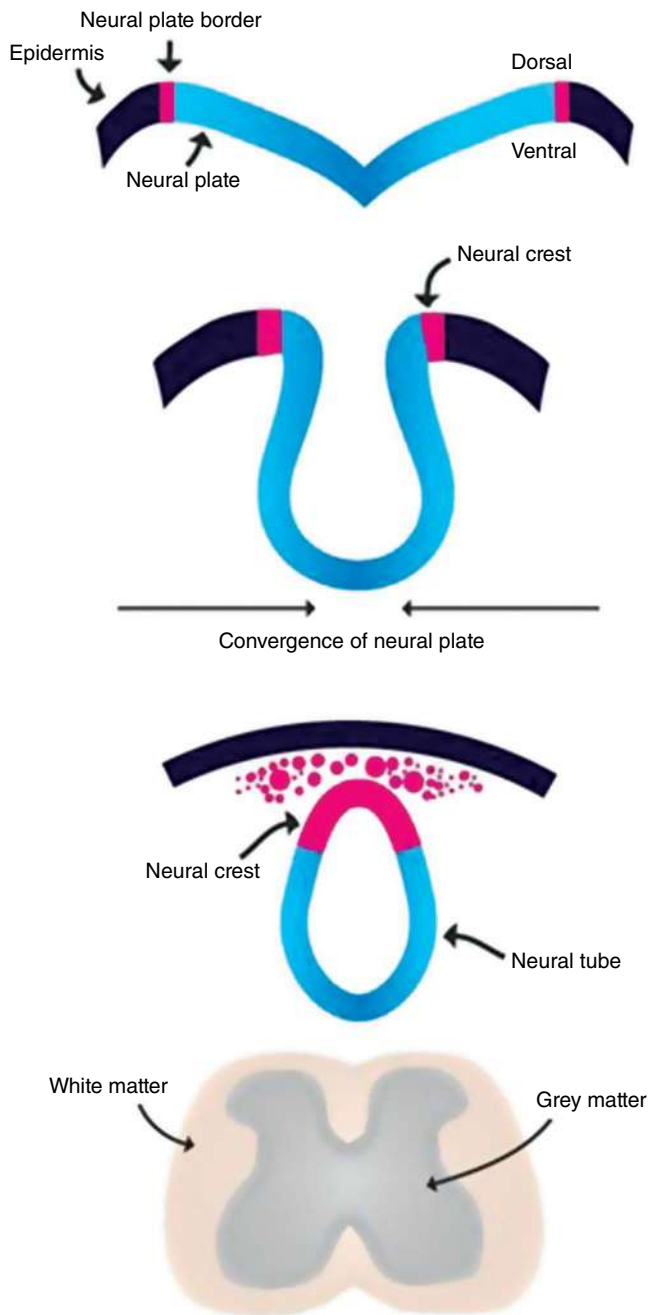


FIGURE 1.17 Formation of the neural tube. (Courtesy of John Ward.)

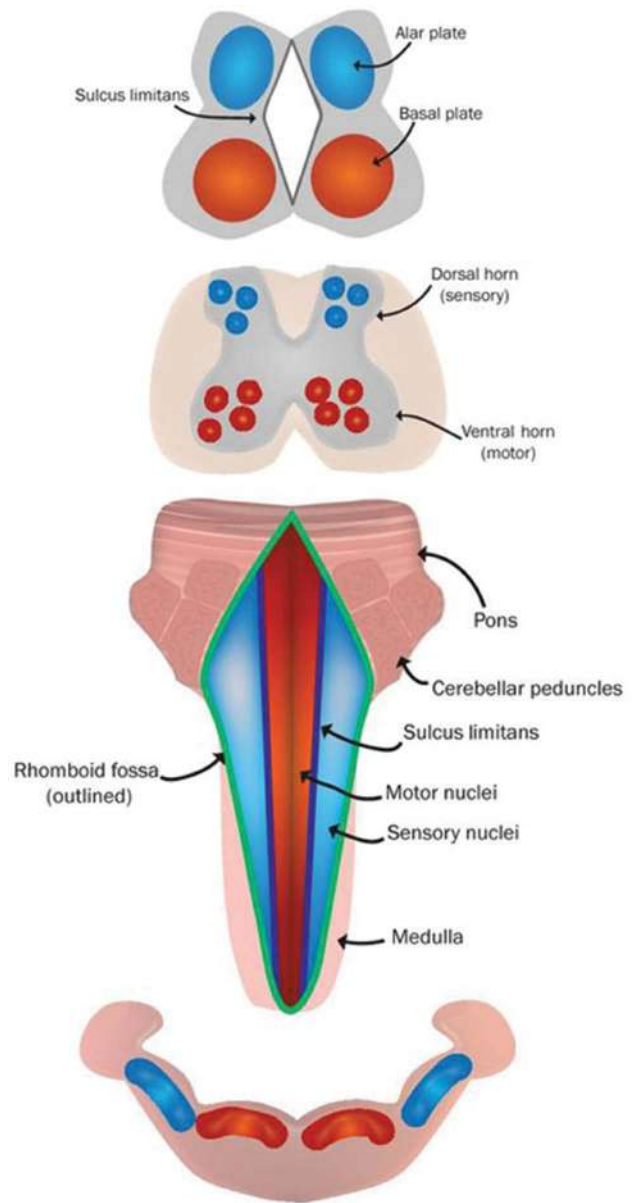


FIGURE 1.18 Alar and basal plates. A depiction of how the developing alar (sensory, blue) and basal (motor, red) plates map onto the grey matter of the adult spinal cord, rhomboid fossa, and a cross-section of the caudal pons. (Courtesy of John Ward.)

CLINICAL NOTE

Neural tube defects: spina bifida

Spina bifida arises following the failure of the caudal neuropore to close, leaving an abnormal opening within the vertebrate body plan of the individual. Three distinct forms of spina bifida have been identified: occulta, meningocele, and myelomeningocele (**Figure 1.19**).

Spina bifida occulta is the mildest and most common form of the condition. It is characterised by the presence of skin covering the surface of the vertebral opening. The layer of skin prevents the communication of spinal nerves and meninges with the external environment. As a result, patients remain unaffected and are usually unaware of their condition. The defect can be identified by tufts of hair or dimples within the skin at the site of the defect.

Meningocele is less common but is a more severe form of the condition. It is characterised by the herniation of meninges

and cerebrospinal fluid (CSF) across the defect, with little to no involvement of nervous tissue. As a result, the child does not suffer from any neurological problems.

Myelomeningocele is the most severe form of the condition, involving the protrusion of the spinal cord and its coverings. Children with this defect suffer from severe neurological problems below the level of the lesion, including motor paralysis, loss of sensation, and bladder and bowel problems. In extreme cases, the upper extremities are also involved.

Primary prevention is regular folic acid supplementation before conception or during pregnancy. Surgery can be carried out to close the vertebral opening and remove the cyst that has herniated posteriorly.

emerge at increasingly oblique angles and travel further to exit the vertebral canal. The mixed spinal nerve then divides again into a ventral primary ramus supplying the anterior trunk, limbs, and viscera, and a dorsal primary ramus supplying the skin of the back and the vertebral muscles (Figure 1.21). Each spinal nerve carries motor neurons (α to skeletal muscle; γ to muscle spindle fibres), sensory (myelinated and unmyelinated), and autonomic fibres (see “Autonomic Nervous System and the Spinal Cord”).

The adult spinal cord ends at the level of the L1/L2 vertebrae. The distal bulbous part is called the **conus medullaris**, and its tapering end continues as a fibrous cord, the **filum terminale**, which extends towards the bottom of the vertebral canal, stabilising the spinal cord and anchoring it to the coccyx. Below the

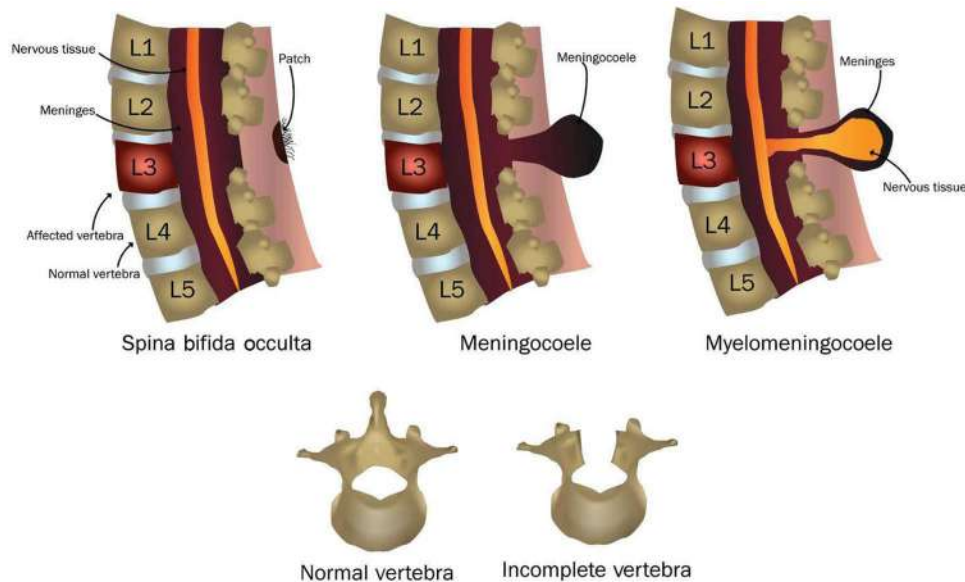


FIGURE 1.19 Spina bifida. (Courtesy of John Ward.)

Gross Anatomy of the Spinal Cord

The spinal cord is non-uniform in structure, 40 to 50 cm long, and consists of four regions: cervical, thoracic, lumbar, and sacral. There are two enlargements, cervical and lumbar, which correspond to the regions of the nerve plexuses which innervate the upper and lower limbs.

The **spinal cord is organised into 31 segments**, defined by 31 pairs of spinal nerves extending from both sides of the spinal cord, travelling towards the periphery via the intervertebral foramina. The spinal nerves are divided into 8 cervical, 12 thoracic, 5 lumbar, 5 sacral, and 1 coccygeal nerve. As there are eight pairs of cervical nerves and seven cervical vertebra, C1–C7 nerves exit the vertebral column above their corresponding vertebra, whilst **C8 nerves exit below the seventh cervical vertebra**. The remaining pairs of spinal nerves exit below their corresponding vertebra (Figure 1.20).

Each nerve emerges via two short roots: the anterior (motor) root and the posterior (sensory) root. Spinal nerves are formed from the union of these roots, and emerge through the intervertebral foramina. As you descend the cord, the spinal nerves

conus medullaris, the vertebral canal contains only the roots of the spinal nerves, which are collected in the **cauda equina** (Latin, “horse’s tail”, named after its distinctive appearance).

Coverings of the Spinal Cord

The spinal cord and part of the spinal nerve roots are sheathed and protected by three layers of meninges (pia mater, arachnoid mater, and dura mater). The dura extends along the nerve roots as the epineurium. The space between the dura and the internal surface of the vertebral canal is called the epidural space. The subarachnoid space is formed between the arachnoid and the pia mater, with the latter closely covering the external surface of the spinal cord. The **subarachnoid space, which extends to the level of the second sacral vertebra, contains the CSF** in which the nerve roots of the cauda equina are bathed. The pia mater is the innermost meningeal layer of the spinal cord. Thickenings of the pia mater, collectively known as the **denticulate ligaments** (tooth-like projections), are found on either side of the spinal cord. Their function is to suspend the spinal cord in the midline by attaching the spinal cord to the dura. The meningeal coverings of the spinal cord are shown in Figure 1.22.

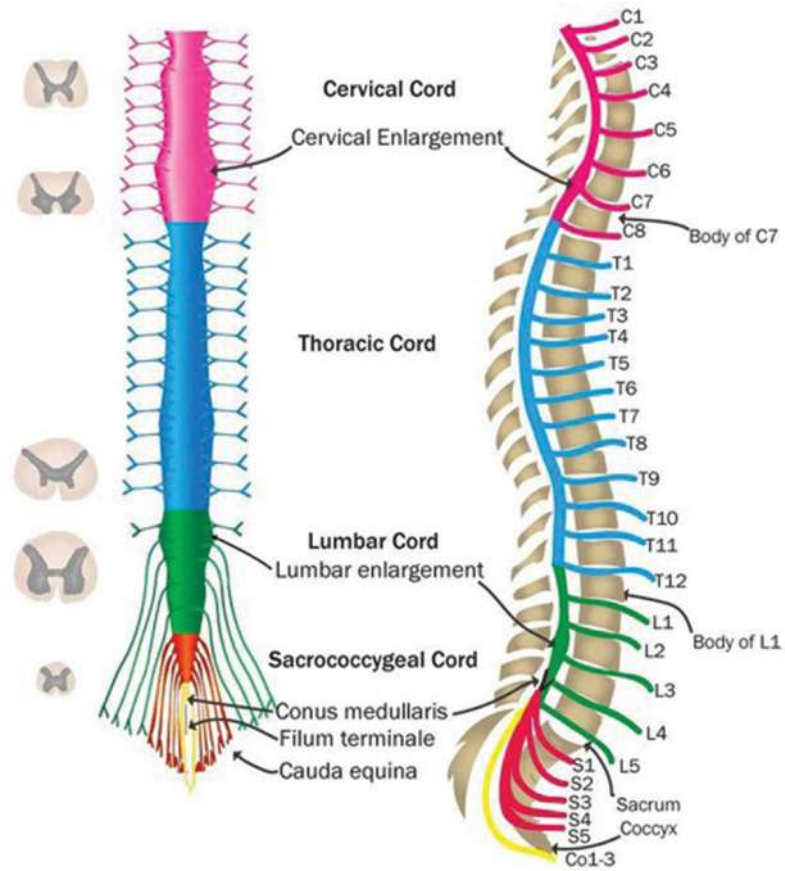


FIGURE 1.20 Gross anatomy of the spinal cord. (Courtesy of John Ward.)

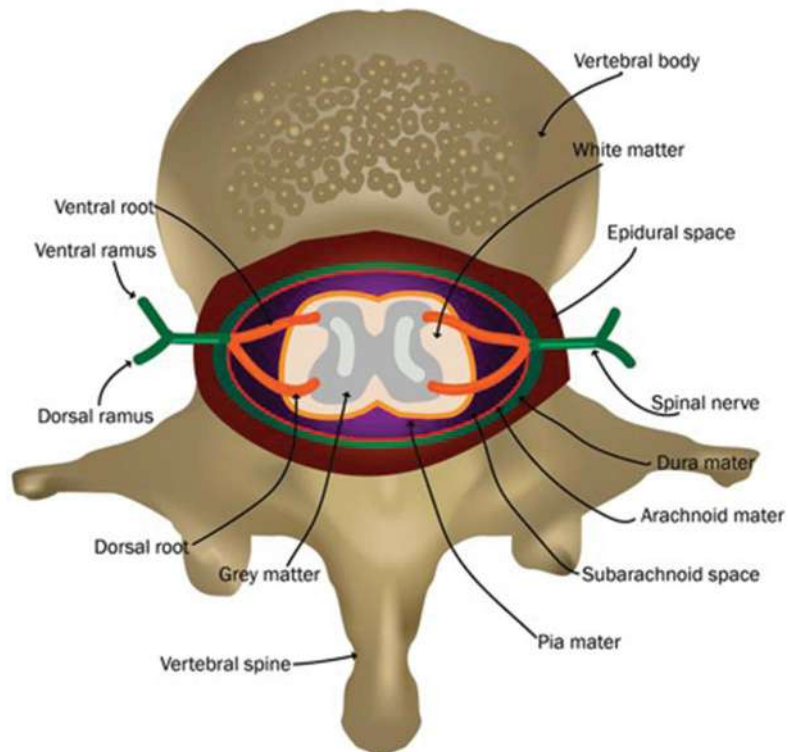


FIGURE 1.21 Bony covering of the spinal cord. (Courtesy of John Ward.)

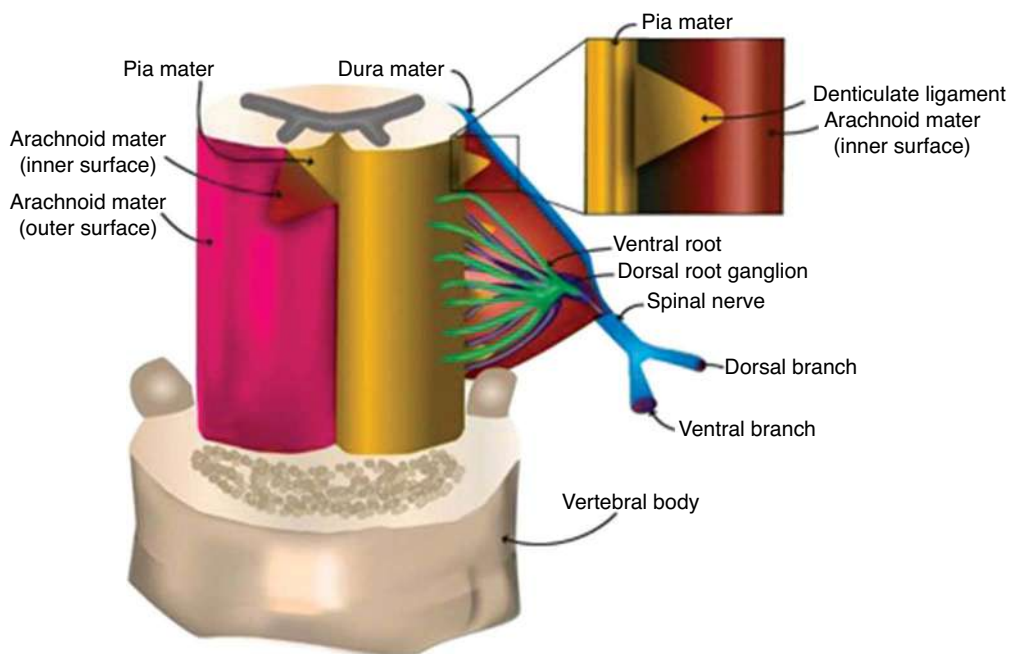


FIGURE 1.22 Meningeal covering of the spinal cord. (Courtesy of John Ward.)

Cross-Section of the Developed Spinal Cord

A cross-section of the spinal cord shows a central body of grey matter, shaped like an H or a butterfly, with its anterior and posterior wings (anterior and posterior horns) containing cell bodies and fibres and peripheral white matter, which contains only nerve fibres. The grey matter “wings” are connected by a transverse tract, the grey commissure, where the central or ependymal canal is located. In front of the grey commissure lies the anterior white commissure, where a bundle of white fibres crosses the midline.

Within the white matter surrounding the central grey matter, ascending tracts transmit sensory information to the brain, whilst descending tracts relay motor information from the brain to skeletal muscles. Key ascending and descending tracts have been highlighted in Figure 1.23.

Autonomic Nervous System and the Spinal Cord

The autonomic nervous system innervates smooth and cardiac muscles, secretory glands, and metabolic organs via a two-neuron chain. Pre-ganglionic fibres, with cell bodies in the brainstem or spinal cord, exit in the ventral ramus of the spinal nerve to ganglia (a ganglion is structure outside the CNS containing neuronal cell bodies. NB: the term “ganglion” can also refer to a cystic lesion related to a muscle tendon). This is the location of the cell body of post-ganglionic fibres, which then continue to visceral targets. The autonomic nervous system is subdivided into the sympathetic nervous system (SNS) and parasympathetic nervous system (PSNS).

The SNS outflow is described as thoracolumbar (T1–L2) and comes from the intermediolateral cell column or lateral horn – a lateral protuberance of the crossbar of the H of grey

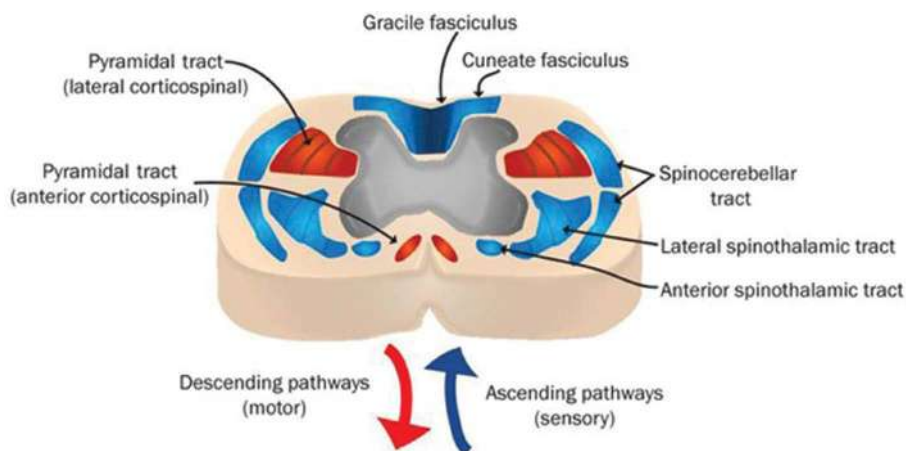


FIGURE 1.23 Key ascending (blue) and descending (red) tracts of the spinal cord. (Courtesy of John Ward.)

matter. Pre-ganglionic fibres enter the sympathetic chain as white (myelinated) *rami communicantes*, and post-ganglionic fibres exit as grey (unmyelinated) *rami communicantes* (singular: ramus communicans). Nerve plexuses surrounding the aorta (coeliac, superior mesenteric, and inferior mesenteric) also form a target for pre-ganglionic sympathetic nerves.

The PSNS outflow is described as craniosacral and is composed of the parasympathetic pre-ganglionic fibres which run with cranial nerves (III, VII, IX, X) and the interomediomedial sacral cord (S2–S4). Named ganglia associated with the PNS include:

- Ciliary ganglion (fibres from the Edinger-Westphal nucleus with the oculomotor nerve)
- Pterygopalatine ganglion (fibres within the facial nerve to supply the lacrimal gland)
- Submandibular ganglion (via the facial nerve to supply the submandibular salivary gland)
- Otic ganglion (via the glossopharyngeal nerve to the parotid gland) (see [Section 2](#))
- **The vagus nerve (CN X) provides parasympathetic supply to most viscera and synapses in ganglia close to the target structures** (see [Sections 2, 4, and 5](#) for more details)

The autonomic nervous system aims to maintain homeostasis of the body’s internal environment. The effect of the SNS is commonly described as “fight or flight” and, conversely, the effect of the PSNS as “rest and digest”. A comparison of sympathetic and parasympathetic effects is provided in [Table 1.5](#).

TABLE 1.5: Opposing effects of the sympathetic and parasympathetic nervous systems

Body System	Sympathetic Effect	Parasympathetic Effect
Cardiovascular	Increased heart rate and force of contraction, peripheral vasoconstriction	Decreased heart rate and force of contraction, peripheral vasodilation
Respiratory	Dilation of bronchi	Constriction of bronchi
Digestive	Decreased motility	Increased motility
Excretory	Reduced salivation, reduced lacrimation, increased sweat gland secretion	Increased salivation, increased lacrimation
Thermoregulatory	Contraction of erector pili muscles	
Visual	Pupil dilation and ciliary muscle relaxation	Pupil constriction and ciliary muscle contraction

CLINICAL NOTE

Sensory examination

A dermatome is an area of skin supplied by sensory (afferent) nerve fibres from a single spinal nerve. Their exact distribution varies between individuals, so common landmarks are used during clinical neurological examination (see [Table 1.6](#) and [Figure 1.24](#)).

TABLE 1.6: Commonly examined dermatomes

Spinal Nerve	Landmark
C2	Posterior skull, lateral to the occipital protuberance
C3	Supraclavicular fossa
C4	Acromioclavicular joint
C5	Radial (lateral) aspect of the distal upper arm, just proximal to the elbow
C6	Dorsal surface of the base of the thumb
C7	Dorsal surface of the base of the middle finger
C8	Dorsal surface of the base of the little finger
T4	Level of the nipples (fourth intercostal space)
T6	Level of the xiphoid process
T10	Level of the umbilicus
L2	Anteromedial thigh
L3	Level of the knee (medial epicondyle of the femur)
L4	Medial malleolus
L5	Dorsum of the foot (except the lateral aspect)
S1	Lateral aspect of the foot
S2	Popliteal fossa

Note: C1 has no dermatome.

CLINICAL NOTE

Motor examination

A myotome is a group of muscles innervated by a spinal nerve. Neurological examination should assess the strength (power) of muscle groups. Power is recorded using the Medical Research Council (MRC) grading: 0 – total paralysis, 1 – a flicker of movement, 2 – active movement with gravity eliminated, 3 – normal movement against gravity but not against additional resistance, 4 – movement against both gravity and resistance but still overcome, and 5 – normal power ([Table 1.7](#)).

TABLE 1.7: Spinal nerves associated with commonly tested movements

Action	Spinal Segment Tested
Upper Limb	
Shoulder abduction	C5, C6 (axillary nerve)
Elbow flexion	C5, C6 (musculocutaneous nerve)
Elbow extension	C7, C8 (radial nerve)
Wrist/finger flexion	C7, C8, T1
Wrist/finger extension	C6, C7
Finger abduction	C8, T1 (ulnar nerve)
Lower Limb	
Hip flexion	L2, L3
Hip extension	L4, L5
Knee flexion	L5, S1 (sciatic nerve)
Knee extension	L3, L4 (femoral nerve)
Ankle dorsiflexion	L4, L5 (deep peroneal nerve)
Ankle plantarflexion	S1, S2
Hallux extension	L5, S1
Anal tone	S2, S3, S4

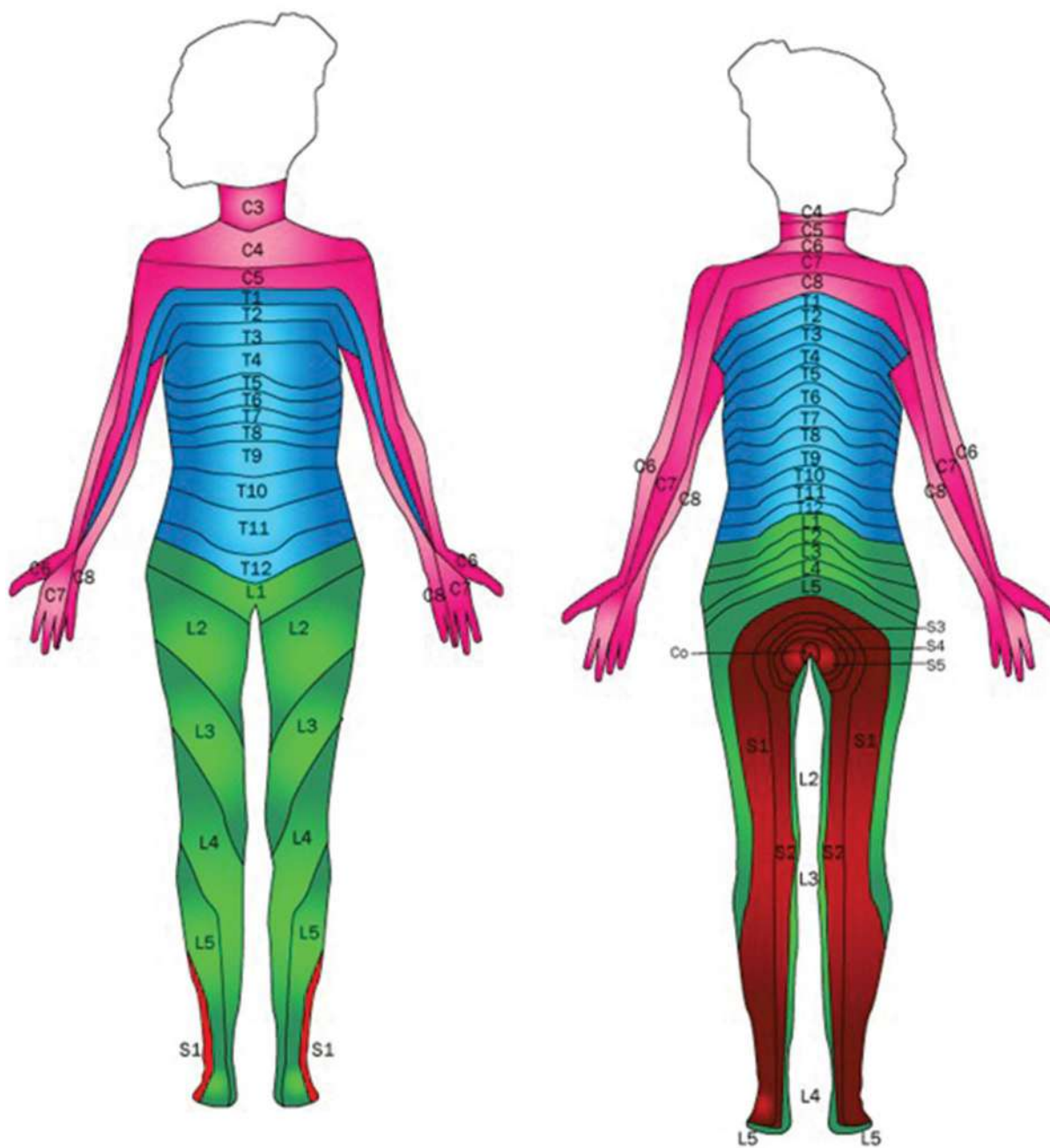


FIGURE 1.24 Dermatome map. (Courtesy of John Ward.)

Reflexes

Reflexes are involuntary responses to a stimulus. Stretch or tendon reflexes assess the integrity of a two-neuron reflex arc: an afferent (sensory) neuron and an efferent (motor) neuron. When a muscle is stretched – for example, by tapping on the attached tendon – groups of sensory proprioceptors (intrafusal muscle fibres) called muscle spindles are stimulated. They trigger a reflex arc instructing the muscle to contract (via extrafusal fibres). Relaxation of the antagonistic muscle group also occurs via inhibitory interneurons (Table 1.8).

TABLE 1.8: Commonly examined deep tendon reflexes

Tendon Reflex	Spinal Segment Tested
Biceps reflex	C5, C6
Brachioradialis reflex	C5, C6, C7
Triceps reflex	C6, C7, C8
Quadriceps reflex (Knee jerk)	L3, L4
Gastrocnemius reflex (Ankle jerk)	S1, S2
Plantar reflex	Integrity of the corticospinal tract

A normal response to testing the plantar reflex is a downward movement of the great toe; an upward movement is termed **Babinski's sign**.

Ascending Tracts

Ascending tracts transmit sensory information coming from the peripheral receptors to the brain. Sensory information can be processed consciously or subconsciously.

Subconsciously processed information is transmitted by tracts which do not follow a three-neuron sequence. These tracts transmit proprioceptive information from the skeletal muscles to the cerebellum. Anatomy of these tracts is beyond the scope of this chapter.

Consciously processed information is transmitted by ascending tracts that follow a three-neuron sequence. Two examples of tracts following this neuronal sequence and carrying consciously processed sensory information are the dorsal column and spinothalamic tracts.

Dorsal Column and Spinothalamic Tracts

The dorsal column pathway transmits tactile (fine touch), proprioception (joint position sense), and vibration sensation. First-order neurons enter the spinal cord through the dorsal root and ascend ipsilaterally as the *fasciculus gracilis* and *fasciculus cuneatus*, the dorsal columns. The medial fasciculus gracilis carries information from below T6, and the fasciculus cuneatus carries information from above T6. In the medulla oblongata, first-order neurons synapse with second-order neurons, which then cross the midline as arcuate fibres (forming the “**great sensory decussation**”) and twist up the brainstem, akin to a ribbon, as the **medial lemniscus**. Third-order neurons arise in the ventral posterior nucleus of the thalamus and traverse the posterior limb of the internal capsule to **terminate primarily in the postcentral gyrus, the somatosensory cortex**.

The spinothalamic tract transmits crude touch and pressure (anterior spinothalamic) and pain and temperature sensation (lateral spinothalamic). The first-order neurons of the spinothalamic tract travel through the dorsal root and synapse with second-order neurons in the grey matter of the spinal cord. The second-order neurons decussate in the anterior white commissure and then ascend contralaterally in the anterolateral white matter of the cord. The majority of fibres project to the thalamus and synapse onto third-order neurons, which follow the same path as those in the dorsal column pathway.

Pain triggers a polysynaptic “**nociceptive flexion reflex**” which can be seen clinically. Afferent sensory neurons stimulate interneurons in the spinal cord that result in almost instantaneous contraction of muscle flexors, moving your hand off a hot stove, for example (and relaxation of the opposite group of extensor muscles). The sensation of pain is described in two waves corresponding to two types of afferent neurons. Fast-onset, sharp, localised pain is mediated by A-delta neurons, and slower-onset, dull, poorly localised pain is mediated by C fibres.

It is important to note that the first-order neurons of the dorsal column pathway are large and myelinated, whilst the first-order neurons of the spinothalamic tract are small and thinly myelinated in nature. Therefore, the transmission of sensory information is faster across the dorsal column pathway than the spinothalamic tract.

The anatomy of the key ascending tracts is summarised in **Table 1.9** and **Figure 1.25**.

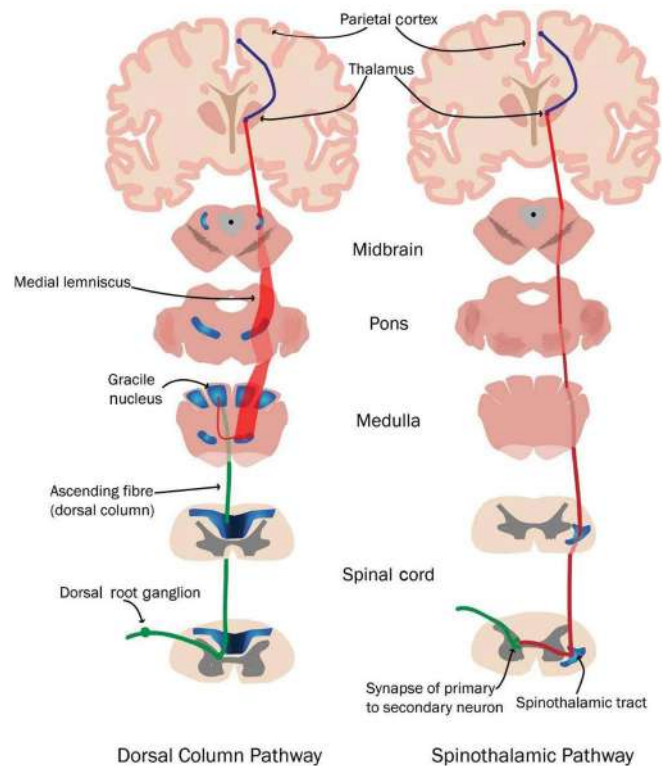


FIGURE 1.25 Anatomy of the dorsal column and spinothalamic pathways. (Courtesy of John Ward.)

CLINICAL NOTE

Lesions to the principal ascending tracts (see **Tables 1.10** and **1.11**).

Descending Tracts

Descending tracts transmit motor signals from the cortex to the motor neurons of the spinal cord (and brainstem) which innervate skeletal muscles. These tracts are involved in the regulation of motion (voluntary and involuntary), muscle tone, posture, and muscle reflexes. These tracts can be categorised into two groups depending on whether they pass through the medullary pyramids: the pyramidal tracts involved in the voluntary control of the muscles, and the extrapyramidal tracts involved in the involuntary control of the muscles, e.g., tone, posture, and balance.

This section will focus on the key pyramidal tracts, which include the corticospinal tract and the corticobulbar tract.

Corticospinal Tract

The corticospinal tract arises from several regions within the brain, mainly from the motor regions of the brain, including the primary motor cortex (precentral gyrus), supplementary motor area, and premotor cortex and from the somatic sensory cortex, parietal lobe, and cingulate gyrus. The tract projects ipsilaterally through the corona radiata, posterior limb of the internal capsule, crus cerebri, pons, and medulla. In the medulla, the

TABLE 1.9: Neuronal arrangement of the key ascending pathways

	First-Order Neuron	Second-Order Neuron	Third-Order Neuron
<i>Dorsal column pathway</i>	The cell body is found in the dorsal root ganglion	The cell body is found within the nucleus cuneatus and nucleus gracilis in the posterior medulla oblongata	The cell body is found in the ventral posterolateral nucleus of the thalamus
	Ascends ipsilaterally in the dorsal aspect of the spinal cord (via fasciculus gracilis and fasciculus cuneatus)	Decussates in the medulla oblongata (“great sensory decussation”) and ascends contralaterally as the medial lemniscus	Ascends through the posterior limb of the internal capsule
	Synapses with second-order neurons in the medulla oblongata	Synapses with third-order neurons in the ventral posterolateral nucleus of the thalamus	Ends in the somatosensory cortex of the brain (postcentral gyrus of the parietal lobe)
<i>Spinothalamic tract</i>	The cell body is found in the dorsal root ganglion	The cell body is found in the spinal cord	The cell body is found in the ventral posterolateral nucleus of the thalamus
	Descend or ascend one or two vertebral levels within the spinal cord	Decussates in the anterior white commissure and ascends in the anterolateral spinal cord	Ascends through the posterior limb of the internal capsule
	Synapses with second-order neurons in the substantia gelatinosa of Rolando of the spinal cord	Synapses with third-order neurons in the ventral posterolateral nucleus of the thalamus	Terminates in the somatosensory cortex of the brain (postcentral gyrus of the parietal lobe)

corticospinal tract, together with the corticobulbar tract, form the pyramids. When the tract reaches the inferior boundary of the medulla, at the lower limit of the pyramids, it separates into two tracts: the lateral corticospinal tract and the anterior corticospinal tract.

The lateral (crossed) corticospinal tract decussates at the inferior margin of the medulla, while the anterior corticospinal tract continues to descend ipsilaterally into the cervical/thoracic region of the spinal cord before decussating at the respective segment. **Roughly 10% of corticospinal tract fibres continue without decussation at the level of the foramen magnum as the anterior (uncrossed) tract.**

The corticospinal tracts are formed of a two-neuron chain. Upper motor neurons (UMNs) that form the lateral corticospinal tract synapse with the lower motor neurons (LMNs) that supply all the skeletal muscles involved in controlling the movement of the limbs. In contrast, UMNs that form the anterior corticospinal tract synapse with LMNs that supply all the skeletal muscles involved in producing axial movement of the trunk. The axons of the LMNs leave the spinal cord to synapse with muscle fibres at the neuromuscular junction (NMJ).

The lateral (crossed) corticospinal tract is depicted in [Figure 1.26](#).

Corticobulbar Tract

Corticobulbar tract fibres originate mainly from the primary motor cortex, but also the somatosensory cortex and the middle frontal gyrus.

The tract follows a similar path to the corticospinal tract and is also formed of a two-neuron chain. It descends ipsilaterally through the corona radiata and the genu of the internal capsule into the brainstem to synapse with LMNs of the cranial nerves (trigeminal, facial, vagus, spinal accessory, and hypoglossal). The LMNs usually receive a bilateral innervation (ipsilateral and contralateral) except for the lower facial and hypoglossal nuclei. LMNs arise from these nuclei and synapse with muscle fibres found within the face, head, and neck.

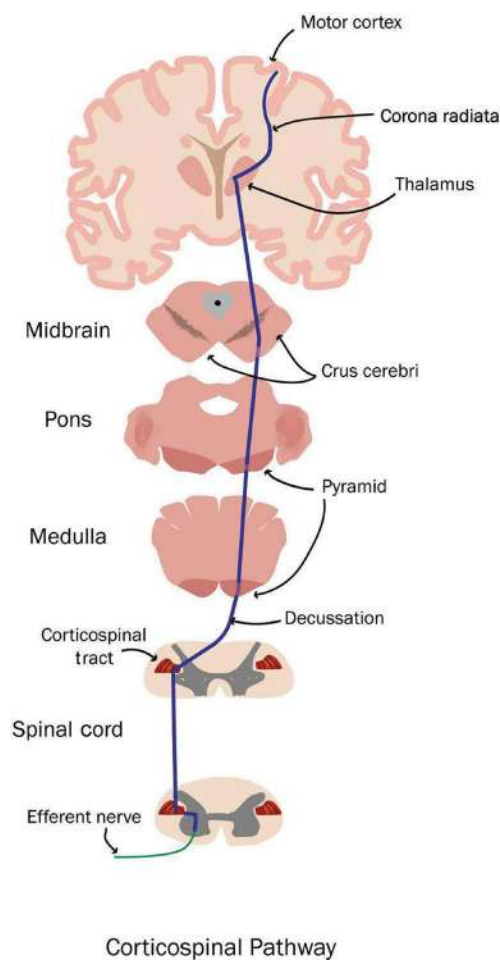


FIGURE 1.26 Anatomy of the corticospinal pathway. (Courtesy of John Ward.)

Each facial nucleus is separated into an upper and lower compartment, supplying muscles of facial expression in the respective upper and lower segments of the face. **The upper facial nucleus receives bilateral innervation, whereas the lower facial nucleus receives contralateral innervation only. The hypoglossal nucleus receives contralateral innervation only.** This has clinical implications.

crying (pseudobulbar affect), dysarthria, dysphagia and slowness of speech, and hyperreflexia.

Blood Supply

The spinal cord is supplied by both vertical and segmental arteries.

TABLE 1.10: Dorsal column pathway lesions

Site of Lesion	Symptoms Presented by the Patient	Common Causes	Sensory Testing
Above the point of decussation (e.g., internal capsule)	Contralateral loss of vibration, proprioception, and tactile sensation below the level of the lesion	Causes include subacute combined degeneration (vitamin B ₁₂ deficiency), multiple sclerosis, trauma, neurosyphilis, space-occupying lesions including tumours, cysts syringomyelia, paraneoplastic, and genetic diseases	The best way to test for this pathway is by using a low-frequency tuning fork (128 Hz) (vibration) and to test position sense (proprioception); positive Romberg's sign
Below the point of decussation (e.g., spinal cord)	Ipsilateral loss of sensory sensation below the level of the lesion		

TABLE 1.11: Spinothalamic tract lesions

Site of Lesion	Symptoms Presented by the Patient	Common Causes	Sensory Testing
Spinothalamic tract	Contralateral loss of pain and temperature, pressure, and light touch sensation below the level of the lesion	Common causes include multiple sclerosis, space-occupying lesions, and penetrating injuries	The best way to test for this pathway is by using a pin prick to induce pain
Anterior white commissure	Bilateral loss sensation at the level of the lesion		

CLINICAL NOTE

Lesions to the principal descending tracts

UMN and LMN lesions present differently in different clinical settings. Patients with UMN lesions present with muscle weakness (pyramidal weakness), hyperreflexia, hypertonia, spastic paralysis with clasp-knife spasticity, and Babinski's sign. Patients with LMN lesions present with muscle weakness, muscle atrophy, fasciculations, hyporeflexia, hypotonia, and flaccid paralysis (Table 1.12).

TABLE 1.12: Corticospinal tract lesions

Site of Lesion	Clinical Presentation
UMN lesion above the point of decussation (above the level of the foramen magnum)	Symptoms associated with an UMN lesion on the contralateral side of the body
UMN lesion below the point of decussation	Symptoms associated with an UMN lesion on the ipsilateral side of the body
LMN lesion	Symptoms associated with a LMN lesion on the ipsilateral side of the body

Pseudobulbar Palsy (Corticobulbar Tract)

Pseudobulbar palsy is a medical condition that arises when both sides of the corticobulbar tract become injured. Patients with this condition present with uncontrollable episodes of laughing and

Vertical Arteries

Vertical arteries run longitudinally along the length of the spinal cord. There are three vertical arteries: the anterior spinal artery and the paired posterior spinal arteries.

The anterior spinal artery originates from the vertebral artery and passes through the ventral median fissure, supplying the anterior two-thirds of the spinal cord.

The paired posterior spinal arteries originate from the vertebral artery or the posterior inferior cerebellar artery (PICA) and run along the posterolateral aspect of the spinal cord, supplying the posterior one-third of the spinal cord.

The anterior and posterior vertical arteries are joined by an anastomosis through the pia mater called the arterial vasocorona, which encircles the spinal cord, supplying the lateral aspect. Inferiorly, the descending vertical arteries anastomose again to form the cruciate anastomosis of the conus medullaris, supplying the distal aspect of the spinal cord.

Segmental Arteries

The blood supply provided by the vertical arteries is reinforced by segmental arteries that enter the spinal cord at each segmental level. Segmental arteries at different levels of the spinal cord have different origins, e.g., vertebral arteries, PICAs, ascending cervical arteries, deep cervical arteries, posterior intercostal arteries, lumbar arteries, and lateral sacral arteries.

In the thoracic region, each segmental artery gives rise to an anterior and posterior radicular artery. In addition, at some vertebral levels, the segmental artery gives rise to segmental medullary arteries, which join the anterior spinal artery and the paired posterior spinal arteries. The artery of Adamkiewicz is the largest segmental medullary artery, originating from the aorta at the level of T9–L2, supplying the lower half of the spinal cord (Figure 1.27).

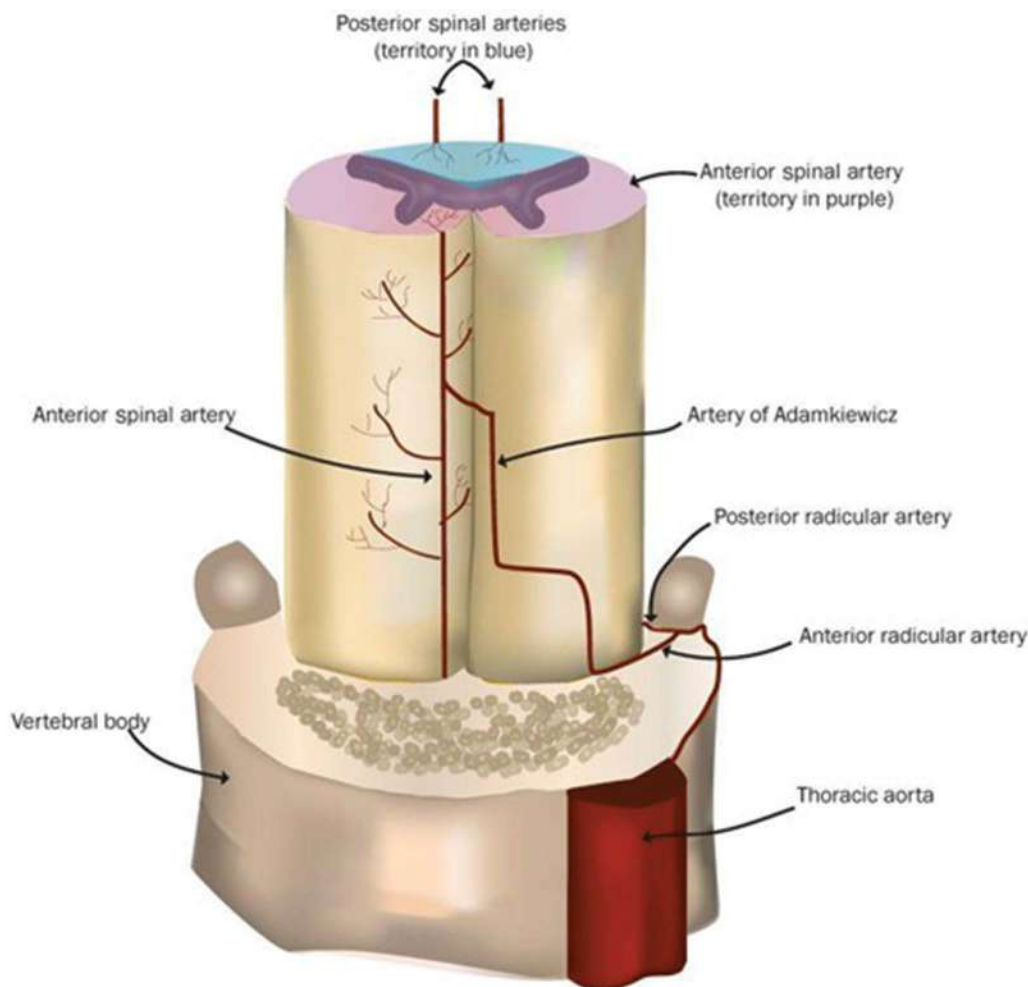


FIGURE 1.27 Blood supply to the spinal cord. (Courtesy of John Ward.)

Venous Drainage

The spinal cord is drained by three anterior and three posterior spinal veins, which run along the length of the spinal cord, receiving blood from radicular veins. This network of spinal veins drains into the internal and external vertebral plexuses, which drain into the systemic circulation. The internal vertebral plexus also communicates superiorly with the dural venous sinuses, and inferiorly, in the male, with the prostatic plexus.

CLINICAL NOTE

Spinal cord ischaemia

Spinal cord segments T3–T7 are most vulnerable to ischaemia, as these regions receive the smallest amount of arterial input from radicular arteries.

Spinal Cord Pathologies

Several factors can contribute to pathologies within the spinal cord, including developmental issues, trauma, infection, inflammatory disease, autoimmune attacks, vascular dysfunction, nutrient

deficiency, and genetic predisposition. The following segments of this section focus on a variety of clinical disorders that are associated with the spinal cord. These conditions have been stratified as traumatic, compressive, or non-traumatic, with respect to aetiology.

Traumatic Causes of Spinal Cord Damage

Brown-Séquard Syndrome

Brown-Séquard syndrome is a rare spinal disorder characterised by a hemisection of the spinal cord. Commonly caused by penetrating trauma (e.g., a stab wound), the condition causes the individual to present with ipsilateral UMN signs below the level of the lesion (corticospinal tract lesion) and ipsilateral LMN signs at the level of the lesion (flaccid paralysis). Sensory deficits, including ipsilateral loss of vibration, pressure, touch, and proprioceptive sense (dorsal columns lesion), as well as contralateral (spinothalamic tract) loss of temperature and pain sensations, are also seen below the level of the lesion. If the hemisection involves the oculosympathetic pathway, the patient will also present with symptoms associated with Horner's syndrome, including miosis, partial ptosis, and anhidrosis.

In clinical practice, a complete hemisection of the spinal cord is rare; therefore, patients typically present with some motor,

sensory, and autonomic deficits representing damage to certain tracts within the spinal cord.

Central Cord Syndrome

Central cord syndrome is the most common form of incomplete spinal cord injury (SCI). The injury is commonly cervical in nature, and patients present with a characteristic cape-like distribution of pain and temperature sensory loss, as well as greater levels of muscle weakness in their upper limbs than their lower limbs and bladder dysfunction. This condition arises following trauma and falls in young patients or hyperextension of the cervical spine in the elderly.

Anterior Cord Syndrome

Anterior cord syndrome is an incomplete cord syndrome characterised by interruption of blood flow (ischaemia of the anterior spinal artery), resulting in damage to the anterior two-thirds of the spinal cord.

As the spinothalamic and corticospinal tracts are found within this region, patients present with sensory deficits, such as loss of crude touch, pressure, pain, and temperature sensation. These patients may become paralysed below the level of the lesion and may present with bladder/bowel, autonomic (e.g., hypotension), and sexual dysfunction.

following a lesion to the dorsal column pathway. The lesion follows as a result of direct trauma to the spinal cord, or the interruption of blood flow through the posterior spinal arteries (**Figure 1.28**).

Epidemiology of Spinal Cord Injuries

The annual incidence of traumatic SCIs varies worldwide. Among developed regions, the incidence of traumatic SCI is higher in North America (39 cases per million individuals) than in Australia (16 cases per million individuals) or Western Europe (15 cases per million individuals), owing to higher rates of violent crime and self-harm (Ahuja et al., 2017).

Cervical spine injury comprises about half of these cases, with motor vehicle accidents, falls, and sport-related as the most common reasons for injury. SCIs are an economic burden on modern society, with estimated lifetime costs of £1.12 million per case in the United Kingdom (McDaid et al., 2019). These injuries are debilitating for the individual and require long-term care. Improvement in patients' function varies, depending on the severity of the injury; however, the regenerative capacity of the CNS is minimal. Current academic research aims to identify ways to regenerate neurons that have become damaged during the injury process and to restore connectivity in order to re-establish functionality (National Institute for Health and Care Excellence [NICE], 2016).

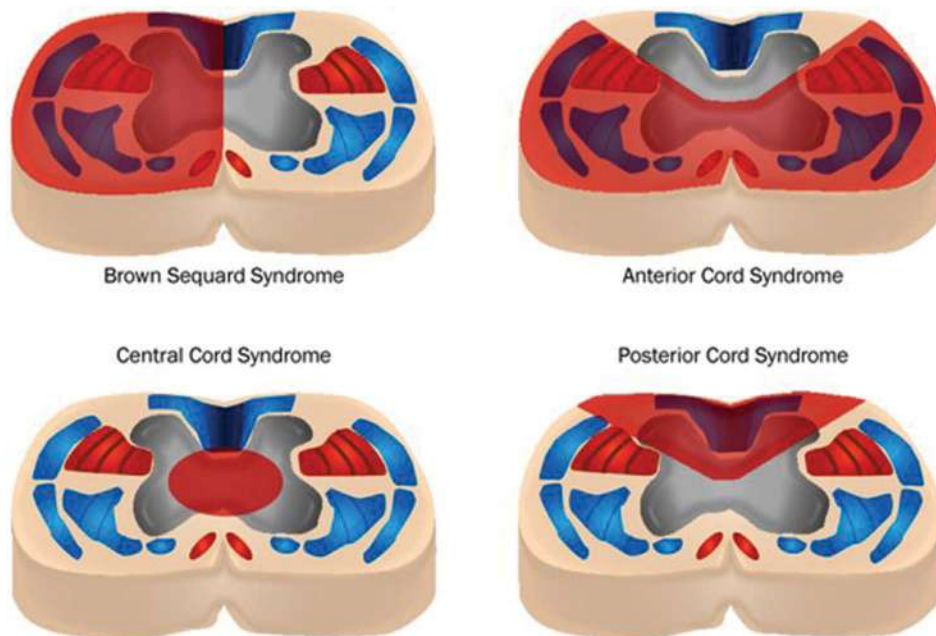


FIGURE 1.28 Traumatic spinal cord pathology. (Courtesy of John Ward.)

Proprioceptive and vibratory sensations remain intact within these patients, as the dorsal column pathway resides in the posterior third of the spinal cord.

Posterior Cord Syndrome

Posterior cord syndrome is an incomplete cord syndrome characterised by the loss of proprioceptive and vibratory sensations

Compressive Causes of Spinal Cord Injury/Defect

Spinal Cord and Nerve Root Compression

Spinal cord compression can be caused by an array of pathologies. Common examples include intervertebral disc disease, tumours, infection, haematomas, cysts, or pathological fractures (fractures that occur in diseased vertebrae commonly due to secondary cancer spread from prostate, breast, and lung cancers). Clinically, one

should check for UMN signs, sensory loss, sphincter control, and signs of infection (the latter may indicate an extradural abscess).

Whilst compression of the cord itself produces UMN signs due to corticospinal tract damage, compression of the emerging spinal nerves produces LMN signs. **This is commonly caused by herniation of an intervertebral disc, which classically protrudes posterolaterally.**

Cauda Equina Syndrome

Cauda equina syndrome is a collection of signs and symptoms caused by the compression of lumbar and sacral nerves below the end of the spinal cord, most commonly due to the herniation of intervertebral discs of the lumbar vertebrae. Patients present with an acute onset of lower back pain, saddle anaesthesia, sciatica, hyporeflexia, and bladder, bowel, and sexual dysfunction, as well as a reduction in anal tone. This condition is a medical emergency because of the possibility of paralysis of the lower limbs, as well as permanent damage to the bladder and bowels. This condition needs urgent neurosurgical referral.

Learning Point

The cauda equina is composed of L2–L5, S1–S5, and coccygeal nerve spinal roots within the dural sac.

Non-Traumatic Causes of Spinal Cord Injury/Defect

Non-traumatic SCI can result from many causes. Notable causes, not discussed in detail here, include infections and inflammation, which present variably depending on their location and the spinal segments involved.

Degenerative Changes

Spinal stenosis most commonly occurs due to spinal degeneration occurring with age. The facet joints enlarge as they become arthritic, osteophytes protrude into the spinal canal, and the supportive ligaments stiffen and thicken, all contributing to encroachment upon the spinal cord. Compressive symptoms include backache, pain radiating down the buttocks and calves, and pins and needles in the legs and feet. Symptoms classically arise with long periods of standing or walking, and improve upon spine flexion.

Learning Point

In contrast to patients with vascular claudications, patients with spinal canal stenosis have normal pulses and ABPI on both sides. The straight-leg-raise test (SLR) is restricted on both sides.

Syringomyelia

The cape-like distribution of pain and temperature loss seen in central cord syndromes can also be caused by syringomyelia, a cystic collection of CSF within the central canal. As with central cord syndromes, an inverse paraplegia is also seen where motor weakness is seen predominantly in the upper limbs. This condition has a strong association with Chiari malformation – the protrusion of the cerebellar tonsils through the foramen magnum.

Acute Poliomyelitis

Acute poliomyelitis is an infectious disease caused by poliovirus. The virus enters the CNS by either crossing the blood–brain barrier or by transport via a peripheral nerve.

Patients with this disease present with muscle weakness and muscle atrophy as a result of damage to the anterior motor neurons within the spinal cord and the brainstem.

The disease is relatively rare, with a low incidence in the UK. This is attributable to the introduction of the polio vaccine as part of the childhood immunisation programme.

Multiple Sclerosis

Multiple sclerosis (MS) is a progressive neurodegenerative disorder characterised by demyelination, where the immune system attacks the myelin protective sheath that covers the nerve cells in the brain and spinal cord. This damage disrupts communication between neurons. Immune cells attack oligodendrocytes and myelin sheaths to disrupt communication between adjacent neurons. Lesions can occur anywhere within the CNS; therefore, symptoms vary widely amongst different patients.

Transverse Myelitis

Transverse myelitis is a condition characterised by the inflammation of whole spinal cord segment(s) involving the entire width of the spinal cord, with subsequent demyelination and disruption of electrical signals passing through the spinal cord. The exact aetiology of the condition remains to be elucidated, but it can arise following infections, autoimmune attacks (e.g., MS), and other inflammatory disorders. Treatment relies on the underlying causes of the disease, with anti-microbials, corticosteroids, and immunosuppressants often used as therapies for treating these patients.

Guillain-Barré Syndrome

Guillain-Barré syndrome (GBS) affects the peripheral rather than central nervous system but is of significant clinical importance. It is a rare autoimmune condition triggered by an upper respiratory tract infection or a gastrointestinal infection. Patients experience an “ascending paralysis”, sensory deficits, and absent deep tendon reflexes. If the paralysis extends up to the muscles of respiration, the condition becomes life-threatening.

Lumbar Puncture (Spinal Tap)

A lumbar puncture is a medical procedure that involves the percutaneous aspiration of CSF from the subarachnoid space of the spinal cord for diagnostic purposes (commonly for the diagnosis of meningitis or encephalitis). It can also be performed for therapeutic purposes, including drainage of CSF when pressure is high, intrathecal injection of local anaesthetic (spinal anaesthesia, *vide infra*), or chemotherapy. This procedure is usually performed below the L2 level, at the level of L3/L4 or L4/L5, to avoid the conus medullaris. To locate this region, one must palpate for the iliac crests, usually while the patient is seated (see [Section 6](#), Pelvis and Perineum). A lumbar puncture must not be performed in a patient with raised intracranial pressure for fear of coning of the brainstem through the foramen magnum.

Epidural versus Spinal Anaesthesia

Spinal anaesthesia is a medical procedure involving the administration of anaesthetic drugs into the subarachnoid space. The substances injected take immediate effect (within

5 minutes), as substances need to diffuse only a short distance towards the nerves of the cauda equina.

Epidural anaesthesia involves the administration of anaesthetics into the epidural space of the spinal cord. It is usually carried out in patients undergoing labour to alleviate pain associated with uterine contractions. However, it can also be performed in individuals undergoing major thoracic or abdominal surgery to continue postoperative pain control by topping up with opioids. The level of anaesthesia can be varied to suit the surgical indication; there is more flexibility than spinal anaesthesia, as the needle lies outside the coverings of the spinal cord. The analgesia takes a longer time to

take effect, as the anaesthetic needs to diffuse through the meningeal layers before affecting nervous tissue within the spinal cord.

The most important side effect of spinal and epidural anaesthesia is hypotension. This side effect is more pronounced in patients undergoing spinal anaesthesia. Headaches can also follow lumbar puncture or spinal anaesthesia. There is a risk of spinal haematoma in patients undergoing anticoagulant therapy, and the coagulation status should be well optimised before embarking on spinal or epidural anaesthesia and until the epidural catheter is removed (Figure 1.29).

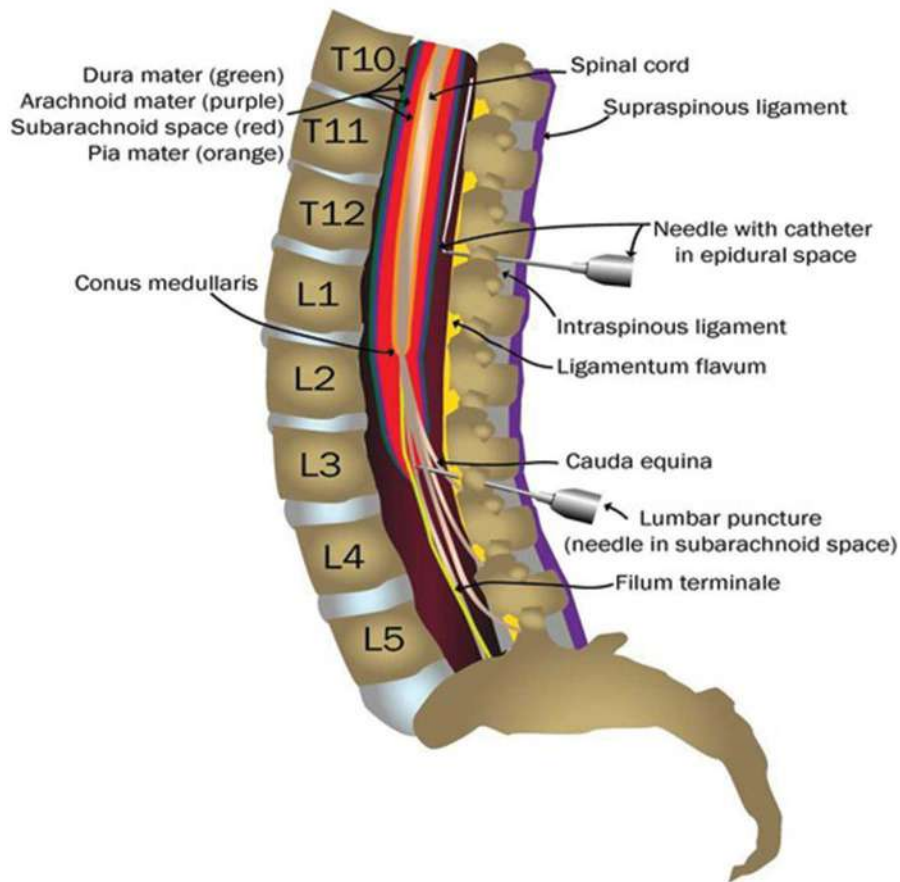


FIGURE 1.29 Applied anatomy: Lumbar puncture and epidural anaesthesia. (Courtesy of John Ward.)

Revision Questions

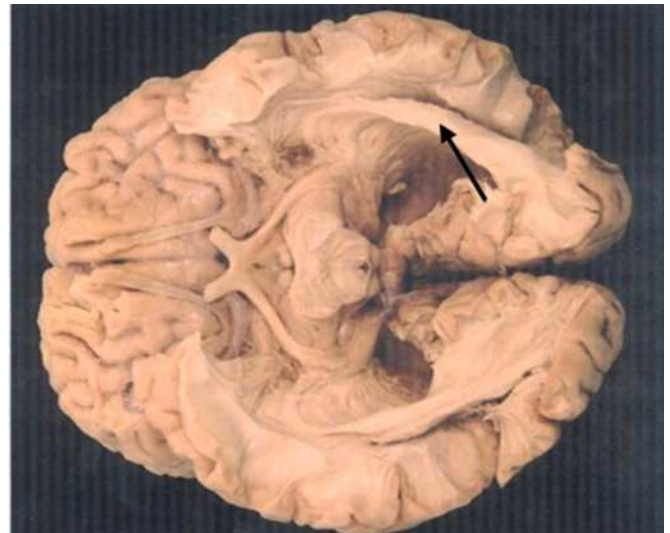
Written Questions

- Q1. Where do the internal carotid arteries enter the skull?
- Q2. Which arteries anastomose to connect the circle of Willis, and where do they branch from?
- Q3. What are the four main mechanisms of stroke?
- Q4. If the lateral part of the cerebral hemisphere appears ischaemic, which artery is most likely to be occluded?
- Q5. Why do most strokes affect the lateral part of the cerebral hemisphere?
- Q6. At how many weeks gestation does the neural tube form, and which germ layer is it formed from?
 - a. 3 weeks gestation, ectoderm
 - b. 3 weeks gestation, mesoderm
 - c. 3 weeks gestation, endoderm
 - d. 12 weeks gestation, ectoderm
 - e. 12 weeks gestation, mesoderm

- Q7. The developing basal plate gives rise to neurons with which function in the adult spinal cord?
- Sensory neurons
 - Motor neurons
 - Autonomic neurons
 - Rami communicantes
 - Mixed spinal nerve
- Q8. How many pairs of nerves emerge from the spinal cord?
- 27: C7, T12, L5, S2, Co1
 - 29: C7, T12, L5, S2, Co3
 - 29: C8, T12, L5, S3, Co1
 - 31: C8, T12, L5, S5, Co1
 - 31: C8, T10, L5, S5, Co3
- Q9. In which parts of the spinal cord do the two enlargements corresponding to plexuses innervating the limbs lie?
- Cervical and thoracic
 - Thoracic and lumbar
 - Lumbar and sacral
 - Thoracic and sacral
 - Cervical and lumbar
- Q10. Which meningeal layer thickens to form the denticulate ligament?
- Pia
 - Arachnoid
 - Dura
 - Arachnoid and dura
 - Pia and arachnoid
- Q11. What best describes the outflow of the sympathetic nervous system (SNS)?
- Cranio-sacral (S2–S4)
 - Sacral only (below S2)
 - Thoracolumbar (T1–L5)
 - Thoracolumbar (T1–L2)
 - All levels of the spinal cord
- Q12. Where does the spinothalamic tract decussate?
- The great sensory decussation
 - The anterior white commissure
 - The arcuate fibres
 - The caudal medullary pyramids
 - It runs ipsilaterally
- Q13. How many neurons form the corticospinal tract?
- Two-neuron chain*: greater motor neuron, lesser motor neuron
 - Two-neuron chain*: afferent motor neuron, efferent motor neuron
 - Two-neuron chain*: upper motor neuron, lower motor neuron
 - Three-neuron chain*: primary order, secondary order, tertiary order
 - Three-neuron chain*: first order, second order, third order
- Q14. From which parent vessel does the artery of Adamkiewicz arise and at which spinal level?
- Vertebral artery, C5–C7
 - Vertebral artery, C1–C3
 - Anterior spinal artery, T9–L2
 - Aorta, T5–T7
 - Aorta, T9–L2
- Q15. Which ascending/descending pathway(s) run in the territory supplied by the posterior spinal artery?
- Dorsal columns
 - Dorsal columns and spinothalamic pathway
 - Spinothalamic pathway
 - Anterior corticospinal and spinothalamic
 - Medial lemniscus

Spotter Questions

- Q1. Which of the following best describes the fibre bundle indicated by the arrow?



(Courtesy of the Department of Anatomical Sciences, SGUL.)

- Anterior commissure
 - Corpus callosum
 - Crus cerebri
 - Fornix
 - Optic radiation
- Q2. Which of the following functions will be impaired by damage to the fibre bundle indicated by the arrow?
- Balance
 - Hearing
 - Olfaction
 - Taste
 - Vision

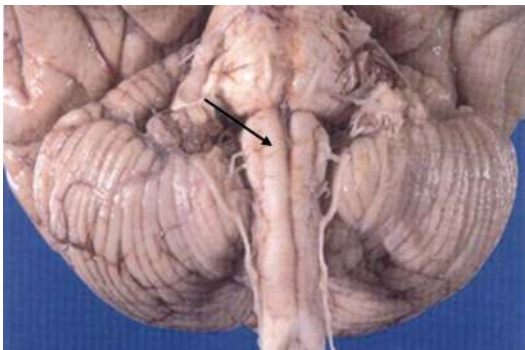
Q3. Which of the following best describes the feature indicated by the arrow?



(Courtesy of the Department of Anatomical Sciences, SGUL.)

- a. Inferior cerebellar peduncle
 - b. Inferior colliculus
 - c. Pulvinar
 - d. Superior cerebellar peduncle
 - e. Superior colliculus
- Q4. Which of the following best describes the function of the feature indicated by the arrow?
- a. Control of balance
 - b. Control of hearing
 - c. Control of visual reflexes
 - d. Processing of touch sensation
 - e. Processing of vision

Q5. Which of the following best describes the feature indicated by the arrow?



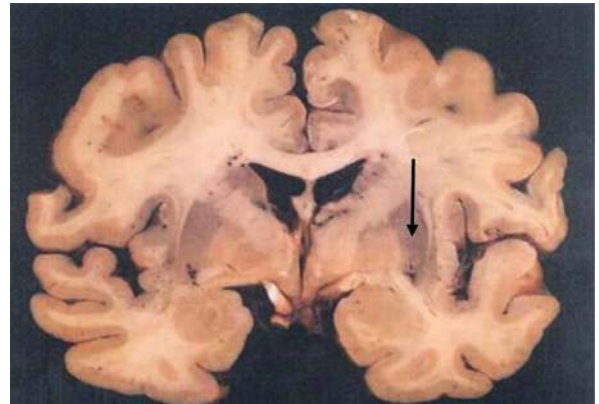
(Courtesy of the Department of Anatomical Sciences, SGUL.)

- a. Flocculus
- b. Olive
- c. Pons
- d. Pyramid
- e. Tonsil

Q6. Which of the following best describes the function of the feature indicated by the arrow?

- a. It is a source of an important input to the cerebellum from the cerebral cortex
- b. It is made up of fibres carrying spinal input to the thalamus
- c. It is made up of fibres carrying spinal input to the cerebellum
- d. It is made up of fibres carrying vestibular input to the cerebellum
- e. It is made up of fibres projecting from the motor cortex to the spinal motor neurons

Q7. Which of the following best describes the region of grey matter indicated by the arrow?



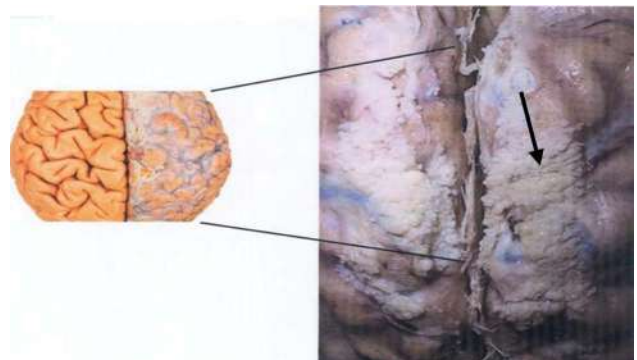
(Courtesy of the Department of Anatomical Sciences, SGUL.)

- a. Caudate nucleus
- b. Globus pallidus
- c. Insula
- d. Putamen
- e. Thalamus

Q8. Which of the following describes the role of the region of grey matter indicated by the arrow?

- a. Cognitive function
- b. Endocrine regulation
- c. Episodic memory
- d. Motor function
- e. Sensory regulation

Q9. Which of the following best describes the structures indicated by the arrow?



(Courtesy of the Department of Anatomical Sciences, SGUL.)

- a. Arachnoid granulations
- b. Falx cerebri
- c. Inferior sagittal sinus
- d. Superior sagittal sinus
- e. Tentorium cerebelli

Q10. Which of the following best describes the function of the structures indicated by the arrow?

- a. Reabsorption of CSF from the subarachnoid space
- b. Formation of CSF
- c. Secretion of neurohormones
- d. Stabilisation of the brain within the cranial cavity
- e. Transfer of blood from the cerebral cortex to the superior sagittal sinus

Q11. Which structure is indicated by the arrow?



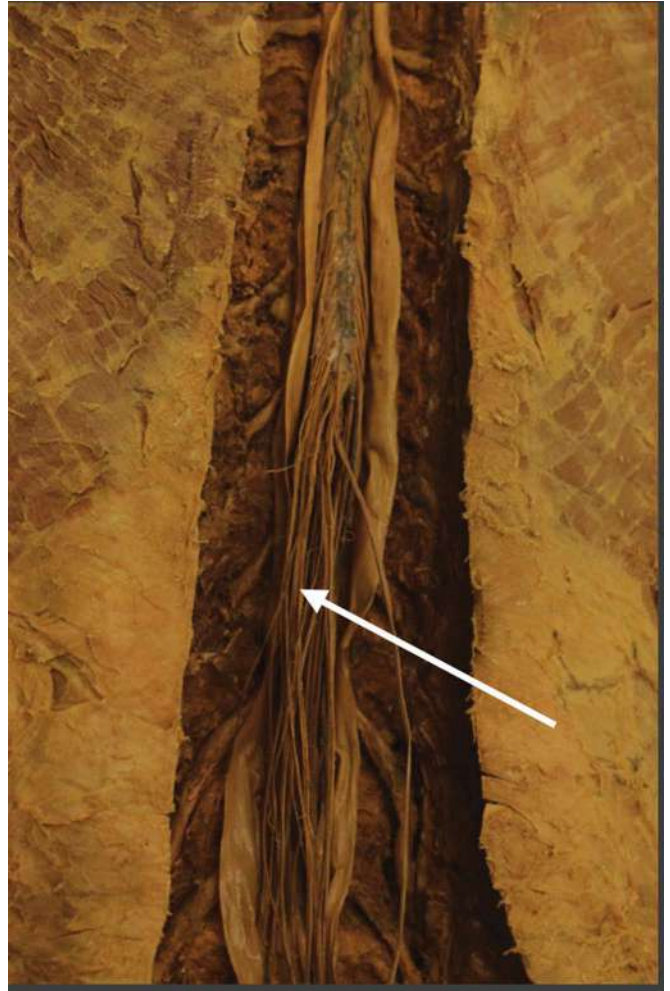
(Courtesy of the Department of Anatomical Sciences, SGUL.)

- a. Cauda equina
- b. Conus medullaris
- c. Denticulate ligament
- d. Filum terminale
- e. Pia mater

Q12. At which vertebral level does this structure taper off?

- a. T11/T12
- b. L1/L2
- c. L2/L3
- d. L3/L4
- e. L4/L5

Q13. Which structure is indicated by the arrow?



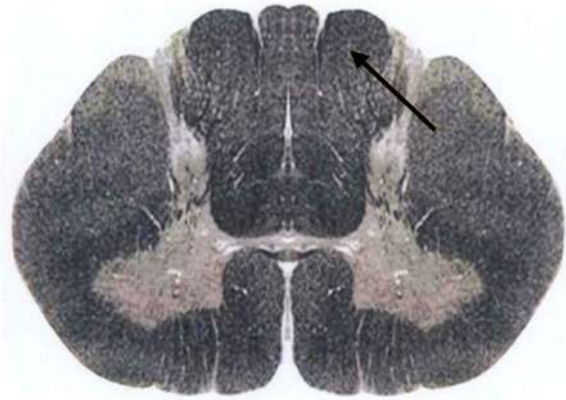
(Courtesy of the Department of Anatomical Sciences, SGUL.)

- a. Conus medullaris
- b. Cauda equina
- c. Filum terminale
- d. Arachnoid mater
- e. Dura mater

Q14. Which nerves make up this structure?

- a. C1–C4
- b. C5–C8
- c. T1–T6
- d. T7–T12
- e. Lumbosacral nerves

Q15. Which of the following functions would be impaired by damage to the region indicated by the arrow?



(Courtesy of the Department of Anatomical Sciences, SGUL.)

- Control of upper limb flexors
- Fine touch perception
- Pain perception
- Temperature perception
- Control of lower limb extensors

Q16. Which of the following best describes the level of the spinal cord section shown in the image?

- C4
- L1
- L5
- T1
- T7

Answers

Written Questions

- A1: The internal carotid arteries enter the middle cranial fossa through the carotid canal (through temporal bone).
- A2: The anterior communicating artery connects the two anterior cerebral arteries. On each side, the anterior cerebral artery branches from the internal carotid artery, which is connected to the posterior communicating artery. The posterior communicating artery connects to the posterior cerebral artery, completing the circle of Willis.
- A3: The four main causes of stroke are thrombosis, embolism, hypoperfusion, and haemorrhage.

A4: The middle cerebral artery is most likely to be occluded because it supplies the lateral portions of the cerebrum. The middle cerebral arteries are branches of the internal carotid arteries.

A5: Most strokes affect the lateral part of the cerebral hemisphere, as the middle cerebral arteries are a continuation of the internal carotid arteries, which carry about 80% of the blood supply to the brain.

- | | |
|--------|--------|
| A6: a | A11: d |
| A7: b | A12: b |
| A8: d | A13: c |
| A9: e | A14: e |
| A10: a | A15: a |

Spotter Questions

- | | |
|-------|--------|
| A1: e | A9: a |
| A2: e | A10: a |
| A3: e | A11: b |
| A4: c | A12: b |
| A5: d | A13: b |
| A6: e | A14: e |
| A7: d | A15: b |
| A8: d | A16: a |

Further Reading

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2

ANATOMY OF THE HEAD AND NECK

Reviewed by Qassim F. Baker, David Sunnucks, and Georga Longhurst

Learning Objectives

- Scalp
- Bones of the skull, cranial fossae, and foramina
- Eye and orbit
- Infratemporal fossa
- Ear
- Nose and paranasal sinuses
- Cranial nerves
- Oral cavity, tongue, and palate
- Salivary glands: parotid and submandibular glands
- Cervical vertebrae
- Fascia and nerves of the neck, along with the suprahyoid and infrahyoid muscles
- Triangles of the neck and their contents
- Blood supply of the head and neck: carotid arteries, subclavian vessels, and jugular veins
- Hyoid bone, larynx, and trachea
- Thyroid and parathyroid glands
- Lymphatic drainage of the head and neck
- The clinical approach to the diagnosis of neck swellings
- Pharynx and cervical oesophagus

The Scalp

The scalp is the area of the head that extends from the forehead to the superior nuchal line of the occipital bone and extends laterally to the zygomatic arch. It consists of the following five layers, which are easy to memorise using the mnemonic SCALP:

S: skin, which has abundant sebaceous glands and hair follicles, so it is a common site for sebaceous cysts.

C: connective tissue, which has a rich blood supply, therefore scalp lacerations bleed profusely.

A: aponeurosis (epicranial) of the **occipitofrontalis** muscle.

The occipitofrontalis muscle is supplied by the facial nerve and functions to move the scalp on the skull and to raise the eyebrows during the expression of surprise (one of the clinical tests to examine the facial nerve).

The anterior frontal belly originates from the subcutaneous tissues of the eyebrows and nose, in addition to the zygomatic arch.

The posterior occipital belly originates from the superior nuchal line of the occipital bone.

Both bellies insert into the epicranial aponeurosis, which is attached laterally to the temporal fascia.

L: loose connective tissue, where fluids, such as pus and blood, can collect.

P: periosteum (pericranium), which adheres to the sutures of the calvaria.

Arterial Supply of the Scalp

The arterial supply of the scalp is profuse and arises from branches of the internal carotid artery via the supratrochlear and supraorbital arteries arising from the ophthalmic artery and the external carotid artery via the superficial temporal, posterior auricular, and occipital arteries.

- *Supratrochlear artery*: supplies the medial region of the forehead
- *Supraorbital artery*: supplies the lateral region of the forehead
- *Superficial temporal artery*: supplies the frontal and temporal regions of the scalp
- *Posterior auricular artery*: supplies the region superior and posterior to the ear
- *Occipital artery*: supplies the posterior scalp

Venous Drainage of the Scalp

The anterior aspects of the scalp and forehead are drained by the supratrochlear and supraorbital veins, which unite to form the facial vein. The posterior aspect of the scalp is drained by the occipital vein, which forms the suboccipital venous plexus. Laterally, the scalp is drained by the superficial temporal vein. This unites with the maxillary vein to form the retromandibular vein. All of the veins of the scalp eventually drain into the external jugular vein, which joins the subclavian vein at the root of the neck.

Note that there are anastomoses of the veins of the scalp and the diploic veins of the cortical bone with the intracranial venous plexuses, through emissary veins. This is of clinical significance, as infection can spread from the scalp to intracranial structures.

Innervation of the Scalp

Sensory supply is by the trigeminal nerve (CN V) and cervical plexus.

Anteriorly, the scalp is supplied by the divisions of the trigeminal nerve:

- Supratrochlear and supraorbital nerves arise from the ophthalmic division (CN V1)
- Zygomaticotemporal nerve arises from the maxillary division (CN V2)
- Auriculotemporal nerve arises from the mandibular division (CN V3)

Posteriorly, the scalp is supplied by branches from the greater (dorsal ramus of C2) and lesser occipital nerves (ventral ramus of C2), which arise from the cervical plexus.

Bones of the Skull

The skull contains 22 bones (8 form the neurocranium, plus 14 facial bones or viscerocranium) (Figure 2.1).

The bones of the neurocranium are one frontal, one occipital, two parietal, two temporal, one ethmoid, and one sphenoid.

The bones of the facial skeleton are one vomer, two nasal conchae, two nasal bones, two maxillae, one mandible, two palatine bones, two zygomatic bones, and two lacrimal bones.

The neurocranium may be divided into the calvaria (cranial vault) and cranial base. The bones of the calvaria are mostly flat and consist of outer and inner tables with cancellous marrow in between them (the diploë, or diploic bone).

Sutures: the joints between the bones of the skull are called sutures. These are fibrous joints that allow only a small amount of movement. Premature closure of sutures is called craniosynostosis, which clinically may manifest as increased intracranial pressure, with or without hydrocephalus and mental retardation.

Four major sutures are described:

- Sagittal suture between the parietal bones
- Coronal suture between the frontal and parietal bones
- Lambdoid suture between the occipital and parietal bones
- Squamous suture (lateral suture) between the parietal and temporal bones

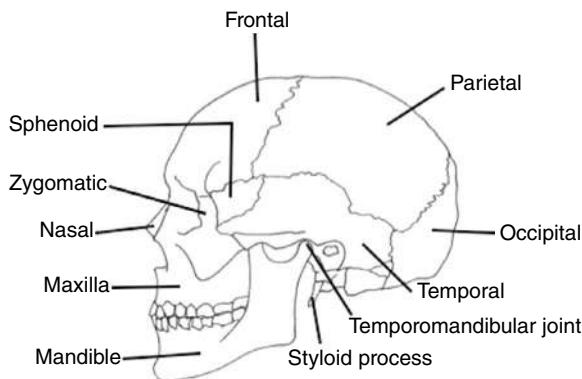


FIGURE 2.1 Lateral view of skull showing the positions of the skull bones. (Courtesy of Calum Harrington-Vogt.)

Learning Point

The **pterion** is the point on lateral side of the skull where four bones (sphenoid, temporal, frontal, and parietal) meet. The bone is thin here, so this is the weakest part of the bony skull. Blunt trauma may thus fracture the pterion, resulting in laceration of the anterior branch of the middle meningeal artery that lies deep to it, causing an extradural haematoma between the bone and dura. Its surface anatomy is two finger-breadths superior to the zygomatic arch and one thumb-breadth lateral to the side of the orbit.

The **fontanelles** are soft regions between the cranial bones of the infant skull. They are important because they allow the skull to deform during birth (known as caput moulding), and they stretch to accommodate the growing brain. There are two major fontanelles in the new-born. The anterior fontanelle is the largest and

lies between the frontal suture (frontal bones are separate in the new-born) and the parietal bones (at the junction of the frontal, coronal, and sagittal sutures). The posterior fontanelle lies between the parietal bones and the occipital bone (the junction between the sagittal and lambdoid sutures).

The posterior fontanelle closes (ossifies) 2 to 3 months after birth, whilst the anterior fontanelle closes between 18 and 24 months after birth. In some individuals (prevalence varies according to race) the frontal suture fails to close, leaving a persistent metopic suture in the adult.

CLINICAL NOTE

Anterior and posterior fontanelles are important clinically because they allow clinicians to undertake ultrasound imaging of the fetal brain to look for pathology (e.g., hydrocephalus), because the unossified cartilage fontanelles act as acoustic windows and do not absorb much ultrasound energy.

A bulging fontanelle may indicate increased intracranial pressure (before closure of the fontanelles) and is seen in conditions such as encephalitis, meningitis, and hydrocephaly. Sunken fontanelles are a sign of dehydration. Additionally, a cerebrospinal fluid (CSF) drain can be placed percutaneously into a fontanelle to relieve an acute hydrocephalus.

QUIZ QUESTION

Q. Name the bones that form the calvaria.

Base of the Skull

The base of the skull is described as having three fossae (Figure 2.2):

- Anterior cranial fossa
- Middle cranial fossa
- Posterior cranial fossa

The contents of each fossa are shown in Table 2.1.

CLINICAL NOTE

HEAD TRAUMA

Head trauma can be an isolated injury or part of trauma to other body regions. Following paramedic assessment, all head trauma patients should be clinically assessed in A&E following a special head injury chart, including the Glasgow Coma Scale (GCS), to assess the level of consciousness, and is not only applied to head trauma patients but to other acutely ill patients, in addition to CN and pupil examination. All severe head injury patients should be assumed to have an associated cervical spine injury. For this reason, applying a cervical collar is an important part of resuscitation.

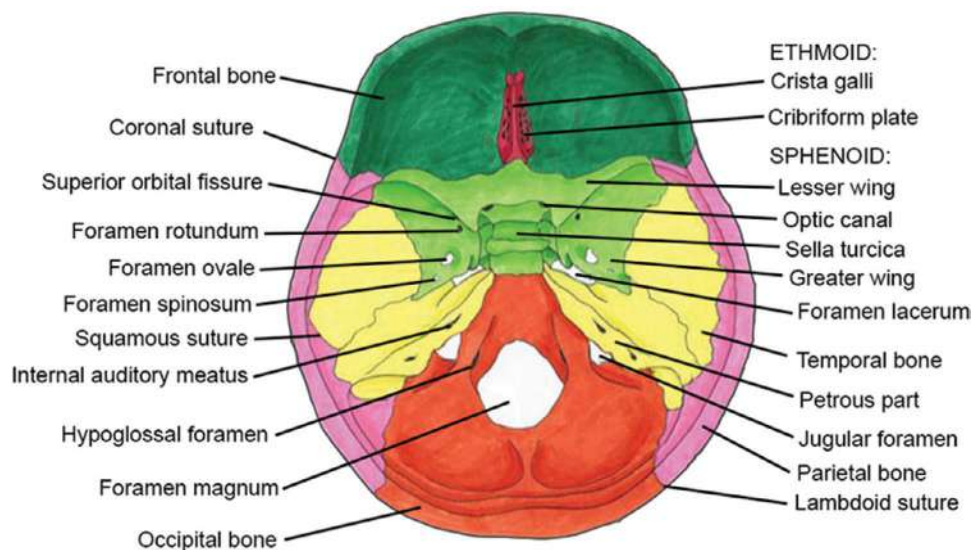


FIGURE 2.2 Cranial fossae with calvaria removed and seen from above. (Courtesy of Calum Harrington-Vogt.)

TABLE 2.1: Contents of the cranial fossae

Fossa	Contents	Cranial Bones Are Formed By
Anterior cranial fossa	<ul style="list-style-type: none"> Frontal lobes, cribriform foramina in cribriform plate (part of ethmoid bone) to transmit the fibres of CN I (olfactory) Optic canal for optic nerve and ophthalmic artery 	<ul style="list-style-type: none"> Frontal and ethmoid bones and lesser wings of sphenoid
Middle cranial fossa	Temporal lobes, foramen rotundum, foramen ovale, foramen spinosum, foramen lacerum, sella turcica (where the pituitary gland is situated), and superior orbital fissure	Greater wings and body of sphenoid and the anterior aspect of the petrous temporal bones
Posterior cranial fossa	<ul style="list-style-type: none"> The occipital lobe is positioned above the tentorium cerebelli The brainstem and the cerebellum sit beneath the tentorium cerebelli It contains the foramen magnum (within the occipital bone), jugular foramen, internal acoustic meatus, and the hypoglossal canal 	Posterior aspect of the petrous temporal bone, the squamous and mastoid of temporal bones, and the occipital bone

Skull Fractures

Skull fractures can be linear, depressed, or compound, where there are scalp or facial wounds, or both (Figure 2.3).

Note that most fractures occur at the anterior cranial fossa (about 70%) and may be associated with the following:

- CSF can escape through the nose (rhinorrhoea), and this has a risk of meningitis, as the meninges are torn
- Bruising around the eyes (raccoon or panda eyes)
- There is risk of infection if the frontal sinus is involved, due to its communication with the nasal cavity
- Anosmia (loss of smell sensation) can follow fractures of the anterior cranial fossa due to damage to the filaments of the olfactory nerve

Basal fractures of the petrous temporal bone may be associated with leakage of CSF from the ears (otorrhoea) and Battle’s sign (bruising behind the ear over the mastoid process).



FIGURE 2.3 Lateral skull X-ray showing a compression fracture (arrowed). (Courtesy of Qassim F. Baker.)

Skull fractures are serious when they are complicated by intracranial bleeding, injury to the brain and CNs, and risk of infection when associated with scalp/facial wounds or connected to a cavity such as the pharynx and the nasal sinuses. Axial CT scan is the imaging of choice.

Foramina and Their Contents

As mentioned in **Table 2.1**, many foramina can be found at the base of the skull. **Table 2.2** highlights structures which pass through these foramina.

Note that the foramen lacerum is not a true foramen, but a gap which transmits the pterygoid (Vidian) nerve and vessels.

TABLE 2.2: Foramina of the skull

Foramen	Structures Passing Through
Cribriform foramina of cribriform plate (of ethmoid bone)	Olfactory nerve fibres (CN I)
Optic foramen	Optic nerve (CN II), ophthalmic artery (branch of the internal carotid artery before it divides into the MCA and ACA)
Superior orbital fissure	Oculomotor nerve (CN III), trochlear nerve (CN IV), ophthalmic branch of trigeminal nerve (CN V1), abducens nerve (CN VI), superior and inferior ophthalmic veins, sympathetic fibres from the internal carotid plexus
Foramen rotundum	Maxillary branch of trigeminal (CN V2)
Foramen ovale	Mandibular branch of trigeminal (CN V3)
Foramen spinosum	Middle meningeal artery and veins, meningeal branch of mandibular nerve (CN V3)
Internal auditory meatus	Facial nerve (CN VII), vestibulocochlear nerve (CN VIII), nervus intermedius and labyrinthine vessels
Jugular foramen	Internal jugular vein, glossopharyngeal nerve (CN IX), vagus nerve (CN X), accessory nerve (CN XI)
Foramen magnum	Spinal cord, vertebral arteries, lowest part of brainstem
Hypoglossal canal	Hypoglossal nerve (CN XII)

The Orbit and Eye

The Orbit

The orbit is a pyramidal cavity of the skull, with the base anteriorly and the apex posteriorly (**Figure 2.4**). It contains the following:

- Eyeball (globe, or bulbus oculi)
- *Nerves:* optic, abducens, oculomotor, branches of CN V1 and V2, ciliary ganglion
- *Muscles:* extraocular muscles (*vide infra*)
- Ophthalmic vessels
- Nasolacrimal apparatus

The boundaries of the orbit are:

- *Roof:* orbital plate of the frontal bone (separating the orbit from the anterior cranial fossa) and lesser wing of the sphenoid
- *Floor:* orbital plate of the maxilla (forming the roof of the maxillary sinus) and orbital process of palatine bone and zygomatic bone
- *Medial wall:* ethmoid bone, frontal bone, and lacrimal and sphenoid bones. The nasolacrimal canal is located anteriorly within the medial wall. It drains tears to the inferior meatus of the nasal cavity
- *Lateral wall (the thickest wall of the orbit):* the zygomatic and greater wing of the sphenoid bone and the zygomatic process of the frontal bone
- *Apex:* located at the opening of the optic canal
- *Base:* opens anteriorly into the face and is bound by the eyelids
- The orbital margin is formed by the frontal bone superiorly, the frontal and zygomatic bones laterally, the zygomatic and maxilla bones inferiorly, and the maxilla and frontal bones medially

Foramina of the Orbit

The foramina include the optic canal and the superior orbital fissure, both of which allow structures to enter and leave the orbit.

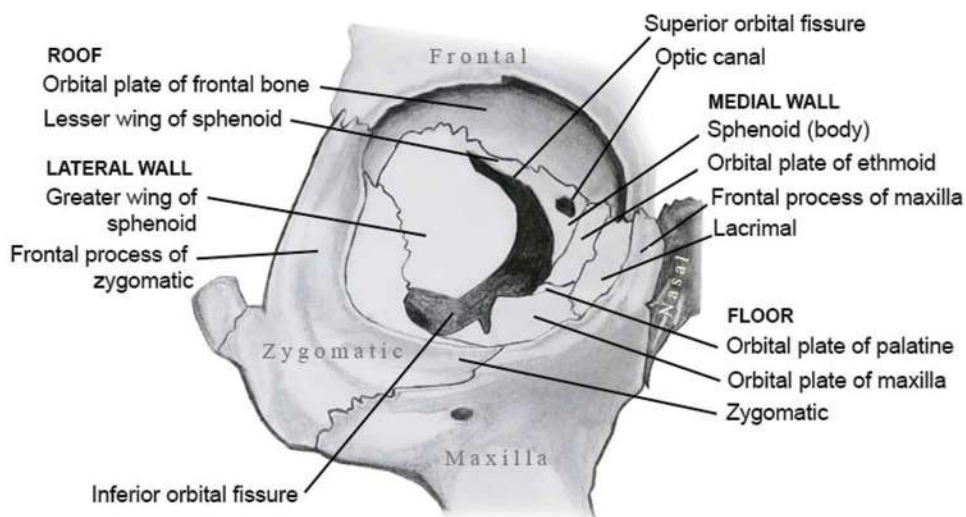


FIGURE 2.4 Boundaries of the right orbit. (Courtesy of Aditya Mavinkurve.)

Superior Orbital Fissure

The superior orbital fissure is a slit-like opening located between the greater and lesser wings of the sphenoid. From superior to inferior, it transmits the:

- *Lacrimal nerve* (branch of CN V1), which supplies the skin of the upper eyelid
- *Frontal nerve* (branch of CN V1), which divides into supra-trochlear and supraorbital nerves to supply the skin of the forehead
- *Ophthalmic veins*, which drain into the cavernous sinus
- *Trochlear nerve* (CN IV), which innervates the superior oblique muscle
- *Oculomotor nerve* (CN III), which innervates all the extrinsic muscles of the eye except for the superior oblique and lateral rectus
- *Nasociliary nerve* (branch of CN V1), which gives rise to the long ciliary nerve, which carries sympathetic fibres to the dilator pupillae muscle
- *Abducens nerve* (CN VI), which innervates the lateral rectus

The inferior orbital fissure (**Figure 2.4**) lies within the floor of the orbit and transmits the infraorbital nerve (from CN V2) and artery (from the maxillary artery) and vein, in addition to the zygomatic nerve (from CN V2) and branches from the pterygopalatine ganglion.

Optic Canal

The optic canal is located within the lesser wing of the sphenoid. It transmits the following structures:

- Optic nerve (CN II), which transmits visual information from the retina to the occipital lobe of the brain
- Ophthalmic artery, which supplies the structures of the orbit

Eyelids

The eye is protected by the upper and lower eyelids. The palpebral fissure is the opening between the two eyelids. Closure of the eyelids results from contraction of orbicularis oculi, which is supplied by the facial nerve (CN VII), and opening results from

contraction of the levator palpebrae superioris, which is supplied by the oculomotor nerve (CN III). The superior tarsal muscle is a smooth muscle that raises the upper eyelids and is supplied by sympathetic nerves (paralysis of this muscle is one of the features of Horner's syndrome).

The conjunctiva is the mucous membrane that lines the inside of the eyelids (palpebral conjunctiva) and is continuous with the conjunctiva over the globe (bulbar conjunctiva).

Arterial Supply

The eyelid receives a rich blood supply from the lateral and medial palpebral arteries (branches of the ophthalmic artery), the facial artery (via the angular branch), and the superficial temporal artery (via the transverse facial artery).

Venous Drainage

The medial eyelid drains via the medial palpebral vein into the angular and ophthalmic veins. The lateral eyelid drains via the lateral palpebral vein into the superficial temporal vein.

Innervation

The trigeminal nerve (CN V) provides sensory innervation to the eyelid; eyelid muscle innervation is discussed in more detail later. The supraorbital branch of the ophthalmic nerve (CN V1) innervates the upper lid, and the infraorbital branch of the maxillary nerve (CN V2) supplies the lower lid.

The Eye

The eye consists of the eyeball and the optic nerve. The eyeball is the globe-shaped structure located within the bony orbit that contains the optical apparatus. The optic nerve (CN II) is the cranial nerve responsible for vision, while the oculomotor (CN III), trochlear (CN IV), and abducens (CN VI) are responsible for eye movements.

Layers of the eyeball (**Figure 2.5**) include the following:

1. *Fibrous layer*: contains the sclera and cornea, which are continuous with each other and provide shape to the eyeball. The sclera is the white part of the eyeball and provides attachment for extraocular muscles. The cornea is

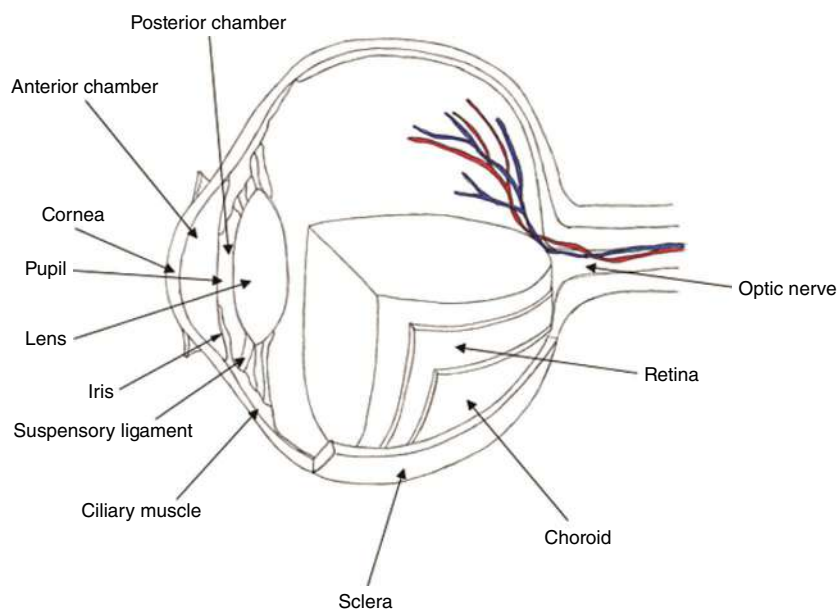


FIGURE 2.5 Layers of the eye. (Courtesy of Calum Harrington-Vogt.)

the transparent part of the eyeball and is located anteriorly; it functions to refract light entering the eye so that it is focused on the retina. The cornea has a stronger refractory power than the lens; however, only the lens can change shape and therefore is responsible for accommodation. The cornea is avascular and is dependent on the aqueous humour for nourishment. If the cornea becomes damaged due to disease or trauma, corneal grafting (transplant) can provide definitive treatment. It involves surgically replacing the damaged cornea with a healthy donor's cornea.

2. **Vascular layer:** consists of the choroid, iris, and ciliary body. The choroid is a layer of connective tissue that is highly vascularised to support and nourish the retina. The iris is a group of smooth muscles that change the diameter of the pupil in response to light stimuli. The ciliary body attaches to the lens through the ciliary processes (Figure 2.5). Contraction of the ciliary muscle relaxes the pull on the lens. This results in the lens forming a more rounded shape and moving slightly anterior. The lens is a biconvex, transparent structure which is situated posterior to the iris. Similar to the cornea, it is completely avascular and is dependent on the aqueous humour for nourishment.
3. **Inner layer:** contains the retina, which can be divided into neural and pigmented layers. The neural layer is located on the lateral and posterior surfaces of the eye. It contains photoreceptors which detect light. The pigmented layer does not contain any photoreceptors, but instead is connected to the choroid layer. This helps to support and nourish the neural layer and is continuous throughout the inner eyeball. The centre of the retina is called the macula and is located posteriorly in the eyeball. The central point of the macula is termed the fovea (meaning a small hole or depression) and can be viewed during ophthalmoscopy (Figure 2.6). The macula is responsible for central (focused) vision and most

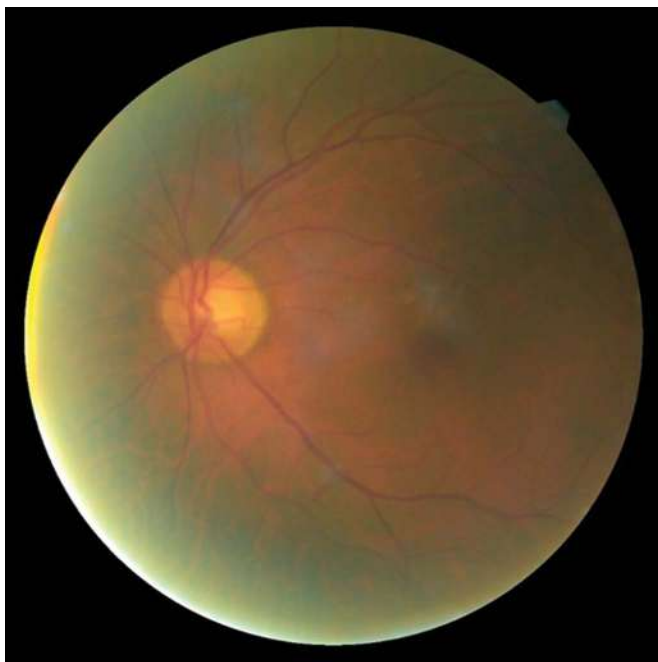


FIGURE 2.6 Ophthalmoscopy showing the optic disc (the yellow spot) and the radiating retinal vessels. (Courtesy of Qassim F. Baker.)

of coloured vision, as a high density of photoreceptor cells are located here. Photoreceptors are divided into rods and cones. Rods are responsible for vision in low-light environments and have low acuity. Cones, on the other hand, are for high-light environments and have high acuity as well as colour receptors. The fovea contains only cone photoreceptors, while the macula contains mostly cone cells with a few rod cells.

Innervation of the Eye

Optic Nerve

The optic nerve (CN II) arises as an outpouching of the diencephalon (optic stalks) during embryonic development. Light enters the retina through the optic disc and relays visual information to the brain. The optic nerve runs through the optic canal to the optic chiasma (partial decussation) and continues as the optic tract (posterior to the chiasma) to the lateral geniculate nucleus (relay centre in the thalamus for the visual pathway). It then travels to the pretectal nuclei and superior colliculus of the midbrain. The visual fibres continue from the lateral geniculate body to the optic radiation and terminate in the occipital cerebral cortex. The optic nerve is encased by the meningeal layers (pia, arachnoid, and dura) along its course, until it pierces the sclera, where it subsequently fuses with all three layers. The central retinal artery (first branch of the ophthalmic artery) enters within the nerve and runs to the retina (Figure 2.7).

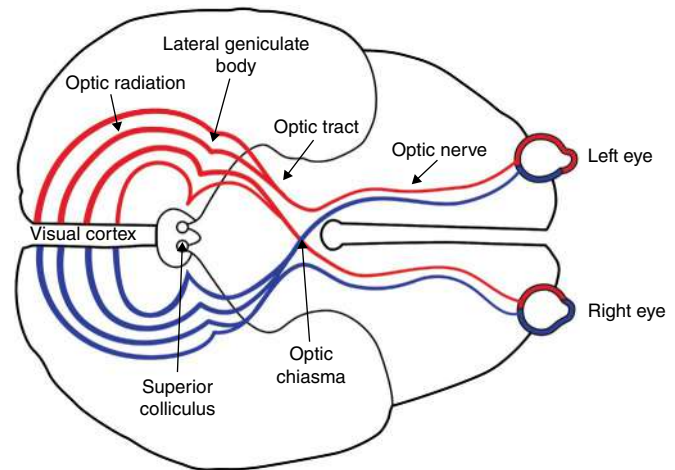


FIGURE 2.7 Visual pathways. (Courtesy of Parker O'Neill.)

Oculomotor Nerve (CN III)

Through its superior and inferior divisions, it supplies motor branches to all the extrinsic ocular muscles (except the superior oblique and lateral rectus) and the levator palpebrae superioris.

The oculomotor nerve carries parasympathetic branches from the Edinger-Westphal nucleus in the brainstem, via the ciliary ganglion, to the sphincter pupillae muscle and the ciliary muscle.

Pupillary Light Reflex

Light shone in one eye will cause consensual pupil constriction of both eyes. The light is detected in the retina and sends a signal through the optic nerve (CN II) to the pretectal nucleus in the midbrain, which activates the bilateral Edinger-Westphal nuclei and causes bilateral pupil constriction (parasympathetic stimulation).

Accommodation Reflex

The accommodation reflex changes the shape of the lens (through the ciliary body) and pupil (through the iris) to adjust vision for short and long distances. It is controlled by the optic nerve (afferent limb of reflex) and the oculomotor nerve (efferent limb of reflex, which stimulates the ciliary body to contract).

Ciliary Ganglion

The ciliary ganglion is a small ganglion which is located near the apex of the orbit. It is traversed by sensory fibres (from the nasociliary nerve, which conveys sensation from the cornea), sympathetic fibres (from the internal carotid plexus), and parasympathetic fibres, which travel with the oculomotor nerve and synapse at the ganglion, to supply the sphincter pupillae and the ciliary muscle.

Aqueous Humour Chambers

There are two aqueous humour chambers of the eyeball. The anterior chamber is located between the cornea and the iris, while the posterior chamber is located between the iris and the ciliary processes (Figure 2.5). The chambers are filled with aqueous humour, a clear fluid that functions to protect and nourish the eye. It flows through the pupil from the posterior chamber to the anterior chamber and is drained via the trabecular meshwork into the canal of Schlemm at the angle between the iris and the cornea.

Arterial Supply of the Eye

The eye is supplied by the ophthalmic artery, which is the first branch of the internal carotid artery. The ophthalmic artery gives rise to the central artery of the retina, which supplies its internal surface. Other branches that supply the eye include the supra-orbital, lacrimal, and anterior and posterior ethmoidal arteries. The terminal branches are the supratrochlear and dorsal nasal arteries.

Venous Drainage of the Eye

The eyeball is drained by the superior and inferior ophthalmic veins, as well as the central retinal vein, all of which drain into the cavernous sinus.

Lymphatics of the Eye

The eyeball (including the cornea, lens, iris, ciliary body, retina, choroid, and sclera) do not contain any lymphatics. However, the majority of the surrounding tissue (including the eyelid, lacrimal gland, and conjunctiva) do contain lymphatics. Lymphatic drainage is to the submandibular nodes (medial) and pre-auricular nodes (lateral).

CLINICAL NOTE

Occlusion of the retinal artery is an ophthalmic emergency, as it can lead to blindness. It is recognised by sudden unilateral vision impairment. Common causes of retinal artery occlusion include diabetes mellitus and atherosclerosis.

Infections can spread into the cavernous sinus from the face (cavernous sinus thrombosis) and can lead to congestion and protrusion of the eyes (exophthalmos). Exophthalmos is an important sign of thyroid gland hyperactivity (thyrotoxicosis) (Figure 2.8).



FIGURE 2.8 Right exophthalmos in a patient with toxic goitre. (Courtesy of Qassim F. Baker.)

Extraocular Muscles

There are six extraocular muscles which function to move the eyes and three extraocular muscles that move the eyelids (Table 2.3, Figure 2.9).

The recti muscles originate from the tendinous ring, which surrounds the optic canal and part of the superior orbital fissure.

The four recti move the eye in different directions in accordance with their names:

- Superior rectus moves the eye upwards
- Inferior rectus moves the eye downwards
- Lateral rectus moves the eye outwards away from the midline
- Medial rectus moves the eye inwards towards the midline

The superior oblique muscle rotates the eyeball downwards and laterally (for example, when looking downstairs), and the inferior oblique rotates the eyeball upwards and laterally.

The levator palpebrae superioris elevates the upper eyelid to open the eye.

The superior tarsal muscle (smooth muscle) assists the levator palpebrae superioris in elevating the upper eyelid to open the eye.

The orbicularis oculi muscle has three distinct parts, each with its own function:

- *Palpebral*: gently closes eyelids
- *Orbital*: tightly closes eyelids
- *Lacrimal*: drains tears

Innervation of the extraocular muscles is as follows:

- *Oculomotor nerve (CN III)*: levator palpebrae superioris, superior rectus, medial rectus, inferior rectus, and inferior oblique
- *Trochlear nerve (CN IV)*: superior oblique (SO4)
- *Abducens nerve (CN VI)*: lateral rectus (LR6)
- *Facial nerve (CN VII)*: orbicularis oculi

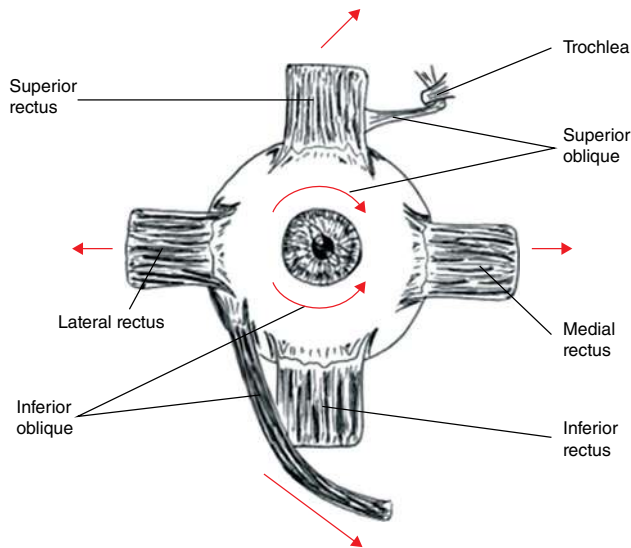


FIGURE 2.9 Extraocular muscles of the right eye. (Courtesy of Alina Humdani.)

Intrinsic Muscles

The intrinsic muscles of the eye are smooth muscles which are supplied by autonomic nerves. The parasympathetic fibres of the oculomotor nerve (CN III) innervate the sphincter pupillae of the iris (which constricts the pupil for near vision) and the ciliary muscles (which control the shape of the lens). The dilator pupillae dilates the pupil and is supplied by the sympathetic branches of the long ciliary nerve (CN V1).

CLINICAL NOTE

Lesions to the oculomotor nerve will cause the eyes to move and remain in a “down and out” position, since the superior oblique and lateral rectus muscles will not be antagonised.

Lacrimal Gland

The lacrimal gland (one for each orbit) is an exocrine gland located laterally in the lacrimal fossa of the frontal bone. It secretes serous fluid, commonly known as tears, which contains

TABLE 2.3: Extraocular muscles

Muscle	Origin	Insertion	Action	Innervation
Superior rectus	Common tendinous ring	Sclera	Elevates, adducts, and laterally rotates eyeball	Oculomotor nerve (CN III)
Medial rectus	Common tendinous ring	Sclera	Adducts eyeball	Oculomotor nerve (CN III)
Inferior rectus	Common tendinous ring	Sclera	Depresses, adducts and medially rotates eyeball	Oculomotor nerve (CN III)
Lateral rectus	Common tendinous ring	Sclera	Abducts eyeball	Abducens nerve (CN VI)
Superior oblique	Body of sphenoid bone	Sclera	Abducts, depresses and medially rotates eyeball	Trochlear nerve (CN IV)
Inferior oblique	Floor of orbit	Sclera	Abducts, elevates and laterally rotates eyeball	Oculomotor nerve (CN III)
Levator palpebrae superioris	Lesser wing of sphenoid bone	Superior tarsal plate and skin of the upper lid	Elevates upper eyelid	Oculomotor nerve (CN III)
Superior tarsal muscle	Underside of levator palpebrae superioris	Superior tarsal plate	Elevates upper eyelid	Post-ganglionic sympathetic fibres from the superior cervical ganglion
Orbicularis oculi	Medial orbital margin, medial palpebral ligament, nasal part of the frontal bone and the lacrimal bone	Superior and inferior tarsal plates and the skin around the orbit	Closes eyelids and drains tears	Facial nerve (CN VII), via the temporal and zygomatic branches
Corrugator supercillii	Supraorbital ridge	Skin of the forehead medial to the eyebrow	Wrinkling of the forehead and assists in closing the eyeball	Temporal branch of the facial nerve

immunoglobulin A, lipocalin, lysosomal enzymes, and other constituents similar to plasma, via the lacrimal ducts. These ducts open into the superior fornix of the conjunctiva, and the secretions are drained inferiorly to the lacrimal sac and through the nasolacrimal duct into the lacrimal groove. The nasolacrimal duct then descends through the nasolacrimal canal of the maxilla to the inferior nasal meatus, where it is partially covered by a fold of mucous membrane (the plica lacrimalis). The serous fluid prevents the eye from drying out and protects it from harmful

environmental factors, such as dust. The glands are supplied by the lacrimal arteries (branches of the ophthalmic arteries) and are drained by the superior ophthalmic veins.

Sensory innervation is through the lacrimal nerve (branch of CN V1), and it is supplied with parasympathetic secretomotor nerves from the facial nerve, synapsing at the pterygopalatine ganglion, which accompany the zygomatic and lacrimal branches of the maxillary division of the trigeminal nerve (CN V2).

CLINICAL NOTES

ORBITAL BLOWOUT FRACTURE

This is caused by large blunt objects impacting the orbit. Common causes include road traffic accidents and sporting injuries; hence patients tend to be young males. The most common sites for fractures are the medial and inferior walls of the orbit, as they are the weakest. Symptoms include swelling, pain, and diplopia (double vision) due to swelling of the ocular muscles or entrapment in the fracture; numbness around the orbit, cheek, and/or teeth, due to injury of the infraorbital nerve; and inferior displacement of the eyeball. Diagnosis is aided with a CT scan, and the fractures are usually treated with surgery.

CONJUNCTIVITIS

Conjunctivitis (inflammation of the conjunctiva) is a common clinical occurrence, usually caused by adenovirus. Other causes include *Staphylococcus aureus* and allergens in atopic patients. It is characterised by hyperaemia (blood-shot eye) and watery discharge.

RETINOBLASTOMA

Retinoblastoma (cancer of the retina) can be detected by failure to elicit the normal red-light reflex during fundoscopy. Instead, the retina will appear white during examination. Retinoblastoma is the most common intraocular tumour in children.

RETINAL DETACHMENT

The inner layer of the retina becomes detached from the choroid layer. If not promptly treated, it can cause permanent loss of vision. Symptoms include patients describing “a black curtain progressively lowering over my vision” or they report “floaters” (*muscae volitantes*: literally “flying flies” in Latin) that obscure their vision.

CATARACTS

Cataracts are the result of opacification of the lens, which distorts the lens's refractive power, leading to loss of visual acuity. Cataracts are quite common, with half of the population over 75 years old suffering from them (National Eye Institute, 2019). Common causes include old age, diabetes, and smoking.

OPTIC NEURITIS

Optic neuritis is inflammation of the optic nerve, which leads to temporary unilateral vision loss with pain. It is commonly linked to multiple sclerosis (MS), as it can be the first clinical manifestation of the disease.

PITUITARY ADENOMA

Tumours of the pituitary gland can compress the optic chiasma and cause bitemporal hemianopia (loss of vision laterally in both visual fields).

GLAUCOMA

Glaucoma is a disease of the optic nerve caused by increased intraocular pressure and is one of the leading causes of blindness in people over the age of 60. There are many types of glaucoma, but they generally fall within two categories:

- Open angle glaucoma is a chronic condition where the outflow of aqueous humour becomes impaired leading to a slow increase in intraocular pressure. This leads to a slow loss of peripheral vision
- Acute closed angle glaucoma is an ophthalmologic emergency caused by a rapid increase in intraocular pressure due to occlusion of the anterior chamber angle (between the iris and the cornea) leading to impaired drainage of the aqueous humour. This condition can lead to irreversible vision loss if not treated within hours

DACRYOADENITIS

Dacryoadenitis is inflammation of the lacrimal gland. The presentation can be acute or chronic. The acute presentation has a rapid onset (hours/days), with severe pain and pressure in the supratemporal region of the orbit. The chronic presentation has a slow onset (months), with painless enlargement of the lacrimal gland. It can result from viral infections or secondary causes such as Graves' disease, Sjögren's syndrome, and sarcoidosis.

Sjögren's syndrome is a chronic autoimmune disease which decreases lacrimal and salivary gland activity through lymphocytic infiltration. Symptoms include dry mouth, eyes, and skin. Females are more commonly affected than males, and the normal age of onset is 40 to 60 years old.

REVISION QUIZ ON THE EYE

- Q1. What are the three layers of the eye? List the major components and function of each layer.
- Q2. What does the ophthalmic artery supply, and where does it originate from?
- Q3. What are the differences between open and closed angle glaucoma?

Answers are at the end of the section.

The Ear

External Ear

- The externally visible part of the ear is formed by the auricle (or pinna) and external acoustic meatus
- The auricle captures and transfers sound waves to the tympanic membrane via the external acoustic meatus. The auricle is composed of elastic cartilage (except for the lobule), which is covered by skin
- The outer lateral curvature and the inner medial prominence of the auricle are termed the helix and anti-helix, respectively. The anti-helix bifurcates into the superior and inferior crura ([Figure 2.10](#))

- The concha is a shallow depression which is located in the middle of the auricle and is continuous with the external acoustic meatus
- The tragus is a small projection over the external acoustic meatus. It partially covers the concha, as does the inferolateral anti-tragus (*tragus*, Gr: "goat", because of its resemblance to a goat's beard in elderly men)

Ear Canal

- The external acoustic meatus (ear canal) continues for approximately 2.5 cm as a sigmoid-shaped canal, which terminates at the tympanic membrane.
- The outer one-third of the ear canal is composed of elastic cartilage, whereas the inner two-thirds is composed of bone.
- The ceruminous glands are modified sweat glands that secrete ear wax as a protective mechanism against foreign bodies. Ear wax can accumulate and block the external ear, causing conductive deafness.
- The tympanic membrane, colloquially known as the eardrum, forms the boundary between the external and middle ear.

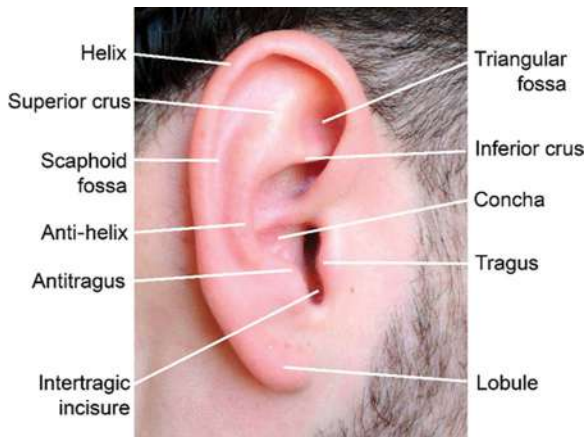


FIGURE 2.10 The auricle or pinna. (Photograph courtesy of Philip J. Adds.)

Blood Supply of the External Ear

The arterial supply of the external ear arises from the:

- Posterior auricular artery (branch of the maxillary artery)
- Superficial temporal artery (terminal branch of the external carotid artery)

The venous draining of the ear is through corresponding veins.

Innervation of the External Ear

The external ear is innervated by the:

- Great auricular nerve (C2–C3).
- Auriculotemporal nerve (branch of CN V3).
- Auricular branch of the vagus nerve (CN X); the meatal side of the tympanic membrane is supplied by the auriculotemporal nerve and the vagus.

CLINICAL NOTE

EXTERNAL EAR INJURY

Injury to the pinna from trauma and sports such as rugby can result in pinna haematoma. Blood collects between the perichondrium and the auricular cartilage causing loss of auricular contour. If not aspirated or evacuated the haematoma enlarges, diminishing blood supply to the cartilage resulting in a "cauliflower ear" (Figure 2.11).

Acute Otitis Externa

Otitis externa is inflammation of the external auditory canal. It is a very painful condition caused by bacteria such as *Pseudomonas aeruginosa*, *Proteus mirabilis*, and *S. aureus*. Fungal causes include *Candida albicans* or *Aspergillus*. It may follow ear syringing for removal of wax.



FIGURE 2.11 Recurrent pinna haematoma pre- and post-incision and drainage with anterior and posterior splinting to prevent re-accumulation of blood under the perichondrium. (Courtesy of Asha Ali.)

Middle Ear

The middle ear is an air-filled cavity which begins at the tympanic membrane and is located within the petrous part of temporal bone. The function of the middle ear is to convert sound waves into vibrations, which travel via the auditory ossicles to the inner ear. It is continuous posteriorly with the mastoid antrum and mastoid air cells.

Tympanic Membrane

The tympanic membrane is orientated obliquely and is mainly composed of the pars tensa and pars flaccida, the latter of which is located above the manubrium of the malleus. Both parts are composed of an epidermal layer (which is continuous with the skin of the external auditory meatus), a fibrous layer (composed of radial and circular fibres), and an inner mucosal layer.

The tympanic membrane is supplied by branches from the external carotid artery (*vide infra*). As the internal carotid artery also supplies the hypothalamus, the core body temperature regulator (through the thermoregulatory centre), the ear acts as an easily accessible and convenient way of measuring core body temperature.

Sound waves travel through the external acoustic meatus to the tympanic membrane and cause it to vibrate. This transfers the sound waves into mechanical vibrations. As the amplitude

Auditory Ossicles

The three bones of the middle ear are the smallest bones in the body and are known as the auditory ossicles: the malleus (“hammer”), incus (“anvil”), and stapes (“stirrup”) (**Figure 2.12**). The auditory ossicles articulate successively to connect the tympanic membrane to the oval window (fenestra ovalis) of the cochlea.

The malleus, the largest and most lateral of the auditory ossicles, is bound to the tympanic membrane via its manubrium. The head of the malleus articulates with the anvil-shaped incus bone. The incus is held in place by the posterior incudal ligament and articulates with the stapes. The stapes is the smallest and most medial of the three auditory ossicles. The footplate of the stapes is connected to the oval window of the cochlea in the inner ear.

An easy way to remember the bony connections is that the *manubrium* of the *malleus* connects to the tympanic *membrane* and that the stapes is stirrup-shaped.

Muscles of the Middle Ear

The two muscles of the middle ear are the **tensor tympani** and the **stapedius**. When the tensor tympani contracts, it pulls the malleus medially, thereby stretching the tympanic membrane inwards. The tensor tympani is innervated by the mandibular branch of the trigeminal nerve (CN V3).

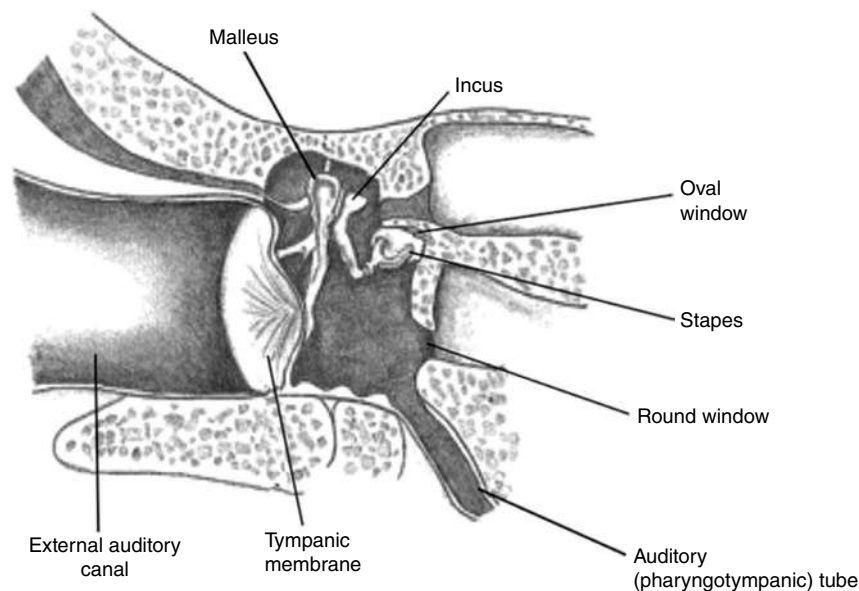


FIGURE 2.12 Middle ear. (Courtesy of Amani Bashir.)

of the sound waves increases, the magnitude of deflection of the tympanic membrane increases. Similarly, as the frequency of the sound waves increases, the rate of vibration increases.

The tympanic membrane is supplied mainly by the auriculo-temporal nerve.

CLINICAL NOTE

The tympanic membrane is visually examined with an otoscope (auroscope). A healthy tympanic membrane is a translucent pale grey colour. It can rupture from barotrauma, blast, and direct injuries (e.g., when cleaning the ears with cotton buds).

The stapedius, the smallest skeletal muscle in the body, acts to stabilise the stapes. The stapedius is innervated by the facial nerve (CN VII).

Auditory Tube (Eustachian or Pharyngotympanic Tube)

The middle ear communicates with the lateral wall of the nasopharynx via the auditory tube, which is composed of bony and cartilaginous elements and which is normally closed. Contraction of the tensor veli palatini muscle (e.g., when swallowing) opens up the eustachian tube, which helps to equalise the pressure between the external and middle ear in order to prevent damage to the tympanic membrane. It also drains the mucus secreted in the middle ear.

Blood Supply of the Middle Ear

The main blood supply comes from branches of the maxillary artery (from the external carotid artery) and from the stylomastoid artery (which originates from either the posterior auricular or the occipital branches of the external carotid artery).

Venous drainage is via the pterygoid venous plexus and the superior petrosal sinus.

Innervation of the Middle Ear

The middle ear, including the mucosal side of the tympanic membrane, is innervated by the glossopharyngeal nerve (CN IX), with a contribution from the vagus nerve (CN X).

CLINICAL NOTE

ACOUSTIC REFLEX

The middle ear muscle reflex, also known as the acoustic reflex, helps to protect against high-intensity, low-frequency sounds. When this stimulus is present, the tensor tympani and stapedius contract, causing the malleus to pull the tympanic membrane medially and the stapes to move away from the oval window. This reduces the transmission of mechanical vibration to the cochlea, thereby having a protective effect.

Otic barotrauma occurs when the eustachian tube fails to equalise the pressure of the middle ear with the atmospheric pressure. This can occur upon an aeroplane's ascent or descent or during deep-sea diving.

Middle Ear Infections

Middle ear infections are often caused by upper respiratory infections. Infection of the middle ear is known as otitis media and may be followed by discharge from the ear after perforation of the tympanic membrane. Otitis media is more common in children because the eustachian tube is much shorter and less vertical, meaning that fluid is more likely to build up. "Glue ear" is the colloquial name for the accumulation of glue-like fluid in the middle ear that can cause deafness.

Complications of otitis media can include labyrinthitis (inflammation of the inner ear) and, very rarely, facial nerve paralysis, meningitis, brain abscesses, and mastoiditis (inflammation of the mastoid air cells).

Mastoiditis

Mastoiditis, a complication of acute otitis media, is characterised by inflammation of the mastoid antrum and air cells. There is a classical anterolateral displacement of the pinna due to a post-auricular abscess. The infection may spread superiorly into the middle cranial fossa, causing osteomyelitis of the tegmen tympani (the roof of the tympanic cavity).

QUIZ QUESTION

Q. When draining pus from the mastoid air cells in cases of suspected mastoiditis, which of the following nerves is at most risk of being damaged? (The answer is at the end of the section.)

- Vestibulocochlear nerve
- Great auricular nerve
- Auricular branch of vagus nerve
- Facial nerve
- Auriculotemporal nerve

Inner Ear

The inner ear, also known as the labyrinth, is involved in both hearing and balance, and therefore consists of the cochlea and vestibular systems, respectively. The cochlea functions to convert the mechanical vibrations from the middle ear into nerve impulses, which the brain perceives as sound.

Vibrations from the middle ear reach the cochlea and cause the basilar membrane to vibrate. The sensory hair cells of the organ of Corti, located on the basilar membrane, convert these vibrations into nerve impulses, via perilymph. (Cochlea is from the Greek *cochlos*, meaning "snail".)

The inner ear is located within the temporal bone and consists of the bony labyrinth and the membranous labyrinth (also known as the cochlear duct). The bony labyrinth consists of the bony structures of the inner ear, whereas the membranous labyrinth is located within the bony labyrinth.

In contrast to the middle ear, the inner ear is filled with fluid. Perilymph flows between the bony and membranous labyrinths, whereas endolymph flows within the membranous labyrinth. The endolymphatic system is separated from the perilymphatic system by the basilar and Reissner's membranes (Figure 2.13).

The cochlea, a spiral cavity, is composed of three separate cavities:

- Scala tympani
- Scala media
- Scala vestibuli

The basilar membrane separates the scala media and scala tympani, whereas the Reissner's membrane separates the scala vestibuli from the scala media. Note that the scala vestibuli and scala tympani contain perilymph, but the scala media contains endolymph.

The scala vestibuli is connected to the oval window, whereas the scala tympani is connected to the round window. A passage connecting the scala vestibuli and scala tympani, the helicotrema, acts to equalise pressure in response to low frequencies. The perilymphatic aqueduct, located at the vestibular end of the inner ear, connects to the CSF surrounding the brain.

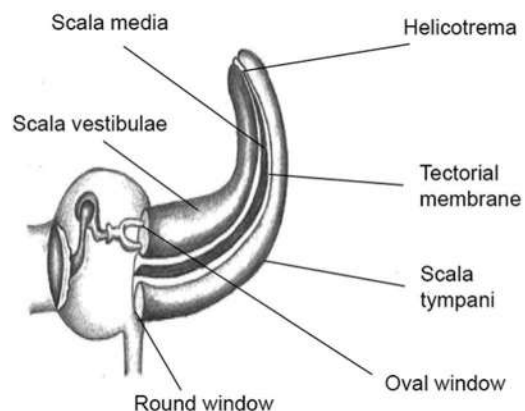


FIGURE 2.13 The inner ear (schematic). (Courtesy of Amani Bashir.)

Innervation of the Inner Ear

The vestibulocochlear nerve (CN VIII) innervates the inner ear and bifurcates into the vestibular nerve and the cochlear nerve. It originates at the cerebello-pontine angle within the posterior cranial fossa and enters the internal acoustic meatus together with the facial nerve (CN VII), the nervus intermedius, and the labyrinthine vessels.

Stimulated hair cells of the organ of Corti send afferent nerve impulses via the cochlear nerve to the brainstem. The two types of hair cells, outer hair cells and inner hair cells, both contain stereocilia. The outer hair cells are tightly adherent to the tectorial membrane, whereas the inner hair cells are loosely bound, if at all, to the tectorial membrane.

Equilibrium (balance) is due to the relationship between the visual system, the vestibular system, and proprioception via impulses in the posterior column of the spinal cord. However, only the vestibular system shall be considered here. The vestibular system consists of the semi-circular canals and the utricle and saccule, all of which contain vestibular receptors.

There are three semicircular canals (anterior, lateral, and posterior) in each ear, which contain endolymph. The canals are perpendicular to one another and detect head movement and acceleration via the movement of the endolymph. The dilated terminal ends of each canal are termed the ampullae. As the head moves, endolymph in the semicircular canals moves the hair cells of the ampullae, thereby stimulating them. As a result, nerve impulses are sent to the brain via the vestibular branch of the vestibulocochlear nerve (Figure 2.14).

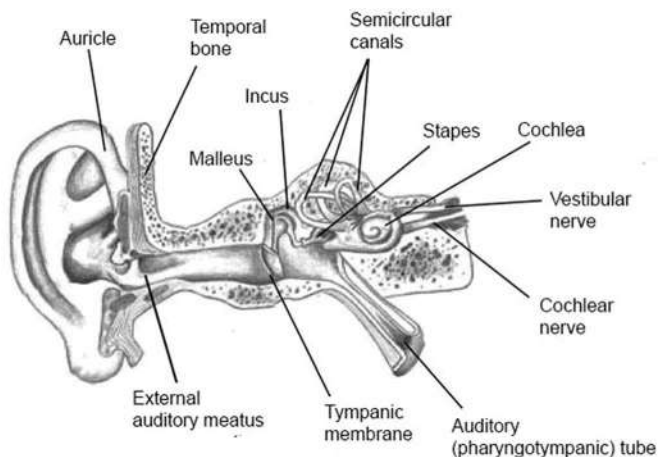


FIGURE 2.14 Anatomy of the parts of the ear. (Courtesy of Amani Bashir.)

A region known as the macula is present in each utricle and saccule. Maculae are found perpendicular to each other. The maculae have an otolithic membrane which contains calcium carbonate crystals. Otoliths and hair cells lie underneath this membrane. As the head moves, so does the otolithic membrane, causing stimulation of the underlying hair cells. This creates action potentials, causing nerve impulses to travel via the vestibular nerve.

Arterial Supply of the Inner Ear

The main blood supply of the inner ear is from branches of the labyrinthine artery, a branch of the anterior inferior cerebellar

(AICA) or basilar artery. The stylomastoid branch of the posterior auricular artery or the occipital artery also supplies the semicircular canals.

CLINICAL NOTES

DEAFNESS (HEARING LOSS)

Conductive hearing loss occurs when sound waves are not efficiently transferred from the external acoustic meatus to the tympanic membrane and auditory ossicles. This can be caused by otitis media with effusion; accumulation of cerumen (ear wax), which is easily diagnosed; or by disruption of the tympanic membrane, for example, due to otic barotrauma.

Sensorineural hearing loss occurs due to malfunction of the cochlea or the cochlear nerve, which may be age-related (presbycusis). Hearing aids such as cochlear implants can sometimes be used to treat this condition. Cochlear implants are fitted surgically and bypass the external and middle ear, causing nerve impulses to be sent via the cochlear nerve. Therefore, the cochlear nerve must still be functional if cochlear implants are to be used.

Meniere's disease is a clinical condition characterised by attacks of vertigo, tinnitus, and sensorineural hearing loss.

Acoustic neuroma is a slowly growing benign tumour of the Schwann cells of the vestibular division of the vestibulocochlear nerve (CN VIII) within the inner ear, although if large it may extend to the cerebello-pontine angle. The main clinical features are gradual hearing loss, tinnitus, vertigo, and sometimes weakness of the facial muscles, due to the proximity of the facial nerve to CN VIII.

The Nose

The nose is a pyramidal-shaped structure, with variability in size and shape, and is the beginning of the respiratory tract. The main functions of the nose are to warm, humidify, and filter inspired air, along with containing olfactory receptors (CN I) to detect smells. The external and visible aspect of the nose protrudes from the face. The nasal cavity, separated by the nasal septum, extends from the external openings (nares or nostrils) to the oval-shaped posterior openings (the choanae) into the nasopharynx. The piriform aperture can be observed with removal of the external nose.

External Part

The external nose consists of a bony and cartilaginous skeleton. The skeletal (bony) part consists of the two nasal bones, and the cartilaginous part consists of major and minor alar cartilages in addition to the midline septal cartilage and its lateral processes.

Muscles of the Nose

The nasal muscles are grouped according to their function (Table 2.4).

TABLE 2.4: Muscles of the nose

Muscle	Main Function
Procerus (Latin, “tall, extended”)	“Frowning” of the nose or concentration muscle
Nasalis in two parts: the compressor and dilator	Narrowing or widening of nares
Depressor nasi septi	Multiple actions, helps pull tip of nose downward
Levator labii superioris alaeque nasi (from the maxilla to the skin of the alar cartilage and the upper lip)	The “Elvis muscle” Widens nares and elevates the nose and the upper lip (in homage to Elvis Presley)

These muscles are supplied by branches of the facial nerve (CN VII), both zygomatic and buccal. All these muscles help facilitate facial expression and respiration.

Blood Supply

The skin of the nose and nasal muscles receive their arterial blood supply via branches from the:

- Facial artery
- Ophthalmic artery (dorsal nasal branch)
- Infraorbital branch of the maxillary artery

Venous return is via the facial veins and ophthalmic veins. Lymphatic drainage is mainly to the submandibular group of lymph nodes.

Cutaneous innervation is via the external nasal and infratrochlear nerve (CN V1) and infraorbital nerve (CN V2).

Boundaries of the Nasal Cavity and Internal Parts (Table 2.5)

Roof: nasal spine of the frontal bone, nasal bones, and cribriform plate of the ethmoid, which separates the nasal cavity from the floor of the anterior cranial fossa and the body of the sphenoid (Figure 2.15).

Floor: palatine processes of the maxilla and horizontal plates of the palatine bones (forming the hard palate).

TABLE 2.5: Parts of the nasal cavities

Vestibule	<ul style="list-style-type: none"> • The area just inside the nostril • Lined by stratified squamous epithelium, (keratinized) skin, and hair follicles • Its main function is to trap and remove pathogens which enter the nose during inspiration
Respiratory	<ul style="list-style-type: none"> • Largest part of the nasal cavity • Lined with pseudostratified ciliated columnar epithelium and flask-shaped goblet glands, which secret mucus to trap foreign bodies • Contains apertures for drainage from the paranasal sinuses and submucous venous plexuses to warm and humidify inspired air
Olfactory	<ul style="list-style-type: none"> • Located on the superior aspect of the nose, above the superior concha, for the detection of smells • It is lined by olfactory epithelium and consists of olfactory receptors which continue with the filaments of the olfactory nerve (<i>fila olfactoria</i>) passing through the cribriform plate of the ethmoid bone

Medial wall: consists of a bony and cartilaginous septum (Figure 2.15)

- Anteriorly the nasal septum is composed of cartilage (the quadrangular cartilage), which meets the bony part posteriorly.
- **Bony:** vomer, perpendicular plate of ethmoid, plus the crests of the maxilla and the palatine, which unite with the inferior border of the vomer (Figure 2.15).

Lateral wall: three shelf-like structures called the turbinate bones (conchae) and the three meatuses, inferior to each concha (Figure 2.16).

Conchae and Meatuses (Figure 2.16)

The **inferior conchae** are the largest turbinate bones. They run horizontally along the entire length of the lateral nasal wall and **are separate bones**. The opening for the nasolacrimal canal is located approximately midway along the inferior concha, which allows drainage of tears from the lacrimal gland. The middle and superior conchae are lateral projections of the ethmoid.

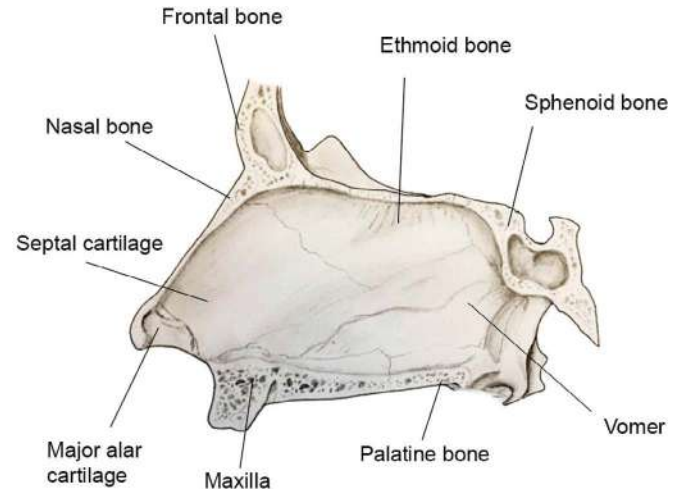


FIGURE 2.15 Structure of the nasal septum. (Courtesy of Kathryn DeMarre.)

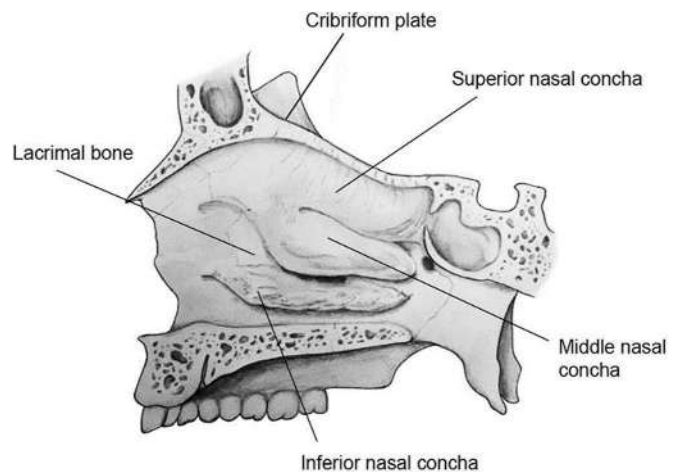


FIGURE 2.16 Turbinate bones of the nose. (Courtesy of Kathryn DeMarre.)

The superior, middle, and inferior meatuses are located inferior and lateral to each respective concha. Incoming air passes posteriorly through the meatuses and collects briefly at the posterior choanae.

Their function is the regulation of airflow direction, temperature and nasal resistance, and protection.

The nasal mucosa lines the nasal cavity, a post-vestibular space, and is lined with pseudostratified ciliated epithelium which has a rich blood supply and contains many goblet cells for mucus secretion.

CLINICAL NOTES

- *Inferior turbinate hypertrophy* is chronic swelling of the inferior turbinate bone. It is commonly caused by allergic reactions, upper respiratory tract infections, sinusitis, pregnancy, hormonal changes, and septal deviation. Symptoms include snoring, nose-bleeds, nasal congestion, difficulty breathing, and sinusitis.
- *Nasal septum deviation* can be congenital or caused by trauma. Common symptoms include nasal congestion, sinusitis, epistaxis, dyspnoea, snoring, sleep apnoea, facial pain, and headaches. Symptoms usually arise when a large deviation is seen.
- *Trapped foreign bodies* are commonly observed in children (**Figure 2.17**).
- *Allergic rhinitis* (hay fever) is inflammation of the mucosa of the nasal cavity when a patient becomes exposed to an allergen, most commonly pollen. Symptoms include sneezing, itching, and a runny nose. Many patients often present with other immunological conditions, such as atopic dermatitis and allergic conjunctivitis.



FIGURE 2.17 Foreign body in the nose. (Courtesy of Asha Ali.)

Blood Supply of the Nasal Cavity

Blood Supply of the Septum

The septum receives its blood supply from the internal and external carotid arteries. The ophthalmic artery is the only branch of the internal carotid artery which supplies the nasal septum.

The ophthalmic artery gives rise to two main arteries which supply the superior aspect of the nasal septum: the anterior ethmoidal and posterior ethmoidal arteries.

The external carotid artery gives rise to two branches which supply the inferior portion of the nasal septum: the maxillary and facial arteries (**Figure 2.18**).

- The posterior inferior portion of the nasal septum is supplied by the sphenopalatine and greater palatine arteries (branches of the maxillary artery).
- The septal branches of the superior labial artery (from the facial artery) supply the anterior inferior portion of the nasal septum.
- **Kiesselbach's plexus** is an anastomosis of several arteries present at the anterior inferior aspect of the nasal septum. These arteries include the anterior and posterior ethmoidal arteries, sphenopalatine artery, greater palatine artery, and septal branch of the superior labial artery. The site at which Kiesselbach's plexus forms is referred to as **Little's area**, Kiesselbach's triangle, or Kiesselbach's area.

Blood Supply of the Lateral Walls and Floor

The superior aspect of the lateral wall is supplied by the anterior and posterior ethmoidal arteries (branches of the ophthalmic artery). The anterior inferior aspect of the lateral wall is supplied by the septal branches of the superior labial artery (from the facial artery). The sphenopalatine artery, from the maxillary artery, supplies the turbinate bones and meatuses and is the main blood supply to the nasal mucosa.

Blood supply of the floor of the nasal cavity is from the greater palatine and superior labial arteries.

Venous Drainage of the Nose

The superior region of the nose is drained by the anterior and posterior ethmoidal veins which drain into the ophthalmic veins, which finally drain into the cavernous sinus (see **Section 1A**).

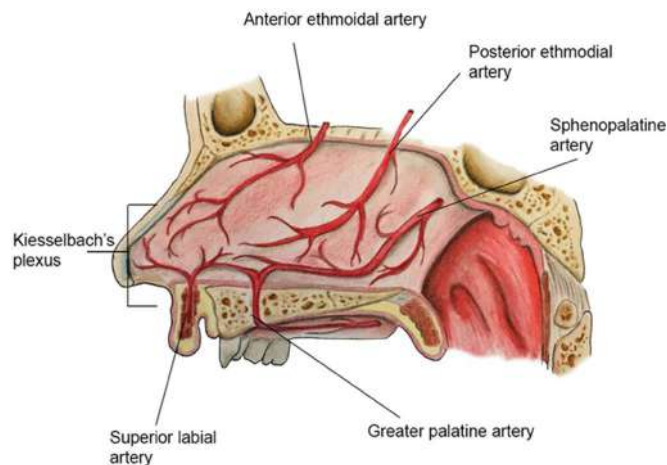


FIGURE 2.18 Blood supply of the nose. (Courtesy of Kathryn DeMarre.)

The anterior inferior region of the nose is drained by the angular vein, which drains into the facial vein. The facial vein drains into the internal jugular vein.

The central region of the nose is drained by the sphenopalatine and greater palatine veins, which drain into the maxillary vein.

The maxillary vein drains into the pterygoid plexus, located in the infratemporal fossa.

CLINICAL NOTES

- Little’s area is a common site for epistaxis (nose-bleed). The most common causes of epistaxis are picking and hard blowing of the nose. Other causes include allergic and non-allergic rhinitis. However, uncontrolled arterial hypertension can present as epistaxis.
- The danger triangle of the face refers to the area between the corners of the mouth and the bridge of the nose. Infection at this triangle can spread via the ophthalmic veins into the brain through the cavernous sinus. This can lead to conditions such as cavernous sinus thrombosis, meningitis, or brain abscess.

Innervation of the Nasal Cavity

Innervation of the nasal cavity can be divided into special and general sensory innervation (Table 2.6).

TABLE 2.6: Innervation of the nasal cavity

Special Sensory Innervation	General Sensory Innervation
Detection of smell Cranial nerve CNI – olfactory nerve Autonomic innervation: a. Post-ganglionic sympathetic fibres supply vasomotor branches to the nasal mucosa b. Pre-ganglionic parasympathetic (greater petrosal nerve) fibres synapse at the pterygopalatine ganglion in the pterygopalatine fossa, to supply secretomotor innervation to the nasal mucosa	The ophthalmic and maxillary divisions of the trigeminal nerve (CN V) provide general sensory innervation to skin, subcutaneous tissue, and mucosa of the nose and paranasal sinuses through: <ul style="list-style-type: none"> • The nasociliary nerve (branch of CNV1), which also supplies the skin of the external nose and part of the nasal septum • The nasal branches of the greater palatine nerve (CN V2) (posterior part of the lateral wall, roof, and floor of the nasal cavity) • The infraorbital nerve (CN V2) supplies the vestibule of the nose • The nasopalatine nerve (branch of CN V2) supplies the central six upper teeth, in addition to the inferior part of the mucous membrane of the nasal septum • The anterior superior alveolar nerve also supplies the anterior parts of the septum and lateral wall

Lymphatic Drainage of the Nasal Cavity

- The anterior part of the nasal cavity (vestibule) is drained by the submandibular nodes.
- The posterior part of the nasal cavity drains into the retro-pharyngeal and superior deep cervical lymph nodes.

Paranasal Sinuses

These air-filled chambers interconnect and communicate with the nasal cavity (Table 2.7, Figures 2.19, 2.20, and 2.21). They are lined with pseudostratified ciliated columnar epithelium. Paranasal sinuses play an important role in humidifying inspired air and provide protection, facilitate vocal resonance, and decrease the overall weight of the skull.

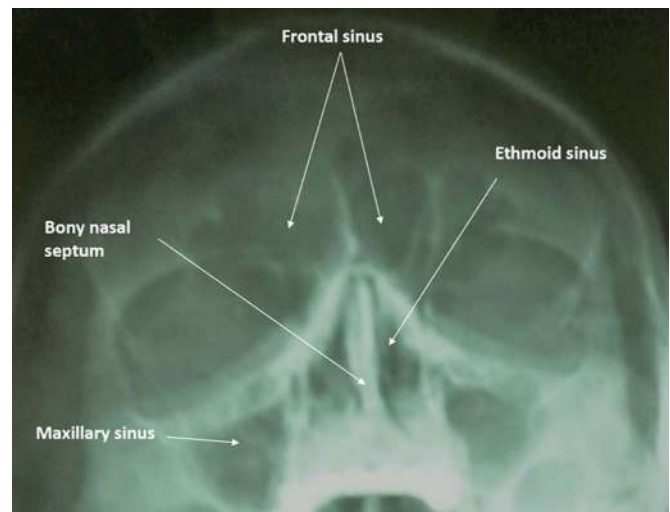


FIGURE 2.19 X-ray of the nasal sinuses. (Courtesy of Baqir Altimimi.)

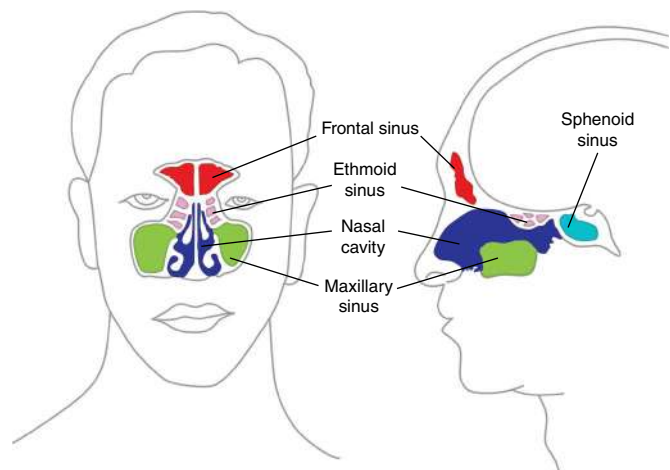


FIGURE 2.20 Paranasal sinuses. (Courtesy of Calum Harrington-Vogt.)

TABLE 2.7: The paranasal sinuses

Sinus	Location	Drainage
Frontal	<i>Frontal</i> : triangular in shape Varied morphology	Middle meatus
Maxillary	<ul style="list-style-type: none"> • Largest of the sinuses, within the maxilla • Its roof is the orbit, its floor is the part of the maxilla which holds the roots of the premolar and molar teeth • Lateral to the nasal cavity 	Middle meatus, through the maxillary ostium (opening)
Ethmoidal	Within the ethmoidal bone, upper lateral aspect of nasal cavity three parts: <ol style="list-style-type: none"> 1. Anterior 2. Middle 3. Posterior 	Middle meatus <i>Middle meatus</i> : drain on or above the ethmoidal bulla (rounded swelling formed by the middle ethmoidal air cells) Superior meatus
Sphenoidal	Body of the sphenoid	Sphenoethmoidal recess above the superior concha

CLINICAL NOTES

Inflammation of the sinuses and nasal cavity may follow upper respiratory tract infections. Causes can be infective, both bacterial and viral, or allergic. Around 98% are viral in origin. Common symptoms include toothache, sinus headache, and halitosis (bad breath). The condition can be both acute and chronic in nature.

MAXILLARY SINUSITIS

Maxillary sinusitis is the most common site of sinusitis due to the narrowness and position (high on the lateral nasal wall) of the ostium. This prevents adequate drainage, resulting in fluid build-up and infection (**Figure 2.21**). Dental pathology

such as tooth root abscesses and oro-antral fistulas can occasionally lead to maxillary sinusitis, usually unilateral.

ORO-ANTRAL FISTULA

Oro-antral fistula is an abnormal communication between the maxillary sinus and the oral cavity.

PITUITARY TUMOUR REMOVAL

The pituitary gland is situated superior to the sphenoid sinus, housed in the sella turcica of the sphenoid bone. Pituitary tumours (commonly adenomas) can be accessed via a trans-sphenoidal approach by passing through the nasal cavity to the sphenoid sinus.

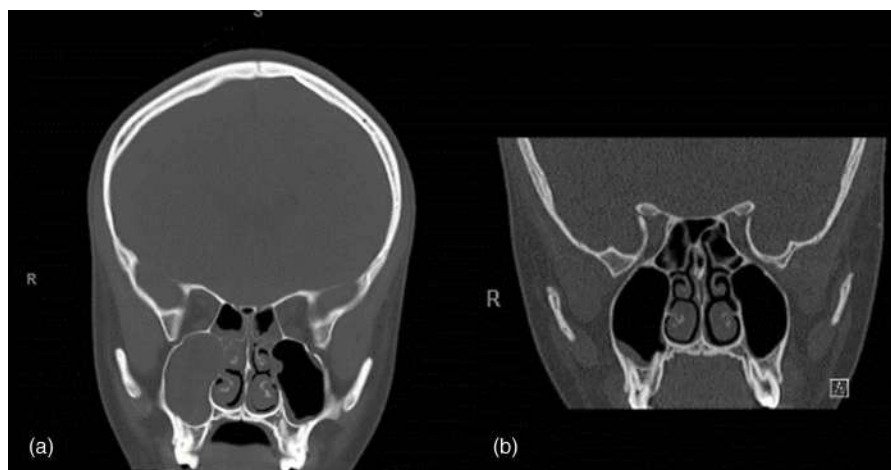


FIGURE 2.21 Coronal CT scan of paranasal sinuses (a) before and (b) after treatment of acute sinusitis. Note marked improvement of fluid/mucosal thickening within the right maxillary antrum. Following treatment, the maxillary antrum is almost completely aerated. (Courtesy of Asha Ali.)

Cranial Nerves (See Section 1)**Olfactory Nerve (CN I)**

The shortest of the cranial nerves and can regenerate after damage; see **Table 1.2** in **Section 1A**.

Optic Nerve (CN II)

See earlier in this chapter. Note that the olfactory and optic nerves are the only cranial nerves which do not originate from the brainstem.

Oculomotor (CN III)

The oculomotor nerve arises from the third nerve nucleus in the midbrain. It traverses the lateral wall of the cavernous sinus (along with CN IV, VI, and V1 and V2, in addition to the internal carotid artery). It emerges from the skull through the supra-orbital fissure (see above).

Trochlear (CN IV)

The trochlear nerve contains the fewest number of axons but has the longest intracranial course, as it is the only cranial nerve to arise from the dorsal aspect of the brainstem. It supplies the contralateral superior oblique muscle.

QUIZ QUESTIONS

Q1. How do you clinically examine the function of the trochlear nerve?

Q2. Why has the trochlear nerve been named as such?

Trigeminal (CN V)

The trigeminal nerve has three divisions, the ophthalmic (V1), maxillary (V2), and mandibular (V3) nerves, and is therefore the largest cranial nerve (Figure 2.22). It supplies sensory fibres to the skin of the face and mucous membrane of the nose, mouth, and nasal sinuses. It leaves the pons as two roots (large sensory and small motor). The Gasserian ganglion contains the sensory cell bodies of the three divisions. The motor root passes under the ganglion to join the sensory division of the mandibular nerve and exits the skull through the foramen ovale.

Ophthalmic Nerve (CV V1)

Contains sensory fibres for the scalp, forehead, cornea, conjunctiva and upper eyelid, nasal mucosa, and frontal sinus. It leaves the skull through the superior orbital fissure after passing through the cavernous sinus. Subsequently, it divides into the frontal, lacrimal, and nasociliary branches.

Maxillary Nerve (CN V2)

Contains sensory fibres for the buccal area, lower eyelid, nasal cavity, palate, pharynx, gums, and upper teeth and leaves the skull through the foramen rotundum to enter the pterygopalatine fossa. It then enters the infraorbital canal as the infraorbital nerve to emerge via the infraorbital foramen. It supplies sensory branches to the side of the nose (nasopalatine nerve), palate (greater and lesser palatine nerves), upper gingiva and mucosa (posterior, middle, and anterior superior alveolar nerves), medial part of the skin of the cheek and upper lip, skin, and conjunctiva of the lower eyelid (zygomatic and infraorbital nerves), and the nasopharynx (pharyngeal nerve). Two branches connect the maxillary nerve to the pterygopalatine ganglion.

Mandibular Nerve (CN V3)

The largest division and contains both sensory and motor fibres. Leaves the skull through the foramen ovale. It carries sensory fibres for the intrabuccal area, including the anterior two-thirds of the tongue, lower teeth, and gums, and motor fibres to the

muscles of mastication, mylohyoid, tensor veli palatini, tensor tympani, and anterior belly of the digastric muscle. The mandibular nerve divides into anterior and posterior divisions. The anterior division supplies:

- Motor innervation to the temporalis, lateral pterygoid, and masseter muscles. The medial pterygoid muscle is supplied by the main trunk before division.
- The buccal nerve carries sensory fibres for the skin and mucous membrane of the cheek (the buccal branch of the facial nerve carries motor fibres to the buccinator muscle).

The posterior division gives rise to the following branches:

- *Auriculotemporal nerve*: supplies the skin of the external ear, meatal surface of the tympanic membrane and temporomandibular joint, and carries parasympathetic and sympathetic branches to the parotid gland.
- *Lingual nerve*: supplies sensory fibres to the floor of the mouth and anterior two-thirds of the tongue (the chorda tympani from the facial nerve accompanies this nerve and supplies secretory parasympathetic and taste sensation to the anterior two-thirds of the tongue). It traverses the floor of the mouth as it crosses the submandibular duct. It can therefore be injured during operations to remove stones from the duct or during removal of the submandibular salivary gland.
- *Inferior alveolar*: a mixed nerve which passes into the mandibular foramen (an opening into the mandibular canal on the medial aspect of the ramus of the mandible), giving branches to the roots of the lower teeth. It terminates by exiting through the mental foramen to give sensory innervation to the anterior vestibular gingiva and the skin of the lower lip and chin through its two terminal branches: the mental and incisive nerves. In addition, it supplies motor branches to the mylohyoid and anterior belly of the digastric muscle (via the nerve to the mylohyoid).

CLINICAL NOTES

- *Inferior alveolar nerve anaesthesia* is one of the most common injection techniques in dentistry. Dentists often block the inferior alveolar nerve before it enters the mandibular canal by injecting local anaesthetic solution to numb the ipsilateral lower teeth. The skin and mucosa of the lower lip, labial alveolar mucosa, and gingiva and skin of the chin are also anaesthetised because they are supplied by the mental branch of this nerve.
- *Trigeminal neuralgia* (tic douloureux) is characterised by intermittent attacks of unilateral intense facial pain. The majority of cases are idiopathic.

QUIZ QUESTION

Q. How do you clinically test for trigeminal nerve function (remember that it has sensory and motor divisions)?

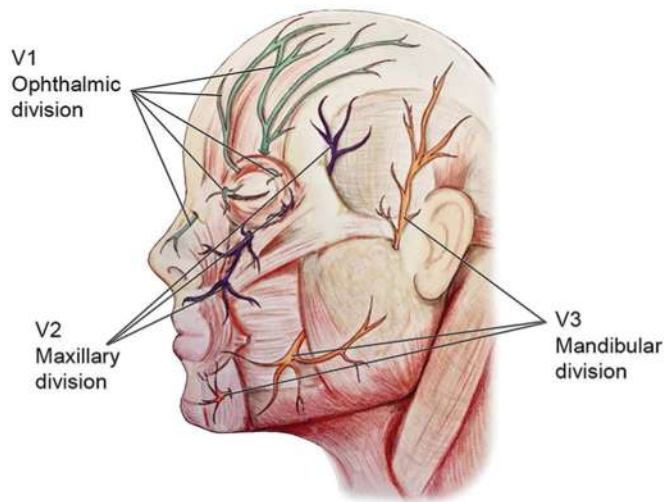


FIGURE 2.22 The distribution of the trigeminal nerve. (Courtesy of Kathryn DeMarre.)

Abducens Nerve (CN VI)

The abducens nerve originates from the abducens nucleus in the pons and emerges at the junction between the pons and medullary pyramids. It passes within the cavernous sinus and enters the orbit through the superior orbital fissure to supply the lateral rectus muscle. The lateral gaze results from a combination of contraction of the ipsilateral lateral rectus muscle and contralateral medial rectus muscle (supplied by CN III). This causes both eyes to fixate or track an object.

Facial Nerve (CN VII)

The facial nerve emerges with the vestibulocochlear nerve (CN VIII) at the ventrolateral aspect of the ponto-medullary junction (intracranial part) and enters the internal auditory meatus (intratemporal part), accompanied by the sensory root. Within the temporal bone (facial canal), it gives rise to the greater petrosal nerve, which joins the deep petrosal nerve to form the nerve of the pterygoid canal (Vidian nerve) and motor fibres to the stapedius.

It leaves the cranial cavity at the stylomastoid foramen (extratemporal part) and passes through the parotid gland (bisecting it into superficial and deep lobes). Therefore, the facial nerve should be examined as part of the examination of parotid swellings. Note that the facial nerve does not supply the parotid gland. The sensory root (the intermediate nerve or nervus intermedius) supplies part of the skin of the external auditory meatus and a small area posterior to the ear (thereby supplementing CN V3). The chorda tympani leaves the facial nerve before it emerges from the stylomastoid foramen to enter the tympanic cavity and passes within the substance of the tympanic membrane. It exits the skull at the petrotympanic fissure to join the lingual nerve.

The facial nerve contains special sensory fibres which supply taste sensation for the anterior two-thirds of the tongue and the hard and soft palate, as well as visceral secretomotor parasympathetic fibres to lacrimal, submandibular, and sublingual glands and the mucous membrane of the nose and palate.

The facial nerve divides into five terminal branches:

- Temporal
- Zygomatic
- Buccal
- Mandibular
- Cervical

These branches supply the muscles of facial expression (*vide infra*). Other motor branches provide innervation to the stylohyoid and posterior belly of the digastric muscle.

The muscles of the face (**Figure 2.23**) are arranged as follows:

- Around the eyelids (see **Table 2.3**) in addition to the occipitofrontalis.
- Around the mouth. The orbicularis oris arises from the medial aspect of the maxilla and the mandible and inserts into the skin of the upper and lower lips. It acts as a sphincter of the mouth, and is supplied by the buccal branch of the facial nerve.
 - *Levator labii superioris*: lifting the upper lip
 - *Depressor labii inferioris*: pulling the lower lip down
 - *Levator anguli oris and depressor anguli oris*: act on the corners of the mouth
 - *Zygomaticus major*: from the zygomatic bone; inserts into the modiolus, helps in smiling
 - *Zygomaticus minor*: arises from the zygomatic bone, inserts into the skin of the lateral upper lip
 - *Mentalis*: from the anterior aspect of the mandible to the skin of the chin
 - *Risorius*: arises from the parotid fascia and inserts into the modiolus; helps in smiling
- Muscles around the nostrils (see **Table 2.4**).
- *Buccinator*: from the alveolar processes of both the mandible and the maxilla and the pterygomandibular raphe; inserts into the orbicularis oris; supplied by the buccal branch of the facial nerve; compresses the cheek against the teeth and helps in mastication and whistling

The modiolus is a fibromuscular structure at the angles of the mouth, where several muscles converge. The modiolus helps in integrating the muscles around the mouth.

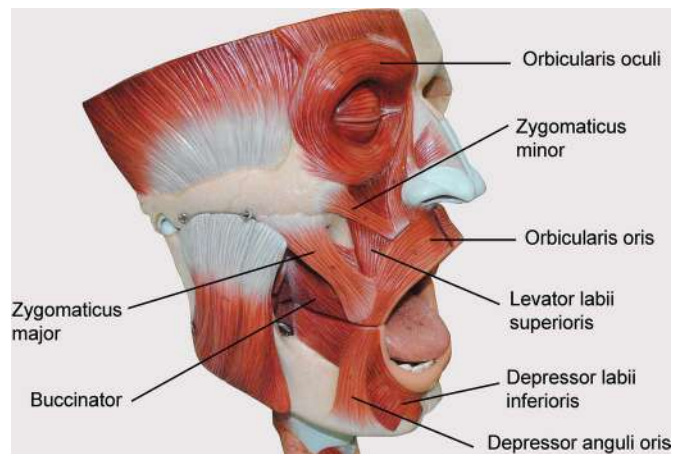


FIGURE 2.23 Muscles of facial expression. (Courtesy of Department of Anatomical Sciences, SGUL.)

CLINICAL NOTES

Understanding the anatomy of the facial muscles is essential in facial aesthetic, e.g., Botox injection to decrease wrinkles.

Bell's palsy is unilateral lower motor neuron paralysis of the facial nerve, which affects both the upper and lower face, in contrast to facial paralysis due to upper motor neuron causes like stroke and intracranial tumours, where the upper face is spared. Patients may experience altered taste (involvement of the chorda tympani) and intolerance of loud noise (paralysis of stapedius). The condition is usually self-limiting. Dynamic facial reanimation surgery can help restore facial expressions such as smiling in patients with Bell's palsy. Other causes of facial palsy include post-parotid surgery, parotid tumours, and infection with herpes zoster virus (Ramsay-Hunt syndrome).

QUIZ QUESTIONS

This child has viral encephalitis (inflammation of brain cells) (Figure 2.24).

Q1. *What is your diagnosis? Which side of the face is affected?*

Q2. *How do you clinically examine the facial nerve?*



FIGURE 2.24 Child with viral encephalitis. (Courtesy of Qassim F. Baker.)

The Vestibulocochlear Nerve (CN VIII)

See “The Ear”.

Glossopharyngeal Nerve (CN IX)

Exits the medulla oblongata, where it originates from four nuclei, emerges through the jugular foramen, and innervates the following:

- Motor supply to the stylopharyngeus muscle
- Parasympathetic innervation to the parotid gland
- Receives information from the baroreceptors of the carotid sinus and chemoreceptors of the carotid body in response to changes in blood pressure and blood gases (O₂ and CO₂)
- General sensory information from the external ear, inner side of the tympanic membrane, upper pharynx, and posterior third of the tongue
- Special sensory (taste sensation) from the posterior third of the tongue

Vagus Nerve (CN X)

The term vagus nerve translates to “wandering nerve” in Latin. It emerges from the anterior surface of the medulla oblongata and exits the cranial cavity through the jugular foramen. It is accompanied by the internal carotid artery (ICA) and subsequently the common carotid artery (CCA) and internal jugular vein (IJV) as it descends within the carotid sheath of the neck. In the neck, the vagus nerve and its branches supply the following:

- Soft palate muscles (except tensor veli palatini)
- Pharyngeal muscles (except stylopharyngeus), including palatoglossus
- Muscles of the larynx
- Sensation at the back of the ear, external auditory meatus, and external aspect of the temporomandibular joint
- Sensation to the larynx and laryngopharynx

The vagus nerve continues as the parasympathetic supply to the thoracic (pulmonary, cardiac, bronchi, oesophageal) and abdominal viscera (down to splenic flexure) (see [Section 5](#)).

Recurrent Laryngeal Nerve

The recurrent laryngeal nerve (RLN) originates from the vagus nerve in the thorax and ascends to the neck. The left RLN loops around the aortic arch at the ligamentum arteriosum, while the right loops around the right subclavian artery and therefore has a shorter course. Ascending in the neck, the RLN lies within the tracheo-oesophageal groove. The RLN supplies all the intrinsic muscles of the larynx except the cricothyroid, and supplies sensory innervation to the mucous membrane inferior to the vocal cords. The nerve should always be identified prior to thyroidectomies (*vide infra*). The final 2 cm of the nerve before entering the larynx are the most vulnerable to injury. The RLN is lateral but close to the lateral thyroid ligament (ligament of Berry).

Accessory Nerve (CN XI)

The accessory nerve is composed of two roots: the spinal root arising from the upper six cervical nerves and the cranial root emerging from the lateral side of the medulla oblongata.

The spinal root enters the posterior cranial fossa through the foramen magnum and unites with the cranial root. Both roots leave the cranial cavity through the jugular foramen, where they separate. The cranial root joins the vagus nerve to provide motor innervation to the muscles of the pharynx and larynx.

The spinal root supplies the sternocleidomastoid muscle and passes through the posterior triangle of the neck to supply the trapezius. Within the posterior triangle it lies in close proximity to cervical lymph nodes. This is of clinical importance during the removal of cervical lymph nodes for biopsy.

Hypoglossal Nerve (CN XII)

The hypoglossal nerve originates from the hypoglossal nucleus in the medulla oblongata as a series of rootlets. It subsequently exits the cranial cavity via the hypoglossal canal. It is related to the carotid arteries within the carotid triangle and can be injured during carotid endarterectomy. It swings from the carotid triangle to the submandibular triangle for its destination to supply all the intrinsic and extrinsic muscles of the tongue except for the palatoglossus. Injury results in ipsilateral tongue atrophy. The superior root of the ansa cervicalis (C1, C2) is closely related to the hypoglossal nerve, but not part of it. Remember that the nerve supply of the geniohyoid muscle (C1) courses with the hypoglossal nerve but doesn't originate from it.

The Oral Cavity

The oral cavity (mouth) is bounded by the lips anteriorly and extends to the palatoglossal folds, where it is continuous with the oropharynx.

Mucous membrane lines the oral cavity, giving it its red appearance, covered by stratified squamous epithelium.

The oral cavity is divided into two parts: the vestibule and the oral cavity proper. If you blow your cheeks out, air fills the vestibule of the mouth. This is the "slit-like" space external to the teeth and between the gums. The oral cavity proper is the space internal to the teeth.

The oral cavity is bound laterally by the left and right buccinator muscles. The parotid duct (salivary duct) pierces the buccinator muscle to open into the oral cavity opposite the upper second molar tooth.

A pocket of fat, the buccal fat pad, lies superficially on the buccinator muscle. The buccal fat pad is relatively large in babies and assists in suckling.

The **mylohyoid and the geniohyoid muscles form the floor of the mouth**. The tongue arises from the floor of the cavity and occupies most of it.

The roof of the oral cavity is formed by the palate (appreciate how the palate also forms the floor of the nasal cavity).

Tongue

The tongue is composed of a mass of skeletal muscle that is covered in mucous membrane. This organ is important for speech, mastication, swallowing, and taste. It is divided into left and right parts by a fibrous septum. It has oral (anterior two-thirds) and pharyngeal (posterior third) parts, demarcated by the V-shaped terminal sulcus (sulcus terminalis). The apex of the V-shaped sulcus marks a pit, the foramen caecum (see Development of the thyroid gland). The tongue has a rough

dorsal surface containing the taste buds and papillae in the anterior two-thirds and a ventral smooth surface. The posterior one-third contains aggregates of lymphoid tissues (the lingual tonsil) (Figure 2.25).

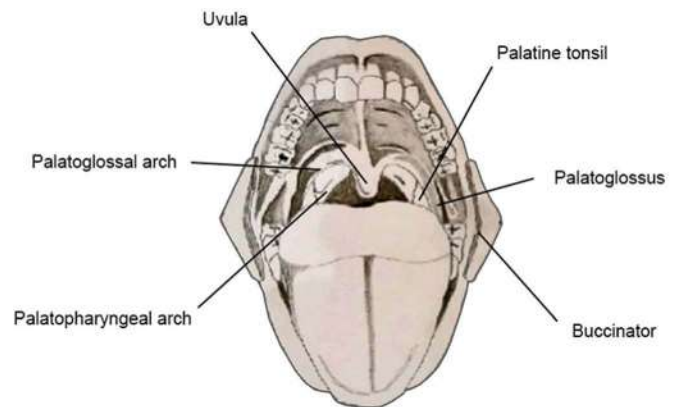


FIGURE 2.25 The tongue and the oral cavity. (Courtesy of John Ward.)

Papillae

Papillae are mucosal projections located on the dorsal surface and give the anterior two-thirds of the tongue (the pre-sulcal area) its rough texture. There are four types of papillae:

- Fungiform (mushroom-like)
- Circumvallate (means surrounded by a "vallum" or wall of mucosa), 8 to 12 in number, located at the anterior part of the terminal sulcus (supplied by the glossopharyngeal nerve)
- Foliate (leaf-like), located on the posterior lateral edge of the tongue
- Filiform (filament or thread-like), numerous and do not contain taste buds

The fungiform, circumvallate, and foliate papillae are considered gustatory papillae, as they contain taste buds. Taste buds are also present on the soft palate (supplied by the facial nerve), on the epiglottis, and on the larynx (supplied by the internal laryngeal branch of the vagus).

The muscles of the tongue arise from the occipital myotomes, which migrate ventrally, bringing their nerve supply (the hypoglossal nerves) with them.

The tongue is composed of four intrinsic and four extrinsic muscles (Figure 2.26). The intrinsic muscles are named for the direction of the muscle fibres and do not attach to any bones. Their function is to alter the shape of the tongue. They are classified as:

- Superior longitudinal
- Vertical
- Transverse
- Inferior longitudinal

The extrinsic muscles attach to superior or inferior bony landmarks and travel into the tongue. They function to move the tongue (Table 2.8).

All the extrinsic muscles are supplied by the hypoglossal nerve (CN XII), apart from the palatoglossus muscle, which is supplied by the vagus nerve (CN X).

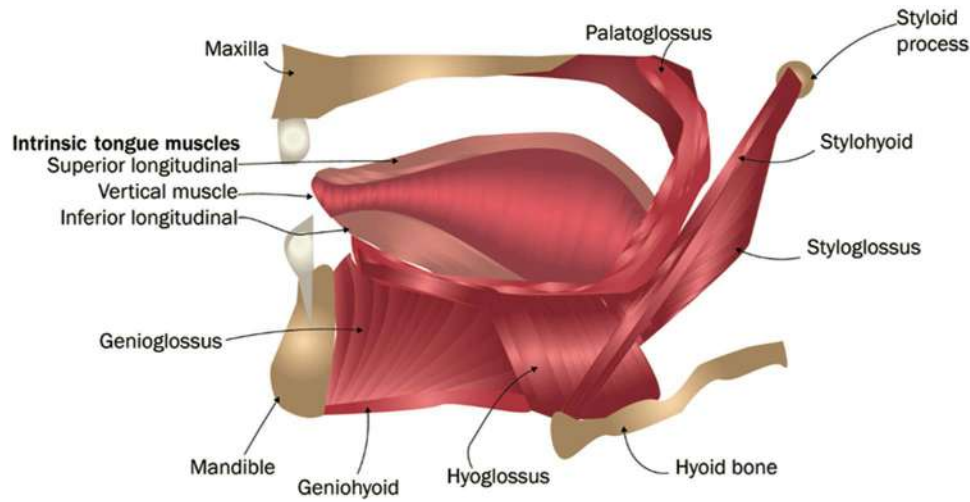


FIGURE 2.26 Sagittal view of the intrinsic and extrinsic tongue muscles. (Courtesy of John Ward.)

TABLE 2.8: Extrinsic muscles of the tongue

Muscle	Origin	Insertion	Action	Innervation
Genioglossus	Superior mental spine on the inner surface of the symphysis menti	Tongue and body of the hyoid bone	<ul style="list-style-type: none"> Depress to create central furrow Posterior part protrudes tongue, anterior part retract tongue 	Hypoglossal nerve (CN XII)
Hyoglossus	Hyoid bone	Side of the tongue between styloglossus and longitudinal muscle	Depresses and retracts tongue	Hypoglossal nerve (CN XII)
Styloglossus	Styloid process of temporal bone	Tongue	Retracts tongue and helps create central furrow	Hypoglossal nerve (CN XII)
Palatoglossus	Palatine aponeurosis of the soft palate	Tongue	Elevates posterior aspect of tongue	Vagus nerve (CN X)

Sensory Supply of the Tongue

The general and special sensory innervation of the anterior two-thirds and the posterior third of the tongue is different.

Anterior two-thirds: arises from the first pharyngeal arch:

- General sensation is supplied by the **lingual nerve**, a branch of the mandibular division of trigeminal nerve (CN V3).
- Special sensory is supplied by the **chorda tympani**, a branch of the facial nerve (CN VII) which runs with the lingual nerve to enter the tongue.

Posterior third: arises from the third and the fourth pharyngeal arches.

General and special sensory fibres arise from the **glossopharyngeal nerve** (CN IX), which also supplies taste buds in the oropharynx. The glossopharyngeal nerve is responsible for the afferent pathway for the gag reflex. The motor part is mediated by the vagus nerve.

Blood Supply of the Tongue

The tongue is supplied predominantly by the lingual artery (a branch of the external carotid). It also receives contributions from the tonsillar branch of the facial artery and from the ascending pharyngeal artery. The lingual veins drain into the internal jugular veins.

Lymphatic Drainage of the Tongue

Lymph from the:

- Tip of the tongue drains to the submental lymph nodes.
- Lateral part of the anterior two-thirds of the tongue drains to submandibular lymph nodes, which drain into the inferior deep cervical lymph nodes.
- Posterior third of the tongue drains into the superior deep cervical lymph nodes.

CLINICAL NOTES

The tongue, historically, is looked at as a reflection of body health. Examination of the tongue is an integral part of the physical examination, looking for dehydration (dry tongue), blue tongue (central cyanosis), and bald tongue (nutritional deficiency).

SUBLINGUAL ABSORPTION OF DRUGS

Drugs placed under the tongue can be quickly absorbed into the bloodstream due to its rich blood supply – for example, sublingual nitroglycerin, a coronary vasodilator which is used by patients with angina.

TONGUE ULCERS

Causes can be classified as:

- *Traumatic* (injuries, sharp teeth, accidental biting).
- *Infections* (human papillomavirus 1, HIV, fungi such as candidiasis, tuberculosis [TB], syphilis). Ulcers due to aphthous stomatitis are usually multiple and very painful and improve within a short time.
- *Malignant* (squamous cell carcinoma), which may be preceded by leucoplakia (white patch on the tongue or on the oral mucosa). This is mostly related to smoking and excessive alcohol consumption and presents as an ulcer or a growth. The lateral aspect of the tongue is the most common site for malignant ulceration (see oropharyngeal cancer).

HYPOGLOSSAL NERVE PARALYSIS

The hypoglossal nerve can be injured during surgery (e.g., carotid endarterectomy), causing the tongue to deviate to the same side as the injury.

The Palate

The palate is composed of the hard palate anteriorly and the soft palate posteriorly. It forms the roof of the mouth and the floor of the nasal cavity.

Hard Palate

The hard palate is formed by two bones:

- Horizontal part of the palatine bone
- Palatine process of the maxillary bone

Soft Palate

The soft palate hangs from the posterior aspect of the hard palate as a mobile flap, which separates the nasal and oral parts of

the pharynx (**Figure 2.27**). The soft palate is composed of five muscles:

- Musculus uvulae (the muscle of the uvula).
- Palatoglossus (from the palate to the side of the tongue within the palatoglossal arch).
- Palatopharyngeus (from the soft palate to the lateral wall of the oropharynx, within the palatopharyngeal arch; the palatine tonsil lies in between the palatoglossal and palatopharyngeal arches). This muscle inserts into the posterior border of the thyroid cartilage and is considered one of the longitudinal muscles of the pharynx.
- Levator veli palatini's contraction helps to shut the nasopharynx from the oropharynx.
- Tensor veli palatini's expanded tendon forms the palatine aponeurosis.

The five muscles are all supplied by the vagus nerve (pharyngeal plexus) except for the tensor veli palatini, which is supplied by the mandibular division of the trigeminal nerve.

The sensory innervation of the palate is by the maxillary division of the trigeminal nerve (CN V2) through the greater and lesser palatine nerves.

Blood supply is provided by branches from the maxillary, facial, and ascending pharyngeal arteries.

Lymphatic drainage is to the deep cervical group of lymph nodes.

CLINICAL NOTE

GAG OR PHARYNGEAL REFLEX

Stimulation of the pharynx wall is detected by the afferent glossopharyngeal nerve (CN IX), which initiates the gag reflex by stimulating the vagus nerve (CN X) to contract the pharyngeal muscles.

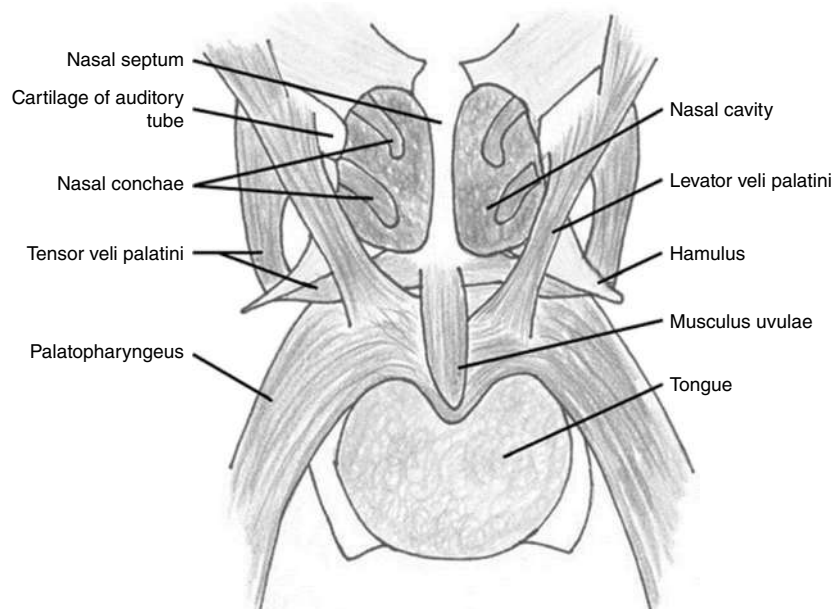


FIGURE 2.27 The muscles of the soft palate, posterior view. (Courtesy of Gabriela Barzyk.)

Cleft Palate

This is a developmental defect that results from the failure of the primary palate (intermaxillary segment) and the secondary palate (palatal shelves) to fuse, normally at the incisive foramen. There are different grades of cleft palate; some are associated with cleft lip ([Figure 2.28](#)) and, rarely, abnormality of the nasal septum. It can result in problems with feeding and phonation.



FIGURE 2.28 Cleft lip and palate. (Courtesy of Mohammed H. Aldabbagh.)

Muscles of Mastication

The muscles of mastication function to move the temporomandibular joint in order to chew and grind up food. They are **all innervated by branches of the mandibular nerve (CN V3)**.

There are four muscles of mastication on each side of the face:

- **Temporalis** arises from the temporal fossa and inserts into the coronoid process and ramus of the mandible.
- **Masseter** passes from the zygomatic arch to the ramus and angle of the mandible.
- **Medial pterygoid** originates as two heads from the lateral pterygoid plate of the sphenoid bone and from the palatine bone. It inserts into the ramus and angle of the mandible.

- **Lateral pterygoid** originates as two heads from the greater wing of the sphenoid and lateral pterygoid plate to insert into the temporomandibular joint and neck of the mandible. It divides the maxillary artery into three parts as it passes between its two heads.

Temporomandibular Joint

The temporomandibular joint is the articulation between the condylar process of the mandible and the mandibular fossa of the temporal bone. It is a bilateral hinge joint, with a biconcave fibrocartilaginous articular disc located between the condyle and the mandibular fossa. The articular disc facilitates complex movements. The capsule is reinforced laterally by the temporomandibular ligament, and there are two accessory ligaments: the sphenomandibular and stylomandibular ligaments.

Infratemporal Fossa

The infratemporal fossa is the area inferior to the zygomatic arch and deep to the masseter muscle. It contains the:

- Lateral pterygoid muscle
- Medial pterygoid muscle
- Maxillary artery (terminal branch of the external carotid artery, divided into three parts due to its relationship with the lateral pterygoid muscle)
- Pterygoid venous plexus
- Mandibular division of the trigeminal nerve (CN V3)
- Chorda tympani branch of the facial nerve
- Otic ganglion, a parasympathetic ganglion, located at the stem of the mandibular nerve, near the foramen ovale. Parasympathetic fibres, through the lesser petrosal branch of the glossopharyngeal nerve, synapse within the ganglion and supply secretomotor fibres to the parotid gland. The sympathetic fibres from the superior cervical ganglion pass without synapsing in the ganglion within the auriculotemporal nerve to supply the parotid gland

Salivary Glands

There are three paired salivary glands: the parotid, submandibular, and sublingual glands. The salivary glands produce saliva to lubricate the oral cavity, help protect the teeth from decay, and aid in digestion.

Parotid Gland

The parotid gland is the largest salivary gland and is located anterior to the external ear, enclosed in a fibrous capsule. It has two lobes (deep and superficial), which are bisected by the facial nerve. Saliva produced in the parotid gland enters the oral cavity by travelling through the parotid duct. The parotid duct is approximately 5 cm in length and emerges from the medial aspect of the gland. It passes over the masseter muscle (inferior to the zygomatic arch) and pierces the buccinator to open in the mouth opposite the upper second molar tooth. Several important anatomical structures traverse the parotid gland:

- The facial nerve branches into its terminal divisions within the gland: temporal, zygomatic, buccal, mandibular, and cervical.

- The external carotid artery travels through the gland and bifurcates posterior to the ramus of the mandible into its two terminal branches: the maxillary and superficial temporal arteries.
- The superficial temporal and maxillary veins unite within the substance of the gland to form the retromandibular vein.

Innervation of the Parotid Gland

Sensory innervation is from the great auricular nerve, a branch of cervical plexus. Autonomic innervation is secretomotor in nature (see the earlier discussion on the otic ganglion).

Sublingual Gland

The sublingual salivary gland opens into the floor of the mouth via multiple ducts. This small gland lies on top of the mylohyoid muscle.

Submandibular Gland

The submandibular salivary glands produce the most saliva. The saliva produced by the submandibular glands is mucoid in nature to facilitate lubrication of the bolus before swallowing. The gland is described as having superficial and deep parts due to its relationship to the mylohyoid muscle. The submandibular salivary gland opens to the side of the frenulum of the tongue. Parasympathetic supply runs with the chorda tympani and increases the amount of saliva secreted (vide infra, the submandibular triangle).

CLINICAL NOTES

- Mumps (a viral infection) is the most common cause of parotid swelling (parotitis). Mumps is particularly painful because the swelling is compressed by the tough capsule covering the gland.
- Pleomorphic adenoma is the most common parotid tumour (**Figures 2.29** and **2.30**).

QUIZ QUESTION

This swelling has been slowly enlarging over many years (**Figure 2.29**).

Q1. *What is the most prominent physical sign?*

Q2. *What should be examined next?*

The facial nerve should always be identified and preserved during surgical removal of the parotid gland (parotidectomy).

With salivary duct calculi (sialolithiasis), the parotid duct is blocked by stones. This is a rare condition.

Submandibular Calculi

Salivary gland calculi (stones) are most commonly located in the submandibular gland and duct. The history of a swelling under the jaw, which is intermittent and appears with food ingestion, represents blockage of the submandibular duct. Examination of the mouth includes looking for the orifice of the submandibular duct (Wharton's duct) below the tongue, to the side of the frenulum, and bimanual palpation of floor of the mouth and the submandibular region. The orifice of the duct may reveal the presence of

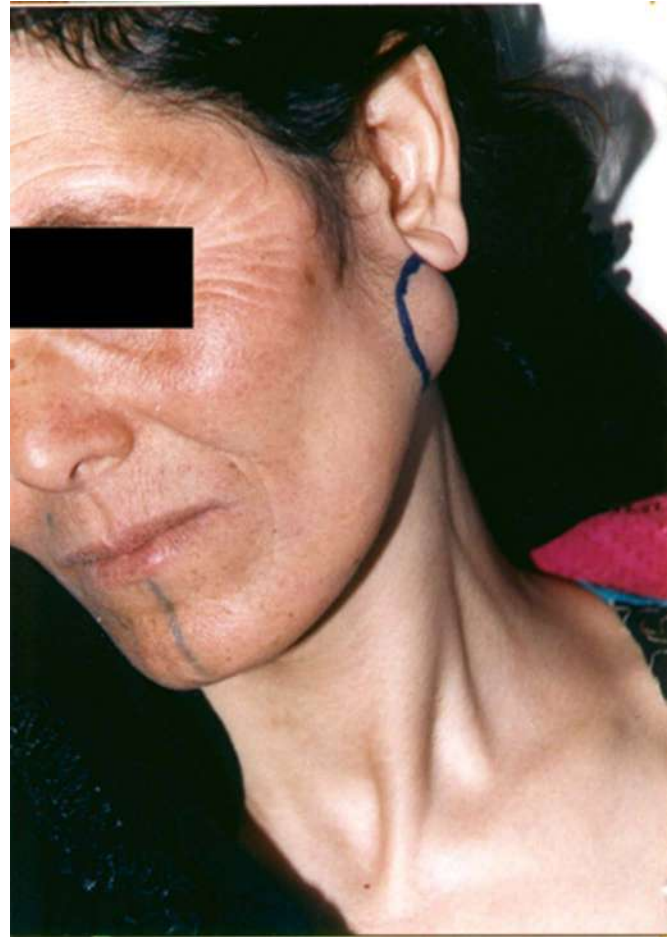


FIGURE 2.29 Mixed parotid tumour. (Courtesy of Qassim F. Baker.)

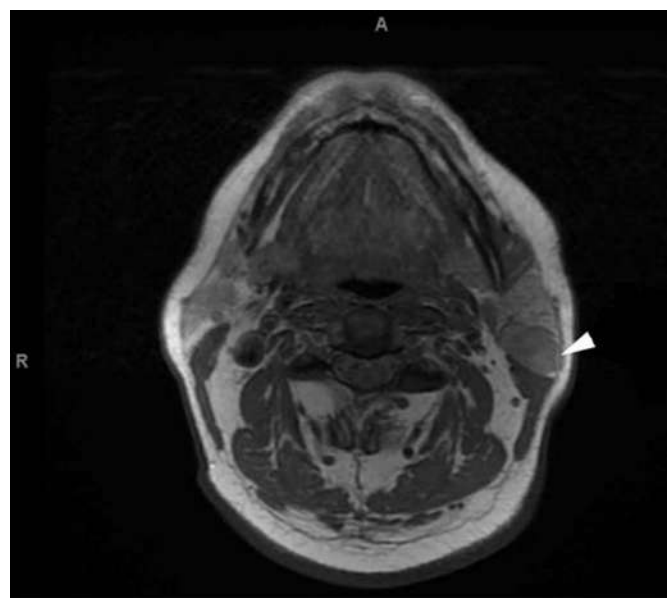


FIGURE 2.30 MRI neck: Axial T1 with contrast: Left parotid adenoma (*arrowhead*). (Courtesy of Asha Ali.)

a stone (**Figure 2.31**). The diagnosis may be confirmed by X-ray of the floor of the mouth or by sialography (injecting a dye through the cannulation of the orifice of the submandibular duct), which may dislodge the stone as well.



FIGURE 2.31 Stone at the orifice of the right submandibular duct. (Courtesy of Ali M. Hasan.)

Anatomy of the Neck

Cervical Vertebrae

There are seven cervical vertebrae in the neck region, of which four are typical (C3–C6) and three are atypical (C1, C2, and C7).

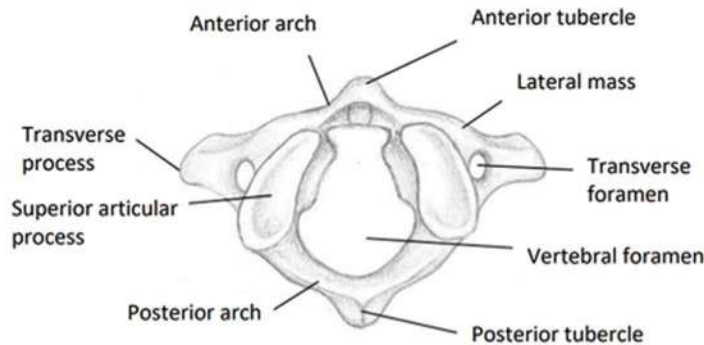


FIGURE 2.32 Superior view of C1 vertebra. (Courtesy of Callum Moffitt.)

Typical Cervical Vertebrae

The bodies of the cervical vertebrae are relatively small, as they do not have to support the weight of the trunk. The vertebral foramen is relatively large and triangular. The cervical spinous processes of C2–C6 are bifid. They each possess a foramen in their transverse processes, the foramina transversaria. The vertebral artery, which supplies the spinal cord and brain, ascends through only six transverse foramina (C6–C1), whereas the vertebral vein descends through all seven (C1–C7). Note that the C7 foramina are small and sometimes absent. Joints between superior and inferior articular processes (zygapophyseal joints) allow flexion and extension of the column.

The Atlas (C1)

The first cervical vertebra is called the atlas (**Figures 2.32 and 2.33**). It is shaped like a ring and does not have a body. The lateral sides are expanded as two masses, which articulate with the occipital condyles of the skull at the atlanto-occipital joint. This joint allows for the nodding movement of the head.

The Axis (C2)

The second cervical vertebra is called the axis (**Figure 2.34**). The most prominent feature is the short odontoid process, or dens, that projects from the superior aspect of the body. The odontoid process articulates with the atlas at the atlantoaxial joint. This joint allows for rotation of the skull, as the dens acts as a pivot.

Vertebra Prominens (C7)

The seventh cervical vertebra has the longest spinous process, which is not bifid. It can be easily palpated at the back of the neck (**Figure 2.35**).

Important cervical landmarks:

- C1: base of nose and hard palate
- C2: teeth in closed mouth
- C3: mandible and hyoid
- C4: bifurcation of the carotid artery
- C3–C6: larynx
- C4–C5: thyroid cartilage
- C6–C7: cricoid cartilage
- C6: laryngopharynx becomes continuous with the trachea and oesophagus

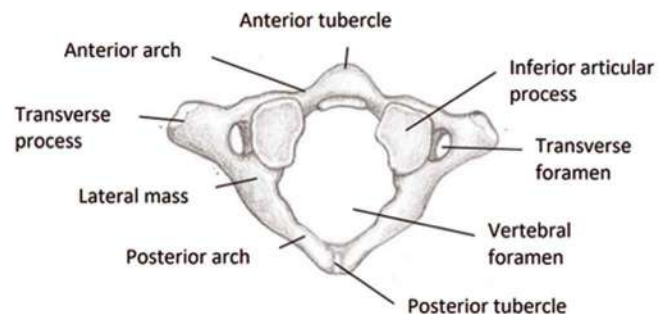


FIGURE 2.33 Inferior view of atlas (C1). (Courtesy of Callum Moffitt.)

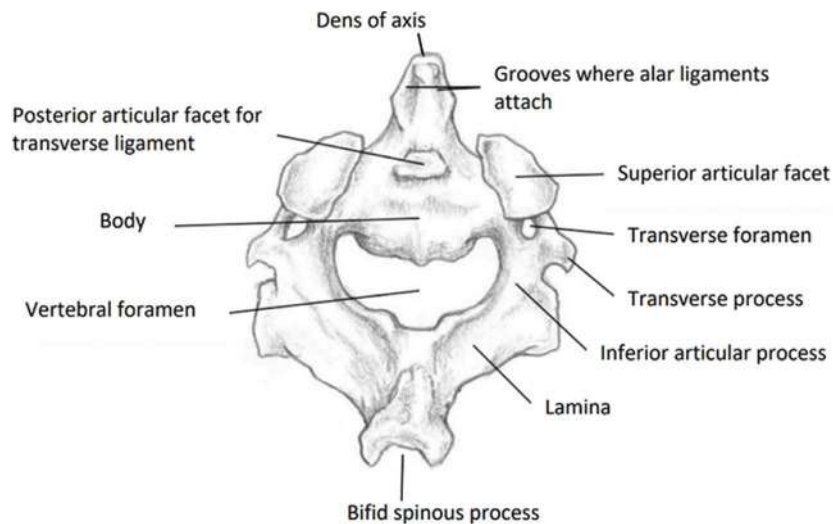


FIGURE 2.34 The axis (C2). (Courtesy of Callum Moffitt.)

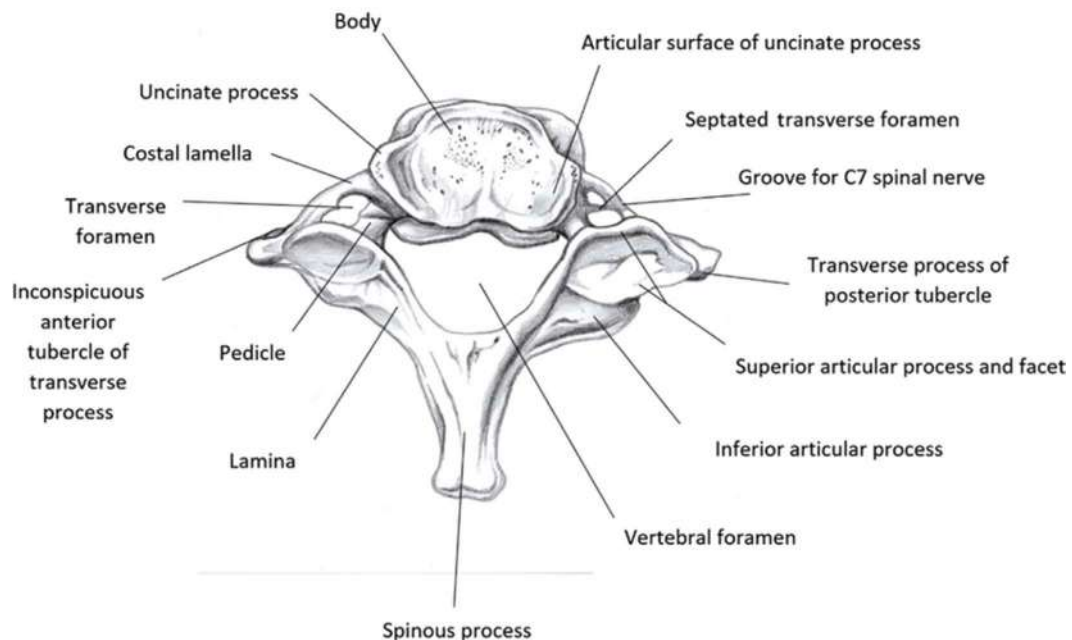


FIGURE 2.35 Superior view of C7. (Courtesy of Callum Moffitt.)

CLINICAL NOTES

CERVICAL SPINE INJURY

- The cervical spine is the most common site of spinal injury, particularly at C7.
- Common patterns of fractures include occipital condyle fractures, Jefferson's fracture (burst fracture of the anterior and posterior arches of C1), atlantoaxial dislocation, hangman's fracture (fracture of the pars interarticularis of C2), odontoid process fracture, compression fractures, and C7 facet joint dislocation.
- The most common cause of cervical spine injury is road traffic accidents (RTAs) resulting in a whiplash injury mechanism. This involves shear, tensile, and rotational

forces from acute flexion, compression, extension, and distraction movement all occurring in less than a second.

- Other causes of cervical spine injury include violent assaults, shallow water diving (axial force producing vertical compression fractures), and falls (common in the elderly).
- All major trauma patients should be presumed to have a cervical spine injury until proven otherwise, due to the high risk of spinal cord injury. Initial management of a severely injured patient at the scene of the accident must include applying cervical spine immobilisation with a rigid collar, lateral head supports, and strapping across. The patient should be very carefully lifted. The cervical collar and other precautions should be kept until the CT scan of the spine reveals no evidence of injury.

(Continued)

- After initial resuscitation (ABCDE) and assessment, a CT scan should be done in accordance with Advanced Trauma Life Support (ATLS) guidelines. A lateral X-ray is only to be used if a CT scan is unavailable.

CERVICAL DEGENERATIVE DISEASES

Spondylosis is a form of osteoarthritis in the vertebral column and leads to the formation of osteophytes. Symptoms arise from osteophyte compression of the nerve root, leading to unilateral radiculopathy. Degenerative disc disease results from dehydration and alterations in the collagen composition of the nucleus pulposus and annulus fibrosus, which occur with age.

CHASSAIGNAC’S (CAROTID) TUBERCLE

The tubercle of the fourth cervical vertebrae separates the carotid and vertebral arteries. The carotid artery can be massaged against this tubercle to relieve symptoms of supraventricular tachycardia.

QUIZ QUESTION

Q. How do you differentiate the seventh cervical vertebra from the first thoracic vertebra?

Fascia of the Neck

The superficial fascia on the front of the neck contains the platysma (a sheet of voluntary muscle that extends from the lower jaw to the front of the upper chest, supplied by the cervical branch of the facial nerve).

Deep cervical fascia is the fibrous connective tissue which surrounds different compartments of the neck. It is composed of the following layers:

- The investing layer is the more superficial layer, which completely invests the sternocleidomastoid and trapezius muscles. Inferiorly, it attaches to the manubrium sterni, clavicles, and acromion and spine of the scapula; superiorly it attaches to the external occipital protuberance, superior

nuchal line, zygomatic arches, and mastoid processes. Posteriorly, it attaches to the ligamentum nuchae, along the spinous processes of the cervical vertebrae. It also splits to enclose the parotid and the submandibular salivary glands.

- Prevertebral fascia is located in front of the vertebral column, the deep muscles of the back, and the scalene muscles. Superiorly, it attaches to the base of the skull and is continuous inferiorly with the endothoracic fascia of the chest and the anterior longitudinal ligament of the vertebral column. Laterally, it extends as the axillary sheath to envelope the axillary vessels and brachial plexus.
- Pre-tracheal fascia is located in the front of the neck and is attached superiorly to the hyoid. It encapsulates the thyroid gland, trachea, and oesophagus, as well as the infrahyoid muscles. The pre-tracheal fascia is weak posteriorly, meaning infection can easily spread backwards in the neck (*vide infra*, the lateral thyroid ligament). Swellings related to the thyroid gland (goitre) move on swallowing, a very important clinical sign (see the later discussion on the anatomy of the thyroid gland).
- The carotid sheath is the fascia which surrounds the common and internal carotid arteries, internal jugular vein, vagus, ansa cervicalis, and deep cervical lymph nodes on each side of the neck from the base of the skull to the root of the neck. The cervical sympathetic trunk is located posterior to the carotid sheath.

Suprahyoid Muscles

The suprahyoid muscles are a group of muscles that attach to the superior part of the hyoid, and thus their contraction results in elevation of the hyoid (Table 2.9).

Infrahyoid Muscles

The infrahyoid muscles are a group of strap muscles that attach to the inferior surface of the hyoid, and hence their contraction depresses the bone itself, Mnemonic: TOSS (Table 2.10).

CLINICAL NOTE

In order to mobilise the thyroid lobes in thyroid gland surgery, the infrahyoid strap muscles must be retracted. Only in extreme operative difficulty are the muscles cut.

TABLE 2.9: Suprahyoid muscles

Muscle	Origin	Insertion	Innervation	Function
Mylohyoid (diaphragm of the mouth)	Mylohyoid line of mandible	Hyoid	Nerve to mylohyoid from mandibular branch of trigeminal (CN V3)	Elevates hyoid
Digastric (anterior belly)	Digastric fossa of mandible, close to symphysis menti	Intermediate tendon attached to the body and greater cornu of the hyoid bone through a fibrous sling	Nerve to mylohyoid (CN V3)	Elevates hyoid, depresses mandible
Digastric (posterior belly)	Intermediate tendon (between the two bellies)	Mastoid notch of the temporal bone	Facial nerve (CN VII)	Elevates hyoid, depresses mandible
Geniohyoid	Inferior mental spine of mandibular symphysis	Hyoid	C1 via hypoglossal (CN XII)	Helps in swallowing by widening pharynx
Stylohyoid	Styloid process of the temporal bone	Hyoid	Facial nerve (CN VII)	Retracts, elevates hyoid to increase length of floor of the mouth

Hyoglossus (see Table 2.8)

TABLE 2.10: Infrahyoid muscles

Muscles	Origin	Insertion	Innervation	Function
Thyrohyoid	Thyroid cartilage	Hyoid	C1 via hypoglossal (CN XII)	Depresses hyoid
Sternohyoid	Manubrium sterni	Hyoid	Ansa cervicalis (C1–C3)	Depresses hyoid and larynx
Sternothyroid	Manubrium sterni	Oblique line on the lamina of thyroid cartilage	Ansa cervicalis (C1–C3)	Depresses larynx
Omohyoid (see Table 2.11)				

Nerves of the Neck

There are three major nervous structures which travel through the neck: the vagus nerve, phrenic nerve, and cervical sympathetic trunk. (Note: the accessory, glossopharyngeal, and hypoglossal nerves also give branches to structures in the neck.)

The Cervical Plexus

This is formed from the ventral rami of C1–C4 and supplies sensory nerves to the neck and motor branches, mainly via the ansa cervicalis, to the infrahyoid and prevertebral muscles and levator scapulae. Branches from C3 and C4 join C5 to form the phrenic nerve. The plexus lies deep to the sternocleidomastoid muscle. Each nerve, except the first (suboccipital nerve) gives rise to both descending and ascending roots in the form of loops.

The sensory branches, which arise at the punctum nervosum (Erb's point) (the middle of the posterior border of the sternocleidomastoid muscle) are:

- *Lesser occipital nerve* (C2) supplies the back of the scalp (see "Innervation of the scalp").
- *Greater auricular nerve* (C2, C3), sensory fibres from the skin over the parotid gland, back of the pinna of the external ear and mastoid process.
- *Transverse cervical nerve* (C2, C3), sensory supply of the anterior aspect of the neck.
- *Supraclavicular nerves* (C3, C4), medial, intermediate, and lateral, supply sensory fibres to part of the skin of the neck and over the shoulder and upper chest down to the second rib (see [Section 5](#) for gallbladder-referred pain to the tip of the right shoulder).

QUIZ QUESTION

Q. What is the importance of the punctum nervosum to the anaesthetist?

Phrenic Nerve (C3–C5, mainly C4)

The major branch from the cervical plexus, the phrenic nerve provides motor innervation to the diaphragm in addition to sensory branches to the pericardium, diaphragmatic pleura, and peritoneum. It runs anterior to the scalenus anterior (see [Section 4](#)).

Ansa Cervicalis (Latin: "Handle of the Neck")

The ansa cervicalis is a looped nerve that is composed of a superior root (C1), which is continuous with an inferior root (C2–C3). The superior root (*descendens hypoglossi*) travels with the hypoglossal nerve, then passes inferiorly to form a loop with the inferior root, which ascends anterior to the internal jugular vein in the carotid triangle. Both roots supply the infrahyoid muscles.

Cervical Sympathetic Trunk

The cervical sympathetic trunk lies on the prevertebral muscles, behind the prevertebral fascia. It is composed of three ganglia (inferior, middle, and superior). The pre-ganglionic fibres arise from the thoracic spinal nerves. The post-ganglionic fibres travel with the cervical nerves to supply blood vessels and glands, such as the lacrimal and salivary glands.

Vagus Nerve (CN X)

See above, Cranial nerves.

Triangles of the Neck

Each side of the neck can be divided into anterior and posterior triangles by the sternocleidomastoid muscle ([Table 2.11](#)).

CLINICAL NOTE

TORTICOLLIS

Torticollis is a condition that results in an abnormal tilting of the top of the head to one side while the chin tilts to the other side. It is caused by the shortening of the sternocleidomastoid, usually as a result of trauma to the muscle during birth.

TABLE 2.11: Key muscles of the neck triangles

Muscle	Origin	Insertion	Innervation	Function
Sternocleidomastoid	Superior surface of manubrium sterni, medial third of the clavicle (sternal and clavicular heads, respectively)	Mastoid process and lateral half of superior nuchal line	Spinal root of the accessory nerve (CN XI)	Laterally rotate the head and flex the neck
Trapezius Has three parts: descending, transverse, and ascending	The medial third of the superior nuchal line, nuchal ligament, spinous processes of the vertebra C7–T12	The lateral third of the clavicle, acromion, and spine of the scapula, respectively	Spinal root of the accessory nerve (CN XI)	Upper fibres pull the scapula upwards, middle fibres pull the scapula medially, and the lower fibres pull the scapula downwards
Omohyoid (inferior belly)	Superior aspect of scapula	Intermediate tendon, which unites the two bellies	Ansa cervicalis (C1–C3)	Depress hyoid and larynx
Omohyoid (superior belly)	Intermediate tendon	Hyoid	Ansa cervicalis (C1–C3)	Depress hyoid and larynx

TABLE 2.12: The scalene muscles

Muscle	Origin	Insertion	Innervation	Action
Scalenus anterior	Anterior tubercles of transverse processes of the third to sixth cervical vertebrae	Scalene tubercle on the inner border of the first rib	Cervical plexus (C4–C6)	Acts as an accessory muscle of respiration by elevating the first rib, also bends the cervical spine forwards and laterally
Scalenus medius (the longest of the scalene muscles)	Transverse processes of the lower five cervical vertebrae	Upper surface of the first rib	Cervical plexus	Elevates first rib
Scalenus posterior	Transverse processes of the fourth to sixth cervical vertebrae	Second rib	Ventral rami of lower three cervical spinal nerves	Elevates the second rib

Scalene Muscles

The term scalene refers to a triangle with sides of unequal lengths. There are three scalene muscles in the neck: scalenus anterior, scalenus medius, and scalenus posterior (**Table 2.12**).

The anterior scalene has important anatomical relations:

- It divides the subclavian artery into three parts (**Figure 2.36**).
- The subclavian vein lies anterior to the muscle belly, so it is readily accessible for cannulation.
- The phrenic nerve descends on its anterior surface to travel into the thorax.
- The brachial plexus emerges between the scalenus anterior and medius at the lateral border of the scalenus anterior. Anaesthetists will perform upper limb nerve blocks here.
- Brachial plexus roots lie posterior to the muscle.

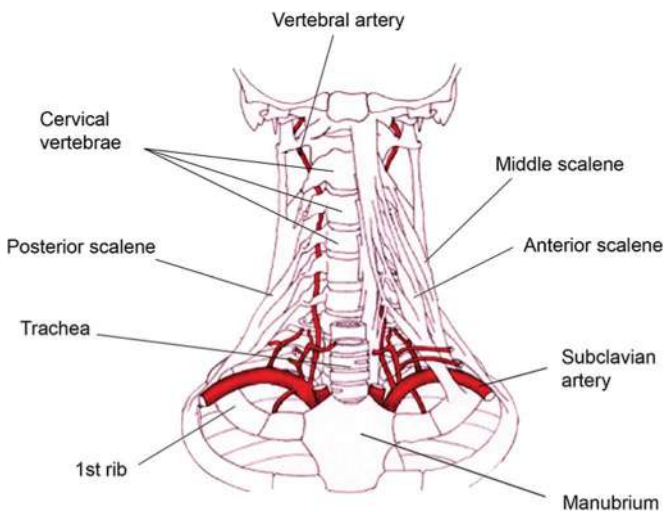


FIGURE 2.36 The anterior scalene (scalenus anterior) muscle divides the subclavian artery into three parts. (Courtesy of Calum Harrington-Vogt.)

Posterior Triangle of the Neck

The boundaries of the posterior triangle are as follows:

- *Anterior:* posterior border of sternocleidomastoid
- *Posterior:* anterior border of trapezius
- *Inferior:* clavicle

The posterior triangle of the neck can be further subdivided into the occipital triangle and the supraclavicular triangle by the inferior belly of the omohyoid (**Figure 2.37**).

The floor of the posterior triangle is covered by the following muscles:

- Inferior belly of omohyoid
- Anterior, middle, and posterior scalenes
- Levator scapulae
- Splenius capitis

A number of important structures are located within the triangle:

- Branches from the cervical plexus, including the phrenic nerve
- Spinal root of the accessory nerve (CN XI)
- Roots of the brachial plexus
- Third part of the subclavian artery lies partly within the supraclavicular triangle and may be palpable

Anterior Triangle of the Neck

The boundaries of the anterior triangle are as follows:

- *Superior:* ramus of mandible
- *Lateral:* anterior border of sternocleidomastoid
- *Medial:* midline of the neck

It can be subdivided into the following triangles:

- Submental
- Digastric
- Muscular
- Carotid

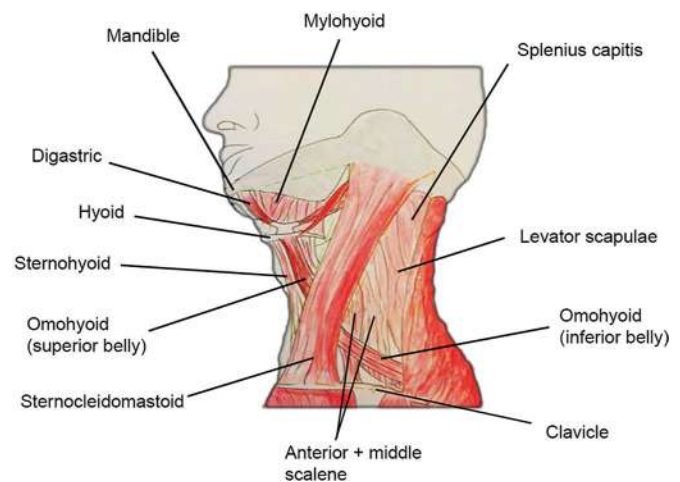


FIGURE 2.37 Triangles of the neck. (Courtesy of Xi Ming Zhu.)

Submental triangle (unpaired) boundaries are as follows:

- *Lateral:* anterior bellies of the right and left digastric muscles
- *Inferior:* body of hyoid bone
- Apex is at the lower part of the symphysis menti

The main content is the submental lymph nodes (drain the tip of the tongue) and the nerves to the mylohyoid muscles, which are united by the mylohyoid raphe and form the floor of the triangle.

Digastric (submandibular) triangle boundaries are as follows:

- *Anteroinferior:* anterior belly of digastric
- *Posteroinferior:* posterior belly of digastric
- *Superior:* mandible

The main contents are the submandibular salivary gland and lymph nodes. The mandibular and cervical branches of the facial nerve pass through the roof of the triangle (skin, superficial fascia, and platysma). The facial artery passes through the triangle deep to the submandibular gland and sometimes indents the gland. It curls towards the inferior border of the mandible. (See “Hypoglossal nerve”, earlier, and information on the facial vein, later.)

CLINICAL NOTES

- Injury to the mandibular and cervical branches of the facial nerve can occur while raising the skin flaps to access the submandibular salivary gland.
- Ludwig’s angina is an aggressive cellulitis of the floor of the mouth, commonly following a lower tooth abscess, which extends to the submandibular triangle. It may compromise the airway by causing laryngeal oedema.

Muscular triangle boundaries include the following:

- *Anterior:* midline of the neck, from the hyoid bone to the sternum
- *Inferoposterior:* anterior border of sternocleidomastoid
- *Posterosuperior:* superior belly of omohyoid

It also contains the infrahyoid muscles.

Carotid triangle boundaries include the following:

- *Superior:* posterior belly of digastric
- *Lateral:* anterior border of sternocleidomastoid
- *Inferior:* superior belly of omohyoid

Its contents include the common, internal, and external carotid arteries, the IJV, and CN X (within the carotid sheath), and CNs XI and XII and the ansa cervicalis (superficial to the carotid sheath).

Arterial Supply of the Head and Neck

Common Carotid Artery

The CCA originates in the thorax (see [Section 4](#)). It travels superiorly from the superior mediastinum to enter the neck, deep to the sternocleidomastoid muscle (lateral retraction of this muscle is of surgical importance during exposure of the artery). It bifurcates into the external and internal carotid arteries at the level of the superior border of the thyroid cartilage (C4). This is an important landmark for the palpation of the carotid pulse.

The **carotid body** is a cluster of chemoreceptors located at the bifurcation of the CCA ([Figure 2.38](#)). It is influenced by changes in the partial pressure of oxygen and carbon dioxide.

The **carotid sinus** is a dilatation at the proximal internal carotid artery, immediately superior to the common carotid bifurcation. The carotid sinus contains baroreceptors which influence systemic blood pressure. The glossopharyngeal nerve (CN IX) transmits information from the carotid sinus and body to the central nervous system.

For details on the internal carotid artery, see [Section 1A](#).

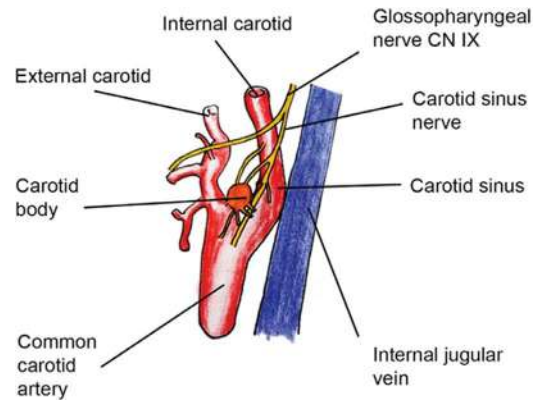


FIGURE 2.38 Carotid sinus and carotid body. (Courtesy of Aditya Mavinkurve.)

CLINICAL NOTE

Carotid endarterectomy is a surgical procedure to remove atherosclerotic plaques from the carotid artery in order to reduce the risk of stroke ([Figure 2.39](#)). The vagus nerve (CN X), ansa cervicalis, and hypoglossal nerve (CN XII) are at risk of damage during this procedure.



FIGURE 2.39 Carotid angiogram before (*left*) and after (*right*) carotid endarterectomy. (Courtesy of Munther Aldoori.)

Massage of the carotid sinus is a therapeutic measure used to slow down the heart rate in supraventricular tachycardia.

Carotid body tumours (carotid body paraganglioma, chemodectoma) arise from the paraganglion cells of the carotid body, at the bifurcation of the CCA. They are usually benign. They present as an asymptomatic, hard, slowly growing neck mass, which can be moved from side to side but not up and down. A small percentage can secrete catecholamines, increasing the sympathetic drive. Patients may therefore have signs such as elevated blood pressure.

External Carotid Artery

The external carotid artery lies anteromedial to the ICA within the carotid triangle. It then travels superiorly, lateral to the internal carotid, to supply structures of the head and neck. From proximal to distal it gives rise to the following branches:

- Superior thyroid artery to upper pole of the thyroid gland, close to the external laryngeal nerve (of surgical importance when clipping or ligating the artery during thyroid surgery)
- Ascending pharyngeal artery to the pharyngeal wall
- Lingual artery to the tongue
- Facial artery to the superficial face
- Occipital artery to the occipital region
- Posterior auricular to the area behind the ear

The external carotid artery passes within the parotid gland behind the neck of the mandible and terminates by bifurcating into two terminal branches:

- Maxillary artery to the deep face and jaw muscles.
- Superficial temporal artery to the side of the head. This is a common site for taking biopsy specimens for the diagnosis of temporal arteritis.

A mnemonic for remembering the branches of the external carotid (proximal to distal) is “some anatomists like freaking out poor medical students” (superior thyroid, *a*scending pharyngeal, *l*ingual, *f*acial, *o*ccipital, *p*osterior auricular, *m*axillary, *s*uperficial temporal).

Subclavian Artery

The right subclavian artery arises from the brachiocephalic trunk, while the left arises from the aortic arch.

The **scalenus anterior muscle divides the artery into three parts**. The third part continues as the axillary artery at the outer border of the first rib.

Branches of the first part (may have aberrant sites of origin) include the following:

- Vertebral artery ascends in the foramina transversaria of all the cervical vertebrae except C7 and enters the skull through the foramen magnum (see **Section 1A**). Extracranially, it gives rise to spinal branches to supply the spinal cord and the meninges.
- Internal thoracic artery (see **Section 4**).
- Thyrocervical trunk, which immediately divides into the inferior thyroid, transverse cervical, and ascending cervical branches

Branches of the second part include the costocervical trunk, which gives rise to the superior (supreme) intercostal and the deep cervical branches.

The third part of the subclavian artery gives origin to the dorsal scapular artery.

The Subclavian Vein

This is a continuation of the axillary vein at the outer border of the first rib to the medial border of the scalenus anterior, which lies posterior to it, where it joins the internal jugular vein to form the brachiocephalic vein. It receives the external jugular vein and the thoracic duct on the left side and the right lymphatic duct on the right side.

Venous Drainage of the Head and Neck

The facial vein drains the structures of the face and is formed by a union of the supratrochlear and supraorbital veins at the medial angle of the eye. It follows the same oblique course as the facial artery. When entering the submandibular triangle (deep to the platysma and the deep fascia), it lies superficial to the submandibular salivary gland.

It drains into the IJV after its union with the anterior division of the retromandibular vein.

The retromandibular vein is formed by the union of the superficial temporal and maxillary veins. It divides into an anterior division, which joins the facial vein, and a posterior division, which joins the posterior auricular vein to form the external jugular vein.

The external jugular vein descends in the neck upon the sternocleidomastoid muscle and drains into the subclavian vein in the root of the neck.

The anterior jugular vein descends in the front of the neck; it joins the opposite vein superior to the suprasternal notch and drains into the external jugular vein.

The IJV is the major vein of the head and neck, including the brain. It is the continuation of the sigmoid sinus and leaves the skull through the jugular foramen. It continues inferiorly within the carotid sheath, usually lateral to the carotid artery. The IJV unites with the subclavian vein to form the brachiocephalic vein, posterior to the sternoclavicular joint. It receives tributaries from the face, tongue, and thyroid gland through the superior and middle thyroid veins.

CLINICAL NOTE

CENTRAL IV LINES

Central lines can be inserted into the internal jugular vein for easy and quick access to the venous system, for example, in cases of shock and prior to major surgery. This procedure is performed under ultrasound guidance.

Jugular Venous Pressure

The IJV is of clinical importance in examining jugular venous pressure (JVP), which reflects venous pressure in the right side of the heart. It is measured with the patient positioned at 45 degrees and looking for the pulsation between the clavicular and the sternal heads of the sternocleidomastoid muscle. The measurement in centimetres is taken from the angle of Louis (sternal angle).

High JVP is a sign of congestive heart failure, excessive fluid overload, and constrictive pericarditis.

Hyoid Bone

The hyoid bone is the only bone in the body that does not articulate with any other bone and is therefore suspended by muscles and ligaments. It is composed of a body and two lesser and two greater horns and is located at the C3 level.

It gives attachment to the infrahyoid and suprahyoid strap muscles, in addition to ligaments including the thyrohyoid membrane, which attaches to the thyroid cartilage, and the stylohyoid ligament, which connects the lesser horn of the hyoid to the styloid process of the temporal bone.

CLINICAL NOTE

Hyoid bone fractures are characteristically associated with strangulation.

Larynx

The larynx is a collection of structures in the neck which function collectively to produce sound (phonation) and protect the airways from foreign bodies, especially during swallowing (Figure 2.40).

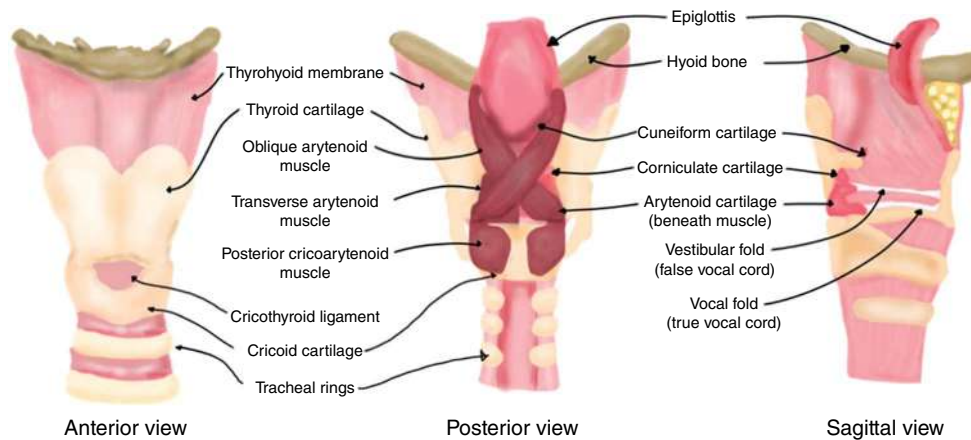


FIGURE 2.40 Anterior, posterior, and lateral views of the larynx. (Courtesy of John Ward.)

The larynx begins at the level of C2–C3 in neonates, but in adults, the level is slightly lower at C3. The adult larynx is continuous with the trachea at the level of C6.

The laryngeal skeleton is composed of **three single cartilages**:

Epiglottis, a leaf-like structure which is composed of elastic cartilage and lies behind the root of the tongue. Its stalk is attached to the posterior aspect of the upper part of the angle formed by the two laminae of the thyroid cartilage through the thyroepiglottic ligament.

- It acts as a protector of the inlet of the larynx. The aryepiglottic fold on each side runs from the side of the epiglottis to the arytenoid cartilage.

Thyroid cartilage, composed of hyaline cartilage, consists of two laminae and superior and inferior horns on each side. The two laminae unite in the midline anteriorly to form the laryngeal prominence (Adam's apple). The oblique line on the external surface of each lamina gives attachment to three muscles: sternothyroid,

thyrohyoid, and thyropharyngeus (see inferior pharyngeal constrictor). The upper borders of the laminae are separated by the V-shaped superior thyroid notch.

Cricoid cartilage, a signet-ring structure of hyaline cartilage, is composed of an arch anteriorly and a lamina posteriorly. The lamina measures 2 to 3 cm from the upper to the lower border, while the arch measures 5 to 7 mm. It articulates with the bases of the arytenoid cartilages and the inferior horn of the thyroid cartilage. Inferiorly, it is attached to the trachea via the cricotracheal ligament (*vide infra*, the cricothyroid membrane).

And **four paired cartilages**:

- Arytenoids (*vide infra*).
- Cuneiform cartilages are small, club-shaped, whitish nodules within the aryepiglottic folds (because of their colour they might be mistaken for lesions).
- Corniculate cartilages are small, conical elastic structures that lie in the posterior part of the aryepiglottic fold and articulate with the apex of the arytenoid cartilage.
- Triticeal cartilages are small elastic nodules variably present within the posterior part of the thyrohyoid membrane.

Arytenoid cartilage has the following features:

- Is pyramidal in shape and has three surfaces, an apex, and a base.
- The base has a vocal process (anteriorly) for the attachment of the vocal ligament (*vide infra*) and a muscular process, which projects backwards and laterally, for the attachment of lateral and posterior arytenoid muscles. The base articulates with the lamina of the cricoid cartilage through a synovial joint.

Ligaments of the larynx include the following:

- **Thyrohyoid membrane** is between the hyoid and the thyroid cartilage. The lateral part of the thyrohyoid membrane is called the lateral thyrohyoid ligament. The thickened middle part is the median thyrohyoid ligament.

It is pierced by the superior laryngeal artery, from the superior thyroid artery, and the superior thyroid vein and the internal laryngeal nerve, a branch of the superior laryngeal nerve from the vagus nerve.

- The **hyoepiglottic ligament and the thyroepiglottic ligament** connect the epiglottis to the hyoid bone and the thyroid cartilage, respectively.
- **Cricothyroid membrane** is the fibroelastic membrane connecting the thyroid and cricoid cartilages of the larynx. It is composed of a median part (median or anterior cricothyroid ligament) and two lateral parts (conus elasticus). The **upper free margin of the conus elasticus is the vocal ligament**, which runs from the angle of the thyroid cartilage (about midway between its upper and lower margins) in the midline anteriorly to the tip of the vocal process of the arytenoid cartilage posteriorly (see information on cricothyroidotomy later).
- The **quadrangular membrane** extends between the epiglottis and the arytenoid cartilages. Its lower end is called the vestibular ligament, which is the core of the vestibular fold (false vocal cord) and looks pink in colour and fixed (in contrast to the mobile white vocal cord). The ventricle is the space between the vestibular fold above and the vocal cord below on each side of the laryngeal cavity.

Important landmarks of the larynx include the following:

- The **superior laryngeal aperture** is composed of the epiglottis anteriorly, the apices of the arytenoid cartilages with the attached corniculate cartilages and the interarytenoid notch posteriorly, and the aryepiglottic folds laterally.
- The **vallecula** is the space between the back of the tongue and the epiglottis.
- The **rima glottidis** is the space between the true vocal cords and the arytenoid cartilages and is the narrowest part of the laryngeal cavity (**Figure 2.41**).

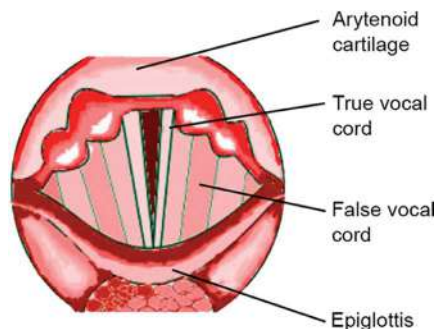


FIGURE 2.41 Vocal folds. (Courtesy of Aditya Mavinkurve.)

The **vocal cord** (the vocal ligament) is composed of elastic tissue and is covered by the mucosa. It consists of the lamina propria (three layers) and the vocalis and thyroarytenoid muscles. It appears pearly white on laryngoscopy, as it is relatively avascular. It is supplied by the recurrent laryngeal nerve.

Muscles of the Larynx

The muscles of the larynx are grouped into extrinsic and intrinsic muscles.

Extrinsic Muscles

The extrinsic muscles function to depress or elevate the larynx, depending on their relationship to the hyoid bone.

- Suprahyoid muscles (**Table 2.9**) and the three extrinsic muscles of the pharynx, *vide infra*. They all elevate the hyoid bone.
- Infrahyoid muscles (**Table 2.10**). They all depress the hyoid.

Intrinsic Muscles

The intrinsic muscles of the larynx function to tense and lengthen the vocal cords by opening (abduction) and closing (adduction) the rima glottidis, which allows for phonation.

- **Cricothyroid:** between the cricoid cartilage and the lower part of the thyroid lamina. The cricothyroid muscle is the only tensor of the vocal cords.
- **Thyroarytenoid:** runs between the inner surface of the thyroid lamina and the arytenoid cartilage. Some muscle fibres run lateral to the vocal ligament, under the name of vocalis.
- **Posterior cricoarytenoid:** from the back of the cricoid cartilage to the muscular process of the ipsilateral arytenoid cartilage. It is the only muscle that opens (abducts) the rima glottidis.
- **Lateral cricoarytenoid:** from the upper border of the cricoid arch to the ipsilateral muscular process of the arytenoid cartilage. It opposes the posterior arytenoid muscle by closing the rima glottidis.
- **Transverse (inter) arytenoid:** this is a single muscle which lies on the back of the larynx between the arytenoid cartilages and acts to approximate them.
- **Oblique arytenoid:** these two muscles cross each other. Each originates from the muscular process of the arytenoid cartilage and inserts into the apex of the contralateral arytenoid cartilage. They are superficial to the transverse arytenoid muscle. Some fibres extend to the aryepiglottic fold and are called the aryepiglottic muscle.

Innervation of the Larynx

The superior laryngeal branch of the vagus divides into the external laryngeal nerve (motor) and internal laryngeal nerve (almost wholly sensory).

All muscles of the larynx are supplied by the RLN, apart from the cricothyroid, which is supplied by the external laryngeal nerve. The RLN is also the sensory nerve supply below the vocal cords. The internal laryngeal nerve is the sensory supply to the level of the vocal cords.

Blood supply is via laryngeal branches of the superior and inferior thyroid arteries. Venous drainage is via the corresponding veins (see information on the superior and inferior thyroid veins).

Lymphatic Drainage

This is very important in regard to the spread of laryngeal cancer, in order to plan surgical or radiotherapy treatment. The part above the vocal cords (supraglottic, the second most common site for malignant tumours) drains to the upper deep cervical lymph nodes, often early and bilaterally. The lower part (subglottic) drains to the pre-tracheal and paratracheal lymph nodes and finally to the inferior deep cervical lymph nodes.

CLINICAL NOTES

Epiglottitis is an acute infection of the epiglottis. The numbers of affected children with *Haemophilus influenzae* as the cause has dramatically reduced with the introduction of Hib vaccination (*H. influenzae* B is the most common causative organism).

The clinical features include drooling, fever, odynophagia (painful swallowing), and dyspnoea.

Epiglottitis is an ear/nose/throat (ENT) emergency because of the potentially rapid and fatal airway obstruction.

A key sign to remember is stridor, which indicates significant airway narrowing.

Cricothyroidotomy is an emergency procedure to relieve upper respiratory obstruction. It entails making a small cut in the skin and underlying median cricothyroid membrane to pass a breathing tube down to the trachea. It is used as a last resort when orotracheal or nasotracheal intubation is not possible (see [Section 4](#)).

Laryngeal obstruction can follow the swallowing of foreign bodies, inflammation (e.g., epiglottitis), and allergic reactions like anaphylactic shock. Diphtheria is a highly dangerous bacterial infection which can cause acute upper airway obstruction.

Vocal cord nodules (singer's nodules) are benign and typically occur in the superficial mid-portion of the membranous vocal cords. They are associated with heavy voice use and are typically seen in professions such singing, acting, and teaching.

Laryngeal papillomatosis are viral warts from human papillomavirus infection (HPV 6-11) can affect the vocal cords. This condition, called recurrent papillomatosis, can cause hoarseness or stridor due to incomplete adduction of the vocal cords.

Laryngeal cancer, the majority of laryngeal cancers are squamous cell carcinoma. Risk factors include heavy smoking, alcohol misuse, and HPV infection (rare with laryngeal cancer, but more common with cancer of the oropharynx). Hoarseness of voice is an early sign in the glottic type (of the vocal cords, the most common type), and the patient usually seeks clinical opinion a earlier than in the other types, supraglottic and subglottic, above and below the vocal cords, respectively. Lymph node metastasis is rare, with the glottic type due to the minimal lymphatic drainage of the vocal cords ([Figure 2.42](#)).

Other clinical features include dysphagia, cough, haemoptysis, or a neck lump. The diagnosis depends on laryngoscopy and tissue biopsy.

Learning Point

All patients with a persistent change of voice for 2 to 3 weeks should be referred to the ENT clinic.



FIGURE 2.42 Intraoperative image of a suspicious left vocal cord lesion in a patient with persistent hoarseness. Note the patient is intubated. (Courtesy of Professor Dae Kim, St. George's Hospital, London.)

Trachea

The trachea, or windpipe, is about 12 cm in length and is the continuation of the larynx at the lower border of the cricoid cartilage. It is composed of multiple C-shaped hyaline cartilaginous rings which are incomplete posteriorly. The incomplete gap is bridged by the trachealis muscle. The trachea bifurcates at the carina into two principal bronchi (T4 level).

CLINICAL NOTES

Foreign bodies are more likely to get lodged in the right bronchus, as it is more vertical, shorter, and wider than the left (see [Section 4](#)).

Endotracheal intubation is accomplished by passing a tube, usually via the mouth, through the vocal cords down to the trachea, with the aid of a laryngoscope. This procedure is the gold standard for airway protection and preventing aspiration of gastric contents into the respiratory passages, especially in emergency settings, as the tube is cuffed. This procedure should be performed by a skilled professional.

Tracheostomy is performed by making a small opening in the trachea, at the level of the second to third tracheal rings, to allow the passage of a breathing tube. This can be performed as an open surgical procedure in the theatre or percutaneously using Seldinger's technique. Patients in the intensive care unit (ICU) will need replacement of mechanical ventilation with a tracheostomy after a certain period, usually between 1 and 2 weeks. It is more difficult than a cricothyroidotomy in emergency settings.

Stridor is a high-pitched respiratory sound mainly produced during inspiration and is caused by turbulent air-flow within the larynx. Stridor is a sign of upper respiratory obstruction (due to infections like epiglottitis, laryngitis, laryngotracheobronchitis, or foreign body inhalation) and is especially important to observe in children with upper respiratory tract infections. Examination of children with stridor should be done by a senior clinician, and care taken not to distress them.

Stertor is a low-pitched, heavy, snoring-like sound heard during inspiration. Stertor is caused by a partial obstruction above the level of the larynx. This sound is often heard in sleep apnoea or as a result of hypoglossal nerve damage. Causes include infections such as epiglottitis or inhalation of a foreign body.

Thyroid Gland

Embryology

The thyroid gland is a butterfly-shaped gland located anteriorly in the neck and is composed of two lobes, which are connected by a band of thyroid tissue called the isthmus, which runs over the second to fourth tracheal rings. It is the first endocrine gland that develops, around 24 days into the gestational period. The median thyroid originates from the primitive pharynx, while the lateral thyroid originates from neural crest cells in between the first and second pharyngeal pouches. The thyroid gland originally develops on the posterior aspect of the tongue at the foramen caecum. The gland descends into the neck through the thyroglossal duct, a hollow tube that is

formed as a result of the thickening of the thyroid primordium at its midline. This duct usually disappears; however, in some individuals the thyroglossal duct is retained, closely associated with the hyoid bone.

In some cases, the gland does not descend adequately and remains located in the back of the tongue, where it is known as a lingual thyroid, which may be the only functioning thyroid tissue available.

The thyroid gland is encased in pre-tracheal fascia (see the discussion on the inferior constrictor of the pharynx). The lateral thyroid ligament (ligament of Berry) is a condensation of the pre-tracheal fascia which connects the posteromedial aspect of each thyroid lobe to the trachea and the cricoid cartilage.

A third lobe, the pyramidal lobe, can be found occasionally arising from the superior border of the isthmus. The pyramidal lobe is suspected to be an embryological remnant of the thyroglossal duct.

The gland lies deep to the infrahyoid strap muscles sternothyroid (medially) and sternohyoid (more laterally) (see earlier, including information on the RLN).

Surface Anatomy of the Thyroid Gland

The thyroid isthmus can be found by palpating inferiorly from the cricoid cartilage downwards towards the second to fourth tracheal rings. The thyroid lobes can be palpated from the isthmus laterally when standing behind the seated patient.

Arterial Supply of the Thyroid Gland

The thyroid gland has a rich blood supply.

The arterial supply of the thyroid gland (**Figure 2.43**) is as follows:

- The superior thyroid artery, the first branch of the external carotid artery, gives the largest contribution.
- The inferior thyroid artery, a branch of the thyrocervical trunk, supplies the inferior and posterior portion of the thyroid gland and the parathyroid glands.
- The *thyroidea ima* is a small inconstant artery which arises from the aortic arch or brachiocephalic trunk.

Venous Drainage of the Thyroid Gland

The venous drainage of the thyroid gland is by three sets of veins:

- The superior thyroid vein runs with the superior thyroid artery to the upper pole of the gland and drains to the IJV.
- The middle thyroid vein drains to the IJV.
- The inferior thyroid vein drains to the innominate (brachiocephalic) veins.

The hormones T3 and T4 are secreted by the thyroid gland. Their secretion is controlled by thyroid-stimulating hormone (TSH) from the anterior pituitary gland through a negative feedback mechanism. The parafollicular C cells of the thyroid gland are responsible for secreting calcitonin, partly responsible for calcium balance (medullary thyroid cancer is a rare type arising in these cells).

CLINICAL NOTES

GOITRE

Goitre is the clinical term for enlargement of the thyroid gland. It can be uninodular (single nodule), multinodular (many nodules) (**Figures 2.44** and **2.45**), or diffuse (entire gland appears swollen). The swelling moves with swallowing.

THYROID CANCER

Cancer of the thyroid gland usually presents with goitre. There are four main types of thyroid cancer: papillary (the most common type, comprising around 85% of all thyroid cancers), follicular, medullary, and anaplastic.

RETROSTERNAL GOITRE

Rarely, the goitre may extend inferiorly to the superior mediastinum (retrosternal goitre) and can compress the trachea and neck veins. The goitre can usually be surgically removed through a neck incision. Rarely, a median sternotomy incision is needed when there is difficulty in delivering the goitre through the neck (**Figure 2.46**).

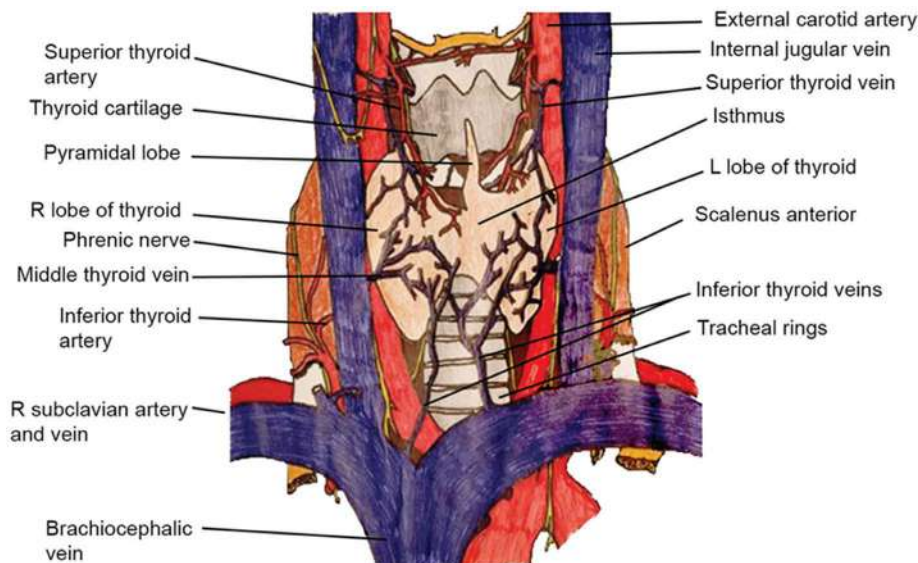


FIGURE 2.43 Blood supply of the thyroid gland. (Courtesy of Aditya Mavinkurve.)



FIGURE 2.44 Patient with multinodular goitre. (Courtesy of Mohammed M. Habash.)

THYROTOXICOSIS

Thyrotoxicosis results from an overactive thyroid and most commonly presents as Graves' disease (primary hyperthyroidism).



FIGURE 2.45 Specimen showing multinodular goitre following total thyroidectomy. (Courtesy of Mohammed M. Habash.)



FIGURE 2.46 Postoperative wound: Large retrosternal goitre; a median sternotomy was needed for access. (Courtesy of Asha Ali.)

Learning Points

- **Thyroid surgery:** total thyroidectomy, removal of the whole thyroid gland. Lobectomy is removal of one of the thyroid lobes and is not advised for localised papillary cancer, which tends to be multifocal. Thyroidectomy is indicated to treat multinodular goitre with pressure symptoms, hyperthyroidism not responding to medical treatment, cosmesis, or to treat thyroid cancer, except the most aggressive anaplastic type.
- While undertaking this surgery several key structures must be maintained, such as the thyroid arteries (bleeding from these can be severe) and the RLNs, which run posterior to the thyroid lobes. Injury to the external laryngeal branch of the superior laryngeal nerve affects the pitch and projection of the voice. This nerve can be injured while ligating the superior thyroid artery at the upper pole. The other important structures to preserve are the parathyroid glands (*vide infra*).
- The lateral thyroid ligament (ligament of Berry) should be divided to ensure removal of the whole lobe (lobectomy).
- Damage to the RLN, whether unilateral or bilateral, results in paralysis of all of the intrinsic muscles of the larynx (except the cricothyroid) on the damaged side. This would result in a hoarse voice due to the fact that the larynx cannot close properly. The patient will be unable to project their voice, reach high notes in singing, and will have a bovine cough (non-explosive cough due to an inability to close the glottis). Due to the close relation of the thyroid gland to the trachea, oesophagus, and thus the tracheoesophageal groove, it is vital to identify the

(Continued)

RLN before proceeding too far into the operation (Figure 2.47).

- Bilateral RLN injury is an anaesthetic emergency resulting in rima glottis closure, stridor, and falling oxygen saturations, as the airway cannot be maintained. This is managed by immediate intubation or emergency tracheostomy.
- Laryngoscopy immediately following thyroidectomy is a medicolegal requirement to ensure the integrity of the vocal cords and should be recorded in the patient's notes.

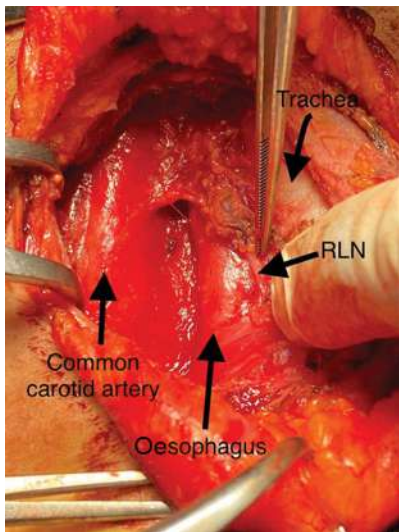


FIGURE 2.47 Perioperative identification of the right recurrent laryngeal nerve within the tracheo-oesophageal groove. (Courtesy of Mohammed M. Habash.)

Thyroglossal Cyst

If the thyroglossal duct remains in adults, it can lead to the appearance of a midline neck swelling, which moves with both swallowing and tongue protrusion (Figure 2.48a). Sistrunk's operation can be performed to treat thyroglossal cysts. Surgeons remove the cyst and duct, in addition to the mid-portion of the hyoid to prevent recurrence (Figures 2.48b and 2.48c).



FIGURE 2.48 (a) Thyroglossal cyst; (b) excision of the thyroglossal cyst with dissection of the central portion of the hyoid bone; (c) excised thyroglossal cyst with the central part of the hyoid bone (Sistrunk's operation). (Courtesy of Mohammed M. Habash.)

Parathyroid Glands

The parathyroid glands are four small, yellowish-brown endocrine glands located on the posterior aspect of the thyroid gland. The parathyroid glands originate from the pharyngeal pouches, which arise from the endoderm. The inferior parathyroid glands originate from the third pharyngeal pouch, while the superior parathyroid glands originate from the fourth pharyngeal pouch. The superior parathyroids have a more constant location than the inferior, which may even migrate to the superior mediastinum.

Arterial Supply of the Parathyroid Glands

The parathyroid glands are mainly supplied by branches from the inferior thyroid arteries.

Function of the Parathyroid Glands

The parathyroid glands secrete parathyroid hormone (parathormone), which regulates calcium metabolism.

CLINICAL NOTE

HYPERPARATHYROIDISM

Hyperparathyroidism is a condition of increased parathyroid hormone in the bloodstream. It can lead to hypercalcaemia (increased calcium level in the blood). Primary hyperparathyroidism is caused by parathyroid tumours, commonly adenomas (benign tumour), and rarely, due to parathyroid cancer. When medical management fails, these patients undergo surgical excision (parathyroidectomy).

Surgical Damage to the Parathyroid Glands

Iatrogenic damage to the parathyroid glands can follow total thyroidectomy and cause postoperative hypocalcaemia (low level of serum calcium).

Postoperative calcium levels are therefore monitored in these patients. Signs and symptoms of hypocalcaemia include perioral and digital paraesthesia, tetany, and less commonly, abnormal heart rhythm (arrhythmia). Tetany involving laryngeal muscles and arrhythmias can be life-threatening.

Lymphatic Drainage of the Neck

Lymphatic drainage of the head and neck can be divided as follows (Figure 2.49).

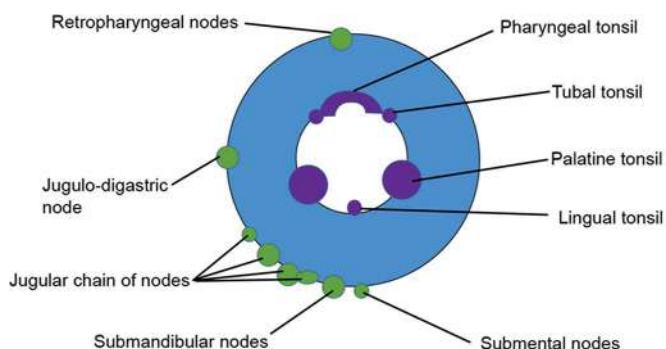


FIGURE 2.49 Lymphatic drainage of neck. (Courtesy of Aditya Mavinkurve.)

Outer ring comprises:

- Submental triangle
- Submandibular triangle
- Pre-auricular
- Occipital

Inner ring of mucosa-associated lymphoid tissue (MALT) or Waldeyer's ring. Waldeyer's ring refers to lymphatic tissue that surrounds the nasopharynx and oropharynx. It consists of the lingual tonsil (at the back of the tongue), the palatine tonsils (between the palatoglossal arch anteriorly and palatopharyngeal arch posteriorly), the tubal tonsils (located near the opening of the auditory tube in the nasopharynx), and the pharyngeal/adenoid tonsil (on the posterior aspect of the roof of the nasopharynx).

The **deep cervical lymph nodes** are arranged longitudinally along the IJV in the carotid sheath. They can be divided into upper, middle, and inferior jugular nodes.

The level of cervical lymph nodes is important when treating metastatic cancers, commonly from the thyroid, tongue, larynx, etc. The levels of lymph nodes can be classified according to the American Academy of Otolaryngology as:

- *Level I:* the submental and submandibular groups
- *Level II:* upper jugular lymph nodes, e.g., the jugulodigastric node
- *Level III:* middle jugular lymph nodes
- *Level IV:* lower jugular lymph nodes
- *Level V:* lymph nodes in the posterior triangle, including the supraclavicular nodes
- *Level VI:* the anterior neck, between the hyoid and the suprasternal notch (infrahyoid, pre-tracheal, paratracheal, pre-laryngeal), jugulodigastric.

The deep cervical lymph nodes on the right side finally drain into the right jugular trunk (for the right upper limb, right side of the head and neck, and right side of the thorax), which drains into the venous system at the subclavian-jugular junction (the right venous angle). The left jugular trunk enters the thoracic duct.

CLINICAL NOTES

PALATINE TONSILS

Palatine tonsils are lined by stratified squamous epithelium which deeply invaginates into the tonsil to form tonsillar crypts. The most common condition affecting the palatine tonsils is acute tonsillitis, which can be complicated by the development of an abscess around the tonsil (peritonsillar abscess), which is called quinsy and is a medical emergency.

LYMPHADENOPATHY

Lymphadenopathy refers to enlarged lymph nodes. Enlarged jugulodigastric lymph nodes are commonly caused by tonsillitis, although TB may be a cause of persistent cases. Tongue cancer also tends to spread to these nodes.

In all patients with cervical lymphadenopathy, when no obvious cause is detected, the oral and nasal cavities, pharynx, and larynx should be examined. A useful general approach to the causes of cervical lymphadenopathy, and based on taking a proper history and doing a full physical examination, which includes examination of other groups of lymph nodes, liver, and spleen, is to categorise the causes into:

- Inflammatory acute adenitis, such as acute tonsillitis, ear infections, and Epstein-Barr virus (infectious mononucleosis). Chronic infections include TB lymphadenitis, secondary syphilis, and brucellosis.
- Primary neoplastic (Hodgkin's and non-Hodgkin's lymphomas, chronic lymphatic leukaemia).
- Secondary (metastatic spread) from areas drained by the cervical lymph nodes.

Metastatic deposits found in the supraclavicular fossa, particularly Virchow's node (Troisier's sign), are commonly from the chest or abdomen, especially gastric and pancreatic cancers.

The Clinical Approach to the Diagnosis of Neck Swellings

A proper clinical approach starts with good history taking and thorough physical examination.

Midline swellings:

- Thyroglossal cyst (see earlier)
- Enlarged pyramidal lobe of the thyroid gland
- Submental lymphadenopathy
- Dermoid cyst

Lateral swellings (anterior triangle):

- Goitre, localised (thyroid adenoma, thyroid cancer) (Figure 2.50) or generalised swelling (multinodular goitre, Graves' disease)
- Submandibular triangle swellings (salivary gland inflammation and tumours, obstruction of the submandibular duct, enlarged lymph nodes)
- Cervical lymphadenopathy (see earlier), can be in any of the triangles that contain lymph nodes

- Branchial cyst (**Figure 2.51**), a remnant of the second and third branchial arches, lies deep to the sternocleidomastoid, at the junction of the upper third and lower two-thirds
- Chemodectoma (see earlier)
- Cystic hygroma (lymphangioma) usually appears at birth but may appear later

Characteristics of a neck lump (the criteria you are expected to mention in clinical exams or clinical briefings, for example, a ward round with your consultant) can also be applied, with some modification, to examination of lumps elsewhere in the body:

- *Site*: anterior or posterior triangles, and their subdivisions
- *Size*: usually measured in centimetres, for example, a 3 X 2 cm mass in the anterior aspect of the neck
- *Shape*: rounded, irregular margin
- *Consistency*: soft, hard, or cystic (positive fluctuation test)

Mobile or fixed to the skin or the underlying structures. Attachment to skin, e.g., sebaceous cyst is attached to the skin; subcutaneous lipoma is separate from the skin.

- Tender or not, e.g., inflammatory swelling is prone to be painful (always ask the patient if it hurts before doing the palpation)
- Watching the movement of the swelling with deglutition while the patient drinks a sip of water is a very important part of the clinical examination (thyroid-related masses)
- *Overlying skin*: temperature (warm skin associated with abscess formation), redness (erythema), presence of sinus/sinuses, e.g., TB lymphadenitis (**Figure 2.52**)



FIGURE 2.50 Right thyroid mass due to papillary thyroid carcinoma. (Courtesy of Qassim F. Baker.)

- Transillumination by shining a light torch through the lump, if indicated, for example, cystic hygroma (see examination of hydrocele, Section 6)
- Pulsatile mass suggests the presence of a carotid body tumour or aneurysm
- Examination of the regional lymph nodes; for example, when finding an ulcer on the tongue, the submandibular and submental lymph nodes should be examined next

Common skin and subcutaneous conditions such as sebaceous cysts (**Figure 2.52**) and lipomas can occur anywhere on the neck.



FIGURE 2.51 Large left branchial cyst. (Courtesy of Qassim F. Baker.)



FIGURE 2.52 A 20-year-old male presenting with a large infected sebaceous cyst in the posterior triangle. Note the overlying erythema and punctum. (Courtesy of Asha Ali.)

The Pharynx and the Cervical Oesophagus

The pharynx (Greek, “throat”) is a fibromuscular tube approximately 12 cm in length that extends from the base of the skull to the inferior border of the cricoid cartilage (C6), where it becomes continuous with the oesophagus (Figure 2.53). It is located directly anterior to the bodies of the cervical vertebrae (C1–C6). The pharynx is responsible for the passage of both air (to the larynx, trachea, and lungs) and food (to the oesophagus and then stomach). It can be described as funnel-shaped and sits behind the nasal cavity, mouth, and larynx; it is therefore divided into three sections: nasopharynx, oropharynx, and laryngopharynx, respectively.

There are three layers to the wall of the pharynx: mucosal, muscular layer, and fibrous (median raphe, which extends posteriorly from the pharyngeal tubercle on the occipital bone down to the oesophagus):

- The mucosal layer is continuous with that of the nasal cavities, mouth, larynx, and tympanic cavity by means of the auditory (pharyngotympanic or eustachian) tubes.
- The upper part of the pharynx (nasopharynx) is lined with ciliated columnar epithelium, and the lower part (oropharynx and laryngopharynx) is lined with stratified squamous epithelium. There is a transitional epithelial zone (cuboid epithelium) where the two layers come together.

Muscles of the Pharynx

There are two layers of muscles in the pharynx: the circular muscles (constrictor muscles) and the longitudinal muscles (Figure 2.54).

Circular muscles

- The three pharyngeal constrictor muscles overlap each other in a vertical arrangement, similar to stacked plant pots.
- The superior, middle, and inferior constrictor muscles are supplied by the pharyngeal plexus, which is in turn supplied by the vagus nerve (CN X).
- They function to propel the bolus of food into the oesophagus through their successive contractions.

Superior Constrictor Muscle

- *Origin:* lower posterior border of the medial pterygoid plate, pterygoid hamulus, pterygomandibular ligament, posterior end of mylohyoid line on the mandible, and the side of the tongue
- *Insertion:* upper fibres curve superiorly and medially and attach to the pharyngeal tubercle of the occipital bone, middle fibres insert into the median fibrous raphe on the posterior wall, and lower fibres curve medially and inferiorly and join the fibrous raphe
- *Function:* upper fibres have a specific function; when they contract, they pull the posterior pharyngeal wall forward, aiding the soft palate in closing off the upper part of the pharynx

Middle Constrictor Muscle

- *Origin:* lower part of the stylohyoid ligament and from the greater and lesser cornua of the hyoid
- *Insertion:* fibres radiate out medially and join the median fibrous raphe attached to the posterior wall of the pharynx.

Inferior Constrictor Muscle

- *Origin:* has two parts, the thyropharyngeus and cricopharyngeus, originating from the oblique line on the outer surface of the lamina of the thyroid cartilage and the cricoid cartilage, respectively.
- *Insertion:* all fibres insert into the median fibrous raphe on the posterior wall of the pharynx. The lower fibres also run inferiorly and are continuous with the circular muscle of the oesophagus below
- *Specific function:* lowest fibres (the cricopharyngeus muscle) act as a sphincter on the lower end of the pharynx (upper oesophageal sphincter).

Longitudinal Muscles

Stylopharyngeus

- *Origin:* styloid process of the temporal bone
- *Insertion:* enters the pharyngeal wall by passing between the superior and middle constrictor muscles and inserts into the posterior border of the thyroid cartilage, along with the palatopharyngeus
- *Action:* elevates the larynx and pharynx when swallowing

Palatopharyngeus

- *Origin:* posterior aspect of hard palate and palatine aponeurosis
- *Insertion:* passes inferiorly and posteriorly to form the palatopharyngeal arch and then inserts into the posterior aspect of the thyroid cartilage
- *Action:* pulls the pharynx superiorly and pulls the palatopharyngeal arch towards the midline

Salpingopharyngeus

- *Origin:* lower part of the cartilage of the auditory tube (pharyngotympanic tube)
- *Insertion:* passes downwards and joins the palatopharyngeus
- *Action:* aids in elevation of the pharynx

The muscles of the pharynx are supplied by the vagus nerve (CN X), except for the stylopharyngeus, which is supplied by the glossopharyngeal nerve.

Blood Supply of the Pharynx

From the branches of the external carotid artery (ascending pharyngeal, facial, maxillary, and lingual arteries).

Venous drainage is via the venous plexus around the pharynx, which drains into the IJV.

Lymphatic drainage is to the deep cervical lymph nodes.

Learning Point

The anatomical basis of deglutition (the action of swallowing). As the two parts of the inferior constrictor muscle are attached to the thyroid cartilage and cricoid cartilage, when the patient swallows, the muscle contracts, and the respective parts of the larynx, thyroid, and cricoid cartilages elevate. The thyroid gland is attached to the larynx by the suspensory ligament of Berry (see earlier), part of the pre-tracheal fascia, which envelops the gland. With this close relationship and attachment of the thyroid gland to the larynx, the gland will move up and down with deglutition (see “Thyroid Gland” earlier).

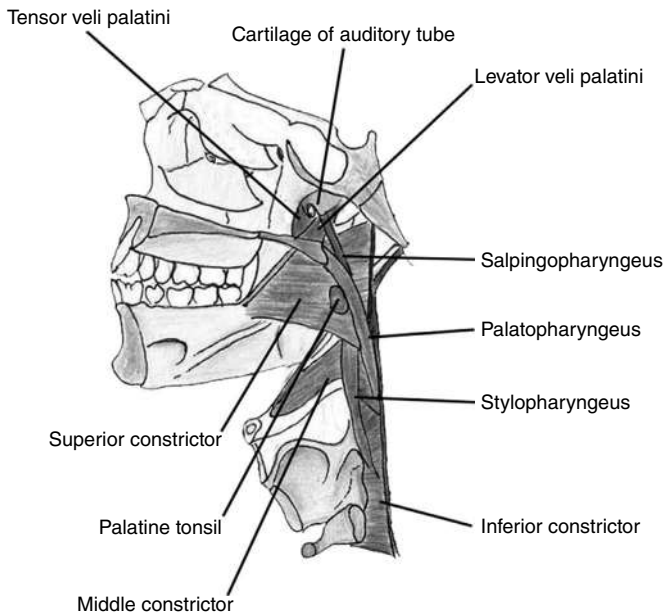


FIGURE 2.53 The inner and outer muscles of the pharynx. (Courtesy of Gabriela Barzyk.)

Parts of the Pharynx (Figure 2.54)

Nasopharynx – Sensory innervation (CN V2)

- The anterior part is the posterior borders of the nasal apertures (choanae) and the posterior edge of the nasal septum.
- The floor is formed by the soft palate.
- The posterior wall and roof contain the pharyngeal tonsils (adenoids).
- The auditory tube (eustachian or pharyngotympanic tube) communicates with the middle ear and opens in the lateral wall of the nasopharynx at the tubal elevation.
- The pharyngeal recess is located behind the tubal elevation.
- The function of the nasopharynx is to purify the inhaled air, in addition to the nasal cavity.

Oropharynx – Sensory innervation (CN IX)

- The oropharynx extends from the inferior border of the soft palate to the superior border of the epiglottis and lies posterior to the mouth.
- The roof is formed by the inferior surface of the soft palate.
- The floor consists of the epiglottis, which closes the larynx to prevent food aspiration.
- The posterior wall is supported by the bodies of the second vertebra and upper part of the third cervical vertebra.
- The anterior aspect contains the opening of the mouth into the oropharynx, known as the isthmus of the fauces (oropharyngeal isthmus), and is formed by the palatoglossal arches laterally, the soft palate superiorly, and the dorsum of the tongue inferiorly.
- The lateral walls contain the palatopharyngeal and palatoglossal arches and the palatine tonsil, which is located between them.

Laryngopharynx (hypopharynx) – Sensory innervation (CN X):

- Extending from the pharyngoepiglottic folds superiorly to the upper oesophageal sphincter inferiorly (level of C3–C6). Posterior to the laryngopharynx lie the bodies of the cervical vertebrae (C3–C6).
- The larynx lies anterior to the laryngopharynx.
- The inferior edge of the cricoid cartilage marks the inferior border.
- The piriform sinus (smuggler's fossa) is a depression posterolaterally on each side of the laryngeal opening lateral to the aryepiglottic fold; swallowed foreign bodies such as fish bones are likely to lodge here.

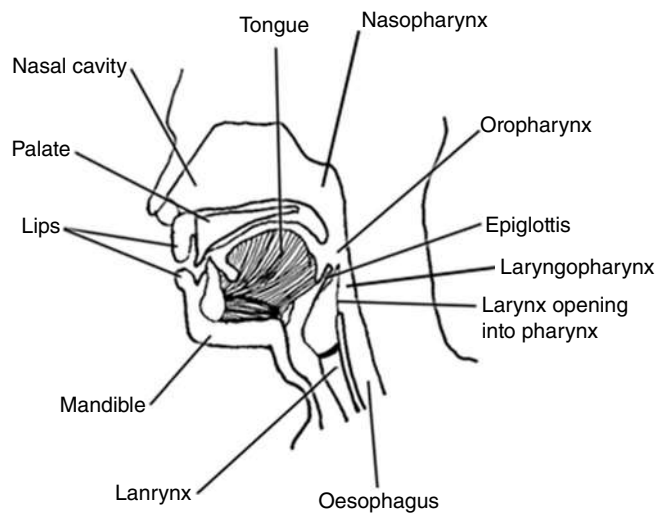


FIGURE 2.54 Parts of the pharynx. (Courtesy of Aditya Mavinkurve.)

CLINICAL NOTE

PHARYNGEAL CANCER

Pharyngeal cancer has a strong association with smoking and alcohol consumption. Other factors include infections with Epstein-Barr virus and HPV, which can be linked to sexual contact.

Killian's Triangle

The inferior constrictor muscle can be subdivided into the thyropharyngeus and cricopharyngeus muscles. Killian's triangle (or Killian's dehiscence) is a potential triangular gap between these two parts of the muscle (Figure 2.55). It represents an area of weakness, through which the pharyngeal mucosa can herniate, known as Zenker's diverticulum, or pharyngeal pouch. The pouch most commonly herniates on the left-hand side, and symptoms include dysphagia, cough, and regurgitation. Imaging in the form of a barium swallow is needed for diagnosis (Figure 2.56).

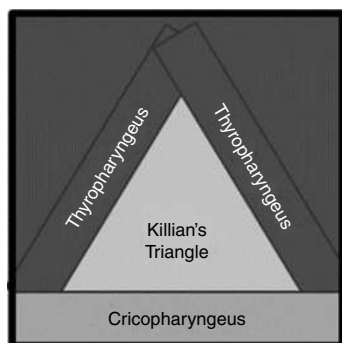


FIGURE 2.55 Simplified diagram of Killian's triangle.



FIGURE 2.56 Lateral view of a barium swallow showing large pharyngeal pouch (*arrowhead*) with posterior outpouching from the hypopharynx (laryngopharynx) at level of C6 vertebral body. (Courtesy of Asha Ali.)

Cervical Oesophagus

The oesophagus is a fibromuscular tube approximately 25 cm in length. It extends from the cricoid cartilage (C6) to the stomach. The mucosa is lined by non-keratinised squamous epithelium. The muscular layer consists of two types of muscles: longitudinal (outermost) and circular (innermost). The function of the oesophagus is to transport food to the stomach for

digestion. The upper third has striated (voluntary) muscle for both the outer longitudinal and the inner circular muscle layers. The middle third has both striated and smooth (involuntary) muscle for both the outer and inner muscle layers, whereas the lower third has smooth muscle in both of its layers. The oesophagus has three anatomical constrictions: one in the neck (see cricopharyngeus muscle), and two in the thorax and the abdomen (see [Section 4](#)).

Anatomical Relations of the Cervical Oesophagus

- The trachea lies anterior to the oesophagus. There is a narrow groove between the trachea and the oesophagus, known as the tracheo-oesophageal groove. This is where the RLN runs.
- Posterior to the cervical oesophagus is the longus coli muscle and the bodies of the C6 and C7 vertebrae.
- Lateral to the oesophagus in the neck lie the respective left and right lobes of the thyroid gland and the carotid sheath. On the left-hand side, the thoracic duct runs for a short distance.

Blood Supply

The blood supply to the upper third of the oesophagus stems from the inferior thyroid arteries and veins.

Lymphatic Drainage

Lymph from the upper third of the oesophagus drains to the deep cervical lymph nodes. Cancer of the cervical oesophagus may spread to these nodes.

Nerve Supply

The cervical oesophagus is innervated by the recurrent laryngeal nerve and post-ganglionic fibres from the sympathetic cervical ganglia.

CLINICAL NOTES

DYSPHAGIA

Dysphagia is defined as difficulty in swallowing (sensation of obstruction) and can be a very serious presenting symptom that may warrant urgent investigation to rule out a sinister cause, such as malignancy. It must be distinguished from other oesophageal symptoms such as odynophagia (pain on swallowing, for example, due to acute tonsillitis and peritonsillar abscess) and regurgitation (reflux of oesophageal contents). The possible causes are categorised in [Table 2.13](#).

Notes:

- Dysphagia may also be a result of neurological pathologies, such as cerebral vascular accidents, brainstem tumours, motor neuron disease (MND), and MS.
- Pharyngeal pathologies like cancer can clinically present as dysphagia.

(Continued)

OESOPHAGEAL CANCER

The majority of cervical oesophageal cancers are squamous cell carcinoma (compare with lower oesophageal cancer, see [Section 5](#)). It is related to heavy smoking, alcohol intake, and infection with HPV. The UK mortality rate is the highest in Europe for both men and women.

SYSTEMIC SCLEROSIS (SYSTEMIC SCLERODERMA)

This is an autoimmune multiorgan connective tissue disease affecting the skin and internal organs (such as the GIT), including the joints and blood vessels ([Figure 2.58](#)).

PLUMMER-VINSON SYNDROME (SIDEROPAENIC DYSPHAGIA)

Characterised by glossitis, angular stomatitis, and oesophageal webs, due to iron-deficiency anaemia.

TABLE 2.13: The categorical causes of dysphagia

Intraluminal	Intramural	Extraluminal
Foreign body such as food bolus, swallowed denture (Figure 2.57)	<i>Stricture:</i> <ul style="list-style-type: none"> Malignant (mainly carcinoma) or benign tumour (e.g., leiomyoma) Oesophagitis (reflux oesophagitis due to sliding hiatus hernia), ingestion of chemical solution like caustic soda and bleaches Scleroderma Pharyngeal pouch Plummer-Vinson syndrome (oesophageal web) Achalasia 	<ul style="list-style-type: none"> Hiatus hernia (rolling type) Retrosternal goitre Bronchial carcinoma Thoracic aortic aneurysm



FIGURE 2.57 Lateral neck X-ray of a 30-year-old male with foreign body (shellfish) in the proximal oesophagus, causing absolute dysphagia. The patient required endoscopy and urgent removal of the foreign body to prevent complications such as upper airway swelling and oesophageal perforation. (Courtesy of Asha Ali.)

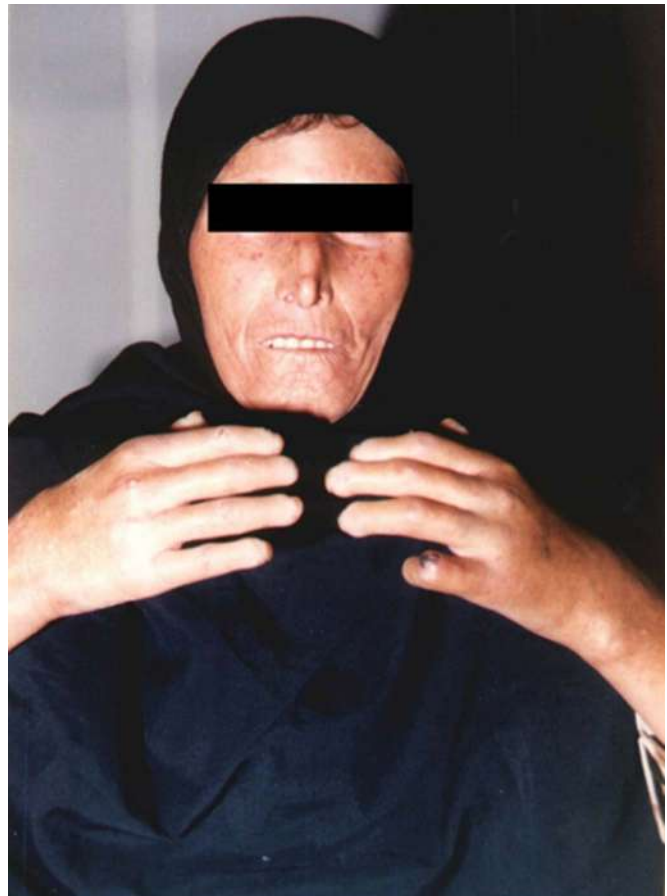


FIGURE 2.58 Systemic sclerosis in a 35-year-old female who presented with dysphagia and Raynaud's phenomenon; note the ulceration on left little finger. (Courtesy of Qassim F. Baker.)

Answers to Quiz Questions on the Eye

- Fibrous layer:* contains the sclera and cornea which provide support for the eyeball.
 - Vascular layer:* contains the choroid, iris, and ciliary body. Supplies blood and manipulates the lens and pupil to aid in accommodation.
 - Inner layer:* contains the retina with photoreceptors and is responsible for vision.
- The ophthalmic artery is the main blood supply to the eyeball of which a prominent branch is the central artery of the retina, which supplies the inner surface of the retina. The ophthalmic artery is a branch of the internal carotid artery.
- Open angle glaucoma occurs when the trabecular meshwork is partially occluded and leads to a slow loss of peripheral vision, whereas closed angle glaucoma is when the iris fully occludes the trabecular meshwork, and the rapid build-up of aqueous humour can lead to blindness if not treated swiftly.

Answer to Quiz Question on the Ear

- A1. d. Facial nerve

Revision Questions

Q1.



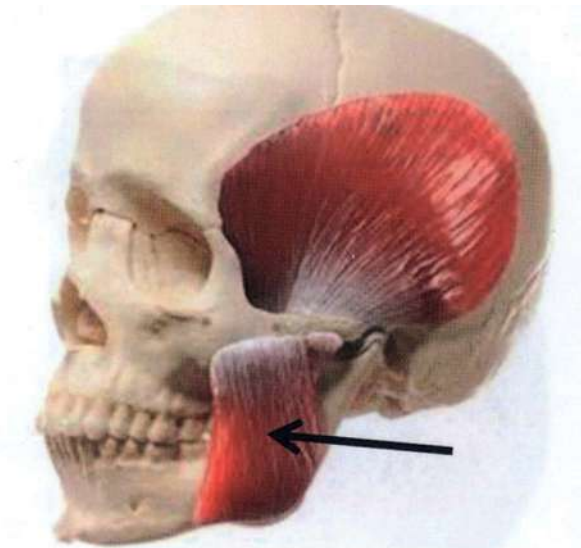
Q1A. Which of the following best describes the muscle that is affected, causing the patient's ptosis?

- a. Lateral rectus
- b. Levator palpebrae superioris
- c. Orbicularis oculi
- d. Superior oblique
- e. Superior rectus

Q1B. Which of the following nerves supplies the patient's affected muscle?

- a. Abducens
- b. Facial
- c. Maxillary
- d. Oculomotor
- e. Ophthalmic

Q2.



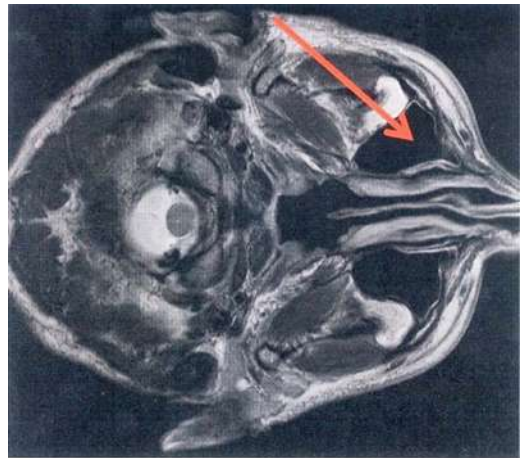
Q2A. The arrow is pointing to:

- a. Buccinator
- b. Lateral pterygoid
- c. Medial pterygoid
- d. Masseter
- e. Temporalis

Q2B. The nerve supply of this muscle is:

- a. Facial nerve
- b. Lingual nerve
- c. Maxillary nerve V2
- d. Mandibular nerve V3
- e. Ophthalmic division of trigeminal V1

Q3.



Q3A. Identify the feature indicated by the arrow.

- a. Clinoid process
- b. Maxillary sinus
- c. Orbit
- d. Pituitary fossa
- e. Sphenoid sinus

Q3B. Which of the following best describes the type of image shown?

- a. Contrast radiograph
- b. CT scan
- c. MRI scan
- d. Plain film radiograph
- e. Ultrasound scan

Q4.



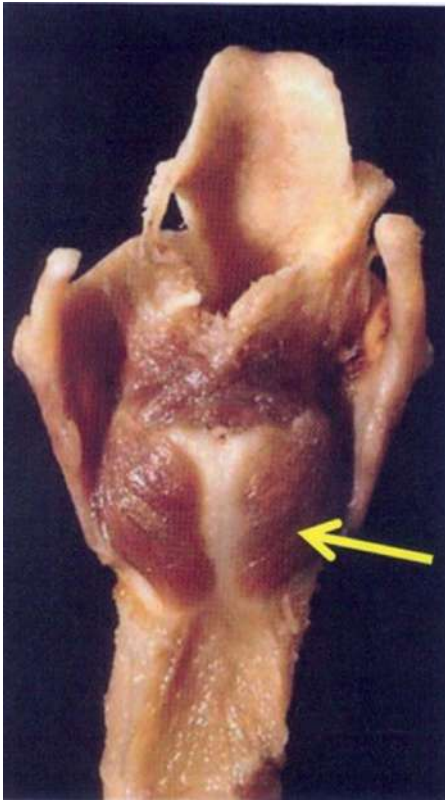
Q4A. Which of the following muscles is likely to have been paralysed in the patient illustrated in the image, who sustained injury to his right posterior triangle?

- a. Deltoid
- b. Levator scapulae
- c. Rhomboid minor
- d. Supraspinatus
- e. Trapezius

Q4B. Which nerve supplies the muscle that appears to be paralysed?

- a. Accessory
- b. Ansa cervicalis
- c. Phrenic
- d. Sympathetic chain
- e. Vagus

Q5.



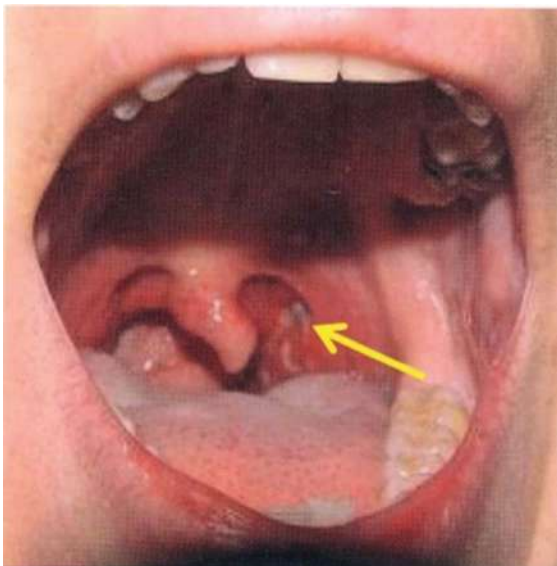
Q5A. Identify the muscle indicated by the arrow.

- Cricothyroid
- Omohyoid
- Posterior cricoarytenoid
- Sternothyroid
- Thyrohyoid

Q5B. Which statement best describes the effects of paralysis of the muscle indicated by the arrow?

- Difficulty in swallowing
- Inability to abduct the vocal cords
- Inability to relax the vocal cords
- Inability to tense the vocal cords
- Spasm of the vocal cords

Q6.



Q6A. Which of the following best describes the structure indicated by the arrow?

- Lingual tonsil
- Palatine tonsil
- Pharyngeal tonsil
- Tubal tonsil
- Waldeyer's ring

Q6B. Which of the following best describes sensory nerve supply to the region indicated by the arrow?

- Glossopharyngeal
- Lingual
- Mandibular branch of the trigeminal
- Recurrent laryngeal
- Superior laryngeal

Q7.



Q7A. What is the structure indicated by the arrow?

- Anterior ethmoidal air cells
- Maxillary sinus
- Middle ethmoidal air cells
- Posterior ethmoidal air cells
- Sphenoid sinus

Q7B. What does this structure drain into?

- Ethmoidal bulla
- Inferior meatus
- Semilunar hiatus
- Sphenoethmoidal recess
- Superior meatus

Additional Questions on the Anatomy of the Neck

- What are the branches of the external carotid artery?
- What are the motor and sensory nerves that supply the larynx?
- What are the borders of the posterior triangle?
- What nerve can get injured in a lymph node biopsy of that triangle?
- What is the carotid sheath? Enumerate its contents.
- What is the blood supply of the thyroid gland?
- What type of epithelium is found lining the vestibule of the nose?

- Q15. What is the blood supply of the nasal septum?
 Q16. What arteries anastomose to form the Kiesselbach's plexus?
 Q17. Where does the maxillary sinus drain into?
- Middle meatus
 - Superior meatus
 - Inferior meatus
 - Sphenoethmoidal recess

Further Reading

- Corbridge R, Steventon, N. Oxford Handbook of ENT and Head and Neck Surgery. (2020) Oxford: Oxford University Press.
 McLatchie G, et al. Oxford Clinical Handbook of Clinical Surgery (2013) Oxford: Oxford Press. 4e. Pages: 554–555.
 Mehta R, Chinthapalli K. Glasgow Coma Scale explained. *BMJ* (2019) 365 doi: <https://doi.org/10.1136/bmj.l1296>
 Raine T, et al. Oxford Handbook for the Foundation Programme (2018) Oxford: Oxford Press. 5e. Page 440.

Answers

- | | | | |
|------|---|------|---|
| A1A. | b | A4B. | a |
| A1B. | d | A5A. | c |
| A2A. | d | A5B. | b |
| A2B. | d | A6A. | b |
| A3A. | b | A6B. | a |
| A3B. | c | A7A. | e |
| A4A. | e | A7B. | d |
- A8–16. see text
 A17. a

3

ANATOMY OF THE UPPER LIMB

Reviewed by Philip J. Addis and Joanna Tomlinson

Learning Objectives

- Osteology of the bones of the pectoral girdle and common pathology
- Anatomy of the shoulder, elbow, and wrist joints
- Anatomy of the brachial plexus, cubital fossa and carpal tunnel, and clinical applications
- Anatomy of the muscles of the upper limb, their compartments and pathology
- Functional anatomy of the upper limb, including movements and types of grips
- Boundaries, contents, and surgical importance of the axilla
- Revision questions

Bones of the Pectoral Girdle

The pectoral girdle comprises the clavicle and scapula (Figure 3.1). Together, they form a strut to keep the upper limb positioned lateral to the thoracic cage and allow for rotation, abduction, adduction, flexion, and extension of the glenohumeral joint.

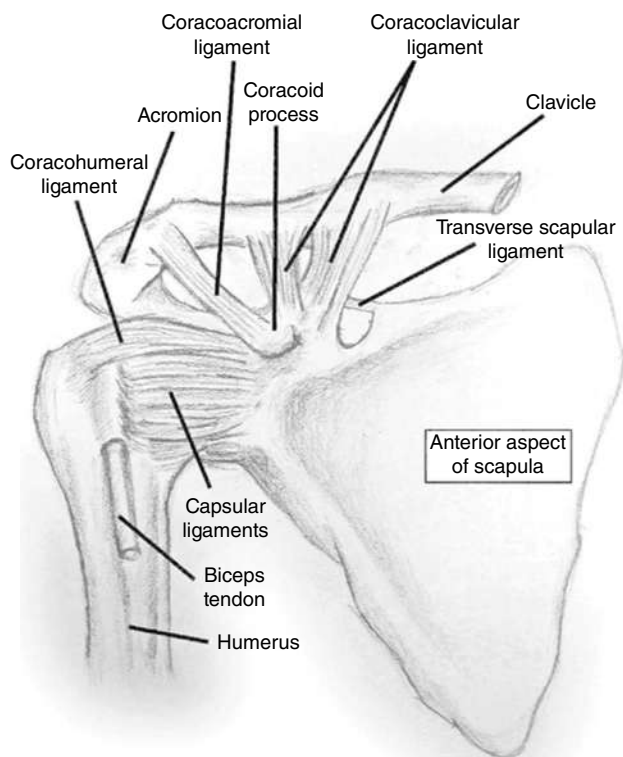


FIGURE 3.1 The pectoral girdle and the ligaments of the shoulder. (Courtesy of Jordan Bethel.)

Clavicle

The clavicle (collar bone) is an S-shaped bone. It is the first bone to ossify in fetal life and the last bone to fuse. The lateral one-third is flattened and wider (Figure 3.2). The weakest part is the junction of its medial two-thirds (convex) and lateral one-third (concave), which is therefore a common site for fractures. The medial end articulates with the manubrium sterni at the sternoclavicular joint (a synovial joint divided into two cavities by a fibrocartilage disc) and the lateral end with the acromion at the acromioclavicular joint, a plane-type synovial joint, stabilised by ligaments.

The conoid tubercle is a projection located inferiorly on the acromial end and gives attachment to the conoid ligament (*vide infra*).

The clavicle has several important roles:

- Shock absorption of the upper limb by transferring forces to the thoracic cage
- Suspension of the scapula to maintain the upper limb lateral to the trunk
- Protection of the subclavian vessels and brachial plexus (despite its role in protection, the clavicle is the most common bone to fracture)
- Attachment site for many important muscles; these are the:
 - Sternocleidomastoid (clavicular head) and sternohyoid (see Section 2)
 - Pectoralis major (sternoclavicular head)
 - Trapezius
 - Deltoid
 - Subclavius

Right clavicle

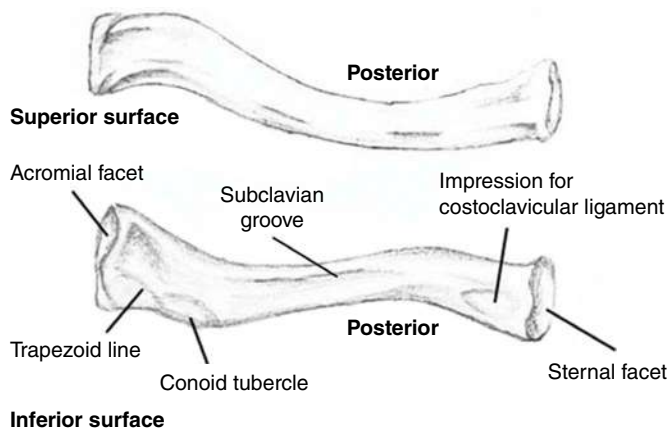


FIGURE 3.2 Diagram of the superior and inferior surfaces of the right clavicle. (Courtesy of Jordan Bethel.)

Scapula

The scapula (shoulder blade) is a flat triangular bone that connects the clavicle to the humerus (Figure 3.3). It extends from the second to the seventh ribs posteriorly. Fractures to the scapula are rare because the scapula is well protected by muscles and usually follow severe trauma to the back.

- Deltoid
- Trapezius (see Section 2)
- Long head of biceps (from the supraglenoid tubercle)
- Long head of triceps (from the infraglenoid tubercle)
- Muscles of the posterior axillary wall (teres major and latissimus dorsi)

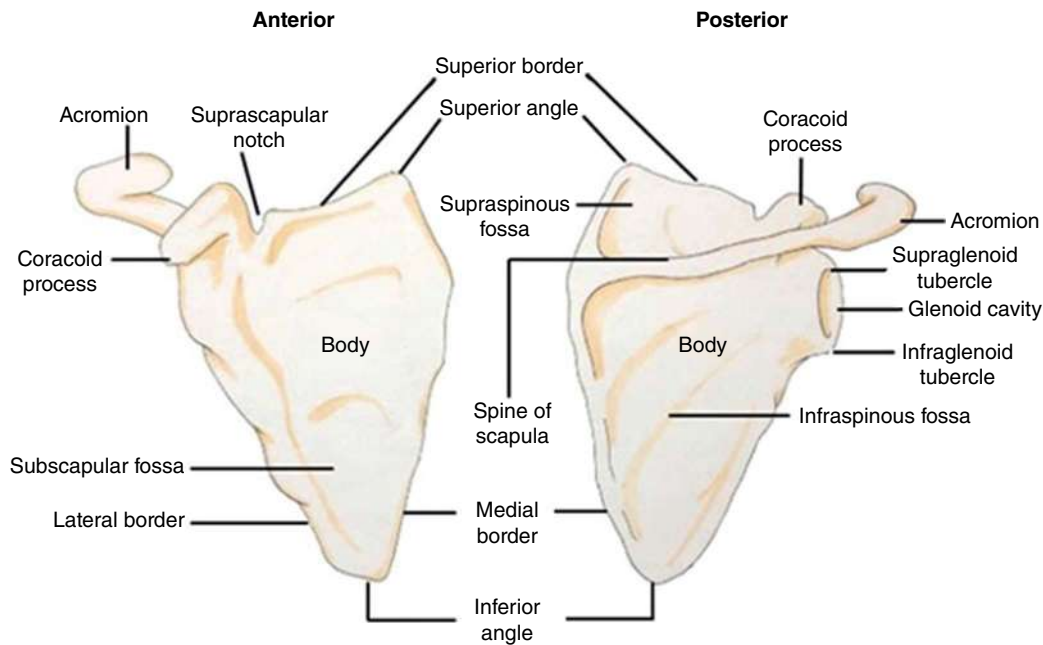


FIGURE 3.3 The anterior and the posterior surfaces of the scapula. (Courtesy of Calum Harrington-Vogt.)

The scapula is composed of several important bony parts:

- Ventral/anterior/costal surface for the origin of the subscapularis muscle.
- Dorsal or posterior surface, which is divided into the supraspinous and infrapinuous fossae by the spine of the scapula, for the origin of the supraspinatus and infrapinatus muscles, respectively.
- Coracoid process (Greek: *korakos*, “crow”), a beak-like projection from the superior border of the scapula.
- Acromion (Greek: *akros*, “outermost”; *omos*, “shoulder”), a bony projection from the spine of the scapula laterally.
- Glenoid fossa (Greek: *glene*, “socket”; *eidōs*, “shape” or “form”), which is located laterally and accommodates the head of the humerus to form the glenohumeral joint.
- The scapula has three angles (inferior, lateral, and superior) and three borders (superior, lateral, and medial). The suprascapular notch is located medial to the base of the coracoid process, and the transverse scapular ligament converts the notch to the foramen, where the suprascapular nerve passes to innervate the supraspinatus and infrapinatus muscles.

Several muscles are attached to the scapula and play a role in the stabilisation of the scapula:

- Four rotator cuff muscles (supraspinatus, infrapinatus, teres minor, and subscapularis; you can use the acronym SITS to help you remember these)

- Muscles attached to the coracoid process (short head of biceps brachii, pectoralis minor, and coracobrachialis)
- Serratus anterior
- Omohyoid
- Rhomboid major and minor
- Levator scapulae

For ligaments attached to the scapula, see Figure 3.1.

The scapular anastomosis is formed by major three arteries which supply the scapula and the attached muscles and help support the blood supply of the upper limb. These arteries are the suprascapular, dorsal scapular, and branches from the subscapular arteries.

Humerus

The humerus (Figure 3.4) is the bone of the arm (“arm” is the correct anatomical term for the upper arm). Proximally, it articulates with the scapula to form the glenohumeral joint, and distally, it articulates with the ulna and radius to form the elbow joint.

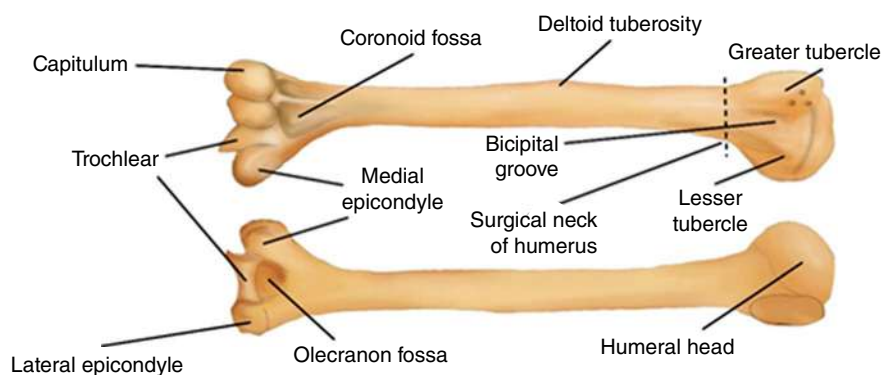
The humerus has several important bony landmarks (Table 3.1).

The articulation of the scapula, clavicle, and humerus (Figure 3.1) is maintained by several strong ligaments:

- *Coracoacromial ligament*, between the coracoid process and acromion. This protects the head of the humerus.
- *Coracoclavicular ligament*, between the coracoid process and clavicle; this is split into a trapezoid and conoid portion, which prevent movement at the acromioclavicular joint and aid in transmission of weight of the upper limb to the skeleton.

TABLE 3.1: Summary of the anatomical features of the humerus

Bony Feature	Description
Head	<ul style="list-style-type: none"> • Located at the superior aspect of the humerus • It is spherical and articulates with the glenoid cavity to form the glenohumeral joint
Anatomical neck	<ul style="list-style-type: none"> • Acts as a bridge between the head and the greater and lesser tubercles of the humerus
Surgical neck	<ul style="list-style-type: none"> • This is the part distal to the head, anatomical neck, and tubercles of the humerus • The surgical neck forms a bridge between the tubercles and the shaft of the humerus
Greater tubercle	<ul style="list-style-type: none"> • Forms the lateral aspect of the proximal humerus • Acts as a site of attachment for three muscles of the <i>rotator cuff</i>: supraspinatus, infraspinatus, and teres minor
Lesser tubercle	<ul style="list-style-type: none"> • Forms the medial aspect of the proximal humerus and acts as a site of attachment for the subscapularis muscle
Bicipital groove (intertubercular groove)	<ul style="list-style-type: none"> • A deep depression on the proximal shaft of the humerus between the greater and lesser tubercles • This contains the tendon of the long head of the biceps brachii • The borders (lips) and floor of the bicipital groove also form a site of attachment for <i>three muscles</i>: pectoralis major (lateral lip), teres major (medial lip), and latissimus dorsi muscles (floor)
Shaft of the humerus	<ul style="list-style-type: none"> • Distal to the surgical neck • The shaft is the longest part of the bone and contains the deltoid tuberosity and radial (or spiral) groove
Deltoid tuberosity	<ul style="list-style-type: none"> • Small ridge on the lateral aspect of the shaft of the humerus. It forms a site of attachment for the deltoid muscle
Radial (spiral) groove	<ul style="list-style-type: none"> • Located along the posterior aspect of the humeral shaft • The radial groove contains the radial nerve and the deep artery of the arm (profunda brachii)
Medial and lateral supracondylar ridges	<ul style="list-style-type: none"> • Formed towards the distal end of the shaft, as it begins to widen • The lateral supracondylar ridge gives origin to the brachioradialis and the extensor carpi radialis longus
Medial and lateral epicondyles (Greek: <i>epi</i> , "upon")	<ul style="list-style-type: none"> • Pointed projections that lead to bony projections on either side of the supracondylar ridges
Medial epicondyle	<ul style="list-style-type: none"> • The common flexor origin • Forms a site of attachment for some flexor muscles of the anterior compartment of the forearm • It also protects the ulnar nerve, which runs posteriorly to it
Lateral epicondyle	<ul style="list-style-type: none"> • The common extensor origin • Forms a site of attachment for some extensor muscles in the forearm • Inflammation of the common extensor tendon is referred to as lateral epicondylitis, or tennis elbow • Patients with this condition will present with pain around the elbow region and a reduction in grip strength
Trochlea	<ul style="list-style-type: none"> • Meaning pulley, this is the only structure which extends to the posterior aspect of the humerus • The trochlea forms the medial aspect of the articular surface of the elbow joint • It articulates with the trochlear notch of the ulna • The olecranon fossa can also be found on the posterior aspect of the distal humerus
Capitulum	<ul style="list-style-type: none"> • Meaning "little head", this forms the lateral aspect of distal articular surface of the humerus • It articulates with the head of the radius • The coronoid and olecranon fossae are involved in receiving the respective processes on the ulna during full flexion and full extension of the forearm, respectively • The radial fossa is involved in receiving the head of the radius during full flexion

**FIGURE 3.4** The bony landmarks of the humerus. (Courtesy of Katie Michaels.)

- *Acromioclavicular ligament*, between the acromion and clavicle; this reinforces the capsule of the joint.
- *Costoclavicular ligament*, between the clavicle and first rib; this provides additional protection for the subclavian artery and vein and acts as an axis of movement for the clavicle.
- *Ligaments of the shoulder capsule* (these are explained in more detail in the “Glenohumeral Joint” section).

Glenohumeral Joint (Shoulder Joint)

A synovial ball-and-socket joint between the head of the humerus and the shallow glenoid fossa of the scapula. The glenoid fossa is deepened by a fibrocartilaginous rim, called the glenoid labrum. This increases the congruency of the joint. Both the head of the humerus and the glenoid fossa are covered by hyaline cartilage. The joint articulation is maintained by the ligamentous capsule, which holds the two bones together and is strengthened by the rotator cuff muscles. The inner aspect of the joint is lined by synovial membrane, which produces synovial fluid to lubricate the joint and communicates with the bursa of the subscapularis.

Stability of the joint is also derived from the ligaments, which are under tension during movement of the shoulder, and muscles acting on the glenohumeral joint. The muscles are included in **Table 3.2** and are explained in more detail in the Muscles of the Upper Limb section.

The ligaments include:

- *Superior glenohumeral ligament*, which is under tension in adduction.
- *Middle glenohumeral ligament*, which is under tension in external rotation.
- *Inferior glenohumeral ligament*, which is under tension in abduction and internal or external rotation.
- *Coracohumeral ligament*, which is under tension in extreme flexion, extension, or external rotation.

TABLE 3.2: Muscles acting on the glenohumeral joint

Muscle	Action
Anterior fibres of the deltoid, pectoralis major, biceps	Flexion
Posterior fibres of the deltoid and muscles of the posterior axillary wall, teres major, and latissimus dorsi	Extension
Subscapularis, teres major, and latissimus dorsi	Internal rotation
Infraspinatus, teres minor, and posterior fibres of the deltoid	External rotation
Supraspinatus and the middle fibres of the deltoid	Abduction
Pectoralis major, latissimus dorsi, and teres major	Adduction

Blood supply is provided by the anterior and posterior circumflex humeral and subscapular arteries (branches of the third part of the axillary artery).

Nerve supply is provided by the articular branches from axillary, suprascapular, and musculocutaneous nerves.

CLINICAL NOTES

FRACTURES AND DISLOCATION OF THE HUMERUS

Three nerves are closely related to the humerus: the axillary, radial, and ulnar nerves. Fractures of associated anatomical landmarks can lead to damage of these structures:

- *Surgical neck of the humerus*: this is narrow in nature and therefore is a common site for fracture (**Figure 3.5**). Fractures of the proximal humerus can lead to damage of the axillary nerve (*vide infra*).
- *Shaft of the humerus*: as the radial nerve and profunda brachii artery run in the spiral groove, these structures may be damaged during fracture of the shaft of the humerus. This can result in wrist drop, as the radial nerve supplies the muscles of the posterior compartment of the forearm.
- *Medial epicondyle*: the ulnar nerve runs posteriorly to this structure, and therefore is at risk of damage during compression or fracture of this bony landmark.

ANTERIOR DISLOCATION OF THE SHOULDER

The glenohumeral joint is commonly the most dislocated joint in the human body in view of its wide ranges of movement. This is due to its poor congruency, as it has a shallow glenoid fossa in relation to the relatively large humeral head.

- Anterior dislocation of the shoulder forms the majority of all shoulder dislocations, as the head of the humerus slips down into the least protected part of the capsule and lies below the coracoid process (subcoracoid position) (**Figure 3.6**).
- This may be caused by a fall on an outstretched hand or during sports.
- Typically, a sign of anterior dislocation is that there is loss of the normal contour of the deltoid (flat shoulder deformity). This is due to the loss of the bulge of the greater tubercle, as it is displaced medially (**Figure 3.7**).
- Axillary nerve function should be assessed, as the displaced humeral head can damage the nerve in the quadrangular space. Rotator cuff muscles may also be affected. However, injury to the axillary artery or the brachial plexus is rare.



FIGURE 3.5 Fracture of the surgical neck of the left humerus in an 85-year-old patient. (Courtesy of Muthana Alqassab.)



FIGURE 3.6 Anterior dislocation of the left shoulder of a 29-year-old patient after a skiing injury. There is anterior displacement of the humeral head on the glenoid fossa. (Courtesy of Salam Ismael.)



FIGURE 3.7 Image of an anterior dislocation of the right shoulder; note the flat shoulder appearance. (Courtesy of Department of Anatomical Sciences, SGUL.)

Brachial Plexus

The brachial plexus is formed from the union of the ventral rami of spinal nerves of C5–C8 and T1. This forms the roots, trunks, divisions, cords, and terminal branches (**Figure 3.8**).

The axillary sheath is a prolongation of the prevertebral fascia, which encloses the axillary artery and the cords of the brachial plexus. T1 divides into a large nerve, which contributes to the brachial plexus, and a small branch, which runs as the first intercostal nerve (see **Section 4**).

In the neck, the roots pass between the anterior and middle scalene muscles to emerge on the lateral border of the scalenus anterior.

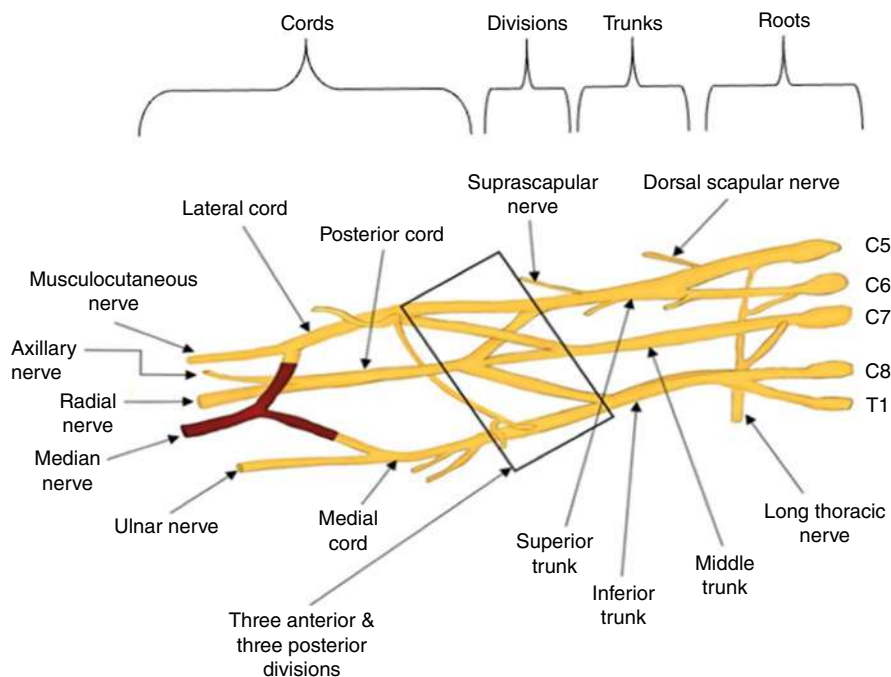


FIGURE 3.8 Diagram of the brachial plexus showing the roots, trunks, divisions, cords, and branches. (Courtesy of Katie Michaels.)

Several nerves originate from the roots:

- C5–C7 roots give the **long thoracic nerve** (nerve of Bell), which supplies the serratus anterior
- C5 **contributes to the phrenic nerve** (C3–C5), which innervates the diaphragm
- **Dorsal scapular nerve** (C5) innervates the rhomboid muscles and levator scapulae

The roots converge to form the trunks, which are present in the lower part of the posterior triangle of the neck behind the middle one-third of the clavicle:

- *Superior trunk*: C5 and C6; forms branches for the **nerve to the subclavius** (which may give rise to the accessory phrenic nerve)
- *Suprascapular nerve*: supplies the supraspinatus and infraspinatus muscles and articular branches to the acromioclavicular and shoulder joints
- *Middle trunk*: C7
- *Lower trunk*: C8 and T1

Each trunk divides into anterior and posterior divisions in the axilla (six divisions in total).

Cords are named in their relation to the axillary artery:

- *Medial cord*: anterior division of lower trunk
- *Posterior cord*: all posterior divisions
- *Lateral cord*: anterior divisions of upper and middle trunks

Branches of the medial cord:

- Ulnar nerve (C8, T1, and occasionally C7)
- Part of the median nerve
- Medial pectoral nerve, to both the pectoralis major (sternocostal part) and minor muscles, with a communicating branch from the lateral pectoral nerve (ansa pectoralis)
- Medial cutaneous nerve of the arm
- Medial cutaneous nerve of the forearm

Branches of the lateral cord:

- Musculocutaneous nerve (C5–C7), supplies the biceps brachii, brachialis, and coracobrachialis
- Part of median nerve
- Lateral cutaneous nerve of the forearm
- Lateral pectoral nerve to the clavicular part of the pectoralis major muscle

The branches of the posterior cord:

- Axillary nerve (C5–C6) to deltoid and teres minor
- Radial nerve (C5–C8, T1) to all arm and forearm extensors (in addition to supinator, anconeus, and brachioradialis) and skin on the dorsal arm, forearm, and hand
- Upper subscapular nerve to subscapularis and lower subscapular nerve to subscapularis and teres major
- Thoracodorsal nerve to latissimus dorsi, which may become injured during the operation of axillary node clearance

Terminal Branches of the Brachial Plexus

The Axillary Nerve

This arises from the posterior cord of the brachial plexus (ventral rami of C5 and C6).

The axillary nerve exits the axilla with the posterior circumflex artery via the quadrangular space. It then divides into three

terminal branches: anterior, articular branches to the shoulder joint, and posterior branches. It supplies the deltoid, teres minor and the long head of the triceps, and a patch of skin covering the inferior region of the deltoid muscle (the “regimental badge” area).

The nerve may be injured during trauma to the shoulder joint and surgical neck fractures and can follow iatrogenic injuries, such as shoulder arthroscopy, intra-articular steroid injections, and intramuscular injections into the deltoid muscle. Patients will experience a loss of ability in abducting their shoulder (paralysis of the deltoid muscle) and a loss of sensation in the regimental badge area. To check the integrity of the axillary nerve in patients with fractures of the surgical neck by examining the function of the deltoid in its three parts, see later in the text.

Musculocutaneous Nerve (C5–C7)

The musculocutaneous nerve has both sensory and motor functions. It begins at the axilla at the level of the lower border of the pectoralis minor muscle. It gives rise to motor branches to the coracobrachialis muscle, which it pierces; runs between the biceps brachii and the brachialis muscle; and gives rise to branches to both respective muscles (the acronym BBC can be used to help you remember this). These muscles are flexors of the anterior compartment of the arm. The biceps brachii is also a strong supinator.

After descending the length of the arm, the musculocutaneous nerve emerges lateral to the biceps tendon and continues into the forearm as the lateral cutaneous nerve of the forearm, which provides sensory innervation to the lateral aspect of the forearm.

The musculocutaneous nerve supplies articular branches to the shoulder and elbow joints.

Ulnar Nerve (C8, T1)

The ulnar nerve courses inferiorly to the elbow, on the medial aspect of the brachial artery, until it pierces the medial intermuscular septum to enter the posterior compartment of the arm.

It then loops behind the medial epicondyle of the humerus. Here, the ulnar nerve runs between the medial epicondyle and skin, leaving it vulnerable to irritation upon impact at this point. Hence, this nerve can cause an electric shock-like sensation when striking the medial epicondyle with the elbow flexed, colloquially referred to as the “funny bone”. **It supplies no branches in the upper arm.**

Median Nerve (C5–C8, T1)

This is formed from both lateral and medial cords of the brachial plexus in the axilla. It makes up the middle nerve of the characteristic “M-shaped” part of the brachial plexus.

- The median nerve runs superficial to the brachial artery, just lateral to the closely related ulnar nerve.
- Midway down the arm, the median and ulnar nerves diverge. The median nerve continues lateral to the brachial artery.
- As the median nerve approaches the elbow, it crosses over the brachial artery and thus enters the cubital fossa medial to the brachial artery.
- **It does not supply branches above the elbow.**

Radial Nerve (C5–T1)

The radial nerve exits the axilla and descends into the arm, running posterior to the axillary artery and then the brachial artery.

The course of the radial nerve is as follows:

- It enters the anterior compartment of the arm through the intermuscular septum, where it becomes surrounded by both brachialis and brachioradialis.
- It firstly gives rise to branches which provide **motor innervation to the medial and long heads of the triceps brachii**.
- It also gives rise to a sensory branch called the **posterior cutaneous nerve of the arm**, which provides sensory innervation for the majority of the skin on the posterior aspect of the arm.
- It then accompanies the profunda brachii artery along the radial (spiral) groove (see above, anatomy of the humerus). Here it supplies the **lateral head of the triceps in addition to brachialis, brachioradialis, and extensor carpi radialis longus**, after leaving the radial groove.
- At the lower aspect of the arm, the radial nerve gives rise to two more sensory branches:
 - The **lateral cutaneous nerve of the arm** (which supplies the lower half of the lateral aspect of the arm)
 - The **posterior cutaneous nerve of the forearm**, which innervates a small area of skin along the middle section of the dorsal aspect of the forearm

- The nerve then divides into its two terminal branches (superficial and deep radial branches) anterior to the lateral epicondyle.

The **deep radial branch continues into the forearm as the posterior interosseous nerve** (which can get injured in proximal injuries to the radius) to provide motor innervation for the posterior compartment of the forearm (extensor muscles).

The superficial radial branch runs distally and anterolaterally, deep to the brachioradialis, along with the radial artery. When near the distal end of the forearm, the superficial radial branch courses laterally to enter the anatomical snuff box. Once it passes the anatomical snuff box, it helps to provide sensory innervation to the lateral surface of the palm and the dorsal surface of the lateral three and a half digits of the hand.

Quadrangular Space

The axillary nerve and the posterior circumflex humeral vessels pass through this space (Figure 3.10) which is bound by the:

- Teres minor superiorly
- Teres major inferiorly
- Surgical neck of the humerus laterally
- Long head of the triceps medially
- Subscapularis muscle, which covers the space anteriorly

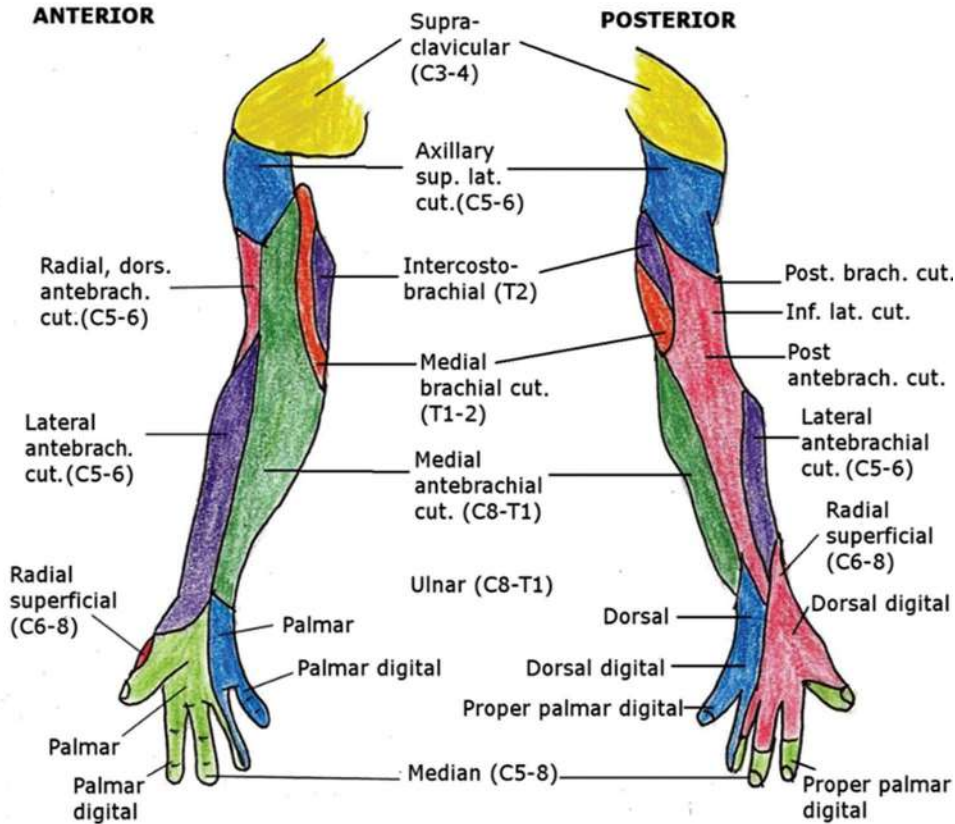


FIGURE 3.9 Sensory innervation of the upper limb. (Antebrach: Antebrachial, Cut: Cutaneous, Dors: dorsal, Inf: Inferior, Lat: Lateral, Sup: Superior.) (Courtesy of Gabriela Barzyk, adapted from Dermatome Maps of Foerster [1933] and Fender [1939].)

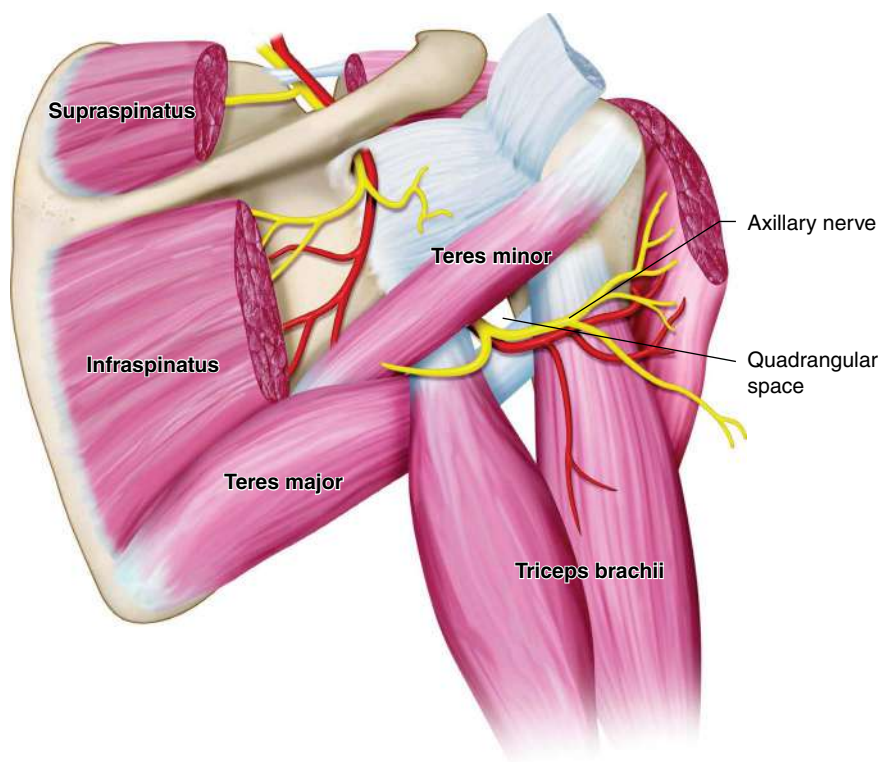


FIGURE 3.10 The anatomy of the quadrangular space. (Courtesy of Kathryn DeMarre.)

CLINICAL NOTES

BRACHIAL PLEXUS

Injury at the superior aspect of the shoulder

Musculocutaneous nerve injury is relatively uncommon because the nerve is well protected at the axilla. However, injury to the nerve can occur during heavy backpacking by injuring the superior trunk (C5–C6) of the brachial plexus.

Radial nerve injury at the axilla

If the injury occurs at the axilla, e.g., during dislocation of the shoulder, stabbing, “Saturday night palsy” (compression of the radial nerve typically follows deep sleep with the arm hanging over the arm rest of a chair, usually following heavy alcohol consumption), or “crutch palsy”, the patient will present with the following motor deficits:

- Inability to extend their forearm, wrist, and fingers; as a result, patients present with wrist drop.

They will also present with the following sensory deficits:

- Loss of sensation in the upper lateral aspect of the arm, posterior surface of the arm, posterior forearm, lateral aspect of the palm, and dorsal aspect of the lateral three and half digits

Injury at the middle part of the upper arm

If the injury occurred at the middle part of the arm, e.g., when there is damage to the radial groove due to fracture of the humeral shaft, patients will present with the following motor deficits:

- Inability to extend the wrist and fingers; therefore, patients present with a **wrist drop** (note that at this level, the radial nerve would have provided motor innervation to the triceps, and therefore patients retain their ability to extend the forearm)
- Weakness in supination due to paralysis of the supinator

They will also present with the following sensory deficits:

- Loss of sensation at the posterior forearm, lateral aspect of the palm, and dorsal aspect of the proximal part of the lateral three and a half digits except the nailbeds. Note that at this level, the radial nerve would have already given rise to the lower lateral cutaneous nerve of the arm and posterior cutaneous nerve of the arm.
- This is why there is no loss of sensation in the upper lateral and posterior aspect of the arm. Therefore, only the superficial radial branch and the posterior cutaneous nerve of the forearm become affected if the injury occurs at this level.

(Continued)

Injury inferior to the elbow

If the injury to the radial nerve occurred just below the elbow (e.g., elbow dislocation), patients will present with the following motor deficits:

- Inability to extend fingers (paralysis of extensors of the digits)
- Weakness in extending hand (partial wrist drop; there is partial wrist drop because the extensor carpi radialis longus is not affected, as it is already innervated)

They will also present with the same sensory deficit as injuries at the middle part of the upper arm.

Injury at the distal aspect of the forearm

- **Wartenberg’s syndrome** results from compression of the superficial radial branch of the radial nerve at the wrist, e.g., due to wearing tight jewellery.
- Patients will only present with a loss of sensation in the lateral aspect of the palm and the dorsal aspect of the lateral three and a half digits of the hand. This happens as the superficial branch would be affected. **Note that the nailbeds would be spared because they are supplied by the median and ulnar nerves.**

Learning Point

Remember the radial nerve supplies the BEST muscles (brachioradialis, extensors, supinator, and triceps).

Other injuries of the brachial plexus include:

- **Birth injuries** during difficult vaginal delivery, due to traction on the upper limb.
- **Blunt and penetrating injuries** to the shoulder and axillary regions.
- **Postoperative injuries** (following injuries during operations such as the removal of axillary lymph nodes, i.e., axillary clearance and diagnostic lymph node biopsy). Examples include injury to the thoracodorsal and long thoracic nerves.

The Shoulder

Muscles of the Shoulder

Deltoid

A triangle-shaped muscle that spans superficially over the glenohumeral joint, forming the rounded appearance of the shoulder. The anterior and posterior parts are unipennate, with the muscle fibres inserted into the tendon on one side. The central part is multipennate – muscle fibres are inserted on both sides of the tendon (Table 3.3).

The Rotator Cuff Muscles

Four muscles form the rotator cuff; their tendons converge to blend with the capsule of the glenohumeral joint. They help to maintain the stability of the shoulder by keeping the head of the humerus within the shallow glenoid fossa (Table 3.4). Additional functions include medial and lateral rotation of the arm and initiation of abduction by the supraspinatus.

TABLE 3.3: Details on the origin, insertion, innervation, and action of the deltoid muscle

Muscle	Origin	Insertion	Innervation	Action
Deltoid, consists of three parts:	Lateral third of the clavicle, acromion, and spine of scapula	Inserts onto the deltoid tuberosity of the humerus	Axillary nerve	<i>Anterior:</i> flexion and medial rotation of arm <i>Central:</i> abductor of shoulder <i>Posterior:</i> extensor and lateral rotator of shoulder
• Anterior				
• Central				
• Posterior				

TABLE 3.4: Rotator cuff muscles

Muscle	Origin	Insertion	Innervation	Action
Supraspinatus	Supraspinous fossa of the scapula	Greater tubercle of the humerus	Suprascapular nerve (C4–C6)	Abductor of the arm
Infraspinatus	Infraspinous fossa	Greater tubercle of the humerus	Suprascapular nerve (C5 and C6)	Lateral rotator of the arm
Teres minor	Middle of the lateral border of the scapula	Greater tubercle of the humerus	Axillary nerve (C5 and C6)	External arm rotator
Subscapularis	Subscapular fossa (ventral surface of the scapula)	Lesser tubercle	Upper and lower subscapular nerves (C5–C7)	Internal rotator of the arm

CLINICAL NOTES

- **Painful arc syndrome** is the impingement of the supraspinatus tendon below the acromion, usually due to wear and tear with age. A sign of this is that the patient may feel pain on abduction of the arm between 60 and 120 degrees. This is diagnosed by history taking and physical examination.
- **Jobe’s test** (also known as the empty can test) is used to diagnose painful arc syndrome. The patient’s arm is elevated to 90 degrees of abduction with internal rotation (arm up

- and out with the thumb turned inward toward the floor). A downward pressure is then applied against the arm. A positive test is the provocation of pain.
- The function of the deltoid muscles (and the axillary nerve which supplies the deltoid) can be tested as the patient abducts their arm 15 degrees from the body against resistance, and simultaneously the examiner should feel the contraction of the deltoid muscle. The deltoid muscle is assisted by the supraspinatus muscle in the initial 10 to 15 degrees.

The Upper Arm

Muscles of the Upper Arm

(Figures 3.11–3.13 and Tables 3.5–3.6)

Flexors: anterior compartment (biceps brachii, coracobrachialis, and brachialis)

Extensor: posterior compartment (triceps muscle)

Posterior Compartment of the Upper Arm

The triceps is the only muscle in the posterior compartment of the arm (Figure 3.13).

CLINICAL NOTE

RUPTURE OF THE BICEPS BRACHII

The long head of the biceps may rupture in older patients following even a minor trauma. There may be an obvious swelling in the arm caused by the contracted biceps muscle. Often no surgical treatment is needed, as the short head can compensate.

TABLE 3.5: Origin, insertion, innervation, and action of the muscles of the upper arm flexor compartment

Muscle	Origin	Insertion	Innervation	Action
Biceps brachii	Originates from two heads The long head of the biceps is intra-articular and arises from the supraglenoid tubercle of the scapula The short head of the biceps arises from the coracoid process of the scapula	Radial tuberosity of the proximal radius Bicipital aponeurosis of the cubital fossa	Musculocutaneous nerve	Flexor of the elbow and supinator of the forearm, e.g., opening a bottle with corkscrew
Brachialis	Anterior surface of the shaft of the humerus, below the deltoid tuberosity; it lies under the biceps	Coronoid process and tuberosity of ulna	Musculocutaneous nerve (with additional innervation from the radial nerve in 70%–80% of people)	Flexor of the elbow joint
Coracobrachialis	Coracoid process of the scapula	Medial surface of the shaft of the humerus	Musculocutaneous nerve	Flexor and adductor of the arm in addition to stabilisation of the humeral head within the shoulder joint

TABLE 3.6: Origin, insertion, innervation, and action of the triceps brachii muscle

Muscle	Origin	Insertion	Innervation	Action
Triceps muscle	Long head originates from the infra-glenoid tubercle of the scapula Lateral and medial heads from the posterior aspect of the shaft of the humerus	The olecranon process of the ulna	Radial nerve, (although some anatomy books mention the axillary nerve as the nerve supply of the long head)	Helps to stabilise the shoulder joint inferiorly Extensor of the elbow joint

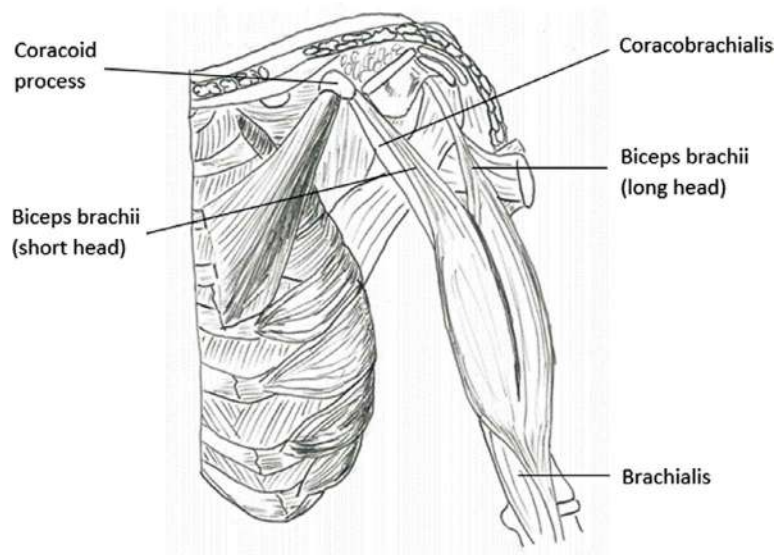


FIGURE 3.11 The anterior upper arm muscles. (Courtesy of Alina Humdani.)

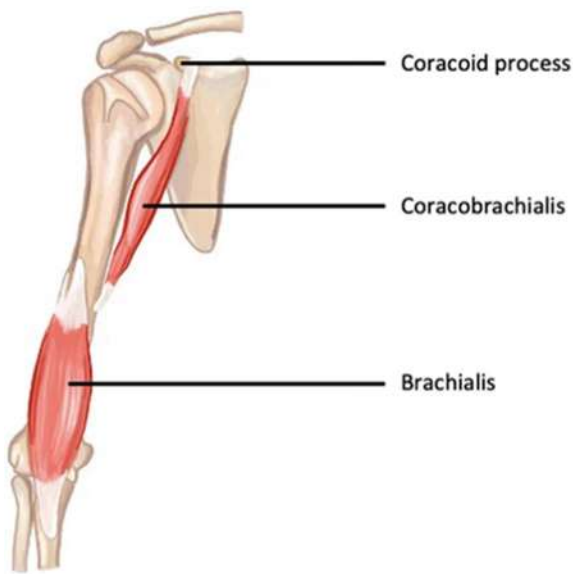


FIGURE 3.12 The anterior upper arm muscles with the biceps brachii removed. (Courtesy of Avni Kant.)

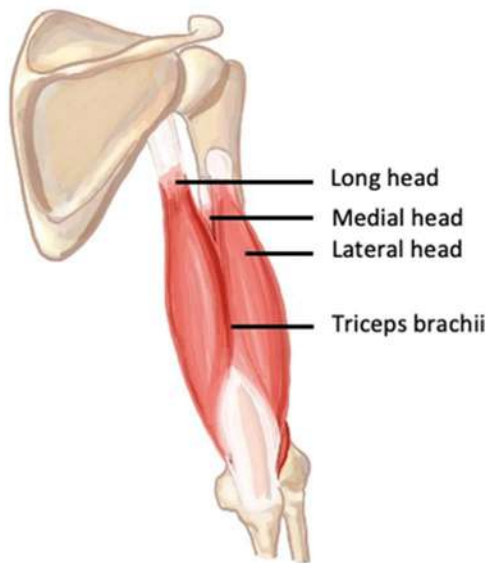


FIGURE 3.13 Posterior view showing the heads of the triceps brachii. (Courtesy of Avni Kant.)

Arterial Supply and Venous Drainage of the Arm

The main artery of the upper arm is the **brachial artery**, which terminates at the level of the neck of the radius by dividing into the radial and ulnar arteries.

The main branches are:

- Profunda brachii follows the radial nerve in the spiral groove and supplies the triceps muscle

- Muscular branches to flexor compartment of the arm
- Superior and inferior ulnar collateral arteries (form an anastomosis around the elbow)

Venous drainage is by the venae comitantes accompanying the brachial artery, which will form the axillary vein.

Cubital Fossa

This is the triangular space at the ventral aspect of the elbow, which is bounded on the ulnar side by the pronator teres, on the radial side by the brachioradialis, and proximally by an imaginary line between the medial and lateral epicondyles.

The floor of the cubital fossa is formed by the brachialis and supinator muscles. The roof is composed of skin and deep fascia, reinforced by the bicipital aponeurosis. The median cubital vein (a common site for venepuncture) runs in the roof of the fossa, alongside the medial and lateral cutaneous nerves of the forearm.

Bicipital Aponeurosis

This is an important band of tissue formed from thickened deep fascia, and represents an extension of the tendon of the biceps brachii muscle. It separates the contents from the superficial structures found within the roof of the fossa. The aponeurosis helps to prevent damage to the brachial artery during venepuncture (the “*grace à Dieu* fascia”).

Contents (Figure 3.14):

- *Biceps tendon (most lateral):* the tendon inserts into the radial tuberosity.
- *Brachial artery (medial to the biceps tendon):* often the brachial artery divides into the radial and ulnar arteries at the apex of the cubital fossa.
- The median nerve is the most medial structure.

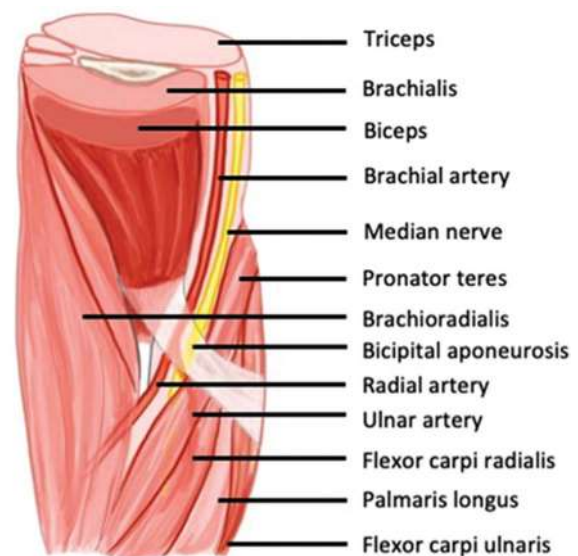


FIGURE 3.14 The contents of the cubital fossa. Note the relationship of the median nerve, brachial artery, and biceps brachii aponeurosis. (Courtesy of Avni Kant.)

CLINICAL NOTES

BRACHIAL ARTERY

The brachial artery is an important landmark when taking blood pressure and is where the bell of the stethoscope is positioned.

It may become damaged following a **supracondylar fracture** (a break in the bone superior to the lateral and medial condyles) of the lower humerus (**Figure 3.15**). It is the most common elbow fracture in children, and commonly follows a fall on the outstretched hand. Neurovascular injury might be associated, so the distal radial and ulnar pulses should always be checked (as the brachial artery may get compromised by the anteriorly displaced bone segment) in addition to median and ulnar nerve examination. Improperly treated fractures can end up with ischaemia of the forearm muscles and fibrosis (fibrous tissue formation replacing the damaged muscles); this is called **Volkman's ischaemic contracture**.

Anatomy of the Forearm and Wrist

The forearm begins distal to the elbow joint and continues to the wrist joint. The forearm has anterior and posterior compartments, which contain muscles that mainly act to produce movements at the wrist joint and fingers.

Bones

The bones of the forearm consist of the radius and ulna; these articulate with the trochlea and capitulum of the humerus at the elbow joint (**Figure 3.16**). These bones are united by the interosseous membrane, which is a strong sheet of fibrous tissue that runs between the interosseous borders. This forms a syndesmosis (fibrous joint) and provides attachment to some of the muscles of the forearm.

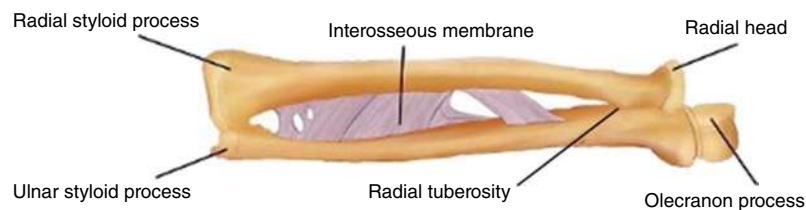


FIGURE 3.16 Radius and ulna. (Courtesy of Katie Michaels.)

The Radius

The radius has a circular proximal head, which allows it to rotate about its axis during pronation and supination. The radius forms a major component of the forearm's articulation at the wrist distally. Unlike the ulna, the head of the radius is found proximally. It is concave and articulates with the capitulum.

Moving just distal to the head, the radius narrows. This is the neck of the radius.

Just distal to the neck is a raised rough area – the **radial tuberosity**. This is the site of insertion of the biceps brachii.

The **shaft** of the radius is narrow proximally but expands distally. The shaft is triangular on cross-section. This triangular shape gives the shaft three borders:

- **Anterior:** starts as a continuation of the radial tuberosity in the proximal end of the shaft



FIGURE 3.15 X-ray of the elbow of a 5-year-old boy with displaced supracondylar fracture. (Courtesy of Qassim F. Baker.)

- **Posterior**
- **Interosseous:** the sharp attachment ridge for the interosseous membrane, on the medial aspect of the shaft

The radius has three surfaces:

- **Anterior**
- **Posterior:** identified due to the large dorsal tubercle (Lister's tubercle, **Figure 3.17**), which acts as a pulley for the tendon of the extensor pollicis longus

- **Lateral:** contains a small roughening for insertion of the pronator teres

At the distal end of the radius the lateral surface extends out as the **radial styloid process**, which can be felt on the lateral side of the wrist in the anatomical position. Medially there is an impression on the radius, the **ulnar notch**, for the articulation with the head of the ulna at the distal radio-ulnar joint.

The Articulations of the Radius

The radius has four articulations:

- **Elbow joint:** *vide infra*.
- **Proximal radio-ulnar joint:** between the radial head and the radial notch of the ulna; the radius rotates against the ulna during pronation and supination.

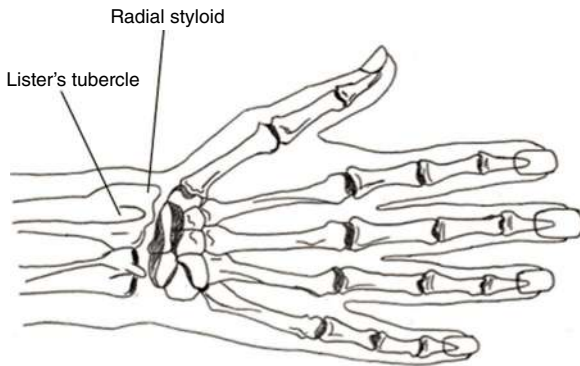


FIGURE 3.17 Posterior aspect of the wrist, showing Lister's tubercle on the distal radius. (Courtesy of Alina Humdani.)

- **Wrist (radiocarpal) joint:** distally, the radius articulates with two of the carpal bones, laterally with the scaphoid, and medially with the lunate.
- **Distal radio-ulnar joint:** see later.

The Ulna

The **olecranon** (from Greek “*olene*”, meaning elbow and “*kranon*”, meaning head) is a bony prominence projecting proximally from the ulna, forming the posterior part of the trochlear notch, with the **coronoid process** forming the anterior. The olecranon gives the elbow its hinge-like properties. On extension, the olecranon will fit into the **olecranon fossa** of the humerus.

Moving distally, the diameter of the **ulnar shaft** narrows from its maximum width at the elbow joint. Similar to the radius, the ulna cross-section is triangular and has three borders:

- **Anterior**
- **Posterior:** can be palpated in its entirety along the posterior forearm
- **Interosseous:** on the lateral aspect for the attachment of the interosseous membrane

The ulna also has three surfaces:

- **Medial:** in contrast to the radius
- **Anterior:** for the attachment of the pronator quadratus
- **Posterior:** for muscle attachments (*vide infra*)

The **ulnar tuberosity** is distal to the coronoid process on the anterior surface and, with the coronoid process, is the site for the **brachialis** muscle insertion.

Distally, the lateral aspect is roughened to allow for the attachment of the pronator quadratus.

The distally located **ulnar head** has a bony protrusion called the **styloid process** (shaped like a *stilus*, Latin for early writing instrument) arising from the posteromedial aspect. The styloid process is linked to the **pisiform** and **triquetrum** via the **ulnar collateral ligament**.

Articulations of the Ulna

The ulna has three articulation points and doesn't contribute to the wrist joint:

- Elbow joint
- Proximal radio-ulnar joint
- Distal radio-ulnar joint

CLINICAL NOTES

FOREARM

A common fracture found in the forearm is that of the **distal radius** seen following a fall on an outstretched arm, known as **Colles' fracture**. The distal fragment of the radius is forced posteriorly producing a “**dinner fork**” deformity and impacted. Although this fracture can happen in young age groups, it is most frequently seen in elderly ladies, due to the common association with osteoporosis. Fracture of the ulnar styloid process may co-exist as well (**Figure 3.18**).

Smith's fracture is a rare fracture of the distal end of the radius with volar displacement (also known as a reverse Colles').

Other fractures:

- **Monteggia's fracture:** fracture of the proximal shaft of the ulna, with associated anterior dislocation of the radius and rupture of the annular ligament; mostly seen in children, but can also occur in adults (**Figure 3.19**).
- **Galeazzi's fracture:** fracture at the junction between the middle and distal thirds of the radius and dislocation at the distal radio-ulnar joint.



FIGURE 3.18 Impacted Colles' fracture of the distal radius in a 63-year-old female after a fall onto an outstretched hand. Also note the ulnar styloid fracture. (Courtesy of Salam Ismael.)



FIGURE 3.19 Monteggia's fracture (fracture of proximal ulnar diaphysis, plus dislocation of the radial head). (Courtesy of Ahmed A. Shakir.)

Elbow Joint

The elbow joint is a synovial hinge joint between the distal humerus and the radius and ulna. The elbow joint is surrounded by a capsule and lined by synovial membrane. The collateral radial and ulnar ligaments span over the joint along the lateral and medial aspects. These support the elbow joint during flexion and extension (**Figure 3.20**).

- The **trochlea articulates with the trochlear notch of the ulna** (consists of the olecranon posteriorly and the coronoid process anteriorly).
- The **capitulum articulates with the head of the radius** (the head and neck of the radius are encircled by the annular ligament).
- The only movements possible at the elbow joint are flexion (by flexors: biceps brachii, brachialis, and brachioradialis) and extension (by triceps and anconeus).

The **proximal radio-ulnar joint** is a synovial pivot joint between the head of the radius and the radial notch of the ulna. Rotation of the radial head within this joint **allows pronation and supination** of the forearm and wrist to occur. This is enabled by the annular ligament, which holds the radius in

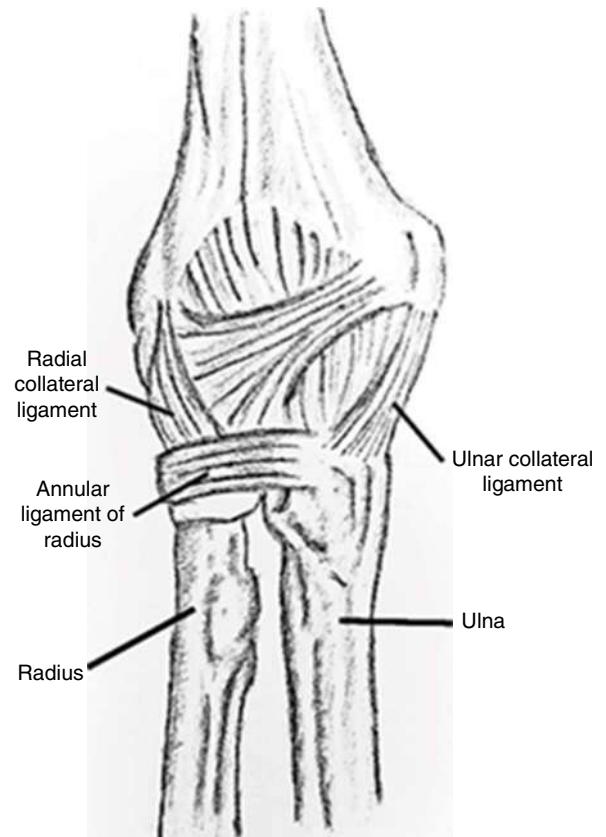


FIGURE 3.20 Diagram of the ligaments of the elbow and upper radio-ulnar joints. (Courtesy of Jordan Bethel.)

place in the radial notch of the ulna and is responsible for the main integrity of this joint. Its capsule is continuous with that of the elbow joint, and the same applies to the synovial membrane (some anatomists consider the elbow and the proximal radio-ulnar joints as one joint).

CLINICAL NOTE

DISLOCATION OF THE ELBOW

Elbow dislocation is one of the most common injuries affecting the elbow, especially in children. The most common type is posterolateral, which commonly occurs in association with a fracture of the elbow. As for supracondylar fractures, it is important to always check the integrity of the neurovascular structures (brachial artery, ulnar and median nerves).

Distal Radio-Ulnar Joint

This is a synovial pivot joint between the head of the ulna and ulnar notch of the radius. A triangular disc of fibrocartilage separates the joint from the wrist joint and holds the two bones together during pronation.

The rotary movements of pronation and supination occur at the upper and lower radio-ulnar joints around a vertical axis that extends from the head of the radius above to the triangular disc below.

TABLE 3.7: Superficial forearm flexor muscles

Muscle	Origin	Insertion	Innervation	Action
Flexor carpi ulnaris	<i>Two heads:</i> <ul style="list-style-type: none"> • Humeral head arises from medial epicondyle • Ulnar head from olecranon of the ulna 	Base of the fifth metacarpal, the pisiform bone, and hook of hamate	Ulnar nerve	Flexes and adducts the wrist
Flexor carpi radialis	Medial epicondyle of humerus	Base of the second (mainly) and third metacarpals	Median nerve	Flexes and abducts the wrist
Pronator teres	<i>Two heads:</i> <ul style="list-style-type: none"> • Humeral head from the medial epicondyle • Ulnar head from the coronoid process of the ulna 	Lateral surface of the radius	Median nerve	Pronator of the forearm
Palmaris longus	Medial epicondyle of humerus	Flexor retinaculum and palmar aponeurosis	Median nerve	Flexion of the hand

The muscles responsible for pronation are the pronators (pronator teres and pronator quadratus) and for supination, the biceps brachii and supinator. Supination is much stronger than pronation.

Muscles of the Anterior Compartment of the Forearm

The muscles of the anterior compartment of the forearm act predominantly to flex the wrist and digits. The anatomy of the hand and wrist is organised to support this motion of flexion. The anterior compartment of the wrist contains three layers of muscles: a superficial, intermediate, and deep layer (Tables 3.7–3.9).

Superficial Layer

The muscles of the superficial layer **all originate from the medial epicondyle of the humerus (Figure 3.21).**

The palmaris longus may be absent unilaterally or bilaterally, depending on the ethnicity of the individuals studied. In other mammals, this muscle is used to retract the claws. You can test for the presence of the palmaris longus by opposing the thumb to the little finger and flexing the wrist, which results in prominence of the palmaris longus tendon if it is present; this is called Schaeffer’s test. The tendon of the palmaris longus may be used in tendon grafting.

The muscles of the superficial anterior compartment are innervated by the **median nerve, except for the flexor carpi ulnaris, which is innervated by the ulnar nerve.**

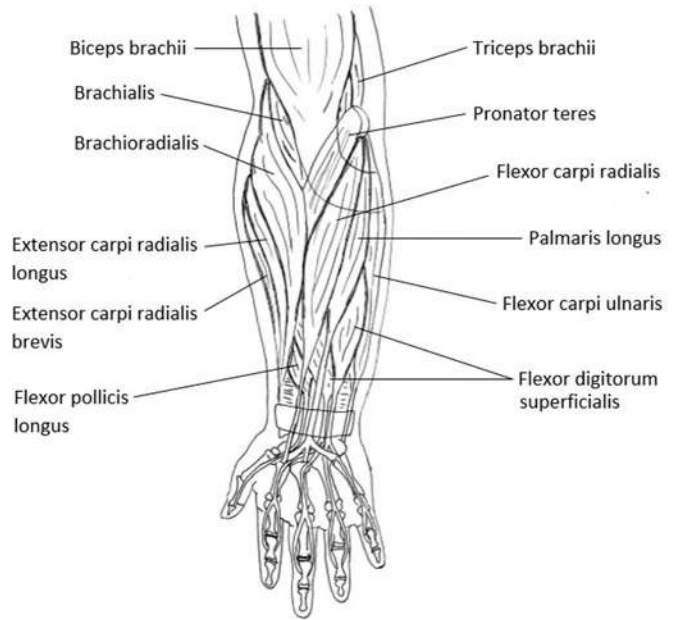


FIGURE 3.21 Muscles of the anterior compartment of the forearm showing the superficial and intermediate flexors and some extensors. (Courtesy of Alina Humdani.)

TABLE 3.8: Intermediate layer of forearm flexors

Muscle	Origin	Insertion	Innervation	Action
Flexor digitorum superficialis (FDS)	<ul style="list-style-type: none"> • Humero-ulnar head (from the medial epicondyle and coronoid process of the ulna) • Radial head (from anterior surface of the radius) 	Middle phalanges of the second to fifth digits after forming Camper’s chiasm (described later) around the flexor digitorum profundus	Median nerve	Flexes the proximal interphalangeal (PIP) joints and the metacarpophalangeal (MCP) joint of the same finger and the wrist

TABLE 3.9: Deep forearm flexor muscles

Muscle	Origin	Insertion	Innervation	Action
Flexor digitorum profundus (FDP)	Anterior surface of the ulna and medial aspect of interosseous membrane	Distal phalanges of the second to fifth digits	Median nerve, lateral half Ulnar nerve, medial half	Flexes the distal interphalangeal (DIP) joint, the MCP, and the wrist
Flexor pollicis longus (FPL)	Anterior surface of the radius	Distal phalanx of the thumb	Median nerve	Flexes the interphalangeal joint of the thumb, as well as the MCP joint
Pronator quadratus	Anterior surface of the ulnar shaft	Anterior surface of the shaft of the radius	Median nerve	Pronates the forearm

The **intermediate layer** contains one muscle (flexor digitorum superficialis [FDS]) (Figure 3.21).

Deep Layer (Figure 3.22)

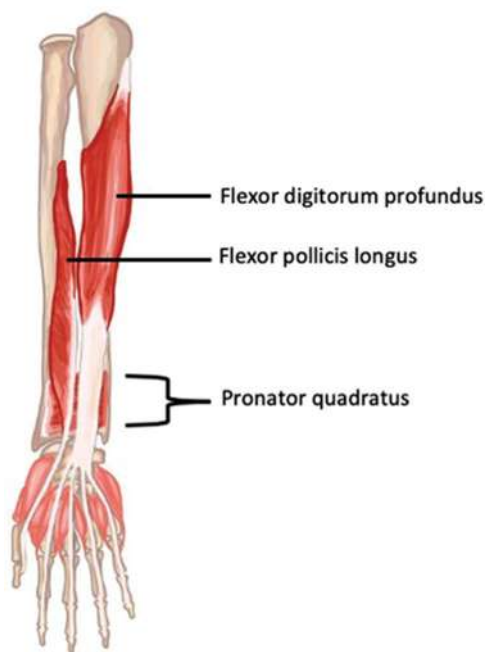


FIGURE 3.22 Muscles of the deep layer of the anterior compartment. (Courtesy of Avni Kant.)

The tendons of the flexor digitorum profundus (FDP) are deep to those of the FDS; however, the tendon of the FDP passes through the tendon of the FDS at the middle phalanx, where the FDS tendon splits into two to form Camper's chiasm (Figure 3.23). The FDP can be tested clinically by fixing the proximal interphalangeal joint (PIP) joint and asking the patient to flex the distal interphalangeal joint (DIP) joint.

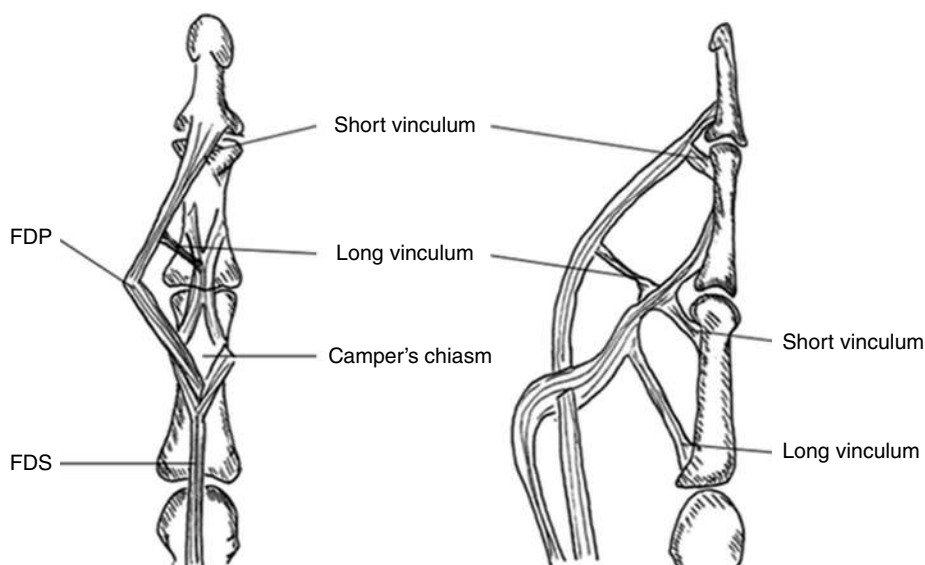


FIGURE 3.23 Camper's chiasm. (Courtesy of Alina Humdani.)

QUIZ QUESTION

Q. How might the flexor digitorum profundus be affected by an ulnar neuropathy, and how might this present?

Neurovascular Structures of the Anterior Forearm and Wrist

Arteries

The **radial** and **ulnar arteries** are the two main arteries of the anterior forearm. These arteries give rise to vessels that also supply the posterior compartment of the forearm. They are formed from the bifurcation of the brachial artery at the level of the neck of the radius.

The **radial artery** (smaller than the ulnar artery) passes laterally through the forearm, superficial to the FDS and can be located in the distal forearm, proximal to the wrist joint, immediately lateral to the flexor carpi radialis tendon.

The radial artery passes posterolaterally around the wrist to supply the thumb and lateral side of the index finger by passing obliquely through an area on the lateral aspect on the dorsum of the hand called the "**anatomical snuffbox**" (described in more detail later).

The **ulnar artery** passes medially through the forearm, deep to the FDS, and is not easily palpable in the distal forearm; hence a patient's pulse tends to be taken with the radial artery.

It gives origin to the common interosseous artery which divides into the anterior and posterior interosseous arteries, which supply the deep forearm flexors and deep and superficial forearm extensors respectively.

The ulnar artery enters the hand by passing lateral to the pisiform bone, via **Guyon's canal**, superficial to the flexor retinaculum of the carpal tunnel (described in detail later). The ulnar artery provides the major blood supply to the medial three and a half digits of the hand.

Both the radial and ulnar arteries anastomose to form the **deep and superficial palmar arches**.

CLINICAL NOTES

RADIAL ARTERY

- *Radial pulse*: as the artery lies superficially under the skin, it is a common place to measure the pulse to get an understanding of the heart rate (bradycardia, tachycardia, or normal rate), cardiac rhythm (regular, irregular, and presence of ectopic beat), and pulse volume (for example, low volume in patients with shock).
- Taking the radial pulse can be applied on both arms simultaneously to identify radioradial delay, or to the femoral and radial arteries to detect radiofemoral delays, which may indicate aortic coarctation; see [Section 4](#).
- Taking an arterial blood sample for arterial blood gas (ABG) is an important clinical skill learnt by junior doctors.
- A radiocephalic fistula (between the cephalic vein and the radial artery) may be formed using the radial artery to gain vascular access in patients on chronic haemodialysis.

MODIFIED ALLEN'S TEST

- Since both radial and ulnar arteries anastomose to form the superficial and deep palmar arches, these arteries can be compressed at the wrist to produce pallor of the clenched fist. The patient then extends their fingers, and the pressure overlying the ulnar artery is released. A positive Allen's test, as shown by a return of colour to the hand within 10 seconds, signifies that the ulnar artery is sufficient to maintain arterial blood to the hand.
- This test assesses circulation in the hand and can be used to initially assess whether the radial artery can be used for coronary artery bypass graft (CABG) surgery and radial forearm flap and before taking a blood sample for ABG analysis, as thrombosis of the radial artery is a possible complication following cannulation for an arterial line or catheterisation (cardiac angiography). There is conflicting evidence to support the use of this test, although adding other tools like pulse oximetry and duplex ultrasound may help to improve the results.

Veins of the Hand and Forearm

The dorsal venous arch (or network) lies on the dorsum of the hand and continues as the **cephalic vein** laterally and the **basilic vein** medially. The cephalic vein ascends to the cubital fossa, then ascends the upper arm lateral to the biceps, and joins the axillary vein after passing through the deltopectoral groove. This vein is a common site for setting up an intravenous (IV) line ([Figure 3.24](#)).

The basilic vein ascends to the medial side of the biceps and joins the venae comitantes of the brachial artery to form the axillary vein.

The **median cubital vein** connects the cephalic and the basilic veins in the cubital fossa (see the notes on the bicipital aponeurosis). This vein is commonly used by phlebotomists when retrieving blood. This vein should be avoided if an IV line is set up, as flexion of the elbow kinks the IV cannula, and even risks cutting a piece of the cannula.

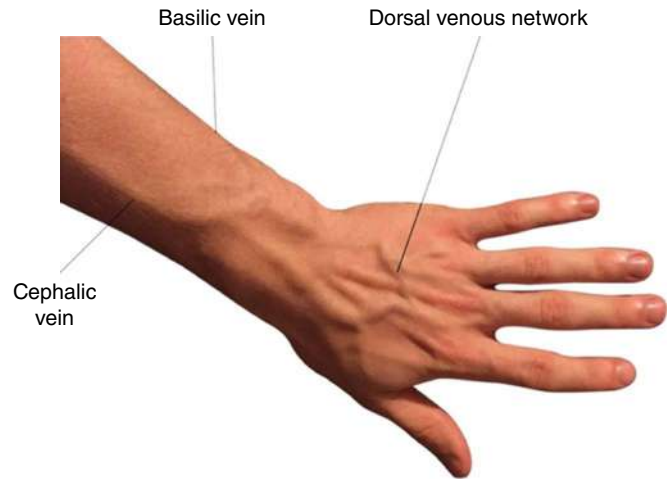


FIGURE 3.24 Dorsal venous arch and superficial veins of the forearm. (Courtesy of Jordan Bethel.)

Nerves

The main nerves of the anterior compartment are the **ulnar**, **median**, and **superficial radial nerves**.

Median Nerve

The course of the median nerve is as follows:

- It courses deep between the two heads of the **pronator teres** to enter the anterior forearm.
- In the forearm, the nerve runs between the FDP and FDS muscles.
- It passes **deep to the flexor retinaculum**, through the **carpal tunnel**, to enter the hand, where it divides into two terminal branches: the **recurrent branch** and the **palmar digital branch**.

Motor Innervation

Supplies **all the flexor muscles** of the anterior forearm **except the medial part of the FDP and flexor carpi ulnaris**.

The anterior interosseous branch of the median nerve passes over the interosseous membrane and innervates the muscles of the deep layer of the anterior compartment, except the ulnar part of the FDP. The skin of the base and central aspect of the palm is innervated by a small palmar branch of the anterior interosseous nerve (**palmar cutaneous branch**), which originates in the forearm and passes superiorly over the flexor retinaculum of the carpal tunnel, so this area is spared in carpal tunnel syndrome.

In the hand, the median nerve supplies the lateral two lumbricals and the muscles of the thenar eminence.

The acronym **LOAF** can be used to remember the muscles that are supplied by the median nerve in the hand:

- Lumbricals 1 and 2 (by the palmar digital branch)
- **O**pponens pollicis, **A**bductor pollicis brevis, and **F**lexor pollicis brevis (the muscles of the thenar eminence), all supplied by the recurrent branch

The recurrent branch of the median nerve is sometimes referred to as the “million-dollar nerve”, due to its vital importance in the

opposition of the thumb to the other four fingers and litigation-related compensation when this branch is accidentally injured during hand surgery.

Note: pollicis in Latin means “of the thumb”; thus, the thenar muscles act on the thumb.

Sensory Innervation

The **median nerve** carries sensory innervation from the following regions:

- The lateral aspect of the palm, including the palmar aspect and distal dorsal region of the thumb
- The palmar surface and distal dorsal aspect (including the nailbeds) of the index, middle, and lateral half of the ring finger (the second, third, and fourth digits) via the palmar digital branch

Ulnar Nerve (C8–T1)

The ulnar nerve enters the forearm by passing between the two heads (humeral and ulnar) of the flexor carpi ulnaris. At this point, muscular and cutaneous branches are given off. It courses along the medial side of the forearm, towards the lateral edge of the flexor carpi ulnaris tendon and **runs superficial to the flexor retinaculum** and the carpal tunnel. It then runs with the ulnar artery and vein in Guyon’s canal into the hand, which is a fibro-osseous passage between the pisiform and the hook of hamate; the transverse carpal ligament and volar carpal ligament proximally; and the hook of hamate, abductor digiti minimi, pisohamate ligament, and fibrous arch of the hypothenar muscles distally.

The ulnar nerve runs medial to the ulnar artery and gives rise to the following cutaneous branches:

- A **palmar branch** innervates the skin on the medial side of the palm.
- A **dorsal branch** innervates the skin on the posteromedial side of the hand and the posterior surfaces of the medial one and a half digits.

Function of the Ulnar Nerve

The ulnar nerve provides motor supply to numerous muscles:

- Flexor carpi ulnaris
- Ulnar half of FDP
- All the intrinsic muscles of the hand, *except* the three muscles of the thenar eminence and two lateral lumbrical muscles, which are supplied by the median nerve. Note that the adductor pollicis is supplied by the ulnar nerve (*vide infra*, Froment’s test)

The ulnar nerve provides sensory innervation to the fifth digit (little finger) and medial half of the fourth digit (ring finger) **on both palmar and dorsal aspects**.

The skin of the anterior thumb, index, middle finger, and lateral half of the fourth digit is supplied by the median nerve, while the

proximal posterior skin across the same four digits is innervated by the radial nerve.

CLINICAL NOTES

ULNAR NERVE INJURY

- The ulnar nerve runs almost unprotected in its whole course and so is liable to injury.
- Ulnar nerve damage gives a “**claw hand appearance**”. Here, the fourth and fifth digits are flexed at the interphalangeal (IP) joints while hyperextended at the metacarpophalangeal joints (**Figure 3.25**). This is different from Dupuytren’s contracture (due to fibrosis of the palmar fascia of the hand, forming nodules in the palm and finger contracture), which presents as flexion of the metacarpophalangeal joint, PIP, and DIP.
- More proximal ulnar lesions (at the elbow) result in the loss of function of the flexor carpi ulnaris and FDP to the medial two digits.
- Distal lesions produce a worse “clawing” of the hand, as the innervation to the FDP is intact, and so flexion still occurs at the DIP joint (this is known as the “ulnar paradox”). There is impaired sensation over areas of skin innervated by the ulnar nerve.

CUBITAL TUNNEL SYNDROME

- The ulnar nerve is pinched in the cubital tunnel, which is formed by the medial epicondyle, olecranon, and Osborne’s band (an elastic tissue between the two bony landmarks).
- Usually, this syndrome follows a repetitive strain injury, e.g., continually sleeping with the arm bent behind the neck. However, often the syndrome spontaneously resolves.
- It results in altered sensation of the volar and dorsal aspects of the little and ring fingers and pain along the course of the ulnar nerve from the elbow to the ulnar side of the hand.

FROMENT’S TEST

- Used to test for ulnar nerve palsy/weakness in the adductor pollicis.
- The patient is asked to pinch a paper between the thumb and the index finger. The examining clinician tries to pull the paper away, whilst the patient applies more pressure to retain the paper by contracting the adductor pollicis.

In ulnar nerve lesions, patients start to pinch the paper by flexing the IP joints more by using the flexor pollicis longus (supplied by the median nerve) to maintain a grip.

Posterior Aspect of the Forearm Muscles

The muscles of the posterior compartment predominantly extend the wrist and digits. All muscles of the posterior forearm are innervated by the radial nerve. The posterior forearm has superficial and deep layers of muscles.



FIGURE 3.25 “Claw hand” due to ulnar nerve damage. Note hyperextension of the fourth and fifth metacarpophalangeal (MCP) joints due to paralysis of the lumbricals. (Photograph courtesy of Philip J. Addis.)

Superficial Layer

All muscles in the superficial layer originate from the **lateral epicondyle of the humerus** (the common extensor origin), except the brachioradialis and the extensor carpi radialis longus, which originate from the lateral supracondylar ridge of the humerus (**Table 3.10**).

Note: The extensor carpi radialis longus and brevis and the extensor carpi ulnaris act synergistically with finger flexors, as they keep the wrist in an extended position to provide additional strength when grasping objects. This is essential for the proper formation of a **power grip**.

Deep Layer

All muscles of the deep posterior compartment originate from the posterior surface of the radius, ulna, and interosseous membrane and are innervated by the **posterior interosseous nerve**, a branch of the deep radial nerve (**Table 3.11**).

TABLE 3.10: Superficial layer of forearm extensors

Muscle	Origin	Insertion	Innervation	Action
Brachioradialis	Proximal aspect of the lateral supracondylar ridge of humerus	Radial styloid process	Radial nerve	Elbow flexion when the forearm is in pronation
Extensor carpi radialis longus	Lateral supracondylar ridge	Base of the second metacarpal	Radial nerve	Extends and abducts the wrist
Extensor carpi radialis brevis	Lateral epicondyle	Base of the third metacarpal	Radial nerve	Extends and abducts the wrist
Extensor carpi ulnaris	Lateral epicondyle of the humerus	Medial side of the fifth metacarpal	Radial nerve (deep branch)	Extends and adducts the wrist
Anconeus	Lateral epicondyle	Posterior and lateral part of the olecranon	Radial nerve	Extends and stabilises the elbow joint Abducts the ulna during pronation of the forearm
Extensor digitorum	Lateral epicondyle	Middle and distal phalanges of the second to fifth digits	Radial nerve (deep branch)	Extension of fingers and wrist
Extensor digiti minimi	Lateral epicondyle of the humerus	Extensor hood of the fifth digit (little finger)	Radial nerve (deep branch)	Extension of little finger

TABLE 3.11: Muscles of the deep layer of the forearm

Muscle	Origin	Insertion	Innervation	Action
Abductor pollicis longus	Posterior surface of the ulna and radius	Base of the first metacarpal bone	Radial nerve (posterior interosseous branch)	Abduction of the carpometacarpal joint of the thumb and thumb extension (see information on the boundaries of the anatomical snuff box)
Extensor pollicis brevis	Posterior surface of the radius and interosseous membrane	Dorsal surface of proximal phalanx of the thumb	Radial nerve (posterior interosseous branch)	Extends the proximal phalanx of the thumb
Extensor pollicis longus	Middle third of posterior ulna and interosseous membrane	Dorsal surface of the distal phalanx of the thumb	Radial nerve (posterior interosseous branch)	Extends the interphalangeal joint of the thumb
Extensor indicis	Posterior ulna and interosseous membrane	Extensor expansion of the index finger	Radial nerve (posterior interosseous branch)	Extends the index finger
Supinator	<i>Two heads:</i> <ul style="list-style-type: none"> • Lateral epicondyle of the humerus • Posterior surface of the ulna and annular ligament 	Lateral surface of the shaft of the radius	Radial nerve (deep branch)	Supination of the forearm, acting by rotating the radius at the proximal radio-ulnar joint

The radial nerve passes through the supinator muscle in the upper forearm. It then divides into deep (posterior interosseous nerve) and superficial (sensory) branches.

The **extensor retinaculum** is a strong thickened band of deep fascia that keeps the extensor tendons in position at the wrist. There are six tunnels for the passage of the extensor tendons lined by synovial sheaths. The retinaculum attaches laterally to the distal part of the radius and medially to the pisiform and hamate carpal bones.

The Wrist and Hand

Bones

Eight carpal bones make up the bones of the wrist. They are arranged in proximal and distal rows (**Figure 3.26**).

Proximal row (medial to lateral):

- *Pisiform* (*Latin*: “pea-shaped”): a sesamoid bone (a bone within a tendon, like the patella) within the tendon of flexor carpi ulnaris
- Triquetrum (*Latin*: *triquetrus*, “three-cornered”)
- Lunate (*Latin*: *luna*, “moon-shaped/crescentic”)
- Scaphoid (*Greek*: “keel-shaped”)

Distal row (medial to lateral):

- The hamate has a hook (or hamulus), called “the hook of the hamate”.
- The capitate is the largest carpal bone and articulates with the third metacarpal bone.
- The trapezoid articulates with the metacarpal of the index finger.
- The trapezium articulates with the thumb.
- The scaphoid, lunate, and triquetrum articulate with the radius and form the radiocarpal wrist joint.

Remember: “trapezium supports the **thumb**; trapezoid lies **in**soid”.



FIGURE 3.26 Carpal bones. (Photograph courtesy of Philip J. Adds.)

Anatomical Snuffbox

The “**anatomical snuffbox**” (so called because it was used in the past when taking snuff) is an anatomical landmark located on the posterolateral aspect of the hand (**Figure 3.27**).

The borders of the snuffbox consist of the:

- *Lateral border*: formed by the tendons of the **abductor pollicis longus** and **extensor pollicis brevis**
- *Medial border*: formed by the tendon of the **extensor pollicis longus**
- *Floor of the snuffbox*: formed by the **scaphoid** and **trapezium**

The **radial artery** runs obliquely through the snuffbox; the cephalic vein crosses it superficially, in addition to the terminal branches of the superficial radial nerve.

The **scaphoid** is the most commonly fractured carpal bone and commonly presents with swelling and tenderness over the area of the anatomical snuffbox (**Figure 3.28**). In around 10% of the population, blood supply comes from the distal to the proximal portion of the scaphoid bone, and so a fracture can lead to **avascular necrosis** of the scaphoid in these individuals due to interruption of the blood supply. Missed diagnosis of scaphoid fractures is a common cause of litigation.

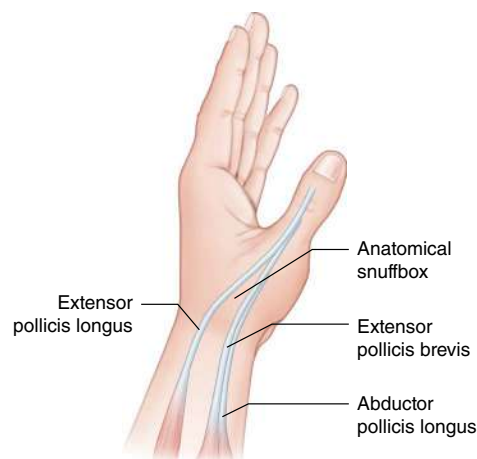


FIGURE 3.27 The anatomical snuffbox. (Courtesy of Jordan Bethel.)



FIGURE 3.28 X-ray of the hand showing fracture of the waist of the scaphoid bone (*arrow*). (Courtesy of Mohammed M. Altalal.)

QUIZ QUESTION

Q. What other bones are susceptible to avascular necrosis?

The Carpal Tunnel

This osteofascial tunnel is formed by the **flexor retinaculum** (thickened deep fascia across the flexor aspect of the wrist). Posteriorly, medially, and laterally the tunnel is formed by the **carpal arch**, which consists of the pisiform and hamate medially and the scaphoid and trapezium laterally.

Several important structures pass through the carpal tunnel from the forearm to the hand:

- FDP tendons (four)
- FDS tendons (four)
- Flexor pollicis longus tendon
- Median nerve

Note: One function of the flexor retinaculum is to prevent bowing of the FDP and FDS tendons to preserve their optimal function during flexion of the digits.

CLINICAL NOTE

CARPAL TUNNEL SYNDROME

- This is a common clinical condition, often idiopathic, due to compression of the median nerve as it travels deep to the flexor retinaculum (**Figure 3.29**). Other causes include osteoarthritis of the wrist joint, acromegaly, rheumatoid arthritis, and following injuries such as Colles' fracture.
- Compression of the median nerve interrupts its motor supply to the thenar muscles, which may lead to their atrophy, which is a late sign.
- May also lead to pain (mainly nocturnal), numbness, and paraesthesia (pins and needles) in the cutaneous distribution of the median nerve.
- More common in women than in men, especially in pregnant women, although it may disappear after labour.

If this is presented as a clinical scenario during an objective structured clinical examination (OSCE), the examiner will expect you to check for tenderness by tapping the retinaculum (Tinel's test) and for paraesthesia on flexion of the wrist (Phalen's test) and to test the function of the thenar muscles and sensation within the territory of the median nerve. Scanning by ultrasound (US) and magnetic resonance imaging (MRI) helps in reaching a clinical diagnosis.

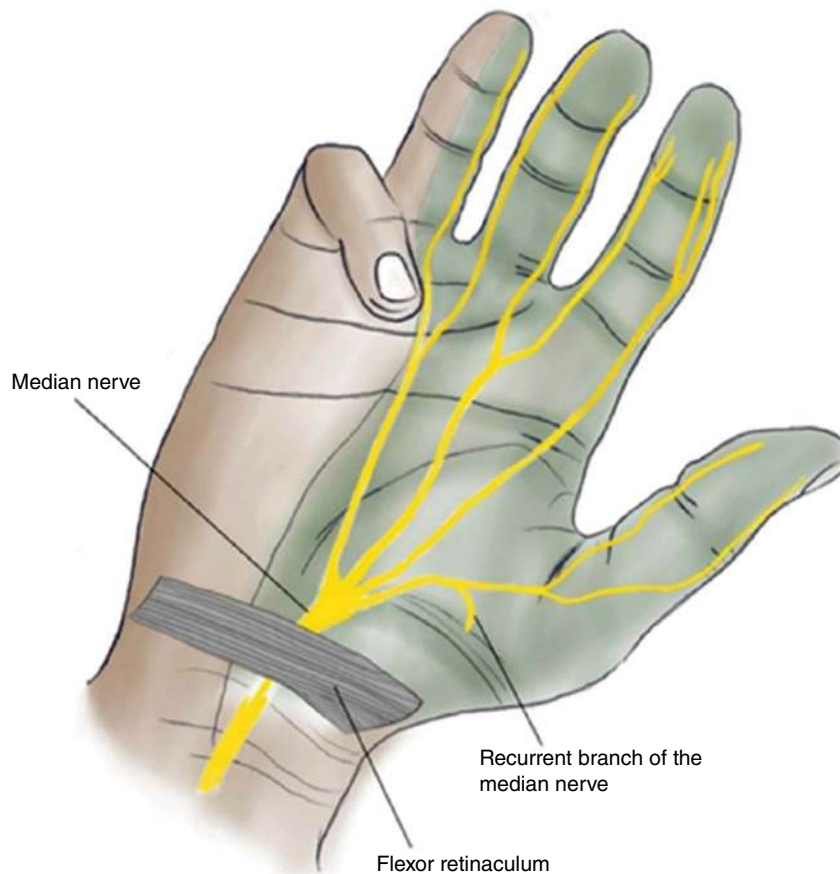


FIGURE 3.29 Diagram showing the innervation of the hand by the median nerve. (Courtesy of Katie Michaels.)

Skin of the Hand

The skin of the hand differs on its palmar and dorsal surfaces. The palmar skin is thicker and anchored to the deep structures and contains plenty of sweat glands but no hair follicles or sebaceous glands. The skin of the dorsum of the hand is loose, and consequently oedema is more liable to collect there.

Bones of the Hand

Distal to the carpal bones are the five **metacarpal bones**, which articulate distally with the proximal phalanges of each digit (**Figure 3.26**).

The second to fifth digits have three phalangeal bones: proximal, middle, and distal.

The thumb has only a **proximal and distal phalanx**.

The second to the fifth digits have two IP joints: PIP and DIP.

Joints of the Hand

Wrist (radiocarpal) joint

- Synovial joint between distal radius and the scaphoid, lunate, and triquetral
- *Movements*: flexion/extension, adduction, and abduction
- Wrist capsule lined by synovial membrane and reinforced by ligaments of the wrist (palmar radiocarpal, dorsal radiocarpal, ulnar collateral, and radial collateral)

Intercarpal joints

- Synovial joints between the adjacent bones of the proximal and distal rows of the carpus; each joint is surrounded by a capsule.
- There is limited intercarpal movement, which contributes to the general hand position.
- Midcarpal joints are between the bones of the proximal and distal carpal bones.

Carpometacarpal joints

- The joint between the base of the first metacarpal (i.e., of the thumb) and trapezium is a synovial saddle joint and allows for a wide range of movements (flexion/extension, adduction/abduction, and circumduction but not rotation).
- Joints of the second through fifth metacarpals allow less movement.

Metacarpophalangeal joints

- Synovial condylar joints between the head of the metacarpal and the base of the proximal phalanx.
- Allows for flexion/extension and abduction/adduction.
- Capsule reinforced by the palmar ligament and medial and lateral collateral ligaments.
- Dislocation of the metacarpophalangeal joint (MPJ) is an uncommon injury, which may be easy to reduce (**Figure 3.30**) unless major damage has occurred to the collateral ligaments.

IP joints

- Hinge joints
- Allow flexion/extension
- Reinforced by ligaments



FIGURE 3.30 X-ray of the hand showing dislocation of the metacarpophalangeal joint of the thumb. (Courtesy of Mohammed M. Altalal.)

Flexion and Extension Mechanisms of the Wrist and Digits

Flexors of the Wrist and Digits

FDP

- Inserts onto distal phalanx
- Flexes digit at DIP
- Flexes the wrist

FDS

- Each tendon inserts onto the middle phalanx by splitting into two insertions, medial and lateral, forming Camper's chiasm
- Flexes digit at PIP

The FDS and FDP tendons exist in a synovial sheath as they pass through the carpal tunnel and progress distally along the palm and palmar aspect of the digits.

Pulley System of the Digits

A pulley system exists on the palmar surface of the digits. This maximises the motion of flexion by maintaining the tendon sheaths of the **FDS** and **FDP** as close to the axis of flexion as

possible, thereby **preventing bowstringing**. This means that the motion of digit flexion brought about by contraction of the FDS and FDP muscles is smooth and efficient.

The pulley system contains **five annular (A) pulleys** and **three cruciate (C) pulleys** (Figure 3.31).

The integrity of the pulley system is of the utmost importance in **flexor tendon repair surgery**, as damage to the pulleys can lead to bowstringing and adhesion formation. This means the tendon becomes stuck, or catches on the tendon sheath, and so cannot glide properly during digit flexion.

The A2 and A4 pulleys are the most important pulleys to preserve to maintain a suitable fulcrum through which to flex the digits and prevent bowstringing. The A2 pulley plays an important role in flexion of the proximal phalanx, and the A4 pulley is largely responsible for flexion of the distal phalanx.

The A1 pulley is commonly involved with trigger finger, where the tendons of the digit catch on the sheath and so the finger flexes or extends in a sharp sudden motion, as if one is pulling a trigger.

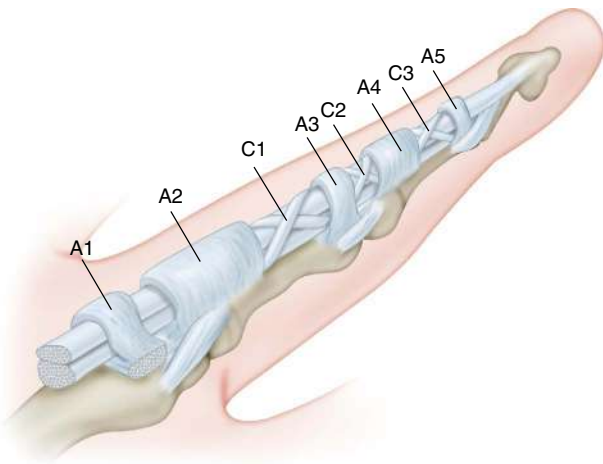


FIGURE 3.31 Pulley system of the digits, including the annular and circumferential pulleys. (Courtesy of Jordan Bethel.)

Extensors of the Wrist and Digits

The extensors of the digits form **extensor expansions (hoods)** on the **dorsal aspect** of the digits. Each expansion consists of three parts: central and two laterals.

The central is inserted into the base of the middle phalanx, second to fifth (proximal phalanx for the thumb), and the two laterals are inserted into the base of the distal phalanx.

To the corners of the extensor expansions attach the tendons of the corresponding interosseous and lumbrical muscles, allowing for complex digital movements and grips.

The extensor muscles forming the extensor hood include:

- **Extensor digitorum** (second to fifth digits)
- **Extensor pollicis longus** and **extensor pollicis brevis** (thumb)
- **Extensor digiti minimi**
- **Extensor indicis**

Intrinsic Muscles of the Hand

The intrinsic muscles of the hand can be split into the **thenar** and **hypothenar eminences**, **adductor pollicis**, **palmaris brevis**, **lumbricals**, and **interossei**. The eminences make up the muscle bulk on the medial and lateral sides of the palmar aspect of the hand.

Lumbricals are four “worm-like” muscles, each associated with a finger (Latin: *Lumbricus terrestris*, the common earthworm).

Each muscle originates from the tendons of the FDP and inserts onto the dorsal side of each of the medial four fingers into the extensor expansion. These act to:

- Link flexor and extensor tendons
- Flex MCP joints and extend the IP joint of the fingers (except the thumb)
- Medial two lumbricals innervated by ulnar nerve
- Lateral two lumbricals innervated by median nerve

There are four **dorsal interossei** and four **palmar interossei**. These extend between the metacarpal bones, and each has a different role.

Dorsal interossei

- Arise from the adjacent sides of the metacarpal bones and insert onto extensor expansions of the index, middle, and ring fingers and the proximal phalanges of these fingers.
- **Abduct the fingers** (“DAB”). Also have a role in flexion and extension of the fingers.

Palmar interossei

- From the first, second, fourth, and fifth metacarpals and insert into the proximal phalanges of the thumb, index, ring, and little fingers and dorsal extensor expansion of each finger (excluding the middle finger).
- **Adduct the fingers** (“PAD”) towards the middle finger.

Adductor Pollicis

A fan-shaped muscle which consists of two heads (oblique and transverse). The radial artery enters the palm between its heads and continues as the deep palmar arch. It is supplied by the ulnar nerve (see discussion on Froment’s test earlier). This muscle adducts and aids in flexion of the thumb.

The **palmaris brevis** arises from the flexor retinaculum and palmar aponeurosis to insert into the skin of the palm. Supplied by the superficial branch of the ulnar nerve. It helps to improve the grip of the hand.

The thenar and hypothenar eminences are both composed of three muscles, discussed next.

Thenar Eminence

Muscles of the thenar eminence arise from the carpal bones and flexor retinaculum. They are supplied by the recurrent branch of the median nerve.

- **Abductor pollicis brevis**
 - Most superficial muscle of the thenar eminence, it inserts into the base of the proximal phalanx of the thumb. It abducts the first metacarpal and the thumb.
- **Flexor pollicis brevis**
 - Has two heads, superficial and deep (the deep head may be supplied by the ulnar nerve); inserts into the base of the proximal phalanx of the thumb. It flexes the metacarpophalangeal (MCP) joint of the thumb.
- **Opponens pollicis**
 - Lies deep to abductor pollicis brevis, inserts into the first metacarpal.
 - Responsible for opposition of the thumb to touch the anterior surface of the other digits.
 - Flexes and abducts first metacarpal.

Hypothenar Eminence

All the hypothenar muscles are supplied by the ulnar nerve.

- *Abductor digiti minimi*
 - Inserts into the proximal phalanx of the little finger
 - Abducts the little finger
- *Flexor digiti minimi*
 - Inserts into the proximal phalanx of the little finger
 - Flexes and adducts the little finger at the MPJ
- *Opponens digiti minimi*
 - Inserts into the fifth metacarpal
 - Deep muscle which flexes and slightly rotates the fifth metacarpal
 - Helps in cupping of the palm by pulling the fifth metacarpal forward

Palmar Aponeurosis (Palmar Fascia)

A triangular sheet of fibrous tissue. Its apex is attached to the flexor retinaculum and receives the tendon of the palmaris longus muscle. The base of the aponeurosis is divided into four slips at the bases of the fingers (except the thumb).

The palmar aponeurosis is separated from the hypothenar eminence by a fibrous septum, which is attached to the fifth metacarpal. Laterally, there is another septum which is attached to the third metacarpal and divides the palm into the **thenar** and the **midpalmar spaces**.

The thenar space is not related to the fascial compartment of the thenar muscles. It contains the first lumbrical and lies anterior to the adductor pollicis muscle. The midpalmar space is related on the dorsal aspect to the third, fourth, and fifth metacarpals. On the palmar side it is related to the long flexors and their tendon sheaths.

Note that the **radial bursa** is the sheath of the flexor pollicis longus that proximally extends into the wrist area.

The **ulnar bursa** (Figure 3.32) contains the common synovial sheath of the flexors of the fingers, apart from the thumb, passing through the flexor retinaculum. In the palm, it is continuous with

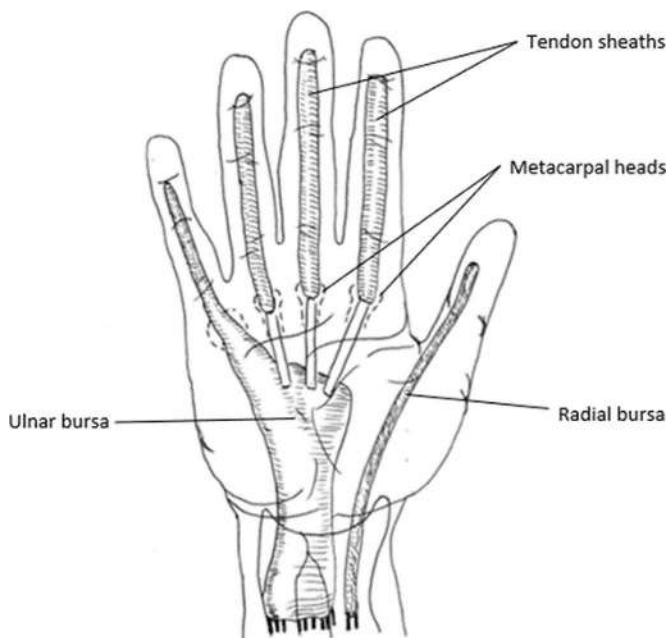


FIGURE 3.32 Ulnar bursa. (Courtesy of Alina Humdani.)

the synovial sheath of the little finger. Infection can extend to the space of Parona in the lower forearm (potential space between the tendons of the FDS and FDP and the pronator quadratus).

CLINICAL NOTES

HAND INFECTIONS

- **Felon** is pulp space infection in the tip of the finger, following needle stick injuries, for example. The distal pulp space is a confined area, and infection within this space can interrupt the blood supply to the diaphysis of the terminal phalanx, which leads to osteomyelitis, bone crumbling, and necrosis. Early treatment is imperative to avoid this serious complication.
- Distally, the thenar and midpalmar spaces are continuous into the lumbrical canals. These spaces are important, as sometimes infection can collect there and can form an abscess. Signs include severe tenderness and loss of palmar concavity.
- Inflammation of the tendon sheaths is called **tenosynovitis**.

Neurovasculature of the Hand

Arteries

- The **ulnar artery** supplies mainly the medial three and a half digits of the hand.
- The **radial artery** supplies mainly the thumb and lateral half of the index finger (*arteria princeps pollicis* and *arteria radialis indicis*, respectively).

The two arteries anastomose in the hand via the **superficial and deep palmar arches**.

Deep palmar arch: a continuation of the **radial artery** after entering the palm (see earlier). It is completed medially by the deep branch of the ulnar artery.

Superficial palmar arch: the direct continuation of the **ulnar artery**, completed laterally by a branch from the radial artery. The curve of the superficial palmar arch lies at the level of the distal border of the fully extended thumb, while the curve of the deep palmar arch lies at the level of the proximal border of the extended thumb.

The deep palmar arch is located deep to the tendons of the long finger flexors, while the superficial palmar arch is deep to the palmar aponeurosis, but anterior to the long finger flexors. Both arches give rise to the digital arteries, which pass to the fingers.

One can test clinically for a dual blood supply to the hand and an adequate radial/ulnar arterial anastomosis by using the **modified Allen's test**, which is described in the context of the clinical relevance of the radial artery (see earlier).

Nerves

Median nerve

- Innervates three thenar muscles (recurrent branch) and lateral two lumbricals (palmar digital branch).
- Innervates skin and nailbeds (palmar digital branch) on the thumb, index, and middle fingers and lateral side of ring (fourth) finger. Tactile sensation is very important to the function of the hand, so median nerve injury would be more harmful than ulnar nerve injury.

Ulnar nerve

- Divides as it leaves Guyon's canal into superficial and deep branches.
- Innervates all other intrinsic muscles of the hand, **including adductor pollicis** (*Remember: HILA: H: Hypothenar eminence, I: Interossei, L: medial two Lumbricals, A: Adductor pollicis*).
- The superficial branch innervates the palmaris brevis and skin on the palmar surface of the little finger and medial half of ring finger, including nailbeds.

Radial nerve

- Superficial branch innervates the skin over the dorsolateral aspect of the palm and dorsal aspect of the lateral three and a half digits proximal to the DIP joints

Arches of the Hand

There are two transverse arches and a longitudinal arch. The intrinsic hand muscles maintain the arches of the hand.

- *Proximal transverse arch*
 - The capitate carpal bone is its keystone.
 - This arch is relatively flexed and runs along the immobile distal carpal row.
- *Distal transverse arch*
 - **The head of the third metacarpal** is the keystone, and it passes through all metacarpal heads.
 - It is more mobile than the proximal transverse arch.
- *Longitudinal arch*
 - Connects the transverse arches. Central pillar consists of the **second and third metacarpals**. Thumb, third, fourth, and fifth **finger flexion** allows the palm to **flatten** or **cup**.

Functional Anatomy of the Hand**Grips**

Successful grip requirements:

- Mobility of the first carpometacarpal (CMC) joint, as well as the fourth and fifth MCP joints.
- Rigidity of second and third CMC joints.
- Stability of the longitudinal and transverse arches of the hand.
- Adequate sensory input to the hand (the pulps of the fingers have a rich sensory supply, which can replace vision in the visually impaired, especially in the Braille writing system).

There are several types of grips (**Figure 3.33**):

1. *Precision grip (tip to tip)*:
 - Manipulates small objects between the thumb and flexor aspect of fingers by using thumb flexion and opposition and finger flexion, like in sewing

2. *Power grip*
 - Fingers flexed at all three joints
 - Usually performed with ulnar deviation and extension of wrist, which maximise the strength of the grip
3. *Coal hammer grip*
 - Thumb wholly occupied in reinforcing the grasping action of the fully flexed digits
 - Contraction of hypothenar eminence forms a groove within which objects, such as a coal hammer, are held
4. *Dynamic tripod*
 - Involves the thumb and index finger to catch the object – a pencil, for example – and the middle finger tucks behind the object
 - One of the important skills in handwriting
 - The fourth and fifth digits are squeezed in towards the palm
 - Used for support and static control
5. *Hook grip (the thumb is not involved with this type of grip)*
 - Requires the flexion of the MPJ and IP joints
 - Used for power over a long period of time, not precision
 - Still possible even if intrinsic muscles of hand are weakened or unable to function because grip requires the use of FDS and FDP muscles

Other types of hand grips:

- *Cylindrical*: holding a glass
- *Spherical*: opening a jar
- Key grip using the flexed thumb and the middle phalanx of the index fingers

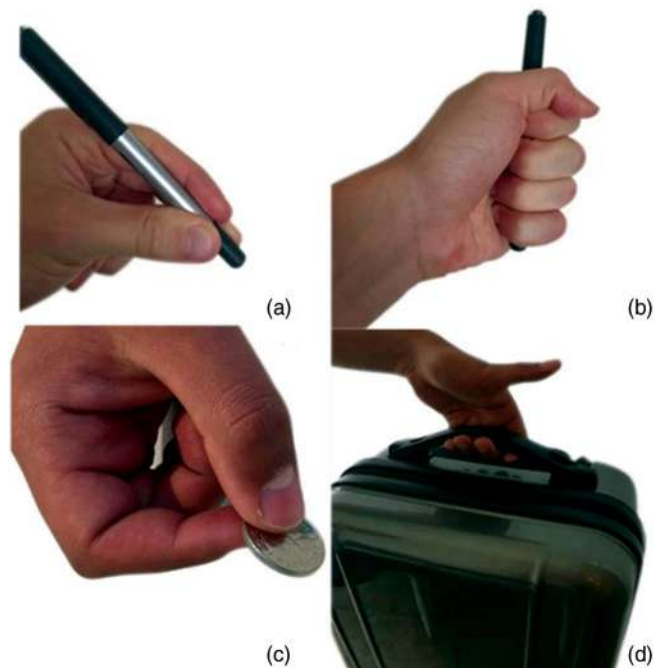


FIGURE 3.33 Photographs of types of grip. (a) Dynamic tripod, (b) coal hammer grip, (c) precision grip, (d) hook grip.

CLINICAL NOTES

THE HAND

The hands are often used to aid in the diagnosis of systemic disorders. Some examples are given here in addition to the changes following injuries of the ulnar, median, and radial nerves (see earlier):

- Power of the grip of the hand when shaking hands with the patient
- *Warm and sweaty hand*: nervousness and thyrotoxicosis
- Tremor of the hand is an important sign in the diagnosis of Parkinson's disease, anxiety, and thyrotoxicosis (see [Section 2](#))
- *Koilonychia*: spoon-shaped nails due to iron deficiency anaemia
- **Clubbing** of the fingers due to many causes, including congenital heart disease, lung cancer, bronchiectasis, right-to-left heart shunts, and endocarditis
- **Dupuytren's contracture** (fibrosis of the palmar aponeurosis), which can be associated with liver cirrhosis
- Deformities, such as the swan neck deformity of rheumatoid arthritis ([Figure 3.34](#))



FIGURE 3.34 Swan neck deformity due to rheumatoid arthritis. (Courtesy of Sami Salman.)

The Axilla

The axilla is a region between the thorax and the upper limb, inferior to the glenohumeral joint. It is colloquially known as the armpit. The axilla is bound by several structures; the boundaries are described in [Table 3.12](#).

TABLE 3.12: Boundaries of the axilla

Border	Anatomical Structure Defining the Border
Apex	Lateral border of first rib, superior border of scapula, and posterior border of clavicle
Anterior	Pectoralis major, pectoralis minor, subclavius, and clavipectoral fascia
Posterior	Subscapularis, teres major, and latissimus dorsi
Medial	Serratus anterior and thoracic wall
Lateral	Intertubercular (bicipital) sulcus of the humerus

Muscles of the Axilla

Several muscles are associated with the axilla ([Table 3.13](#)).

Contents of the Axilla

Several important components are found in the axilla:

1. Axillary artery
2. Axillary vein
3. Lymph nodes and axillary fat
4. Brachial plexus

The Axillary Artery

This is a continuation of the subclavian artery at the lateral border of the first rib. Alongside the brachial plexus, the axillary artery is enveloped by the axillary fascia, which is continuous with the prevertebral fascia. It is divided by the pectoralis minor into three anatomical parts:

- *First part*: one branch. Medial to the medial border of the pectoralis minor, gives rise to the superior (highest) thoracic artery.
- *Second part*: two branches. Behind the pectoralis minor, gives rise to the thoracoacromial and lateral thoracic arteries. The thoracoacromial artery divides into four branches: pectoral, clavicular, acromial, and deltoid. Each of these branches supplies the area corresponding to their name. The lateral thoracic artery follows the lateral margin of the pectoralis minor muscle.
- *Third part*: three branches. Continues as the brachial artery at the lower border of the teres major. Prior to this it gives rise to the subscapular artery, posterior circumflex, and anterior circumflex humeral arteries. The circumflex arteries are important for the anastomosis around the upper humerus.

The Axillary Vein

This is formed at the lower border of the teres major, the same location where the axillary artery ends, from the union of the venae comitantes of the brachial artery, in addition to the basilic vein. The cephalic vein joins the axillary vein after passing through the deltopectoral groove (between the deltoid and pectoralis major) towards the axilla.

The axillary vein continues as the subclavian vein at the outer border of first rib. It forms an important surgical landmark while removing axillary lymph nodes, i.e., during axillary node dissection.

TABLE 3.13: Muscles of the axilla

Muscle	Origin	Insertion	Innervation	Action
Pectoralis major A large, fan-shaped (convergent) muscle situated deep to the breast	<ul style="list-style-type: none"> Sternoclavicular head (medial half of clavicle and lateral aspect of sternum) Costal head (upper six costal cartilages) 	Lateral lip of the bicipital groove of humerus (broad insertion)	Medial pectoral (C8–T1) and lateral pectoral (C5–C7) nerves	<ul style="list-style-type: none"> Adduction + medial rotation of arm at glenohumeral joint Accessory muscle of respiration with arm fixed
Pectoralis minor* A small, fan-shaped muscle deep to the pectoralis major	Third to fifth ribs	Coracoid process of scapula	Medial pectoral nerve	<ul style="list-style-type: none"> Depresses scapula Aids in raising third, fourth, and fifth ribs, with scapula fixed
Serratus anterior Slips of muscle situated laterally over the ribs, spanning posteriorly	<ul style="list-style-type: none"> Upper eight ribs Interdigitates with origin of external oblique muscle 	Medial border of scapula	Long thoracic nerve (C5–C7)	<ul style="list-style-type: none"> Upward rotation of scapula, enabling elevation of the arm Protraction (as in throwing a punch) and stabilisation of scapula
Latissimus dorsi The broadest muscle of the back**	<ul style="list-style-type: none"> Pelvis – iliac crest Thoracolumbar fascia Spinous processes of seventh thoracic to fifth lumbar vertebrae 	Floor of bicipital groove of humerus	Thoracodorsal nerve From the posterior cord of brachial plexus, C6–C8	<ul style="list-style-type: none"> Extend arm Adduct arm

* Regarded as the key muscle of the axilla. Lies anterior to the axillary artery and vein.

** To help you remember the insertion site of the latissimus dorsi, you can use the mnemonic “lady between the two majors” (tendons of teres major and pectoralis major).

Axillary Lymph Nodes

These receive lymph from the upper limb, the breast, and the walls of the thorax and upper abdomen, from the level of the umbilicus.

From the surgical point of view, the axillary lymph nodes are divided into three levels by the pectoralis minor muscle (Table 3.14 and Figure 3.35). The bulk of lymph nodes are located within level 1. Classical clinical teaching defines these as the anterior (pectoral), posterior (subscapular), lateral (humeral), central, and apical lymph nodes (see Section 4).

TABLE 3.14: Surgical classification of the levels of axillary lymph nodes

Level	Location of Nodes at Each Level
Level I	Nodes are inferior and lateral to the pectoralis minor
Level II	Nodes are below the axillary vein and behind the pectoralis minor
Level III	Nodes are medial to the muscle against the chest wall towards the root of the neck

Brachial Plexus

This is described in detail in the anatomy of the nerves of the upper limb (see earlier). This structure passes through the axilla and is closely related to the axillary artery (Figure 3.36).

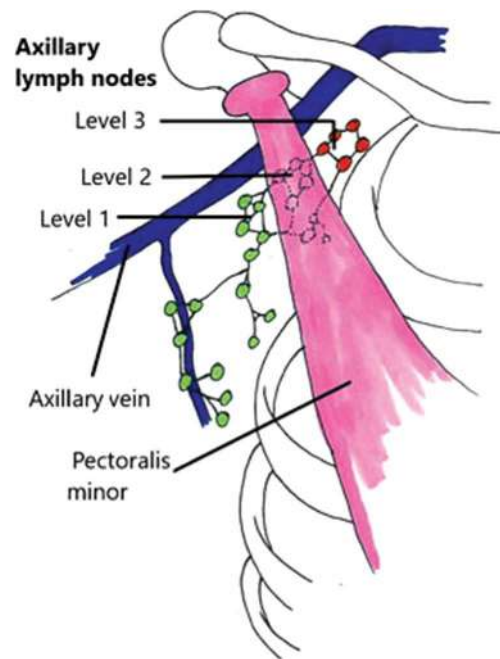


FIGURE 3.35 Levels of axillary lymph nodes in relation to the pectoralis minor muscle. (Courtesy of Calum Harrington-Vogt.)

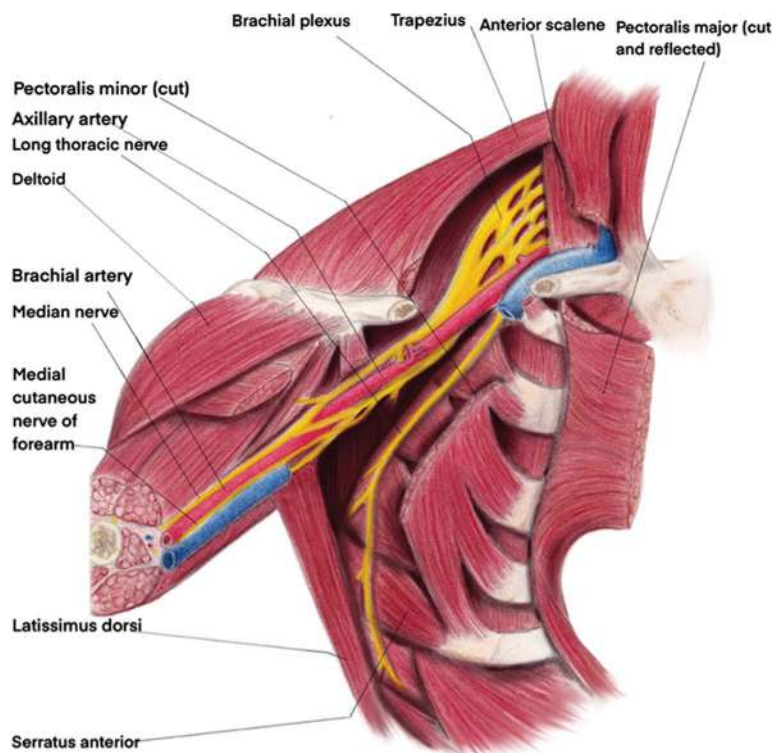


FIGURE 3.36 The brachial plexus coursing through the axilla and its related structures. (Courtesy of Kathryn DeMarre.)

CLINICAL NOTES

AXILLA

The axilla is of surgical importance and is used as an access point during several procedures ([Table 3.15](#)).

Further to this, the axilla is also used as a location of reference for several procedures:

- Subpectoral space is the space deep to the pectoralis major is now commonly used to insert synthetic prostheses to augment the breast.
- Latissimus dorsi flap (LD flap) reconstruction is one of the options offered to women following mastectomy. The muscle can be mobilised and positioned on the anterior chest wall without interference to either nerve or blood supply, which come from the axilla.
- Poland syndrome is the congenital unilateral absence or underdevelopment of the muscles of the chest, shoulder, arm, or hand. Typically, individuals with Poland syndrome lack a pectoralis major, resulting in a concave appearance of the chest.
- The long thoracic nerve has the nerve roots C5–C7. Injury to this nerve, which may occur during axillary node clearance for metastatic breast cancer, can result in a winged scapula ([Figure 3.37](#)). This is the reason why this nerve, and the thoracodorsal nerve (which supplies the latissimus dorsi), should be identified and safeguarded during surgery.

TABLE 3.15: Surgical importance of the axilla

Procedure	Description
Sentinel node biopsy (SNB)	<ul style="list-style-type: none"> • This is a relatively new modality in treating conditions such as breast cancer and melanoma • It is based on the theory of the first lymph node to where the cancer spreads (see Section 4)
Axillary node dissection	<ul style="list-style-type: none"> • Removal of lymph nodes in levels I and II • The main long-term complication is the development of lymphoedema of the upper limb due to interruption of lymphatic drainage
Excisional biopsy of a suspicious axillary lymph node	<ul style="list-style-type: none"> • This may be used to prove the diagnosis of malignant conditions like lymphoma



FIGURE 3.37 Image of a patient with a winged right scapula due to injury to the long thoracic nerve. The serratus anterior muscle, which receives its nerve supply from the long thoracic nerve, is clinically examined by asking the patient to push up against a wall. (Courtesy of the Department of Anatomical Sciences, SGUL.)

Revision Questions

Q1.



(Courtesy of Department of Anatomical Sciences, SGUL.)

Q1A. Which of the following best describes the type of joint indicated by the arrow?

- Ball and socket
- Hinge
- Plane
- Saddle
- Symphysis

Q1B. Which of the following nerves is commonly damaged when this joint is dislocated?

- Axillary
- Musculocutaneous
- Radial
- Subscapular
- Ulnar

Q2.



(Courtesy of Department of Anatomical Sciences, SGUL.)

Q2A. What is the name of the structure indicated by the arrow?

Q2B. Which important muscle is inserted at this structure, and what is its nerve supply?

Q3.



(Courtesy of Department of Anatomical Sciences, SGUL.)

Q3A. What is the structure indicated by arrow 1?

Q3B. What is the main clinical condition that can affect this structure?

Q4A. Identify the bones indicated by arrow 2.

Q4B. What type of joint do they form?

Q5. Identify the bone indicated by the asterisk.

Q4A. What type of bone is it?

Q5B. Which tendon attaches here?

Q6. What are the most common upper limb injuries following a fall onto an outstretched hand (FOOSH)?

Q7. What are the terminal branches of the brachial plexus?

Q8. What are the causes for a missed diagnosis of scaphoid fracture?

Q9. What are the muscles involved in a precision hand grip?

Answers

A1A. a

A1B. a

A2. (A) Olecranon, (B) Triceps muscle supplied by the radial nerve

A3. (A) Scaphoid, (B) Fracture scaphoid

A4. (A) Trapezium, (B) First metacarpal; synovial saddle-joint (first carpometacarpal joint)

A5. (A) Pisiform, (B) Sesamoid bone, flexor carpi ulnaris

A6. Fractured clavicle, anterior shoulder dislocation, supracondylar fracture of the humerus, fracture of the head of the radius, Colles' and Smith's fracture, Galeazzi's and Monteggia's fracture dislocation.

A7. Median, ulnar, radial, axillary, and musculocutaneous nerves.

A8. Ignoring the tenderness in the snuff box, an early X-ray may not show the fracture (if in doubt, recheck the patient in the fracture clinic).

A9. Flexors of the thumb and fingers, opponens pollicis.

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4

ANATOMY OF THE THORAX

Reviewed by Qassim F. Baker and Mohammed Al Janabi

Learning Objectives

- The thoracic wall and the diaphragm and their clinical applications
- The thoracic cavity and the mediastinum
- The lungs and the pleura
- The heart and the great vessels
- The anatomy of the breast and its clinical notes

Introduction

The thorax is defined as the region between the neck and the abdomen, which includes the cavity enclosed by the ribs, sternum, and thoracic vertebrae. It is normally described as an irregularly shaped cylinder with a relatively small opening at the top (**superior thoracic aperture**) compared to a larger opening at the base (**inferior thoracic aperture**).

Note that the superior thoracic aperture may also be referred to as the thoracic inlet in other texts. Confusion often arises with regard to thoracic outlet syndrome, where the superior thoracic aperture is referred to as the thoracic outlet. Thoracic outlet syndrome refers to compression of the subclavian artery and lower trunk of the brachial plexus.

The constituents of the thorax can be separated into the thoracic wall and three cavities.

Thoracic Wall

The main components of the thoracic wall are the musculoskeletal elements:

- Anteriorly, the wall comprises the sternum and costal cartilages. The sternum is made up of the manubrium, sternal body, and xiphisternum (also known as the xiphoid process). The pectoralis major and minor muscles form an important part of the anterior chest wall.
- Laterally, the 12 ribs on either side make up the wall along with the three-layered intercostal muscles, which enclose the intercostal spaces formed between neighbouring ribs. The serratus anterior is an important muscle on the lateral aspect of the chest wall (medial wall of the axilla).
- Posteriorly, the bony structure is composed of the 12 thoracic vertebrae and the intervertebral discs that hold them together, in addition to the scapulae. Important muscles of the back include the erector spinae, latissimus dorsi, and trapezius.

The superior thoracic aperture is bounded as follows:

- *Anteriorly*: by the suprasternal notch
- *Laterally*: by the first ribs and their costal cartilages
- *Posteriorly*: by the body of the first thoracic vertebra

The suprapleural membrane, which is a dense fascia originating from the endothoracic fascia, closes the thoracic outlet on each side of the structures passing through the aperture, including the trachea, oesophagus, and great vessels, and attaches laterally to the inner border of the first ribs and their costal cartilages. The cervical pleura underlies the suprapleural membrane.

The inferior thoracic aperture is bounded by the T12 vertebra posteriorly, xiphisternal joint anteriorly, and costal margin on both sides laterally. This aperture is closed by the diaphragm.

Functions of the Thoracic Wall

The thoracic wall has **two main functions**: to enable the lungs to expand and hence facilitate breathing, in which the actions of the ribs and the sternum are likened to the bucket handle and pump handle movements (**Figure 4.1**), and to provide protection to the internal cavities which house the heart, lungs, and other important internal organs such as the upper abdominal organs.

Thoracic Skeleton and Joints

The skeleton in the thorax comprises the sternum, ribs, costal cartilages, and thoracic vertebrae (T1–T12). The scapulae lie posteriorly and are attached by muscles to the thoracic cage. The clavicles articulate with the manubrium sterni at the sternoclavicular joint, which is a synovial joint.

Joints of the Thoracic Wall

The skeletal system of the chest wall involves many joints to hold the bones together. The main joints are summarised here:

- *Interchondral*: synovial joints formed between the costal cartilages of the ribs (e.g., fusion of eighth costal cartilage with the seventh).
- *Sternocostal*: synovial joints between the costal cartilage and sternum (except for the first rib, where it is a primary cartilaginous joint.)

Sternum

The sternum is a combination of three bones which are held together by two joints: the **manubriosternal** (between the manubrium and sternal body) and **xiphisternal** (between the sternal body and xiphoid process) (**Figure 4.2**). Both these joints are symphysis joints, which is a type of cartilaginous joint that allows for some minimal movement. The first costal cartilage is connected to the sternum by a primary cartilaginous joint (to fix the first rib on inspiration), while second to the seventh costal cartilages are connected to the sternum by synovial joints. The suprasternal or jugular notch is a depression on the upper part of the manubrium. The trachea is felt in the centre of this notch. It lies opposite the lower border of T2.

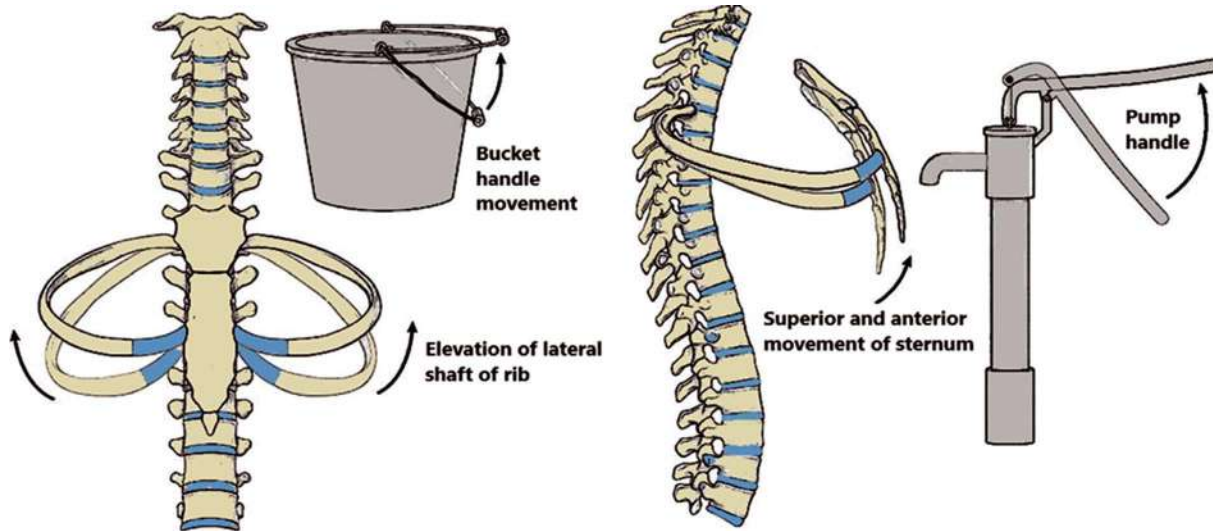


FIGURE 4.1 The bucket handle and pump handle movement represents the actions of the ribs and sternum during inspiration. (Courtesy of Kathryn DeMarre.)

The manubriosternal joint is at an angle (also referred to as the **angle of Louis** or **sternal angle**), which is felt as a transverse ridge on the anterior aspect, where the second costal cartilage articulates. This junction forms an important landmark which is used in identifying the ribs and intercostal spaces during physical examinations of the chest and electrocardiogram (ECG) lead placement, as the first rib is not clinically palpable. The angle of Louis lies opposite the intervertebral disc between T4 and T5.

The xiphisternal joint lies at the level of the body of the T9 vertebra. The xiphoid process can become calcified or ossified in adult life and be mistaken for a hard lump in the epigastric region, and even referred to surgical clinics on that assumption.

Ribs

There are **12 pairs** of ribs in the thorax, each associated with their corresponding vertebrae. The ribs are subdivided according to their attachments to the sternum (**Figure 4.3**):

- **True ribs (ribs 1 to 7):** the costal cartilages of these ribs are directly connected to the sternum individually via the synovial sternocostal joints. The joint formed between the ribs and costal cartilage is known as the costochondral joint. The costochondral joints (and the joint between the first costal cartilage and the sternum) are primary cartilaginous joints, or synchondroses. Synchondrosis joints are immovable, so the manubrium of the sternum and the two first ribs move up and down as a unit.
- **False ribs (ribs 8 to 10):** the costal cartilages of each rib do **NOT** attach directly to the sternum, but rather to the **costal margin**. The cartilage fuses with the cartilage of the next higher rib. Hence, the costal cartilage of rib 8 fuses with the cartilage of rib 7 and so on down to rib 10.
- **Floating ribs (ribs 11 and 12):** these ribs are free and do not attach anteriorly to anything, as their costal cartilages end within the muscles of the abdominal wall.

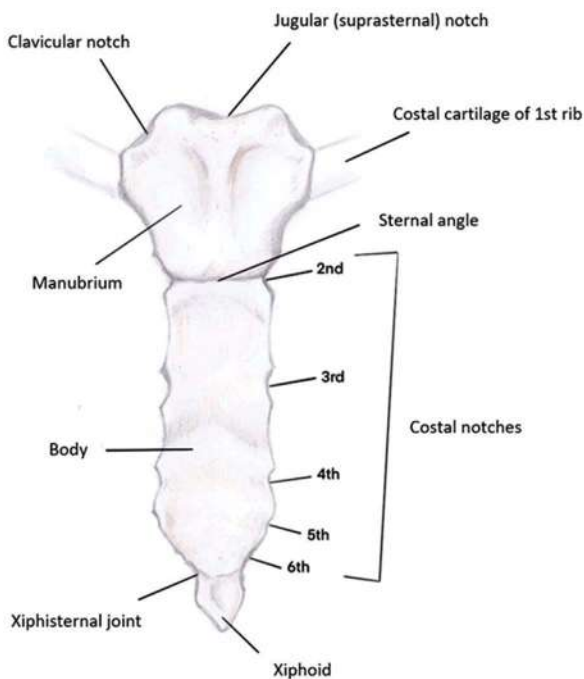


FIGURE 4.2 Bony anatomy of the sternum. (Courtesy of Kathryn DeMarre.)

Most of the ribs have the same basic anatomy, with a few exceptions.

The posterior end of a typical rib is called the **head of the rib**. The head has two facets to articulate with the costal demifacets of the respective thoracic vertebra and the vertebra immediately above it. The tubercle of the rib articulates with the facet on the transverse process of the vertebrae. The **neck of the rib** is a small narrowing between the head and the **body**. The tubercle is a protuberance on the outer aspect at the junction between the neck and the body. The neck follows on to join the body of the rib (shaft). The body of the rib is curved, with a groove on the inferior interior aspect (the **costal groove**) in which the neurovascular bundle of veins, arteries, and nerves runs to supply the chest wall.

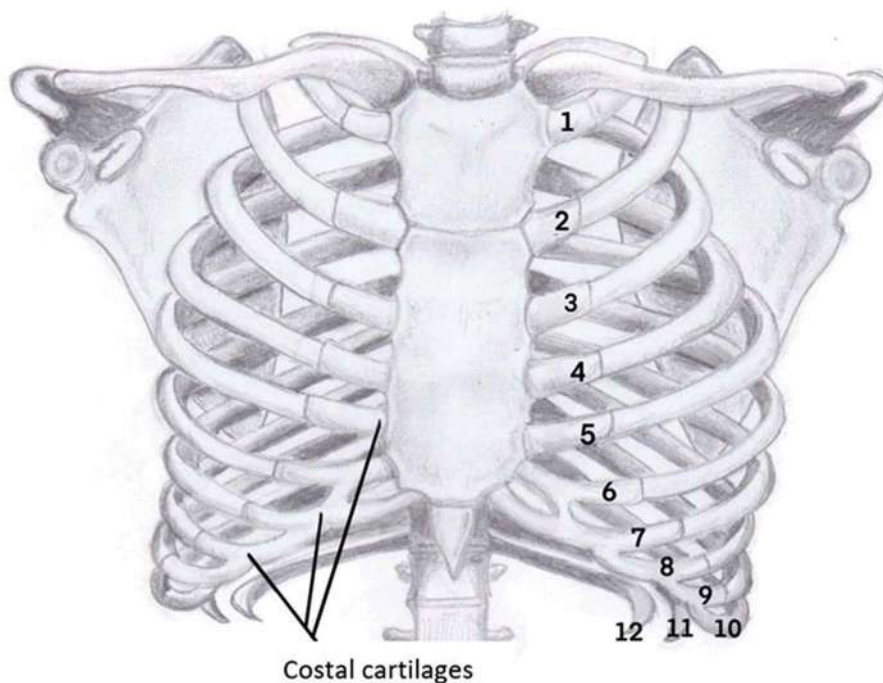


FIGURE 4.3 Skeletal anatomy of the thorax. (Courtesy of Kathryn DeMarre.)

The **angle** is where the shaft bends sharply forward and is the most common site for rib fractures (**Figure 4.4**).

cannot be palpated, and hence it shows how well the subclavian vessels and brachial plexus are protected by the first rib and the clavicle (**Figure 4.5**).

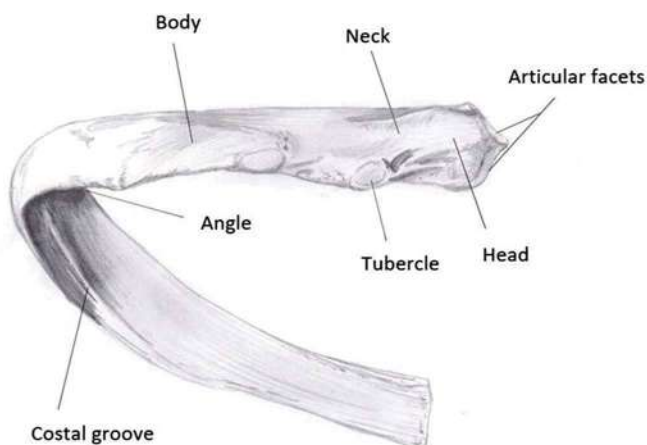


FIGURE 4.4 True rib anatomy. (Courtesy of Kathryn DeMarre.)

The exceptions are the “atypical” ribs 1, 11, and 12.

The first rib is the strongest, shortest, broadest, and flattest of the 12 ribs. It has no costal groove and is the only rib to have a protuberance on the superior surface, the scalene tubercle, where the scalenus anterior muscle is attached. Anterior to the tubercle, the subclavian vein crosses over the rib and passes through the superior thoracic aperture.

Posterior to the tubercle, the subclavian artery and lower trunk of the brachial plexus run in between the scalenus anterior and scalenus medius. The superior surface is marked by grooves for the subclavian vein and artery. This rib is rarely fractured due to its protected position below the clavicle. In this position, the rib

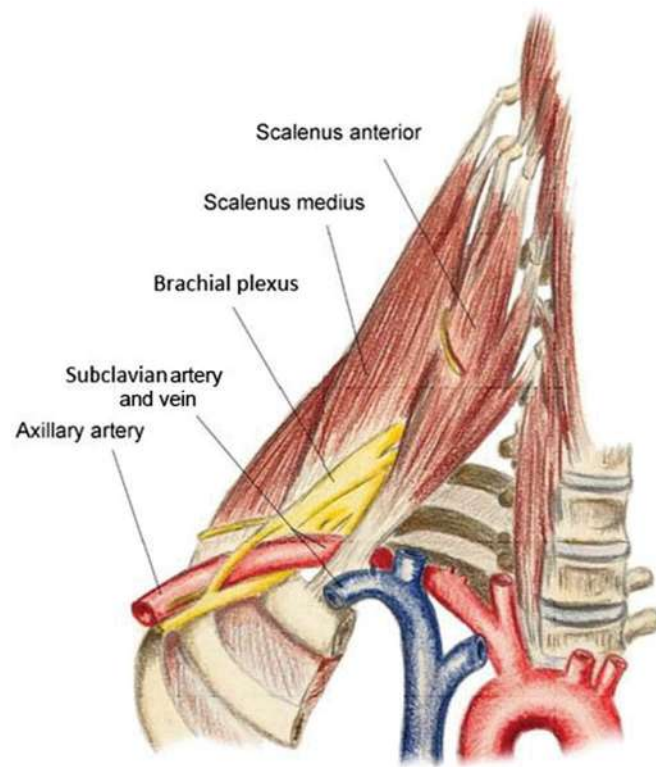


FIGURE 4.5 Relationship of subclavian vessels and brachial plexus with scalene muscles on the clavicle. (Courtesy of Kathryn DeMarre.)

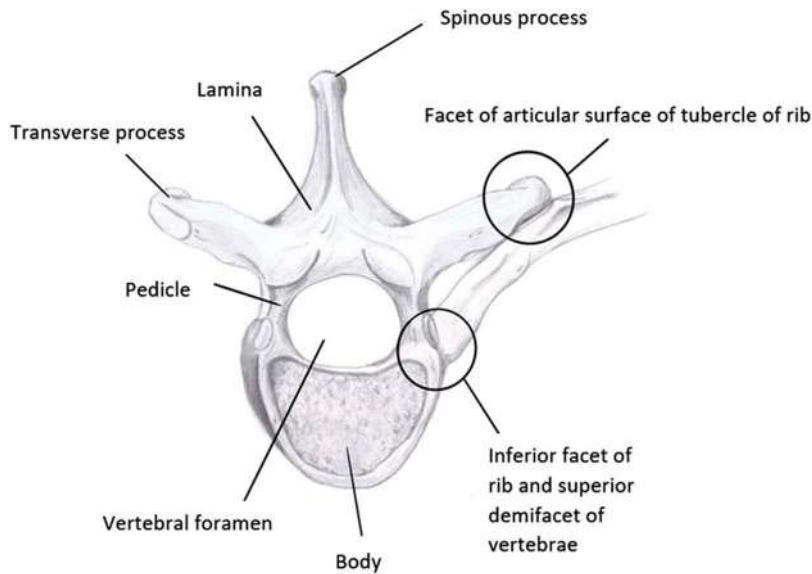


FIGURE 4.6 Thoracic vertebra and articulation of a rib with both the body (**costovertebral**) and transverse process (**costotransverse**) of the vertebra. (Courtesy of Kathryn DeMarre.)

The **1st, 11th, and 12th ribs are considered atypical** as they have only one facet on their head for articulation to the corresponding vertebra. The 11th and 12th ribs have no neck or tubercles, and the 12th rib has no costal groove.

Thoracic Vertebrae

There are 12 thoracic vertebrae.

How to recognise thoracic vertebrae:

- The vertebral body of thoracic vertebrae is heart shaped.
- Thoracic vertebrae are easily identified by their spinous processes, which project inferiorly.

Thoracic vertebrae also have **costal demifacets** on the vertebral bodies and transverse processes which **articulate with the head and tubercle of the rib, respectively** (Figure 4.6). There is very

little movement of the vertebral column in the thoracic region due to the presence of the sternum and ribs. It is the most stable region of the column.

Musculature of the Thoracic Wall

The muscles play an important role in the thoracic wall’s main functions. They may assist during breathing and allow the thorax to be more mobile. The most important set of muscles on the chest wall are the intercostal muscles. These muscles are involved in ventilation by changing the position of the ribs (Table 4.1).

There are also **accessory muscles of respiration** which aid in forced respiration during exercise. These include the sternocleidomastoid, pectoralis major, and scalene muscles (anterior, middle, and posterior).

TABLE 4.1: Intercostal muscles

Muscle	Origin (O) and Insertion (I)	Action	Innervation	Blood Supply	Additional Notes
External intercostal	O: inferior border of the rib above I: superior border of the rib below	Elevate and protract the ribs on forceful inhalation	Intercostal nerves	Intercostal and internal thoracic vessels	Most superficial muscle of the three The muscle fibres run inferoanteriorly (downwards and forwards) Anteriorly, they continue as the anterior intercostal membrane
Internal intercostal	O: inferior border of rib above I: superior border of ribs below	Depress and retract the ribs on forceful exhalation	Intercostal nerves	Intercostal and internal thoracic vessels	In between external and innermost Muscle fibres are in the inferoposterior orientation (downwards and backwards) Posterior to the angles of the ribs, they are continuous with the posterior intercostal membrane
Innermost intercostal	O: inferior border of rib above I: superior border of ribs below (Same as internal)	Depress the ribs on forceful exhalation	Intercostal nerves	Intercostal and internal thoracic vessels	Deepest muscle of the three Muscle fibres are in the inferolateral orientation (downwards and towards the sides) The neurovascular bundle runs in between the internal and innermost muscle layers

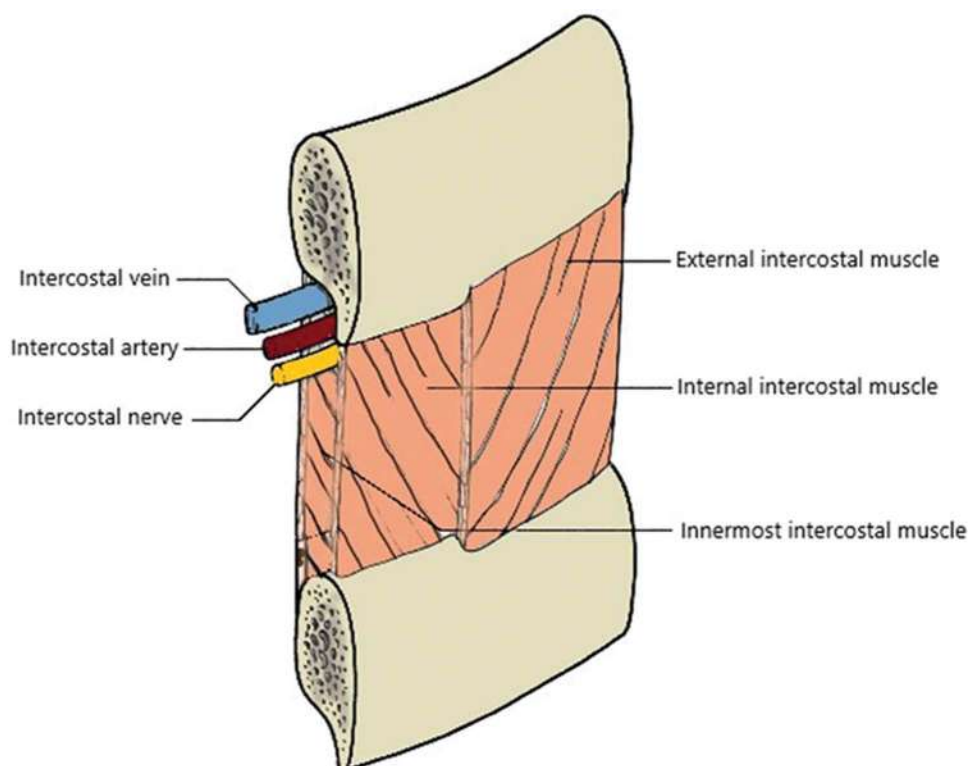


FIGURE 4.7 Intercostal muscles and intercostal neurovascular bundle. (Courtesy of Vamsi Thammandra.)

The **endothoracic fascia** separates the ribs and intercostal muscles from the parietal pleura. Superiorly, the fascia is continuous as the thicker **suprapleural membrane**, which covers the lung apex covered by the cervical pleura.

Vasculature and Innervation of the Thoracic Wall

The thoracic wall has a rich vasculature and receives blood from several sources. There is a lot of variation from person to person, but understanding the common anatomy is imperative to appreciate any differences.

The arteries and veins of the thoracic wall (i.e., the intercostal spaces) are segmental, as different regions are supplied by different sources. Arterial supply to the intercostal spaces is divided into the **posterior** and **anterior intercostal arteries**.

There are **11 posterior intercostal arteries** in which:

- The **upper two** arise from the superior intercostal branch of the **costocervical trunk of the subclavian artery**.
- The **lower nine** arise from the **descending thoracic aorta**.

There are **nine anterior intercostal arteries** of which:

- The **upper six** arise from the **internal thoracic artery** (branch of first part of the subclavian artery,) which descends vertically about one fingerbreadth from the lateral margin of the sternum. The internal thoracic artery divides into the superior epigastric (see [Section 5, Abdomen](#)) and musculophrenic artery, which also supplies the diaphragm.
- The **lower three** arise from the **musculophrenic artery**.

The venous drainage is also split into anterior and posterior intercostal veins:

- There are 9 anterior intercostal veins, which follow the same path as the anterior intercostal arteries and **drain into the internal thoracic veins**, which ultimately join the **brachiocephalic veins**.
- The 11 posterior intercostal veins utilise the azygos and hemiazygos venous system ([Figure 4.8](#)).

Due to this, there is some variation between the venous drainage of the right and left side of the thorax ([Table 4.2](#)).

TABLE 4.2: Venous drainage of the posterior intercostal veins

Posterior Intercostal Veins	Right Side	Left Side
First	Right brachiocephalic vein	Left brachiocephalic vein
Second and third	Join to form right superior intercostal vein, which drains into the azygos vein	Join to form left superior intercostal vein and drains into left brachiocephalic vein
Fourth to eighth	Azygos vein	Accessory hemiazygos vein
Ninth to eleventh	Azygos vein	Hemiazygos vein

The **azygos vein** is formed by the union of the right ascending lumbar vein and the right subcostal vein and enters the thorax through the aortic hiatus. It receives the lower eight right posterior intercostal veins and the right bronchial vein.

The **accessory hemiazygos vein** is formed from the union of the left fourth to eighth posterior intercostal veins. The left bronchial vein drains into it.

The **hemiazygos vein** is the continuation of the left ascending lumbar vein and passes upwards under the left crus of the diaphragm. It receives the 9th to 11th posterior intercostal veins in addition to the left subcostal vein.

Note that the accessory hemiazygos and hemiazygos drain into the azygos vein at the levels of T8 and T9, respectively. The azygos then arches forward over the right main bronchus to drain into the superior vena cava (creating an impression on the right lung). An interesting variation is the azygos lobe, which is when the azygos vein loops around the right lung, creating a small lobe, rather than a groove. The azygos system may also act as a continuation of the inferior vena cava, as it directly drains into the superior vena cava, bypassing the inferior aspect. This does lead to a dilated azygos, but in most cases, it is asymptomatic.

Note: Azygos is from zyg, “paired” in Latin, and a meaning “not”.

branch continues as the first intercostal nerve, within the first intercostal space, and continues anteriorly as the first cutaneous branch.

A branch of the second intercostal nerve joins the medial cutaneous nerve of the arm to form the intercostobrachial nerve that supplies the skin of the axilla and medial side of the upper arm. This nerve may be sacrificed during axillary node clearance for treatment of metastatic cancer in the axillary lymph nodes, commonly from breast cancer. Therefore, patients should be well informed of the possibility of loss of skin sensation after surgery.

The anterior rami from **nerves T7–T11** also supply the anterior abdominal wall and supply the skin, muscles, and parietal peritoneum (remember T10 supplies the skin at the level of the umbilicus). T12 is the subcostal nerve (runs below the 12th rib).

The intercostal nerves give rise to the lateral and anterior cutaneous branches.

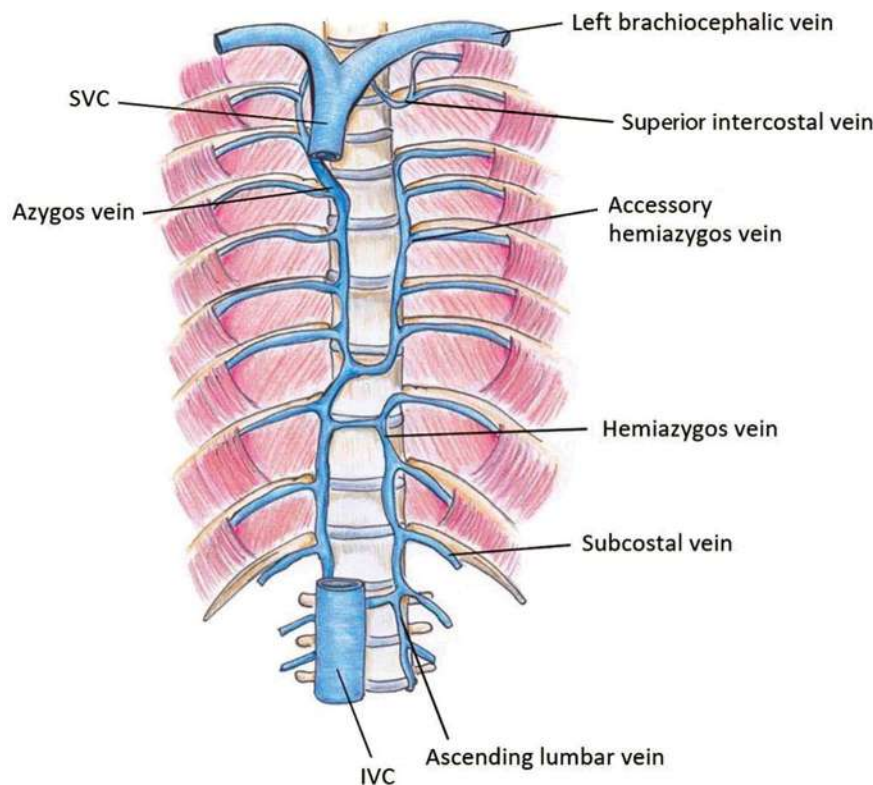


FIGURE 4.8 Azygos venous system. (Courtesy of Kathryn DeMarre.)

Innervation of the Chest Wall

Each spinal nerve emerges from an intervertebral foramen and divides into anterior (ventral) and posterior (dorsal) rami. The intercostal nerves, which run in the most inferior position in the neurovascular bundle, are the anterior rami of the spinal nerves in the thoracic region from T1 to T11. The **upper six intercostal nerves** run in the intercostal spaces to supply the chest wall (skin, intercostal muscles, periosteum of the ribs, and parietal pleura).

The first thoracic nerve contributes a large branch to the brachial plexus (see **Section 3**, Upper Limb). Another small

The **posterior rami** supply the skin, muscles, and bony structures of the midback.

Lymphatic Drainage of the Chest Wall

Lymphatic drainage of the skin of the anterior and posterior chest wall is to the anterior and posterior axillary nodes, respectively. The lymphatic drainage of the intercostal spaces is anteriorly to the internal thoracic nodes and posteriorly to the posterior intercostal nodes and then to the para-aortic lymph nodes in the posterior mediastinum.

CLINICAL NOTES

THORACIC WALL

Auscultation is an important skill that will need to be learnt for any clinical examination. Using a stethoscope, there are points on the chest wall that can be used to listen to every valve of the heart opening and closing (first and second heart sounds in addition to murmurs) and breath sounds (inspiratory and expiratory and abnormal sounds like rhonchi and crepitations).

Another commonly practised test is an **electrocardiogram** (ECG), which requires six chest leads placed at specific areas that can be identified using bony landmarks on the chest wall.

The costal cartilages allow the thoracic wall to be durable and resilient to trauma that could damage the chest wall. For example, during cardiopulmonary resuscitation (CPR), the ability to press down on the chest without breaking the ribs is due to the presence of the sturdy but flexible costal cartilages. However, in the elderly, the cartilages lose their elasticity and become brittle, making them more prone to fractures. The costal cartilages may calcify and become radio-opaque.

Another clinical condition associated with the cartilage is **costochondritis** (also known as **Tietze's syndrome**) which is inflammation of the costal cartilage and presents as localised pain at the site of inflammation. This can lead to confusion, as women presenting with localised chest pain may be erroneously referred to a breast clinic (although breast cancer is usually painless, *vide infra*) or to the cardiology clinic for suspicion of anginal chest pain.

Pectus excavatum is a congenital deformity in which the sternum and the ribs abnormally grow inward, forming a depression of the sternum. In severe cases it can cause cardiopulmonary symptoms.

Pectus carinatum (pigeon chest) is a less common deformity than excavatum, and it is the opposite, where the anterior chest wall protrudes forward, and is more of a cosmetic rather than a clinical problem. However, it could be part of another genetic problem such as Marfan's syndrome.

CERVICAL RIB

This is an extra rib which arises from the transverse process of the seventh cervical vertebra. Cervical ribs occur in approximately 0.5% of the population and are more common in females. The rib is normally asymptomatic, but can cause **thoracic outlet syndrome**, as the rib can compress the subclavian vessels and lower trunk of the brachial plexus. This can present clinically as pain and numbness on the medial (ulnar) aspect of the forearm and hand and sometimes even wasting of the small muscles of the hand (T1 spinal segment distribution). The compression of the subclavian artery can result in arm ischaemia.

RIB FRACTURES

One of the most common forms of injuries that ribs encounter are fractures. These are mostly following blunt chest trauma. Although rib fractures alone are rarely serious, it may be an external marker for severe internal injury inside the chest and upper abdomen. As the 7th to 10th ribs are the

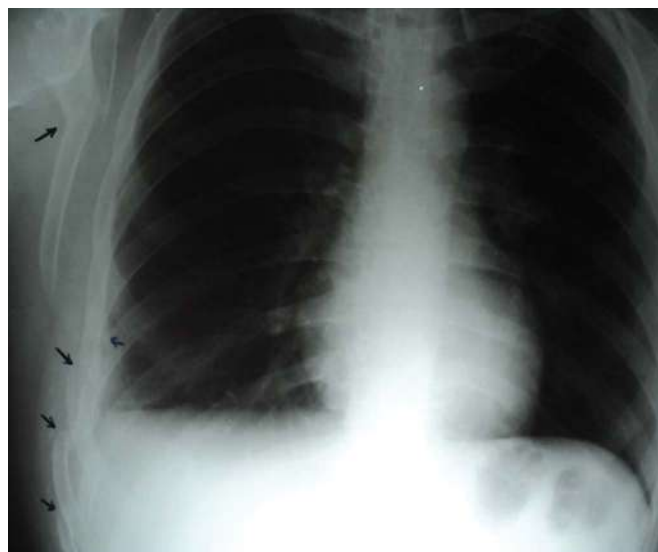


FIGURE 4.9 Chest X-ray showing fractures of right-sided ribs and scapula. (Courtesy of Abdel-Aziz Abdel-Ghany.)

most commonly fractured, the lungs are prone to problems such as a bruised lung (pulmonary contusion) or collapsed lung (due to pneumothorax with or without the accumulation of blood in the pleural cavity, a haemothorax) that may need the insertion of a chest drain (**Figure 4.9**).

If the lower ribs are fractured, abdominal organs, such as the liver or the spleen, may also sustain damage. A ruptured spleen or liver is a medical emergency and can be lethal if not detected early, due to their rich blood supply and hence rapid blood loss. Along with the other organs, the diaphragm may also be ruptured. Since the pressure is higher in the abdominal cavity than in the chest cavity, rupture of the diaphragm is almost always associated with herniation of abdominal organs into the chest cavity, which is called a **traumatic diaphragmatic hernia**. This herniation can interfere with breathing, and the blood supply to the organs that herniate through the diaphragm can be cut off, damaging them. This rupture may be undiagnosed for many months and present with problems, such as bowel obstruction, in the future (**Figures 4.10** and **4.11**).

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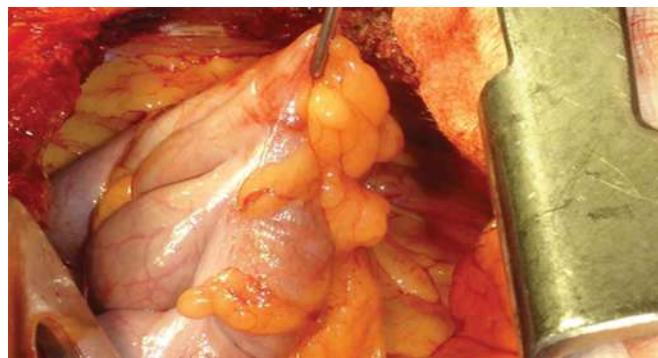


FIGURE 4.10 Herniation of the colon into the left chest due to ruptured left dome of the diaphragm. (Courtesy of Waleed M. Hussien.)

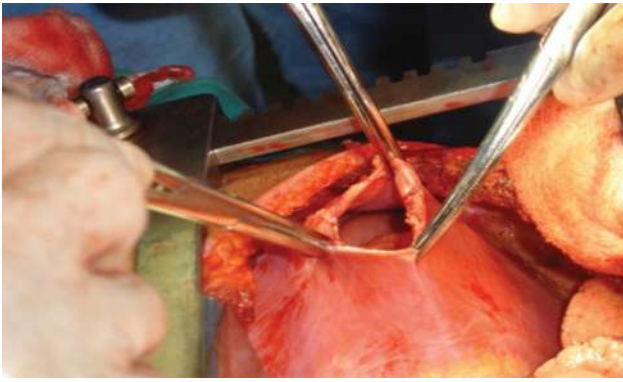


FIGURE 4.11 Thoracic view of tear of the left dome of the diaphragm. (Courtesy of Waleed M. Hussien.)

A **flail chest** can occur if several adjacent ribs (at least three) fracture in more than one place and the chest wall separates. This makes ventilating very painful, and the patient is breathless due to paradoxical respiration (area of injury “sinks in” with inspiration and expands with expiration (opposite of normal chest wall mechanics).

A **thoracotomy** is a surgical procedure that can be used to gain access to the thoracic cavity to deal with problems like excision of lung cancer or to stop severe bleeding inside the thoracic cavity. This procedure involves making an incision in between the ribs, usually at the fourth or fifth intercostal space on the lateral aspect close to the upper border of the rib (to avoid the neurovascular bundle), and incising the pleura to get access to the thoracic cavity. This procedure is sometimes combined with exploration of the abdomen (laparotomy) to deal with severe liver trauma or for the management of cancers, e.g., excision of oesophageal cancer (the Ivor-Lewis procedure).

Intercostal nerve block provides local anaesthetic infiltration to numb the intercostal nerves in the subcostal groove before the origin of the lateral cutaneous nerve at the midaxillary line. This procedure is usually performed by the anaesthetist to alleviate pain from, for example, fractured ribs. The main complication is puncture of the pleura leading to a pneumothorax.

The **sternum** is used for many examinations and procedures. Examples include:

- **Bone marrow biopsy** is sometimes taken from the sternum to diagnose haematological disorders (due to abundance of red bone marrow); the other alternative is the iliac crest (see **Section 6**, Pelvis and Pericardium).
- **Fracture of the sternum** is rare and needs a high-impact force such as high-speed vehicle accidents. The underlying heart enclosed by the pericardium is at risk of injury, which can be fatal (see below, cardiac tamponade).
- In heart surgery, a **sternotomy** is commonly used to gain access. This involves cutting the sternum in half vertically with a bone saw. Procedures such as coronary artery bypass graft (CABG) and heart valve surgery are common examples for using this approach. At the end of surgery, the sternum is joined back together using metal wires.

Thoracic Spine

The vertebral bodies increase in size from T1 to T12 due to increased weight from above. Wedge vertebral fracture is most common at T12, due to the abrupt transition of thoracic to lumbar characteristics. In general, the vertebral column is the third most common site for metastasis (following the lung and liver) due to its abundant blood supply. Cancers which most frequently metastasise here are breast, lung, and prostate. Osteoporosis, cancer, and infections (e.g., tuberculosis) cause weakening in the vertebrae, which can result in vertebral compression fractures.

T4 is an important level in the thorax. It is the level of the sternal angle, which divides the mediastinum into superior and inferior parts (vide infra).

Scoliosis is a condition resulting in a lateral S-shaped curvature of the spine.

Kyphosis (from the Greek, “hump”) is excessive convex curvature of the spine.

Kyphoscoliosis is a combination of both conditions.

Lordosis is excessive inward curvature of the spine, usually in the cervical and the lumbar parts of the spine.

Adolescent idiopathic scoliosis (AIS) is the most common type of scoliosis. It affects children (more commonly girls) in early adolescence. The aetiology is not fully understood. Severe cases may require surgery (**Figure 4.12a**).

Muscles of the Back

There are superficial, intermediate, and deep muscles of the back (**Figure 4.12b**). **Table 4.3** summarises some of the important muscles of the back.

CLINICAL NOTE

Latissimus dorsi (LD) can be used as a flap during breast reconstructive surgery. Injury to the rhomboid major can result in winging of the scapula; another cause is damage to the long thoracic nerve, paralysing the serratus anterior.

The Diaphragm

The **diaphragm is the major muscle of respiration** and consists of peripheral muscular parts and a central tendinous part at the level of the xiphisternal joint (T9). The diaphragm contracts upon inspiration to move down and create a larger surface area and lower pressure in the thorax. The diaphragm has two domes, or cupolae (right and left), which can reach the fifth rib (**Figure 4.13**).

Embryology

The diaphragm develops from the septum transversum at the level of C2 (mesodermal origin) and takes its origin from the

TABLE 4.3: Muscles of the back

Name	Attachments	Innervation	Actions
Trapezius	<i>Origin:</i> nuchal ligament and cervical spinous processes <i>Insertion:</i> external occipital protuberance, clavicle, acromion, spine of scapula	Accessory nerve –motor C3–C4 fibres for proprioception	Rotation, retraction, elevation, and depression of the scapula
Latissimus dorsi	<i>Origin:</i> T6–12 spinous processes, thoracolumbar fascia, iliac crest, inferior four ribs, inferior angle of scapula <i>Insertion:</i> bicipital groove of humerus	Thoracodorsal nerve	Adduction, extension, and internal rotation of the arm
Rhomboid major	<i>Origin:</i> T2–T5 spinous processes <i>Insertion:</i> medial border of scapula	Dorsal scapular nerve	Retracts and rotates the scapula to depress it
Rhomboid minor	<i>Origin:</i> C7–T1 spinous processes <i>Insertion:</i> medial border of scapula	Dorsal scapular nerve	Retracts and rotates the scapula
Spinalis*	<i>Origin:</i> spinous processes of lumbar vertebrae <i>Insertion:</i> spinous processes of thoracic and cervical vertebrae	Dorsal ramus of spinal nerve	Laterally flexes head and neck Bilaterally extends vertebral column
Longissimus*	<i>Origin:</i> transverse processes of lumbar vertebrae <i>Insertion:</i> transverse processes of cervical and thoracic vertebrae	Dorsal ramus of spinal nerve	Laterally flexes head and neck Bilaterally extends vertebral column
Iliocostalis*	<i>Origin:</i> sacrum, spinous processes of lumbar vertebrae, iliac crest <i>Insertion:</i> ribs	Dorsal ramus of spinal nerve	Laterally flexes vertebral column Bilaterally extends vertebral column
Psoas major	<i>Origin:</i> T12–L5 transverse processes <i>Insertion:</i> lesser trochanter of femur	L1–L3 nerves from lumbar plexus	Flexion of hip
Quadratus lumborum	<i>Origin:</i> iliac crest and iliolumbar ligament <i>Insertion:</i> last rib and transverse processes of lumbar vertebrae	Anterior rami of T12–L4	Unilateral: lateral flexion of vertebral column Bilateral: depression of the rib cage, fixes 12th rib

* Indicates the muscles supplied by the posterior rami of the spinal nerves, collectively known as erector spinae.



FIGURE 4.12A Anteroposterior (AP) postoperative X-ray showing fixation of rods from T1 to L5 to correct severe kyphoscoliosis in a 15-year-old girl. (Courtesy of Philip J. Adds.)

third, fourth, and fifth cervical myotomes, hence the phrenic nerve origin from C3, C4, and C5 spinal segments, which follows the descent of the diaphragm to divide the thorax from the abdomen. The other part is the growth of the pleuroperitoneal membranes medially from the body wall.

The diaphragm's motor innervation is by the phrenic nerve ("C3, 4, 5 keeps the diaphragm alive").

The phrenic nerve also supplies sensory fibres to the diaphragmatic pleura over the domes and the diaphragmatic peritoneum lying beneath the dome. The sensory supply of the peripheral parts of the diaphragmatic pleura is via the lower six intercostal nerves.

An accessory phrenic nerve may also be observed as an anatomical variant, seen in around one-third of patients.

Occasionally, the C5 part of the phrenic nerve originates from the nerve to the subclavius.

The diaphragm has several attachments. The main attachments are:

- Lower costal cartilages and ribs 7 to 12
- Xiphoid process (posterior surface)
- Lumbar vertebrae (L1–L3 and their intervertebral discs) and arcuate ligaments

Two main tendinous structures arise from the vertebrae:

- *Left crus:* starts from L1 to L2 (overlapping their intervertebral discs).

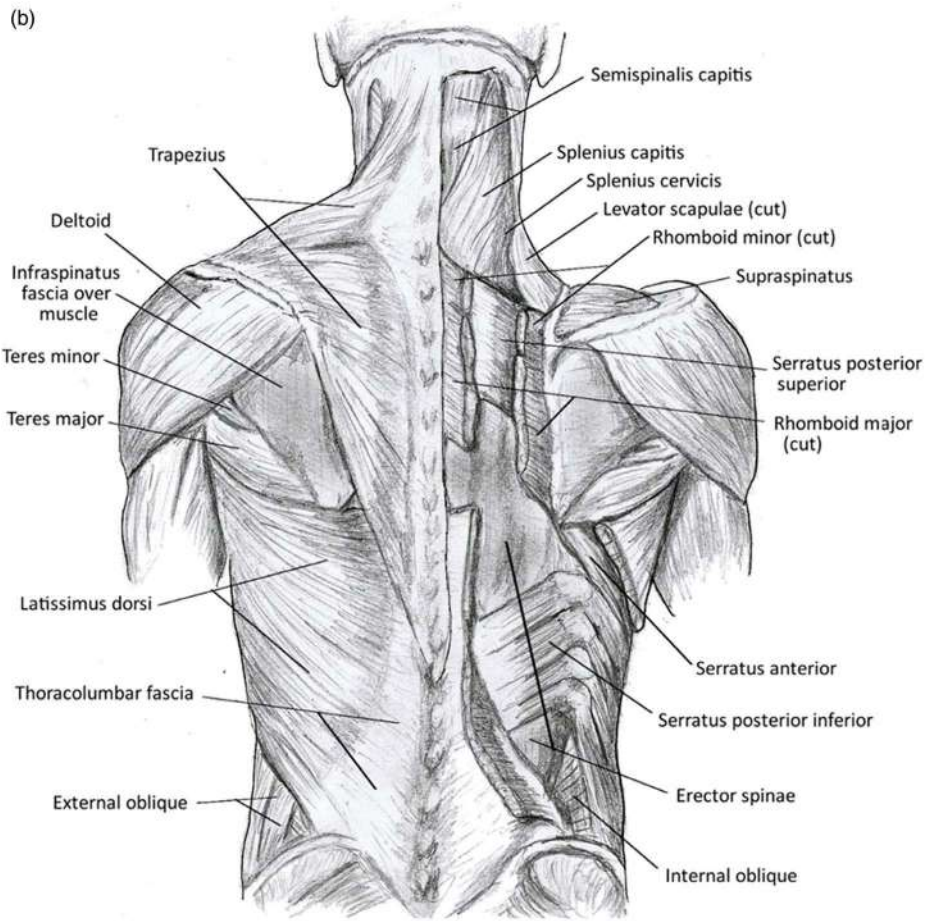


FIGURE 4.12B Diagram showing the muscles of the back. (Courtesy of Gabriela Barzyk.)

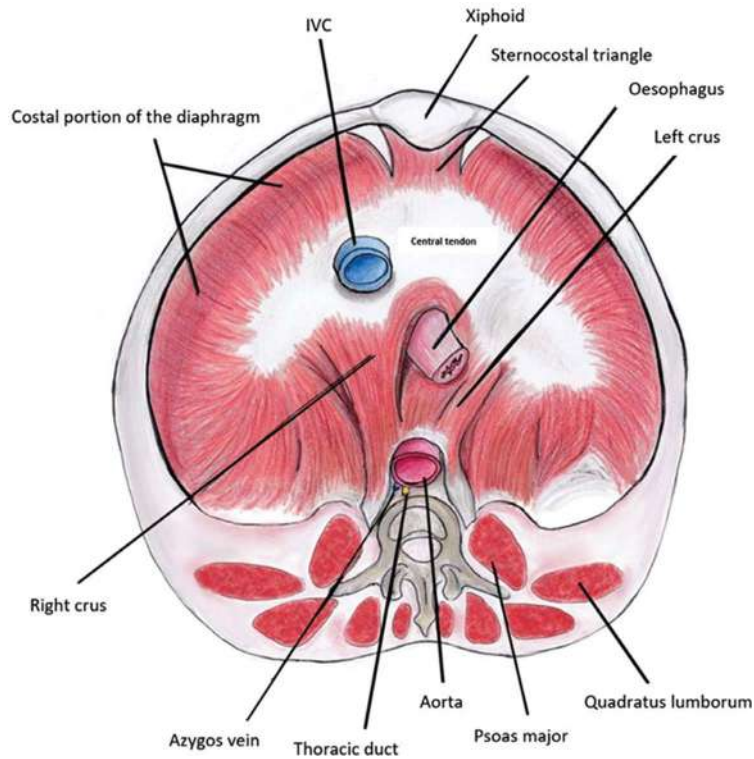


FIGURE 4.13 Abdominal surface of the diaphragm. (Courtesy of Kathryn DeMarre.)

- *Right crus*: starts from L1 to L3 (overlapping the intervertebral discs). **A few muscular fibres surround the oesophageal sphincter and help to prevent reflux.**

Three ligaments are formed by the attachments of the diaphragm:

- The **median arcuate ligament** is formed in between the right and left crura. This encloses the aorta and thoracic duct.
- The **medial arcuate ligament** is situated between the median and lateral arcuate ligaments. The psoas major passes posterior to it.
- The **lateral arcuate ligament** is the most lateral ligament; the quadratus lumborum passes posterior to it.

Openings

- Aortic*: the **descending aorta** passes through the aortic hiatus at **T12**, with the thoracic duct and azygos vein.
- Oesophageal*: the **oesophagus passes** through the right crus at **T10**, in addition to the right and left vagus nerves and the oesophageal branches of the left gastric vessels.
- Caval*: the inferior vena cava (IVC) passes through at **T8**. It passes through the **central tendon** of the diaphragm – this allows the hiatus to remain open even in inspiration to ensure constant blood flow back to the heart.

How to remember: aortic hiatus has 12 letters, oesophagus has 10, and vena cava has 8.

Learning Point

During normal respiration, the diaphragm is the only muscle that contracts to inflate the lungs and relaxes to deflate the lungs. The accessory muscles are used to further expand and collapse the lungs during *forceful* inspiration and expiration, e.g., during exercise.

During forced inspiration, the external intercostal muscles and diaphragm increase the volume of the thorax when they contract. This creates a negative pressure in the thoracic cavity, which causes air to move into the lungs, allowing them to fill. The lungs themselves cannot expand!

The opposite happens during forced expiration (i.e., the diaphragm relaxes and the internal intercostals contract to decrease thoracic volume and hence increase pressure). These forces air out of the cavity, causing exhalation.

CLINICAL NOTES

Pain from the irritation of diaphragmatic peritoneum due to acute cholecystitis (inflammation of the gallbladder) can be felt in the right shoulder, which is innervated by the supraclavicular nerves, sharing the same spinal segments as the diaphragm (referred pain).

Congenital diaphragmatic hernia (rare) can occur due to the persistence of the pleuroperitoneal membrane.

Paralysis of the phrenic nerve can follow involvement of the nerve in malignant tumours in the neck or thorax and, rarely, due to injury to the nerve in the neck. The hemidiaphragm on the involved side moves upwards on inspiration.

THE THORACIC CAVITY

The thoracic cavity is divided into three main compartments: **right and left pleural cavities** and the **mediastinum**.

The mediastinum (**Figure 4.14**) is divided into **superior** and **inferior** compartments through an imaginary **transverse plane** at the vertebral level of **T4–T5** at the manubriosternal joint.

The **superior mediastinum** is bounded superiorly by the superior border of the manubrium, the first thoracic vertebra (T1), and the first ribs and their costal cartilages; inferiorly by the transverse thoracic plane (T4–T5); and laterally by the upper lungs and pleura. The manubrium forms its anterior border, whilst the first four thoracic vertebrae form its posterior border.

The **inferior mediastinum** can be further subdivided into anterior, middle, and posterior compartments. The anterior, middle, and posterior mediastina are bounded by the same superior, inferior, and lateral boundaries.

The **anterior mediastinum** is bounded superiorly by the trans-thoracic plane (T4–T5), inferiorly by the thoracic surface of the diaphragm, and laterally by the lungs and the mediastinal pleura. The body of the sternum forms its anterior surface, whilst the anterior surface of the pericardium forms its posterior surface. The anterior and posterior surfaces of the pericardium form the respective anterior and posterior borders of the middle mediastinum. The **posterior mediastinum** is also bounded anteriorly by the posterior surface of the pericardium and posteriorly by the bodies of T5–T12 vertebrae.

Contents of the Mediastinum

Superior Mediastinum

Many structures can be found within the superior mediastinum, including blood vessels, nerves, the trachea, the oesophagus, the thoracic duct, and the thymus gland sitting on top of the aortic arch.

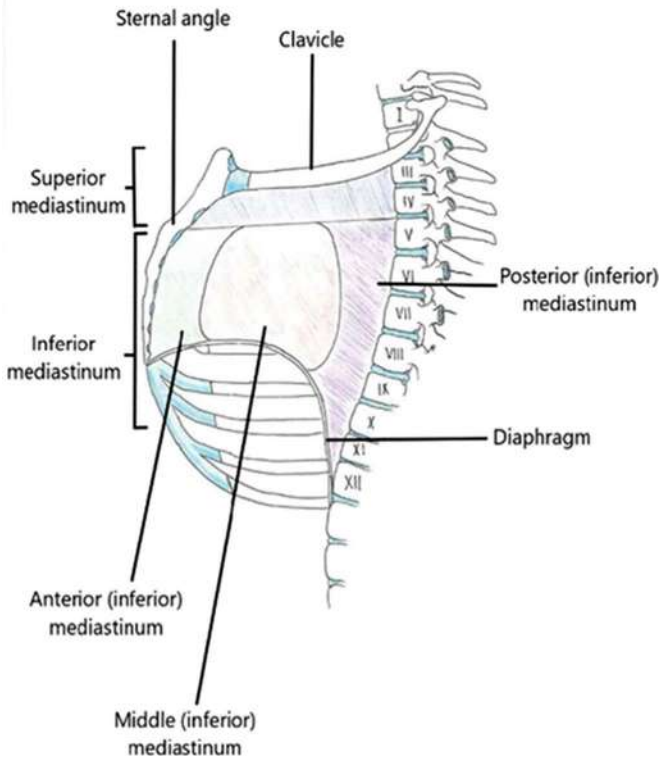


FIGURE 4.14 Sagittal view of the thorax. (Courtesy of Ming Zhu.)

Blood vessels within the superior mediastinum include:

- *The arch of the aorta (which divides into its respective branches: brachiocephalic trunk, left common carotid, and left subclavian arteries)*
- The superior vena cava, which drains the right and left brachiocephalic veins and the azygos system

Nerves include **right and left phrenic nerves**, which descend anterior to the anterior scalene muscles before entering the superior mediastinum via the superior thoracic aperture. The phrenic nerves run in the superior and then the middle mediastinum.

The **right phrenic nerve** runs lateral to the right brachiocephalic vein and superior vena cava (SVC). It then passes anterior to the root of the right lung and descends to the right side of the fibrous pericardium, which it supplies, in addition to the mediastinal pleura. It finally supplies the muscle of the right dome of the diaphragm, in addition to supplying sensory fibres to the diaphragmatic pleura, and diaphragmatic peritoneum, via branches which pass through the caval opening of the diaphragm.

The **left phrenic nerve** runs lateral to the left subclavian artery to cross the left side of the aortic arch. Like the right phrenic nerve, it passes **in front** of the root of the left lung to continue over the left side of the pericardium (where it supplies both the mediastinal pleura and pericardium with sensory

fibres) to terminate by supplying the left dome of the diaphragm and sending sensory fibres to the peritoneum of the under-surface of the diaphragm and the pleura covering the central diaphragm.

The course of the **right and left vagi** in the neck is related to their respective carotid sheaths, along with the common carotid artery and the internal jugular vein.

The **right vagus nerve** enters the superior mediastinum lateral to the trachea to pass **behind** the root of the right lung (where it supplies parasympathetic fibres to the pulmonary plexus). It continues in the posterior mediastinum posterior to the oesophagus to take part in the oesophageal plexus (it supplies the oesophageal branches). Note that the **right recurrent laryngeal nerve** loops around the right subclavian artery in the root of the neck to ascend in the tracheo-oesophageal groove to supply structures in the neck, mainly the larynx. The right vagus contributes parasympathetic innervation to the cardiac plexus.

The **left vagus nerve** enters the thorax between the left common carotid and left subclavian arteries to cross the left side of the aortic arch (note the left vagus is crossed by the left phrenic nerve). It passes posterior to the root of the left lung (sending parasympathetic branches to the pulmonary plexus). The left vagus nerve then passes in the posterior mediastinum, anterior to the oesophagus, to contribute to the oesophageal plexus and passes through the oesophageal opening of the diaphragm to supply parasympathetic fibres to the anterior surface of the stomach (see [Section 5](#), Abdomen). The **left recurrent laryngeal nerve** arises in the thorax as the vagus crosses the aortic arch. It then loops around the arch of the aorta at the site of the ligamentum arteriosum and ascends to the neck in the tracheo-oesophageal groove (see [Section 2](#), Head and Neck).

Thoracic Sympathetic Trunks

Each trunk is composed of a chain of 11 to 12 ganglia and lies posteriorly on the heads of the ribs to leave the thorax at the T12 level by passing beneath the medial arcuate ligament (see the discussion on the anatomy of the diaphragm). It continues upwards and downwards as the cervical sympathetic and lumbar sympathetic trunks, respectively. The sympathetic trunk is connected to the spinal nerves via white and grey rami communicates. The sympathetic paravertebral ganglia receive the pre-ganglionic white fibres (T1–L2) along the ventral rami of the spinal nerves to either synapse at the same level, ascend, descend, **or pass without synapsing to the prevertebral ganglia (coeliac, superior mesenteric, inferior mesenteric, and the adrenal medulla)**. The post-ganglionic fibres (grey) are longer than the pre-ganglionic fibres and run along all the spinal nerves to different parts of the body.

The upper thoracic ganglia give rise to post-ganglionic fibres to the:

- **Cardiac plexus** (sympathetic stimulation causes tachycardia and increased cardiac muscle contractility and dilatation of the coronary arteries); afferent pain fibres pass with the sympathetic nerves to the central nervous system (CNS) (see below, The Heart). There are superficial and deep cardiac plexuses. The superficial plexus lies anterior

to the arch of the aorta and medial to the ligamentum arteriosum, whereas the deep plexus lies anterior to the trachea and posterior to the arch of the aorta.

- **Pulmonary plexus** (for bronchodilation).
- **Aorta and oesophagus.**

The splanchnic nerves on each side (greater, lesser, and least) arise from the lower eight thoracic ganglia and enter the abdominal cavity through the right and left crura of the diaphragm. The **greater splanchnic nerves** arise from T5 to T9, contributing to the nerve supply of the foregut; the **lesser splanchnic nerves** arise from T10 to T11 to join the aorticorenal ganglion and supply the midgut; and the **least splanchnic nerves** arise from T12, supplying the kidneys (see [Section 5, Abdomen](#)).

The **stellate ganglion** (“star-shaped”) is formed by the fusion of upper thoracic and lower cervical ganglia opposite the head of the first rib (see discussion on Horner’s syndrome).

Endoscopic thoracic sympathectomy is a form of minimal-access surgery targeting the upper thoracic sympathetic chain to treat excessive sweating (hyperhidrosis) when other non-invasive measures fail to relieve it.

Other structures within the superior mediastinum include the trachea (which divides into two bronchi at the carina) oesophagus, thymus gland, and thoracic duct.

Anterior Mediastinum

The thymus gland and the phrenic nerves (see earlier) continue into the anterior mediastinum.

The **thymus gland** is a triangular-shaped, bilobar organ located on the superior surface of the heart. It is positioned posterior to the body of the sternum. Each lobe consists of three distinctive regions (superficial to deep): fibrous capsule, cortex, and medulla. It is a primary lymphoid organ which is involved in T-lymphocyte maturation. It is most prominent in size during childhood and atrophies during puberty.

Middle Mediastinum

The middle mediastinum contains the heart, surrounded by the pericardium. The roots of the great vessels, i.e., the ascending aorta, the pulmonary trunk, and the SVC, pass through the pericardium to, or from, the heart.

Posterior Mediastinum

The oesophagus and the vagi continue from the superior mediastinum and into the posterior mediastinum (see earlier).

The **oesophagus** runs posterior to the trachea and anterior to the thoracic aorta. It pierces the diaphragm through the oesophageal hiatus at the vertebral level of T10.

Thoracic Oesophagus

The oesophagus is a fibromuscular tube approximately 25 cm long extending from the cricoid cartilage (C6) down to the stomach.

The oesophagus enters the superior mediastinum posterior to the trachea. It then passes to the left behind the left

bronchus and the left atrium down to the posterior mediastinum, where it passes anterior to the bodies of the thoracic vertebrae. The thoracic descending aorta is posterior to the lower oesophagus (see the discussion on the relations of the right and left vagi).

The oesophagus consists of three parts: cervical, thoracic (the longest), and the short intra-abdominal.

The wall of the oesophagus contains two types of muscles: longitudinal (outermost) and circular (innermost). It is also composed of a combination of skeletal and smooth muscle with different innervations.

The oesophagus has three anatomical constrictions, one in the neck and two in the thorax (some sources give four constrictions – including both aortic and left bronchi separately):

- *Upper/pharyngeal constriction*: in the neck. It is constricted by the upper oesophageal sphincter (the cricopharyngeus muscle).
- *Middle/aortobronchial constriction*: in the thorax. It is constricted first by the aorta then by the left main bronchus at the level of T4, where the bronchus passes anterior to the oesophagus.
- *Inferior/diaphragmatic constriction*: as it passes through the diaphragm at T10.

The three anatomical narrowings of the oesophagus are the most likely places for foreign bodies to lodge. They are 15 cm, 25 cm, and 40 cm from the upper incisor teeth, respectively.

Blood supply of the thoracic oesophagus is from the descending thoracic aorta for the middle third. The lower third is supplied by the oesophageal branches of the left gastric artery (a branch of the coeliac trunk). For the cervical part of the oesophagus, see ([Section 2, Head and Neck](#)).

The venous drainage is via the azygos system and left gastric veins (portal system) (see [Section 5, Abdomen](#)).

Lymphatic drainage of the middle and lower thirds is to the mediastinal lymph nodes and coeliac lymph nodes (along the left gastric vessels). This is of surgical importance in the treatment of oesophageal cancer.

The **aortic arch** continues as the descending thoracic aorta at the level of the transthoracic plane (T4–T5). The thoracic aorta gives rise to its respective branches, which include the bronchial arteries, posterior intercostal arteries, oesophageal arteries, pericardial arteries, and superior phrenic arteries. It enters the abdomen at T12 via the aortic hiatus to become the abdominal aorta ([Figure 4.15](#)).

The **thoracic duct** is the largest lymphatic vessel in the human body, and it can also be found within the posterior mediastinum. The thoracic duct arises from the cisterna chyli in the abdomen at the vertebral level of L1. It enters the thorax through the aortic opening of the diaphragm, initially on the right of the midline, but crosses to the left around the vertebral levels of T4–T6. It continues to ascend on the left side of the thoracic cavity and drains at the junction between the left internal jugular vein and left subclavian vein. It drains three-fourths of the body’s lymph; the upper right quadrant of the body is drained by the right lymphatic duct.

The azygos system of veins is also found within the posterior mediastinum (see earlier).

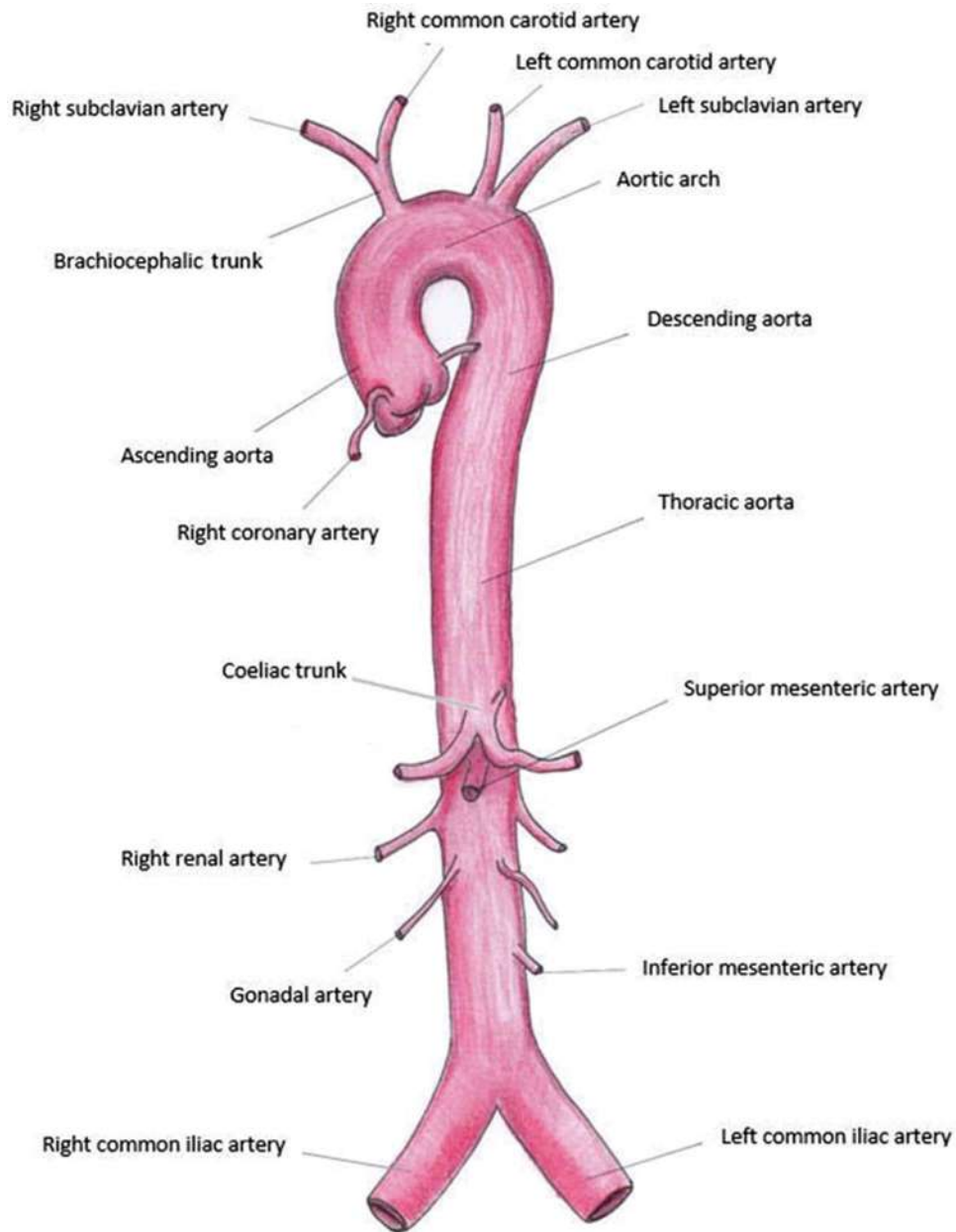


FIGURE 4.15 The aorta. (Courtesy of Kathryn DeMarre.)

CLINICAL NOTES

LANDMARKS IN RELATION TO THE MEDIASTINAL VISCERA RELATIVE TO POSITION

Supine (lying down) position

- The tracheal bifurcation occurs at the carina at the transthoracic plane.
- The arch of the aorta lies superior to the plane.

- The central tendon of the diaphragm is located at the level of the xiphisternal junction and T9 vertebra.

Standing up

- The tracheal bifurcation lies inferior to the plane.
- The arch of the aorta lies at the plane.
- The central tendon falls to the level of the middle xiphoid process opposite the T9–T10 intervertebral disc.

Mediastinal Tumours

Mediastinal tumours are rare and are typically found in middle-aged patients. However, they can develop in patients of all ages.

Mediastinal tumours occurring in children are often benign in nature and are usually found in the posterior mediastinum. Neurogenic neoplasms (peripheral nerve sheath tumours, paragangliomas, and tumours related to the sympathetic ganglia) are the most common type of tumours found within the posterior mediastinum.

In contrast, tumours found in middle-aged patients usually occur in the anterior mediastinum and tend to be malignant, such as thymic carcinoma, which is the most common pathology; germ cell tumours; and lymphoma.

Some patients are asymptomatic, and therefore may not be diagnosed until later stages. If a patient does present with symptoms, it is often due to the compression of surrounding structures, e.g., the trachea. These patients will therefore present with symptoms such as dyspnoea, wheezing, stridor, or hoarseness of the voice, which occur due to the compression of the recurrent laryngeal nerve.

Retrosternal goitre is an enlarged thyroid gland extending down into the superior mediastinum and tends to displace the trachea (**Figure 4.16**) (see **Section 2**, Head and Neck).

Mediastinal masses can be indicated on a chest X-ray via a widened mediastinum. Computed tomography (CT) scans are used more commonly to define the extent of these masses. A widened mediastinum can also be indicative of other pathologies as well, including aortic aneurysms.

Technical factors such as patient positioning (when carrying out an X-ray of the chest) may exaggerate the width of the mediastinum, so ensure that this is ruled out before making a diagnosis.

Mediastinitis is inflammation of tissues, mostly due to bacterial infection, within the mediastinum and can be dangerous because of its close proximity to essential organs.

Common causes include infection following cardiovascular surgery, such as median sternotomy, and perforation of the oesophagus following endoscopic procedures or dehiscence of oesophageal anastomosis following oesophageal resection (e.g., Ivor-Lewis operation). Perforated oesophagus is a rare but serious condition with a high mortality rate if the diagnosis is delayed. Therefore, early diagnosis is vital. Subcutaneous emphysema at the root of the neck, due to leakage of air, is an important clinical feature.

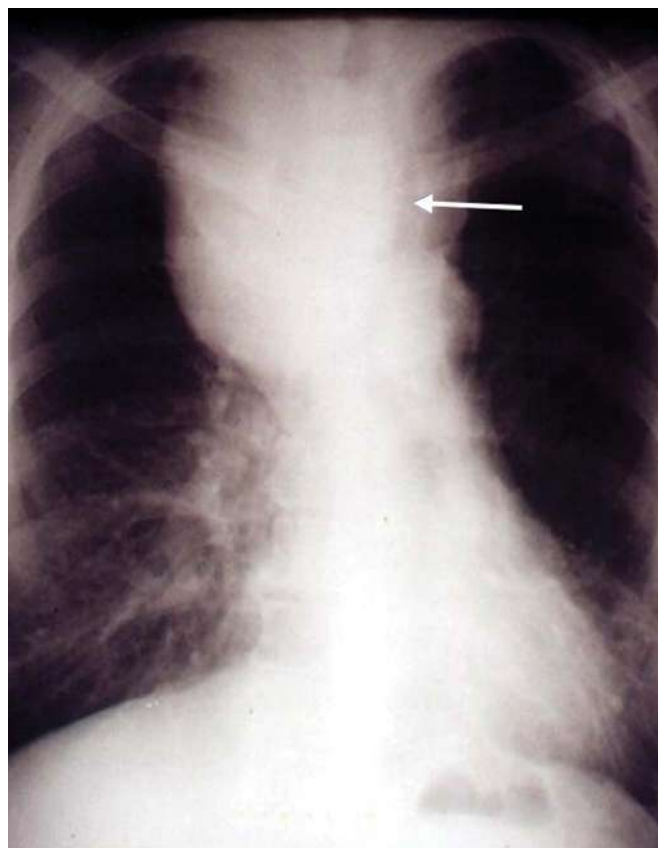


FIGURE 4.16 Chest X-ray showing large retrosternal goitre compressing the trachea to the left side (*arrow*). (Courtesy of Qassim F. Baker.)

Mediastinoscopy is the passing of an endoscope to the superior mediastinum by making a small incision above the suprasternal notch and taking a biopsy from the lymph node at the carina to exclude metastatic spread, for example, from lung cancer.

Endobronchial ultrasound bronchoscopy (EBUS bronchoscopy) is a procedure where transbronchial biopsies are taken from mediastinal and hilar lymph nodes. Confirming involvement of these lymph nodes secondary to lung cancer is crucial for the proper staging and planning of treatment, as early-stage lung cancer can still be treated with surgery.

THE LUNGS

These air-filled organs lie on either side of the mediastinum. Their main function is for gas exchange, allowing oxygen from the air to enter the blood and carbon dioxide, a product of metabolism, to be removed from the blood (**Figure 4.17**, **Table 4.4**).

Gross Appearance of the Lungs

The typical appearance of the lung of a healthy, non-smoking individual is pink. However, it may appear dark on the cadaver if

the lungs have been exposed to pollution (as seen in urban environments) or due to irritants such as tobacco smoke.

Each lung is made up of:

Apex: the most superior point, covered by the cervical pleura and the suprapleural membrane.

Surfaces: three main surfaces including diaphragmatic (base), mediastinal (surface on which the hilum is present), and costal (outer surface exposed to the ribs and costal cartilages).

TABLE 4.4: Comparison of right and left lungs

Right Lung	Left Lung
Has three lobes known as the upper, middle, and lower lobes	Has two lobes known as the upper and lower lobes
Horizontal fissure runs from the fourth costal cartilage to meet with the oblique fissure at the midaxillary line, usually visible on PA chest x-ray. The middle lobe is bounded by the horizontal and oblique fissures	Left lung lacks a horizontal fissure and also lacks a middle lobe
Oblique fissure runs lateral to the spine of the fourth thoracic vertebra down to the sixth costochondral junction. Can be seen on lateral chest X-ray	Oblique fissure runs lateral to spine of fourth thoracic vertebra down to sixth costal cartilage
Groove for superior vena cava and azygos vein are visible on the right lung only	Cardiac notch and groove for arch of aorta are visible on the left lung only
Occasionally on the right lung, an extra fissure is formed from the indentation of the azygos vein as it arches over the apex of the lung. This occurs in around 1% of people	Lingula (Latin, "little tongue"), refers to the projection of the upper lobe of the left lung only

Lobes: the right lung has three lobes, upper, middle, and lower (Figure 4.17). The left lung has two lobes, upper and lower – this is to allow room for the heart which lies on its cardiac impression.

Borders: the three main borders are anterior, posterior, and inferior. The anterior border of the right lung extends from behind the sternoclavicular joint vertically to the xiphisternal joint, at the junction of the costal and the

mediastinal surfaces. The anterior border of the left lung differs by deviating laterally at the fourth costal cartilage, forming the cardiac notch, to accommodate the heart.

The inferior border separates the base of the lung from the costal surface and corresponds to the same course as the pleura. The rounded posterior border of each lung lies beside the vertebral column, about 4 cm from the midline and vertical from the spinous process of C7–T10.

Note that the **pleura crosses the 12th rib posteriorly**, and this of surgical importance in operations such as nephrectomy when 12th rib resection is needed to improve access.

It is possible to identify which lobe is involved in pneumonic process by looking at a chest X-ray (CXR) and using the silhouette sign, which refers to the loss of the radiological borders between thoracic structures on chest radiograph.

Root and Hilum of the Lungs

The root of the lung contains several structures that enter or leave the lung from the mediastinum of the thorax surrounded by a sleeve of pleura, where the mediastinal and visceral pleurae meet. The hilum is a depression on the mediastinal surface of the lung which extends from T5 to T7 (Figure 4.18) (compare with the porta hepatis of the liver Section 5, Abdomen).

The **pulmonary ligament**, a sleeve of pleura made up of both parietal and visceral layers, is located inferior to the hilum of the lungs and attaches the lungs medially to the mediastinum by attaching to the parietal pleura. Its function is to allow the expansion of lung tissue during inspiration.

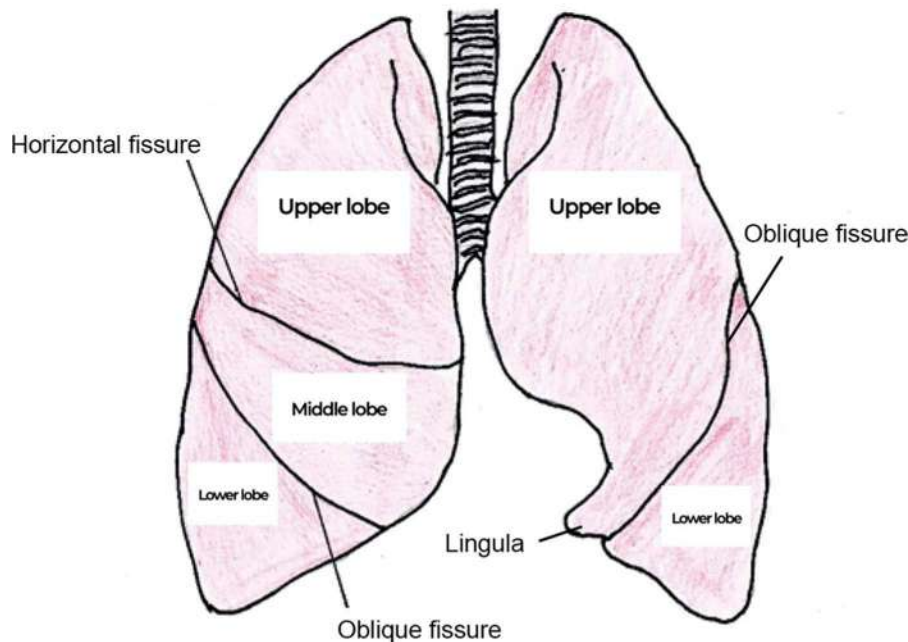


FIGURE 4.17 Lobes of the lungs. (Courtesy of Hannah Katmeh.)

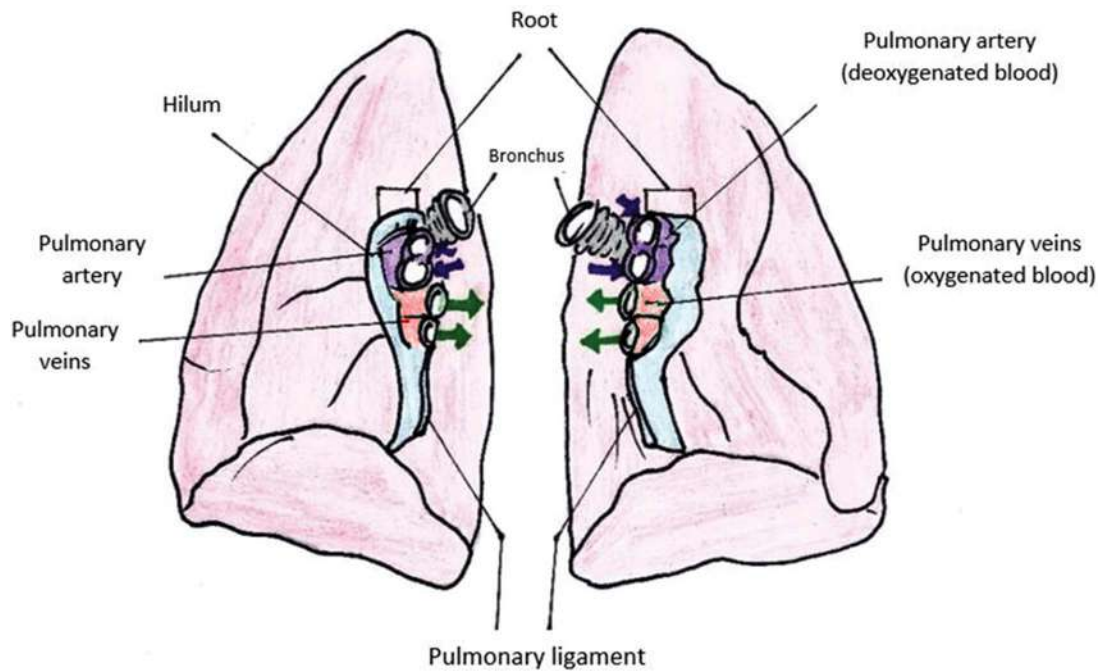


FIGURE 4.18 Root and hilum of right and left lung. (Courtesy of Hannah Katmeh.)

Each root is made up of **one** pulmonary artery, **two** pulmonary veins, a bronchus (with C-shaped cartilaginous rings to prevent collapsing), bronchial vessels, various plexuses of nerves, and numerous groups of lymph nodes.

The trachea bifurcates at the **carina**, which lies at the level of **T4**, into the left and right principal bronchi. The right bronchus is **more vertical, shorter, and wider** than the left (**Figures 4.19 and 4.20**). Any object aspirated is more likely to get lodged in the right side than in the left. The right bronchus is about 1 inch long, while the left bronchus is about 2 inches long.

Each of these bronchi continues distally until it enters the lungs at the hilum. The airways then divide in a dichotomous branching to 23 generations; down to 16 generations represent the conducting zone, and the remaining form transitional and respiratory zones (**Figure 4.21**).

Learning Point

(LUNG ROOT)

Arteries Above the veins and Bronchus at the Back!
Note that there is only ONE pulmonary artery but TWO pulmonary veins.
Arteries = Carry blood AWAY from the heart.
Veins = Carry blood TO the heart.

The Respiratory Tree (Tracheobronchial Tree)

The **trachea** is a continuation of the larynx and begins at **C6**. It is about 12 cm in length and is made up of incomplete C-shaped cartilaginous rings. This is because posterior to the trachea lies the oesophagus, and hence the C-shape allows the bolus of food to move freely down. The C-shape also protects and maintains the airways. The trachealis muscle fills the gap between the ends of the cartilaginous rings and is supplied by sympathetic nerves. Sensory supply is via the vagal and the recurrent laryngeal nerves.

The trachea is centrally located in the suprasternal notch, so it can be easily felt. In the superior mediastinum, the trachea lies posterior to the aortic arch.

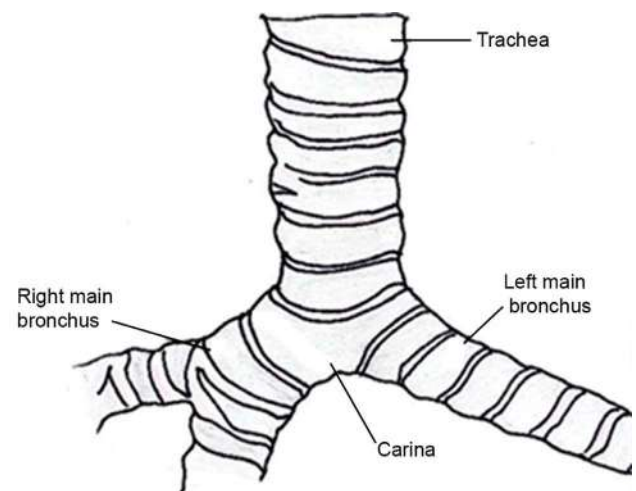


FIGURE 4.19 The bifurcation of the trachea. (Courtesy of Hannah Katmeh.)

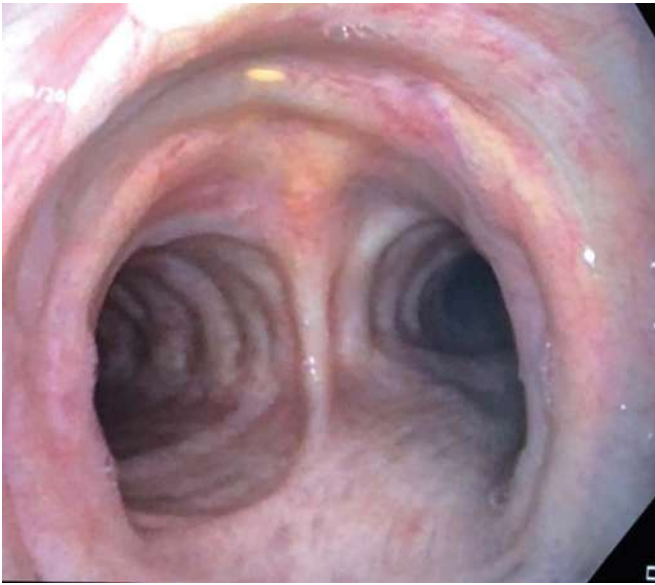


FIGURE 4.20 Bronchoscopy showing the bifurcation of the trachea and the carina. (Courtesy of Mohammed Al Janabi.)

The right bronchus gives rise to the superior lobar bronchus before entering the hilum to supply the upper lobe. Then it divides into the middle and inferior lobar bronchi. The left bronchus enters the hilum and divides into a superior and an inferior lobar bronchus.

Each lobar bronchus subdivides into smaller branches (segmental or tertiary bronchi), which pass to part of the lung forming a functionally independent unit with its own blood supply, autonomic nerves, and lymphatic drainage (i.e., segmental division). The tributaries of the pulmonary veins lie in the connective tissues between the segments.

The smallest bronchi give rise to bronchioles, which lack cartilaginous rings and are lined by ciliated columnar epithelium and have smooth muscle fibres in their walls.

The terminal or respiratory bronchioles end by branching into the alveolar ducts, where alveolar sacs contain the alveoli (with a combined surface area of 40 to 80 m²). Gaseous exchange takes place between the air in the alveoli and blood in the capillaries surrounding the alveoli. Oxygen diffuses into the blood in exchange for carbon dioxide. The terminal bronchioles, alveolar ducts, and alveoli constitute the respiratory zone of the tracheo-bronchial tree.

The clinical importance of **bronchopulmonary segments** (10 in the right lung and 8 to 10 in the left lung) is relevant to diseased segments (cancer, tuberculosis [TB]), which can be removed individually without removing the whole lobe or lung. Compare with the liver segments (see [Section 5](#), Abdomen).

Deoxygenated blood enters the right atrium and then the right ventricle. Contraction of the ventricle pumps blood to the pulmonary trunk, which bifurcates into two pulmonary arteries, one entering each lung at the hilum. Oxygenated blood leaves via two pulmonary veins from each lung. Thus, the left atrium receives blood from four pulmonary veins in total.

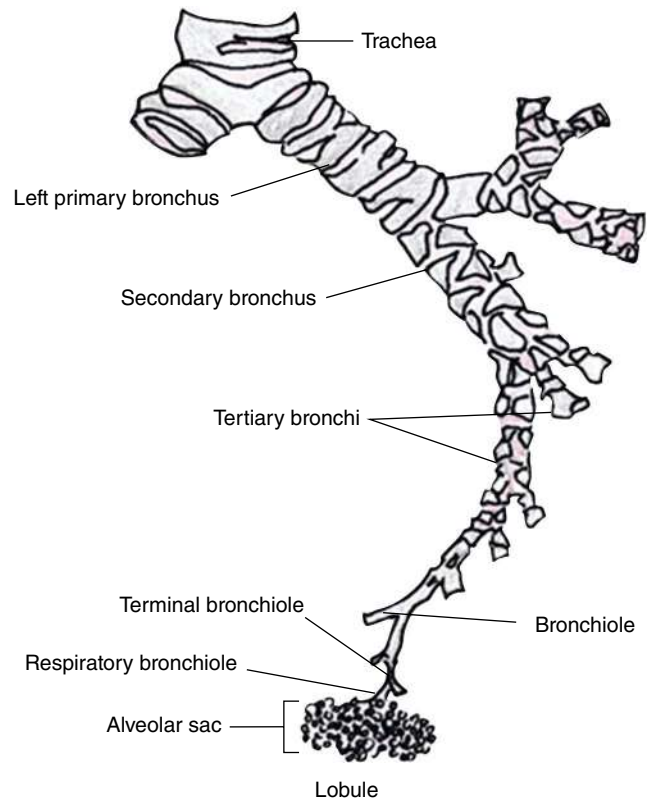


FIGURE 4.21 Tracheobronchial tree. (Courtesy of Hannah Katmeh.)

The **control of breathing** is modulated by higher centres and feedback from sensors such as peripheral chemoreceptors, located near the bifurcation of the common carotid artery at the carotid body, and central chemoreceptors located near the ventral surface of the medulla. The rostral ventrolateral medulla (RVLM) of the brainstem is split into the dorsal and ventral respiratory groups and governs the pattern and rate of breathing.

The **bronchial arteries** are branches of the **descending thoracic aorta** and carry **oxygenated blood** to the bronchi and connective tissues of the lungs, including the visceral pleura.

The **bronchial veins** provide venous drainage of the pulmonary tissues. Veins from the right lung drain into the azygos vein, whilst the left lung drains into the accessory hemiazygos vein, which will subsequently drain into the azygos vein.

Innervation of the Lungs

The pulmonary plexuses run both anterior and posterior to the hilum of the lungs. These plexuses are made up of fibres from the vagus nerve joined by sympathetic nerves. The sympathetic nerves have bronchodilator and vasoconstrictor actions. Parasympathetic stimulation leads to bronchoconstriction, vasodilatation, and an increase in glandular secretion.

Lymphatic Drainage of the Lungs

There are no lymphatic vessels in the alveolar walls. The lymphatic drainage of the lungs collects at the bronchopulmonary lymph nodes at the hilum of each lung. From there, lymph passes to the tracheobronchial nodes at the carina and then to the bronchomediastinal lymph trunks. **This is of special importance when resecting lung cancer.** Suspicious lymph nodes can be biopsied with the bronchoscope to stage cancer or to diagnose other pathologies, e.g., infections.

The Pleura

Surrounding the lungs is a serous membrane, the pleura, which is composed of two layers:

- *Parietal*: the parietal pleura adheres to the rib cage, mediastinum, and diaphragm.
- *Visceral*: the visceral pleura covers the lung itself and extends into the depth of the interlobar fissures.

The parietal and visceral pleurae are continuous at the hilum of the lung (see the earlier discussion on the pulmonary ligament).

The **pleural cavity** or pleural space lies between the parietal and visceral layers, at a **sub-atmospheric pressure** of around minus 4 mm Hg, due to the opposing elastic forces of the chest wall and the recoil of the lungs. This negative pressure in the pleural cavity allows the lungs to be pulled, and hence inflated, when the chest wall expands up and out.

The parietal pleura can be further split into four parts:

- Cervical, which is attached to the under-surface of the suprapleural membrane at the root of the neck
- Costal, related to the ribs
- Diaphragmatic, related to the domes of the diaphragm
- Mediastinal, related to the mediastinal surfaces of the lungs

Nerve Supply of the Pleura

The parietal pleura is sensitive to pain, touch, and temperature. Its sensory innervation comes from:

- *Costal pleura*: intercostal nerves
- *Mediastinal pleura*: phrenic nerve
- Diaphragmatic pleura over the domes is supplied by the phrenic nerve, while the peripheral part is supplied by the intercostal nerves

Visceral pleura is sensitive only to touch and is supplied by the pulmonary plexus (from the autonomic nervous system).

Note: Compare the arrangement of the nerve supply with that of the peritoneum (see [Section 5](#), Abdomen).

Pleural Recesses

During forced inspiration, the lungs fill the pleural cavities; however, during quiet respiration there are some parts that do not get filled. These are the pleural recesses, of which we have two:

- Costodiaphragmatic (a potential space between the costal and diaphragmatic pleura)
- Costomediastinal (a potential space between the mediastinal and costal pleura)

Pleural effusion tends to collect in these recesses.

CLINICAL NOTES

LUNGS

Chronic obstructive pulmonary disease (COPD): a collective term which includes both chronic bronchitis and emphysema. It is a chronic, progressive, and irreversible disease, mostly linked to cigarette smoking and air pollution. It is characterised by chronic inflammation of the airways and damage to the lung parenchyma and alveoli. The main symptoms are shortness of breath and productive cough. Chronic hypoxaemia and hypercapnia, with the need for supplemental oxygen, and pulmonary hypertension are some of the complications of COPD.

Asthma: a common intermittent chronic condition that affects the airway. In contrast to COPD, it represents a reversible bronchoconstriction. It causes intermittent wheezing (caused by bronchospasm due to spasmodic contraction of the smooth muscle of the airways); cough (increased mucus production), although unlike COPD, the cough is usually dry; and difficulty in breathing. It is the most common chronic condition in childhood.

Pneumonia: an inflammatory condition of the lung caused by infections, mainly affecting the alveoli. This condition may prove serious, especially in the extremes of life and in the immunosuppressed patient and may need admission to an intensive care unit (ICU) for mechanical ventilation. It is usually treated by administering antibiotics and oxygen therapy.

Pulmonary oedema: fluid pushed into the alveoli, resulting in restricted oxygen exchange between the lungs and blood. This is often caused by congestive heart failure, mainly left-sided heart failure.

Acute respiratory distress syndrome (ARDS): a life-threatening condition caused by inflammation of the lungs due to sepsis or severe injury. This inflammation causes fluid from small blood vessels to leak into the alveoli, leading to non-cardiogenic pulmonary oedema restricting the rate of oxygen transfer from the lungs to the blood. Ultimately, this will affect other major organs such as the kidneys and brain, as they will be receiving less oxygen, so symptoms can escalate quickly and become life-threatening ([Figure 4.22](#)).

Coronavirus disease 2019 (COVID-19): a highly infectious disease caused by the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The virus primarily affects the respiratory system with a heterogeneous presentation of lower respiratory tract symptoms ranging

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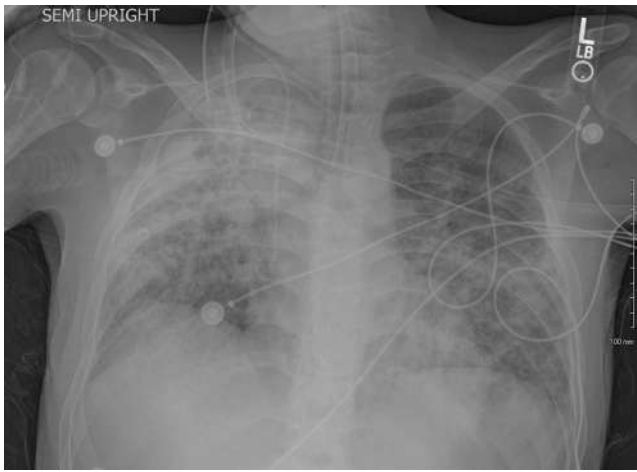


FIGURE 4.22 Chest X-ray showing acute respiratory distress syndrome (ARDS). Note the bilateral heterogeneous appearance. (Courtesy of Mohammed Al Janabi.)

from mild, dry cough and fever to significant hypoxia with ARDS (Figure 4.23). Although the pathophysiology is not fully understood, the virus binds to the angiotensin-converting enzyme 2 (ACE2) receptor, which is abundant in the lung as well as other organs (e.g., heart, kidney, bladder), making it susceptible to invasion and subsequent inflammation. Overall, inflammation in this region results in a variety of respiratory symptoms which ultimately contribute to complications such as hypoxia, subsequent multiorgan failure, and septic shock.

Pulmonary embolism (PE): an obstruction in the pulmonary artery, commonly due to a clot that has travelled from elsewhere in the body. Deep vein thrombosis (DVT) is often the main cause of PE, as clots in the deep veins of the legs get dislodged and can travel up towards the heart. If the DVT arises above the level of the knee, it is more likely

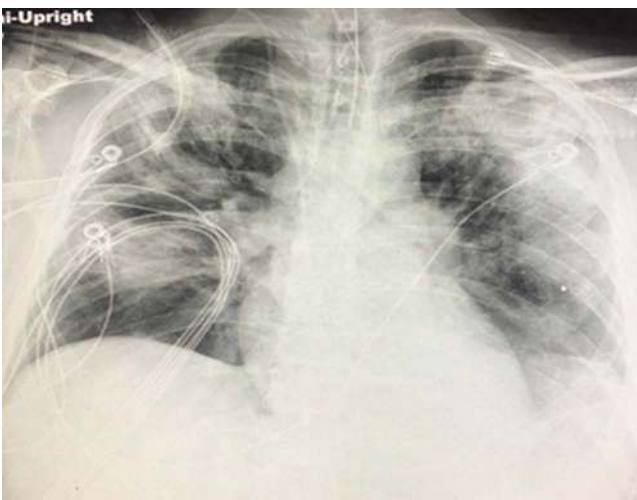


FIGURE 4.23 Chest X-ray of a patient with typical features of COVID-19 infection: bilateral multifocal areas of consolidation, predominantly peripheral rather than perihilar. (Courtesy of Mohammed Al Janabi.)

to cause PE. The thrombus travels up into the right atrium via the inferior vena cava and into the pulmonary artery. If it obstructs a smaller branched vessel of the pulmonary artery, the outcome is not immediately serious. However, if the obstruction is in one of the main branches, it can cause immediate death due to a lack of lung perfusion leading to a decrease in blood oxygenation, and blood will build up in the right ventricle. Other substances blocking the pulmonary artery can include fat and air. The symptoms are non-specific; therefore, the diagnosis needs a high index of suspicion and should be based on pre-test probability. Prophylactic measures to combat DVT, and hence PE, are taken seriously in the management of all surgical patients, especially those who are immobile after surgery or injury.

Lung cancer: primary lung cancer is one of the most common cancers in both males and females and is mainly related to smoking. Secondary lung cancer (metastatic) may spread to the lungs from the breast, the kidney (renal cell carcinoma), the placenta (choriocarcinoma), the prostate, or the gastrointestinal (GI) tract (Figure 4.24).



FIGURE 4.24 Cannonball metastatic lung cancer in 50-year-old male diagnosed with colon cancer 2 years previously. (Courtesy of Hamza Al Sabah.)

Pancoast syndrome: also known as cancer of the apex of the lung. Due to its location, the tumour can cause compression and invasion of the structures at the thoracic inlet and lower brachial plexus (thoracic outlet syndrome). It can also cause Horner's syndrome if the cervical sympathetic trunk becomes compressed. Horner's syndrome presents with a triad of symptoms: ptosis (drooping eyelid due to loss of innervation of the superior tarsal muscle), miosis (constricted pupil), and ipsilateral anhidrosis (absence of sweating of the face); enophthalmos (sinking of the eyeball) may be noticed as well.

CLINICAL NOTE

PLEURA

The cervical pleura protrudes through the superior thoracic aperture and is the covering of the apex (or cupola) of the lung. It can extend to about 2.5 cm into the root of the neck, especially on the left side, above the clavicle, in a curved line, which extends from the sternoclavicular joint to the junction of the medial and middle thirds of the clavicle. This is clinically significant if there is a wound in the root of the neck, and upon inserting a central line into the subclavian vein or internal jugular vein, sometimes it can pierce the cervical pleura as it protrudes above the clavicle. For this reason, CXRs are recommended after a central line has been inserted to exclude iatrogenic pneumothorax.

Pneumothorax (air in the pleural cavity): this can occur as a result of puncturing the pleura surrounding the lungs, e.g., due to rupture of emphysematous bullae (spontaneous pneumothorax), or due to penetrating thoracic injuries (traumatic pneumothorax) and iatrogenic (perioperative pneumothorax), or due to insertion of central venous lines in the subclavian or internal jugular vein. Air enters the pleural space and the lung collapses (Figure 4.25).

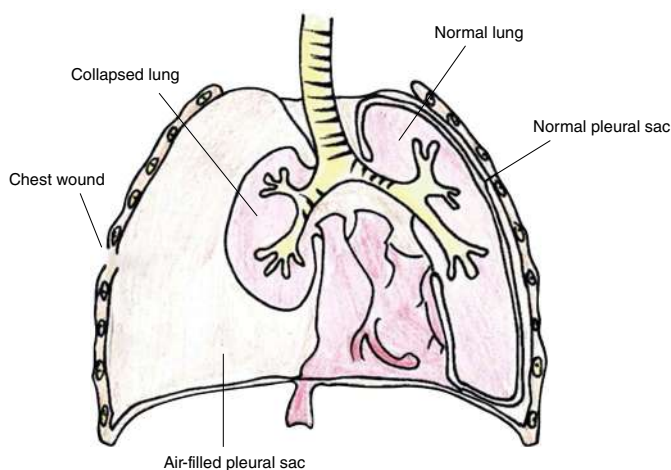


FIGURE 4.25 Diagram illustrating right-sided traumatic pneumothorax. (Courtesy of Hannah Katmeh.)

CLINICAL SCENARIO

A 76-year-old male patient sustained blunt trauma to the left chest wall after falling on the stairs. He developed chest pain, shortness of breath, and diffuse subcutaneous emphysema extending superiorly to the neck and inferiorly to the abdominal wall. Computed tomography (CT) of the chest showed non-displaced fractures of the fifth to eighth ribs and left pneumothorax (Figures 4.26 and 4.27).

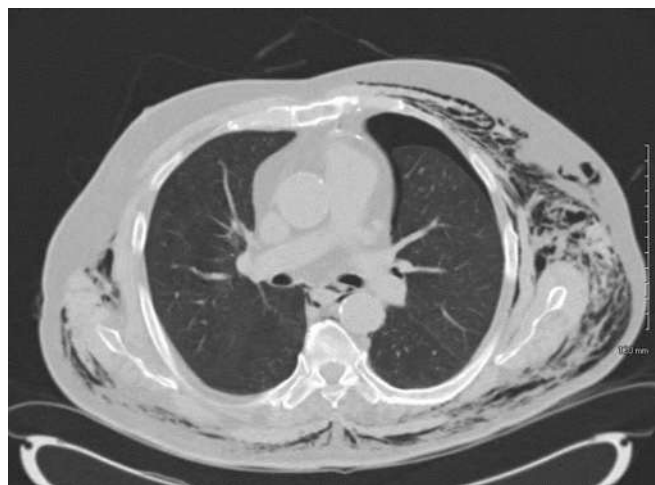


FIGURE 4.26 CT scan of the chest showing left-sided pneumothorax, pneumomediastinum, and diffuse subcutaneous emphysema. (Courtesy of Mohammed Al Janabi.)



FIGURE 4.27 Chest X-ray after insertion of small pig-tail catheter in the left second intercostal space, which resolved the patient's pneumothorax and emphysema. (Courtesy of Mohammed Al Janabi.)

Tension pneumothorax: a life-threatening condition in which the air is trapped in the pleural cavity under pressure. The one-way valve mechanism allows air to get in but not to return. This causes an increase in pressure within the pleural space that can rapidly lead to a collapsed lung and deviation of the mediastinum towards the unaffected side, occluding the venous return to the heart. Patients in

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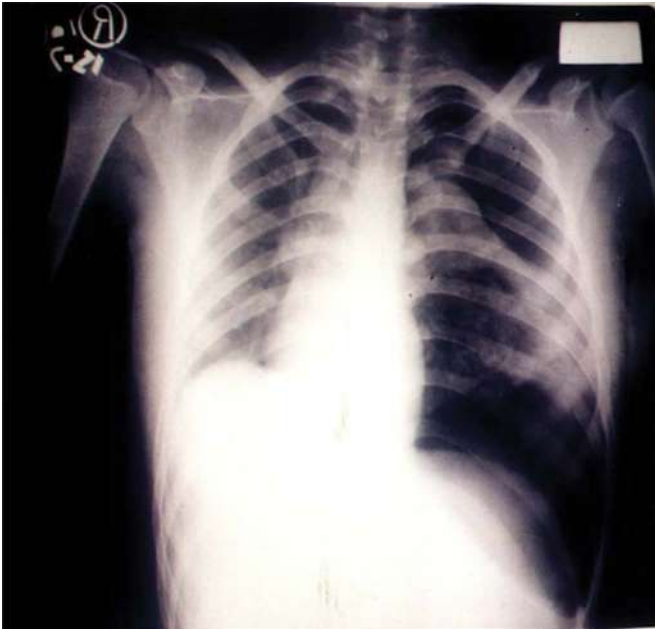


FIGURE 4.28 Chest X-ray showing left tension pneumothorax, with collapsed left lung and downward displacement of the left dome of the diaphragm. (Courtesy of Qassim F. Baker.)

ICUs can develop tension pneumothorax (**Figure 4.28**) due to positive-pressure mechanical ventilation, and therefore should be monitored carefully.

In clear-cut cases (i.e., shock, respiratory distress, cyanosis, distended neck veins, reduced breath sounds, deviated trachea), **needle thoracostomy** can be lifesaving. A large IV cannula size, 14 to 16 G, is usually inserted through the second intercostal space in the midclavicular line. An

immediate rush of air is typical of tension pneumothorax if the tip of the IV cannula is sited correctly in the pleural cavity.

Pleural effusion: fluid accumulating in the pleural space is known as a pleural effusion. There are various types of pleural effusion, dependent on the nature of the fluid entering the pleural space, such as **haemothorax** (blood), **chylothorax** (chyle), **hydrothorax** (water), and **pyothorax** (pus). It can be divided into inflammatory exudate, e.g., parapneumonic, due to lung infections, or non-inflammatory transudate. The most common cause of transudate is right-sided heart failure. Other important causes include metastatic cancers such as lung and breast cancer and pulmonary TB.

A sample of fluid can be aspirated from the pleural cavity and sent for analysis mainly for protein content and lactate dehydrogenase (both high in exudate) to differentiate exudate from transudate. Other tests include Gram stain, culture and sensitivity, glucose, pH (both low in empyema), cell count and differential, and cytology (looking for malignant cells, especially for haemorrhagic non-traumatic effusion).

Pleural effusion can be aspirated below the inferior angle of the scapula at the level of the spinous process of T7.

The insertion of the needle into the pleural cavity **should be on the superior border of the rib** to avoid injury to the intercostal vessels and subsequent bleeding (the intercostal neurovascular bundle runs along the inferior border of the rib). The procedure is preferably done with ultrasound guidance to avoid injury to the intrathoracic organs.

Chest drains can be inserted into the pleural space to remove the fluid. For this procedure, the patient needs to be leaning forward, or lying down with head of the bed elevated and their arm outstretched at 90 degrees and the hand resting behind their head, or in the supine position, for example, in the resus room or theatre. The insertion site, known as the **safe triangle**, must be identified (**Figure 4.29**).

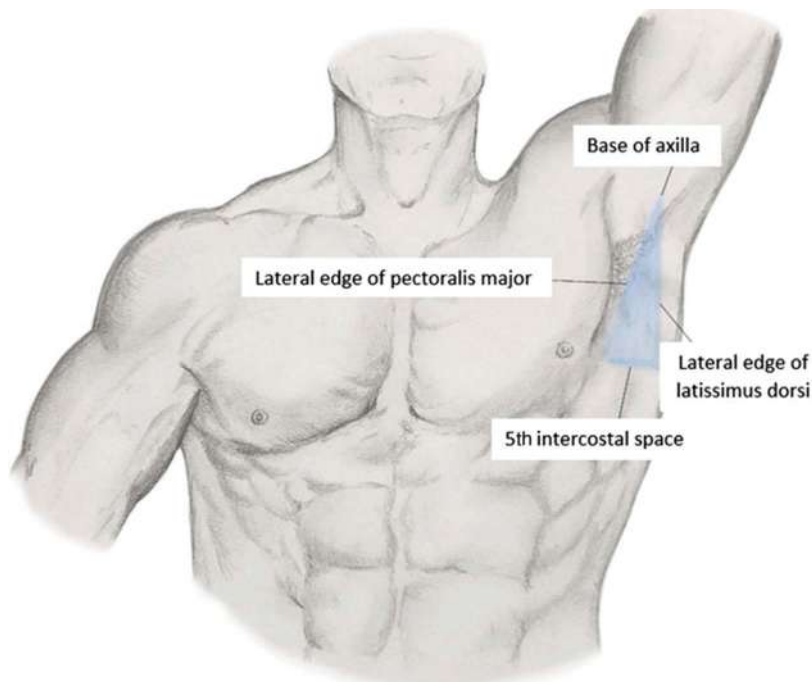


FIGURE 4.29 Boundaries of the safe triangle. (Courtesy of Kathryn DeMarre.)

There are several techniques used to insert the tube (e.g., the Seldinger technique, for more details see [Section 7, Lower Limb](#)), and a chest X-ray is normally taken to confirm placement and position. The tube is attached to an underwater seal.

CLINICAL CASE

Read the following clinical case and relate it to the imaging to aid in your understanding.

Presenting complaint: a 75-year-old male with a history of malignant melanoma treated with surgical excision presented with shortness of breath and a dry cough of 2 weeks' duration.

CXR: large right-sided pleural effusion. Note that air appears dark on a CXR and CT ([Figures 4.30, 4.31, and 4.32](#)).



FIGURE 4.30 Chest X-ray showing massive right pleural effusion. (Courtesy of Mohammed Al Janabi.)



FIGURE 4.31 CT chest with contrast, coronal view: Large right-sided pleural effusion with massive right pulmonary atelectasis (partial collapse of the lung). (Courtesy of Mohammed Al Janabi.)



FIGURE 4.32 CT chest with contrast, axial view: Large right-sided pleural effusion with massive right pulmonary atelectasis (partial collapse of the lung). (Courtesy of Mohammed Al Janabi.)

THE HEART

Introduction

This muscular organ is complex and has many functions, which are all responsible for sustaining life. Many pathologies are associated with this organ, and while it is vital for normal function, its failure can be fatal.

Surface Anatomy

The heart is situated in the middle mediastinum and is orientated so that the right atrium forms the right border and the left ventricle forms most of the left border (Figure 4.33).

The right and left ventricles are separated by the anterior and posterior interventricular sulci.

CLINICAL NOTE

The apex beat can be palpated in the fifth intercostal space at the midclavicular line, although this can vary for individuals. Any deviation of the apex beat to the left suggests hypertrophy of the left ventricle, which may be due to a number of different reasons, such as uncontrolled arterial hypertension.

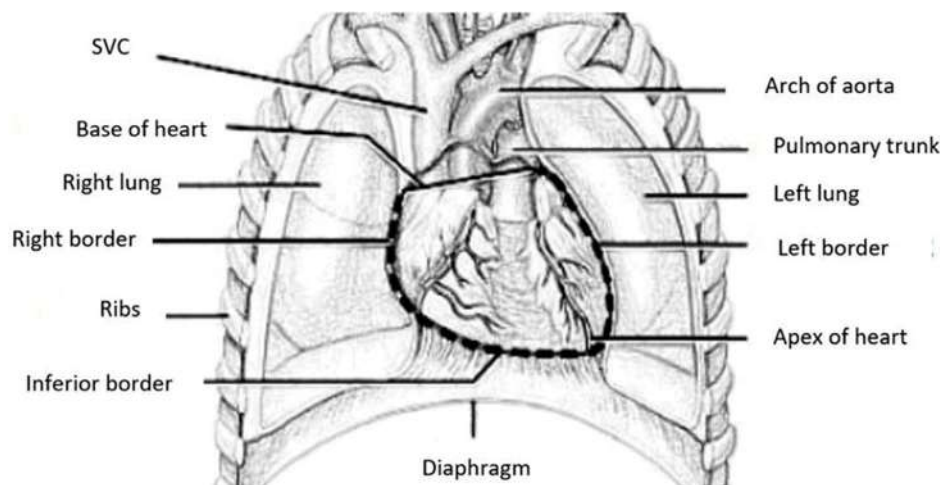


FIGURE 4.33 Borders of the heart. (Courtesy of Kathryn DeMarre.)

The surfaces and borders of the heart are:

- *Right border:* right atrium.
- *Left border:* left ventricle and a small part of the left atrium superiorly to the apex inferiorly.
- *Superior border:* atria and the great vessels (ascending aorta and pulmonary trunk).
- *Inferior surface:* most of the left ventricle and some of the right ventricle in close association with the central tendon of the diaphragm; the inferior border consists mainly of the right ventricle and a small contribution from the left ventricle.
- *Base:* consists of the posterior surface of the left atrium.
- *Anterior surface:* consists of the right atrium, right ventricle, and some of the left ventricle.

The atria and the ventricles are separated by a grooved sulcus, the atrioventricular sulcus.

The Pericardium

The pericardium is the sac that surrounds the heart and the roots of the great vessels entering or leaving the heart and helps to stabilise the heart within the thoracic cavity.

The pericardium consists of two layers:

- An outer fibrous layer, which prevents excessive dilation of the heart, especially during sudden rises in blood volume
- An internal, serous double layer

The internal serous layer of the pericardium consists of the:

- Parietal pericardium (found on the inside of the fibrous layer).
- Visceral pericardium, or epicardium (this is directly attached to the myocardium – the heart muscle).
- **Pericardial cavity, which is a potential space between the visceral and the parietal layers of the serous pericardium.** It contains pericardial fluid (normally about 25 mL), which

is secreted by the inner visceral layer. The pericardial fluid acts as a lubricant to reduce friction on the cardiac surface during systole and diastole, thereby allowing smooth cardiac contraction (**Figure 4.34**).

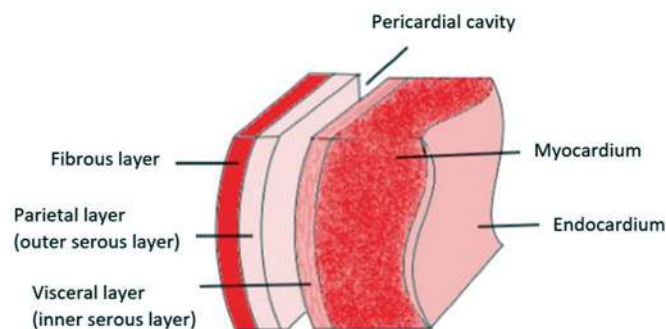


FIGURE 4.34 Layers of the heart and pericardium. (Courtesy of Aditya Mavinkurve.)

Pericardial Sinuses

There are two pericardial sinuses:

- Oblique pericardial sinus
- Transverse pericardial sinus

These are located on the posterior surface of the heart and are formed by the reflection of the serous pericardium.

The transverse pericardial sinus can be found posterior to the origin of the ascending aorta and the pulmonary trunk and anterior to the superior vena cava (SVC). It can be used to apply a clamp or pass a ligature to the aorta and pulmonary trunk during coronary artery bypass graft (CABG) surgery or other cardiac surgical procedures in order to temporarily divert the circulation (extracorporeal circulation).

The oblique sinus lies behind the left atrium.

A surgeon may insert their index finger through the transverse pericardial sinus and use their thumb to massage the great vessels to control the cardiac output of the heart (**Figure 4.35**).

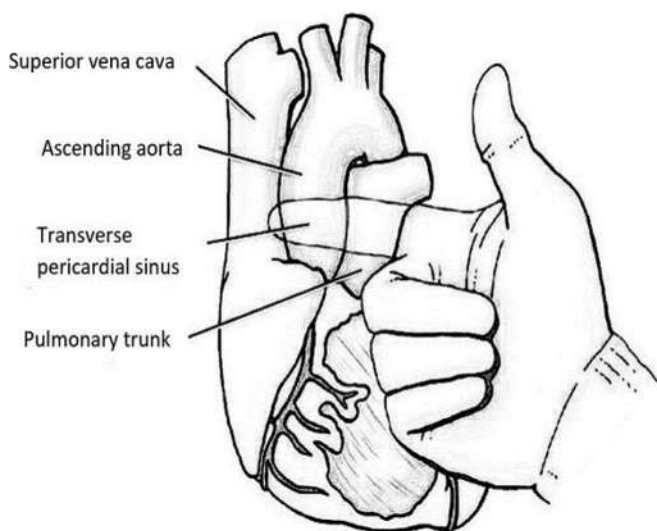


FIGURE 4.35 Transverse pericardial sinus. (Courtesy of Vamsi Thammandra.)

Blood Supply of the Pericardium

The pericardium is supplied by the pericardiophrenic artery (a branch of the internal thoracic) in addition to branches from the musculophrenic, bronchial, oesophageal, and superior phrenic arteries.

Venous drainage is via the azygos venous system.

Innervation of the Pericardium

The phrenic nerves supply the fibrous layer and the parietal layer of the serous pericardium.

The visceral layer of the serous pericardium has autonomic innervation (vagus and sympathetic fibres).

CLINICAL NOTES

Pericarditis refers to inflammation of the pericardium. Common causes include post-viral infections, bacterial infections like tuberculosis (TB) (which is more common in developing countries), and kidney failure. Some cases are also idiopathic in nature. The condition is more common in men than in women and is more prevalent in adults than in children.

Acute pericarditis usually presents with acute chest pain along with fever, chills, dyspnoea, dysphagia, and excessive sweating. An important physical sign for this condition is **pericardial rub**, which is the sound produced by rubbing of the inflamed visceral and parietal layers on auscultation.

Chronic pericarditis, e.g., due to TB, can take a slower course and end up with fibrosis and even calcification of the pericardium (constrictive pericarditis).

Pericardial effusion is the abnormal accumulation of fluid within the pericardial cavity. Common causes include pericarditis, congestive heart failure, chest trauma, aneurysm of the thoracic aorta, kidney failure, and lung cancer. Pericardial effusion is potentially life-threatening but may be treated by performing **pericardiocentesis**. This involves inserting a needle at Larry's point* into the pericardial cavity and aspirating the fluid from that region.

* **Note: Larry's point** is at 45 degrees to the skin, at the junction between the xiphoid process and costal margin. The needle must be aimed towards the left shoulder, and the procedure must be carried out under ultrasound guidance.

Cardiac tamponade occurs due to build-up of fluid, such as blood (haemopericardium) in the pericardial cavity. Fluid build-up exerts pressure on the heart, which reduces normal expansion of the ventricles. This prevents appropriate contraction of the heart. As a result, cardiac output declines, causing reduced perfusion to target organs, which can subsequently lead to organ failure and death. Common symptoms include acute chest pain which radiates to neck, shoulders, back, or abdomen (see "Innervation of the Pericardium"). Other symptoms and signs include dyspnoea, tachycardia, tachypnoea, pallor

(Continued)

(due to low cardiac output)/blue (cyanosis) skin discolouration, excessive sweating, and fainting.

Three clinical signs which are collectively referred to as **Beck's triad** are used to help identify cardiac tamponade (the "three Ds"). These signs are:

- *Muffled heart sounds*: the extra fluid in the pericardial cavity acts to insulate, and therefore reduce, the amplitude of the heart sounds detected by auscultation.
- *Hypotension*: a result of reduced cardiac output (remember, blood pressure is the product of cardiac output and total peripheral resistance).
- *Raised jugular venous pressure*: blood accumulates in the veins leading to a pressure rise within, since the heart is unable to pump the blood that returns to the heart via these veins.

Beck's Triad of Acute Cardiac Tamponade

3 Ds

- Distant or muffled heart sounds
- Decreased arterial blood pressure
- Distended jugular veins

Heart Tissue

The heart is primarily composed of the epicardium, myocardium, and endocardium.

Epicardium forms the outermost layer and is synonymous with the serous visceral pericardium. It is made up of loose fatty connective tissue, nerves, and blood vessels, including coronary arteries.

Myocardium consists of cardiac myocytes (involuntary striated muscle), which is involved in carrying out cardiac contractions.

Endocardium is the thinnest and innermost layer which lines the heart valves. It consists of endothelial cells and collagen. It is rich in Purkinje fibres, which are essential for conduction of electrical impulses. (Purkinje fibres are modified cardiac myocytes, not nerves.)

Coronary Circulation

The heart receives oxygen and nutrients via the **coronary arteries**. The coronary arteries are functionally end arteries; however, during coronary occlusion, coronary collaterals are a potential alternative blood supply in areas of ischaemia.

The coronary arteries arise from the ascending aorta (coronary arteries are the first branches of the aorta). The two main branches are the **right** and **left** coronary arteries.

Right coronary artery:

- Arises from the anterior aortic sinus of the ascending aorta and runs initially between the right atrial appendage and the pulmonary trunk.

- Descends in the right atrioventricular groove and wraps around the diaphragmatic surface of the heart to the cardiac crux (the junction between the interatrial and interventricular grooves) to become the **posterior (inferior) interventricular artery**, supplying the posterior one-third of the interventricular septum and atrioventricular (AV) node. This is called **right dominance** and occurs in about 60% of people. Left dominance is where the posterior interventricular artery originates from the circumflex artery (**Figure 4.36**). This occurs in about 30% of people. In about 10% of the population the right coronary artery and the circumflex artery contribute to the posterior interventricular artery.
- The right coronary artery supplies branches to the right atrium and ventricle, and its marginal branch runs on the lower border of the heart toward the apex.
- Also supplies the artery of the sinoatrial (SA) node (the pacemaker of the heart). Therefore, inferior myocardial infarction (MI) results in bradycardia or AV block.

Left coronary artery

- Arises from the left posterior sinus of the ascending aorta and runs in the left AV groove. After a short course it branches into the circumflex and left anterior descending (LAD) arteries. It provides most of the blood supply to the left atrium and ventricle.
- Its calibre is larger than the right coronary artery.
- **The LAD artery (left anterior interventricular)** runs in the anterior interventricular groove and is directed towards the apex of the heart. The LAD provides the main blood supply to the left ventricle and the anterior two-thirds of the interventricular septum. It may continue in the interventricular groove to meet the terminal branches of the posterior interventricular artery.
- **The circumflex artery** runs in the AV groove posteriorly, after winding around the left border of the heart. It supplies branches to the left atrium and ventricle. **Left dominance** is where the posterior interventricular artery originates from the circumflex artery (**Figure 4.36**).

Cardiac perfusion is limited to diastole, because the aortic valve opens during systole, its cusps cover the ostia that lead to the coronary arteries, which prevents blood flow into the coronary arteries. Furthermore, the rapid ejection of blood limits the amount of time blood can pool around the ostia and enter the coronaries.

The blood supplied is drained by the coronary veins. These veins drain into the **coronary sinus**, which lies in the **posterior cardiac sulcus** located posteriorly in the atrioventricular groove (**Figure 4.37**).

The coronary sinus is formed by the junction of the **great cardiac vein** (which runs from the apex of the heart through the anterior interventricular groove and drains both the ventricles and the left atrium) and the oblique vein of the left atrium.

Two main veins drain into the **coronary sinus**:

- *Middle cardiac vein*: runs in the posterior interventricular groove. It drains the posterior aspect of the heart.
- *Small cardiac vein*: runs in the posterior AV groove and drains the right atrium and right ventricle.

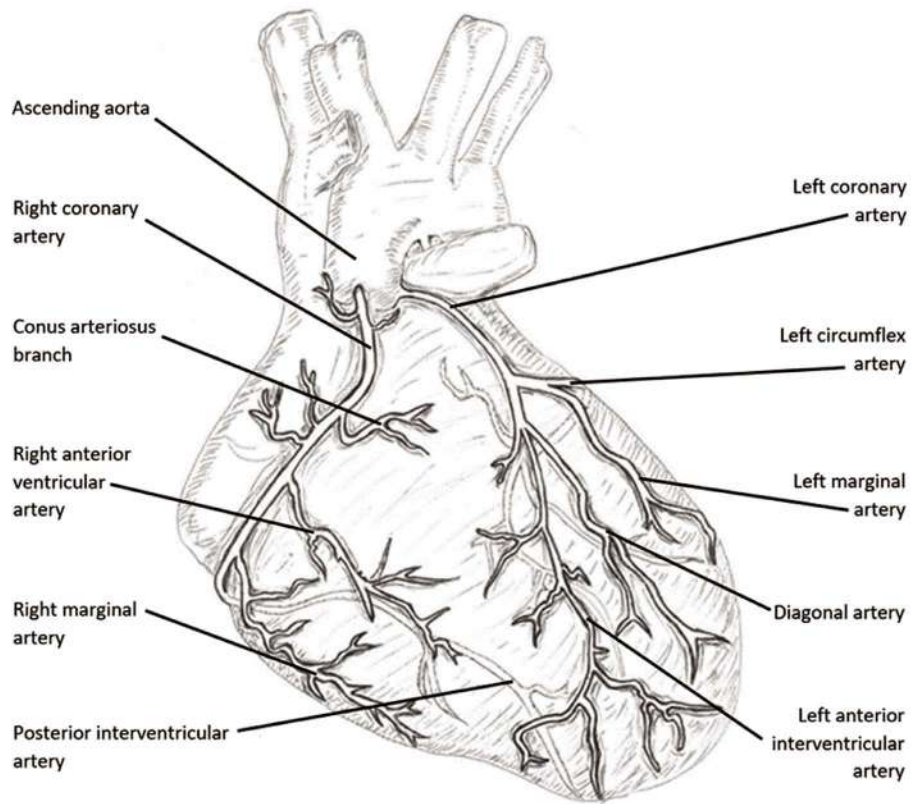


FIGURE 4.36 Coronary arteries of the heart. (Courtesy of Alina Humdani.)

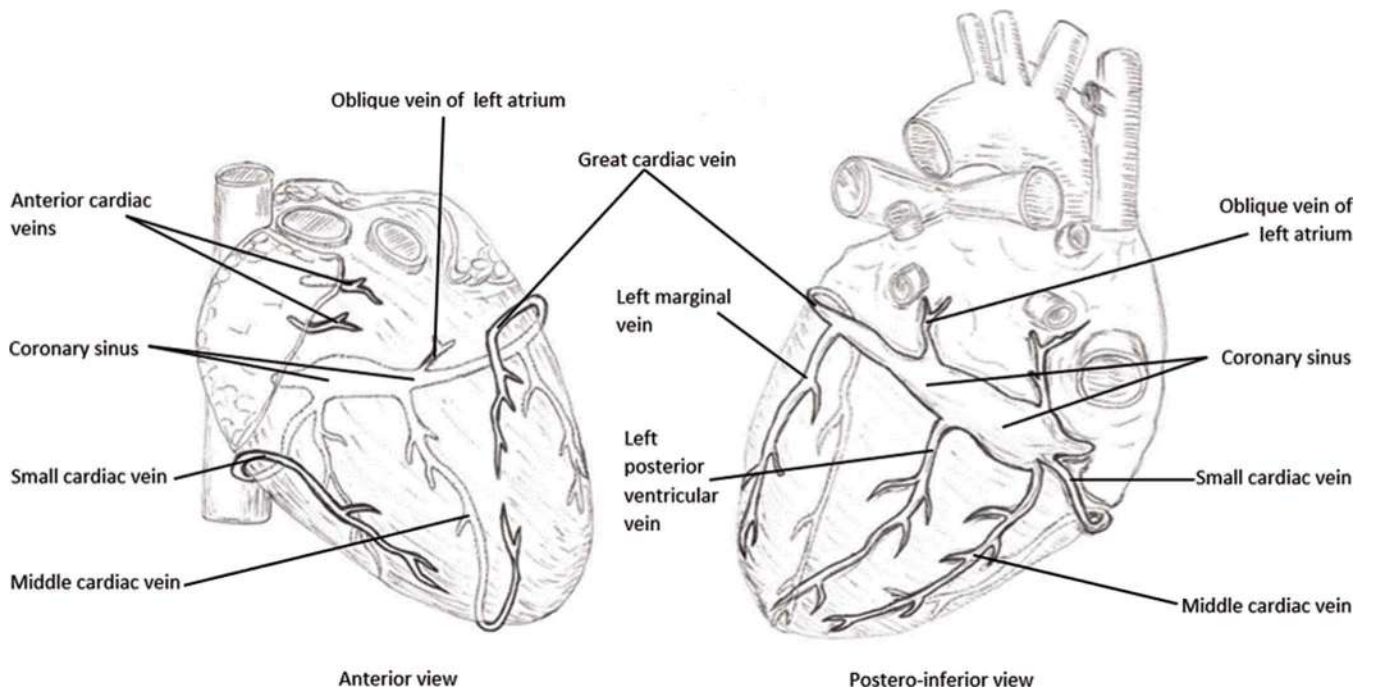


FIGURE 4.37 Coronary veins of the heart. (Courtesy of Alina Humdani.)

Blood in the coronary sinus drains into the right atrium via an opening between the tricuspid valve and the inferior vena cava (IVC).

CLINICAL NOTES

MYOCARDIAL INFARCTION

Commonly known as a heart attack. This condition is caused by lack of perfusion to heart tissue, which is usually due to thrombosis secondary to atherosclerosis of the coronary arteries. With massive MI, sudden death can occur before reaching the hospital.

The most serious MIs are caused by occlusion of the LAD artery, which therefore had the infamous nickname of “the widow maker”.

MI is clinically manifested in most patients as severe central chest pain, which may radiate to the arms, neck, or even the jaw. The **afferent pain fibres**, activated by a reduced arterial blood supply, reach the central nervous system via the **sympathetic nerves of the cardiac plexus** within the upper four thoracic spinal nerves. The pain is felt in the skin areas supplied by those nerves (T1–T4).

MI of the diaphragmatic surface of the heart may be misdiagnosed as due to gastric causes. MI should be part of the differential diagnosis of patients with epigastric pain and, if suspected, electrocardiogram (ECG) and plasma troponin estimation should be requested.

ANGINA PECTORIS

Angina is chest pain caused by temporary cardiac ischaemia (lack of oxygen supplied to the cardiac tissue). It is characterised by pain on exertion and relieved by rest (compare with intermittent claudication of the lower limb muscles). It is indicated by an ST depression in an ECG. By contrast, an MI is indicated by an ST elevation.

NSTEMI: non-ST elevation MI is caused by partial obstruction of coronary arteries.

STEMI: sT elevation MI is caused by complete obstruction of coronary arteries.

Coronary angiogram: a special X-ray procedure under fluoroscopic control which delineates the coronary arteries for blockage by injecting a radio-opaque dye through a long catheter inserted into the femoral artery at the groin or the radial artery at the wrist. The tip of the catheter is carefully threaded into the coronary arteries through their ostia. This procedure is performed as a matter of urgency, before irreversible death of the cardiac muscle (MI) occurs.

Occlusions are treated by using **balloon angioplasty**, a technique where an inflatable balloon is used to widen the artery. A **stent** may then be placed to hold the artery open. Coronary angiography and catheterization plus interventions (balloon angioplasty and stenting) are major advances in treating myocardial ischaemia and aid in early revascularisation of the cardiac muscle before irreversible damage occurs.

Coronary artery bypass graft (CABG): if the blockage in the coronary arteries or their main branches is not amenable to balloon angioplasty, open surgery is indicated to bypass the blockage using a segment of vein (commonly the long saphenous vein), which is harvested from the leg, or occasionally, the internal thoracic artery can be used instead.

Nerve Supply of the Heart

The heart is myogenic in nature; however, the autonomic nervous system is also involved in controlling both the rate and the force of contraction. The nerve supply to the heart is by both pre-ganglionic sympathetic nerve fibres (upper four thoracic nerves – remember T1 is part of the brachial plexus) that synapse in the upper thoracic ganglia or ascend to synapse in the cervical ganglia and by the parasympathetic nerve fibres originating from the vagus nerve on each side. The sympathetic and parasympathetic innervation form the cardiac plexus.

Both are regulated by the cardioregulatory centre in the medulla and have opposite actions on the **SA node**. Sympathetic innervation increases the heart rate and contractility. However, the SA node can function autonomously by depolarising the cardiac muscles.

Ischaemic pain afferent fibres pass with the sympathetic fibres through the upper four thoracic nerves, so the pain is typically felt as band-like pain anteriorly and can radiate to the upper arm through T1.

Conductive System of the Heart

For the heart to contract, both nodal and non-nodal action potentials are required. These pacemaker potentials are generated at the SA node, which is located at the top of the right atrium, at the **crista terminalis** (the embryonic junction between the venous part and the right atrium proper). The impulses spread across the right and left atria simultaneously, down to the **AV node** found in the floor of the right atrium. The nodes (SA and AV) are specialised cardiac muscle fibres that are continuous with the rest of the organ.

Bachmann's bundle is a broad band of myocytes which passes from the right atrium between the SVC and the ascending aorta to the wall of the left atrium. Its function is to provide a preferential path for electrical activation of the left atrium, allowing it to contract simultaneously with the right atrium.

Pacemaker potentials produced by the SA node are delayed at the AV node to allow proper ventricular filling during late diastole. Nodal action potentials are then transmitted via the **bundle of His** towards the apex of the heart. Impulses are then released via **Purkinje fibres** leading to the contraction of the ventricles **from the apex upwards** (towards the base).

The bundle of His is a collection of heart muscle cells which transmit the electrical signal of the heart. It is located along the interventricular septum before branching further into right and left bundles which give rise to the thin Purkinje fibres, which distribute the electrical impulses to the ventricular muscles (**Figure 4.38**).

Electrical Conduction Diagnosis and Disorders

ECG: a diagnostic tool that shows electrical activity of the heart and any possible disorders (**Figure 4.39**).

- *P wave:* atrial contraction
- *QRS complex:* ventricular contraction + atrial relaxation
- *T wave:* ventricular relaxation
- *PR segment:* atrial nodal delay
- *ST interval:* time during which ventricles are contracting and emptying (systole)
- *TP interval:* time during which ventricles are relaxing and refilling (diastole)

ECG is part of the investigations to diagnose cardiac ischaemia and conductive heart problems such as heart block.

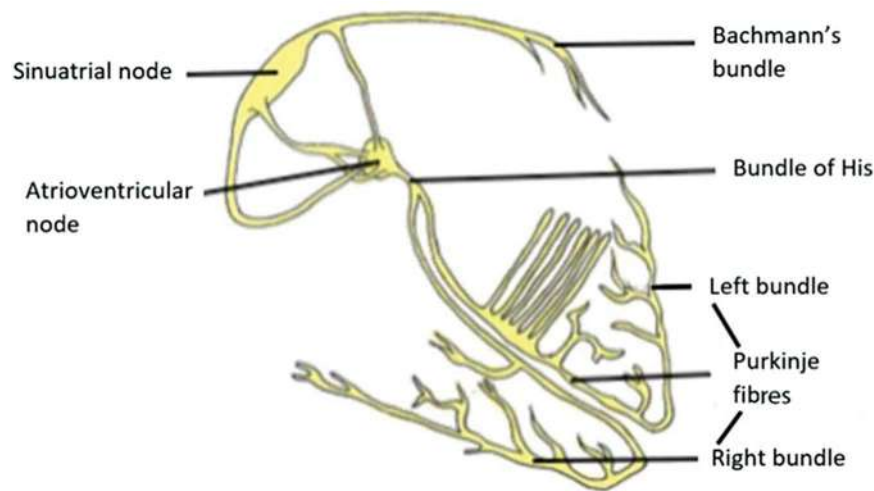


FIGURE 4.38 Electrical conduction system of the heart. There are several pathways that the impulses may take; however, the standard path is shown here. (Courtesy of Calum Harrington-Vogt.)

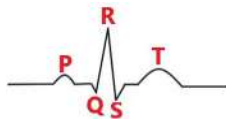


FIGURE 4.39 Normal sinus wave, which represents electrical cardiac conductance.

Heart Block

This is a common condition which is caused by the destruction or desensitisation of conductive pathways. It leads to an abnormal heart rhythm as the electrical signals are not transmitted, leading to unsynchronised contractions of different regions of the heart.

There are three types of heart block, each with increasing levels of severity.

Atrial Fibrillation

Atrial fibrillation (AF) is a rhythm characterised by uncoordinated, irregular, and rapid contractions of the atrial walls. Rapid contractions lead to pooling of blood within the atria. This can lead to the formation of a thrombus and the possible spread of emboli in the arterial system leading to ischaemia (e.g., cerebral, lower limb, or mesenteric ischaemia). Clinically, the pulse is irregularly irregular. The ECG shows typical features.

Virchow's triad refers to the three main factors that contribute to clot formation and mainly applies to venous thrombosis. Stasis of blood flow is of particular concern in AF (**Figure 4.40**).

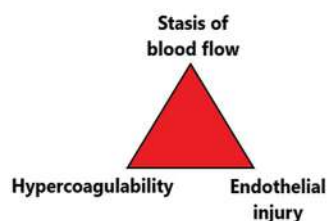


FIGURE 4.40 Virchow's triad.

Ventricular Fibrillation

Ventricular fibrillation (VF) is characterised by uncoordinated, irregular, and fast contraction of the ventricles. This condition normally results in cardiac output dropping to zero and can be fatal if not attended to immediately. There are several causes of VF, most commonly coronary artery disease (CAD). VF can be diagnosed by an ECG, which should show an increase in irregular QRS complexes without distinct P waves. This is commonly seen before the onset of MI and hence is a valuable diagnosis.

Internal Cardiac Anatomy

The heart has **four chambers: two atria and two ventricles**. The right atrium receives blood that is returned to the heart from the rest of the body via the superior and inferior vena cavae. It also receives blood from the coronary circulation (see earlier).

Atria

The right atrium is covered by an **appendage** called the **right auricle** (or right atrial appendage) which serves to increase the storage volume for blood and plays a minor role in the contraction of that chamber. The right atrium is anterior and to the right of the left atrium. The left atrium also has an **auricle** (left atrial appendage), although this appendage is much longer, narrower, and smaller in size.

The SVC enters the dome of the right atrium, while the IVC enters posteroinferiorly.

The wall of the right atrium is lined with **musculi pectinati** (Latin, "like a comb"), which gives it a rough appearance. The pectinate muscle ends at the **crista terminalis**, which is a C-shaped fibromuscular ridge, at which point the wall becomes smoother in nature and is formed by the junction of the embryonic sinus venosus and primitive right atrium. The crista terminalis marks the boundary between the right atrium proper and its appendage and the venous sinus. The musculi pectinati are parallel muscular fibres that extend anterolaterally from the crista terminalis to the auricle. On the external aspect of the right atrium, and corresponding to the crista terminalis, is a groove, the **sulcus terminalis**, which is the groove between the right atrium and right auricle. **The SVC, IVC, and coronary sinus open into the venous sinus** (represents the embryological sinus venosum). The

entrance of the SVC has no valve, in contrast to the opening of the IVC which is guarded by the flap-like eustachian valve (or valve of the IVC), which is well developed in embryonic life to direct blood from the right atrium to the left atrium through the foramen ovale.

The **fossa ovalis** is an oval depression seen on the septal wall of the right atrium. During fetal development, the fossa ovalis is open and is called the foramen ovale. This foramen allows blood to be shunted into the left atrium in order to bypass the lungs, as they are still developing, and the pulmonary circulation is not functional at birth. Once born, this foramen is sealed shut, preventing blood flow into the left atrium, as the lungs are now functional and can oxygenate the blood.

The venous component of the left atrium has four openings for the pulmonary veins (left and right superior and inferior), returning oxygenated blood to the heart. The mitral valve allows the oxygenated blood to flow into the left ventricle (Table 4.5). The musculi pectinati are fewer and smaller in the left atrium.

TABLE 4.5: Differences between the right and the left atrium

Right Atrium	Left Atrium
Auricle is larger	Auricle is smaller
Venous return via SVC, IVC, and coronary sinus	Venous return via four pulmonary veins
Blood leaves through TRICUSPID VALVE into right ventricle	Blood leaves through BICUSPID/MITRAL VALVE into left ventricle
Venous blood is deoxygenated	Venous blood is oxygenated

Atrial septal defect (ASD), also known as **patent foramen ovale**, is a condition which is characterised by the failure of the foramen ovale to close after birth. This results in diversion of blood from left to right due to the difference in pressure gradient, leading to the enlargement of the right atrium, right ventricle, and pulmonary trunk. Usually, this condition is asymptomatic, as in most cases, the patent foramen ovale is too small to cause haemodynamic disturbances.

Ventricles

The **ventricles** are the largest chambers with the most cardiac muscle. It is important to note that the left ventricle has a thicker myocardium than the right, as the left side pumps blood to the entire body, while the right-side pumps blood only to the lungs. The internal structure of the ventricles is similar.

The ventricle wall has a rough lining of muscle called **trabeculae carneae** (meaty ridges), which is equivalent to **musculi pectinati** found in the atria. The **papillary muscles** are part of the trabeculae carneae attached to both mitral and tricuspid valves via **chordae tendineae** (tendinous chords or “heart strings”). Papillary muscles contract **before ventricular systole** which allows the chordae tendineae to become **taut** and maintain tension when the ventricles contract. This tension prevents the valves from prolapsing, thus preventing backflow of blood into the atria.

Each ventricular wall becomes smooth leading up to the aortic and pulmonary valves (in the right ventricle, this area is called the **infundibulum** or **conus arteriosus**). The ventricles pump blood through the semilunar valves into the aorta and pulmonary trunk. The right ventricle contains the **moderator band** (or septomarginal trabecula), which spans between the interventricular septum and the anterior papillary muscle. This transmits the right branch of the AV bundle. The **tricuspid valve**

(right atrioventricular valve) is located in between the right atrium and the right ventricle.

Learning Point

Both ventricles have the same cardiac output, but the pressure of ejection is far greater on the left than on the right.

CLINICAL NOTES

VENTRICULAR SEPTAL DEFECT

This represents about 25% of all congenital heart defects. Ventricular septal defect (VSD) is an opening which is present in the interventricular septum that leads to shunting of blood from left to right, causing pulmonary hypertension and right heart failure.

TETRALOGY OF FALLOT

This is a congenital defect and one of the most common causes of cyanotic heart disease consisting of four separate defects (tetralogy) (Figure 4.41):

- VSD
- Pulmonary stenosis (right ventricular outflow tract obstruction [RVOTO])
- Overriding aorta (aorta is located over the VSD in between the right and left ventricles)
- Right ventricular hypertrophy

The cause of this condition is not known; however, it is common in people with Down’s syndrome.

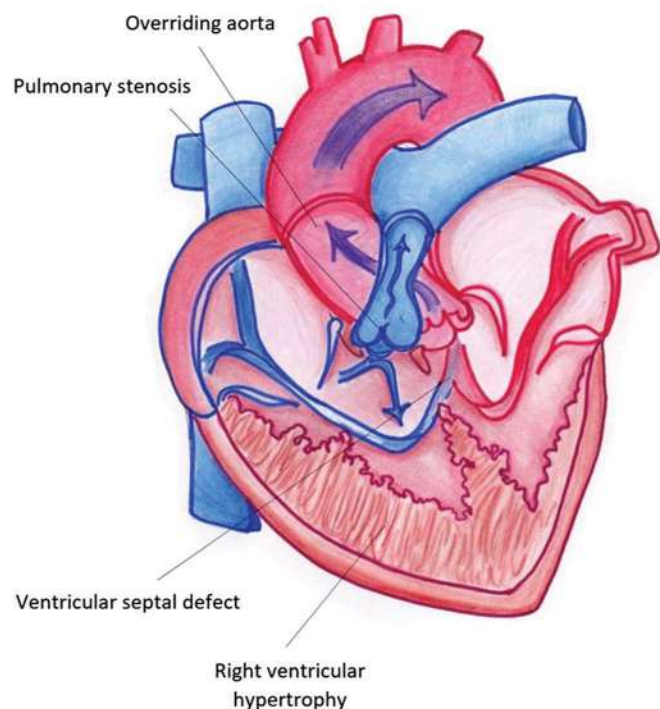


FIGURE 4.41 Tetralogy of Fallot. (Courtesy of Kathryn DeMarre.)

Heart Valves

The valves consist of **tendinous rings** (or annulus) of collagen and elastic fibres, which ensure that the valves do not collapse, with cusps (leaflets) that allow blood to flow in one direction only.

The aortic and pulmonary valves (semilunar valves) both have three cusps and allow blood flow into the great vessels (aorta and pulmonary trunk, respectively). The tricuspid valve is composed of three cusps: anterior, posterior, and septal.

The **mitral valve** (from the Latin *mitra*, “headdress” – a mitre is a bishop’s hat, which is two-sided) is the **only bicuspid valve in the heart**. This valve has a single cusp and a conjoined cusp. The space between each cusp is called the **commissure** (Figure 4.42).

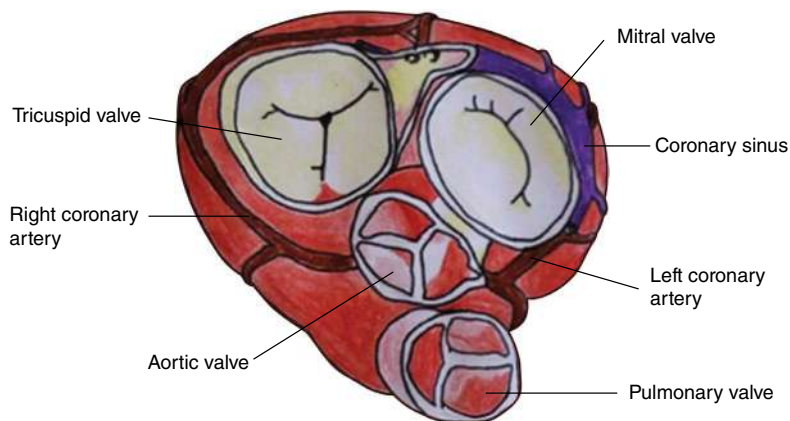


FIGURE 4.42 Cross-section of the heart at the level of T6. (Courtesy of Aditya Mavinkurve.)

The four valves can be auscultated superficially as shown (Figure 4.43):

- *Aortic valve*: second intercostal space, right sternal edge
- *Pulmonary valve*: second intercostal space, left sternal edge
- *Tricuspid valve*: fourth intercostal space, left sternal edge
- *Mitral valve*: left fifth intercostal space, midclavicular line

Heart murmurs are abnormal sounds heard on auscultation due to turbulent blood flow through stenosed or leaking valves. Echocardiography can be used to visualise the irregular flow as a non-invasive form of imaging and assessment. Other investigations include transthoracic echocardiography and transoesophageal echocardiography (TEE), which allows a description of the anatomical relation of the left atrium to the oesophagus,

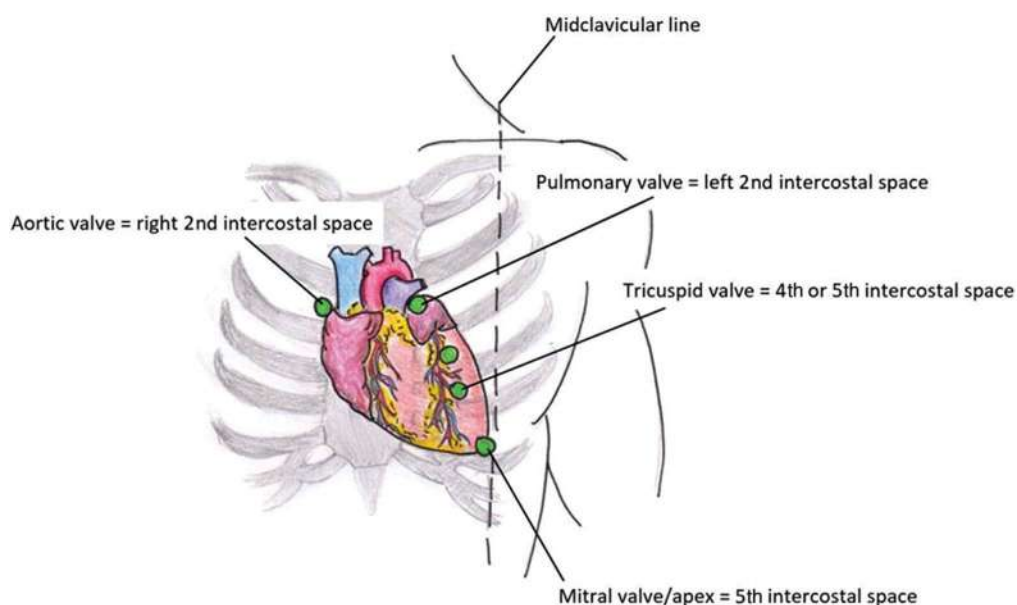


FIGURE 4.43 Locations of auscultation of the different heart valves. (Courtesy of Kathryn DeMarre.)

which is very important. Also, TEE is the best way to visualise the mitral valve.

Causes of valvular disease

- **Age-related calcification of a normal valve** occurs as a result of cumulative “wear and tear” due to valve movement over many years, which leads to endothelial and fibrous damage, causing gradual calcification and stenosis of an otherwise normal valve.
- **Bicuspid aortic valve** is a congenital abnormality whereby the valve is made up of only two leaflets. It occurs in approximately 1% to 2% of the population and has a strong association with aortic coarctation. Years of turbulent flow across this abnormal valve causes continual disruption of the endothelial and collagen matrix, resulting in gradual calcification. This develops by approximately 30 years of age with progressive stenosis.
- **Rheumatic heart disease** can arise from rheumatic fever, which is an inflammatory disease that develops after a streptococcal infection. It is the most common paediatric cardiovascular condition in developing countries. This inflammatory disease affects various connective tissues, especially the heart valves (with predilection to the mitral valve), joints, and skin. As the heart valves become inflamed and scarred over time, they lead to stenosis or regurgitation.
- **Vegetations** (mass of platelets, fibrin, and microcolonies of microorganisms). Infections by bacteria such as streptococci or fungi can cause vegetations to grow on the valve cusps, leading to conditions like **subacute infective endocarditis**, where vegetations get detached and spread via the bloodstream to different body organs and cause further complications (infective emboli). Infection may be introduced during brief periods of having bacteria in the bloodstream, such as after dental work, colonoscopy, and other similar procedures.

Great Vessels

The **superior vena cava (SVC)** is responsible for venous return from the thorax, the head and neck, and both upper limbs. It is formed by the union of the right and left brachiocephalic (innominate) veins.

Each brachiocephalic vein is formed by the union of the subclavian and the internal jugular veins at the root of the neck. The SVC drains blood into the right atrium, and **this junction is NOT guarded by any valves – it is almost continuous**. The azygos vein also drains into the SVC before the latter enters the pericardium. The azygos system connects the IVC and SVC outside the right atrium, giving a path for blood to return to the right atrium if either vena cava is blocked. Its main function is to drain the intercostal spaces and the posterior thoracic wall.

The **aorta** is the largest artery in the body (see **Figure 4.15**) and is split into four sections:

- **Ascending aorta:** this part arises from the left ventricle and immediately gives rise to the right and left coronary arteries. A dissecting aneurysm is formed when the inner layer (the intima) separates from the middle layer and

allows the blood to pass between them. The dissection can extend proximally (in this case compromising the origin of the coronary arteries), or distally. Both are life-threatening conditions requiring immediate attention. Aortic dissection is mostly related to hypertension and Marfan’s syndrome.

In the past (pre-antibiotic era) aneurysms of the ascending aorta correlated to syphilis (syphilitic aortitis), but nowadays this is very rare.

- **Arch of the aorta:** starts and ends at the level of T4, in front of the trachea, and arches to the left to continue as the descending aorta. The aortic arch gives rise to three branches: the brachiocephalic trunk, the left common carotid artery, and the left subclavian artery.
- **Thoracic descending aorta:** runs posterior to the oesophagus, through the posterior mediastinum. It gives rise to small arteries that supply the thoracic wall (posterior intercostal arteries) on both sides and several paired branches as it descends. In descending order, these include the bronchial, mediastinal, oesophageal, pericardial, and superior phrenic arteries.
- **Abdominal aorta:** the thoracic aorta becomes the abdominal aorta at the level of T12 when it passes through the diaphragm via the aortic hiatus. The abdominal aorta terminates at the level of L4, at which point it bifurcates to form the two common iliac arteries (see **Section 5** for further details).

The **pulmonary trunk** arises from the right ventricle and divides into the right and left pulmonary arteries, which carry deoxygenated blood to the lungs for oxygenation. The right pulmonary artery runs posterior to the ascending aorta and SVC, while the left pulmonary artery runs below the aortic arch and anterior to the descending aorta on its way to the root of the left lung.

CLINICAL NOTES

COARCTATION OF THE AORTA

Coarctation of the aorta is a congenital narrowing of the aorta, limiting the blood flow to the inferior part of the body. The narrowing most commonly occurs near the point of attachment of the ligamentum arteriosum. If the coarctation is inferior to this site, it is possible for the development of a collateral circulation to bypass the stenotic aorta through the intercostal and internal thoracic arteries.

PATENT DUCTUS ARTERIOSUS

Patent ductus arteriosus (PDA) is the persistence of the ductus arteriosus, which connects the left pulmonary artery to the aortic arch in embryonic life to bypass the lungs. PDA leads to highly pressured blood flow from the aorta to the pulmonary artery, leading to pulmonary hypertension. Normally, after birth, the ductus arteriosus is closed and replaced by the ligamentum arteriosum (remember the relation of the left recurrent laryngeal nerve to this structure).

THE BREAST

Introduction

The breast refers to the collection of tissue that lies anterior to the pectoralis major muscle and is a distinguishing feature of the class Mammalia. It develops as an epidermal appendage (ectodermal tissue) derived from the apocrine glands. Understanding the anatomy of the breast is incomplete without studying the anatomy of the axilla (see [Section 3](#), Upper Limb).

Boundaries

About two-thirds of the breast are located superficial to the pectoralis major and pectoral fascia, which covers the pectoralis major. The rest of the breast lies laterally over part of the serratus anterior (this is important when placing subpectoral breast implants into the retromammary space during breast augmentation).

The breast extends horizontally from the lateral border of the sternum to between the anterior and midaxillary lines. This is of surgical importance when performing a mastectomy. Vertically it extends from the second to sixth ribs.

The axillary tail of the breast extends superiorly and laterally, pierces the deep fascia at the lateral border of the pectoralis major, and enters the axilla ([Figures 4.44](#) and [4.45](#)).

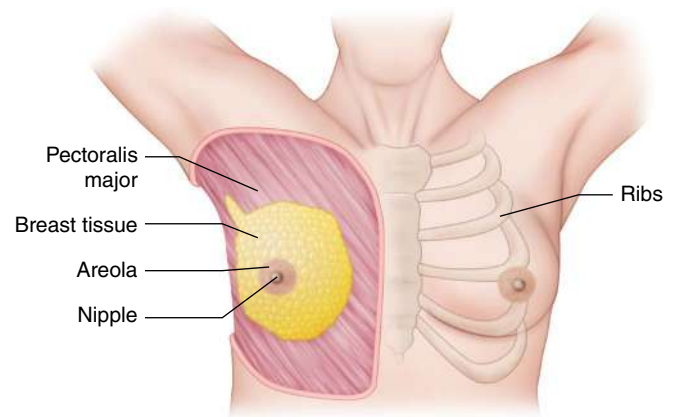


FIGURE 4.44 Anterior view of the breast and thorax. (Courtesy of Calum Harrington-Vogt.)

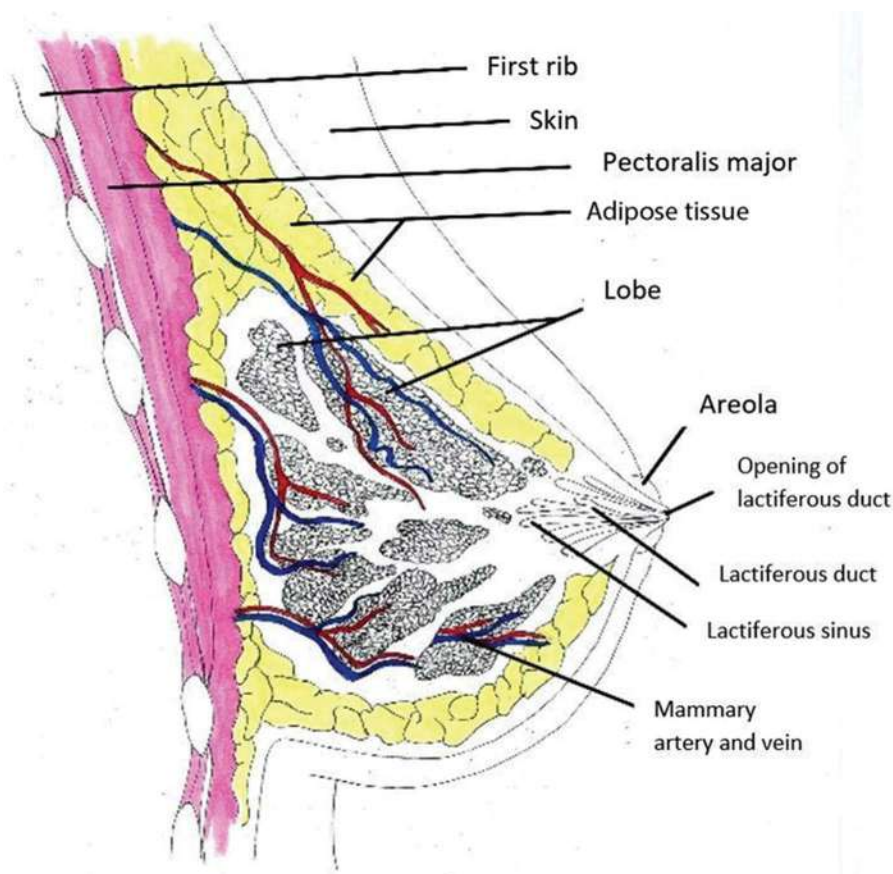


FIGURE 4.45 Sagittal section of the breast showing the lobes and lactiferous ducts. (Courtesy of Calum Harrington-Vogt.)

The **nipple-areola complex (NAC)** is usually located at the level of the fourth intercostal space and is therefore supplied by the T4 dermatome. This location alters with age, as the breast begins to sag (breast ptosis). The NAC comprises the **nipple** (a larger central projection that becomes more prominent during arousal and cold weather), surrounded by the **areola**, a pigmented circular area of skin, which includes smaller projections, called Montgomery's tubercles. The total diameter of the NAC usually spans 4 cm; however, this is variable. Appreciating the normal anatomy is important for recognising symptoms of breast cancer, e.g., recent inversion of the nipple, which may suggest the development of breast cancer in the lactiferous ducts underneath the NAC.

The smallest functional units of the breast are the acini. These contain secretory cells, which empty into ducts. About 10 to 100 acini form a lobule, and 20 to 40 lobules form a lobe. The breast is made up of 15 to 20 lobes embedded in fat. These drain via lactiferous ducts (15 to 20 from each lobe) into the nipple.

Cooper's ligaments are bands of connective tissue which support the breast in its upright position on the chest wall and run through the breast tissue to the dermis overlying the breast. Involvement of the ligaments by malignant cells causes skin dimpling. This becomes more evident by asking the patient to raise their arms.

Blood Supply

Arterial supply (Figure 4.46)

- Medially by perforating branches from the internal thoracic (mammary) artery (a branch of the subclavian artery which runs along the internal aspect of the internal

thoracic wall, lateral to the sternum) and small branches from the anterior intercostal arteries.

- The greatest contribution is from the perforating branches.
- Laterally by the pectoral branch of the thoracoacromial artery, the external mammary branch of the lateral thoracic artery, and branches from the subscapular artery.
- Perforating branches from the second, third, and fourth intercostal arteries.

Venous drainage

- Veins accompany the arteries and drain mainly to the axillary and subclavian veins.

Lymphatic drainage

- Ninety to ninety-five per cent drains to axillary lymph nodes (this is of surgical importance when assessing lymph node status (*vide infra*, sentinel node biopsy); 5% to 10% drains to the internal mammary lymph nodes (thoracic chain) and to the contralateral breast.
- Axillary lymph node levels: see [Table 3.14, Section 3, Upper Limb](#).

Nerve supply of the breast: anterior and lateral cutaneous branches of the second to the sixth intercostal nerves.

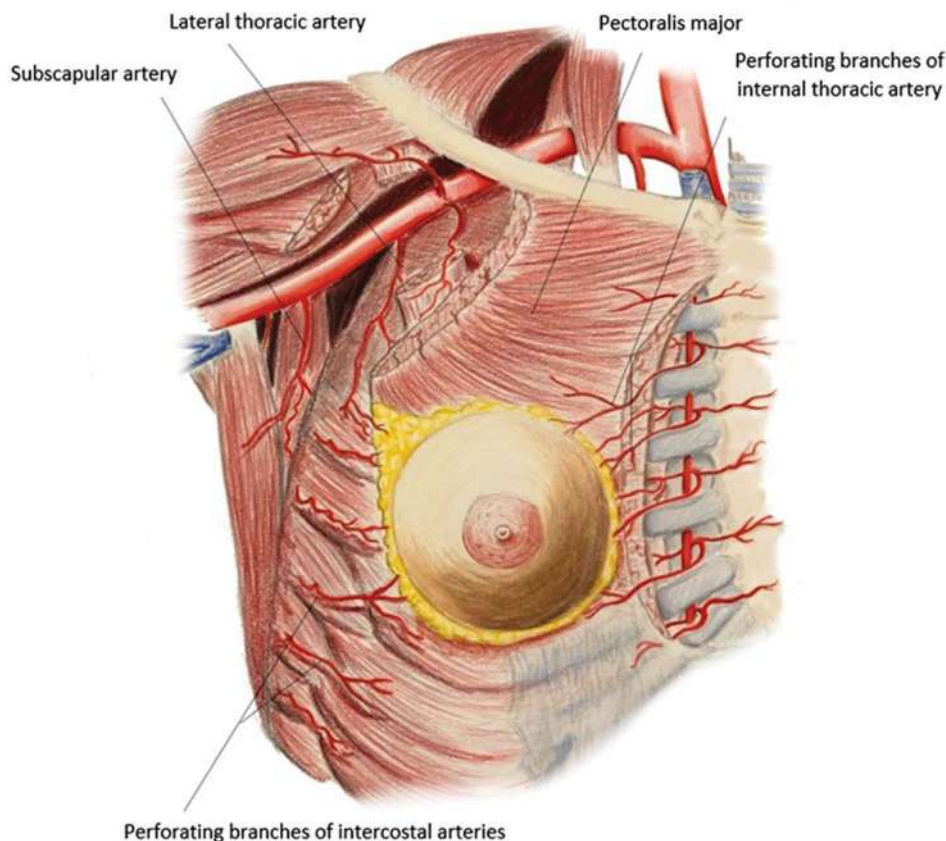


FIGURE 4.46 Arterial supply of the breast. (Courtesy of Kathryn DeMarre.)

Breast Cancer

Breast cancer is the most common cancer in females in the United Kingdom. There are around 56,000 new diagnoses of breast cancer in the UK each year according to Breast Cancer UK, which is over 150 cases diagnosed every day. Worldwide, it is estimated that more than 2.3 million women were diagnosed with breast cancer in 2020, and there were 685,000 deaths.

CLINICAL NOTES

- Interference with lymphatic drainage due to malignancy can cause skin oedema (*peau d'orange*).
- A rare but more aggressive type of breast cancer mimics mastitis (inflammation of breast tissue) and is called inflammatory cancer (Figure 4.47).
- One of the clinical pitfalls is diagnosing Paget's disease of the nipple as nipple eczema (Figure 4.48).
- Breast cancer often metastasises to axillary lymph nodes, bone, lungs, pleura, liver, and skin.
- Breast cancer in males (Figure 4.49) tends to infiltrate deep to the pectoral fascia, pectoralis major, and axillary lymph nodes, and therefore has a poor prognosis. Breast cancer in males is about 1% the rate in females; this is probably due to the fact that the volume of breast tissue in males is roughly 100 times less than in females. Another factor contributing to its poor prognosis is that men are generally not aware that it is possible and ignore symptoms, whereas women are more suspicious of lumps in their breast.



FIGURE 4.47 Inflammatory cancer of the left breast. (Courtesy of Qassim F. Baker.)



FIGURE 4.48 Advanced cancer of the right breast (Paget's disease of the nipple) showing erosion of the nipple, skin changes (*peau d'orange*), and increased size. (Courtesy of Qassim F. Baker.)



FIGURE 4.49 Advanced right breast cancer in a 63-year-old male. (Courtesy of Ali M. Hasan.)

Triple assessment is the term used in the assessment of breast problems and involves:

- *Clinical assessment:* history taking and examination of both breasts and axillae in addition to other body areas, if needed.
- *Pathological:* core biopsy of suspicious areas sent for histopathological examination; this procedure can be ultrasound-guided for small or impalpable lesions.

(Continued)

- **Radiological:** mammogram and/or ultrasound of the breast. Usually two views are taken: craniocaudal (CC) and mediolateral oblique (MLO). Ultrasound of the axilla may be added as well to check for suspicious lymph nodes (**Figures 4.50** and **4.51**).

The American College of Radiology introduced its original report on the Breast Imaging Reporting and data System (BI-RADS) in 1993 as a universal quality assurance tool to standardise breast imaging reporting and facilitate outcome monitoring. It utilizes a score of 0 to 6 to assess breast imaging (Magny et al., 2021).



FIGURE 4.50 Right breast MLO view mammogram showing suspicious opacity (*arrow*) in the upper part of the breast. (Courtesy of Thomas Marsh.)



FIGURE 4.51 Mammogram showing spiculated mass (*arrow*) and nipple retraction due to cancer invasion of the lactiferous ducts. (Courtesy of Ali M. Hasan.)

Mastectomy: removal of whole breast tissue for treatment of breast cancer or as a risk-reducing procedure (rather than the old terminology of prophylactic mastectomy) in patients with a genetic predisposition to breast cancer. In 2013, Hollywood actress Angelina Jolie underwent a double mastectomy to reduce her chances of getting breast cancer (*BBC News*, 2013).

Lumpectomy: also known as wide local excision (WLE), this is removal of the cancerous area in addition to a free margin around it as a part of breast-conserving surgery (BCS).

Sentinel lymph node biopsy: surgical removal of axillary nodes closest to the tumour and most likely affected if the tumour spreads. This can be achieved by either injection of blue dye or radioactive isotope, or both, in the breast (**Figure 4.52**). This procedure is intended to avoid unnecessary removal of lymph nodes, which can result in lymphoedema of the upper limb.

Axillary node dissection or clearance: removal of lymph nodes affected by the cancer spread, usually for level 1 and 2 lymph nodes.

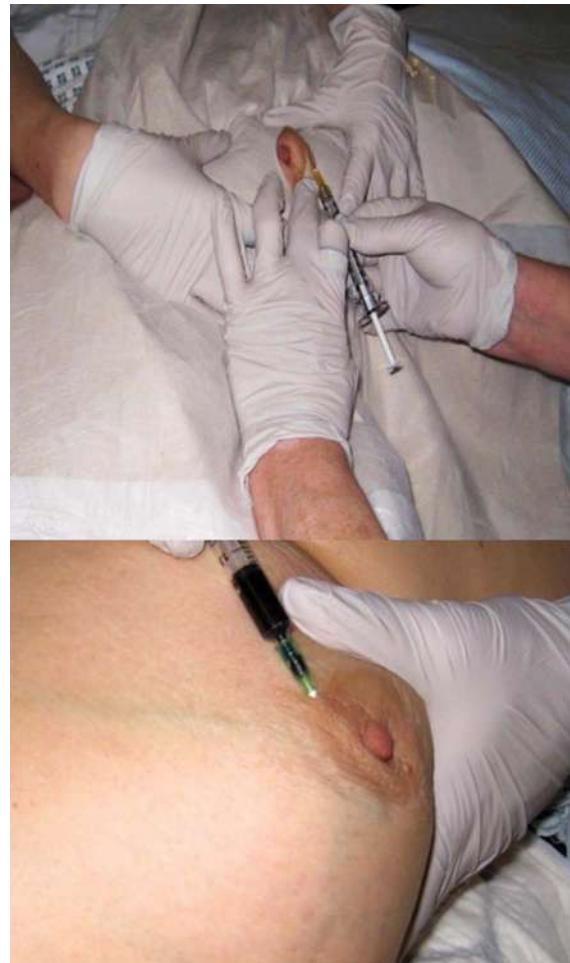


FIGURE 4.52 Injection of the radioisotope in the X-ray department (*top*) and blue dye in the theatre (patient is anaesthetised). (Courtesy of Qassim F. Baker.)

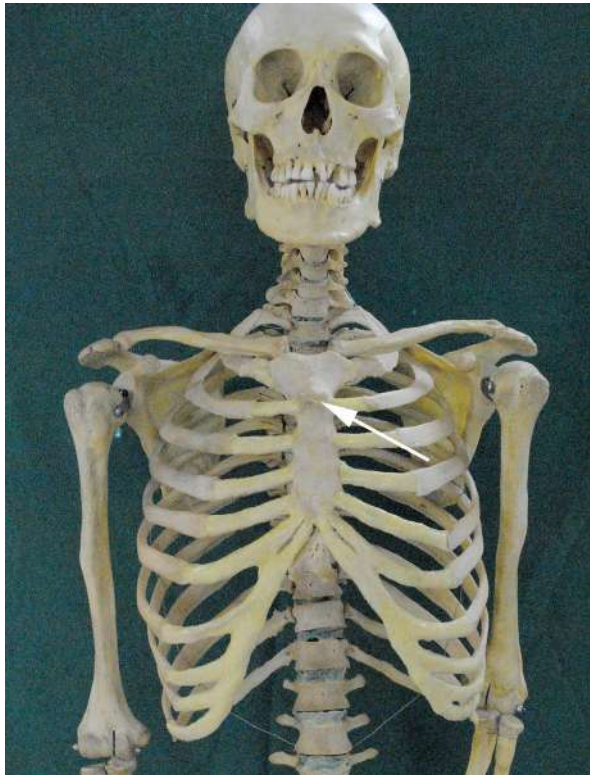
Revision Questions

The Thoracic Wall

- Q1. The second costal cartilage can be located by palpating the:
- Costal margin
 - Sternal angle
 - Sternal notch
 - Sternoclavicular joint
 - Xiphoid process
- Q2. The tubercle of the seventh rib articulates with which structure?
- Body of vertebra T6
 - Body of vertebra T7
 - Body of vertebra T8
 - Transverse process of vertebra T6
 - Transverse process of vertebra T7
- Q3. The serratus anterior is innervated by which nerve?
- Intercostal nerves
 - Lateral pectoral nerve
 - Long thoracic nerve
 - Medial pectoral nerve
 - Nerve to subclavius
- Q4. What is the order of the intercostal muscles from anterior to posterior?
- Q5. What type of rib is the fourth rib, and list three differences between this rib and the first rib?

Divisions of the Thoracic Cavity

Q1.

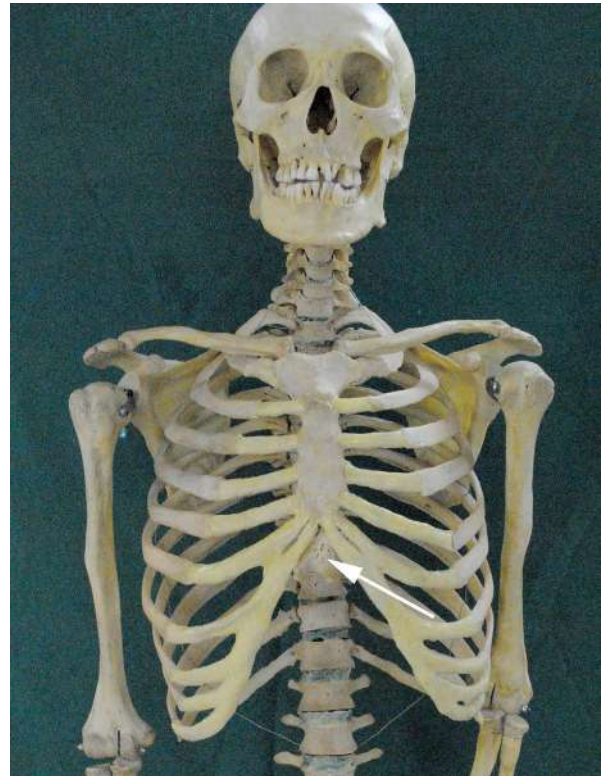


(Courtesy of Department of Anatomical Sciences, SGUL.)

- Q1A. What is this joint called?
- Costochondral
 - Manubriosternal
 - Sternoclavicular
 - Sternocostal
 - Xiphisternal

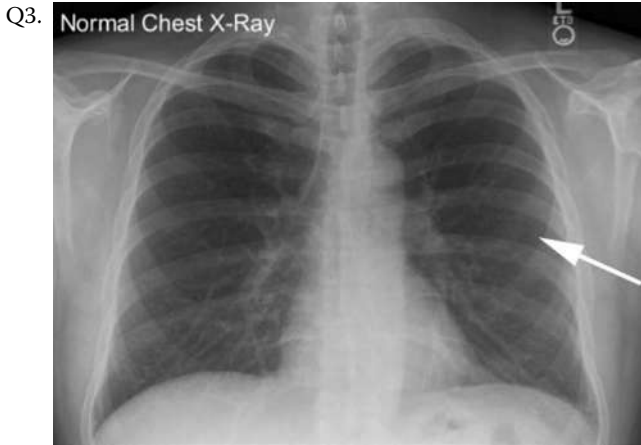
- Q1B. Between which two vertebral levels is this structure located?
- C7 and T1
 - T2 and T3
 - T4 and T5
 - T5 and T6
 - T6 and T7

Q2.

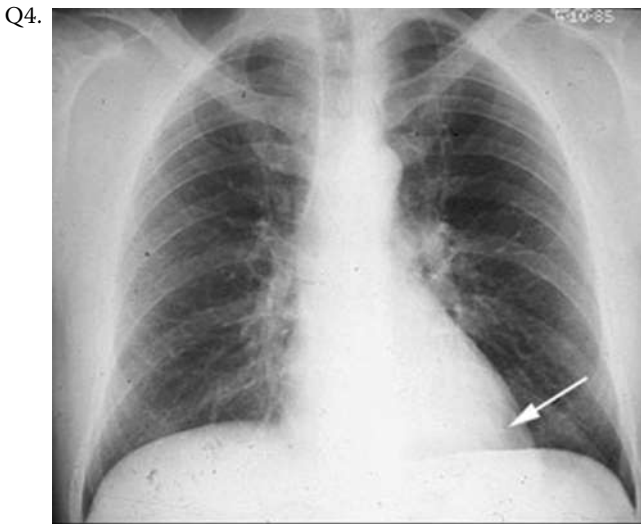


- Q2A. What structure is shown by the arrow?
- Angle of Louis
 - Body of sternum
 - Costal angle
 - Floating rib
 - Xiphoid process

- Q2B. The junction between the structure shown and the body of the sternum corresponds to which two vertebrae?
- T7 and T8
 - T8 and T9
 - T9 and T10
 - T10 and T11
 - T11 and T12

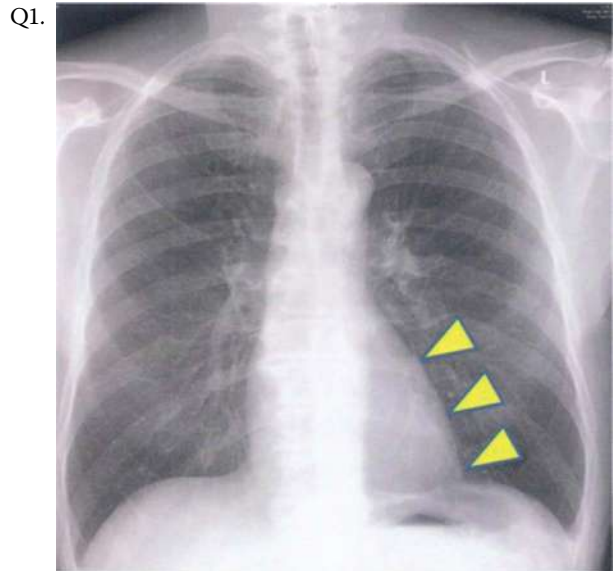


- Q3A. What nerve innervates the region marked by the arrow?
- Intercostal nerve
 - Long thoracic nerve
 - Phrenic nerve
 - Sympathetic trunk
 - Vagus nerve
- Q3B. What does damage of this nerve lead to?
- Bradycardia
 - Hemidiaphragm
 - Hoarse voice
 - Paralysis of intercostal muscles
 - Winged scapula



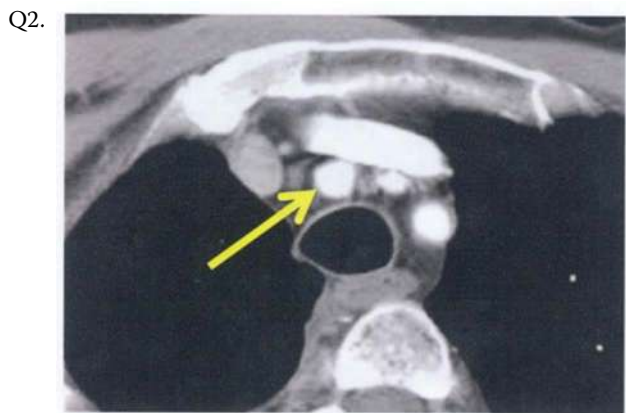
- Q4A. What structure is indicated by the arrow?
- Left atrium
 - Left ventricle
 - Right atrium
 - Right auricle
 - Right ventricle
- Q4B. In which anatomical compartment can this structure be found?
- Anterior mediastinum
 - Middle mediastinum
 - Pleural cavity
 - Posterior mediastinum
 - Superior mediastinum

The Heart



(Courtesy of Department of Anatomical Sciences, SGUL.)

- Q1A. Which of the following best describes the structure outlined by the arrowheads?
- Aorta
 - Left atrium
 - Left ventricle
 - Right atrium
 - Right ventricle
- Q1B. Which of the following best describes the sensory nerve supply to the region indicated by the arrowheads?
- Left cardiac sympathetic plexus
 - Left phrenic
 - Left vagus
 - Right phrenic
 - Right vagus

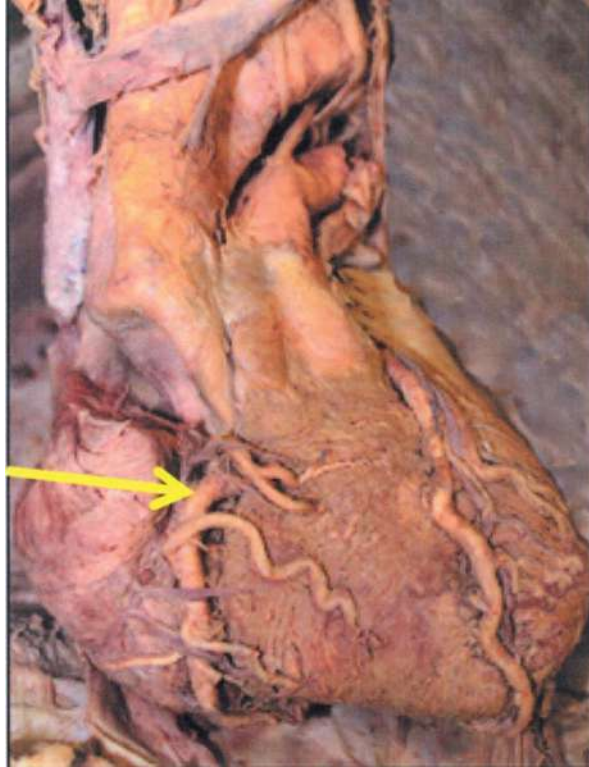


- Q2A. Identify the vessel indicated by the arrow.
- Brachiocephalic trunk
 - Left common carotid artery
 - Left subclavian artery
 - Right common carotid artery
 - Right subclavian artery

Q2B. Which of the following best describes the regions supplied by the vessel indicated by the arrow?

- Left head and neck
- Left upper limb
- Right head and neck
- Right upper limb
- Right upper limb and head and neck

Q3.



Q3. Which of the following best describes the artery indicated by the arrow?

- Anterior descending
- Circumflex
- Marginal
- Nodal
- Right coronary

The Lungs

- What nerve runs posterior to the hilum of the lung?
 - Accessory nerve
 - Phrenic nerve
 - Posterior intercostal nerve
 - Sympathetic trunk
 - Vagus nerve
- List three clinical signs of Horner's syndrome.
- What is the term used to describe the embryological origin of the ligamentum arteriosus?
- What is the normal pressure of the pleural cavity at the end of inspiration?
- How many pleural recesses are present in the thorax, and what are their names?
- What is the surface marking of the oblique fissure?
- What is the function of the pulmonary ligament?
- What is the average length of the adult trachea?
- What are the accessory muscles of respiration?

The Breast

- What is the main contributor to arterial blood supply of the breast?
- What is the significance of the levels of the axillary lymph nodes?
- What is the concept of sentinel node biopsy in the treatment of early breast cancer?
- What is meant by Cooper's ligaments of the breast, and what is their clinical significance?

Answers

The Thoracic Wall

- b
- e
- c
- External intercostals, internal intercostals, and innermost intercostals.
- True rib, first rib has scalene tubercle, first rib has no costal groove, and the first rib is joined to the sternum by a fibrous joint. The fourth rib has no scalene tubercle, has a costal groove, and the rib is joined to the sternum by a synovial joint.

Divisions of the Thoracic Cavity

- b
- c
- e
- c
- a
- d
- b
- b

The Heart

- c
- b
- a
- e
- e

The Lungs

- e
- Ptosis, miosis, enophthalmos
- Ductus arteriosus
- 0.5 kpa
- Two, the costodiaphragmatic and costomediastinal recesses.
- From the tip of the T3 or T4 spinous process posteriorly to the fifth intercostal space at the midaxillary line down to the sixth costal cartilage anteriorly.
- Its function is to allow the expansion of lung tissue during inspiration.
- Approximately 12 cm; the range is 10 to 13 cm in adult males and shorter in females
- The sternocleidomastoid, pectoralis major, and scalene muscles: anterior, middle, and posterior.

The Breast

- The main contributors to arterial blood supply are the perforating branches of the internal thoracic artery.
- The significance of the levels of the axillary lymph nodes is to assess the extent of lymph node involvement.

- A3. Sentinel node biopsy entails removal of the closest axillary lymph nodes to the cancer without removing the whole nodes, in the old days risking the development of arm lymphoedema.
- A4. These are strands of fibrous tissue which connect the skin overlying the breast to the pectoral fascia and are responsible for keeping the shape of the breast and preventing sagging (breast ptosis).

Further Reading

The Thoracic Wall

Intercostal Drain (Chest Drain/Pleural Drain) Insertion – Oxford Medical Education [Internet]. Oxford Medical Education. Available from: <http://www.oxfordmedicaleducation.com/clinical-skills/procedures/intercostal-drain/>

Rib Fracture: Practice Essentials, Pathophysiology, Epidemiology [Internet]. Emedicine.medscape.com. Available from: <http://emedicine.medscape.com/article/825981-overview>

Scoliosis

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5

ANATOMY OF THE ABDOMEN

Reviewed by Qassim F. Baker and David Sunnucks

Learning Objectives

- *Anterior abdominal wall*: rectus sheath, umbilical and para-umbilical hernia
- The peritoneal cavity (greater and lesser sac) and peritonitis
- Major blood vessels (abdominal aorta and its branches, inferior vena cava, portal vein)
- *Foregut*: coeliac axis, lower oesophagus, stomach, liver, biliary system, spleen and pancreas
- *Midgut*: superior mesenteric artery, small bowel
- *Hindgut*: inferior mesenteric artery and colon
- Posterior abdominal wall and the retroperitoneal space
- Kidneys and the adrenal glands
- Revision questions

What Is Meant by the Anterior Abdominal Wall?

The anterior abdominal wall refers to the area bounded above by the costal margins and the xyphoid process between them, laterally by the midaxillary lines, inferiorly by the anterior part of the iliac crests, the junction of the groin (including the inguinal canals) with the upper thighs, and the upper part of the symphysis pubis.

Divisions of the Anterior Abdominal Wall

The anterior abdominal wall can be divided into four quadrants (right upper, right lower, left upper, and left lower) by a midline vertical line and a horizontal line which bisects the umbilicus. Clinically, we speak about pain in the upper right quadrant due to, for example, gallstones, or right lower quadrant pain due to, for example, acute appendicitis.

The anterior abdominal wall can also be divided into nine regions by two imaginary horizontal (transpyloric and intertubercular) and two imaginary vertical (midclavicular) lines (**Figure 5.1**).

- **Transpyloric (Addison's) plane** is an imaginary plane midway between the jugular (suprasternal) notch and the upper border of the symphysis pubis. It passes through the pylorus of the stomach at the vertebral level of L1.
- **Intertubercular plane** passes between the tubercles of the iliac crests, which corresponds to the vertebral level of L5.

Layers of the Anterior Abdominal Wall

The anterior abdominal wall is composed of several layers. From superficial to deep, it includes:

- Skin
- Superficial fascia
- Muscles and their fascia

- Transversalis fascia
- Extraperitoneal tissue
- Peritoneum

Skin

Sensory supply is from the ventral rami of spinal nerves T7–L1. The umbilicus is present between the vertebral levels of L3 and L4 and at the dermatomal level of T10.

Superficial Fascia

The superficial fascia can be divided into two main layers:

- The outer fatty layer, referred to as **Camper's fascia**, continues downwards to the scrotum, where there is very little adipose tissue, and which contains the dartos muscle (continues to the labia majora in females).
- The inner membranous layer, called **Scarpa's fascia**, continues inferiorly into the perineal region, including the external genitalia, as the **superficial perineal fascia** (Colles' fascia), which attaches to the deep fascia of the thigh (fascia lata), about 1 inch below the groin and posteriorly to the perineal body and the posterior margin of the perineal membrane (see **Section 6**). This layer becomes thinner in the upper abdomen.

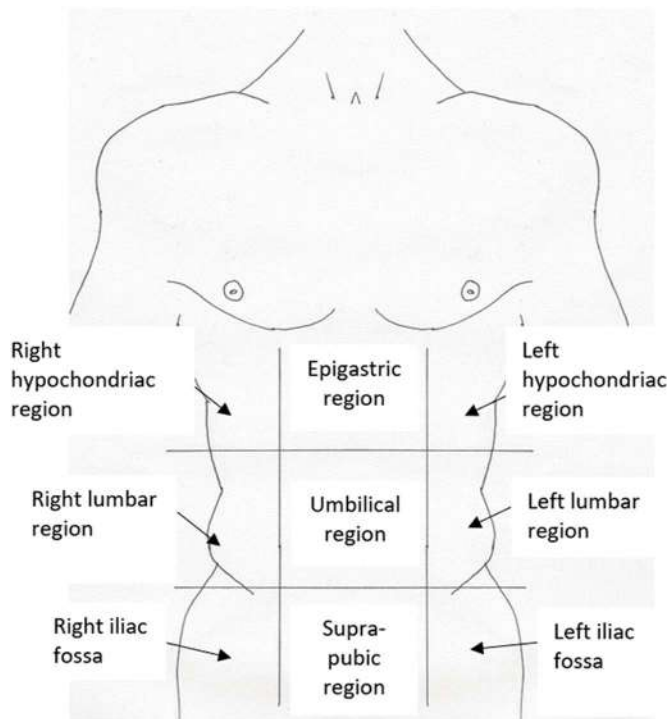


FIGURE 5.1 Divisions of the anterior abdominal wall. (Courtesy of Calum Harrington-Vogt.)

Muscles

Muscles in the anterior abdominal wall can be divided into two categories: vertical muscles and flat muscles (Figure 5.2).

- *Vertical muscles:* rectus abdominis on each side (*vide infra*) and pyramidalis (which is sometimes absent)
- *Flat muscles:* external oblique, internal oblique, and transversus abdominis

Rectus Abdominis

Anteriorly, the two recti are present within the rectus sheath. They are vertically aligned muscles which run parallel to each other. On each side, the rectus abdominis originates from the symphysis pubis and pubic crest. It inserts into the fifth, sixth, and seventh costal cartilages and xiphoid process. There are **three tendinous intersections** across the rectus muscle, which give rise to the six-pack appearance in thin individuals, which are adherent to the anterior aspect of the rectus sheath. The tendinous intersections are situated at the level of the umbilicus, xyphoid process, and midway between them. The **semilunar line** (linea semilunaris) is the lateral margin of the rectus abdominis.

The rectus abdominis muscle is supplied by the lower six thoracic nerves (T7–T12).

Action: flexor of the trunk.

Pyramidalis

A triangular-shaped muscle located anterior to the inferior aspect of the rectus abdominis. It arises from the pubic crest and symphysis and inserts into the linea alba. It is missing in some people.

The **linea alba** (Latin: “white line”) is a midline fibrous structure that binds the two rectus sheaths together and extends from the xyphoid process to the symphysis pubis and the pubic crest. It is formed by decussation of the aponeuroses of the two oblique muscles and the transversus abdominis (*vide infra*, the **midline incision**).

The **umbilicus** (navel or belly button) is a cicatrix (scar from a healed injury) sited almost in the middle of the linea alba and represents the fusion of embryonic structures. In embryonic life it transmits the umbilical cord and the urachus. After birth, the urachus is closed and forms the median umbilical ligament (if it stays open, it forms a fistula between the bladder and the umbilicus). Other causes of umbilical fistulas include patent omphalomesenteric duct (see the embryology of the gut and Meckel’s diverticulum).

- The left umbilical vein becomes the round ligament (ligamentum teres) of the liver after birth. The right umbilical vein starts to disappear at the fourth week of intrauterine life.
- The right and left medial umbilical ligaments are formed from the obliterated umbilical arteries.

The site just inferior to the umbilicus is the most common site for the insertion of ports in laparoscopic surgery (*vide infra*, umbilical hernia).

Rectus Sheath

The rectus sheath wraps around the vertical muscles. It is made up of the aponeuroses of external oblique, internal oblique, and transversus abdominis.

The aponeurosis of the external oblique unites with part of the aponeurosis of the internal oblique to form the anterior wall of the rectus sheath.

The other part of the internal oblique aponeurosis unites with that of the transversus abdominis to form the posterior wall of the sheath.

This arrangement of the aponeuroses changes midway between the umbilicus and the pubic symphysis, as all the aponeuroses unite anterior to the rectus muscles. At this point, the rectus muscle is now in direct contact with the transversalis fascia behind it. The point at which this change occurs is referred to as the **semi-circular fold of Douglas, or the arcuate line** (arcuate means bent like an arc or bow). The arcuate line is at the level of the anterior superior iliac spine (ASIS) (Figure 5.2).

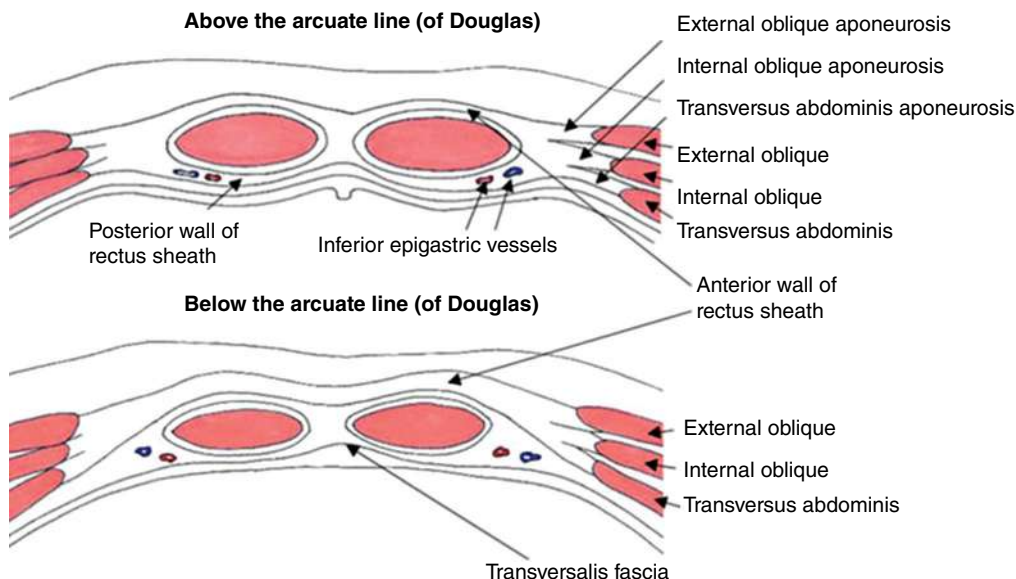


FIGURE 5.2 Arrangement of the rectus sheath above and below the arcuate line. (Courtesy of Calum Harrington- Vogt.)

The inferior epigastric vessels enter the rectus sheath at the arcuate line.

The **transversalis fascia** is the fascia which is deep to the transversalis muscle and outside the extraperitoneal tissue.

The **deep inguinal ring** is an opening in the transversalis fascia to transmit the spermatic cord in the male and the round ligament of the uterus in the female (see [Section 6](#) for more details).

The **extraperitoneal fat** is the layer between the transversalis fascia and the parietal peritoneum.

Flat Muscles

Laterally, there are three muscular layers (external oblique, internal oblique, and transversus abdominis); each muscle ends in a strong aponeurosis to form the rectus sheath on each side ([Table 5.1](#)).

External oblique:

- Fibres run medially and inferiorly towards the anterior aspect of the body (“hands in pockets” direction) ([Figure 5.3](#)).
- Fans out into a large aponeurosis, the **lower margin of which is the inguinal ligament** which runs between the ASIS and the pubic tubercle; see [Section 6](#), Pelvis and Perineum.

The **conjoint tendon** is the union of the lower fibres of the internal oblique and the tendinous part of the transversus abdominis, which is attached to the pubic crest and the pectineal line.

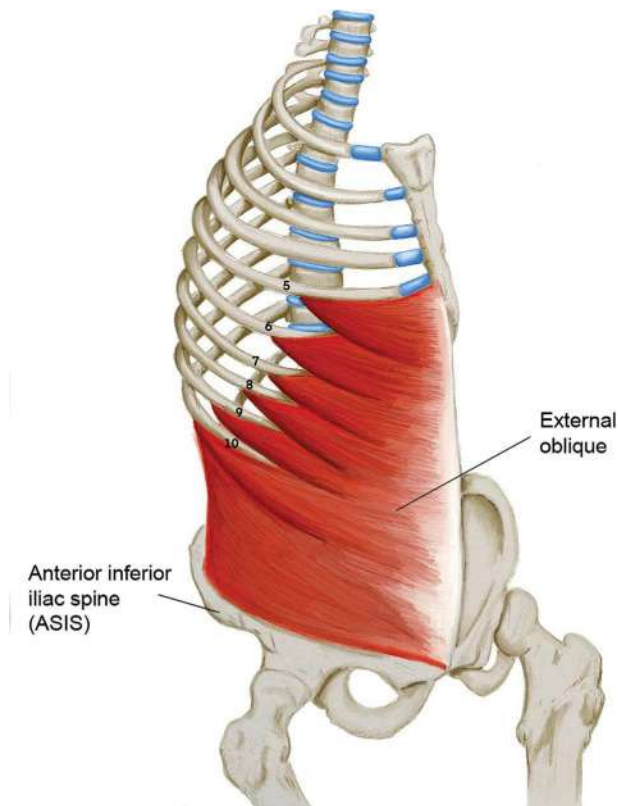


FIGURE 5.3 Origin of the right external oblique muscle. (Courtesy of Kathryn DeMarre.)

Internal oblique ([Figure 5.4](#)): fibres run medially and superiorly towards the anterior aspect of the body, i.e., at right angles to those of the external oblique.

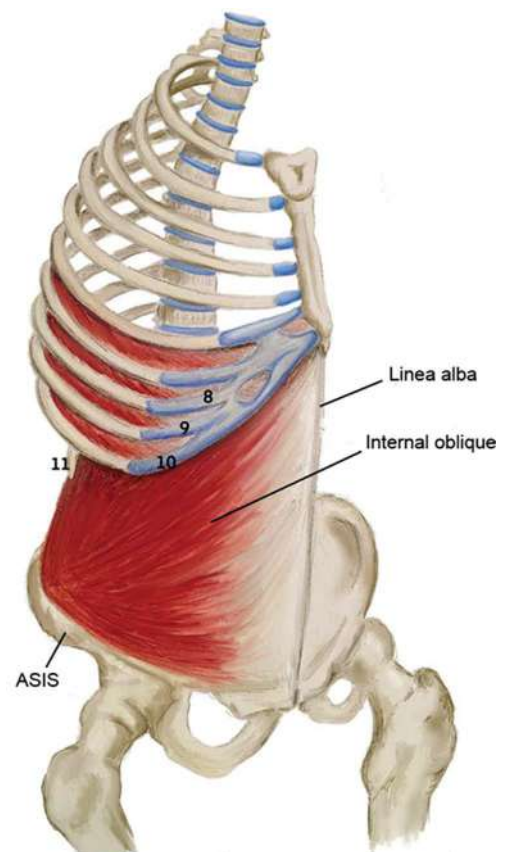


FIGURE 5.4 The right internal oblique muscle. (Courtesy of Kathryn DeMarre.)

The fibres of the **transversus abdominis** run horizontally from the back to the rectus sheath ([Figure 5.5](#)).

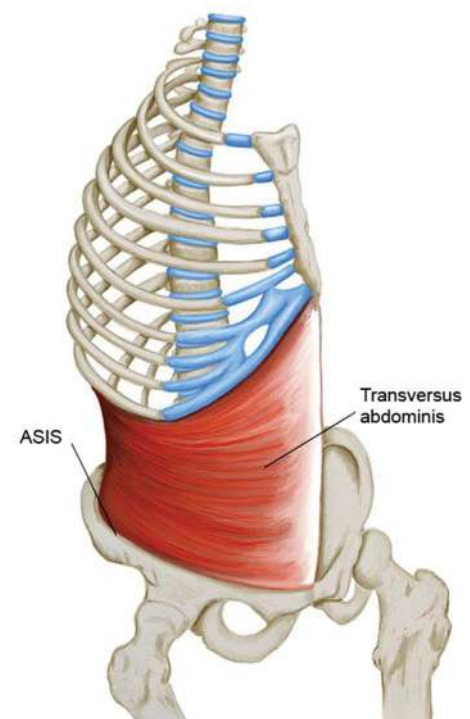


FIGURE 5.5 The right transversus abdominis. (Courtesy of Kathryn DeMarre.)

TABLE 5.1: Flat muscles of the lateral abdominal wall

Muscle	Origin	Insertion	Nerve Supply	Function
External oblique	Arises from the lower 8 ribs (ribs 5–12), interdigitating with the lower fibres of serratus anterior and latissimus dorsi muscles	Rectus sheath, pubic tubercle, anterior half of the outer lip of the iliac crest	<ul style="list-style-type: none"> • Intercostal nerves T7–T11 • Subcostal nerve T12 	<ul style="list-style-type: none"> • Contralateral rotation of torso • Compression of abdominal contents and increasing the intra-abdominal pressure (during forced expiration, defaecation, and vomiting) • Flexor of the trunk when contracting bilaterally
Internal oblique	Thoracolumbar fascia, anterior two-thirds of iliac crest, and to the iliopectineal arch (thickened fascia between the ASIS and the iliopectineal eminence)	<ul style="list-style-type: none"> • Ribs 10–12 and their costal cartilages, xiphoid process, anterior and posterior layers of rectus sheath, and conjoint tendon • The superior margin of the aponeurosis is attached to costal cartilages of seventh, eighth, and ninth ribs 	Intercostal nerves (T7–T11) Subcostal nerve (T12) Iliohypogastric nerve and ilioinguinal nerve (L1)	<ul style="list-style-type: none"> • Ipsilateral rotation of torso • Compression of abdominal contents
Transversus abdominis	Anterior two-thirds of the inner lip of the iliac crest, 7th–12th costal cartilages (interdigitating with the diaphragm) and from iliopectineal arch (deep to the lateral one-third of the inguinal ligament)	Anterior and posterior layers of the rectus sheath and conjoint tendon	<ul style="list-style-type: none"> • Intercostal nerves (T7–T11) • Subcostal nerve (T12) • Iliohypogastric and ilioinguinal nerves (L1) 	Compression of abdominal contents

Blood Supply

Blood supply of the rectus sheath is via the **superior epigastric artery** (one of the terminal branches of the internal thoracic artery, from the first part of the subclavian artery) and the **inferior epigastric artery** (branch of the external iliac artery and has the largest contribution). The inferior epigastric vessels form an important landmark in laparoscopic inguinal hernia repair surgery (see [Section 6](#)).

These arteries form a **free anastomosis** between the subclavian and external iliac arteries.

Lymphatic drainage of the skin above the umbilicus is via axillary lymph nodes, whilst lymphatic drainage below the umbilicus is via inguinal lymph nodes.

CLINICAL NOTES

Infections around the umbilicus can spread towards both the axillary and the inguinal lymph nodes. However, oedema of the abdominal wall can be caused by obstruction of the lymphatic vessels by malignant cells. Rarely, the cause is intrapelvic malignancy, such as ovarian cancer ([Figure 5.6](#)). (For teaching purposes, a female patient who opted to have a vaccination around the umbilicus for cosmetic reasons, ended up with swollen axillary and inguinal lymph nodes.)

The abdominal wall used to be the site for rabies vaccine prophylaxis and is one of the favourite sites for insulin injection in patients with diabetes mellitus type 1 (insulin dependent).



FIGURE 5.6 Oedema of the lower anterior abdominal wall due to lymphatic spread from advanced ovarian cancer in a 35-year-old patient. (Courtesy of Mohammed M. Habash.)

ANOMALIES OF THE ANTERIOR ABDOMINAL WALL

Omphalocele is a birth defect of the anterior abdominal wall, with evisceration of bowel loops and other intra-abdominal organs that are covered with peritoneum and the amnion.

Gastroschisis is similar to omphalocele with evisceration of the intra-abdominal organs through a defect near to the umbilicus where the organs are not covered by membranes.

ABDOMINAL WALL HERNIAS

A hernia is an abnormal protrusion of peritoneum (sac) and viscera (e.g., small bowel and omentum) through an opening in the abdominal wall (external hernia) or through an opening inside the abdominal cavity, e.g., a hole in the mesentery (internal hernia).

Hernias of the groin (inguinal and femoral hernias) are the most common type of abdominal wall hernias (see Sections 6 and 7).

VENTRAL HERNIAS

Hernias that occur at the anterior or lateral abdominal wall are referred to as ventral hernias. Examples of ventral hernias include umbilical, paraumbilical, epigastric, incisional, and Spigelian hernias.

Umbilical hernias are the most common types of ventral hernias. They can be both congenital and acquired. Umbilical hernias can arise after birth if the rectus sheath fails to close properly during embryological development.

Epigastric hernia is the protrusion of extraperitoneal fat through a defect in the linea alba above the umbilicus, which can present as a tender lump.

Paraumbilical hernia is an acquired condition which is more prevalent in females and occurs as a result of a defect in the rectus sheath, usually around the umbilicus. It is liable to strangulation of its contents (omentum, bowel); this constitutes a medical emergency (Figures 5.7 and 5.8).



FIGURE 5.7 Huge obstructed paraumbilical hernia in an 80-year-old female. (Courtesy Omar M. Khalaf.)



FIGURE 5.8 The sac of the paraumbilical hernia contains small and large bowels; this is the same patient as in Figure 5.7. (Courtesy of Omar M. Khalaf.)

Incisional hernia is a complication of abdominal surgery. It occurs through the scar at the site where an incision was previously made, including insertion of ports in laparoscopic surgery (port-site hernia).

Spigelian hernia is a rare type of hernia that occurs in an area of weakness at the semilunar line, commonly at the level of the arcuate line. This type of hernia is easily missed during a clinical examination (especially in obese patients) because the hernia is typically small (Figure 5.9).

(Continued)



FIGURE 5.9 Left Spigelian hernia. (Courtesy of Qassim F. Baker.)

NECROTISING FASCIITIS

Necrotising fasciitis is a serious, **rapidly spreading infection** of the fascia and is characterised by thrombosis of the cutaneous blood vessels resulting in the development of gangrene of the skin and subcutaneous tissue (Baker & Aldoori, 2009). It can be caused by several types of aerobic and anaerobic bacteria, including group A haemolytic streptococcus and *Bacteroides*. It is more common in immunocompromised patients, e.g., diabetic, alcoholic, cancer patients on chemotherapy, and HIV patients.

Patients with this condition will present with symptoms such as red/purplish skin pigmentation and ulceration, skin gangrene, and systemic manifestations of sepsis.

If it occurs on the scrotum and the perineum, it is called **Fournier's gangrene**.

Early diagnosis and treatment are of prime importance, as these infections are associated with high complications and mortality. The treatment includes radical wound debridement, which may need repeating after 24 hours (second-look surgery), in addition to vigorous systemic antibiotic therapy and resuscitation.

A **TRAM flap** (transverse rectus abdominis myocutaneous flap) is a **pedicled flap** of the skin, subcutaneous fat, and rectus abdominis muscle, used to reconstruct the breast following mastectomy.

A **DIAP flap** (deep inferior epigastric perforator) is a **free flap** of the skin and subcutaneous fat (but without harvesting the rectus abdominis muscle). It is transferred from the lower abdomen to the anterior chest wall, following mastectomy. This is a lengthy operation, using a microsurgical technique to anastomose the deep inferior epigastric vessels to blood vessels in the anterior chest, e.g., the internal thoracic vessels.

RECTUS SHEATH HAEMATOMA

- Bleeding within the rectus sheath, usually unilateral.
- Follows strenuous contraction and rupture of the epigastric vessels.
- May cause clinical confusion because this condition is an uncommon cause of abdominal pain, and therefore may be misdiagnosed. Imaging with ultrasound scan (USS) or computed tomography (CT) scan helps in reaching a diagnosis and avoiding unnecessary explorative laparotomy.
- Patients undergoing anticoagulant therapy are at higher risk, due to larger haematoma formation and comorbidities.

COMMON SURGICAL INCISIONS

With the advances in keyhole surgery (minimally invasive surgery), fewer open procedures are being performed. Open abdominal surgery remains an important part of emergency surgery for different indications, however, such as trauma and acute abdomen.

Midline incision

Midline incision, **through the linea alba**, gives excellent access to the abdominal cavity. It is relatively easy to perform (and to extend, if needed) and causes minimal blood loss; this is ideal for emergency surgery.

The skin incision skirts the umbilicus to avoid wound contamination and difficult wound closure.

Gridiron incision

Gridiron (McBurney's) incision is located one-third of the distance between the ASIS and the umbilicus.

It entails incising the aponeurosis of the external oblique along the wound and splitting the internal oblique and transversus muscle fibres to access the peritoneal cavity.

McBurney's incision is classically used for open appendectomy (Figure 5.10).



FIGURE 5.10 McBurney's point (1), umbilicus (2), ASIS (3). (Courtesy of Philip J. Addis.)

Lanz's incision is a modification of the gridiron incision, being in the crease line of the skin; it provides better cosmetic results.

Other incisions, such as subcostal (Kocher's incision), paramedian, and transverse, are less commonly performed.

Nowadays there is more emphasis on laparoscopic (keyhole) surgery to avoid unnecessary damage to the abdominal wall, less postoperative pain, quicker postoperative recovery, and shorter hospital stays.

Closure of abdominal incisions can be followed by complications of wound failure, e.g., wound infection, burst abdomen, and incisional hernia.

BURST ABDOMEN

Burst abdomen is one of the complications that can follow laparotomy, as the abdominal wound opens up. It can be complete dehiscence or partial (**Figures 5.11 and 5.12**).



FIGURE 5.11 Burst abdomen following laparotomy via a midline incision, with knuckle of small bowel protruding. (Courtesy of Wan Khamizar.)



FIGURE 5.12 Partial abdominal wall dehiscence following lower midline incision laparotomy for perforated appendix. Note the exposed rectus abdominis muscle. (Courtesy of Qassim F. Baker.)

Peritoneum

Visceral and Parietal Layers

The peritoneum is a serous membrane (single layer of mesothelial cells on a connective tissue base) which covers the abdominal cavity and its contents. It is composed of two continuous layers: the visceral and parietal layers.

The **visceral layer** surrounds the viscera in the abdominopelvic cavity, whilst the **parietal layer** covers the internal surface of the abdominal wall.

Embryologically, the parietal layer arises from the somatic mesoderm, whilst the visceral layer arises from the splanchnic mesoderm.

Due to its embryological origin, the parietal layer receives the same blood and lymphatic and somatic nerve supply as the region of the abdominal wall it covers, whilst the visceral layer receives the same neurovascular supply as the organs that it covers.

The parietal peritoneum is sensitive to changes in pressure, temperature, and stretching, whilst the visceral peritoneum is only sensitive to distension and chemical irritation. The parietal peritoneum of the abdominal cavity is supplied by the same somatic nerves that supply the overlying skin (T7–L1), except for the central part of the diaphragmatic peritoneum, which is supplied by the phrenic nerve, while the peripheral part is still supplied by T7. The pelvic peritoneum is supplied by branches from the obturator nerve (L2–L4).

Somatic pain felt from irritation of the parietal peritoneum is well localised, whilst visceral pain felt from damaging the visceral peritoneum is poorly localised and is referred to areas of the skin that are supplied by the same nerve root.

Peritoneal Cavity

The peritoneal cavity is a potential space which exists between the visceral and parietal layers of the peritoneum. It contains a small amount of fluid, which is important for lubrication of the two layers, *vide infra*, ascites.

The abdominal cavity is the largest serous cavity of the human body. The total surface area of the peritoneum in adults approximates the surface area of skin (1.5 to 2 m²).

The parietal peritoneum comprises about 30% of the whole peritoneum and receives its blood supply from the blood vessels of the abdominal wall.

The visceral peritoneum represents the rest of the whole peritoneal surface, and its arterial supply comes from the three arteries of the gut (coeliac trunk, superior mesenteric, and inferior mesenteric arteries).

Do not confuse the abdominal cavity with the peritoneal cavity, as the abdominal cavity is composed of both the peritoneal cavity and the space behind it (the retroperitoneal space).

Intraperitoneal Organs versus Retroperitoneal Organs

Intraperitoneal organs are present within the peritoneal cavity and are attached to the abdominal wall via a mesentery (e.g., the jejunum, ileum, and transverse and sigmoid colon) or greater and lesser omenta (the stomach and first inch of the duodenum). The liver is an intraperitoneal organ, except for the bare area posteriorly (see later). The spleen is an intraperitoneal organ.

Retroperitoneal organs are present behind the peritoneal cavity, such that the anterior surface of the respective organ is covered by parietal peritoneum. Examples include the kidneys, suprarenal glands, ureters, bladder, and upper rectum. The abdominal aorta,

including its terminal divisions (the common iliac and external and internal iliac arteries), inferior vena cava (IVC), and common and internal and external iliac veins are all retroperitoneal.

Secondary retroperitoneal organs are organs which were originally intraperitoneal. However, during embryological development, the mesentery of these organs became fused with the posterior abdominal wall, causing these organs to become retroperitoneal in nature. Examples include most of the duodenum, the pancreas, and ascending and descending colon (mnemonic: PCD for pancreas, colon, and duodenum).

Peritoneal Attachments

A peritoneal attachment is a double fold of peritoneum. Three types of peritoneal attachments can be found (mesentery, omentum, and peritoneal ligaments) (Figure 5.13).

A **mesentery** is a peritoneal attachment that usually connects an organ to the posterior abdominal wall. Examples include small bowel (jejunum and ileum), transverse mesocolon, and sigmoid mesocolon. It is important to note that mesenteries are important in transmitting neurovascular structures and lymphatics to their respective organs.

An **omentum** is a peritoneal attachment which connects the greater and lesser curvatures of the stomach to the transverse colon and liver, respectively.

Other examples of peritoneal folds are **peritoneal ligaments**, including the falciform ligament, coronary, and triangular ligaments (*vide infra*).

Greater Omentum

The greater omentum is an apron-like fold of peritoneum which arises from the greater curvature of the stomach and rolls up to the transverse colon. It hangs from the transverse colon and forms part of inflammatory masses, such as the appendicular mass in the right iliac fossa (RIF). This is why it is referred to as the “abdominal policeman”, because it helps to localise infection, preventing its spread across the peritoneal cavity.

- It can be divided into three main components (gastrocolic, gastrosplenic, and gastrophrenic ligaments) depending on its attachment point.

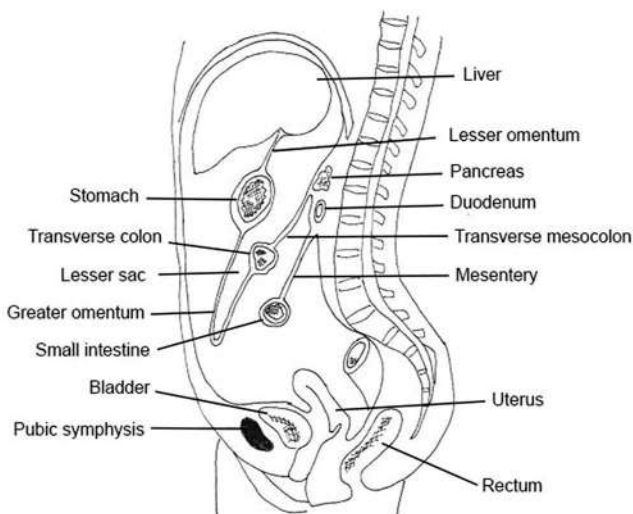


FIGURE 5.13 Sagittal section of the abdomen showing the arrangements of the peritoneum in a female. (Courtesy of Ho Chun.)

- It serves as a site for the storage of fatty deposits and is also involved in producing an immune response against foreign material (contains a macrophage collection).

Lesser Omentum

The lesser omentum is a double fold of peritoneum which arises from the lesser curvature of the stomach and the first inch of the first part of the duodenum and extends to the liver.

The lesser omentum is composed of two ligaments: the hepato-gastric and hepatoduodenal ligaments.

Three important structures pass in the free margin of the lesser omentum:

- Common bile duct (CBD)
- Common hepatic artery (anteriorly)
- Portal vein (posteriorly)

Bleeding from the gallbladder during cholecystectomy can be controlled by gentle bidigital pressure or after applying a soft clamp to the free border of the lesser omentum through the epiploic foramen (of Winslow) and is traditionally known as **Pringle’s manoeuvre**.

Divisions of the Peritoneal Cavity

The peritoneal cavity can be divided into greater and lesser sacs.

The greater sac forms the largest portion of the peritoneal cavity. It is divided into two compartments (supracolic and infracolic) by the mesentery of the transverse colon (the transverse mesocolon).

The two compartments communicate with each other via the right and left paracolic gutters.

The infracolic compartment is further subdivided into right and left infracolic compartments by the mesentery of the small intestines.

The lesser sac (omental bursa) is the space behind the lesser omentum and the stomach. It is the smaller of the two sacs.

Epiploic Foramen

The lesser sac communicates with the greater sac via the epiploic foramen or aditus to the lesser sac, which is **located posterior to the free edge of the hepatoduodenal ligament**.

Boundaries of the epiploic foramen are:

- **Anterior:** hepatoduodenal ligament (medial part of the lesser omentum)
- **Posterior:** parietal peritoneum, which covers the IVC
- **Superior:** visceral peritoneum, which covers the caudate lobe of the liver
- **Inferior:** visceral peritoneum, which covers the first part (superior aspect) of the duodenum

CLINICAL NOTES

Pseudocyst *vide infra*, anatomy of the pancreas.

Paracolic gutters are recesses between the lateral aspects of the ascending and descending colon and the lateral abdominal wall.

These gutters form pathways for the flow of ascitic fluid and intraperitoneal infections (e.g., following perforation of the appendix or a hollow viscus such as perforated duodenal ulcer).

PERITONITIS

Peritonitis is inflammation of the peritoneum which, in the majority of cases, follows the spread of infection from:

- Abdominal organs such as the vermiform appendix (acute appendicitis is still the most common cause of acute abdomen that needs surgical intervention).
- Perforated hollow viscera such as the stomach and duodenum (peptic ulcers), colon (colonic cancer, diverticulitis), ruptured gallbladder, and intraperitoneal urinary bladder rupture.
- Infection may spread from female genital organs (see [Section 6](#)).

Peritonitis and pus collection may stay localised to one part of the peritoneal cavity, such as the pelvis (pelvic peritonitis), or it may spread to a larger area (generalised peritonitis), which carries a poor prognosis due to septicaemia (absorption of bacterial toxins into the circulation) and the development of liver abscesses through the spread of infection via the portal vein (portal pyaemia).

Chemical peritonitis follows spillage of irritant substances such as gastric juices, including hydrochloric acid, with early perforated gastric or duodenal ulcer; bile (ruptured gallbladder or liver trauma); or urine (intraperitoneal bladder rupture) into the peritoneal cavity.

Blood collection in the peritoneal cavity (haemoperitoneum) causes peritoneal irritation.

Common causes of haemoperitoneum include:

- Bleeding from ruptured viscus (injury to solid organs, e.g., the liver or spleen)
- Ruptured ectopic gestation
- Vascular accidents such as ruptured aortic abdominal aneurysm

Symptoms of peritonitis include abdominal pain, nausea, vomiting, abdominal distension, and constipation or the passage of loose stools in pelvic peritonitis.

On examination, localised or generalised tenderness and rigidity of the abdomen can be noted. Bowel sounds (borborygmi) may be absent on auscultation of the abdomen.

Since abdominal pain becomes more intense with movement, patients often lie still (in contrast to patients with biliary or ureteric colic) and may flex their knees and hips in an attempt to alleviate their pain.

Ascites is excessive fluid collection in the peritoneal cavity. General causes include liver cirrhosis (the most common cause), heart failure, and constrictive pericarditis. Local causes commonly include metastatic spread from gastrointestinal (GI) and ovarian cancers, inflammatory causes like tuberculosis (TB), and pancreatitis. Aspiration of ascitic fluid (paracentesis) can be done for diagnostic and therapeutic reasons. In classical medical teaching remembering the 5Fs helps in reaching a clinical diagnosis of distended abdomen (Fat, Fluid, Flatus, Faeces, and Fetus).

PERITONEAL DIALYSIS (PD)

Due to the large surface area of the peritoneum, it can work as one of the options in treating chronic kidney disease (CKD). Commonly, haemodialysis is performed through a vascular fistula between the radial artery and a suitable vein, such as the cephalic vein, at the wrist. PD starts with the instillation of pre-packaged fluid (dialysate), through a Tenckhoff catheter into the peritoneal cavity. The dialysis occurs between the capillaries of the peritoneum on one side and the dialysate on the other side across the semipermeable membrane (the peritoneum).

Mesenteries

Mesentery of the small intestine (mesentery proper) begins at the duodenojejunal junction, and ends at the ileocaecal junction, attaching the jejunum and ileum to the posterior abdominal wall.

The colon is primarily intraperitoneal. Only the ascending and descending colon are (secondarily) retroperitoneal, and therefore without a mesentery. The caecum is intraperitoneal, but usually lacks a mesentery.

Mesoappendix is the mesentery of the appendix. The appendicular artery (a branch of the ileocolic artery) passes through the mesoappendix. Functionally, it is an end artery, and therefore thrombosis of the appendicular artery due to acute appendicitis will lead to ischaemia and gangrene of the appendix, leading to localised or generalised peritonitis.

Transverse mesocolon and **sigmoid mesocolon** are the respective mesenteries of the transverse and sigmoid colon.

The transverse mesocolon transmits the middle colic artery, whilst the sigmoid mesocolon transmits both the sigmoidal arteries (from the inferior mesenteric artery) and the superior rectal artery (a continuation of the inferior mesenteric artery).

The **transverse mesocolon** is attached to the posterior abdominal wall and runs obliquely from the lower pole of the right kidney, across the second part of the duodenum and the pancreas, to be attached to the upper pole of the left kidney, in close proximity to the lower pole of the spleen, as often there is a ligament which connects the two structures.

The root of the **sigmoid mesocolon** forms an inverted V shape. Its apex is anterior to the left ureter and is near the division of the common iliac artery. The mobility of both the transverse and sigmoid colon helps to bring them outside the abdominal cavity when creating a stoma (colostomy).

Peritoneal Ligaments

The **falciform** (Latin: “sickle-shaped”) **ligament**, a double peritoneal fold, attaches the ventral surface of the liver to the anterior abdominal wall. It is derived from the ventral mesentery of the fetus (ventral mesogastrium).

Along with the coronary ligament, it helps to divide the liver into **right and left anatomical lobes**. The falciform ligament splits into two layers. The right layer forms the upper layer of the coronary ligament and the right triangular ligament at its right corner. The left layer forms the upper layer of the left triangular ligament, which attaches the lateral part of the liver to the diaphragm.

The **round ligament** (ligamentum teres) runs along the inferior free edge of the falciform ligament. It is a remnant of the left umbilical vein which delivers oxygenated blood from the placenta to the growing fetus.

The **ligamentum venosum** is a fibrous remnant of the ductus venosus, a vein which shunts blood from the left umbilical vein to the IVC to bypass the liver sinusoids in fetal life. Note that the ligamentum venosum is not a peritoneal ligament.

The **coronary (crown-like) ligament** has anterior and posterior layers which converge on the right and left sides of the superior surface of the liver to form the **right and left triangular ligaments**, respectively. The area between the peritoneal layers of the coronary ligament is called the **bare area** of the liver (lymphatics from this area drain to the posterior mediastinal lymph nodes) (see **Figure 5.33**).

The liver can be mobilised during relevant surgical procedures by dividing these ligaments.

Umbilical Folds

Elevations of the peritoneum, referred to as folds, can found on the deep surface of the anterior abdominal wall.

A median fold, made up of the falciform ligament, can be found superior to the umbilicus.

One median, two medial, and two lateral folds can be found inferior to the umbilicus.

The median fold contains a remnant of the urachus (**median ligament**). The urachus is a canal that connects the bladder to the umbilicus in fetal life. This canal usually becomes obliterated after the 12th week of gestation to be replaced by the median ligament. Failure to do so leads to a patent urachus. Patients with this condition may leak out urine via their umbilicus.

The two medial folds contain medial umbilical ligaments which are remnants of umbilical arteries.

The two lateral folds are formed by the course of the inferior epigastric vessels toward the rectus sheath.

Blood Supply of the Abdominal Cavity

- *Arterial*: abdominal aorta and its branches
- *Venous*: IVC and hepatic portal vein

Abdominal Aorta

The descending thoracic aorta enters the abdomen through the aortic hiatus of the diaphragm at the level of T12 (tip: “aortic hiatus” has 12 letters). The aorta gives origin to:

- *Paired arteries*: middle suprarenal, renal, lumbar, inferior phrenic, and gonadal.
- *Unpaired arteries*: coeliac trunk (T12 level), superior mesenteric artery (SMA) (L2 level) and inferior mesenteric artery (IMA) (L3 level), and the small median sacral artery.

The IVC is to the right of the abdominal aorta, and both lie on the posterior abdominal wall.

The **abdominal aorta divides at the level of L4** into right and left common iliac arteries.

True aneurysm involves dilatation of all three layers of the arterial wall (intima, media, and adventitia). Subdivisions of true aneurysms include fusiform and saccular aneurysms, according to the shape. The main cause of abdominal aortic aneurysm (AAA) is atherosclerosis.

The common clinical problem which affects the abdominal aorta is leaking or ruptured AAA, most commonly infrarenal, i.e., below the origin of the renal arteries.

False or pseudoaneurysm is caused by leakage of the blood following a breach in the arterial wall but contained within the adventitia, commonly following a puncture of the wall – for example, false aneurysms of the femoral artery following intra-arterial catheterisation and injections in the groin in IV drug abusers.

Learning Point

AAA should be always looked for in patients above 60 years old who clinically present with abdominal, loin, or back pain. On examination it manifests as pulsatile supraumbilical swelling. Clinicians who overlook this condition risk the main danger of aneurysmal rupture with high morbidity and mortality. With advances in interventional radiology, most uncomplicated aneurysms are repaired with endovascular stenting (endovascular aneurysm repair [EVAR]). However, the open approach may still be necessary.

Inferior Vena Cava

The IVC is the biggest vein in the body and is formed from the union of the right and left common iliac veins **at the level of L5**.

It does not receive the corresponding veins of the coeliac trunk, SMA, and IMA, which drain to the portal vein, while the IVC receives veins corresponding to the paired arteries (see above).

The three hepatic veins drain into the IVC.

The IVC leaves the abdomen through the central tendon of the diaphragm **at the level of T8** (tip: “vena cava” has eight letters) to immediately join the right atrium.

Embryology of the Gut

The gut originates from the yolk sac. The endoderm contributes to the development of the epithelial layer, including the glands. The mesoderm forms the muscular layers and the serous layers.

The **stomach** is a dilated part of the foregut and originally has right and left surfaces related to the right and left vagus, respectively, and ventral and dorsal mesenteries. With progressive growth of the liver, the stomach rotates to the right, and the left surface becomes anterior and the right surface posterior. With the new position of the stomach, the stomach mesenteries become the greater and lesser omenta.

The **duodenum shares an origin from the foregut and midgut**. Originally, it has a dorsal mesentery, which later disappears, except for a small part at the duodenojejunal junction that forms the **suspensory ligament of Treitz**. The first part and a portion of the second part have a ventral mesentery, but only a small bit will remain as part of the lesser omentum that attaches to the first inch of the first part of the duodenum.

The midgut forms a loop to which the vitelline duct is attached. This loop is forced to herniate through the umbilical cord and leave the coelomic cavity because of the rapidly enlarging liver.

This loop has a cephalic part (jejunum and most of the ileum) and caudal part (rest of the ileum, caecum, vermiform appendix,

ascending colon, and transverse colon as far as the splenic flexure). The midgut rotates around the supplying artery (SMA) a total of **270 degrees anticlockwise** (90 degrees initially and 180 degrees after returning to the abdominal cavity). The caecum and appendix are initially under the liver but later descend to the right iliac fossa, and the ascending colon is formed. The transverse colon is formed anterior to the SMA and the second part of the duodenum, but the SMA passes over the third part of the duodenum (see later discussion on superior mesenteric syndrome).

The omphalomesenteric duct connects the midgut to the yolk sac. Failure of the duct to obliterate results in Meckel's diverticulum (see later), or umbilical fistula (see later discussion on the umbilicus), or rarely, the presence of a band that connects the ileum to the umbilicus, which may allow small bowel loops to twist around it and cause small bowel obstruction.

The mesenteries are related to most of the duodenum, and the ascending and descending colon fuse with the parietal peritoneum of the posterior abdominal wall. This explains why surgeons mobilise these parts during operative procedures, such as reflecting the duodenum medially (Kocherisation).

The gut is divided into three parts according to its arterial supply:

- *Foregut: coeliac trunk (also known as the coeliac axis)*
- *Midgut: SMA*
- *Hindgut: IMA*

Foregut

The foregut, anatomically speaking, includes the lower oesophagus, stomach, liver, spleen, pancreas, and duodenum down to the major duodenal papilla. The foregut originally extends from the buccopharyngeal membrane to the second part of the duodenum. It is the caudal portion that gives rise to the distal end of the oesophagus, liver, pancreas, spleen, stomach, and biliary system, which all appear during weeks 4 to 5 of fetal life. **All these structures are supplied by the branches of the coeliac trunk (Figure 5.14).**

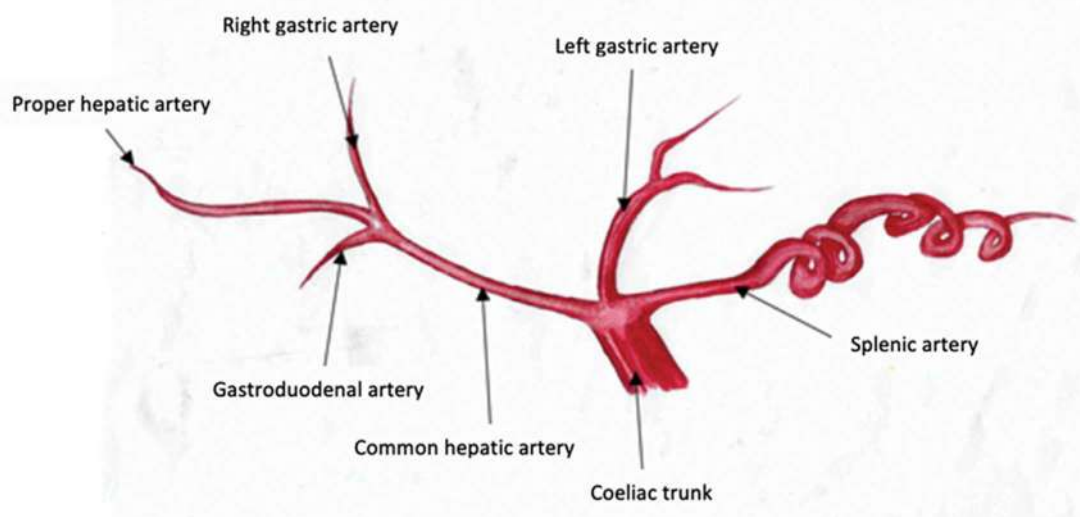


FIGURE 5.14 The branches of the coeliac trunk which supply the foregut. (Courtesy of Calum Harrington-Vogt.)

The coeliac trunk can get compressed by the median arcuate ligament, which binds the left and right diaphragmatic crura. This can cause chronic abdominal pain after meals or activity (median arcuate ligament syndrome [MALS]).

Nerve Supply of the Gut and Pelvic Organs

Sympathetic innervation (from the thorax to the abdomen, through the diaphragm):

- The intermediolateral part of spinal segments **T1–12 and L1–L2** is responsible for the sympathetic innervation.
- They run as white (myelinated) pre-ganglionic *rami communicantes* with the ventral rami of the spinal nerves and, **without synapsing**, to the paravertebral sympathetic ganglia.

Three splanchnic nerves emerge and pass through the crura of the diaphragm and synapse as follows:

- The **greater splanchnic nerve** (T5–T9) to the coeliac ganglion
- The **lesser splanchnic nerve** (T9–T10 or T10–T11) to the aorticorenal ganglion
- The **least (lowest) splanchnic nerve**, often absent (T11–T12 or T12–L2), to synapse with the renal ganglion

The thoracic sympathetic trunk continues downwards as the lumbar and then sacral sympathetic trunk and upwards as the cervical sympathetic trunk.

The sympathetic visceral nerves contain both afferent (pain fibres) and efferent fibres.

In the abdomen:

- The **lumbar sympathetic trunk** consists of four interconnecting ganglia, which give rise to grey *rami communicantes* to the ventral rami of the lumbar nerves. These **vascular and cutaneous** post-ganglionic fibres supply the branches of the abdominal aorta in addition to the skin.

- The **lumbar splanchnic nerves** are four lumbar splanchnic nerves arising from L1–L2 spinal segments that innervate the smooth muscles and glands by joining the coeliac, inferior mesenteric (hindgut), and hypogastric plexuses (pelvic viscera, including the neck of the bladder and the prostate gland).

Parasympathetic innervation

- The **two vagi** (anterior and posterior) arise on the lower oesophagus from the oesophageal plexus and supply the foregut and midgut (down to the distal part of the transverse colon) (see [Section 6](#)).

Enteric Nervous System

The GI tract (GIT) from the upper oesophagus to the anus is controlled by the enteric nervous system (ENS), which is independent of the central nervous system. The autonomic nervous system (ANS) has a modulatory function. The ENS is mainly found within the myenteric plexus (Auerbach's plexus, between the longitudinal and circular muscle layers) from the upper oesophagus to the anus, and the submucous plexus (Meissner's plexus, although this can be either absent or minimal in the oesophagus and stomach).

The ENS is an autonomously operating system composed of afferent, interneurons, and efferent neurons and a huge number of small ganglia that regulate both the longitudinal and circular smooth muscle activity, bowel absorption, transmucosal fluid fluxes, and blood flow. Some scientists have nicknamed this extensive network our "second brain".

Coeliac Plexus

It is also known as the solar plexus, due to its appearance being likened to the radiation of light from the sun. This plexus is formed by the communications between the greater (T5–T9) and lesser (T10–11) splanchnic nerves and the anterior and posterior vagal trunks. It consists of ganglia and intercommunicating fibres and is located anterior to the upper abdominal aorta, behind the stomach and the lesser sac. Its branches supply the liver, pancreas, spleen, stomach, kidneys, suprarenal glands, genital organs, and midgut. Afferent nerve stimuli pass within the coeliac plexus (see "Pancreatic Cancer").

The **superior hypogastric plexus** lies over the bifurcation of the aorta in the pre-sacral space. It receives post-ganglionic sympathetic fibres from the thoracic and lumbar splanchnic nerves and parasympathetic fibres from S2 to S4 (*nervi erigentes*). It is connected to the **inferior hypogastric plexus** via two nerves (the hypogastric nerves), which pass along the internal iliac vessels. For information on the **inferior hypogastric plexus**, see [Section 6](#).

Distal End of the Oesophagus

The oesophagus is a muscular tube, approximately 25 cm long, connecting the pharynx at the level of C6 to the stomach. It is formed by the diverticulum appearing in the ventral wall of the pharynx, with the tracheo-oesophageal septum splitting the pharynx into ventral and dorsal portions. The thoracic part of the oesophagus finally passes through the oesophageal hiatus, with both anterior and posterior vagi, at the level of T10 (tip: "oesophagus" has 10 letters).

The intra-abdominal segment (below the diaphragm) is short in length (1 to 2.5 cm). The oesophagogastric junction is at the level of T10–T11.

There are two high-pressure zones: at the junction of the laryngopharynx and oesophagus and at the lower oesophageal sphincter (LOS).

Gross Anatomy of the Distal End of the Oesophagus

Four layers

- *Mucosa (inner layer)*: lined by non-keratinised squamous epithelium.
- *Submucosa*: contains the mucous glands, which produce mucus from goblet cells to moisturise the oesophagus, in addition to the extensive vascular (arterial and venous) networks and nerve cells (Meissner's plexus).
- *Muscularis (muscular layer)*: composed of outer longitudinal and inner circular smooth muscle. Helps in peristaltic movements to push the food bolus toward the stomach. The muscularis of the upper part is skeletal (striated) and that of the middle part is mixed.
- *Adventitia (outer layer)*: a fibrous layer which attaches the oesophagus to adjacent structures. The phreno-oesophageal ligament connects the lower oesophagus to the oesophageal diaphragmatic hiatus.

The **lower oesophageal sphincter (LOS)** is a physiological, rather than an anatomical, sphincter. The LOS relaxes to allow food to enter the stomach and constricts to prevent reflux of acid and stomach contents up the oesophagus. There are at least two components: the first is intrinsic, from the circular muscle of the lower oesophagus, and the second is extrinsic, due to the encircling right crus of the diaphragm. The LOS represents a high-pressure zone between the negative intrathoracic pressure transmitted to the thoracic part of the oesophagus and the positive pressure of the short intra-abdominal oesophagus.

The LOS is supplied by the ANS (vagi and sympathetic fibres from the greater and lesser splanchnic nerves T5–T12) in addition to its intrinsic nervous system.

The anterior vagus is closely related to the outer surface of the outer longitudinal muscle, but the posterior vagus lies loose behind and to the right of the oesophagus (see the later discussion on truncal vagotomy).

On oesophagogastroduodenoscopy (OGD), the transition from the oesophageal mucosa to gastric mucosa is manifested by a colour change from pale pink mucosa to deeper-coloured gastric mucosa (the zigzag or Z-line).

Blood Supply

The abdominal part of the oesophagus is supplied by the oesophageal branches of the left gastric artery, which arises from the coeliac trunk, as well as branches from the short gastric arteries. There is also some contribution from the left phrenic artery.

Venous drainage of the abdominal portion occurs through the left gastric vein draining into the hepatic portal vein and to the azygos and hemiazygos venous system. The connection with the oesophageal tributaries that drain into the azygos/hemiazygos venous system forms part of the portosystemic connection, which opens up in **portal hypertension** (oesophageal varices) and can cause vomiting of blood (haematemesis).

Nerve Supply and Lymph Drainage

The oesophagus is innervated by both parasympathetic (vagus) and sympathetic (afferent and efferent) fibres (greater and lesser splanchnic nerves). The vagi are the predominate motor innervation to the oesophagus.

The lymph drainage of the lower third of the oesophagus is to the left gastric and coeliac nodes. In lower oesophageal cancer, the mediastinal lymph nodes may also be involved.

CLINICAL NOTES

GASTRO-OESOPHAGEAL REFLUX DISEASE (GORD)

Stomach contents, including gastric acid, flow back into the oesophagus.

BARRETT'S OESOPHAGUS

The cells lining the oesophagus switch from normal stratified squamous to simple columnar epithelium and goblet cells (metaplasia), due to chronic reflux of gastric acid up the oesophagus, which can accompany sliding hiatus hernia (see next). This is a pre-cancerous condition. Patients with this condition need a regular upper endoscopy and biopsy to detect malignant changes.

HIATUS HERNIA

There are two main types:

Sliding hiatus hernia

- The most common form
- LOS slides upwards, resulting in reflux oesophagitis

Rolling hiatus hernia

- Para-oesophageal hernia
- Part of the stomach squeezes through the oesophageal hiatus of the diaphragm, which can result in serious complications due to the blood supply being cut off, causing ischaemia of that part of the stomach. This is a surgical emergency (Figure 5.15)

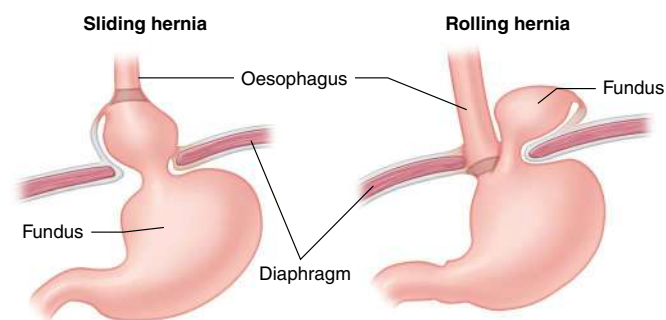


FIGURE 5.15 Types of hiatus hernias. (Courtesy of Calum Harrington-Vogt.)

CANCER OF THE OESOPHAGUS

The cardia is a common site for the development of oesophageal cancer (Figure 5.16) (see also Section 2). The main symptom is an increasing dysphagia to both solids and liquids and weight loss.



FIGURE 5.16 Contrast X-ray (barium swallow) of an oesophageal cancer, showing filling defect and rat-tail appearance. (Courtesy of Qassim F. Baker.)

ACHALASIA

This is failure of the LOS to relax. It is due to absent or a low number of ganglion cells of the myenteric plexus at the LOS, resulting in difficulty in swallowing (dysphagia) and regurgitation of undigested food and even aspiration to the respiratory passages (Figure 5.17).

Investigation of patients who present with persistent dysphagia include endoscopic examination of the oesophagus, stomach, and duodenum. This is performed by inserting a flexible fiberoptic endoscope through the mouth down to the pharynx and the oesophagus to check for abnormalities like growths and also to take samples for histopathological examination (biopsy). Depending on the extent of oesophageal blockage, the examination is extended down to the stomach and duodenum.



FIGURE 5.17 Barium swallow showing dilated oesophagus due to achalasia. (Courtesy of Qassim F. Baker.)

Stomach

The stomach is a hollow muscular organ located in the upper abdomen towards the left hypochondrium. It is the part of the foregut which extends from the distal oesophagus to the duodenum. Its functions include:

- Mechanical degradation of food
- Production of mucus, protecting the mucosa from the noxious action of hydrochloric acid (HCl)
- HCl production from parietal cells
- Pepsin production from the chief cells as an inactive form (to change to an active form of pepsinogen in the acidic environment created by HCl and start protein digestion to smaller peptides and amino acids)
- Endocrine secretions, e.g., gastrin, hormone secretion from G cells at the pyloric antrum (to stimulate HCl secretion)
- Secretion of intrinsic factor for vitamin B₁₂ absorption

The stomach is related posteriorly mainly to the lesser sac and the pancreas and is divided into four regions: cardia, fundus, body, and pylorus.

- The **cardia** is the region adjacent to the oesophageal opening, where the stratified squamous epithelium of the oesophagus changes to simple columnar epithelium.

- The **fundus** is the most superior, dome-shaped part of the stomach to the left of the cardia and related to the left dome of the diaphragm.
- The **greater curvature** extends from the left of the gastro-oesophageal junction over the fundus to the pylorus.
- The **body** is the largest region of the stomach and extends to the *incisura angularis* at the lesser curvature. The body of the stomach is involved in the digestion of food through the action of acid, enzymes, and mechanical degradation.
- The **lesser curvature** starts at the cardia down to the pylorus and is shorter than the greater curvature.
- The **pyloric region** is a continuation of the distal part of the body of the stomach from the *incisura angularis* to the pylorus. It starts with the **pyloric antrum**, moves to the **pyloric canal** (1 to 2 cm), and ends at the **pyloric sphincter or pylorus** (anatomical and physiological sphincter between the stomach and the duodenum composed of smooth muscle controlling the release of chyme from the stomach). The pyloric sphincter is under neural (vagal and sympathetic) and hormonal control.

The gastric wall consists of four layers (Figure 5.18).

The **mucosa** is the thick innermost layer. It consists of simple columnar epithelium and goblet cells (mucus production is important in mucosal protection by neutralising acid). In addition, there is a deeper lamina propria, which is loosely adherent to the mucosa and to a thin layer of smooth muscle called the muscularis mucosa. Folds of the inner surface of the stomach are known as **rugae**, and these can expand to accommodate large volumes of food intake.

The second layer is the **submucosa**, and it consists of fibrous connective tissue and the submucosal nerve plexus, or **Meissner's plexus** (part of the ENS).

The **muscular layer** is composed of inner oblique smooth muscle and is responsible for mechanical degradation of the solid luminal bolus. The middle layer is circular, and at the pylorus it forms the pyloric sphincter. The outermost layer is longitudinal and is responsible for peristaltic contraction.

Auerbach's or myenteric plexus is part of the ENS.

The **serosa (visceral peritoneum)** is the outermost layer. The stomach is completely covered by the visceral peritoneum, except for a very small area near the cardiac orifice posteriorly. The peritoneum leaves the greater curvature as the greater omentum, which hangs down like an apron to roll back and attach to the transverse colon and the gastrosplenic omentum (see above).

The visceral peritoneum leaves the lesser curvature as the lesser omentum.

The main anatomical relations of the stomach are:

- **Anteriorly:** the left lobe of the liver and the anterior abdominal wall
- **Superiorly:** oesophagus and left dome of the diaphragm
- **Inferiorly:** head and neck of the pancreas (within the curve of the duodenum)
- **Posteriorly:** the lesser sac separates the stomach from the anterior surface of the pancreas, splenic artery, visceral surface of the spleen, left suprarenal gland, and upper pole of the left kidney (stomach bed)

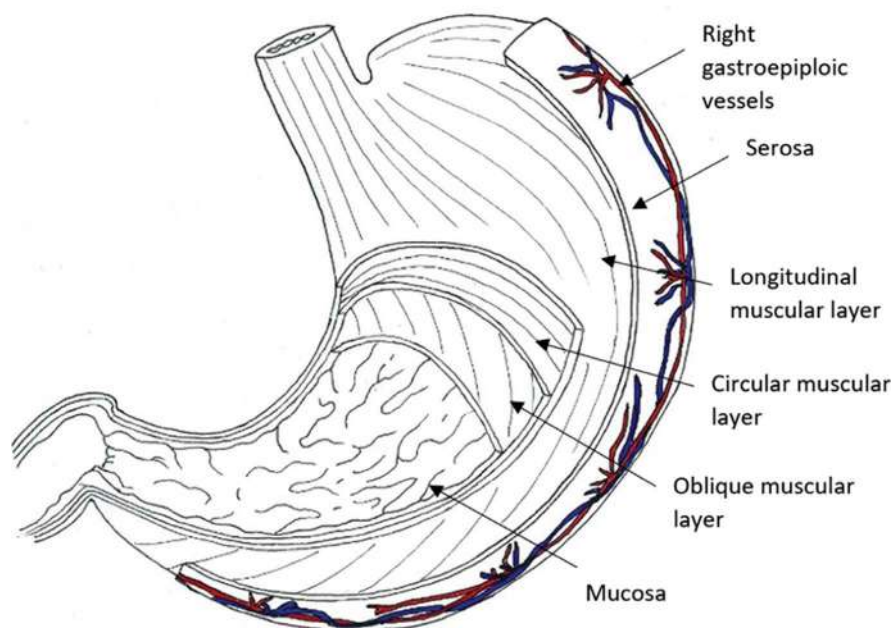


FIGURE 5.18 Layers of the stomach. (Courtesy of Calum Harrington-Vogt.)

Arterial Blood Supply and Venous Drainage

The stomach has a generous blood supply derived from the branches of the coeliac trunk. The arteries freely anastomose (**Figure 5.19**).

The lesser curvature of the stomach receives blood from the anastomoses of the **left and right gastric arteries** (within the layers of the lesser omentum).

The greater curvature of the stomach receives blood from the anastomoses of the **left and right gastro-epiploic arteries**. The **gastrooduodenal artery** supplies the pyloric part of the stomach.

Origin of arteries:

- Coeliac trunk → left gastric artery
- Splenic artery → left gastro-epiploic artery and the short gastric arteries
- Common hepatic artery → right gastric artery and gastro-duodenal artery → right gastro-epiploic artery

Venous drainage is via the accompanying veins, which finally drain to the hepatic portal vein. The short gastric veins drain the fundus and upper part of the stomach and drain into the splenic vein.

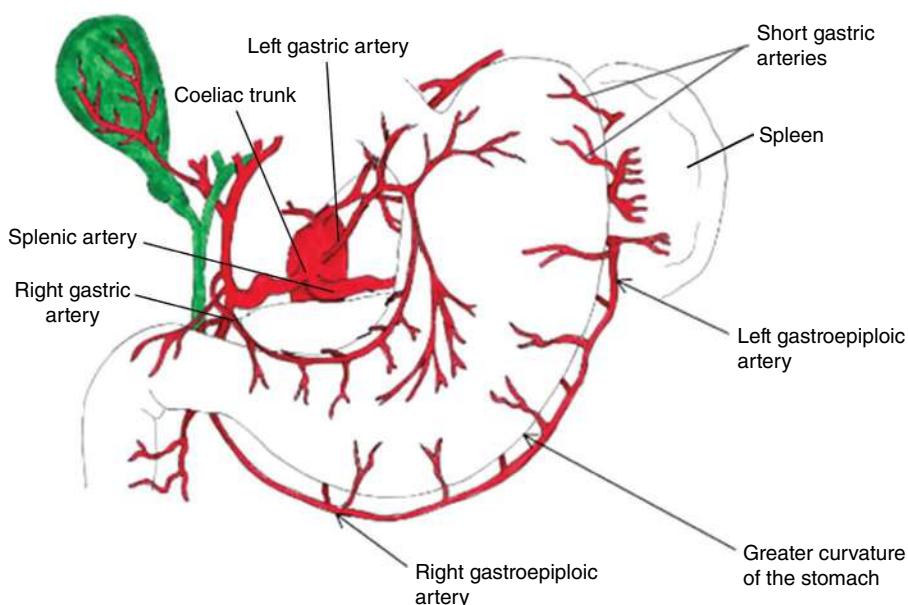


FIGURE 5.19 Arterial blood supply of the stomach. (Courtesy of Calum Harrington-Vogt.)

Nerve Supply

From both the parasympathetic fibres (vagus) and sympathetic fibres (greater and lesser splanchnic nerves via the coeliac plexus). The vagi are responsible for the motility and acid/pepsin secretion in the stomach. Truncal vagotomy, an operation to cut both vagi above the cardia, although now rarely performed, is used to treat patients with peptic ulcers, to decrease HCl secretion, and to help heal gastric and duodenal ulcerations. This operation has largely been superseded by the use of proton pump inhibitors (PPIs).

The sympathetic supply is inhibitory to the muscles of the stomach and constricts the pylorus. It also transmits the afferent pain fibres from the stomach.

Lymph Drainage

Lymphatic drainage is to the nodes found on the greater and lesser curvatures. These then drain to the coeliac lymph nodes, important when radical gastrectomy is considered for gastric cancers.

CLINICAL NOTES

Gastric cancers are mainly epithelial (carcinoma). They can cause a variety of presentations, such as iron deficiency anaemia (due to chronic blood loss), obstruction of the gastric outflow (gastric outlet obstruction), or GI bleeding (haematemesis/melaena). They are often diagnosed at a late stage and carry a poor prognosis. In countries with a high incidence of gastric carcinoma such as Japan, endoscopic screening is utilised to detect the cancer at an early stage. Endoscopic mucosal resection (EMR) is one of the options for treating early gastric and oesophageal cancers. Other malignant tumours include gastric lymphoma (the stomach is the most common site for extranodal non-Hodgkin's lymphoma).

Pyloric stenosis (gastric outlet obstruction) is a blockage to the flow of partially digested food to the duodenum. This can be an acquired condition, due to scarring from chronic duodenal ulcer, or cancer of the distal part of the stomach (**Figure 5.20**).

Congenital pyloric stenosis (**Figure 5.21**) results in projectile **bile-free vomiting**, usually within the first 4 weeks after birth. This is due to idiopathic hypertrophy of the circular muscle of the pylorus. Pyloromyotomy (division of the thickened pylorus) is the surgical procedure used following correction of water and electrolyte abnormalities, as the result of repeated vomiting.

GASTROSTOMY FEEDING

This is one of the forms of enteral nutrition used when it is not possible to take food by mouth, for example, in patients with stroke and dysphagia.

Percutaneous endoscopic gastrostomy (PEG) is performed with the help of a gastroscope to insert a feeding tube through the anterior abdominal wall into the stomach. Further tubes may be extended through the pylorus and the duodenum into the jejunum (PEG-J tube).

Rarely, the gastrostomy is done as an open procedure.



FIGURE 5.20 Barium meal of a 50-year-old adult with repeated vomiting showing dilated stomach and cut-off at the gastroduodenal junction. Gastroscopy and biopsy revealed antral cancer. (Courtesy of Qassim F. Baker.)

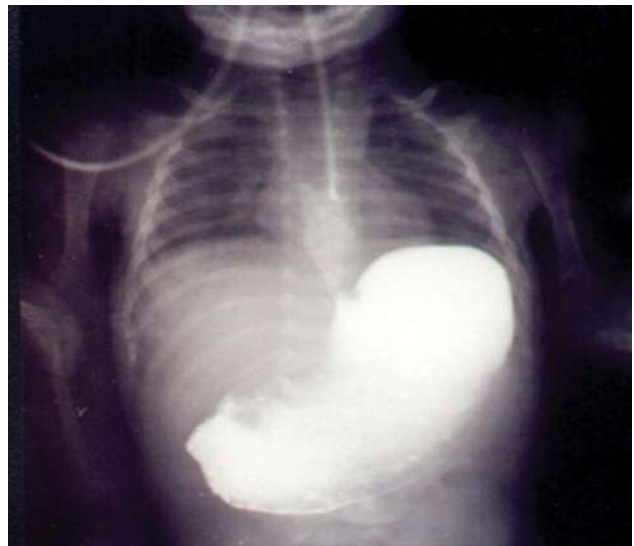


FIGURE 5.21 Gastrografin meal showing congenital pyloric stenosis in a 4-week-old child. (Courtesy of Qassim F. Baker.)

Duodenum

The duodenum (from Latin, with its length being equivalent to the breadth of approximately 12 fingers) is the first segment of the small intestine which originates from both the foregut and midgut. It is a C-shaped tube about 25 cm in length which starts from the pylorus of the stomach and ends at the duodenojejunal junction (DJJ), connecting the stomach to the jejunum of the small intestine. It consists of a proximal and distal part, in which the proximal part starts at the pylorus and ends at the major duodenal papilla.

Gross Anatomy of the Duodenum

By convention, the duodenum is divided into four parts, D1 to D4 (superior, descending, horizontal, and ascending) (**Figure 5.22**).

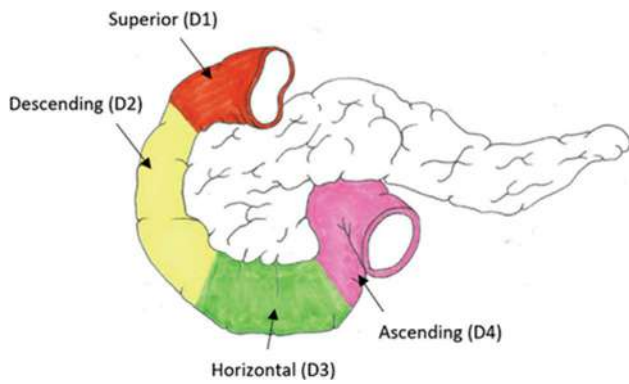


FIGURE 5.22 Parts of the duodenum. (Courtesy of Calum Harrington-Vogt.)

D1: superior Part (L1 Level)

Starts from the end of the pylorus of the stomach and ends at the superior duodenal flexure.

It passes superiorly, and the first inch (the duodenal cap) attaches to the liver by the hepatoduodenal ligament (part of the lesser omentum) and is intraperitoneal.

The first part of the duodenum is the most common site for duodenal ulceration (DU) and its complications such as bleeding, perforation, and gastric outlet obstruction.

Peptic Ulcer

An ulcer is a discontinuity in the epithelial lining (skin or mucosa). The current theory for the cause of gastric and duodenal ulcers is due to the presence of *Helicobacter pylori*, a type of gram-negative bacteria. Other causes include disruption between the balance of the amount of acid produced and the production of the mucus barrier (which offers protection) caused by the ingestion of medications like non-steroidal anti-inflammatory drugs (NSAIDs) such as aspirin, which damage the mucosa.

The gastroduodenal artery passes behind this part, which can bleed profusely with a penetrating posteriorly sited duodenal ulcer, resulting in vomiting of blood (**haematemesis**) and the passage of black tarry stool (**melaena**), due to the digestion of haemoglobin by the gastric and intestinal secretions (*vide infra*, upper and lower GI bleeding). Also, a peptic ulcer sited anteriorly in the first inch of D1 may perforate into the peritoneal cavity causing peritonitis (**Figures 5.23–5.25**).

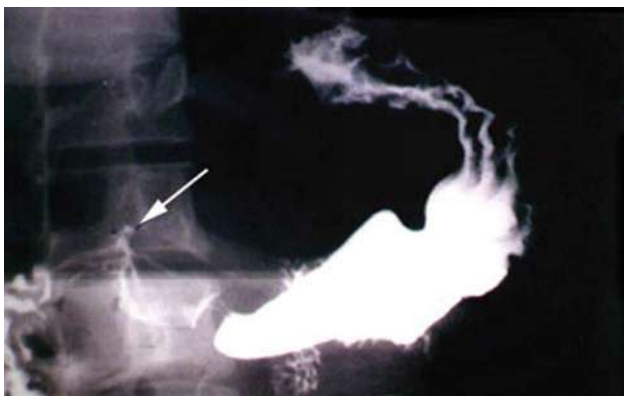


FIGURE 5.23 Barium meal showing ulcer crater (*arrow*) in the first part of the duodenum. (Courtesy of Qassim F. Baker.)



FIGURE 5.24 Operative view of perforated ulcer in the anterior part of the first part of the duodenum. (Courtesy of Ali M. Hassan.)

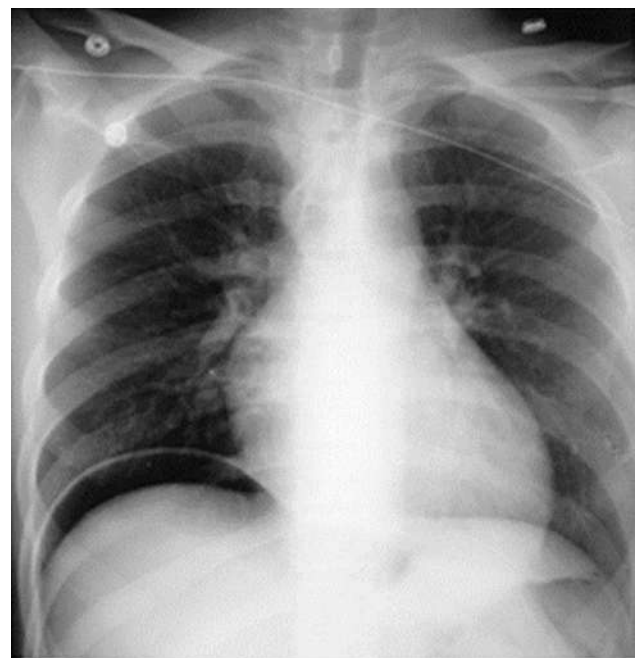


FIGURE 5.25 Chest X-ray showing air under the right dome of the diaphragm due to perforated duodenal ulcer. (Courtesy of Qassim F. Baker.)

D2: Descending Part (Extends from L1 to L3)

Starts at the superior duodenal flexure and ends at the inferior duodenal flexure. Passes inferiorly, lateral to the head of the pancreas, and overlies the hilum of the right kidney and IVC.

Contains the **major duodenal papilla**, which demarcates the opening of the CBD and the main pancreatic duct (ampulla of Vater) and the beginning of the midgut.

The peritoneum covers its anterior aspect. This part can be mobilised by incising the peritoneum on its lateral aspect and reflecting the duodenum medially (this procedure is called **Kocher's manoeuvre** which helps in surgical exposure of the lower end of the CBD).

Carcinoma of the head of the pancreas can compress the duodenum (duodenal obstruction), and it is an important cause of obstructive jaundice.

D3: Inferior Part (At the Level of L3)

Starts at the inferior duodenal flexure. Passes to the left and anteriorly to the IVC and aorta. The SMA, originating from the anterior aspect of the abdominal aorta, can compress this part of the duodenum and cause partial or complete duodenal obstruction (superior mesenteric syndrome).

D4: ascending Part (Extends from L3 to L2)

Ascends anteriorly towards the duodenojejunal junction, where it ends. The DJJ is the demarcation point between upper and lower GI bleeding.

The **ligament of Treitz** (or suspensory ligament of the duodenum) is formed of double folds of the peritoneum; it suspends the fourth part of the duodenum to form the DJJ and marks the origin of the jejunum.

Blood Supply and Venous Drainage

The proximal part of the duodenum (ending at the major duodenal papilla) receives its blood supply from the superior pancreaticoduodenal artery, which is a branch of the gastroduodenal artery, arising from the common hepatic artery.

The proximal part of the duodenum's venous drainage occurs at the prepyloric vein and the superior pancreaticoduodenal vein, which both drain into the hepatic portal vein.

The part of the duodenum which originates from the midgut receives arterial supply from the inferior pancreaticoduodenal (from the SMA). Its venous drainage is to the portal vein.

Nerve Supply and Lymphatic Drainage

The duodenum is innervated by both sympathetic (greater and lesser splanchnic nerves) and parasympathetic fibres from the vagus (via the coeliac plexus).

Lymphatic drainage is to the pancreaticoduodenal lymph nodes.

Learning Point

The major duodenal papilla is the line of demarcation between the foregut and midgut.

CLINICAL NOTES**UPPER GI BLEEDING**

Refers to gut bleeding proximal to the DJJ. Common causes include bleeding peptic ulcers, variceal bleeding due to portal hypertension, gastric tumours, and Mallory-Weiss syndrome (tear at the gastro-oesophageal junction, usually following severe vomiting and retching).

LOWER GI BLEEDING

Refers to bleeding distal to the DJJ (common causes are diverticular disease, colonic polyps and cancer, angiodysplasia, and bleeding from a Meckel's diverticulum). The presentation can be acute with passing fresh blood per rectum (haematochezia) or as chronic loss (which results in iron deficiency anaemia; a common example is right colonic cancer). Note that severe upper GI bleeding may present as bleeding per rectum.

Duodenal atresia is a congenital condition due to failure of canalisation of the duodenum, usually distal to the major duodenal papilla. The new-born baby is presented with bile-stained vomiting (compare with congenital pyloric stenosis, see above).

The Pancreas

The pancreas is a long organ that develops from both the dorsal and ventral mesogastria as dorsal and ventral buds. It lies deeply seated on the posterior abdominal wall in the upper abdomen, behind the stomach. It is a secondarily retroperitoneal organ which has both endocrine (secretion of insulin and glucagon by the islet cells of Langerhans to regulate blood sugar level) and exocrine (release of enzymes for the digestion of lipids, proteins, and carbohydrates) functions.

Gross Anatomy of the Pancreas

The pancreas can be divided into the following parts (**Figure 5.26**):

- **Head:** embraced by the C-shaped duodenum.
- **Neck:** the junction between the head and the body of the pancreas; it overlies the origin of the portal vein.

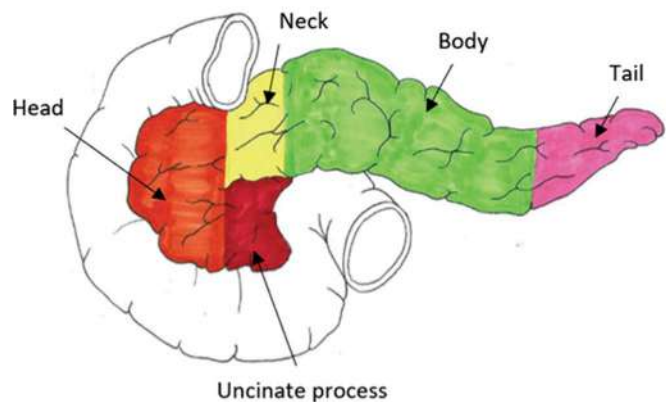


FIGURE 5.26 Parts of the pancreas. (Courtesy of Calum Harrington-Vogt.)

- **Body:** the largest part, which lies behind the stomach, anterior to the aorta and the emerging SMA. The transverse mesocolon attaches to the anterior surface of the pancreas. The splenic artery runs a tortuous course along the superior border of the body, and the splenic vein runs posteriorly and indents the body.
- **Tail:** it is related to the hilum of the spleen, so it needs to be protected during splenectomy to avoid postoperative pancreatic fistula.

The uncinata (*Latin*: “hook”) process is that part of the head which lies posterior to the superior mesenteric vessels.

Blood Supply and Lymphatic Drainage

The pancreas receives its blood supply mainly from the pancreatic branches of the splenic artery. The head receives an additional blood supply from the anterior and posterior superior pancreaticoduodenal and inferior pancreaticoduodenal arteries, which arise from the gastroduodenal and superior mesenteric arteries, respectively.

Venous drainage of the pancreas is via the splenic vein, which drains into the hepatic portal vein.

The lymphatic drainage of the pancreas is to the pancreaticosplenic nodes and pyloric nodes. Both drain into the coeliac and superior mesenteric lymph nodes.

Nerve Supply

The pancreas's nerve supply comes from the parasympathetic fibres (vagus) and sympathetic fibres (thoracic splanchnic nerves and then coeliac plexus).

Duct System

Due to the double embryological origin of the pancreas, there are two pancreatic ducts.

The **main pancreatic duct** (MPD) (of Wirsung) unites with the lower CBD in a common channel arrangement (ampulla of Vater) to open in the second part of the duodenum at the major duodenal papilla. The entrance is surrounded by smooth muscle (sphincter of Oddi).

The current view is that common channel obstruction, most commonly by gallstones, explains the pathogenesis of acute pancreatitis through reflux of bile and pancreatic juice into the main pancreatic duct.

The **accessory pancreatic duct** (of Santorini) is variably present. It drains part of the head of the pancreas and opens in the duodenum at the minor duodenal papilla, 2 cm proximal to the opening of the common channel of the CBD and MPD.

CLINICAL NOTES

Acute pancreatitis is autodigestion of the pancreatic tissue, mostly caused by gallstones or high alcohol consumption. Most cases are treated conservatively and rarely need urgent surgical intervention. An abdominal CT scan (**Figure 5.27**) helps in reaching a diagnosis in addition to raised serum amylase level. There are many scoring systems in clinical practice that assess the severity of acute pancreatitis.

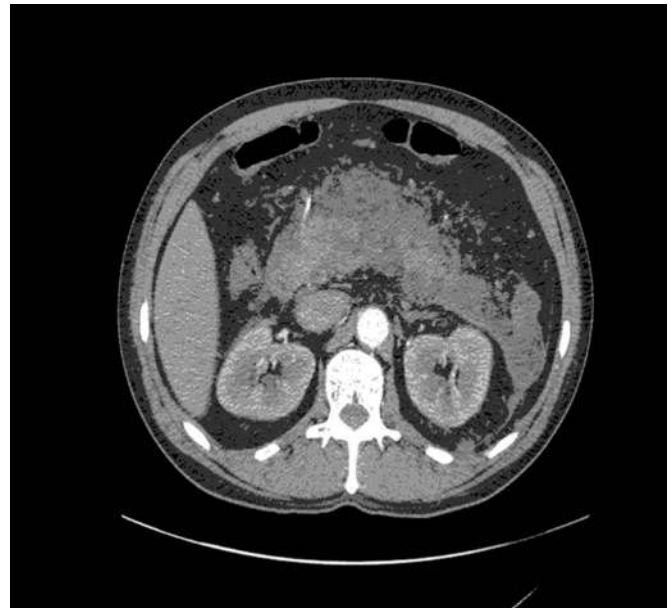


FIGURE 5.27 CT scan of the abdomen showing necrosis of the pancreas and extensive peri-pancreatic inflammatory change in a patient with acute pancreatitis. (Courtesy of Qassim F. Baker.)

PANCREATIC PSEUDOCYST

This is a collection of fluid in the lesser sac, commonly following acute pancreatitis or pancreatic trauma. Perforated posterior gastric ulcer is another rare cause. It is clinically manifested as a mass in the epigastric region a few weeks after the onset of the acute pancreatitis.

Imaging (ultrasound or CT scan) is required to establish the diagnosis.

Due to the position of the cyst posterior to the stomach, open surgical drainage may be performed via the posterior gastric wall (cystogastrostomy) if the cyst has not resolved. The pseudocyst may be dealt with laparoscopically, depending on the availability of the expertise and resources.

PANCREATIC CANCER

This is an aggressive type of cancer with a poor prognosis. The clinical presentation depends on the location of the cancer:

- Cancer of the head of the pancreas (the most common site) usually presents as obstructive jaundice due to obstruction of the lower part of the CBD.
- Carcinoma of the body of the pancreas has a poor prognosis, as it is usually diagnosed at an advanced stage, where the tumour invades the great vessels and makes resection impossible. Cancer of the body and tail presents as severe upper abdominal pain, which radiates to the back.
- Weight and appetite loss are important clinical features (the same applies to gastric cancer).

(Continued)

Rarely, curative surgery is possible (**Figure 5.28**); usually, only palliative treatment is possible.

Due to the location of the pancreas on the posterior abdominal wall and its proximity to the coeliac plexus, intractable pain can result from widespread local metastasis. Coeliac plexus block is one of the options to alleviate the pain.

WHIPPLE'S PROCEDURE (PANCREATODUODENECTOMY)

This procedure entails removal of the head of the pancreas, duodenum, gallbladder and lower part of the CBD and sometimes the distal part of the stomach. It is indicated for operable cancer with no invasion of the portal vein or the superior mesenteric vessels. The stomach, bile duct, and MPD are then joined to the bowel. This operation is performed either as an open or laparoscopic procedure.



FIGURE 5.28 Distal pancreatectomy and splenectomy for cancer of the pancreatic tail. (Courtesy of Aqeel S. Mahmood.)

The Spleen

The spleen is an intraperitoneal organ and the largest of the lymphoid organs. It is surrounded by a thin capsule. It develops from the dorsal mesogastrium during the fifth week of gestation. It is located in the upper left quadrant of the abdominal cavity, between the fundus of the stomach and the left dome of the diaphragm. The spleen has immunological and haematological functions (see the discussion on post-splenectomy sepsis).

1, 3, 5, 7, 9, and 11 Rule of the Spleen:

- 1, 3, 5: the dimensions of the spleen are 1 × 3 × 5 inches.
- 7: the spleen weighs around 7 ounces on average (although this is variable).
- 9, 11: the spleen underlies ribs 9, 10, and 11 and is related to them at the midaxillary line.

Surface Anatomy of the Spleen

The main anatomical relations of the spleen are:

- *Anteriorly:* greater curve of the stomach, tail of the pancreas, and splenic flexure of the colon (the three structures to be safeguarded while ligating the splenic vessels during splenectomy)
- *Inferiorly:* left kidney and left suprarenal gland
- *Superiorly and laterally:* left dome of the diaphragm, separating the spleen from the left pleural cavity and left lung

Gross Anatomy of the Spleen

Can be regarded as having two surfaces: diaphragmatic and visceral (**Figure 5.29**). The diaphragmatic surface is in contact with rib cage and diaphragm.

The visceral surface contains the following impressions:

- Gastric (for the fundus of the stomach)
- Colic (in contact with the splenic flexure of the colon)
- Renal (in contact with the anterior surface of the left kidney)

The **splenic notch** is situated on the anterior border, which is clinically important when the spleen extends inferomedially, towards the right iliac fossa, and the notch can be palpated to

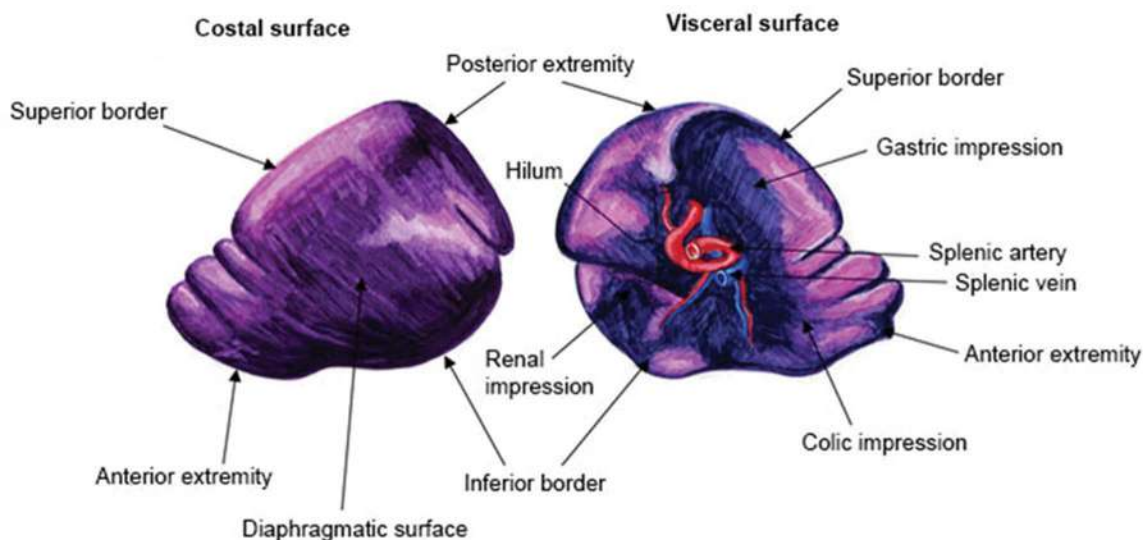


FIGURE 5.29 The costal and visceral surfaces of the spleen. (Courtesy of Calum Harrington-Vogt.)

diagnose splenomegaly (enlarged at approximately 2 to 3 times its normal size).

Peritoneal ligaments (parts of the greater omentum) are made up of two peritoneal layers. These ligaments are incised to mobilise the spleen during open or laparoscopic splenectomy.

Gastrosplenic ligament connects the spleen to the greater curvature of the stomach.

The short gastric arteries and the left gastroepiploic, arising from the splenic artery, run in it. It also contains the terminal part of the splenic artery and vein and the tail of the pancreas.

Lienorenal (or splenorenal) ligament connects the lower pole of the spleen to the left kidney.

Blood Supply and Drainage

Arterial supply to the spleen is from the **splenic artery**, the largest of the three branches of the coeliac trunk, which runs a tortuous course related to the superior border of the pancreas. Once the splenic artery enters the spleen, it usually divides into two to three branches to the upper, middle, and lower parts of the spleen. These branches divide the spleen into separate vascular segments, important in partial splenectomy where one segment can be removed without affecting others.

The splenic artery supplies the pancreas as well. The *arteria pancreatica magna* (greater pancreatic artery) is one of the largest branches of the splenic artery to the pancreas. The splenic artery is next to the aorta and iliac arteries to develop aneurysm, often clinically asymptomatic.

The splenic vein and the superior mesenteric vein (SMV) unite behind the neck of the pancreas to form the hepatic portal vein. The inferior mesenteric vein has a variable drainage between the SMV and the splenic vein, but it usually drains into the splenic vein.

Nerve Supply and Lymph Drainage

Nerve supply to the spleen is from the splenic plexus, which is derived from the coeliac plexus supplying the spleen with both sympathetic and parasympathetic nerve fibres.

The lymphatic drainage of the spleen is to the lymph nodes at the splenic hilum and to the coeliac lymph nodes.

CLINICAL NOTES

Splenomegaly (enlarged spleen) (**Figure 5.30**) can be caused by a variety of medical conditions, which include:

- **Haematological** pathologies, e.g., haemolytic anaemia (spherocytosis, sickle cell, thalassemia), Hodgkin's and non-Hodgkin's lymphoma, leukaemia, and immune thrombocytopenic purpura (ITP).
- **Congestive causes such as portal hypertension** (mostly due to liver cirrhosis), splenic vein thrombosis, and congestive heart failure.
- **Infections** such as malaria, Epstein-Barr virus (EBV), and typhoid fever.
- **Systemic diseases** such as Felty's syndrome (rheumatoid arthritis, leucopenia, and splenomegaly) and systemic lupus erythematosus (SLE)
- In tropical areas the most common causes of massive splenomegaly are malaria, kala-azar, and bilharziasis. Myeloproliferative disease is another cause for massive spleen.

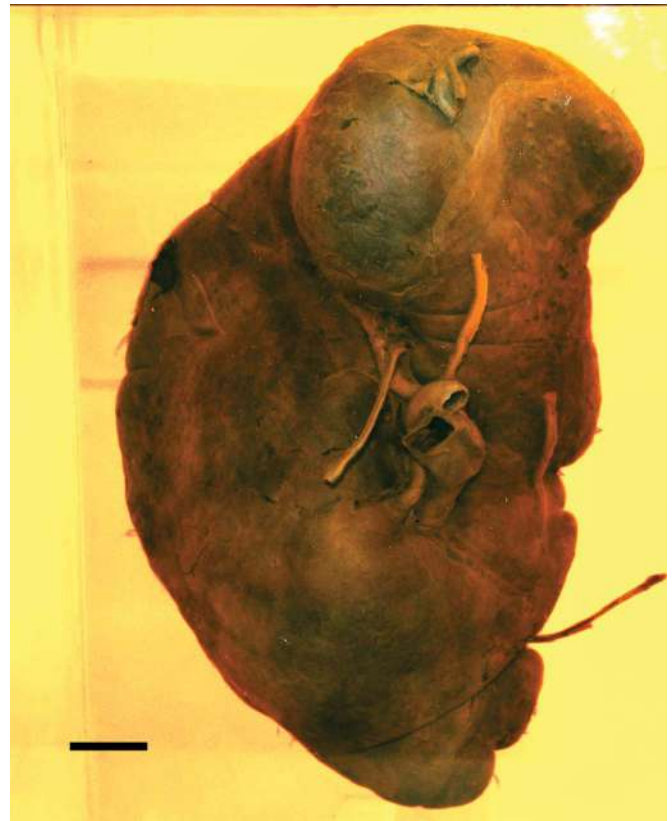


FIGURE 5.30 Splenectomy specimen in a patient with splenomegaly, bar = 2 cm. (Courtesy of Department of Anatomical Sciences, SGUL.)

Hypersplenism is the clinical term for a hyperactive spleen with excessive destruction of one or more of the blood cells (red cells, white cells, and platelets).

A common clinical question is **how to differentiate splenomegaly from an enlarged retroperitoneal organ in the left flank (e.g., an enlarged kidney)**. The answer includes:

- Direction of splenic enlargement is towards the right iliac fossa
- Palpation of splenic notch
- The enlarged left retroperitoneal mass is bimanually palpable

A **ruptured spleen** is the cause of a common surgical emergency because it can lead to life-threatening severe bleeding. The spleen is liable to injury and is the most common intra-abdominal organ injured following blunt abdominal trauma.

SPLENECTOMY

The surgical operation to remove the spleen, commonly for a badly injured spleen following trauma (**Figure 5.31**) or iatrogenic injury during the course of another operation, for example, injury to the lower pole of the spleen whilst mobilising the splenic colon flexure.

(Continued)

Splenorrhaphy is a relatively new option in the treatment of splenic injury, and it involves suturing of the injured spleen, following certain operative criteria.

Other indications for splenectomy include ITP, spherocytosis (sometimes combined with cholecystectomy to treat gallstones due to excessive haemolysis of the red cells), hypersplenism, and for radical excision of gastric cancer.

OVERWHELMING POST-SPLENECTOMY SEPSIS (OPSS)

Splenectomy can affect the body's immunity, and serious infections with capsulated bacteria may follow. Vaccination against these bacteria is indicated either preoperatively, for elective patients undergoing splenectomy, or following emergency splenectomy, in addition to antibiotic coverage.



FIGURE 5.31 CT scan showing linear laceration of the spleen (*arrow*) and haemorrhage around the splenic hilum, following stab injury to the left loin. (Courtesy of Wan Khamizar.)

Liver

The liver **develops in the ventral mesogastrium**, splitting the ventral mesentery into two derivatives: anterior (falciform ligament) and posterior (lesser omentum). The falciform ligament attaches the liver to the anterior abdominal wall.

Facts about the liver

- The liver is the largest gland and the second largest organ in the body, after the skin.
- Weighing about 1.5 kg, this heavy organ is mainly supported by the attachment of the hepatic veins, usually three in number, to the IVC.
- The liver receives around 1.5 litres per minute of blood supply, 25% from the proper hepatic artery and 75% from the hepatic portal vein. It drains into the IVC via three hepatic veins. Consequently, liver trauma can be a life-threatening condition due to severe bleeding leading to hypovolaemic shock.
- The liver is located in the right upper quadrant of the abdomen, extending from the fifth intercostal space to the

costal margin. This fact is essential during liver examination where palpation and percussion are required.

- Penetrating injuries to the thorax may involve the liver and other anatomically related structures, as the liver is protected by the lower right ribs.

Liver function includes

- Production of bile (essential for lipid digestion) and clotting factors
- Detoxication of harmful substances brought to the liver by the portal vein, like alcohol
- Amino acids formation and changing the toxic by-product ammonia into urea to be excreted by the kidneys
- Carbohydrate metabolism through the formation of glucose from glycogen and vice versa by storing excess glucose as glycogen
- Storage of fat-soluble vitamins like vitamin K and minerals like iron and copper
- The liver has an immunological function

Surface Anatomy of the Liver

The main anatomical relations of the liver are:

- *Superiorly*: diaphragm
- *Anteriorly*: rib cage and abdominal wall
- *Posteriorly (visceral or the posterior surface)*: lower oesophagus, stomach, superior part of duodenum, and gallbladder

Gross Anatomy of the Liver

Glisson's capsule is the fibrous layer covering the liver and has somatic innervation from the lower intercostal nerves (hepatomegaly can be painful due to stretching of the capsule).

Two main anatomical lobes (split by the falciform ligament anatomically) (**Figure 5.32**):

- **Left lobe** (smaller in size)
- **Right lobe** (larger in size)

There are two accessory lobes:

- **Caudate lobe** or segment I (located superiorly on the posterior surface of the liver), found between the IVC (right) and the fissure of the ligamentum venosum (left)
- **Quadrante lobe** (located inferiorly on the posterior surface of the liver), found between the gallbladder (left) and the fissure of the ligamentum teres (right)

The liver has diaphragmatic (collective of the anterior, superior, and right surfaces) and visceral (posteroinferior) surfaces.

The **porta hepatis** is an H-shaped transverse slit (about 4 cm in length) on the posterior surface of the liver, located between the caudate and quadrante lobes, which transmits:

- Right and left branches of the hepatic artery
- Right and left branches of the common hepatic duct
- Hepatic portal vein
- Autonomic fibres (vagal and sympathetic)
- Some lymph vessels that emerge from the liver

The lesser omentum splits to embrace the porta hepatis.

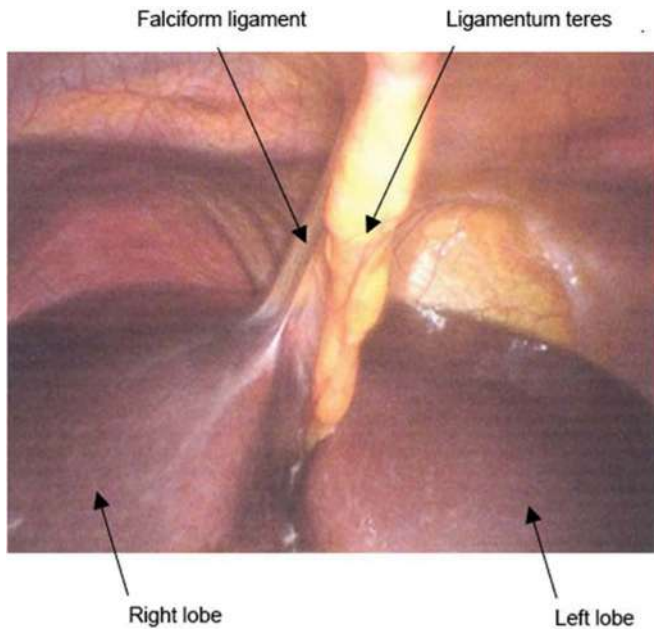


FIGURE 5.32 Laparoscopic view of the anterior view of the liver lobes and the attachment of the falciform ligament. (Courtesy of Paul Carter.)

Surgical liver segments

- The Cantlie line extends from the midpoint of the gallbladder fossa to the midpoint of the IVC and divides the liver into left and right lobes.
- The liver is divided into eight segments according to Couinaud’s classification, with each segment having its own blood supply and biliary drainage. This is important in planning interventional radiology procedures such as

therapeutic embolization and specific surgical segmental or lobe resection; so, for example, we talk about resection of segment I or II, left or right lobectomy, and so on (Figures 5.33 and 5.34).

Peritoneal recesses

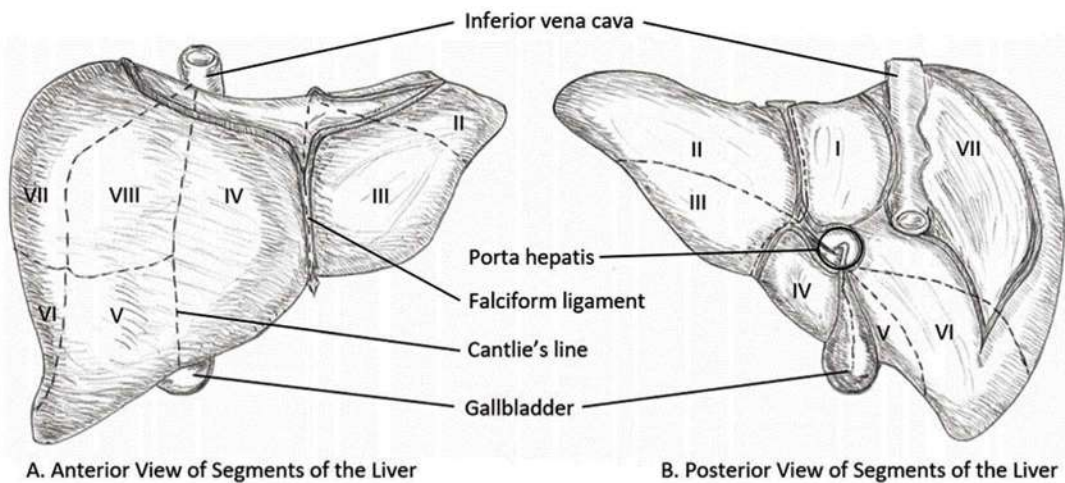
- Subhepatic space is found between the liver and the transverse colon.
- Subphrenic space is located between the diaphragm and the liver. The falciform ligament divides this into left and right spaces.
- Morison’s pouch is the space between the right kidney and the visceral surface of the liver.

Fluid such as pus can collect in these spaces, e.g., following perforation of a hollow viscus. Image-guided aspiration of abscesses, where possible, avoids an open surgical procedure.

Blood Supply of the Liver

The **common hepatic artery**, originating from the coeliac trunk, gives rise to the right gastric and the gastroduodenal arteries before it passes within the free margin of the lesser omentum. It divides into the right and left hepatic arteries. The hepatic artery proper starts after the origin of the gastroduodenal artery and supplies oxygen-rich blood to the liver sinusoids.

The **hepatic portal vein** is formed by the union of the splenic and superior mesenteric veins behind the neck of the pancreas. It then passes posteriorly to the first part of the duodenum to join the hepatic artery proper and the CBD within the free margin of the lesser omentum, to divide into two branches at the porta hepatis. This vein supplies nutrient-rich, deoxygenated blood to the liver. Finally, once both oxygenated and deoxygenated blood have entered the liver and have been stripped of their essentials, blood drains into the IVC via the three hepatic veins.



The segments are usually referred to by number (name): I (caudate); II (left lateral superior); III (left medial inferior); IV (left medial superior) (sometimes subdivided into superior and inferior parts); V (right medial inferior); VI (right lateral inferior); VII (right lateral superior); VIII (right medial superior).

FIGURE 5.33 Anterior and posterior views of the liver showing the eight liver segments. (Courtesy of Alina Humadani.)

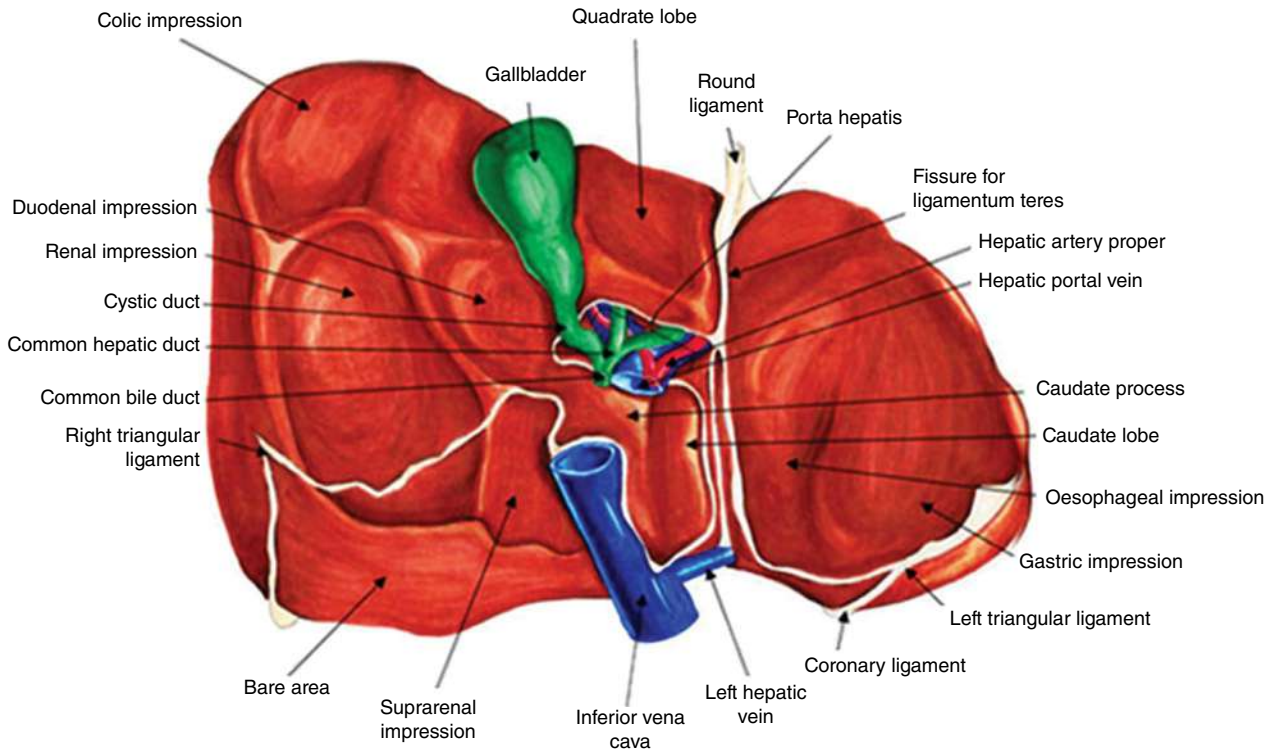


FIGURE 5.34 Visceral surface of the liver. Note the liver is tilted upside down. (Courtesy of Calum Harrington-Vogt.)

Nerve Supply

The liver, except its capsule, is innervated by the **hepatic plexus**, which contains both sympathetic (from the coeliac plexus) and parasympathetic fibres from the vagus, passing through the porta hepatis. The capsule is innervated by somatic nerves (lower intercostal nerves supply the parietal peritoneum). Pain from stretching the liver capsule by inflammatory or neoplastic conditions is well localised to the right upper quadrant of the abdomen. However, pathologies which involve the diaphragmatic surface may be felt as referred pain in the right shoulder (see the phrenic nerve, **Section 4**).

Lymphatic Drainage

The lymphatic vessels of the liver drain into the hepatic lymph nodes, which are found close to the hepatic vessels, before entering the coeliac lymph nodes. Other lymphatic vessels in the liver pass from the bare area to the mediastinal lymph nodes, found posteriorly.

congestive heart failure, and primary and secondary liver tumours. In tropical countries, hydatid cyst (helminthic infestation with *Echinococcus granulosus*) is a common cause of hepatomegaly, as the liver is the most common body organ to harbour the disease (**Figure 5.35**).

Physical examination (see earlier) is required to give a rough estimate of the liver size, in addition to general signs like jaundice and palmar erythema. Other tests include liver function test (LFT), USS, CT, and magnetic resonance imaging (MRI).

CLINICAL NOTES

EXAMINATION OF THE LIVER

The lower edge of the liver extends to the right costal margin. Hepatomegaly is clinically detected by percussion from above (*chest*: resonant compared to the dullness of the liver) and by palpation starting from the lower right quadrant upwards to feel for the lower edge.

HEPATOMEGALY

An enlarged liver is caused by a variety of conditions, including viral hepatitis (mostly hepatitis A, B, and C), alcoholic liver disease due to excessive alcohol consumption,



FIGURE 5.35 Twenty-five-year-old male who presented with hepatomegaly. CT image shows a thin-walled fluid collection in the right hepatic lobe, due to hydatid cyst. (Courtesy of Ahmed Alsagban.)

PORTAL HYPERTENSION

This term refers to the rise of the portal venous pressure above the normal range of 5 to 10 mm Hg. Commonly caused by liver cirrhosis through either excessive alcohol consumption or following infection with hepatitis B or C. In some countries such as Egypt, bilharziasis is an important cause of portal hypertension. The liver becomes damaged, resulting in pressure build-up within the tributaries of the portal vein. The portosystemic communications, which are normally closed, open up. Varices form in the lower oesophagus, stomach, rectum, and radiating veins from the umbilical region (caput medusa, Latin for the head of the Medusa). If the oesophageal varices rupture, severe blood loss can occur in the form of haematemesis and melaena.

LIVER METASTASIS

The liver is the most common site for metastasis from GI malignancies, often from colorectal cancer and malignant tumours from other sites like the breast, malignant melanoma, and lung cancer. Percutaneous image-guided liver biopsy is used to take small pieces of liver tissue by inserting a special needle in the midaxillary line at the level of the eighth or ninth intercostal space into the liver. The clotting screen should be within normal limits; otherwise, this procedure may risk bleeding from the liver.

The other methods to take a liver biopsy are laparoscopic and transvenous. For patients with abnormal clotting, a procedure via a small neck incision is used, cannulating the internal jugular vein and passing the catheter down the hepatic veins into the liver. This procedure needs the injection of IV contrast to delineate the veins and guide the cannula and the biopsy needle into the liver. Transjugular liver biopsy may be combined with transjugular intrahepatic portosystemic shunt (TIPSS) to treat portal hypertension.

LIVER TRANSPLANT

The liver has a peculiar ability to regenerate within a few months following injury or infections like hepatitis. However, the liver can fail acutely (acute liver necrosis) or in the long term (end-stage liver disease) and will necessitate liver transplant, which is a major surgical procedure.

In the majority of cases, the transplanted liver comes from a deceased registered donor (cadaveric), which will replace the recipient's damaged liver, or from a section of a living donor (**orthotopic transplantation**). In **heterotopic liver transplant**, an auxiliary liver graft is provided without removal of the diseased liver in the hope that the native liver recovers function (see the NICE Guidelines on liver transplantation, which can be found online).

The Gallbladder and Biliary System

The biliary system develops as an outgrowth of the foregut. It is responsible for draining bile (about 700 to 1000 mL/day, important for lipid digestion) from the liver into the duodenum. The gallbladder is a pear-shaped sac, covered by visceral peritoneum, for storage and concentration of bile secreted by the liver. It is found on the posterior side of the liver (right lobe) with a storage capacity of around 50 mL (**Figure 5.36**).

Gross Anatomy of the Gallbladder and Biliary System

The gallbladder can be divided into:

- **Fundus** (end part of the gallbladder and most dependent)
- **Body** (largest part of the gallbladder)
- **Neck** connects with the **cystic duct**

A dilatation from the neck to the body in the presence of gallstones is termed **Hartmann's pouch** (**Figure 5.37**).

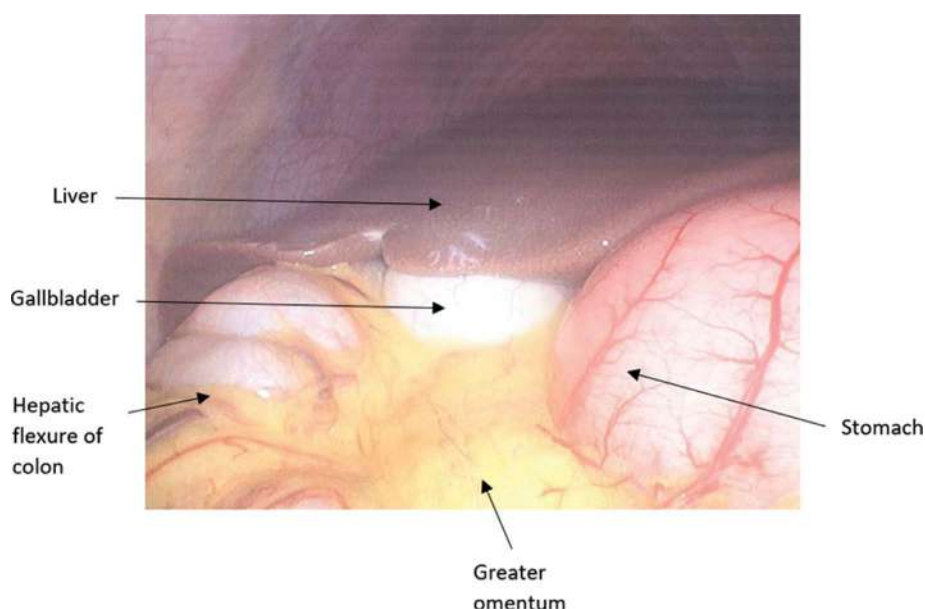


FIGURE 5.36 Laparoscopic view of the stomach, liver, gallbladder, and ascending colon. (Courtesy of Paul Carter.)

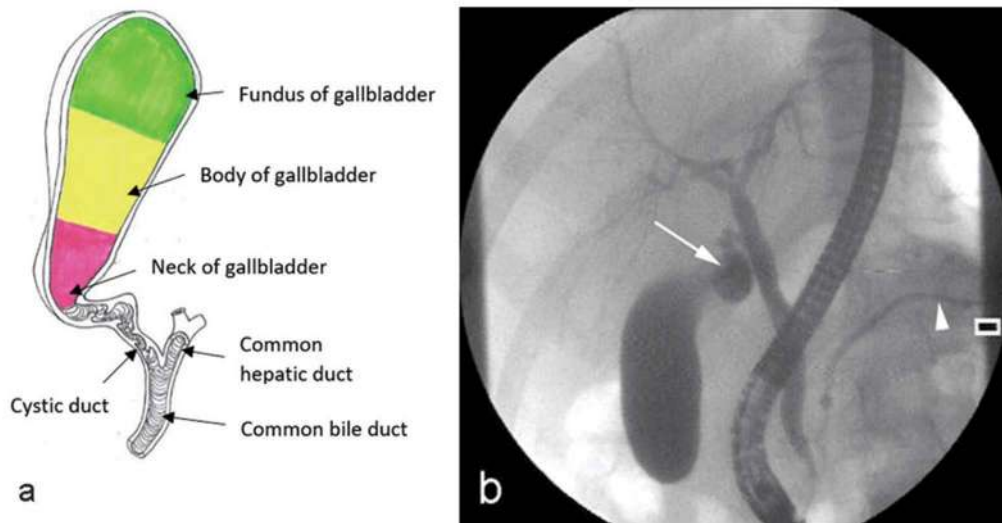


FIGURE 5.37 (a) Parts of the gallbladder and biliary system. (Courtesy of Calum Harrington-Vogt); (b) endoscopic retrograde cholangiopancreatography (ERCP) showing the biliary system, including Hartmann's pouch (*arrow*). The main pancreatic duct (MPD) is also visible (*arrowhead*). (Courtesy of Department of Anatomical Sciences, SGUL.)

Biliary Tree

The bile is secreted through numerous ducts from the liver; bile canaliculi lie between hepatocytes.

Extra Hepatic Biliary System

The right and left hepatic ducts at the porta hepatis form the common hepatic duct (CHD).

The common hepatic duct is joined by the cystic duct to form the CBD.

The CBD is about 3 inches in length. It divides into three parts:

- Supraduodenal, in the free border of the lesser omentum
- Retroduodenal (behind the first part of the duodenum)
- Paraduodenal or pancreatic segment (indents the posterior aspect of the head of the pancreas)

The CBD usually joins the main pancreatic duct to form the ampulla of Vater, which empties the bile into the second part of the duodenum via the major duodenal papilla, which is regulated by the sphincter of Oddi (muscular valve).

Blood Supply

The arterial supply comes from the **cystic artery**, usually originating from the right hepatic artery and passing through the hepatobiliary triangle, *vide infra*. Venous drainage of the gallbladder occurs through the cystic vein, which drains into the hepatic portal vein.

Lymphatic Drainage

Lymphatic drainage is to the cystic node found close to the neck of the gallbladder. The cystic node drains into the coeliac nodes via the hepatic lymph nodes.

Nerve Supply

The gallbladder receives innervation from the coeliac plexus (sympathetic fibres) and the vagus nerve (parasympathetic fibres). Parasympathetic innervation causes the gallbladder to contract, releasing bile into the cystic duct towards the duodenum, in addition to the cholecystikinin (CCK) hormone secreted from the duodenal mucosa.

The **hepatobiliary triangle (Calot's triangle)** is bounded by the CHD, the cystic duct, and the inferior surface of the liver. It

is bridged by a double layer of peritoneum. Its main content is the cystic artery.

Identification of this triangle is of high surgical importance in both open and laparoscopic cholecystectomy.

Biliary anomalies, such as an accessory bile duct or short or long cystic duct, are common and should always be kept in mind while dissecting the hepatobiliary triangle to avoid unnecessary complications.

Endoscopic retrograde cholangiopancreatography (ERCP):

- Entails locating the major duodenal papilla and cannulation of the CBD (**Figures 5.37b** and **5.38a**). It is done by passing a side-view endoscope through the stomach and into the duodenum. ERCP is used both for diagnostic and therapeutic



FIGURE 5.38a ERCP showing biliary system and main pancreatic duct (MPD).

purposes, such as extraction of residual stones in the CBD following cholecystectomy, splitting the sphincter of Oddi (endoscopic sphincterotomy) to assist free drainage, passing of small stones (Figure 5.38b), and relief of jaundice by stenting the CBD, for example, as a palliative measure in patients with inoperable pancreatic cancer.

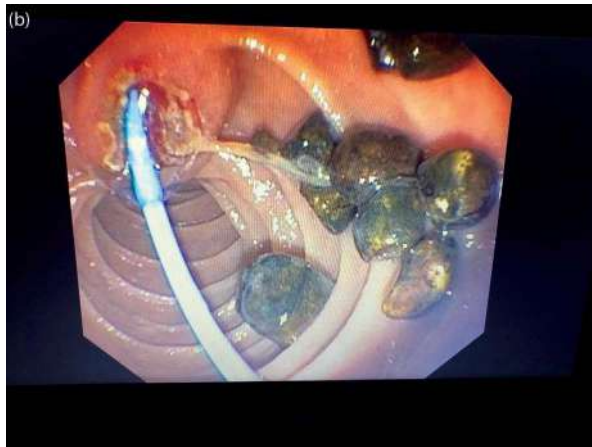


FIGURE 5.38b Intraduodenal view of ERCP sphincterotomy of the ampulla of Vater and extraction of CBD stones. (Courtesy of Akram A. Najeeb.)

CLINICAL NOTES

Gallstones (cholelithiasis) are a common condition and can be silent (asymptomatic) or symptomatic (Figures 5.39 and 5.40). They can cause severe pain in the upper abdomen, mainly on the right side (biliary colic).

Acute cholecystitis (inflammation of the gallbladder) usually follows obstruction of the cystic duct. However, cholecystitis can occur without the presence of gallstones (acalculous cholecystitis). Rarely, impacted gallstones in the cystic duct or the neck of the gallbladder may compress the CHD and cause obstructive jaundice, and may even cause fistula formation between the gallbladder and the CHD (Mirizzi's syndrome).

The obstructed infected gallbladder may turn into a bag of pus (empyema of the gallbladder), which necessitates urgent percutaneous pus aspiration (interventional radiology procedure) or sometimes surgical evacuation and drainage of the gallbladder (cholecystostomy).

Cholelithiasis is the most common cause of acute pancreatitis.

A big gallstone can fistulate from the gallbladder to the duodenum and move down the small bowel to its narrowest part, the ileum, and cause small bowel obstruction (gallstone ileus).

Murphy's sign: this physical examination involves the patient breathing in deeply with the examiner's hand placed at the location of the gallbladder, under the right costal margin. An inflamed gallbladder feels tender to palpation, and this sign is positive.

Post-hepatic (obstructive) jaundice occurs when gallstones pass into the CBD. Septicaemia is a serious complication which can follow infection of the bile ducts (cholangitis). The most common causative organisms are gram-negative bacilli like *Escherichia coli*.

Liver abscess (pus formation) can also follow biliary tract infections.

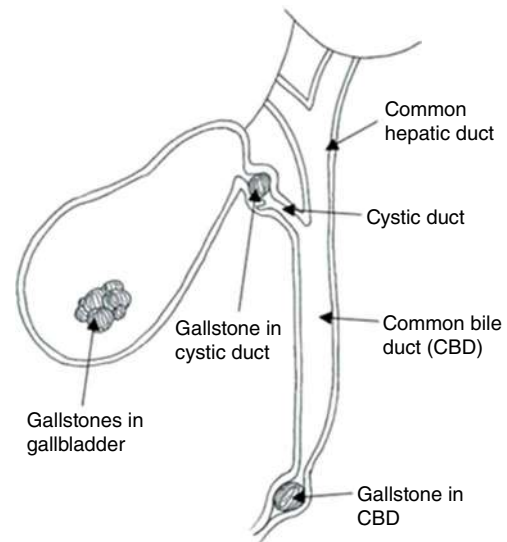


FIGURE 5.39 Expected sites of gallstones. (Courtesy of Calum Harrington-Vogt.)



FIGURE 5.40 Gallstones removed from a cholecystectomy specimen from a patient with empyema of the gallbladder. (Courtesy of Qassim F. Baker.)

Biliary obstruction can be:

- **Intramural (lumen):** commonly by gallstones (Figures 5.41 and 5.42) or, rarely, by parasitic worms such as *Ascaris* or a ruptured liver hydatid cyst
- **Mural (wall):** cholangiocarcinoma (cancer of the epithelial lining of the bile duct), sclerosing cholangitis, and stricture formation following previous cholecystectomy
- **Extramural** (pressure from outside, commonly due to cancer in the head of the pancreas or periampullary carcinoma)

(Continued)



FIGURE 5.41 ERCP showing residual stones in a dilated CBD. (Courtesy of Qassim F. Baker.)



FIGURE 5.42 Surgical specimen showing gallbladder containing multiple gallstones. (Courtesy of Mohammed M. Habash.)



FIGURE 5.43 Patient with obstructive jaundice due to pancreatic cancer. (Courtesy of Aqeel S. Mahmood.)

There are three main types of **jaundice** (yellow discolouration of the skin and sclera due to high bilirubin level in the blood) (**Figure 5.43**):

- *Pre-hepatic* (excessive red cell destruction, i.e., haemolysis, with the release of unconjugated bilirubin). Common examples are haemolytic anaemia (spherocytosis, sickle cell anaemia, thalassaemia) and malaria.
- *Intrahepatic (cholestatic)*: the disruption happens in the liver, e.g., in patients with viral hepatitis.
- *Post-hepatic (obstructive)*: characterised by passing dark-coloured urine, pale-coloured faeces, and sometimes itching of the skin.

In both intrahepatic and post-hepatic jaundice there is an increased level of serum conjugated bilirubin, which is water-soluble and can pass through the filtration mechanism of the kidneys and results in passing dark-coloured urine.

Learning Point

Laparoscopic cholecystectomy is one of the most common surgical procedures. Keeping in mind the presence of anomalies of the biliary system and blood supply to the gallbladder will avoid serious complications, such as perioperative severe bleeding and postoperative biliary fistulas.

QUIZ QUESTION

Q. Why does pain from an inflamed gallbladder refer to the tip of the right shoulder?

The Ileum and Jejunum

The jejunum and the ileum are the next parts of the small intestine. They extend from the DJJ to the ileocaecal valve. There is no clear boundary for differentiating between the jejunum and

the ileum, as they both form a continuous tube which gradually changes along its length. As there is no distinct boundary between the jejunum and the ileum, they are often spoken of together as the jejunum-ileum (Table 5.2 and Figure 5.44).

The wall consists of the mucosa, submucosa, muscularis, and serosa.

- The **mucosa** is designed for absorption of products of digestion, aided by the huge surface area formed by the villi. The epithelial cells renew every 3 to 5 days.
- The **submucosa** consists of a layer of connective tissue that contains the blood vessels, nerves, and lymphatics.
- The **muscular layer** is formed of outer longitudinal and inner circular layers.
- The **serosa** is formed by the visceral peritoneum.

The secretion and motility of the small bowel are controlled by its autonomic innervation and its ENS.

The jejunum and ileum are suspended from the posterior abdominal wall by the mesentery (see earlier), which transmits branches and tributaries of the superior mesenteric vessels, lymphatics, and autonomic nerves. The jejunum and ileum measure about 6 metres in length, while its mesentery attaches to a small strip of the posterior abdominal wall from the level of the L2 vertebra on the left to the right iliac fossa (the “root” of the mesentery).

The Superior Mesenteric Artery (SMA) (Figure 5.45)

The SMA is the artery of the midgut and supplies the bowel from the level of the major duodenal papilla (second part of the duodenum) to the splenic flexure of the colon. It arises from the abdominal aorta at the level of the L2 vertebra.

Branches

- **Inferior pancreaticoduodenal**, supplies part of the head of the pancreas and duodenum from the second part.
- **Middle colic** divides into right and left branches within the transverse mesocolon to supply the transverse colon. The left branch anastomoses with branches of the left colic artery (from the IMA) at the splenic flexure (watershed area) to form the marginal artery (of Drummond).
- **Jejunal and ileal branches** arise from the left side of the artery and connect with each other via a series of arcades (important to recognize if small bowel resection is attempted, e.g., for small bowel gangrene, injuries, tumours, or Crohn’s disease).
- **Ileocolic artery** supplies the terminal ileum, caecum, vermiform appendix (appendicular artery), and ascending colon. This is the reason to resect the terminal ileum in the operation of right hemicolectomy, commonly performed for right-sided colon cancer.
- **Right colic artery** to the ascending colon up to the hepatic flexure and anastomoses with the right branch of the middle colic artery.

Corresponding tributaries join the SMV, which runs with the artery within the mesentery and which joins the splenic vein to form the hepatic portal vein behind the neck of the pancreas.

After resection of a segment of the small bowel, the two ends can be joined together (end-to-end anastomosis) in the majority of cases because of the rich blood supply of the small bowel and less contaminated contents. In comparison, immediate large bowel anastomosis is less feasible.

SMA Occlusion

The SMA can get blocked by thrombosis or emboli (for example, in patients with uncontrolled atrial fibrillation [AF]). This results in widespread bowel ischaemia, and, if not diagnosed early, bowel gangrene follows, which is usually fatal.

Nerve Supply

Visceral afferent fibres (sympathetic) pass to thoracic segments of the spinal cord via the greater and lesser splanchnic nerves. Visceral pain from small bowel obstruction is felt first in the dermatome T9–T11 (central abdominal pain). Efferent pre-ganglionic sympathetic axons travel down the greater and lesser splanchnic nerves to the coeliac plexus and to the superior mesenteric plexus to accompany the arteries arising from the SMA. They act as vasoconstrictors and inhibitors to the smooth muscles of the jejunum and ileum.

Parasympathetic innervation comes from the vagus, increasing secretomotor activity and bowel motility.

Lymphatic Drainage

The lymphatic vessels of the jejunum and ileum not only have an immune function but also help in absorption of fat and fat-soluble vitamins via lacteals in the villi. The lymphatic vessels join mesenteric lymph nodes (within the mesentery) and finally join the lymph nodes at the origin of the SMA.

Inflammation of these lymph nodes is called **mesenteric adenitis**, sometimes clinically indistinguishable from acute appendicitis, especially in children.

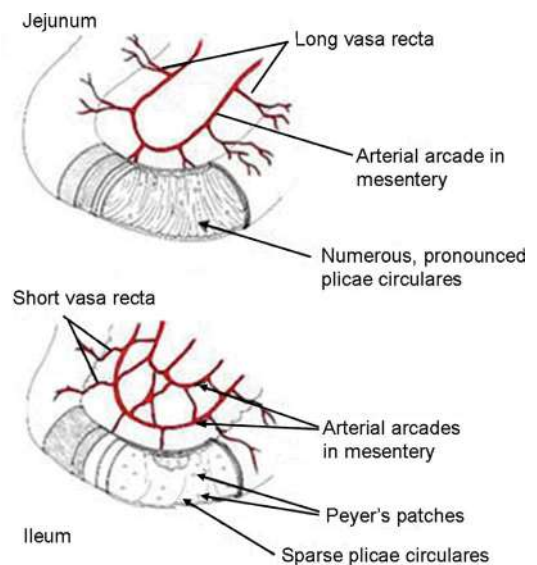


FIGURE 5.44 How to differentiate the jejunum and ileum. (Courtesy of Calum Harrington-Vogt.)

Small Bowel Obstruction

The small bowel can get obstructed and may become ischaemic (cut off of blood supply), commonly from outside causes (adhesions following previous bowel surgery or a segment of bowel being pinched off and pushed through an orifice in the body wall – obstructed inguinal, paraumbilical, umbilical, incisional, and femoral hernias), or rarely, small bowel loops are trapped into, for example, a mesenteric hole (internal hernia). In comparison to the large bowel, the small bowel is rarely obstructed by tumours (benign, like submucous lipoma, or malignant, like carcinoid tumour, lymphoma, and adenocarcinoma). If

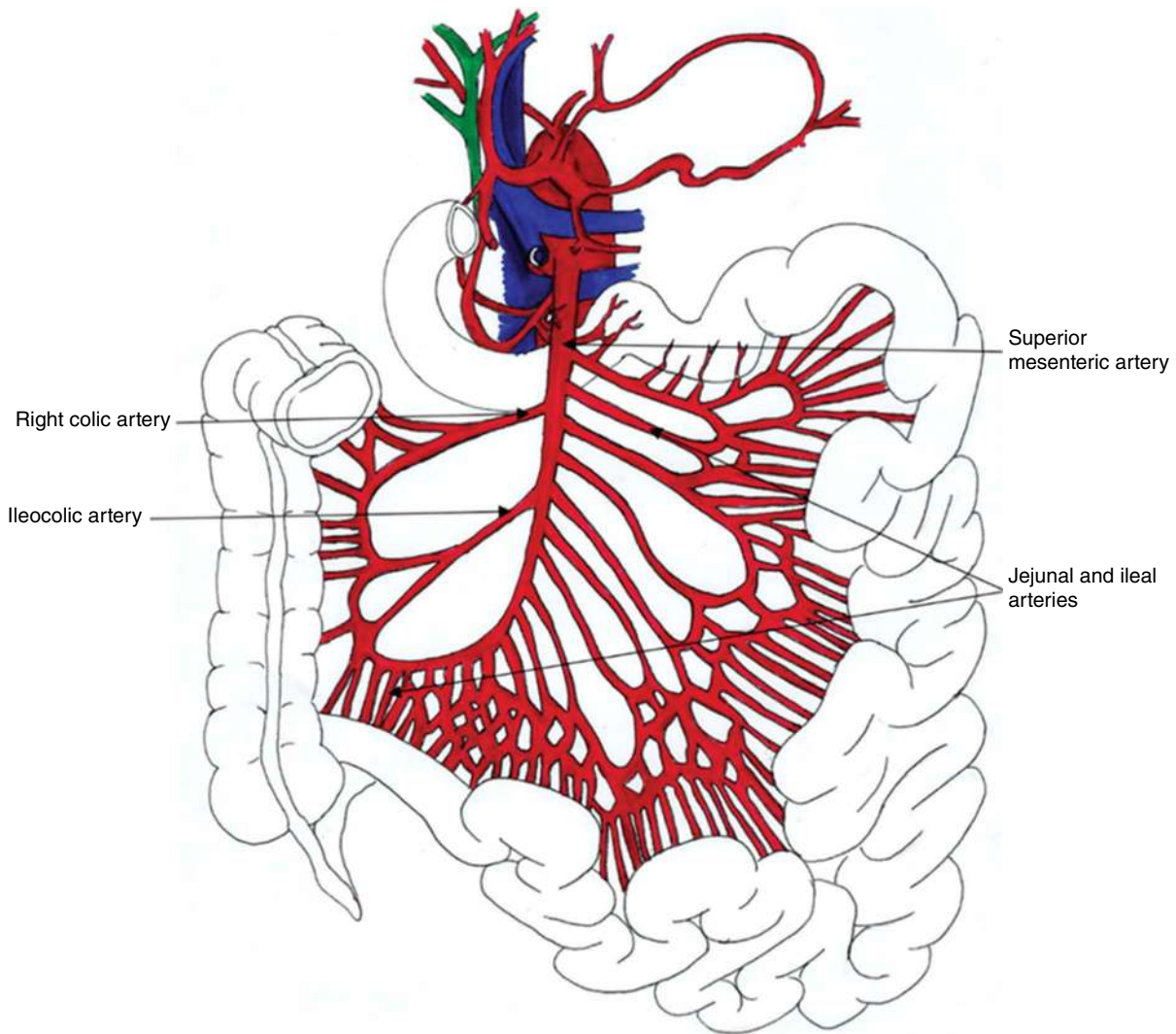


FIGURE 5.45 Blood supply of the small bowel and right colon. (Courtesy of Calum Harrington-Vogt.)

TABLE 5.2: Differences between the jejunum and the ileum

Jejunum	Ileum
Thicker walled, with a wider lumen relative to the ileum	Thinner-walled, with a narrower lumen relative to the jejunum
More vascularised relative to the ileum; the mesentery has fewer arterial arcades, with a longer vasa recta	Less vascularised relative to the jejunum; its mesentery has more arterial arcades compared to the jejunum, with a short vasa recta
The main site of absorption for carbohydrates, proteins, and most other nutrients extracted from food. Has a much more richly folded luminal mucosal lining, which forms a dense microvilli surface, ideal for quick and efficient absorption of nutrients	The ileum is the main site for lipid (and other lipid-soluble molecules), vitamin B ₁₂ , and bile salt absorption. The luminal mucosa is much less projected into microvilli, giving the ileum much less absorptive capacity relative to the jejunum
The jejunum has little mucosal-associated lymphoid tissue (MALT)	The ileum has MALT present facing into the lumen. These patches of lymphoid tissue are known as Peyer's patches and have an immunological function in the gastrointestinal tract
The jejunum has numerous pronounced plicae circulares (circular folds) projecting into its lumen	Less obvious plicae circulares. The distal ileum has barely any plicae circulares

the circulation is not restored, the bowel becomes gangrenous (black in colour, no pulsation in the branches of the SMA, and not contractile), which will necessitate resection of the gangrenous segment (Figure 5.46).

The classical symptoms of patients with small bowel obstruction include central colicky abdominal pain, vomiting, abdominal distension, and constipation.

Plain X-ray of the abdomen in the erect position reveals multiple air–fluid levels (Figure 5.47).



FIGURE 5.46 Ischaemic loop of small bowel (which may be still salvageable); compare this to the pink colour of healthy bowel. (Courtesy of Maan Aldoori.)

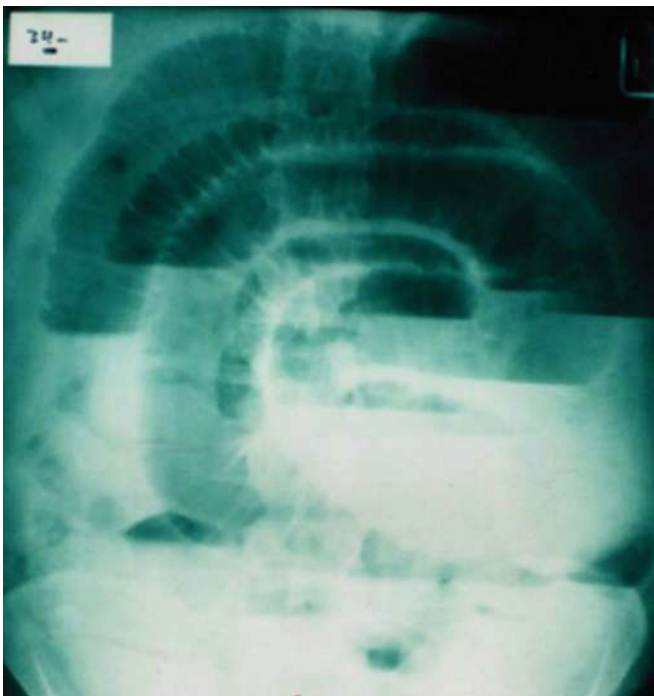


FIGURE 5.47 Plain X-ray (erect position) of a patient with small bowel obstruction showing multiple air–fluid levels in a ladder pattern appearance. (Courtesy of Qassim F. Baker.)

Learning Point

The two most common causes of small bowel obstruction are postoperative adhesions and obstructed hernias.

Crohn's Disease

This inflammatory condition of unknown aetiology can affect the whole GIT, but has a preference for the terminal ileum. It can cause small bowel obstruction, bleeding, and fistula formation into the GIT and rarely perforates into the peritoneal cavity.

Notes on Inflammatory Bowel Disease

Both Crohn's disease and ulcerative colitis (UC) are forms of inflammatory bowel disease (IBD). In medical school exams, the features in Table 5.3 are often used to distinguish between the two.

TABLE 5.3: Comparison between the main two types of inflammatory bowel disease

Crohn's Disease	Ulcerative Colitis
Occurs anywhere within the GIT (commonly the terminal ileum, often rectal sparing)	Confined to the colon, always affects the rectum
Skip lesions possible	Continuous lesions, extending proximally from the rectum; sharp transition from normal to inflamed colon
Transmural inflammation – strictures and fistulae therefore more common than UC	Mucosal inflammation

Note: Some patients have overlapping features of UC and Crohn's disease. IBS can therefore be considered a spectrum between the two. Care is often shared between medical and surgical teams.

Meckel's Diverticulum

A Meckel's diverticulum is an outpouching of a segment of bowel from the anti-mesenteric border, commonly in the terminal ileum (Figure 5.48). It represents a patent remnant of the proximal part of the vitelline duct (omphalomesenteric duct) arising from the distal ileum (see the discussion on the umbilicus for more information).

Meckel's diverticulum is classified as a **true diverticulum**, as it involves all the layers of the gut (including the muscular layer, not just the mucosa), in contrast to false diverticuli of the colon. There may be some heterotopic epithelium of gastric, pancreatic, or colonic type. The gastric epithelium may undergo ulceration and bleed, causing bleeding per rectum.

Most patients who have a Meckel's diverticulum are asymptomatic and do not need to have bowel resection surgery.

Meckel's diverticulum has a 2, 2, 2, 2 record; with 2% of the population possessing a Meckel's diverticulum, it being located approximately 2 feet from the ileocaecal junction proximally, usually 2 inches in length, and typically presenting before the age of 2.

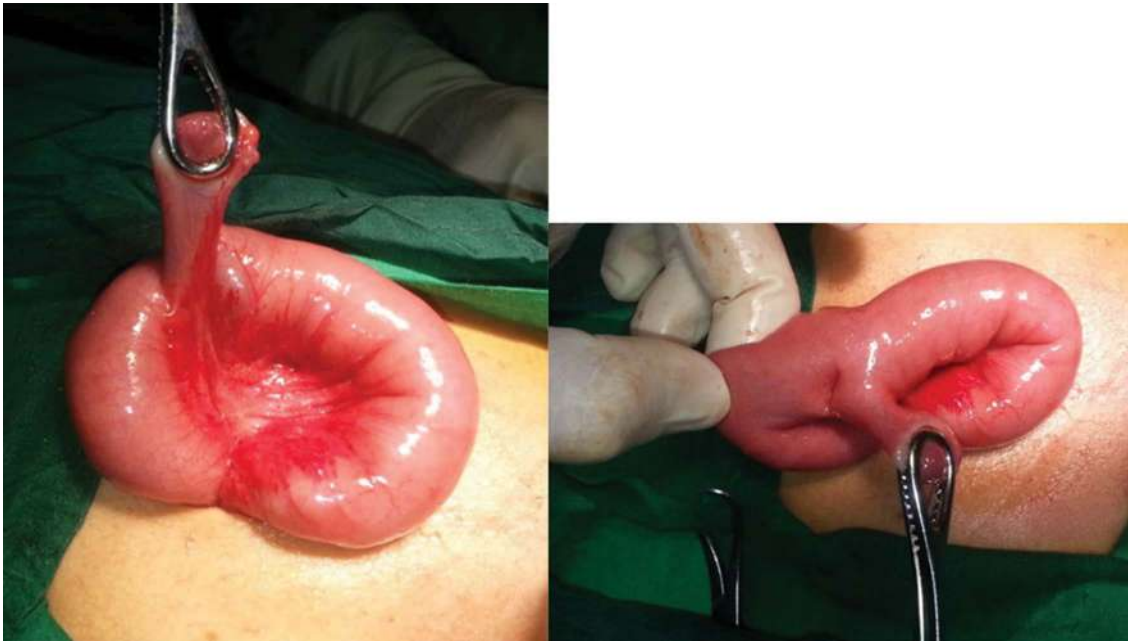


FIGURE 5.48 Meckel's diverticulum. (Courtesy of Mohammed H. Aldabbagh.)

Meckel's diverticulum, if symptomatic, usually produces symptoms early on in life. Inflamed diverticulum usually produces symptoms similar to acute appendicitis and is often misdiagnosed for acute appendicitis; only at operation is Meckel's diverticulum usually diagnosed. Other complications include bleeding per rectum and invagination of the bowel segment containing the

diverticulum into another adjacent bowel segment (intussusception), causing bowel obstruction (*vide infra*).

Intussusception

Intussusception is the invagination of a proximal bowel segment into another one, causing bowel obstruction. The most common type is ileocolic (the distal ileum telescopes into the proximal colon but may go farther down the colon). It mostly affects children in their first year, with the peak age at 9 months. The diagnosis can be achieved by USS of the abdomen. Contrast barium enema is more diagnostic (**Figure 5.49**) and can be used as a therapeutic measure as well to undo the bowel invagination under fluoroscopic screening. If radiological reduction fails, a laparotomy is indicated before bowel gangrene establishes, in which case it will need a bowel resection. In adults, intussusception may have an underlying bowel condition such as small bowel tumours, e.g., submucous lipoma or lymphoma.

Large Bowel or Large Intestine

Extends from the ileocaecal valve to the anus and is derived from the distal midgut (caecum, ascending colon, proximal two-thirds of transverse colon), hindgut (distal one-third of the transverse colon, descending and sigmoid colon, and rectum), and the proctodeum. The division between the midgut and the hindgut is at the splenic flexure (watershed area between the SMA and IMA). The large bowel's main function is storage and transmission of the intestinal contents, absorption of water and electrolytes, vitamin production (by the commensal bowel bacteria), and absorption of vitamins such as B and K.

Layers of the colon

- Mucosa, lined by columnar epithelium
- Submucosa, connective tissue that contains the blood vessels, lymphatics, and nerves
- Inner circular muscle
- Outer longitudinal muscle

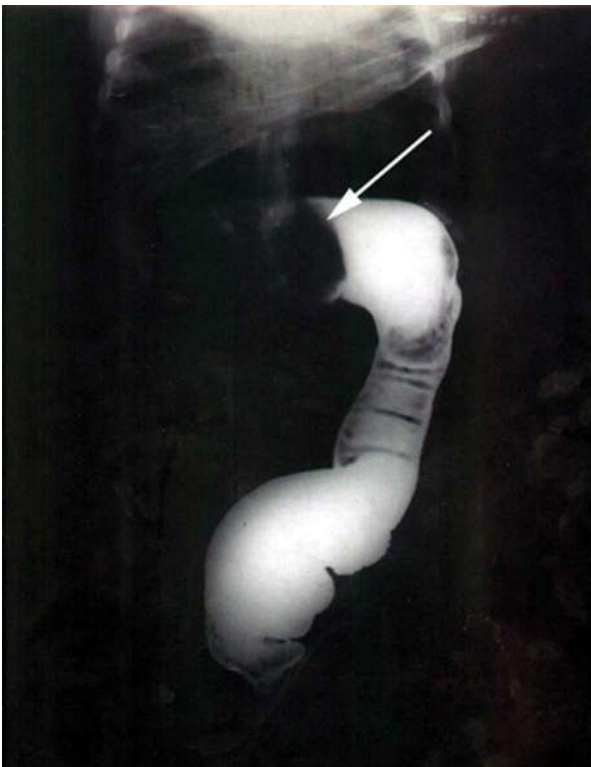


FIGURE 5.49 Barium enema of a child with ileocolic intussusception showing the meniscus sign (*arrow*). (Courtesy of Qassim F. Baker.)

- Serosa, complete peritoneal covering on the caecum, transverse colon, and sigmoid colon; the ascending and descending colon are covered only anteriorly by the peritoneum

The colon does not have a continuous covering of longitudinal smooth muscle; the longitudinal smooth muscle takes the form of three thin whitish bands known as the *taeniae coli* (*taenia*: latin, “ribbon”) which aid in the peristalsis of bowel contents. As the colon does not have a continuous covering of longitudinal smooth muscle, it can form diverticuli (protrusions of the mucosa) in high-pressure areas of the colon, such as the sigmoid colon.

The **rectum** is retroperitoneal and **has a continuous covering of longitudinal smooth muscle**, so it is immune to the formation of diverticuli (see [Section 6](#), Pelvis and Perineum).

The small intestine is separated from the large intestine by the ileocaecal valve. This valve is usually competent, allowing the passage of bowel contents in one direction and preventing back-flow to the small bowel.

If there is an obstructing lesion distally along the large intestine or the rectum, there will be a build-up of bowel contents proximally causing dilation of the colon, and especially of the

wide-lumened caecum, which may end up with caecal perforation and faecal peritonitis (a very serious type of bacterial peritonitis).

The transverse and sigmoid colon have a mesentery, while the rest of the colon is secondarily retroperitoneal, and therefore partially covered by peritoneum. The caecum, however, is frequently intraperitoneal, but usually has no mesentery. The sigmoid colon can twist around its mesentery (volvulus), which results in huge abdominal distension.

The colon has a dual arterial supply:

- From the SMA (see earlier)

The IMA gives rise to the following branches:

- Left colic
- Sigmoidal arteries, running through the sigmoid mesocolon
- IMA continues as the superior rectal artery

See [Section 6](#) for more information.

The **marginal artery of Drummond** runs on the mesenteric margin of the colon and is formed by the anastomosis of ileocolic, right colic, middle colic, and left colic arteries. The most susceptible part is at the splenic flexure (watershed area; this explains ischaemic colitis at this site) ([Figure 5.50](#)).

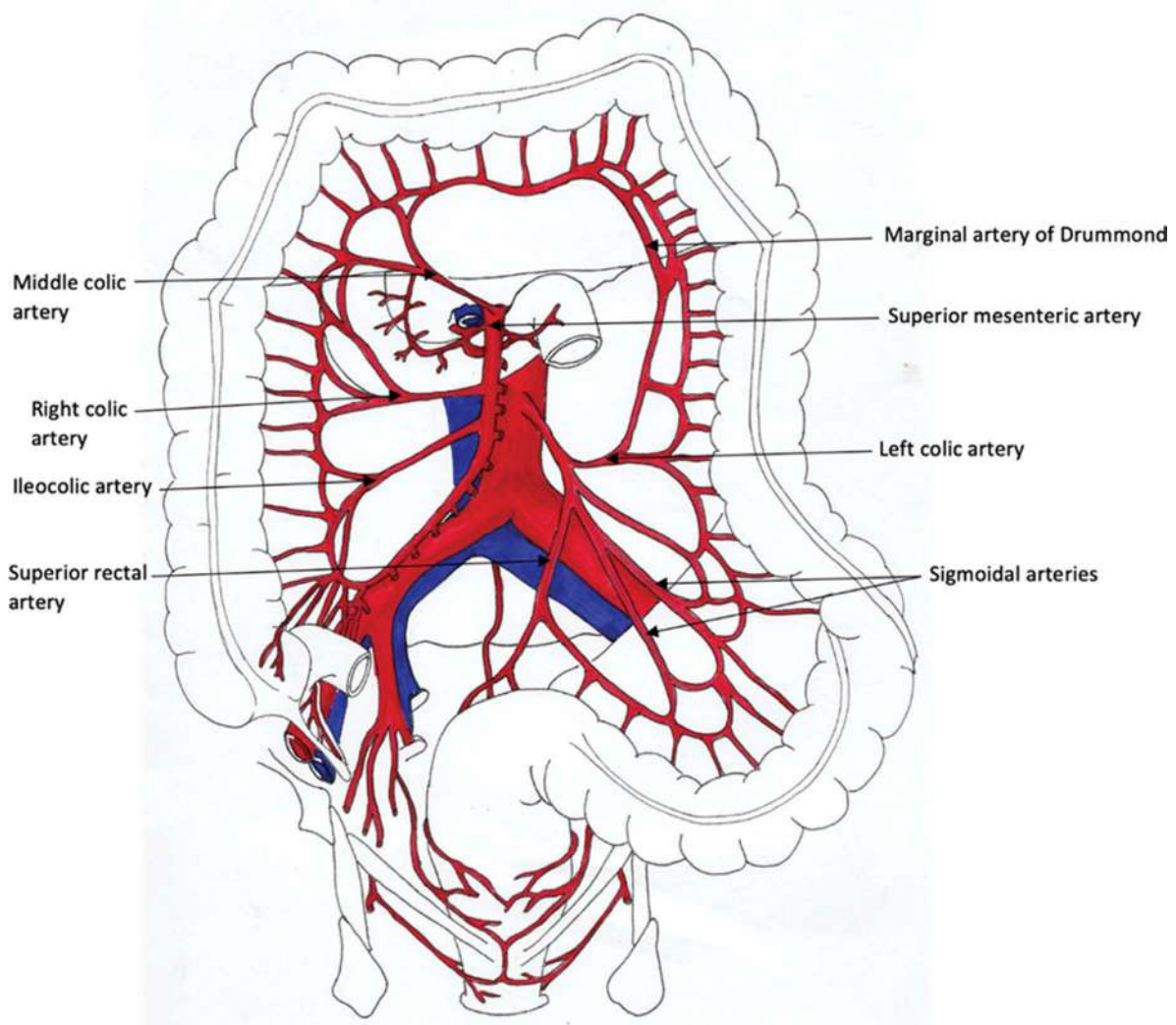


FIGURE 5.50 The arterial supply of the colon. (Courtesy of Calum Harrington-Vogt.)

Lymphatic drainage of the colon follows the arterial blood supply. The colic lymph nodes can be divided into epicolic, paracolic, intermediate, and pre-terminal (near to the origins of the SMA and IMA).

Radical colonic resection aims at removal of the colic lymph nodes, draining the excised part of the colon (right, left, or total colectomy).

How to differentiate the large from the small bowel:

- The presence of taeniae coli
- Appendices epiploicae, small fatty projections on the free surface of the colon
- Wider calibre of the large bowel
- Sacculations (haustrations) seen on radiological examination of the colon

Parts of the Colon

Caecum

This part of the colon is a blind sac, lying below the ileocaecal junction (ileocaecal valve). It has a large diameter which makes it susceptible to distension and perforation with increased intracolonic pressure (see earlier). Rarely, the appendix and the caecum fail to descend to the RIF and stay in a subhepatic position. In this case, pain from an inflamed appendix may be mistaken for acute cholecystitis.

The vermiform appendix (*vermiform*: latin, “worm-like”) is a narrow blind tube which is attached to the caecum on its posteromedial aspect. It has a mesentery (the mesoappendix) and is frequently completely covered by peritoneum. Traditionally, McBurney’s point is the surface marking on the anterior abdominal wall to indicate the site of the base of the appendix (see [Figure 5.10](#)).

The taeniae coli of the caecum converge and surround the vermiform appendix (a practical way to locate the appendix at operation is by following the taeniae coli). The appendix is supplied by the appendicular artery, which usually arises from the ileocolic artery (from the SMA) ([Figure 5.51](#)). The tip of the appendix varies in position and can lie behind the caecum (retrocaecal), down in the pelvis (pelvic), anterior or posterior to the ileocaecal junction, and rarely, ascending behind the visceral surface of the liver (subhepatic); appendicectomy in this case will necessitate ligation and division of the base of the appendix and the appendicular vessels first and continuing the dissection upwards, behind the caecum and ascending colon, until complete excision of the appendix.

Acute appendicitis is the most common cause for acute abdomen needing surgical intervention and is mostly due to obstruction of its lumen, e.g., by faecolith (solid particle of faeces). The appendicular artery is an end artery, so thrombosis of this artery due to acute appendicitis can lead to gangrene and perforation of the appendix, causing localised or generalised peritonitis, a serious surgical emergency ([Figure 5.52](#)). The appendix can be removed via an open approach or laparoscopically ([Figure 5.53](#)).

The greater omentum and loops of small bowel may surround the inflamed appendix and form an inflammatory mass (**appendicular mass**), which can be felt as a tender mass in the right iliac fossa. Most cases are treated conservatively (non-operatively) with IV antibiotics and close clinical observation.

As part of the midgut, the pain of acute appendicitis is usually first felt around the umbilicus (**visceral pain**). The pain sensation

is conducted via afferent sympathetic nerves to the T10 segment of the spinal cord, and this is the same spinal segment that supplies the skin at the level of the umbilicus. When the inflammation reaches the parietal peritoneum, it will be more localised and sharper (**somatic pain**). Older patients can develop acute appendicitis, but consideration must be given to an obstructing lesion on the right side of the colon, such as carcinoma. Usually, a preoperative CT scan is arranged to rule out right colon cancer. Psoas sign is due to inflammation of the parietal peritoneum overlying the iliopsoas muscles (flexors of the hip joint) due to, for example, a retrocaecal appendicitis and is manifested clinically by pain on extension of the hip joint.

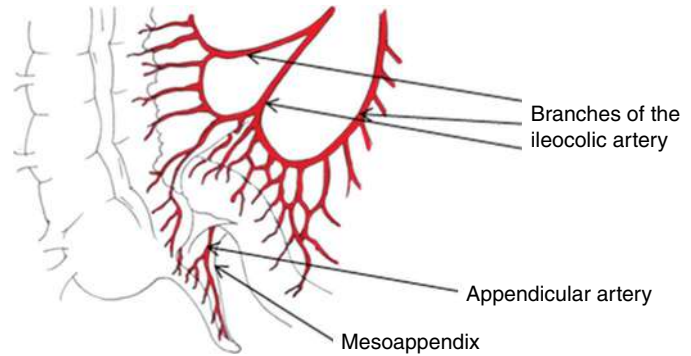


FIGURE 5.51 Blood supply of the appendix and right side of the colon. (Courtesy of Calum Harrington-Vogt.)



FIGURE 5.52 Specimen of inflamed distended appendix. (Courtesy of Qassim F. Baker.)

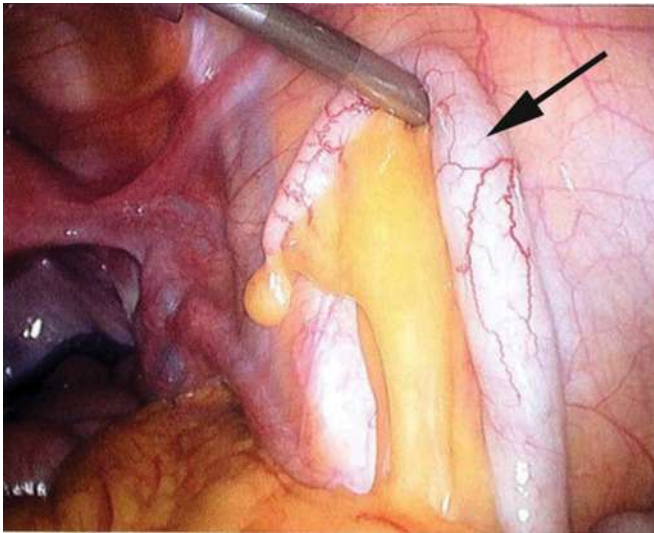


FIGURE 5.53 Laparoscopic view showing the vermiform appendix (*arrow*). (Courtesy of Paul Carter.)

Differential diagnosis of pain in the RIF, in addition to acute appendicitis, should include:

- Other bowel pathologies such as Crohn's disease, mesenteric adenitis, and caecal and ascending colon cancer
- *Gynaecological causes:* complicated ovarian cysts, acute salpingitis, mittelschmerz (midcycle bleeding), and ectopic pregnancy
- Urological causes such as ureteric colic and urinary tract infection (UTI)

Ascending Colon

The ascending colon runs from the ileocaecal junction to the **hepatic flexure**, where the colon bends to the right to form the transverse colon.

The hepatic flexure is related to the visceral surface of the liver. Lesions of the hepatic flexure, such as cancer, should be part of the differential diagnosis of pain in the right upper quadrant of the abdomen (common causes include biliary and hepatic problems).

The blood supply of the ascending colon comes from the ileocolic and right colic arteries.

Transverse Colon

The transverse colon runs across the upper abdomen, starting at the hepatic flexure and ending at the splenic flexure, and is suspended from the transverse mesocolon. The splenic flexure is higher than the hepatic flexure. The gastrocolic omentum from the greater curve of the stomach fuses with the anterior part of the transverse colon and continues inferiorly as the **greater omentum**.

The transverse colon is rarely interposed between the diaphragm and the liver, and on imaging, the air within the colon may be mistaken as hollow viscus perforation (Chilaiditi's syndrome).

The blood supply is from the middle colic artery, which runs within the transverse mesocolon.

Descending Colon

Starts at the splenic flexure and ends at the pelvic brim, where it becomes the sigmoid colon.

The blood supply is from the left colic artery and upper sigmoidal arteries (branches of the IMA).

The **white lines of Toldt** are zones of avascular peritoneum originally described **along the lateral edges of the ascending colon and descending colon** at the meeting point of the visceral peritoneum and the peritoneum of the posterior abdominal wall. They are important in open, laparoscopic, or robotic mesocolic excision (excision of the tumour-bearing segment and its mesocolon).

In the operation of right or left colectomy, the colon should be mobilised first by cutting through the bloodless line of parietal peritoneum along the paracolic gutter; the blood supply is then secured with clips or ligatures.

On the right side the following structures need to be identified and safeguarded:

- Right ureter, which is retroperitoneal but **frequently adherent to the parietal peritoneum**
- Right gonadal vessels
- The second part of the duodenum; unnoticed injury may result in the development of duodenal fistula, which can be missed

On the left side, the left ureter and gonadal vessels need to be identified.

Sigmoid Colon

This starts as a continuation of the descending colon and ends at the level of the third sacral vertebra to become the rectum. It is suspended by an inverted V-shaped structure: the sigmoid mesocolon.

CLINICAL NOTES

Stomas are openings in the small or large bowel delivered to the skin surface of the abdomen to divert bowel contents to a bag, which is fixed to the abdominal wall, mostly necessary during surgery for large bowel obstruction.

Colostomy is an opening in the colon to divert contents after relieving obstruction or to protect anastomosis following large bowel resection. The sigmoid and transverse colon are the most suitable to be brought to the skin in view of their mesenteries (sigmoid and transverse mesocolon, respectively). Colostomy can be temporary (with bowel continuity restored after a while) or can be permanent, for example, following excision of the rectum in abdominoperineal resection.

Ileostomy is an opening in the ileum (usually in the last part) which is brought to the skin surface, for example, following total removal of the colon (total colectomy) or to protect a distal colonic anastomosis.

Colorectal carcinoma (CRC) is one of the most common surgical cancers and starts in the mucosa. Certain pathological conditions can predispose to CRC; among these are IBD (UC and Crohn's disease) and familial adenomatous polyposis (FAP, **Figure 5.54**).

The extent of colorectal cancer can be staged according to the degree of bowel wall invasion, involvement of the regional lymph nodes, and presence of liver metastasis (common site for cancer spread). See **Section 6**.

In minimal access surgery (laparoscopic surgery), the transverse colon is at risk of injury while inserting the trocar, prior to insufflation of the peritoneal cavity.

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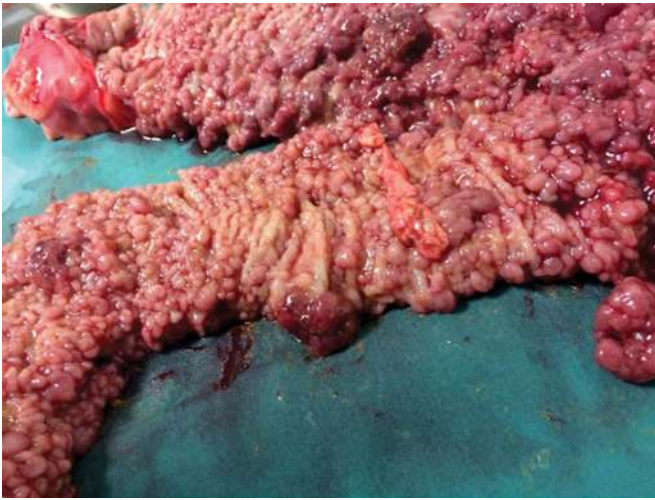


FIGURE 5.54 Colectomy specimen showing the colon riddled with extensive polyps due to familial adenomatous polyposis (FAP). (Courtesy of Rashide Yaacob.)

Diverticulosis of the colon (Figure 5.55) refers to the protrusion of the colonic mucosa, usually in the sigmoid colon. It is a common finding, which is usually asymptomatic, but can become complicated in the form of inflammation (acute diverticulitis), localised or generalised peritonitis due to bowel perforation, bleeding per rectum (which can be profuse), and fistula formation (tracking to another organ, e.g., the urinary bladder).



FIGURE 5.55 Barium enema showing extensive diverticulosis of the descending and sigmoid colon. (Courtesy of Qassim F. Baker.)

COMMON CAUSES OF LARGE BOWEL OBSTRUCTION

The large bowel is commonly obstructed by cancer, especially on the left side of the colon (**Figure 5.56**) and rectum. Other causes include volvulus, faecal impaction, and foreign bodies inserted into the rectum.



FIGURE 5.56 Plain X-ray of the abdomen showing colonic distension due to obstructing distal colon cancer. The ileocaecal valve is competent, so the small bowel is not distended

SIGMOID VOLVULUS

Sigmoid volvulus is a condition where a loop of bowel, commonly the sigmoid colon, twists around its mesentery, which results in cutting off of its blood supply and bowel gangrene. Patients with this condition present with a sudden onset of abdominal pain, vomiting, constipation, and massive abdominal distension (**Figures 5.57** and **5.58**).

Hirschsprung's disease is a congenital disease due to a lack of nerve cells (aganglionosis) of usually a short segment of the distal colon and rectum, which impairs peristalsis and causes constipation and large bowel obstruction in affected neonates (**Figure 5.59**).

ISCHAEMIC COLITIS

This term refers to the pathological changes which follow lack of blood supply (ischaemia) to the colon, specifically to the mucosa. It typically affects the watershed area at the junction of the territories of the SMA and IMA (splenic flexure). The main cause is atherosclerosis, and ischaemic colitis is a disease of older patients. The main clinical presentation is abdominal pain and rectal bleeding.



FIGURE 5.57 Volvulus of sigmoid colon. (Courtesy of Maan Aldoori.)



FIGURE 5.58 Ischaemic sigmoid colon in a 52-year-old man who presented with sudden lower abdominal pain and distension due to sigmoid volvulus. (Courtesy of Walid M.G. El-Haroni.)

Posterior Abdominal Wall

What are the structures that form the posterior abdominal wall?

- Lumbar vertebrae and the intervening intervertebral discs and connecting ligaments
- Muscles
- Diaphragm (see [Section 4](#))
- Lumbar plexus



FIGURE 5.59 Plain X-ray and barium enema of a 3-year-old child with chronic constipation, faecal impaction, soiling, and abdominal distention, diagnosed with Hirschsprung's disease. (Courtesy of Mohammed H. Aldabbagh.)

There are five **lumbar vertebrae**:

- The lumbar vertebrae have a large kidney bean-shaped body with a triangular vertebral foramen ([Figures 5.60a](#) and [5.60b](#)).
- They have short, thick, and broad spinous processes and long, slender transverse processes. The pedicles are relatively strong, whilst the laminae are broad and short.
- The superior articular facets are concave and face posteromedially, whilst the inferior articular facets are convex facing anterolaterally. This reciprocity means that the lumbar spine is the most flexible region of the vertebral column, allowing flexion, extension, lateral flexion, and axial rotational movement.
- L5 has the largest body and is significantly deeper anteriorly, contributing to the lumbosacral angle.

The vertebral lamina extends from the base of the spinous process to the junction of the upper and lower articular facets. It has an anterior surface towards the vertebral canal and a posterior surface that gives attachment to the erector spinae muscles.

The **ligamenta flava** (*singular*: ligamentum flavum), yellow in colour because of their elastin content, are paired structures which run between adjacent vertebral laminae ([Figure 5.61](#)).

The **intervertebral disc** is composed of the peripheral annulus fibrosus (fibrocartilage) surrounding a gel-like centre, the nucleus pulposus ([Figure 5.62](#)).

Intervertebral discs contribute 25% of the total length of the vertebral column. They separate the vertebrae, which aids movement of the column. In addition, they act as a shock absorber to any mechanical force exerted on the column.

Sacralisation of L5 and lumbarization of S1 are congenital abnormalities – S1 takes lumbar characteristics, and L5 takes sacral characteristics.

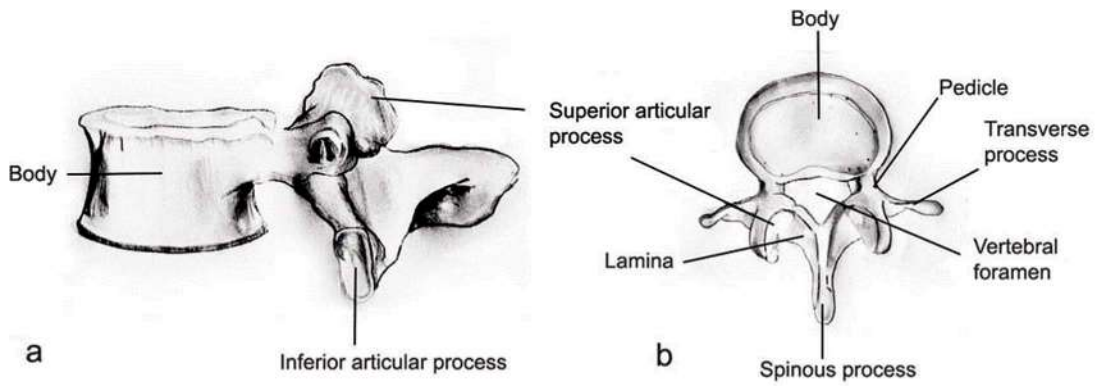


FIGURE 5.60 Lateral (a) and superior (b) view of a lumbar vertebra. (Courtesy of Aditya Mavinkurve.)

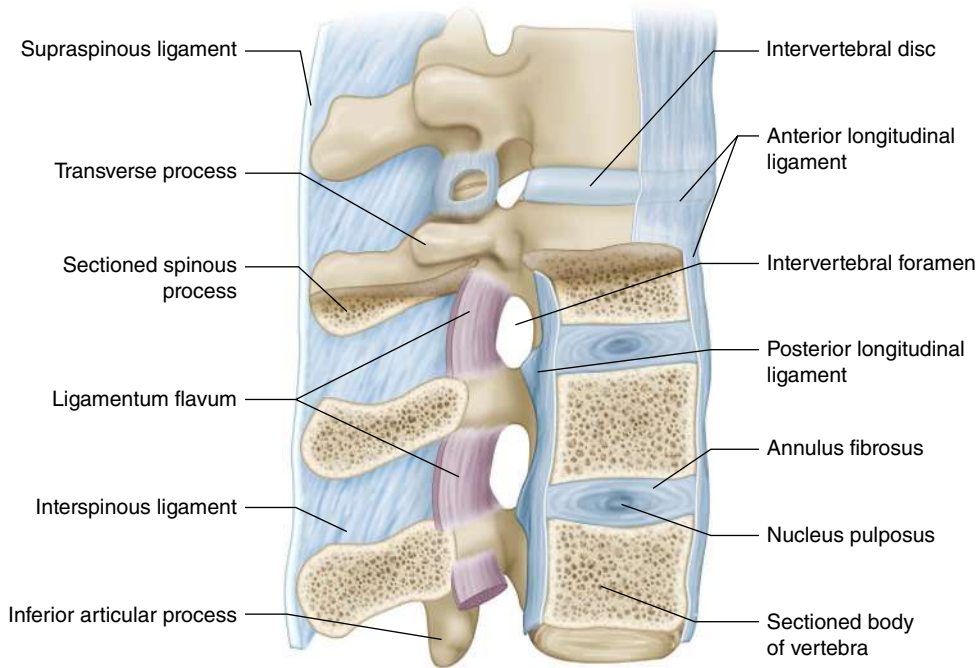


FIGURE 5.61 Diagram showing the ligaments of the vertebral column. (Courtesy of Gabriela Barzyk.)

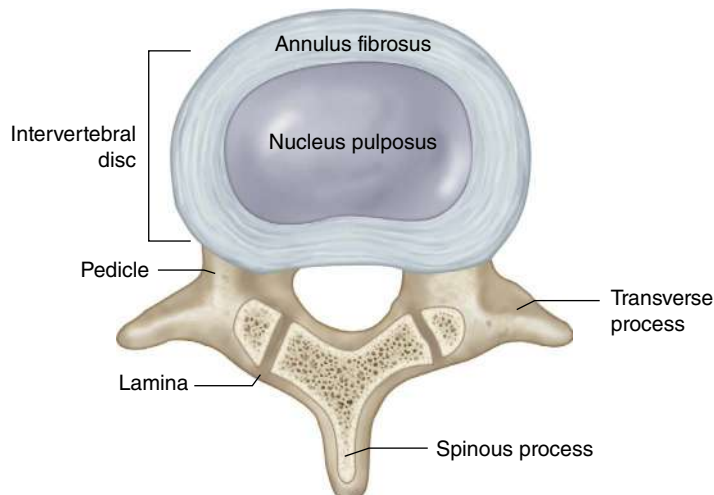


FIGURE 5.62 Diagram of a vertebra and intervertebral disc. (Courtesy of Gabriela Barzyk.)

Anatomical Planes

The lumbar vertebrae are important for identifying specific planes of the abdomen and pelvis:

- The adult spinal cord typically terminates at L1 (L3 in children) and continues as the conus medullaris.
- *L1*: transpyloric plane.
- *L3*: subcostal plane.
- Body of L4 is usually at the middle point of the horizontal line, joining the highest points of the iliac crests (intercristal line).
- *L5*: trans-tubercular plane; see the discussion on the division of the anterior abdominal wall.

CLINICAL NOTES

Degenerative disc disease results from alterations in the collagen composition of the nucleus pulposus and annulus fibrosus, which occur with age. Ossification and thickening of the endplates alter the shear and tensile force distribution across the disc. Annular tears develop, resulting in extrusion (fragmentation of the nucleus pulposus) or prolapse (escape of nuclear fluid – **posterolateral is the most common route**). Symptoms include localised back pain and muscular and radicular pain in the lower limbs from nerve root compression (sciatica). The main sites for slipped disc are L5–S1 and L4–L5.

Laminectomy is one of the most common orthopaedic operations performed to gain access to the spinal canal to relieve pressure on the spinal cord or cauda equina. Spinal stenosis is the most common indication for laminectomy (see **Section 1B**). Other indications include intervertebral disc herniation and primary or secondary tumours (metastatic spread to the vertebrae).

Changes in the height or curvature of the column can lead to compression of spinal nerve roots, resulting in radicular pain and loss of function.

Spondylosis is a form of osteoarthritis in the vertebral column and leads to the formation of osteophytes. Symptoms result from localised osteophyte compression of the nerve root, leading to unilateral lower limb radiculopathy, muscle spasm, and back pain.

The first symptoms of **osteoporosis** may result from wedge compression fractures of the lumbar vertebrae. Reduced bone mineral density leads to fragility fractures from minimal trauma. Fractures result in localised vertebral tenderness, a kyphotic spinal curvature, and reduced vertical height.

L5 is a common site for **spondylolysis** (a stress fracture of the vertebral arches) and **spondylolisthesis** (anterior dislocation of vertebrae).

Flexion-distraction fractures (seatbelt injury, for example) are common in the lumbar region, and spinal stenosis occurs from vigorous flexion, resulting in compression of the anterior portion of the vertebral body and a transverse fracture in the posterior element.

SPINAL METASTASIS

Metastases of cancer to the vertebral column are common, due to its extensive blood supply, and it is believed to be related to the extensive valveless veins of the paravertebral plexus, often referred to as Batson's plexus, which connects the thoracic veins and the pelvic veins, draining the prostate, bladder, and rectum. In descending order, the most common cancers which metastasise to the spine are prostate, breast, lung, thyroid, and renal.

Muscles of the Posterior Abdominal Wall

The following muscles lie on each side of the vertebral column:

- Psoas major and iliacus
- Quadratus lumborum
- Transversus abdominis (see discussion on the abdominal wall muscles)
- The posterior part of the diaphragm

Psoas Major

Origin

The name psoas comes from Greek (“of the loin”). This muscle lies along the lumbar spine and originates from the tips of the transverse processes and sides of the vertebral bodies of T12–L5 and the intervening intervertebral discs. It unites with the iliacus muscle, which originates from the upper part of the iliac fossa, to form the **iliopsoas**, and passes deep to the inguinal ligament to be inserted into the lesser trochanter of the femur. **The lumbar plexus runs within the muscle (Figure 5.63)**. It is covered by the psoas fascia, part of the lumbar fascia.

The nerve supply is from branches from L1 to L3 of the lumbar plexus. The iliacus is supplied by the femoral nerve (*vide infra*, “Lumbar Plexus”).

In terms of action, both the iliacus and the psoas major are flexors of the hip joint.

Psoas abscess refers to a collection of pus within the psoas fascia. The causes include TB of the spine and spreading infection from infective focus in the GIT or the urinary system. The pus collection may track down the upper thigh, posterior to the inguinal ligament, and present as a mass in the groin (see **Section 6**).

Quadratus Lumborum

This quadrangular sheet of muscle lies lateral to the psoas major and originates from the inner lip of the iliac crest and the ilio-lumbar ligament, to be inserted into the 12th rib and transverse processes of the upper four lumbar vertebrae.

The nerve supply is from the lumbar plexus. See the anatomy of diaphragm, **Section 4**, for more information.

In terms of action, it helps in respiration by fixing the 12th rib and also acts as an extensor and lateral flexor of the spine.

Lumbar Plexus

The lumbar plexus is formed from the **ventral rami of spinal nerves L1–L5 and T12 (Figures 5.63 and 5.64)**. The plexus forms lateral to the intervertebral foramina on either side of the vertebrae. The course of the branches is described in relation to the psoas major, as well as the quadratus lumborum and iliacus (**Table 5.4**).

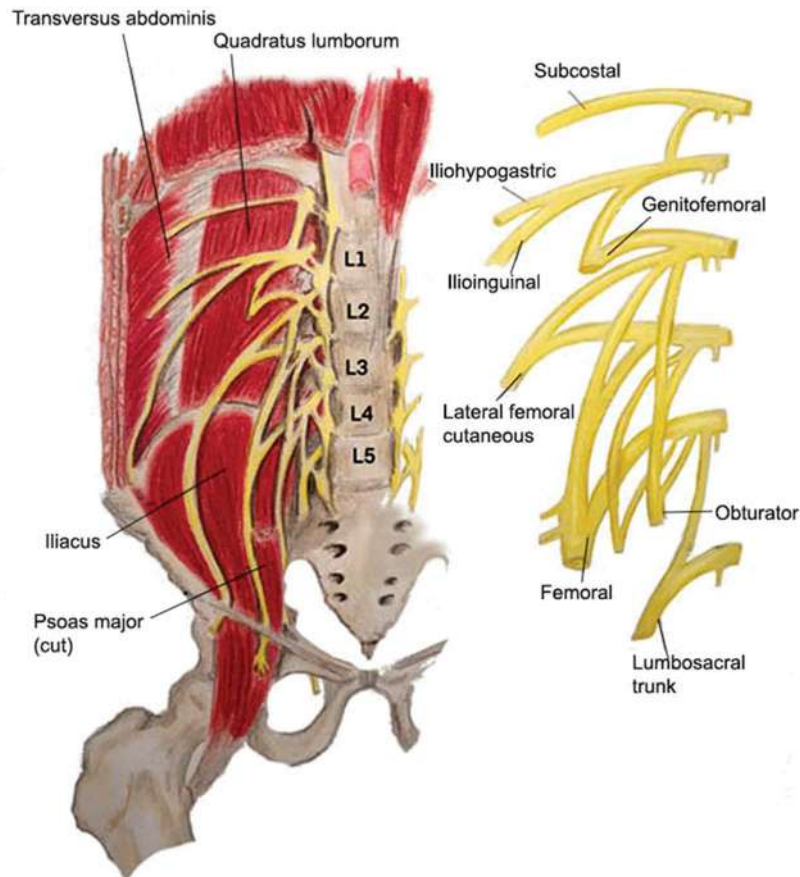


FIGURE 5.63 Nerves of the lumbar plexus and their relations with the psoas major and quadratus lumborum. (Courtesy of Kathryn DeMarre.)

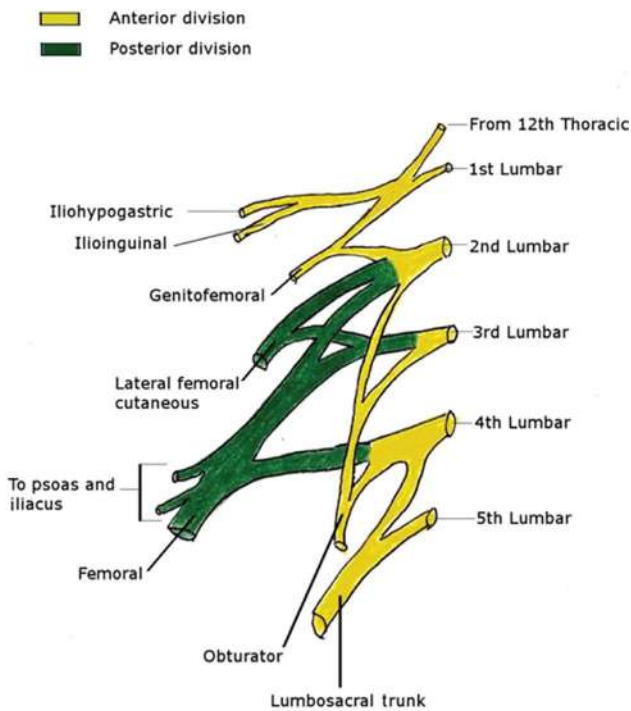


FIGURE 5.64 The branches of the lumbar plexus. (Courtesy of Gabriela Barzyk.)

CLINICAL NOTES

The **ilioinguinal nerve** may be blocked with local anaesthetic during inguinal hernia operations, 2 cm medial and 2 cm superior to the ASIS. It can also be damaged in open appendectomy and inguinal hernia repair, causing loss of innervation to the conjoint tendon, predisposing to postoperative direct inguinal hernia. The nerve might also suffer entrapment during open hernia repair (herniorrhaphy), which results in postoperative chronic groin pain.

The **genitofemoral nerve** is important in eliciting the cremasteric reflex (L1, L2), which is used in neurological examination of the lumbar plexus; the reflex is particularly noticeable in new-born males. (See Further Reading: role of the genitofemoral nerve in testicular descent.)

The **obturator nerve** can be irritated by ovarian pathology, due to its close association with the ovary, passing just lateral to it in its descent. Irritation results in referred pain to the knee and inner thigh.

Femoral nerve (L2–L4) block: 2 cm below the inguinal ligament, 1 cm lateral to the femoral artery. When accessing the femoral vein for taking a blood sample, it is important to find the femoral pulse and go medially, as the femoral nerve can be damaged if you go lateral to the pulse.

The **saphenous nerve** is a sensory branch of the femoral nerve and the longest cutaneous nerve in the body. It can be damaged in varicose vein surgery, e.g., stripping of the great saphenous vein; see [Section 7](#).

TABLE 5.4: The nerves of the lumbar plexus

Nerve	Spinal Segment	Course	Innervates
Iliohypogastric	T12 and L1	Lateral to psoas major and runs inferolateral across quadratus lumborum, posterior to kidneys Passes between the transversus abdominis and internal oblique muscles	Sensory to skin of suprapubic and the posterolateral gluteal skin. Motor to internal oblique and transversus abdominis
Ilioinguinal	L1	Lateral to psoas major, inferior to iliohypogastric, runs inferolateral across quadratus lumborum and iliacus. Pierces posterior wall of inguinal canal and accompanies spermatic cord through superficial inguinal ring	Sensory to skin of upper medial aspect of thigh and anterior one-third of scrotum/labia majora. Motor branches to internal oblique and transversus abdominis (conjoint tendon)
Genitofemoral	L1 and L2	The only nerve that pierces anterior surface of psoas major Splits into genital and femoral branches, which course separately through the deep inguinal ring and femoral sheath, respectively	Genital branch sensory to anterior genitalia and motor to cremasteric muscle Femoral branch sensory to upper anterior aspect of thigh
Lateral femoral cutaneous (lateral cutaneous nerve of the thigh)	L2 and L3	Lateral to psoas major, runs inferolateral across iliacus, 1–2 cm medial to ASIS and inferior to inguinal ligament	Sensory to skin on anterolateral aspect of thigh
Obturator	L2–L4 (Ventral divisions)	<ul style="list-style-type: none"> • Descends at medial border of psoas major • Runs along lateral pelvic wall, lateral to the internal iliac vessels and the ovary on medial surface of obturator internus • Passes through obturator foramen 	<ul style="list-style-type: none"> • Sensory to medial aspect of the thigh down to knee • Motor to adductor muscles of thigh (adductor longus, brevis, and part of magnus), as well as gracilis and obturator externus • Somatic branches to the pelvic peritoneum
Femoral	L2–L4 (Dorsal divisions)	<ul style="list-style-type: none"> • Emerges in groove between iliacus and psoas major at lateral border of psoas major • Passes inferior to inguinal ligament lateral to femoral artery and outside femoral sheath • Splits into anterior and posterior divisions 	<ul style="list-style-type: none"> • Sensory to anterior aspect of thigh and medial aspect of leg and foot via saphenous nerve • Motor branches to quadriceps femoris (knee extensors) and iliacus, pectineus and sartorius (hip flexors) • <i>Knee jerk: L3–L4</i>

The Retroperitoneal Space

The retroperitoneal space is an anatomical space posterior to the parietal peritoneum of the posterior abdominal wall, which is superiorly closed by the diaphragm (**Figure 5.65**).

Contents of the retroperitoneal space

- Suprarenal glands (adrenal glands)
- Urinary organs (kidneys, ureters)
- *Bowel*: most of the duodenum, ascending and descending colon

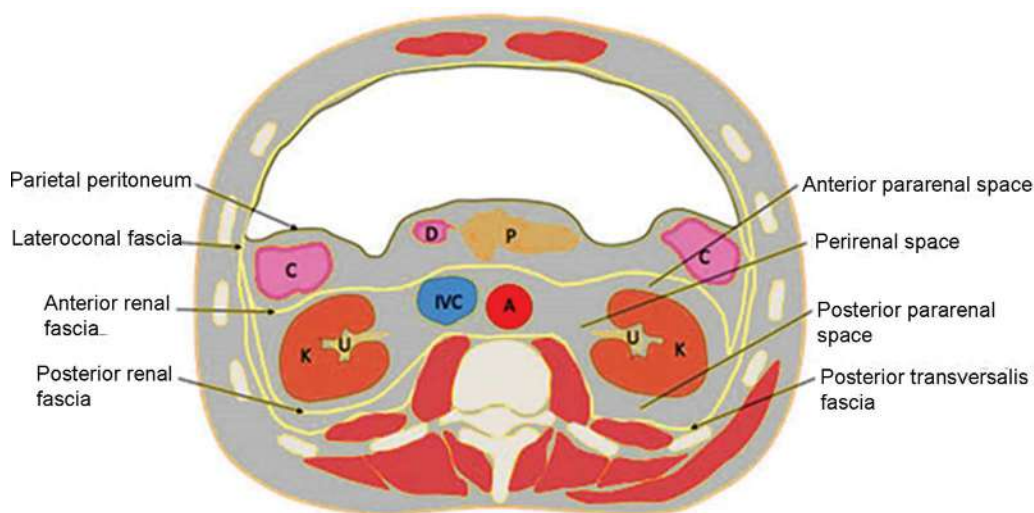


FIGURE 5.65 Cross-section of lumbar region showing the retroperitoneal organs. C: Colon, P: Pancreas, D: Duodenum, K: Kidney, U: Ureters, IVC: Inferior vena cava, A: Aorta. (Courtesy of Adam Lebbey)

- Pancreas
- Major vessels (abdominal aorta; common, internal, and external iliac arteries and their branches; IVC and corresponding iliac veins; origins of the azygos and hemiazygos veins – see [Section 4](#)).
- Lumbar plexus and abdominal autonomic plexuses
- Gonadal vessels
- Pre-aortic and para-aortic lymph nodes, cisterna chyli, and the origin of the thoracic duct (see [Section 4](#))
- Connective tissue, including fat (retroperitoneal lipoma or liposarcoma can develop here and reach a huge size)

Suprarenal Glands

Each caps the upper pole of the kidney. There are two parts to each adrenal gland, of different embryological origins.

The **cortex (mesodermal origin)** has three layers: the zona glomerulosa, zona fasciculata, and zona reticularis (*mnemonic*: GFR).

This part is hormone-secreting as follows:

- *Zona glomerulosa*: mineralocorticoids such as aldosterone
- *Zona fasciculata*: corticosteroids such as hydrocortisone
- *Zona reticularis*: sex hormones (androgen, progesterone, and oestrogen)

Hormonal secretion is regulated by adrenocorticotropic hormone (ACTH) from the anterior pituitary gland.

Medulla (neural crest origin) is part of the sympathetic system (chromaffin cells) and secretes the catecholamines adrenaline and noradrenaline. The sympathetic pre-ganglionic fibres (via the greater splanchnic nerves) bypass the coeliac plexus to supply the chromaffin cells of the adrenal medulla, which can be considered post-ganglionic neurons.

Blood Supply

The adrenal glands have one of the richest blood supplies in the body relative to their weight.

The arteries are the superior suprarenal, middle suprarenal, and inferior suprarenal arteries from the inferior phrenic, abdominal aorta, and renal artery, respectively.

The venous drainage is via the adrenal vein to the IVC on the right side and to the renal vein on the left side (note that the right adrenal vein is quite short – an important operative consideration during removal of adrenal gland tumours).

Common clinical problems include Cushing's syndrome (due to excessive secretion of corticosteroids) and pheochromocytoma (usually presents as intermittent or constant hypertension due to excessive catecholamine secretion from the adrenal medulla).

Removal of the adrenal gland/glands (adrenalectomy) can be performed via an open procedure, laparoscopic intraperitoneal/posterior extraperitoneal, or robotic surgery.

The Kidneys

Each kidney is a bean-shaped structure which lies on each side of the vertebral column from the level of T12–L3. The normal adult kidney measures about $12 \times 6 \times 3$ cm and weighs about 130 to 150 g. The right kidney lies at a slightly lower level, due to the position of the right lobe of the liver. Above each kidney is the suprarenal (adrenal) gland. Each has anterior and posterior surfaces, two borders: lateral convex and medial concave, which contains a vertical slit, the hilum of the kidney, for the passage of the renal vein, renal artery, ureter, branches of the renal plexus (sympathetic from the lower thoracic segments and parasympathetic from the vagus), and lymphatics.

Each kidney consists of an outer area (cortex) and an inner area (medulla); the nephron is the functional unit.

The embryology is as follows ([Figure 5.66](#)):

- The kidneys are derived from intermediate mesoderm.
- A **urogenital ridge** forms on either side of the aorta, from which the kidneys develop cranially to caudally through three sequential stages:
 - *Pronephros*: this is non-functional, and forms the nephrotomes, paired tubules draining into the pronephric duct, which regress by the end of week 4 of gestation.
 - *Mesonephros*: develops caudally to the pronephros and drains into the mesonephric ducts (Wolffian ducts). These carry out rudimentary kidney functioning, until many regress around 2 months of gestation. Some of these persist, opening into the cloaca of the embryo. The ureteric bud is also derived from the caudal end of the mesonephric ducts and later forms the collecting system of the mature kidney.

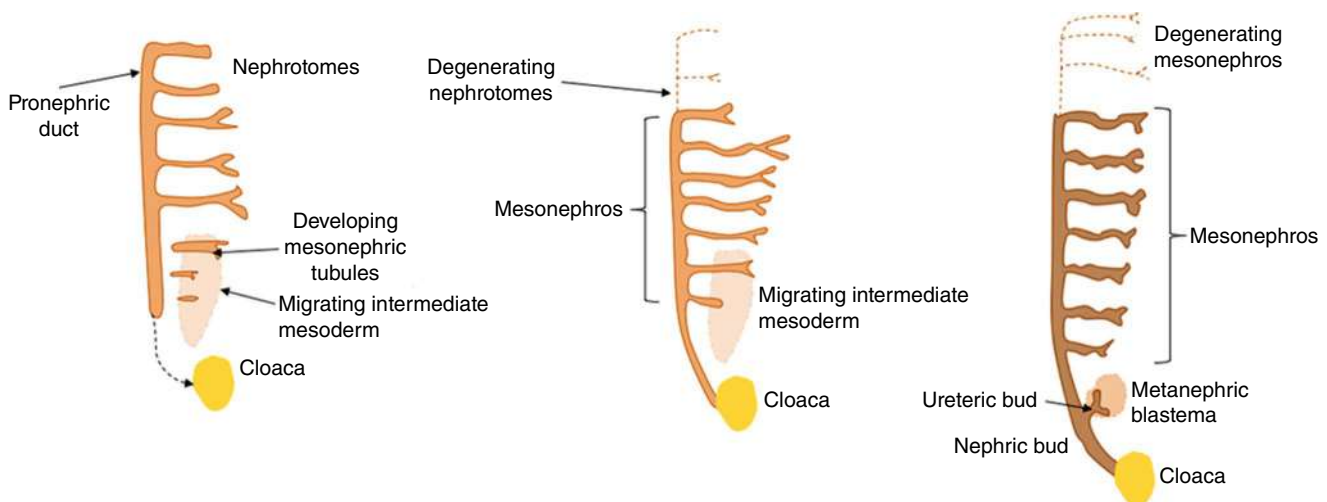


FIGURE 5.66 Embryological development of the kidneys. (Courtesy of Adam Lebbey.)

- *Metanephros*: develops between the 5th and 12th weeks of gestation at the sacral level. Derived from the mesonephric duct (ureteric bud) and metanephric blastema (caudal intermediate mesoderm). Ultimately, this forms the mature kidney.
 - *Collecting system: (From the ureteric bud)* Ureter, renal pelvis, major and minor calyces, collecting ducts
 - *Excretory system: (From metanephric blastema)* Nephrons (Bowman's capsule enclosing the glomerulus, proximal convoluted tubule, loop of Henle, distal convoluted tubule)

The kidneys begin caudally in the embryo (initially sacral), and so the initial vascular supply is from the common iliac and middle sacral arteries. However, as the embryo grows and elongates, the kidneys come to sit in the lumbar region (ascension). Instead of pulling their blood supply with them (as seen in the testicular arteries), the kidneys send out new arterial branches to the aorta, thus forming the mature renal arteries. The caudal arteries then regress. This process of ascending can be deranged, leading to a number of **malformations** (Figures 5.67 and 5.69).

Posteriorly

Posterior abdominal wall (the diaphragm, psoas major, quadratus lumborum, and transversus abdominis). The diaphragm separates the upper pole from the pleura. Also related to the 11th and 12th ribs and upper nerves of the lumbar plexus (iliohypogastric, ilioinguinal in addition to the subcostal nerve) (see Section 4 for information on the relationship of the pleura to the lower ribs).

The kidney is surrounded by a **fibrous capsule**, then the **perinephric fat**, which is surrounded by the **perinephric fascia** (of Gerota), which encloses the adrenal gland as well. This is of surgical importance when embarking on radical nephrectomy for renal cancer. The perinephric fat and fascia must be removed en bloc, including the suprarenal gland. The kidney hilum lies at the transpyloric plane. **The renal vein is the most anterior, and the ureter is the most posterior.** This explains the posterior approach to dealing with the removal of renal stones, while the anterior approach is more appropriate to secure the pedicle while removing tumours, such as renal cell carcinoma (RCC). However, more stone operations are performed by the interventional radiologists (percutaneous nephrolithotomy) than by open surgery.

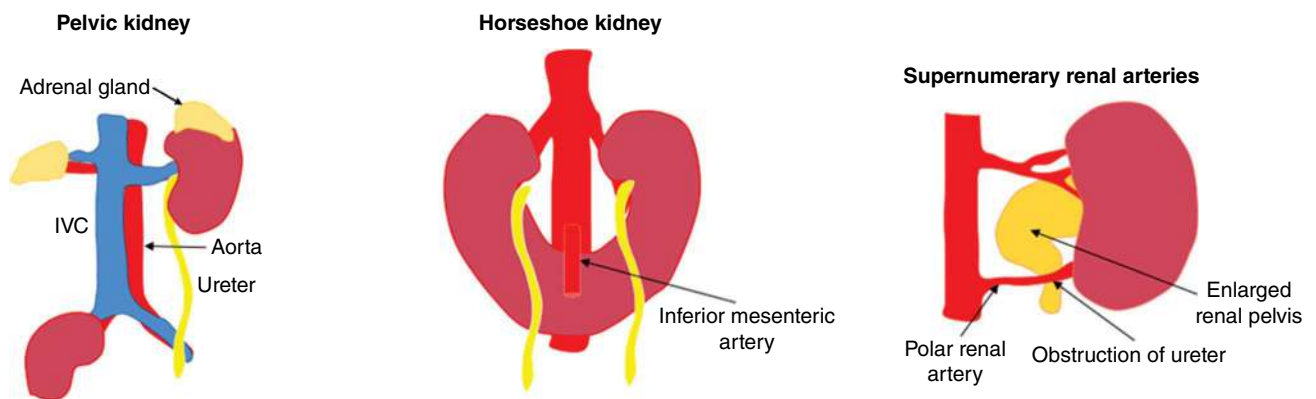


FIGURE 5.67 Developmental anomalies of the kidneys. (Courtesy of Adam Lebby.)

Main functions of the kidneys include:

- Excretory function
- Maintenance of water, acid–base balance, and blood pressure
- Hormonal function (secretion of erythropoietin, renin–angiotensin system to control blood pressure, secretion of vitamin D active metabolite 1,25-dihydroxycholecalciferol)

Anatomical Relations

Anteriorly

Right kidney: second part of duodenum and hepatic flexure of the colon. The hepatorenal pouch of Morison separates the upper pole of the right kidney from the visceral surface of the right lobe of the liver and is one of the sites of peritoneal fluid collection due to its connection to the right paracolic gutter and the right subphrenic space.

Left kidney: pancreatic body and tail medially, with spleen laterally and splenic flexure of the colon related to the lower pole.

Arterial blood supply is through the renal arteries. These arise at a right angle from the abdominal aorta, below the origin of the SMA at the level of intervertebral discs between L1 and L2. The right renal artery passes posteriorly to the IVC. However, some 30% of people have accessory renal arteries. These mostly arise from the abdominal aorta. Accessory arteries may compress the pelviureteric junction (PUJ) and cause hydronephrosis. Extrarenal branches include the inferior suprarenal artery, branches to the upper ureter, renal capsule, and perinephric fascia (Figure 5.68).

- Each renal artery divides into an anterior and a posterior division.
- Five segmental arteries (understanding this is especially important when planning partial nephrectomy for cancer of the upper or the lower pole).
- Lobar, interlobar, arcuate, and interlobular arteries.
- Afferent arterioles to the glomeruli.
- Efferent arterioles to peritubular capillary plexus.
- Venous ends of capillaries to the interlobular veins, arcuate, and interlobar veins, and then to the renal vein.

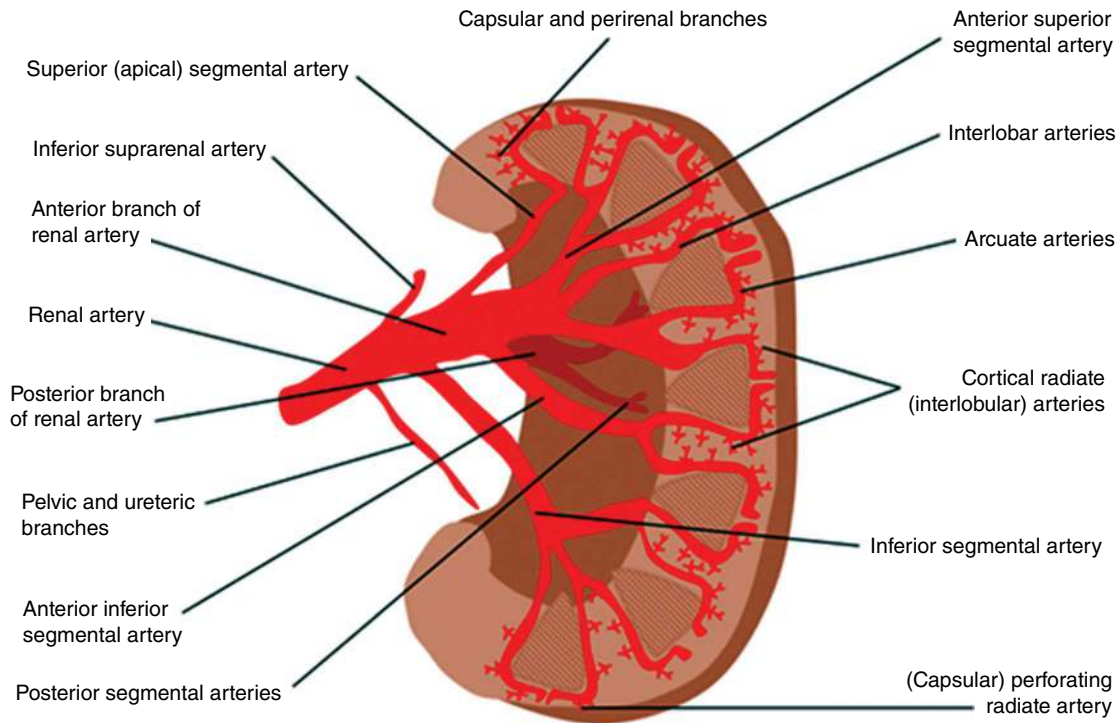


FIGURE 5.68 Diagram of renal blood supply with the renal pelvis removed. (Courtesy of Adam Lebby and Alina Humdani.)

The kidneys have a high contribution of blood flow through the renal arteries (about 20% of cardiac output per minute), so renal trauma can result in severe blood loss and hypovolaemic shock. The left renal vein passes anterior to the aorta, where it receives the left gonadal vein; see [Section 6](#). Each renal vein drains into the IVC.

Lymphatic drainage is through four to five lymphatic trunks to the lateral aortic lymph nodes.

Nerve supply is via autonomic nerves: sympathetic pre-ganglionic fibres that run with T12–L1 (least splanchnic nerve) to the renal and coeliac plexuses. Renal pain from stretching of the renal capsule, due to inflammation (e.g., glomerulonephritis) or obstruction of the PUJ, is felt in the back and flanks (T12 and L1 nerve distribution; see information on ureteric colic, later).

Parasympathetic is from the vagus nerve.

CLINICAL NOTES

- Ureteric colic (see [Section 6](#), Pelvis and Perineum).
- Renal artery stenosis is one of the causes of secondary hypertension, which can be correctable (other causes include pheochromocytoma and coarctation of the aorta).
- Kidney tumours, commonly RCC, which may be manifested as haematuria and unilateral loin pain.

- The right renal vein is shorter than the left. Malignant kidney tumours may extend down the renal vein into the IVC, making removal of the malignant emboli more difficult on the right side.
- Kidney infections (pyelonephritis), inflammation (glomerulonephritis), and nephrotic syndrome are common clinical conditions.
- Acute kidney injury and CKD (for more details see Baker & Aldoori, 2009).
- Kidney injuries, which can be part of injuries to other abdominal organs. Most renal injuries are treated conservatively, and nephrectomy (surgical removal of the kidney) is kept as the last resort for severely shattered or avulsed kidneys.
- Pelvic kidney results from failure of ascent. It forms one of the differential diagnoses of masses in the RIF or left iliac fossa (LIF).
- Horseshoe kidney ([Figure 5.69](#)) is a congenital anomaly where the lower poles of each kidney are united. The IMA prevents the ascent of the isthmus that bridges the lower poles of the kidneys. This anomaly predisposes the kidneys to stone formation and repeated UTI.
- *Supernumerary arteries*: non-regression of caudal arteries can lead to multiple renal arteries. This increases the risk of pressure on the ureter, leading to back-up of urine into the kidney and hydronephrosis.



FIGURE 5.69 Horseshoe kidney. (Courtesy Dept. of Anatomical Sciences, SGUL.)

- Polycystic kidney disease is an autosomal dominant disorder, characterised by the formation of multiple cysts within the kidneys in adult life. The end stage is chronic renal failure (**Figure 5.70**).
- Agenesis of one or both kidneys (failure of the kidney to develop) is rare but important to note when embarking on nephrectomy during explorative laparotomy for trauma.

KIDNEY TRANSPLANTATION

Because of its longer renal vein, the left kidney is the preferred side for live donor nephrectomy. The donor kidney is positioned retroperitoneally in one of the iliac fossae, and the renal artery and vein are anastomosed to the corresponding external iliac vessels, while the ureter is attached to the bladder.

CLINICAL EXAMINATION

Palpation of the kidneys should be done as part of any abdominal examination. In a healthy adult with no anatomical malformation, it is unlikely that you will be able to palpate any more than the inferior pole of the kidney, when the patient is supine and in full inhalation. Even this may not be possible in all patients.



FIGURE 5.70 IVU examination showing spider leg configuration of bilateral polycystic kidneys. (Courtesy of Qassim F. Baker.)

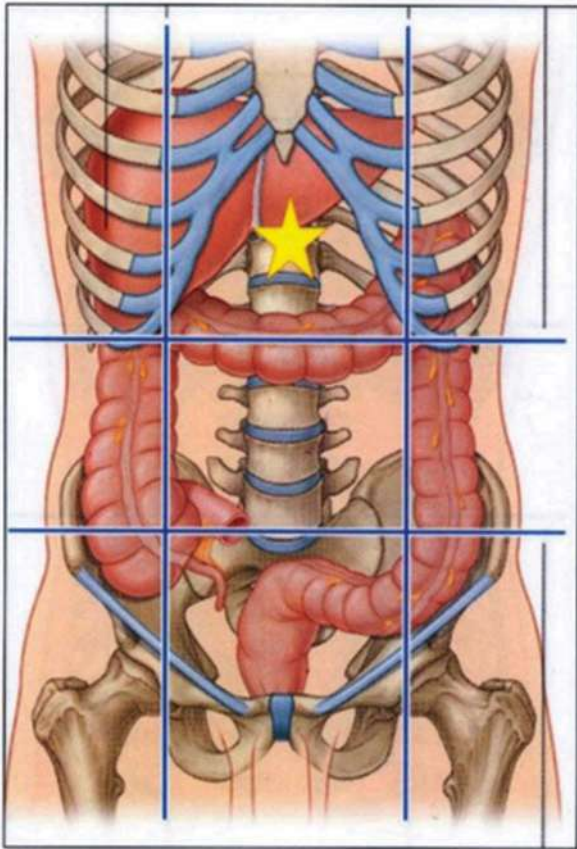
Note: The right kidney is sometimes more palpable in very thin patients or children, as it sits lower due to the liver.

To examine a kidney, one should use both hands, in a technique known as balloting: the lower hand pushes up from the back in the costophrenic angle, whereas the upper hand pushes into the abdomen from the upper quadrant, lateral to the rectus abdominis muscle.

An easily palpable or tender kidney is abnormal and should raise clinical suspicion of renal pathology, including but not limited to neoplasia, infection, obstruction, or trauma. The clinical history should be thorough to help elucidate potential pathology. Back examination should be part of a proper abdominal exam to check the spine and for swelling and tenderness at renal angles, e.g., perinephric abscess.

Revision Questions

Q1.



(Courtesy of Dept. of Anatomical Sciences, SGUL.)

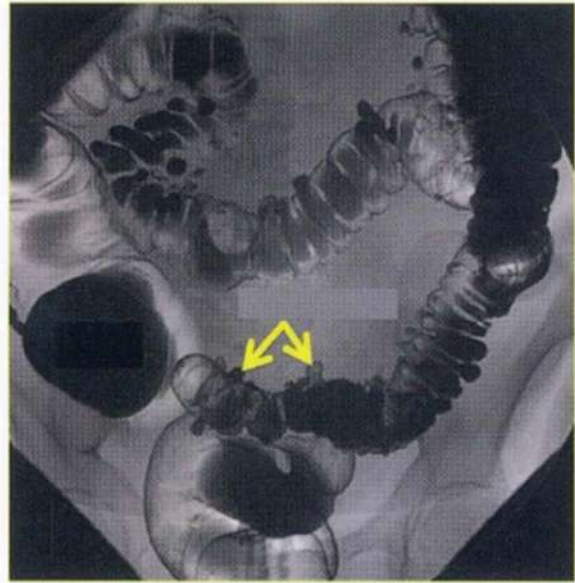
Q1A. Which of the following best describes the region indicated by the star?

- a. Epigastric
- b. Left hypochondrium
- c. Right hypochondrium
- d. Suprapubic
- e. Umbilical

Q1B. Which of the following best describes the region of the gut from which pain may be referred to this region?

- a. Appendix
- b. Ileum
- c. Jejunum
- d. Pylorus
- e. Sigmoid colon

Q2.



(Courtesy of the Dept. of Anatomical Sciences, SGUL.)

Q2A. Which of the following best describes the features indicated by the arrow?

- a. Appendices epiploicae
- b. Colonic diverticula
- c. Haustra
- d. Mesenteric lymph nodes
- e. Taeniae coli

Q2B. Which of the following best describes the abdominal region where pain emanating from these features would be felt most?

- a. Epigastric
- b. Lower left quadrant
- c. Umbilical
- d. Upper right quadrant
- e. Upper left quadrant

Q3. Embryologically, what does the parietal peritoneum arise from?

- a. Ectoderm
- b. Endoderm
- c. Neuroectoderm
- d. Somatic mesoderm
- e. Splanchnic mesoderm

Q4. Which of the following is a secondarily retroperitoneal organ?

- a. Ascending colon
- b. Kidney
- c. Liver
- d. Stomach
- e. Ureter

- Q5. What is the anterior relation of the epiploic foramen?
- Hepatoduodenal ligament
 - Hepatogastric ligament
 - Parietal peritoneum covering the IVC
 - Visceral peritoneum covering the caudate lobe of the liver
 - Visceral peritoneum covering the superior aspect of the duodenum

What is Pringle's manoeuvre?

- Q6. Which structure helps to divide the infracolic compartment into its right and left components?
- Ligament of Treitz
 - Mesentery proper
 - Mesoappendix
 - Sigmoidal mesocolon
 - Transverse mesocolon

- Q7. Which structure runs posterior to the apex of the sigmoid mesocolon?
- Common iliac artery
 - Common iliac vein
 - Inferior vena cava
 - Left ureter
 - Right ureter

Q8. The ligamentum teres (round ligament) is a remnant of which embryological structure?

Q9. The ligamentum venosum is a remnant of which embryological structure?

- Q10. Which of the following structures is contained within the lateral umbilical folds?
- Inferior epigastric artery
 - Superior epigastric artery
 - Umbilical artery
 - Umbilical vein
 - Urachus

Q11. Why do patients with pelvic peritonitis flex their knee and hip?

Q12.



(Courtesy of the Dept. of Anatomical Sciences, SGUL.)

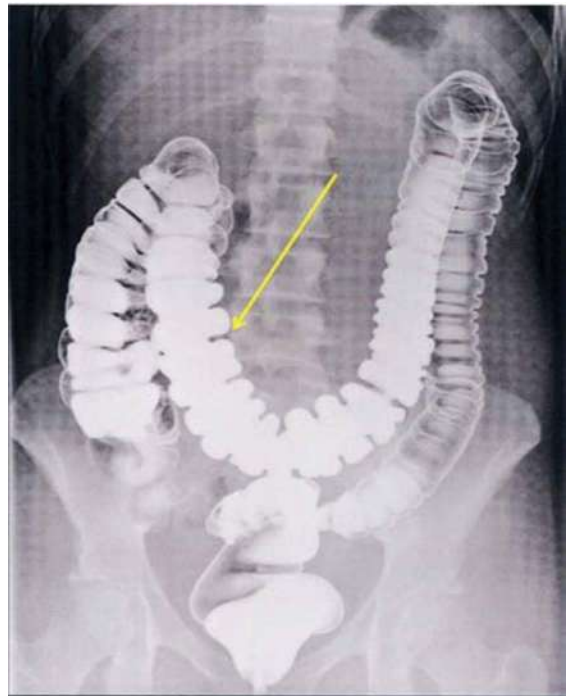
Q12A. Which term best describes the structure indicated by the arrows?

- Common bile duct
- Cystic duct
- Fundus of gallbladder
- Neck of gallbladder
- Quadrangle lobe

Q12B. Inflammation of the structure indicated by arrows may be perceived as pain arising in which of the following regions?

- Epigastric region
- Left hypochondrium
- Right hypochondrium
- Suprapubic region
- Umbilical region

Q13.



(Courtesy of the Dept. of Anatomical Sciences, SGUL)

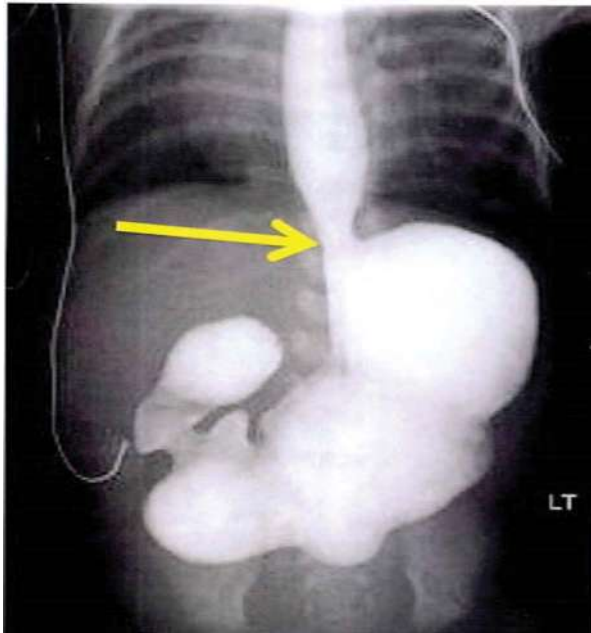
Q13A. Which of the following best describes the structure indicated by the arrow?

- Ascending colon
- Caecum
- Descending colon
- Sigmoid colon
- Transverse colon

Q13B. Which of the following best describes the arterial supply of the region of the gut marked by the arrow?

- Ileocolic
- Jejunal
- Left colic
- Middle colic
- Right colic

Q14.



(Courtesy of the Dept. of Anatomical Sciences, SGUL.)

Q14A. Which of the following best describes the region of the stomach indicated by the arrow?

- Body
- Cardia
- Fundus
- Pylorus
- Pyloric antrum

Q14B. What is the usual vertebral level of the region indicated by the arrow?

- T6
- T8
- T10-T11
- T12
- L2

Q15.



(Courtesy of the Dept. of Anatomical Sciences, SGUL.)

Q15. What is the azygos system? What can cause engorgement of the anterior abdominal wall veins? What are the sites of portosystemic anastomosis?

Answers

- A1A. a
 A1B. d
 A2A. b
 A2B. b
 A3. d
 A4. a
 A5A. a
 A5B. Applying pressure to the free border of the lesser omentum through the epiploic foramen to control bleeding during surgery
 A6. b
 A7. d
 A8. Left umbilical vein
 A9. Ductus venosus
 A10. a
 A11. Patients with peritonitis lie still on one side or the other, with the knees and hips flexed to relax the anterolateral abdominal muscles (the psoas sign).
 A12A. c
 A12B. c
 A13A. e
 A13B. d
 A14A. b
 A14B. c
 A15. The azygos system connects the IVC and SVC outside the right atrium, giving a path for blood to return to the right atrium if either vena cava is blocked. Its main function is to drain the intercostal spaces and the posterior thoracic wall. See **Figure 4.8** and **Table 4.2** in **Section 4**.

Engorgement of the veins of the anterior abdominal wall can be caused by portal hypertension and IVC obstruction.

Sites of portosystemic anastomosis include the lower oesophagus, inferior and superior rectal veins, and veins on the anterior abdominal wall; some are radiating from the umbilicus (caput medusa).

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6

ANATOMY OF THE PELVIS AND PERINEUM

Reviewed by Paul Carter, Qassim F. Baker, and Philip J. Adds

Learning Objectives

- Understand the overall anatomy of the pelvis
- Understand the blood supply and innervation of the pelvic organs
- Describe the function and components of the pelvic floor
- Know the pelvic organs and understand the clinical implications of their location
- Understand the overall anatomy of the rectum and anal canal
- The perineum
- The male genital organs
- The female genital organs
- Revision questions

The Pelvic Girdle

Consists of the two innominate (coxal) bones, the sacrum, and the coccyx, which enclose the pelvic cavity (**Figures 6.1** and **6.2**).

The main functions of the pelvic girdle are:

- Transmission of body weight from the spine to the femurs, via the sacroiliac joints
- Protection and support of pelvic organs, including the bladder, rectum, and the internal reproductive organs
- Provide attachment for the muscles of the anterior and posterior abdominal walls, buttocks, and thighs

Components of the Pelvic Girdle

The pelvic brim divides the **true (lesser) pelvis**, below the brim, from the **false (greater) pelvis**, above the brim (which can be considered part of the abdominal cavity). The true pelvis has an inlet (pelvic brim), cavity, and outlet. The pelvic cavity projects posteriorly from the abdominal cavity towards the buttocks.

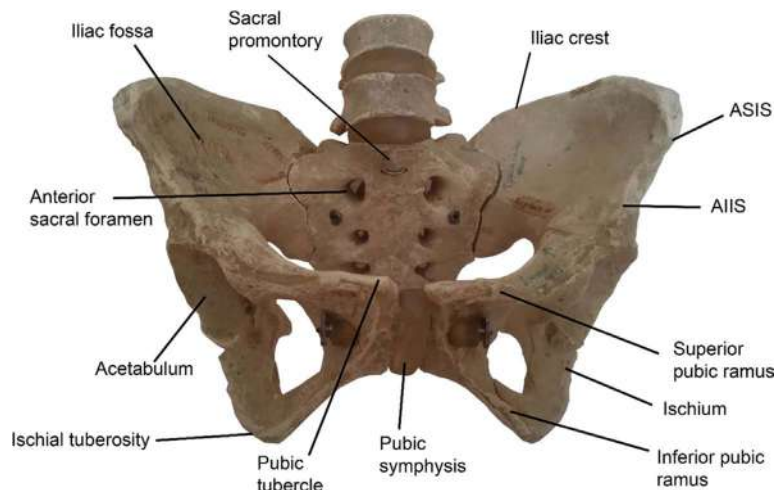


FIGURE 6.1 Pelvic girdle. (Courtesy of Qassim F. Baker.)

What Is Meant by the Pelvic Brim?

The pelvic brim extends from the sacral promontory (the anterior lip of the superior surface of S1) to the upper part of the pubic symphysis and includes the ala of the sacrum, the arcuate line of the ilium, the ilio-pubic eminence, and the pectineal line of the pubis.

The Pelvic Outlet

The pelvic outlet is diamond-shaped and consists anteriorly of the lower border of the pubic symphysis and the two ischiopubic rami (forming the pubic arch); posteriorly it consists of the ischial tuberosities, sacrotuberous ligaments, and coccyx.

The Innominate Bone

- The innominate or coxal bone (*os coxa*) consists of three bones (ischium, ilium, and pubis) which fuse at the “Y-shaped” cartilage in the acetabulum (“vinegar cup” in Latin); this is where the head of the femur articulates with the pelvis to form the hip joint.
- During puberty the cartilage ossifies and the three bones fuse.
- The ilium is the largest and most superior portion of the innominate bone. Superior to the acetabulum, the ilium expands to form the **ala**, the winged portion of the ilium, which articulates with the alar surface of the sacrum at the synovial sacroiliac joint and transmits all the forces of the upper body downwards.
- The ilium is composed of three surfaces: gluteal (on the outside), iliac (forming the iliac fossa, above the pelvic brim), and a sacropelvic surface. The gluteal surface has the anterior, inferior, and posterior gluteal lines, which provide attachment points for the gluteal muscles (see **Section 7, Lower Limb**).
- The iliac crest extends between the posterior superior iliac spine (PSIS) and the anterior superior iliac spine (ASIS), which is the most anterior part; it has inner and outer lips.

The external lip of the iliac crest has four muscle attachments:

- External oblique
- Latissimus dorsi (LD; this attachment is detached when creating an LD flap, commonly for breast reconstruction)
- Tensor fasciae latae
- Internal oblique

The internal lip of the iliac crest has four muscle attachments:

- Transversus abdominis
- Quadratus lumborum
- Sacrospinalis (erector spinae)
- Iliacus (mainly originates from the iliac fossa)

See [Section 5](#) for more information on the muscles of the anterior abdominal wall.

The horizontal **intercrystal line** is between the highest points of the iliac crests and corresponds to the level of L4-L5. It is used for lumbar puncture positioning and insertion of epidural catheters.

The pectineal line (Latin *pecten*, “comb”) is a ridge on the superior ramus of the pubic bone, which joins the arcuate line to form the iliopectineal line. The **pectineus muscle** arises from the superior pubic ramus (pectineal line) and inserts onto the pectineal line of the femur. It forms a quadrangular sheet of muscle in the upper and medial thigh and part of the floor of the femoral triangle. It is mainly an adductor of the thigh and is supplied by the femoral and obturator nerves.

The **pubic tubercle** is a projection lateral to the pubic symphysis that gives attachment to the adductor longus and the medial end of the **inguinal ligament**, which originates on the ASIS.

The **spermatic cord** passes down to the scrotum, superior to the pubic tubercle. The pubic tubercle is an important landmark in differentiating between inguinal and femoral hernias. Inguinal hernias are above and medial to the pubic tubercle, whereas femoral hernias are below and lateral.

The **pubic arch** is formed by the pubic symphysis in the middle and the bodies of the inferior pubic rami at the sides.

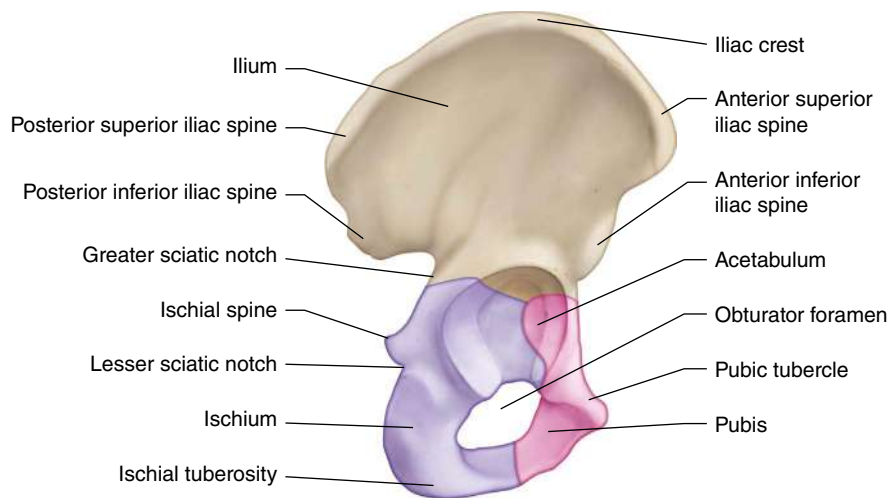


FIGURE 6.2 The lateral aspect of the innominate bone. (Courtesy of Chun Ho.)

The Arcuate Line

The **arcuate line** is a smooth, rounded border on the internal surface of the ilium. It is inferior to the iliac fossa and iliacus muscle (which attaches, with the psoas major muscle, onto the lesser trochanter of the femur) and above the medial aspect of the acetabulum. The pelvis is orientated so that the pubic symphysis and ASIS are in the same vertical plane. Therefore, the posterior aspect of the iliac fossa is superior to the arcuate line, and the anterior portion of the iliac fossa is anterosuperior. The line indicates where weight is transferred from the sacroiliac joint to the hip joint. The arcuate line is continuous with the pectineal line (*vide infra*).

The ilium provides muscle attachment to the sartorius (at the ASIS) and piriformis, from the area below the posterior inferior iliac spine (PIIS).

The Pubic Bone

- Composed of three parts: body, superior ramus, and inferior ramus.
- The pubic symphysis joins the two pubic bones at a secondary cartilaginous joint.

The angle at the lower end of the pubic symphysis is called the **subpubic angle**.

Learning Point

Typically, secondary cartilaginous joints occur in the median plane of the body and permit limited movement. Examples include the pubic symphysis, manubriosternal joint, and intervertebral discs.

The Ischium

The ischium is the lower part of the innominate bone. It is inferior to the ilium and posterior to the pubis. The superior part of the ischium forms one-third of the acetabulum.

The ischium consists of:

- The body and ramus. The deep and superficial transverse perineal muscles originate from the body of the ischium.

- The ramus of the ischium ascends to join the inferior ramus of the pubis (forming the ischiopubic ramus), and together form the lower boundary of the obturator foramen. It is the partial origin for the gracilis and adductor magnus.

The **ischial tuberosity** is a bony prominence on the posterior portion of the superior ischial ramus. It marks the lateral boundary of the pelvic outlet and carries the body weight in the sitting position.

- Structures attaching to the ischial tuberosity include extensors of the hip, (the hamstring muscles) and the sacrotuberous ligament.

The **ischial spine** is a posterior bony projection from the body of the ischium and gives attachment to the superior gemellus muscle, sacrospinous ligament, and coccygeus muscle.

The ischial spine is an important landmark between the greater and lesser sciatic notches. The pudendal nerve passes beneath the piriformis muscle and medial to the ischial spine (site for pudendal nerve anaesthesia in obstetrics).

The **greater sciatic notch** is located on the ilium, directly inferior to the PIIS. The **sacrospinous ligament** attaches from the ischial spine to the sacrum and converts the greater sciatic notch into the greater sciatic foramen, which is partly filled by the piriformis (see [Section 7](#), Lower Limb, gluteal region).

The **lesser sciatic notch** is located on the ischium, directly inferior to the ischial spine. The sacrotuberous ligament attaches from the ischial tuberosity to the sacrum, posterior to the sacrospinous ligament, creating the lesser sciatic foramen from the lesser sciatic notch (which transmits the nerve to the obturator internus and its tendon, the pudendal nerve, and internal pudendal vessels).

For further details review the anatomy of the buttock in [Section 7](#), Lower Limb.

Lateral Pelvic Wall

The **obturator foramen** is bounded by the pubis anteriorly and the ischium posteriorly and is covered by the **obturator membrane**, except for a small superolateral passage, the **obturator**

canal, for the passage of the obturator nerve (from the lumbar plexus) and the obturator vessels to supply the medial (adductor) compartment of the thigh (see [Section 7](#), Lower Limb).

The **obturator internus** muscle takes its origin from the pelvic aspect of the obturator membrane and the surrounding bone. Its tendon passes through the lesser sciatic foramen to insert onto the greater trochanter of the femur. It is a lateral rotator of the femur at the hip joint and is supplied by its own nerve from the sacral plexus.

The **obturator externus muscle** originates from the outer part of the obturator membrane and the adjacent bones of the obturator foramen and inserts into the trochanteric fossa of the femur. It is supplied by the obturator nerve and helps in stabilising the hip joint.

The Sacrum (Figure 6.3)

The sacrum consists of the union of five vertebrae. It articulates, above, with L5 vertebra and, below, with the coccyx and, laterally, with the iliac bones at the sacroiliac joint (a synovial joint with limited movement). Ossification and fusion of the sacrum are not complete until age 18 to 35 years.

The **anterior and posterior sacral foramina** (four, on both the pelvic and the dorsal surfaces of the sacrum) are the sites for exit of the ventral and dorsal rami of the sacral spinal nerves S1–S4, respectively.

The **median sacral crest**, posteriorly, represents the fused spinous processes of the sacral vertebrae and can be felt on the upper part of the cleft between the buttocks.

The lower three fused sacral vertebrae are associated with the retroperitoneal lower third of the rectum.

The **sacral hiatus** (through which the fifth sacral spinal nerves exit) is situated at the lower end of the sacral canal and is flanked by two bony prominences (sacral cornua, which form an important landmark to find the hiatus). It is located about 5 cm above the tip of the coccyx.

The **coccyx** (*Greek*: “cuckoo”, from its resemblance to a cuckoo’s beak) is usually composed of four fused vertebrae. It articulates at its upper end with the sacrum. The anterior surface of the coccyx can be felt by rectal digital examination.

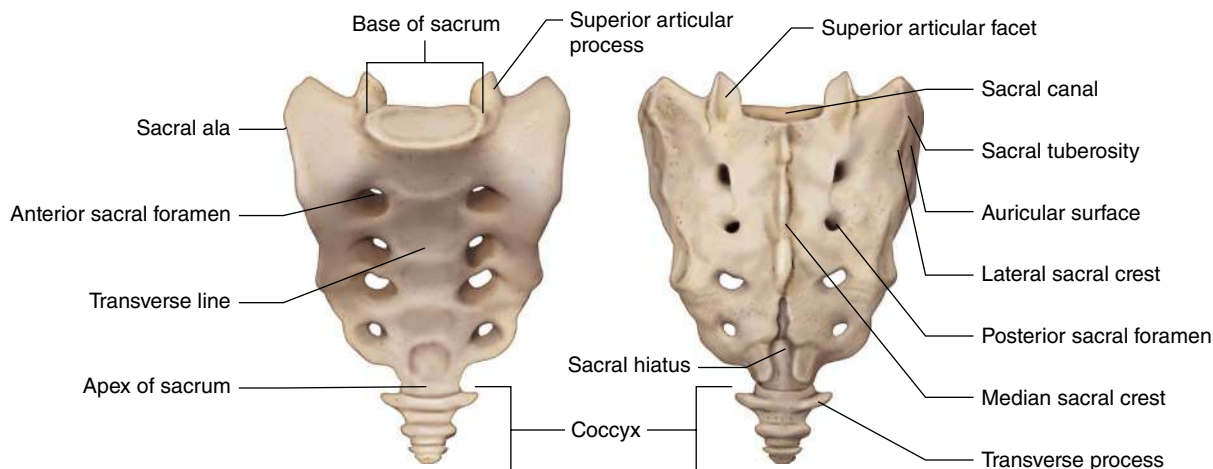


FIGURE 6.3 Anterior and posterior aspects of the sacrum and the coccyx. (Courtesy of Callum Moffitt.)

Learning Point

The subarachnoid space extends down to S2, whilst the spinal cord terminates at L1–L2 in the adult. The subarachnoid space can be approached via the hiatus to inject anaesthetic solutions for caudal blocks.

CLINICAL NOTES

- *Bone marrow transplant:* the iliac crest is easily accessible and provides a large reservoir of bone marrow cells.
- *Bone graft:* bone grafting involves the transplantation of bone tissue into bones which have been damaged from different causes, e.g., trauma. The iliac crest is the most common site for bone tissue donation.

Fractures of the sacrum and coccyx are rare; however, neurological deficit is common if they do occur.

Caudal regression syndrome is underdevelopment of the sacrum and coccyx.

Cauda equina syndrome is compression of the cauda equina. This can be a consequence of herniated disc compression at L5–S1, ruptured disc, tumour, or abscess (see [Section 1B](#), Spinal Cord).

The sacrum is the most common site for development of a rare sarcoma, known as **chordoma**, from the remnants of the notochord.

PELVIC FRACTURE

This commonly follows road traffic accidents or falling from heights. The fracture can be displaced or non-displaced, depending on the integrity of the pelvic ring ([Figure 6.4](#)). Displaced fractures result from more than one fracture or dislocation of the sacroiliac joint or symphysis pubis. The pelvis almost always fractures in two places; therefore, if one fracture is identified, always look for another fracture.

Complications include:

- **Hypovolaemic shock**, from internal haemorrhage due to rupture of the thin pelvic veins.
- **Injuries to other organs** such as the urethra, bladder, and rectum. Therefore, it is important to perform a rectal examination on all patients with a pelvic fracture.

QUIZ QUESTION

Q. What are the expected clinical problems in the management of the patient in [Figure 6.4](#) in an A&E department?

Blood Supply of the Pelvic Organs

Arterial Supply

The main arterial supply is from the **internal iliac artery**, a branch of the common iliac artery at the level of the sacroiliac joint (the other division is the external iliac artery, which continues as the common femoral artery underneath the inguinal ligament).

The internal iliac artery divides into anterior and posterior divisions at the level of the upper margin of the greater sciatic notch ([Figure 6.5](#)).



FIGURE 6.4 X-ray of the pelvis and upper femora showing severe disruption of the pelvic ring and comminuted fracture of the upper left femur. (Courtesy of Qassim F. Baker.)

Branches of the Anterior Division

The anterior division contains nine arteries: three arteries supplying the bladder, three arteries supplying the viscera, and three arteries supplying the body wall.

Arteries supplying the bladder

- *Umbilical artery:* extends from the fetus to the placenta during embryonic life; after birth, the proximal part remains as the superior vesical artery, the occluded distal part becomes the medial umbilical ligament (see [Section 5](#), Abdomen)
- *Superior and inferior vesical arteries:* supply the bladder, ductus deference, seminal vesicles, and the prostate gland

Arteries supplying the viscera

- *Middle rectal (see information on the blood supply of the rectum):* supplies the lower part of the rectum; may be absent in both sexes, especially in females
- *Vaginal and uterine arteries:* in females, the vaginal artery may replace the inferior vesical artery; see later discussion on the blood supply of the vagina

Arteries supplying the body wall

- *Internal pudendal artery:* follows the course of the pudendal nerve (leaving through the greater sciatic foramen to enter the gluteal region, then enters the ischiorectal fossa through the lesser sciatic foramen within the Alcock's canal, giving off the inferior rectal artery through its course in the fossa)
- *Obturator artery:* passes with the obturator nerve to the adductor compartment of the thigh
- *Inferior gluteal artery:* enters the buttock through the great sciatic foramen, underneath the piriformis; supplies the gluteus maximus

Branches of the posterior division (supply parietal structures) –

Remember that the posterior division supplies the *parietal* structures.

- *Superior gluteal artery:* the largest branch of the internal iliac artery (see anatomy of the gluteal region in [Section 7](#),

Lower Limb) and runs above the piriformis and enters the buttock through the greater sciatic foramen to supply the three gluteal muscles (maximus, medius, and minimus)

- *Lateral sacral artery (or arteries):* supply the skin and muscles dorsal to the sacrum after exiting through the posterior sacral foramina
- *Iliolumbar artery:* supplies the iliacus, quadratus lumborum, and psoas major

Intraoperative ligation of the internal iliac artery can be lifesaving in cases of uncontrollable bleeding during pelvic surgery, for example, after pelvic trauma and during hysterectomy.

of the pubic symphysis and is about 10 cm in the adult male compared to 11.2 cm in the female; the **transverse diameter** is measured between the furthest points of the inlet (13.1 cm in the female to 12.5 in the male).

For the pelvic outlet, the following diameters can be elicited:

- **The transverse diameter** of the outlet, the distance between the ischial tuberosities, measures approximately 11.8 cm in the female compared to 8.5 cm in the male.
- **The AP diameter** of the outlet, the distance between the tip of the coccyx and the inferior border of the pubic symphysis, is approximately 12.5 cm in the female, 8.0 cm in the male.

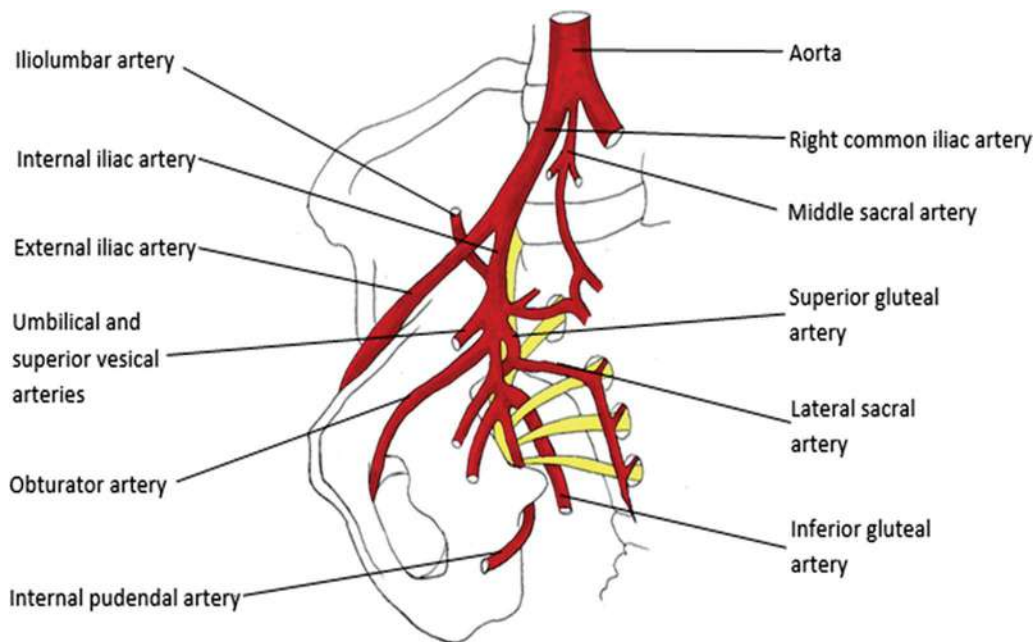


FIGURE 6.5 Arterial blood supply of the pelvis. (Courtesy of Calum Harrington-Vogt.)

Venous Return

The veins correspond to the branches of the internal iliac artery. They converge to form the internal iliac vein. The internal iliac vein unites with the external iliac vein to form the common iliac vein. The union of the right and left common iliac veins forms the inferior vena cava (IVC) at the level of L5. The only exception is the iliolumbar vein, which drains into the common iliac vein.

Lymphatics of the Pelvis

These accompany the blood vessels and, therefore, the lymph nodes are named accordingly (internal iliac, common iliac lymph nodes).

Sexual Dimorphism

Male and female pelvises have evolved differently, as a result of the female pelvis being adapted for childbirth. These differences are useful in differentiating between male and female skeletons (**Table 6.1**).

Diameters of the Female Pelvis

The diameter of the female pelvis is very important in relation to the diameter of the skull of the fetus. Measurement of this is known as pelvimetry and nowadays uses plain radiographs or magnetic resonance imaging (MRI) scanning of the pelvis. The pelvic diameters are as follows.

Of the inlet (superior pelvic aperture):

- The **anterior-posterior (AP) diameter** is measured from the midpoint of the sacral promontory to the upper border

- The **diagonal conjugate diameter**, the distance between the sacral promontory and the lower border of the pubic symphysis, is approximately 12.5 cm in the adult female
- The **interspinous distance**, the distance between the ischial spines, is approximately 9.5 cm in the adult female

It is important to note that the widest point of the pelvic *inlet* is the transverse diameter, whereas the widest point of the pelvic *outlet* is the AP diameter. This is the reason the fetal head must rotate 90 degrees during labour to pass through the pelvic cavity.

TABLE 6.1: The differences between male and female pelvises

Male	Female
Smaller and less wide (optimised for bipedal locomotion)	Larger, wider, and rounder (to aid in childbirth)
Iliac crest is higher	Iliac crest is lower
Sacrum is longer, narrower, and straighter	Sacrum is shorter, wider, and rounder
Subpubic angle is acute	Subpubic angle is obtuse
Greater sciatic notch is narrow	Greater sciatic notch is wider
Acetabula are closer together	Acetabula are wide apart
Pelvic inlet is slightly heart shaped	Pelvic inlet is oval
Pelvic outlet is narrow and oval	Pelvic outlet is more circular

Types of pelvises (Figure 6.6)

- *Gynaecoid (Female type)*: the most suitable pelvis shape and dimensions for childbirth, as the inlet is ovoid in shape and its transverse diameter is greater than the AP diameter.
- *Platypelloid (Flat pelvis)*: there is a flat inlet and a prominent sacrum, with the transverse diameter being greater than the AP diameter; the subpubic arch is wide, and the ischial spines are prominent
- *Android (Male type)*: this pelvis has a wedge- or a heart-shaped inlet, with a prominent sacrum, and consequently narrow AP diameter; the reduced pelvic outlet leads to increased risk of complications during childbirth.
- *Anthropoid (Ape-like)*: the pelvic inlet is oval, and the AP diameter of the pelvic inlet is greater than the transverse diameter with a narrow subpubic angle.

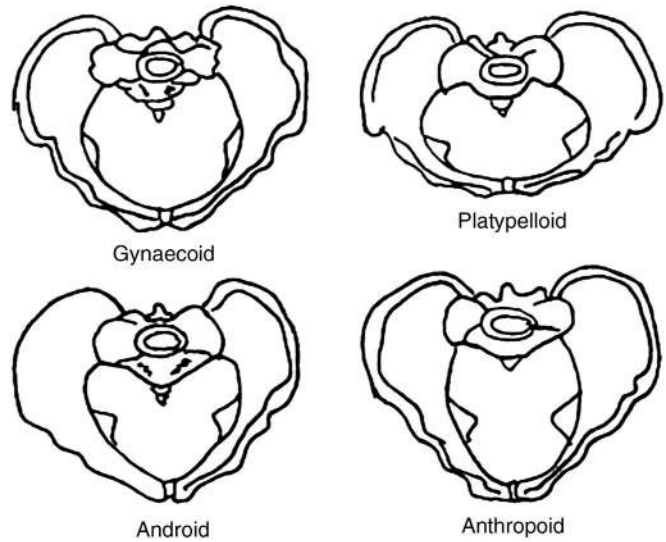


FIGURE 6.6 Pelvis types. (Courtesy of Chun Ho.)

Innervation of the Pelvis

Sacral Plexus

The sacral plexus is formed from the ventral rami of spinal nerves L4–S4. There is a contribution from the lumbar plexus by the **lumbosacral trunk** (L4, L5), which connects the two plexuses. The nerves are on the anterior surface of the piriformis muscle on the posterior pelvic wall. Ultimately, they converge towards the greater sciatic foramen and unite to form a flattened band, which continues as the sciatic nerve. There are numerous branches

arising from the sacral plexus, as shown in **Figure 6.7** and **Table 6.2** (see also **Figure 7.3** in **Section 7, Lower Limb**).

The plexus lies on the posterior surface of the pelvis between the piriformis muscle and pelvic fascia. It is posterior to the internal iliac vessels, ureter, and sigmoid colon, on the left side.

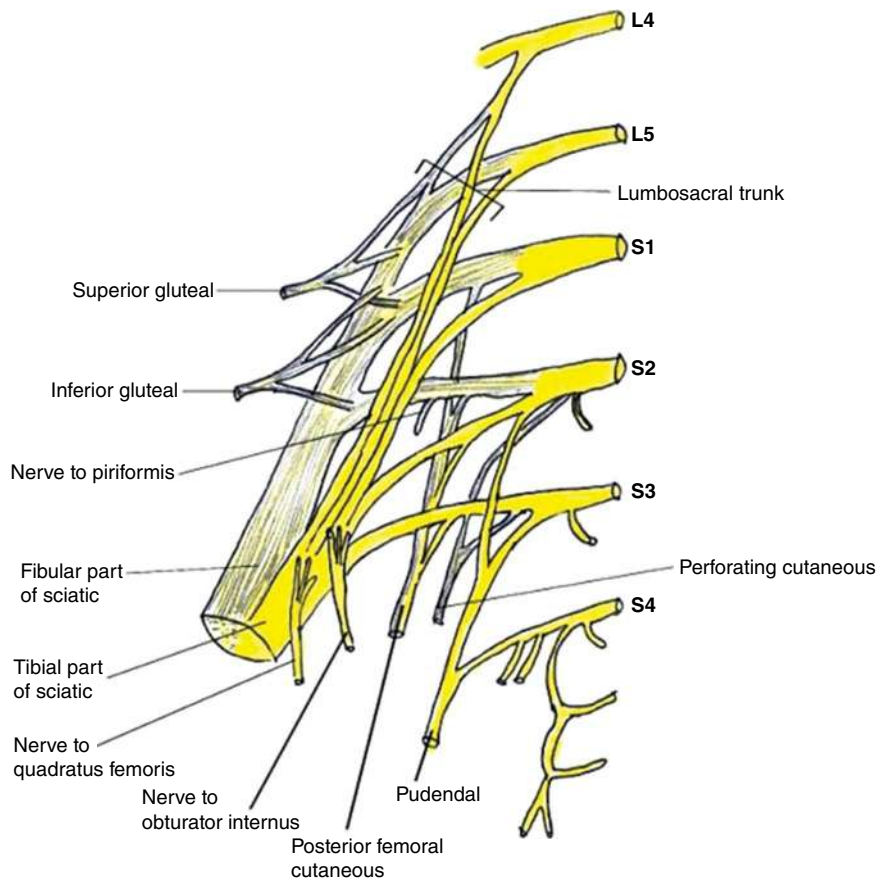


FIGURE 6.7 The branches of the sacral plexus. (Courtesy of Gabriela Barzyk.)

TABLE 6.2: Branches of the sacral plexus

Nerve	Spinal Segment	Course	Innervates
Sciatic (main lateral nerve)	L4–L5 to S1–S3	Passes inferior to piriformis, through greater sciatic foramen and descends in the posterior thigh to the popliteal fossa, where it divides	Provides sensory and motor innervation via its two branches; it also innervates the hamstring muscles
Common peroneal (common fibular)	L4–L5 to S1–S2	Winds around the neck of the fibula and then divides into superficial and deep branches, which descend on the lateral and anterior aspects of the leg, respectively, towards the foot	Provides sensory and motor innervation to the anterior and lateral compartments of the leg
Tibial	L4–L5 to S1–S3	Continues down the posterior aspect of the leg towards the foot	Provides sensory and motor innervation to the posterior compartment of leg (see Section 7 , Lower Limb)
Superior gluteal nerve	L4–L5 to S1	Travels through the greater sciatic foramen superior to piriformis	Motor innervation to gluteus medius, gluteus minimus, and tensor fasciae latae
Inferior gluteal nerve	L5 to S1–S2	Travels through the greater sciatic foramen inferior to piriformis	Motor innervation to gluteus maximus
Nerve to piriformis	S1 and S2	Enters along the anterior surface of piriformis	Motor innervation to piriformis
Nerve to quadratus femoris and inferior gemellus	L4–L5 to S1	Exits via greater sciatic foramen and passes anterior to sciatic nerve and the anterior surfaces of innervated muscles	Motor innervation to quadratus femoris and inferior gemellus Articular branches to the hip joint
Nerve to obturator internus and superior gemellus	L5 to S1–S2	Exits pelvis via the greater sciatic foramen, inferior to piriformis, and gives a branch to the superior gemellus; it then crosses the ischial spine and re-enters the pelvis through lesser sciatic foramen to give rise to the obturator internus branch	Motor innervation to obturator internus and superior gemellus
Posterior cutaneous femoral nerve (posterior cutaneous nerve of the thigh)	S1–S3	Exits through the greater sciatic foramen inferior to piriformis	Gluteal branch (inferior cluneal nerve) provides skin sensation to the skin of the inferior part of the buttock Perineal branch supplies the posterior part of the scrotum or the labia majora Cutaneous branch supplies the posterior thigh, down to the popliteal fossa
Nerve to levator ani	S4		Motor innervation to levator ani
Pudendal nerve	S2–S4	Initially leaves through greater sciatic foramen, crosses sacrospinous ligament laterally, then wraps around the ischial spine and re-enters pelvis through lesser sciatic foramen, where it joins the internal pudendal vessels and accompanies these through the pudendal canal (Alcock's canal), which is formed by the fascia over the obturator internus muscle	Splits into three branches: inferior rectal nerve, perineal nerve, and dorsal nerve of penis/clitoris Inferior rectal nerve is the first branch, gives sensory supply to area below the pectinate line (in lower part of anal canal) and perianal skin, as well as motor supply to the external anal sphincter The perineal branch supplies sensation to the posterior two-thirds of the scrotum/labia majora and minora and perineum Motor function to perineal muscles, including bulbospongiosus, ischiocavernosus, external urethral sphincter, and levator ani Dorsal nerve of penis/clitoris provides sensation to (skin) of penis/clitoris
Perforating cutaneous nerve	S2–S3		Supplies skin on the lower medial aspect of the buttock
*Pelvic splanchnic nerves (<i>nervi erigentes</i>)	S2–S4	Travel from the sacral plexus to corresponding inferior hypogastric plexuses bilaterally	Provide parasympathetic innervation to pelvic and genital organs, as well as the hindgut

* The **pelvic splanchnic nerves**, or *nervi erigentes*, arise from the ventral rami of S2–S4, which carry **parasympathetic fibres**. They join the superior hypogastric plexus before travelling to the inferior hypogastric plexus, where they synapse and supply the pelvic and genital organs.

The **superior hypogastric plexus** lies at the bifurcation of the aorta and consists of sympathetic and visceral afferent fibres. It is connected to the inferior hypogastric plexus via the hypogastric nerves, which lie on the medial aspect of the descending ureters.

The **inferior hypogastric plexus (pelvic plexus)** lies extra-peritoneally along the pelvic sidewall towards the base of the bladder and, in the male, to the prostate gland and on each side of

the seminal vesicles; in the female, it lies on each side of the cervix and vaginal fornix. The inferior hypogastric plexus is mainly composed of sacral sympathetic splanchnic nerves and the parasympathetic splanchnic pelvic nerves.

The parasympathetic supply of the large bowel, from the splenic flexure to the upper half of the anal canal, arises from branches of the hypogastric plexuses, containing fibres from the

pelvic splanchnic nerves, which accompany the branches of the artery of the hindgut, i.e., the inferior mesenteric artery (see the discussion on the hindgut in [Section 5](#), Abdomen). The pelvic splanchnic nerves also form some of the afferent pain sensation pathway from the sigmoid colon and rectum, as well as from the cervix in females.

The *nervi erigentes* can be damaged in pelvic surgery, e.g., excision of rectal cancer or radiotherapy.

Pelvic Part of the Sympathetic Innervation

There are two sacral sympathetic trunks, which are continuations of the lumbar sympathetic trunks. They pass medial to the anterior sacral foramina of the sacrum. These trunks contain four to five ganglia and send post-ganglionic grey *rami communicantes* that accompany the sacral and coccygeal nerves to supply pelvic organs, e.g., male internal reproductive organs (vas deferens, seminal vesicles, and prostate gland), perineum, and the lower limb. Note that the sympathetic nerves relax organs and tighten sphincters, whereas the parasympathetic nerves do the opposite. The sympathetic trunk ends as a structure called the ganglion impar.

CLINICAL NOTES

- The sacral plexus is formed from the ventral rami of spinal nerves L4–S4 and lies on the anterior surface of the piriformis. The acronym SIPPS helps to remember the important nerves of the plexus: S (superior gluteal), I (inferior gluteal), P (posterior femoral cutaneous), P (pudendal), and S (sciatic).
- *Anal tone*: S2–S4 (anal tone and the anal reflex can be lost in spinal cord injuries).
- *Ankle jerk*: S1.

- The **sciatic nerve** is the thickest nerve in the human body; it innervates most of the muscles in the lower limb (see the distribution of the femoral and obturator nerves in [Section 7](#), Lower Limb). It emerges deep to the piriformis in the posterior compartment of the thigh. Lower back problems such as intervertebral disc herniation, degenerative disc disease, lumbar spinal stenosis, and piriformis hypertrophy can result in compression and irritation of the fibres destined for the sciatic nerve; this is known as sciatica and results in pain extending from the lower back down the leg to the foot, depending on the affected nerve roots.
- Superior and inferior gluteal nerves supply the main abductors of the lower limb. The inferior gluteal nerve can be damaged during hip replacement. **These nerves have no cutaneous innervation** (see the anatomy of the buttock in [Section 7](#), Lower Limb).
- A **pudendal nerve block** is used to anaesthetise the perineum in order to perform instrumental deliveries or repair an episiotomy. To perform a pudendal nerve block, it is first necessary to palpate the ischial spine per vagina before guiding the needle, as the nerve passes medial to the tip of the ischial spine ([Figure 6.8](#)). Damage to the pudendal nerve can lead to inability to differentiate between faeces and flatus, leading to faecal incontinence. The pudendal nerve is responsible for both faecal and urinary continence (the inferior rectal branch supplies the external anal sphincter, and the perineal branch supplies the external urinary sphincter). Calling the pudendal nerve, the “social nerve” helps students to understand part of its function (personal communication, Prof. Richard Tunstall).

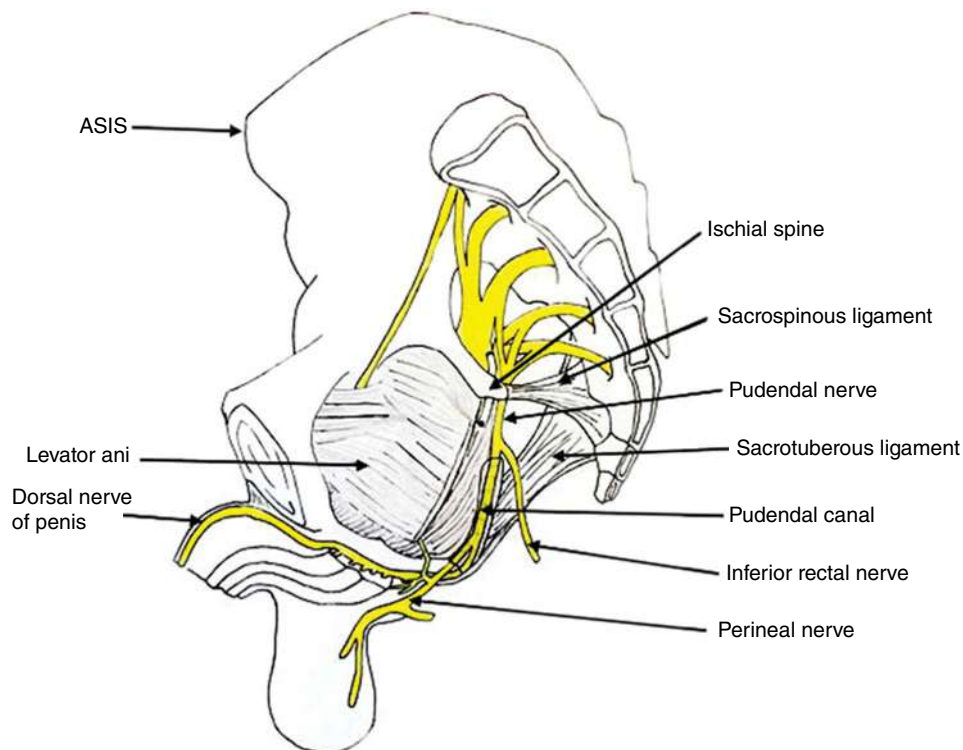


FIGURE 6.8 The pudendal nerve and its branches. (Courtesy of Fallon O'Neill.)

QUIZ QUESTION

Q. Which nerve is irritated by ovarian pathology? What are the clinical presentations?

A. Obturator nerve. Presents as pain along the inner thigh extending to the knee.

Pelvic Floor (Pelvic Diaphragm) (Figure 6.9)

The levator ani

- Separates the pelvic cavity from the perineum
- Forms slings around the rectum, vagina, and urethra to assist in urinary and anal continence
- Provides support for pelvic organs such as the bladder, rectum, and uterus
- Plays an important part in labour by rotating the fetal head from its transverse position upon entering the pelvic cavity to the AP position required to safely exit the pelvic outlet

The pelvic floor muscles contract in response to increased intra-abdominal pressure, such as coughing or lifting heavy objects.

The levator ani is a flat sheet of muscle which originates from the posterior aspect of the pubis, the lateral wall of the pelvis (tendinous arch on the obturator internus fascia), and the ischial spine. The paired levators form a gutter-like arrangement which slopes downwards and forwards and which constitutes the pelvic floor.

The **nerve supply** to the levator ani is from the sacral plexus: nerve to levator ani (S3–S4) on the pelvic surface and both the perineal and inferior rectal branches of the pudendal nerve on the perineal surface.

The levator ani receives its blood supply from the inferior gluteal, inferior vesical, and pudendal arteries.

The **ischiococcygeus** (also known as the coccygeus) is not part of the levator ani, but together they form the pelvic diaphragm. This triangular, rather fibrous muscle, at the posterior aspect of the levator ani, originates from the ischial spine and inserts into the lower end of the sacrum and the coccyx. The coccygeus lies on the pelvic surface of the sacrospinous ligament and may fuse with it.

CLINICAL NOTES

- The levator ani can become damaged during pregnancy and during vaginal delivery (parturition).
- Weakness of the levator ani contributes to prolapse of the rectum (rectocele), uterus (uterine prolapse), and the urinary bladder (cystocele).
- Knowledge of this anatomy is vital in abdominoperineal excision of the rectum when treating low rectal cancer where a sphincter-conserving approach is not possible.

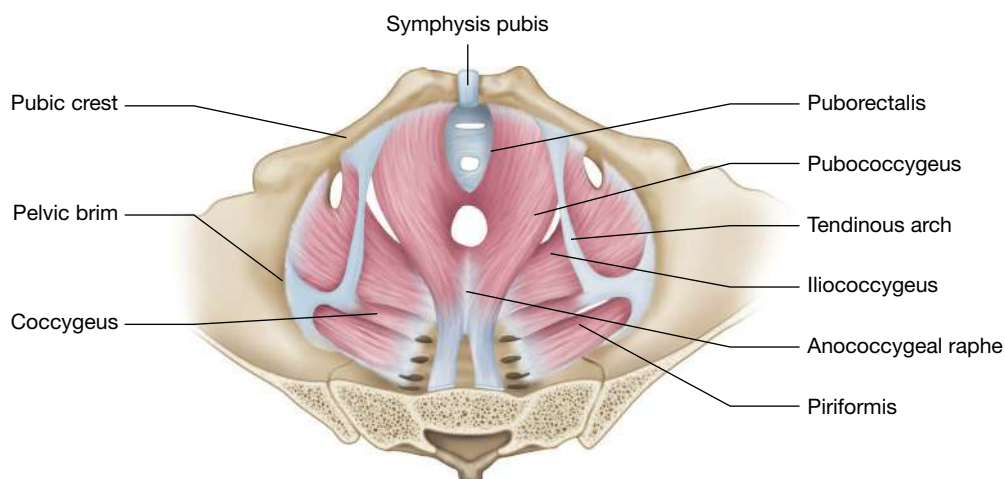


FIGURE 6.9 Superior view of the male pelvic diaphragm. (Courtesy of Xi Ming Zhu.)

The muscle can be divided into three parts: **pubococcygeus** (further subdivided into pubourethralis, pubovaginalis in the female, or puboprostaticus in the male), **iliococcygeus** (from the tendinous arch of the obturator internus), and **puborectalis**. These muscles all insert into a fibrous midline raphe (the **anococcygeal raphe**). The pubococcygeus also inserts into the perineal body.

These three muscles constitute the main part of the pelvic diaphragm.

Medial to the pubococcygeus is the **puborectalis**, which arises from the posterior aspect of the ischiopubic rami. Its fibres decussate behind the rectum to form a sling around the anorectal junction and fuse with the external anal sphincter.

Pelvic Organs

Embryology

The cloaca is divided by the urorectal septum into the urogenital sinus and the anorectal canal. The urogenital sinus develops into the urinary bladder and its neck and the phallic segment. The phallic segment forms the penile urethra in the male and the vestibule of the vagina in the female.

Ureter

For its embryology, see the embryology of the ureter in Section 5, Abdomen.

The ureter is a retroperitoneal muscular tube that connects the renal pelvis to the bladder. It is about 25 to 30 cm in length. It

leaves the renal pelvis (ureteropelvic junction [UPJ]) posterior to the renal vessels. The ureter runs lateral to the tips of the transverse processes of the lumbar vertebrae.

Note how the tips of the transverse processes of the lumbar vertebrae, the sacroiliac joints, and the ischial spines form a useful guide to identify radio-opaque stones within the course of the ureter on a kidney, ureter, and bladder (KUB) X-ray.

The ureter is divided into three parts:

1. **Abdominal ureter:** from the UPJ to the pelvic brim, anterior to the sacroiliac joint, at the bifurcation of the common iliac artery. It is crossed anteriorly by the gonadal vessels (“bridge over water”). On the left side, the apex of the sigmoid mesocolon, containing the sigmoidal vessels, runs anterior to the ureter. In a sigmoid colectomy, the ureter should be clearly identified, as it may be densely adherent to the diseased colon (bowel cancer or complicated diverticular disease). The same applies on the right side when removing right colon cancer (right hemicolectomy). The ureter is usually adherent to the posterior peritoneum.
2. **Pelvic ureter:** passes from lateral to medial, towards the bladder wall, and is about half of its total length, i.e., 12.5 cm. In the male, the vas deferens loops over it, just before it enters the bladder. The ureter travels to the bladder accompanied by inferior vesical vessels and branches of the inferior hypogastric (pelvic) plexus. In the female, the ureter courses posterior to the ovary and then reaches the base of the broad ligament of the uterus. Finally, just before entering the bladder, it passes the anterior vaginal fornix. **Note the close proximity of the ureter to the uterine vessels.** This is the site where ureteric injuries most commonly occur during gynaecological procedures.
3. **Intramural ureter:** a short segment passing obliquely through the bladder wall. The oblique course prevents reflux of urine during urinary bladder contraction. The ureters receive vascular supply from the renal arteries, abdominal aorta, gonadal arteries, common and internal iliac arteries, and the superior and inferior vesical arteries. This rich blood supply helps in mobilising the ureter during operations without compromising its vascularity.

Nerve Supply of the Ureter

Aortic plexus, superior hypogastric, and inferior hypogastric plexuses (i.e., most nerves it passes).

The ureter has three constrictions:

- At the UPJ
- Where it crosses the pelvic brim
- Ureterovesical junction (intramural part)

These constrictions are common sites for stone impaction (Figure 6.10).

How to identify the ureter at operation? The following can be of great help in identifying the ureter, especially during difficult surgery due to adhesions or local cancer spread:

- The ureter crosses the bifurcation of the common iliac vessels.
- The ureter vermiculates on gentle pinching, due to peristalsis (Kelly’s sign).
- A hugely dilated ureter (hydroneurter) can be aspirated with a needle and syringe.

CLINICAL NOTES

- The ureters are at risk of injury during pelvic surgery and hysterectomy. The ureter lies inferior to the uterine artery (female) or the vas deferens (male). This can be remembered as “water under the bridge”.
- Stones impacted in the lower ureter can be felt during a vaginal examination through the lateral fornices. Note that this is the only location in the body where stones in the ureters can be palpated.
- The most common clinical problem is ureteric colic.

Ureteric colic is a severe intermittent pain due to contraction of ureteric smooth muscle to overcome an obstruction, usually due to a stone (calculus). The pain may radiate to the lower abdomen (“from loin to groin”), testis, or tip of the penis.

In contrast to patients with peritonitis, who lie still and avoid moving, patients with ureteric colic are restless in bed (very useful clinical observation).

The urinalysis usually shows frank or microscopic haematuria (blood in the urine) and sometimes signs of a urinary tract infection (UTI) (presence of bacteria, raised white blood cells [WBCs] and nitrates).

The main risk of a ureteric stone is obstruction of the ureter with the development of hydroneurter and hydronephrosis (Figure 6.10).



FIGURE 6.10 Intravenous urogram (IVU) showing obstructed left ureter (hydroneurter) and kidney (hydronephrosis) due to stone (arrow) in the left ureter. (Courtesy of Qassim F. Baker.)

Non-contrast abdominal computed tomography (CT) is now the standard investigation which is requested for patients with ureteric colic (**Figure 6.11**).



FIGURE 6.11 Non-contrast abdominal CT showing a proximal stone in the left ureter (*arrow*). (Courtesy of Mudhar Hassan.)

The Bladder

The bladder is a distensible, three-sided, pyramidal-shaped, hollow muscular structure that can store more than 1000 mL of urine in acute urinary retention (**Figure 6.12**). It consists of an apex, base, superior surface, and two sloping inferolateral surfaces. The bladder is lined by multilayered epithelium called the urothelium (traditionally called transitional cell epithelium), which also lines the ureter and renal pelvis. It is extraperitoneal when empty but becomes increasingly intraperitoneal as it fills.

The **detrusor muscle** (smooth muscle) is the muscular layer of the urinary bladder. The bladder lies in the pelvis, but when distended, it extends into the abdominal cavity and can be clinically detected as a suprapubic swelling. When the bladder is empty, it is covered by the parietal peritoneum anteriorly. The bladder is separated from the rectum in the male by the rectovesical pouch; in the female, the vesicouterine pouch separates the uterus from the bladder.

In children up to the age of 6 years, the bladder is an abdominal organ because the pelvis is not yet large enough to accommodate the bladder.

The bladder receives blood supply from the anterior division of the internal iliac arteries, including the superior and inferior vesical arteries, with small contributions from the obturator, inferior gluteal, and uterine arteries (in the female).

See information on the urachus, in **Section 5**, Abdomen, for more information.

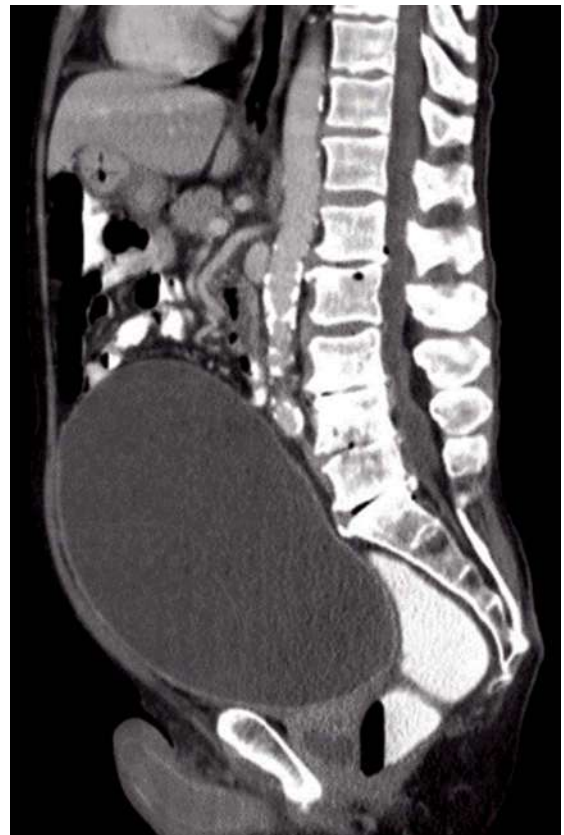


FIGURE 6.12 Sagittal CT reformat of the abdomen and pelvis showing distended urinary bladder. (Courtesy of Mudhar Hassan.)

The urge to micturate

Stretch receptors in the bladder wall stimulate the parasympathetic nerves (pelvic splanchnic nerves S2–S4) to contract the detrusor muscle and relax the internal urinary sphincter (involuntary). The external urethral sphincter (voluntary) is controlled by the perineal branch of the pudendal nerve, S2.

CLINICAL NOTES

Cystitis is the most common clinical problem related to the bladder. It is more frequent in females because of their shorter urethra, which allows organisms to reach the bladder more easily.

Acute urinary retention is the inability to voluntarily empty the bladder and is the most common urological emergency, especially in males with urethral obstruction from prostatic enlargement. Passing a urinary catheter might be needed if other measures fail to alleviate the problem.

Bladder tumours are usually manifested by the passage of blood in the urine (haematuria) (*vide infra*).

Suprapubic cystostomy (insertion of a catheter into the bladder, just above the symphysis pubis, in the midline) is usually performed under local anaesthetic when it is not possible to empty the bladder via the urethra.

(Continued)

Cystoscopy is the visualisation of the inside of the bladder via an endoscope passed through the urethra and is a common procedure used to diagnose and treat bladder pathologies, such as tumours (by taking a biopsy, transurethral resection of bladder tumour [TURBT]), or as part of other procedures to treat prostatic hypertrophy (transurethral resection of the prostate [TURP]) (Figure 6.13). Also used for retrograde insertion of ureteric catheters and double J stents (pigtail) to treat ureteric obstruction and ensure free urinary drainage from the kidney.

Structures seen during cystoscopy:

- The **trigone** is a triangular-shaped area at the bladder base, which connects the internal urethral orifice, ureteric orifices, and **interureteric fold**. The trigone contains stretch receptors that signal the need to micturate. The rugae of the bladder will flatten when the bladder distends, and the bladder will become increasingly intraperitoneal.

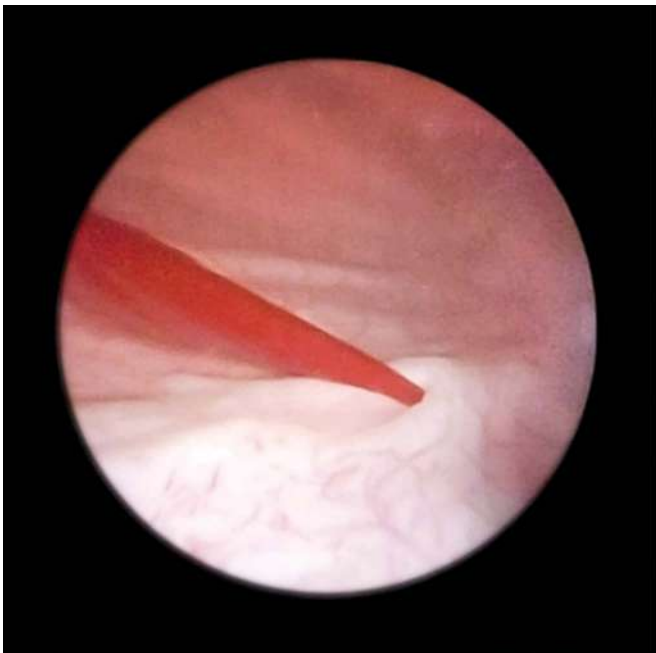


FIGURE 6.13 A blood jet through the left ureteral orifice during a cystoscopy, a sign of bleeding from the left upper urinary tract. (Courtesy of Mudhar Hassan.)

INJURIES OF THE BLADDER

The bladder can be injured in the following circumstances:

- Perioperative, such as when dissecting a pelvic tumour or during gynaecological operations,

including hysterectomy and caesarean section. This is why an indwelling urinary catheter, e.g., Foley's catheter, is routinely inserted before pelvic surgery to keep the bladder empty and less liable to injury.

- **Radiotherapy to treat pelvic cancers:** this treatment can damage the bladder (radiation cystitis) with risk of perforation/fistula formation.
- Long and difficult labour.
- Instrumentation of the bladder such as cystoscopy, TURBT, and TURP.
- **External trauma (blunt or penetrating injuries):** bladder injury should be excluded in all patients with pelvic trauma.

The injury of the bladder can be mild, such as contusion of the bladder wall, or more serious with urine extravasation extraperitoneally or intraperitoneally (especially injuries sustained with a full bladder).

HAEMATURIA

The presence of blood in the urine. Haematuria can be microscopic (blood visible only under high-powered microscopy) or frank (macroscopic), with or without clots.

There are many causes, which can be generally divided into:

- **Traumatic** (external trauma to the renal system such as renal, bladder, or urethral injuries).
- **Iatrogenic injuries** (inflicted during a surgical, therapeutic, or diagnostic procedure) form an important cause, including bladder and urethral injuries during catheterisation and endoscopic operations (TUR and TURP and cystoscopy; see "Injuries of the Bladder", above).
- **Inflammatory conditions** such as glomerulonephritis, pyelonephritis, cystitis, and prostatitis.
- **Stone formation**, which usually starts in the kidneys and then travels down the ureter causing ureteric colic and obstruction (see Figure 6.10) and can impede urinary function, is an important cause of haematuria. However, stones can form in the bladder and cause haematuria and UTIs. Typically, the spiky oxalate stones irritate the urothelium of the bladder (Figure 6.14).
- **Neoplastic conditions** such as renal cell carcinoma (RCC) and bladder and prostate tumours.

In some countries, such as Egypt (infection was diagnosed in mummies 3000, 4000, and 5000 years old) and Iraq, parasitic infection with *Schistosoma haematobium* causes bilharziasis, which presents as frank haematuria and may end up with the development of bladder cancer (usually of the squamous cell type). *Further Reading:* M.R. Barakat, Epidemiology of Schistosomiasis in Egypt: Travel through Time. Journal of Advanced Research 2013.



FIGURE 6.14 Plain X-ray of the pelvis showing a large vesical stone. (Courtesy of Abdel-Aziz Abdel-Ghany.)

Rectum and Anal Canal

The rectum and upper anal canal are derived from the embryological hindgut (endodermal origin).

The rectum (Latin, “straight”) is a 12- to 15-cm muscular tube and is a continuation of the sigmoid colon at the rectosigmoid junction, at the level of the third sacral vertebra. Unlike many primates, which have a straight rectum, the human rectum follows the curvature of the sacrum and has lateral curves (two on the right and one on the left). The **rectum has a complete longitudinal muscle layer** (which explains the non-existence of diverticuli in the rectum), in contrast to the colon, where the longitudinal muscle layer is restricted to the three taeniae coli.

The rectosigmoid junction is a common site for cancer.

Houston’s valves are mucosal shelves that correspond with the three rectal curves and can be seen on sigmoidoscopy. The lower one-third of the rectum is completely retroperitoneal, while the upper one-third is covered by peritoneum anteriorly and laterally. The middle one-third is covered on the anterior aspect only.

The rectum continues as the anal canal, at the anorectal junction, by curving backwards. The puborectalis (part of the levator ani) forms a loop at the anorectal junction, and this marks the transition from rectum to anal canal. The dilated lower part of the rectum is called the rectal ampulla.

Learning Point

When a sigmoidoscopy is performed, the scope needs to be pointed towards the umbilicus when inserted into the anus.

Related Fascial Layers

Denonvillier’s fascia (recto-prostatic fascia or recto-vaginal fascia in females) is a fascial layer extending superiorly from the perineal body to the floor of the recto-vesical pouch of the peritoneum in the male. It separates the prostate and base of the bladder from the rectum and covers the seminal vesicles and ductus deferens ampulla.

It is an important landmark when performing radical prostatectomy (removal of the prostate gland) for prostatic cancer.

Presacral fascia is the part of the endopelvic fascia which lines the anterior part of the sacrum.

Mesorectum (mesorectal fascia) is the connective tissue that surrounds the rectum and contains fatty tissue, the superior rectal artery and vein, and lymph nodes. Posteriorly, it connects the rectum with the pre-sacral fascia and blends anteriorly with the recto-prostatic fascia or recto-vaginal fascia. There is special emphasis on total mesorectal excision (TME) to decrease the incidence of local recurrence of cancer.

Waldeyer’s fascia extends between the pre-sacral fascia and the mesorectum from the S2 to S4 level.

Blood supply

- Superior rectal artery (continuation of the inferior mesenteric artery at the pelvic brim and divides into two terminal branches)
- Middle rectal artery (from the anterior division of the internal iliac artery, or sometimes from the inferior vesical or the vaginal artery, sometimes absent)
- Inferior rectal artery (branch of the internal pudendal artery) supplies the anal canal, the external and internal sphincters, and the perianal skin, in addition to the lower rectum
- Small contribution from the middle sacral artery, which runs on the lumbosacral vertebrae within the presacral space

Venous drainage

- Tributaries of the rectal plexus drain to the superior rectal vein → inferior mesenteric vein → splenic vein (portal circulation)
- Middle rectal vein → internal iliac vein (systemic circulation)
- Inferior rectal vein → internal pudendal vein → internal iliac vein (systemic circulation)

Engorged anal and rectal veins (haemorrhoids) can be a feature of portal hypertension due to connections between the portal and caval systems in this region.

Nerve supply

- Sympathetic (lumbar splanchnic L1, L2)
- Parasympathetic (*nervi erigentes* S2–S4)

CLINICAL NOTES

- Colorectal cancer is the fourth most common cancer in UK with around 40,000 new cases diagnosed annually. There has been a revolution in the management of rectal cancer with the proper staging using pelvic MRI and CT of the thorax, abdomen, and pelvis (TAP) to detect cancer spread. Minimally invasive and robotic surgery helps to carry out proper dissection and minimise blood loss.
- There is now more sphincter-saving surgery for low rectal tumours than before. However, abdominoperineal resection (APR) is still indicated for anal canal and very low rectal cancer.
- Male patients undergoing surgical removal of rectal cancer should be warned that damage to the *nervi erigentes* may cause postoperative impotence.

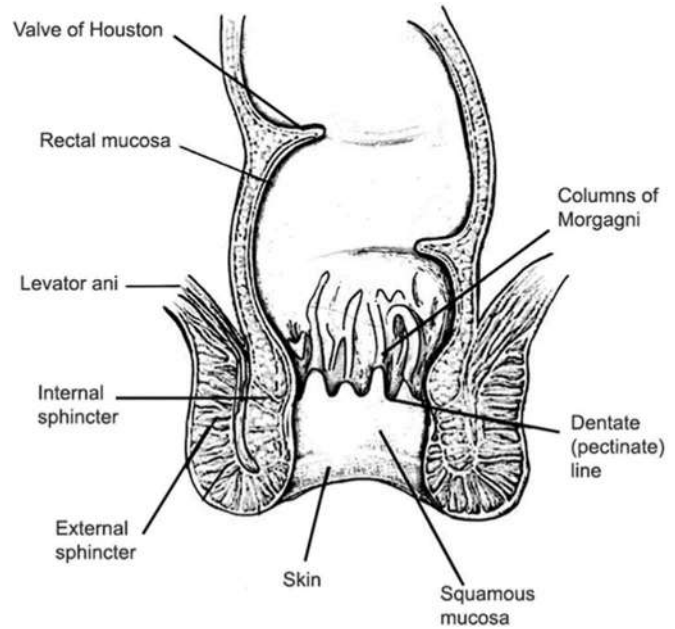


FIGURE 6.15 Lower rectum and anal canal. (Courtesy of Chun Ho.)

Lymphatic drainage of the rectum and anal canal above the dentate line

- Pararectal lymph nodes (of Gerota) in the mesorectum and then along the lymphatics accompanying the superior rectal artery to the pre-aortic lymph nodes
- Lymphatics along the middle and inferior rectal arteries to the internal iliac lymph nodes

The Anal Canal

The anal canal is a muscular tube about 3 to 4 cm long, extending posterior-inferiorly from the rectum to the anal orifice, situated within the anal triangle of the perineum, below the pelvic diaphragm. Its wall consists of the epithelium lining and internal and external sphincters, in addition to the neurovascular structures (Figure 6.15).

It lies between the ischioanal (ischiorectal) fossae, which allows expansion of the canal during defaecation. Posteriorly the anal canal is connected to the coccyx through the anococcygeal ligament. Anteriorly it is connected to the perineal body.

The **dentate** (“tooth-like”) or **pectinate** (“like a comb”) line delineates the upper and lower anal canals, which vary in embryological origin. The upper part arises from endodermal and mesodermal tissue, while the lower part arises from ectodermal tissue (proctodeum), where there is a change in the type of epithelium from the columnar epithelium of the embryological hindgut to the non-keratinised squamous epithelium of the anus. Below the intersphincteric groove, the epithelium becomes keratinised squamous epithelium.

The differences between the upper and lower anal canals are listed in Table 6.3.

Anal columns (of Morgagni) are longitudinal folds in the upper part of the anal canal separated by furrows and are joined at their lower ends by the valve-like folds called the **anal valves**. The anal glands open into the anal valves. Perianal abscesses are believed to arise from infection of the branched anal glands that may penetrate the internal sphincter.

Anal cushions are normal protrusions of vascular subepithelial tissue from the internal haemorrhoidal plexus, above the dentate line, which correspond to the terminal branches of the superior rectal vessels and play a role in anal continence by sealing the

TABLE 6.3: The differences between the upper two-thirds and lower one-third of the anal canal

<i>Embryonic origin</i>	Above the dentate line (endoderm)	Below the dentate line (ectoderm)
<i>Blood supply</i>	Superior rectal artery (continuation of inferior mesenteric artery)	Inferior rectal artery (from the internal pudendal artery)
<i>Nerve supply</i>	Sympathetic fibres from the inferior mesenteric plexus relax bowel and contract internal sphincter <i>Parasympathetic (from the pelvic splanchnic nerves):</i> contracts bowel and relaxes internal sphincter during defaecation	Inferior rectal nerve from the pudendal nerve (somatic)
<i>Lymphatic drainage</i>	Pararectal to pre-aortic lymph nodes	Superficial inguinal lymph nodes
<i>Epithelial lining</i>	Columnar epithelium	Stratified, squamous non-keratinised epithelium

anal canal. They are sited at the left lateral, right posterior, and right anterior, which corresponds to 3, 7, and 11 o'clock, respectively, when viewed through a proctoscope with the patient in the lithotomy position.

The **internal sphincter** (smooth muscle) is a continuation of the inner circular muscle of the rectum. It is tonically contracted at rest but becomes relaxed secondary to distension of the lower rectum.

It is innervated by the sympathetic and parasympathetic pelvic splanchnic nerves from the inferior hypogastric plexus.

The **external anal sphincter** (striated muscle) surrounds the anal canal, outside the internal sphincter. The old classification into subcutaneous superficial and deep components is no longer valid, and the whole muscle acts as one unit. It is superiorly

blended with the puborectalis (part of the levator ani) (see [Figure 6.9](#)) and anteriorly attached to the perineal body and can be injured during childbirth. Posteriorly, it is attached to the coccyx via the anococcygeal ligament.

Its nerve supply is from the inferior rectal branch of the pudendal nerve. The external anal sphincter enables voluntary closure of the anus and can be voluntarily contracted for a short time to resist passing faecal matter.

The **conjoint longitudinal muscle** is a continuation of the longitudinal muscle of the large bowel which runs between the external and the internal sphincters. It is supplied by autonomic nerves and acts to shorten and widen the anal canal on defaecation.

Anal continence is enabled by sympathetically mediated contraction of the internal sphincter in addition to the contraction of the external sphincter and anal cushions (see earlier).

Common causes of faecal incontinence include injury to the anal sphincter during childbirth and iatrogenic injuries to the anal sphincters that follow anal surgery for high fistula-in-ano, haemorrhoidectomy, or internal sphincterotomy for treatment of anal fissures. Spinal injuries can also result in faecal incontinence.

CLINICAL NOTES

Internal haemorrhoids (piles) are abnormally dilated anal cushions (see earlier), which contain blood vessels called the sinusoids. They can become engorged and can bleed following repeated intra-abdominal pressure and straining in patients with constipation.

Internal haemorrhoids are **painless (above the dentate line)** but tend to bleed (fresh bright blood during or shortly after defaecation). They appear as anal bulges at the 3, 7, and 11 o'clock positions when looked at in the lithotomy position. This type is called grade I haemorrhoids.

Internal haemorrhoids can prolapse to the outside and can reduce either spontaneously (grade II) or by manual reduction (grade III). Grade IV haemorrhoids are prolapsed outside the anal verge. Prolapsing haemorrhoids (piles) may strangulate when the blood supply becomes occluded by the constricting action of the anal sphincters.

External haemorrhoids are below the dentate line (from the external haemorrhoidal plexus) and can become painful, especially if they become thrombosed.

Learning Point

All patients with rectal bleeding, with or without recent changes in bowel habits, should be thoroughly investigated, including a full anorectal examination, to exclude anorectal or colonic pathologies, including cancer (see NICE Guidelines, 2017: <https://cks.nice.org.uk/topics/gastrointestinal-tract-lower-cancers-recognition-referral/>).

Painful Perianal Conditions

Commonly seen in clinical practice and may be referred to A&E or the colorectal clinic:

- *Perianal haematoma*: a collection of blood around the anus which results from rupture of superficial blood vessels.

- *Anorectal suppuration*: pus formation commonly around the anal verge (perianal abscess) or in the ischiorectal fossa. Perianal abscess may end up with fistula formation (track between the lining of the anal canal and the skin); the most common type is intersphincteric. Rare but more complicated trans-sphincteric fistula can prove difficult to treat. Fistula-in-ano can be associated with bowel disease such as Crohn's disease.
- *Anal fissure*: a crack at the lower part of the anal canal, most commonly posteriorly, which causes pain when passing stools and can bleed. Digital examination is contraindicated in patients with acute anal fissure. If conservative measures fail to heal the fissure, day case surgery may be considered (lateral internal sphincterotomy).
- *Anal ulcerations*: can be caused by a variety of diseases such as Crohn's disease, tuberculosis (TB), squamous cell carcinoma, malignant melanoma, and sexually transmitted disease (STD; herpes, syphilis) in addition to trauma.

Digital rectal examination (DRE) or per rectum (PR) examination is an important bedside examination of the anal verge, anal canal, and lower rectum. It is usually performed with the patient lying in the left lateral position with their hips and knees flexed to their chest.

What structures can be felt on performing a PR examination?

Males: the prostate gland (size, consistency, tenderness, and presence of median sulcus between the two lateral lobes) and seminal vesicles (usually palpable only if inflamed or enlarged).

Females: the cervix can be felt as well as any masses present within the recto-uterine pouch, e.g., ovarian cysts.

Tenderness may be elicited on PR exam in patients with pelvic peritonitis (infection of the pelvic peritoneum from a septic focus such as acute appendicitis).

Palpable pathologies such as rectal polyps, tumours, and the presence of blood/mucus on the gloved finger should be noted.

Further evaluation of the anal canal, rectum, and sigmoid colon requires either a sigmoidoscopy or colonoscopy ([Figure 6.16](#)).



FIGURE 6.16 Endoscopic view of rectal polyp. (Courtesy of Akram A. Najeeb.)

The Perineum

Defined as a diamond-shaped region between the thighs, caudal to the pelvic diaphragm.

The perineum is divided into two triangles by an imaginary line between the ischial tuberosities:

- *Anterior:* urogenital triangle
- *Posterior:* anal triangle

The boundaries of the perineum are:

- *Anterior:* lower end of the pubic symphysis
- *Lateral:* ischiopubic rami and sacrotuberous ligaments
- *Posterior:* tip of the coccyx

- The **deep pouch** contains the compressor urethrae muscle and the sphincter urethrovaginalis, a skeletal muscle sphincter complex surrounding the urethra and vaginal orifices

The vagina and the urethra traverse the deep and superficial pouches. The urethra is surrounded by both inner circular smooth muscle (as a continuation of the detrusor muscle of the bladder, under autonomic control) and outer skeletal muscle (innervated by the pudendal nerve).

Stress incontinence (leakage of urine during actions that increase the intra-abdominal pressure such as coughing or sneezing) is the most common type of incontinence in women and is due to problems with the closing mechanism of the bladder.

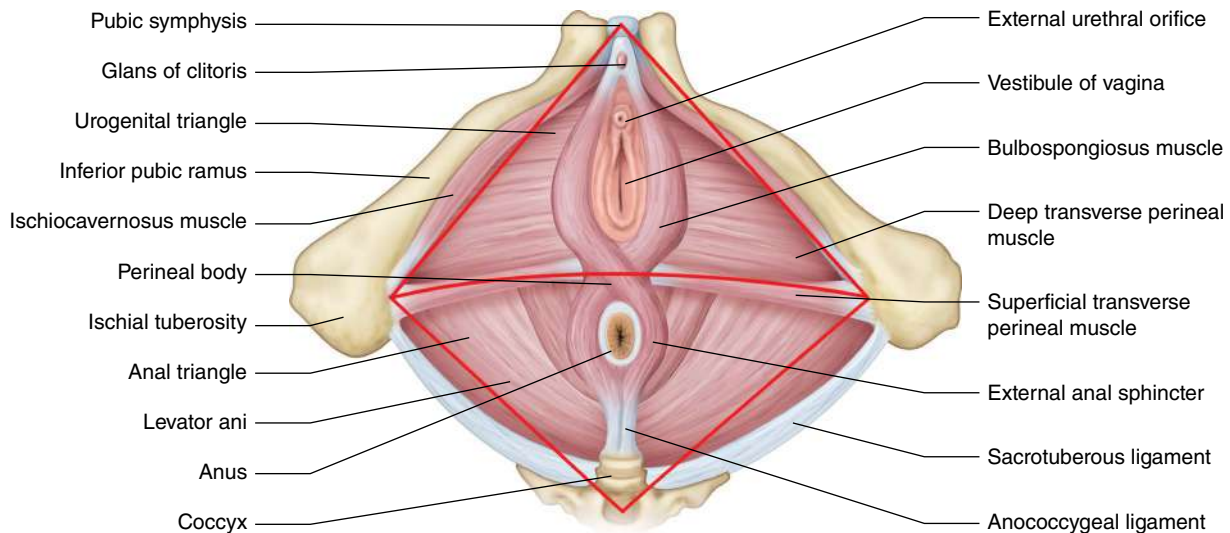


FIGURE 6.17 The triangles of the female perineum. (Courtesy of Hatidzhe Masteva.)

The **perineal body** (central tendon of the perineum) is a median, fibromuscular mass between the urogenital and anal triangles and is situated midway between the two ischial tuberosities (between the posterior commissure of the labia majora and the anus). It is an important attachment point for the perineal muscles that supports the pelvic floor.

The **anterior urogenital triangle** is further divided by the perineal membrane (a triangular sheet of connective tissue that lies between the ischiopubic rami) into superficial and deep pouches.

The **posterior (anal) triangle** contains the anal canal, internal and external anal sphincters, and ischioanal fossa (one on each side of the anal canal).

Female Perineum (Figure 6.17)

Urogenital triangle:

- The **superficial pouch**, which contains the structures that form the root of the clitoris and includes the bulbospongiosus, ischiocavernosus, and superficial transverse perineal muscles, in addition to the lesser vestibular (Skene's) glands and the greater vestibular (Bartholin's) glands.

CLINICAL SIGNIFICANCE

During childbirth, the perineal body can be stretched or torn, leading to the prolapse of pelvic viscera. This could be avoided by a mediolateral episiotomy (favoured), where the perineum is cut. This prevents uncontrolled tears of the perineal body (**Figure 6.18**).

Male Perineum

- The urethra pierces the urogenital diaphragm in the urogenital triangle.
- The superficial perineal pouch contains the root of the penis and the superficial perineal muscles: bulbospongiosus, ischiocavernosus, and superficial transverse perineal muscles, all supplied by the pudendal nerve.
- The deep perineal pouch contains the deep transverse perineal muscles, membranous urethra, and bulbourethral

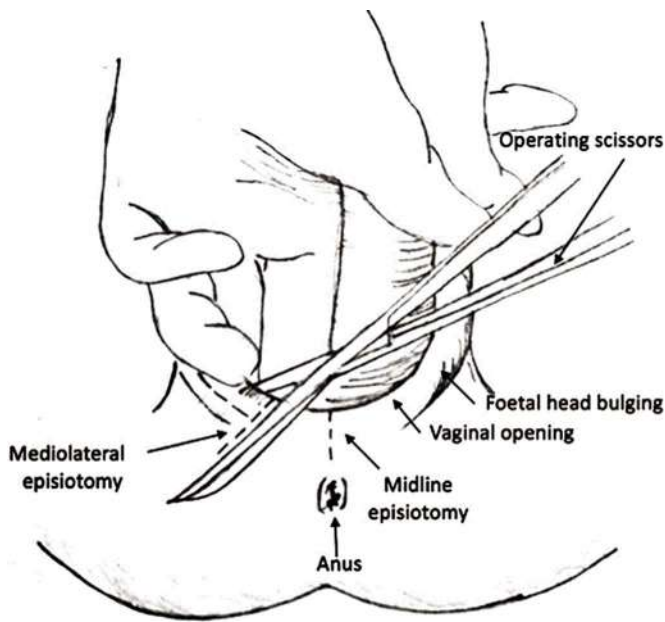


FIGURE 6.18 Diagram of mediolateral episiotomy. (Courtesy of Naomi Bartholomew.)

glands. The membranous urethra is surrounded by the circular muscle fibres of the external sphincter urethrae.

- The deep transverse perineal muscles arise from the ischial rami and are inserted into the perineal body. They are, in addition to the sphincter urethrae, supplied by the pudendal nerve.

The **ischioanal fossa (ischiorectal)**, on each side, is situated lateral to the anal canal between the obturator internus muscle and its fascia laterally and the pelvic diaphragm (levator ani) and its inferior fascia, as well as the external anal sphincter, medially. The pudendal canal (Alcock’s canal), which contains the internal pudendal vessels and pudendal nerve, is a fascial compartment on the lateral wall of the ischioanal fossa. The fossa is filled with fat and contains the inferior rectal nerve and vessels. Abscess formation can occur at the ischioanal fossae and may develop a fistula to the rectum or the anal canal.

Anatomy of the Male Genital Tract and Inguinal Canal

During early development, the external genitalia of both sexes are similar in structure and appearance. This is the **indifferent stage**. Subsequently, in the male, the scrotal folds fuse, forming the scrotum (remaining as the labia majora in the female), while the urethral folds fuse in the midline to surround the penile urethra (remaining as the labia minora in the female). The genital tubercle then elongates to form the phallus. Thus, by 9 weeks, the differences between the male and female sexes are apparent. With a common

origin, male and female anatomical structures are comparable (**Table 6.4**).

TABLE 6.4: Comparison of male and female genital structures

Male Structures	Female Structures
Testes	Ovaries
Penis	Clitoris
Scrotum	Labia majora
Penile skin	Labia minora
Seminal vesicles	N/A
Prostate gland	Paraurethral/lesser vestibular/Skene’s gland
Bulbourethral gland	Greater vestibular/Bartholin’s gland
Bulb of penis	Vestibular bulbs
Glans penis	Clitoral glans
Crura of penis	Clitoral crura
Foreskin	Clitoral prepuce
Gubernaculum testis	Round ligament of uterus and the ligament of the ovary

Note: The prostatic utricle (a depression on the urethral crest in the male) is the analogue of the uterus and vagina in females and represents the distal end of the fused paramesonephric ducts (*vide infra*, female reproductive tract).

The male external genitalia (**Figure 6.19**) consist of:

- Penis
- Scrotum
- Testes
- Epididymides (*singular*: epididymis)
- Vasa deferentia (*singular*: vas deferens – also known as the ductus deferens)

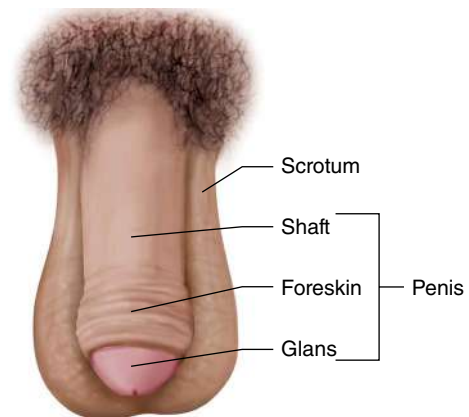


FIGURE 6.19 External male anatomy. (Courtesy of Gabriela Barzyk.)

The Penis

When describing the dorsal and ventral surfaces of the penis, note that, in the anatomical position, the penis is erect and comprises the root, penile body (shaft), and glans penis, from proximal to distal. The penis develops from the genital tubercle.

fold of skin that covers the glans and is surgically removed in circumcision.

Thus, the **shaft of the penis** is composed of the three corpora (the three cylindrical bodies of the penis). Buck's fascia, also called the investing deep fascia of the penis, surrounds these three corpora (**Figure 6.20**).

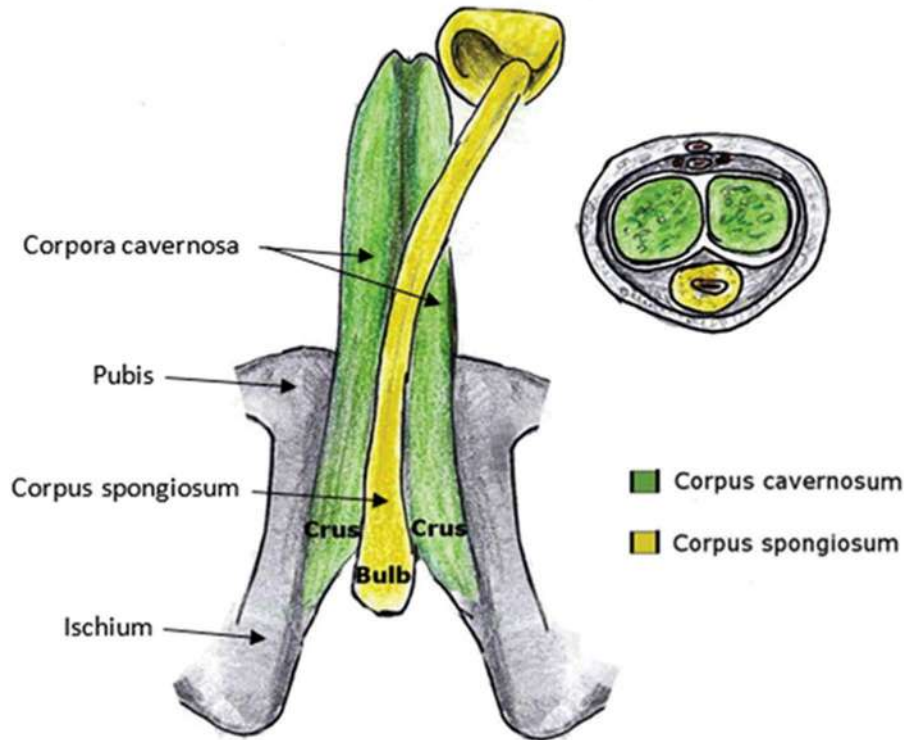


FIGURE 6.20 The corpora of the penis. (Courtesy of Gabriela Barzyk.)

The **root (radix) of the penis** consists of the following structures:

- *The bulb of the penis:* continues as the corpus spongiosum and is traversed by the spongy or penile urethra, which pierces the posterior surface of the bulb and is the outflow tract for urine and semen via the external urethral meatus. The bulb is firmly attached to the perineal membrane.
- The bulbospongiosus muscles, one on each side, cover the bulb of the penis, which helps in clearing the urethra of urine and semen.
- The **right and left crura** (*singular: crus*) of the penis arise from the ischiopubic rami and are covered by the ischiocavernosus muscles, which are attached to the pubic arch and help in erection; the bulbospongiosus and ischiocavernosus muscles are supplied by the perineal branch of the pudendal nerve.

The **corpora cavernosa** (*singular: corpus cavernosum*) are two cylindrical masses of porous tissue which represent the extension of the crura. They become engorged with blood on erection. Distally, they are located on the dorsal aspect of the penis.

Located on the **ventral** aspect of the penis, the **corpus spongiosum** is the third erectile tissue, containing the urethra, which ends distally as the **glans penis**. The rim of the glans is called the **corona**. Inferiorly, a thin band of tissue, the frenulum, links the glans to the **prepuce** or foreskin. The prepuce is a double

Remember: “*SpongeBob* lives *under* the sea”, which helps recall that corpus *spongiosum* is *inferior* to corpus cavernosum.

The **two suspensory ligaments of the penis** support the erect penis, anchoring it to the pubic symphysis, and are continuous with the Buck's fascia (**Figure 6.21**).

Blood Supply (Figure 6.22)

The internal pudendal artery, which arises from the anterior division of the internal iliac artery, gives rise to three branches to the corpora of the penis (distal to the origin of the perineal branch). The three branches are:

1. *Bulbourethral artery:* a short artery which supplies the penile bulb and urethra, Cowper's gland, corpus spongiosum, and glans
2. *Dorsal artery of the penis:* supplies the circumflex branches to both the corpora cavernosa and corpus spongiosum, glans, and penile skin
3. *Deep artery of the penis:* supplies the cavernosal artery, runs within the corpus cavernosum on each side (*vide infra*, mechanism of erection)

Venous Drainage of the Penis

There are three venous systems, superficial, intermediate, and deep:

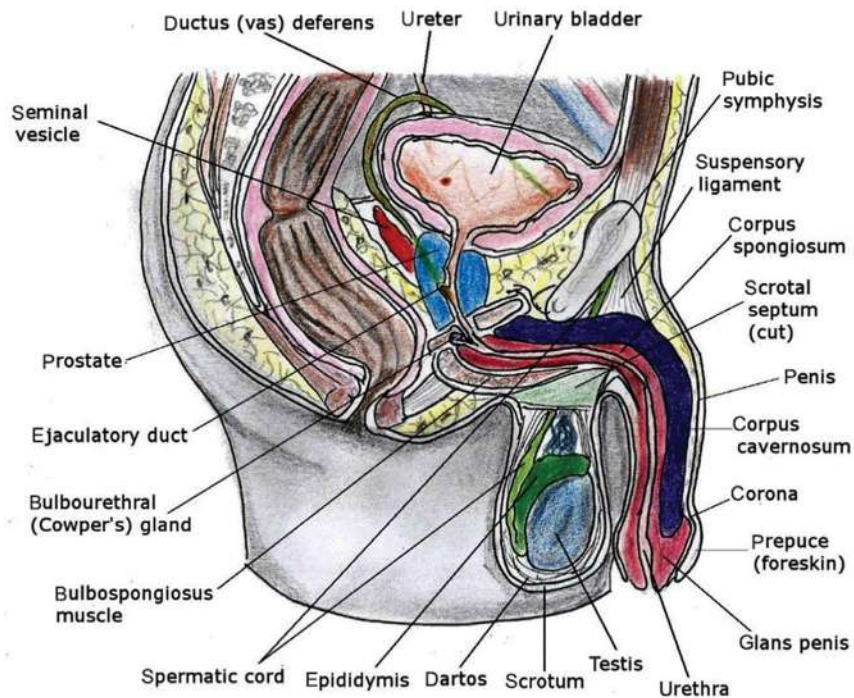


FIGURE 6.21 Midsagittal section of the male genitourinary anatomy. (Courtesy of Gabriela Baryzk.)

Superficial Venous System

The superficial veins from the penile skin drain to the **superficial dorsal vein**, which ultimately joins the superficial external pudendal vein and terminates in the long saphenous vein.

The Intermediate System

The **deep dorsal and circumflex veins, beneath the Buck's fascia**, drain the corpus spongiosum, glans, and distal two-thirds of the corpora cavernosa to the prostatic plexus.

The Deep Venous System

The deep veins (crural and cavernous) receive drainage from the proximal one-third of the penile corpora cavernosa and drain into the internal pudendal veins.

The **lymphatic drainage** of the skin of the penis, except the glans, is to the superficial inguinal lymph nodes. The glans penis drains to the deep inguinal lymph nodes. The erectile tissue and penile urethra drain to the internal iliac lymph nodes.

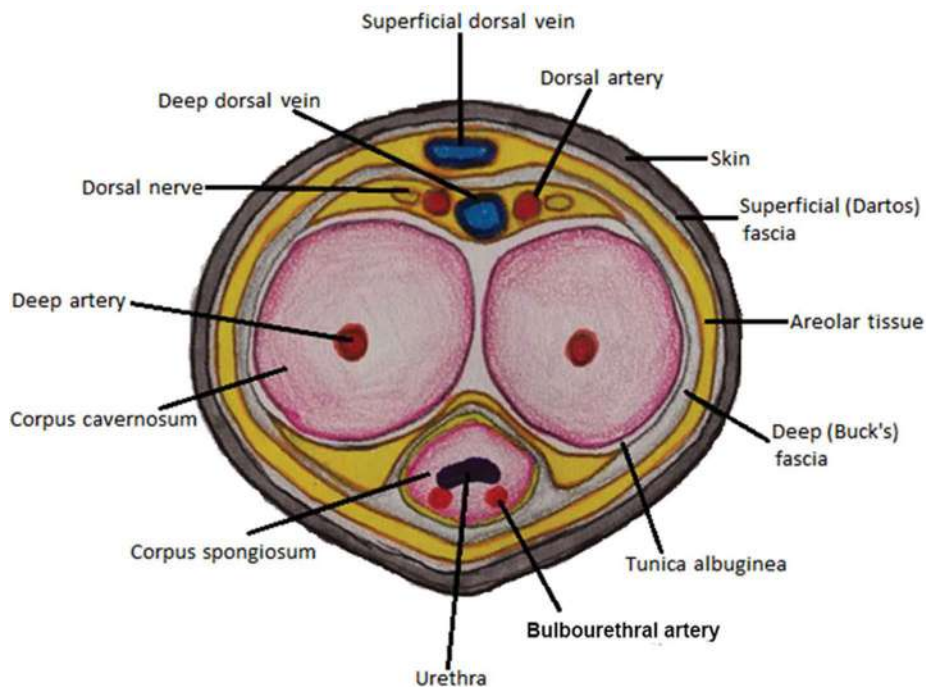


FIGURE 6.22 Axial section of the shaft of the penis showing the blood supply. (Courtesy of Neha Gadiyar.)

Nerve Supply of the Penis

The **dorsal nerve of the penis**, one arising on each side from the pudendal nerve, supplies the skin of the shaft of the penis and the glans. It travels with the dorsal artery and deep dorsal vein, in the groove between the corpora cavernosa, deep to Buck's fascia. Branches from the perineal branch of the pudendal nerve supply the ischiocavernosus and bulbospongiosus muscles.

The **sympathetic innervation** originates from the intermediolateral cell columns of T11, T12, and L1 segments of the spinal cord. Pre-ganglionic fibres synapse within the ganglia of the sympathetic chain. Post-ganglionic sympathetic fibres join the inferior hypogastric plexus (pelvic plexus) and course with the cavernous nerve. The **parasympathetic innervation** (pelvic splanchnic nerves) arises from S2, S3, and S4 (the *nervi erigentes*), which form the **cavernous nerves** that supply the three corpora.

Mechanism of Erection

Following sexual stimulation (visual, smell, tactile, and others), efferent stimuli are transmitted from the pelvic splanchnic nerves (S2–S4), reaching the spongy tissue of all three corpora, via the cavernous nerve, with nitric oxide acting as a neurotransmitter, which increases arterial blood flow (via the helicine arteries) causing vasodilation and penile engorgement. The spongy erectile tissue of the corpora cavernosa contains sinusoids separated by smooth muscle fibres.

The **ischiocavernosus muscles** surround the crura of the penis; by contracting they help to fill the corpora cavernosa with blood.

The **helicine arteries** are the terminal coiled branches of the deep (cavernous) arteries. They uncoil on parasympathetic stimulation, causing penile engorgement. The corpora cavernosa is enveloped by the tunica albuginea, an elastic tissue structure, which consists of an outer longitudinal layer surrounding them together, and an inner layer which separately surrounds each of the corpora.

The **emissary veins** from the corpora are compressed by the outer layer of the tunica albuginea, which causes the arterial blood to temporarily remain in the corpora cavernosa.

Ejaculation

The process of ejaculation is mainly under **sympathetic control** and is initiated by stimuli from the glans penis to the central nervous system (sensory fibres through the dorsal nerves of the penis). Sympathetic stimulation leads to contraction of smooth muscles in the **seminal vesicles**, **prostate**, and **epididymis** and discharge of **seminal fluid** (which is composed of **spermatozoa** and fluids from seminal vesicles, prostate, and bulbourethral glands) into the **prostatic urethra**, whilst the internal sphincter of the bladder contracts to prevent retrograde flow of semen into the bladder. The contraction of the **bulbospongiosus muscles** (supplied by the pudendal nerve) compresses the intrabulbar fossa of the urethra to aid the emission of semen (ejaculation).

CLINICAL NOTES

The **prepuce** (foreskin) is part of the penile skin covering the glans. Due to many medical, cultural, and religious reasons, males may be circumcised and have the foreskin removed. Medical reasons for this include **phimosis**, where a tight foreskin is unable to be retracted past the

glans penis, which can cause discomfort. The benefits of circumcision are debated, yet it is recommended as part of a strategy to combat HIV spread, decreasing infection risk by up to 60%.

Paraphimosis is a medical emergency where the foreskin cannot be returned to its normal anatomical position, covering the glans penis. If not remedied, ischaemia can result as the blood supply of the glans is occluded.

Priapism is a continuous, painful erection which is unrelated to sexual stimulation. This is a medical emergency that, if untreated, can lead to permanent damage to the penis and erectile dysfunction. Important risk factors include haemoglobinopathies such as sickle cell anaemia and intake of medications, for example, vasoactive drugs and an overdose of sildenafil (Viagra).

Penile carcinoma is a rare type of cancer, and the majority are squamous cell carcinomas. It can occur under the foreskin in uncircumcised patients. Human papilloma virus (HPV) infection is an important risk factor.

Chancere is the ulcerative lesion which characterises the primary stage of **syphilis** and usually occurs on the glans penis.

The Urethra

The urethra is the conduit for urine and semen, extending from the bladder to the external urethral meatus. During micturition, the smooth muscle of the internal and skeletal muscle of the external urethral sphincters are relaxed.

The **internal urethral sphincter**, located inferior to the bladder, has both parasympathetic innervation from the pelvic splanchnic nerves (S2–S4) and sympathetic innervation via the hypogastric nerve (T11–L2). The **external sphincter** has somatic innervation via the pudendal nerve (S2–S4), allowing conscious constriction of the external sphincter until it is socially convenient to pass urine.

Note that in the male, the internal sphincter (also known as the sphincter vesicae) contracts during orgasm (under sympathetic stimulation) to prevent retrograde flow of semen into the bladder.

This innervation is summarised in **Figure 6.23**.

The **male urethra** can be divided into two parts, the posterior urethra and anterior urethra, as per **Figure 6.21**.

The **posterior urethra** is composed of the following:

1. **Pre-prostatic** (intramural) is about **1 cm** long, between the bladder base and prostate gland.
2. **Prostatic**, **3 to 4 cm** long, passes through the prostate gland. The urethral lumen in this segment contains the **urethral crest**, a mucosal fold in the midline posteriorly. Here, the urinary and reproductive systems meet, and the ducts of the prostate gland empty lateral to the urethral crest into the prostatic sinuses. The **seminal colliculus** (or verumontanum) is an elevation on the floor of the prostatic urethra in the middle of the urethral crest and marks the site of the **prostatic utricle** (develops from the paramesonephric ducts). The seminal (ejaculatory) ducts open on each side of the prostatic utricle. The seminal colliculus is an important operative landmark in TURP to avoid damage to the urethral sphincter.

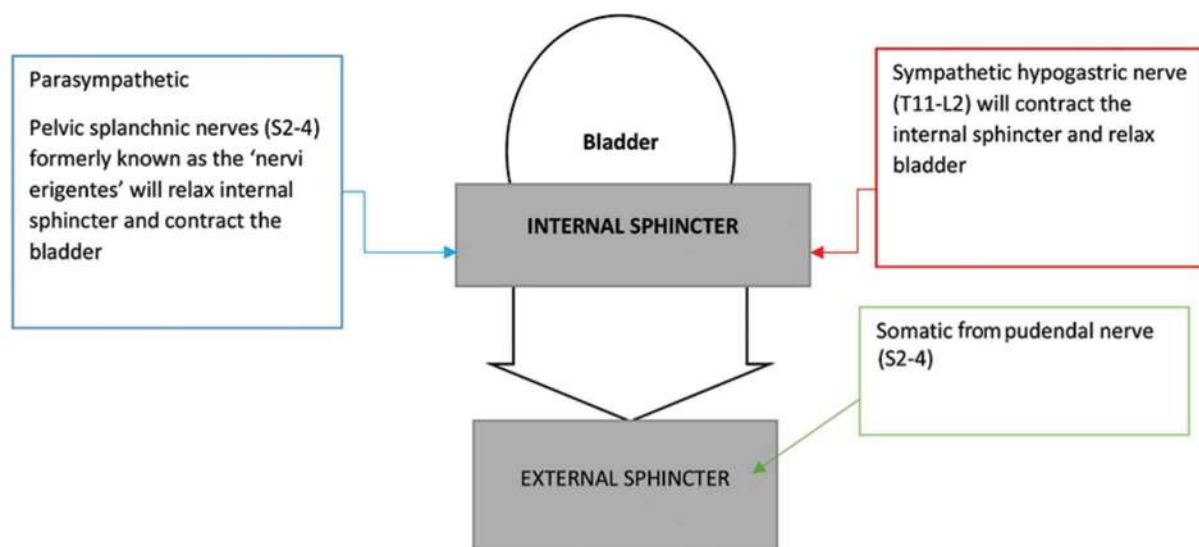


FIGURE 6.23 Mechanism of urination. (Courtesy of Faris Hussein.)

3. **Membranous**, approximately 2 to 2.5 cm long as it passes through the deep perineal pouch. The striated external urethral sphincter surrounds the membranous urethra and inserts into the perineal body; it is reinforced by the pubococcygeus muscle (part of levator ani). This section of the urethra is the least dilatable and most fixed, and so is most liable to injury via catheterisation. A displaced pelvic fracture (with disruption of the pelvic ring) may also injure the membranous urethra (see earlier).

The **anterior urethra**, about 15 cm long, is encased in the corpus spongiosum and is in two parts:

- The **bulbar urethra** lies within the superficial perineal pouch, surrounded by the bulbospongiosus muscles, and is the widest part of the urethra. The bulbourethral glands open into the bulbar urethra. The dilated portion within the bulb of the penis is known as the intrabulbar fossa.
- The **penile, or pendulous, part** has an enlargement near the distal end called the **navicular fossa**, further distal to which is the external urethral orifice, which is the narrowest part of the urethra. The **external urethral meatus**, at the distal end of the glans, is a vertical slit, having the effect of “rifling” the urethra so urine is propelled as a straight stream on exit. There are numerous mucous glands within the submucosa of the urethra, particularly in the anterior part.

Learning Point

The perineal membrane is the anatomical landmark that divides the urethra into anterior and posterior parts.

CLINICAL NOTES

UTIs can be upper, such as **pyelonephritis**, or lower, such as **cystitis, urethritis, and prostatitis**.

Inflammation of the urethra (urethritis) can be caused by gonococcal and non-gonococcal infections. Sexually

transmitted infections (STIs), such as **gonorrhoea** and **chlamydia**, are of increasing concern, due to antimicrobial resistance (AMR). Symptoms of STIs include urethral discharge and a burning sensation on urination. If untreated, urethritis may lead to urethral stricture (narrowing) formation and infertility.

Common causes of **posterior urethral rupture** include trauma (pelvic fractures) or **iatrogenic**, such as urinary catheterisation and endoscopic TURP or TURBT. **Iatrogenic injuries are the most common cause of urethral injuries worldwide.**

Extravasation of urine into the scrotum, and sometimes upwards on the anterior abdominal wall, along the attachment of Scarpa’s fascia, can follow rupture of membranous or bulbar urethra.

For those who are interested in historical considerations, the death of King William I (The Conqueror) in 1087 gives an example of understanding the effects of urethral trauma (Mundy & Andrich, 2011).

Anterior urethral rupture usually follows crushing injuries such as road traffic accidents, straddle injuries, direct kicks to the perineum (bulbar urethral injury), and self-inflicted injuries.

The least dilatable part of the urethra is the membranous part and therefore is most liable to injury during catheterisation. **Thus, the anatomy of the urethra must be taken into consideration when catheterising a male patient.**

Hypospadias is a common congenital anomaly, where the external meatus opens on the ventral aspect of the penis. In hypospadias, circumcision is contraindicated, since a flap can be constructed from the foreskin later, as part of surgical treatment, depending on the type of hypospadias. Similarly, **epispadias** is a urethral birth defect whereby the urethra opens on the dorsal side of the penis. This is rarer, with a rate of 1/30,000 compared to the more common hypospadias that occurs in 1/300 births.

The Scrotum (Figure 6.24)

The scrotum contains the **testes**, **epididymides**, and part of the **spermatic cord**. Embryologically, it develops from the labio-scrotal swellings on each side of the embryonic genital tubercle, which fuse later to form the scrotum.

The scrotum is critical for the temperature regulation necessary for spermatogenesis. It is composed of two compartments separated by a relatively avascular septum. A **midline raphe** extends from the external urethral meatus down the ventral aspect of the penis and along the scrotal skin to the anus, signifying the line of fusion of the genital tubercles during development. Urologists access either or both scrotal compartments via a longitudinal skin incision through the septum, for example, when treating bilateral hydrocele or testicular torsion.

The skin of the scrotum is pigmented and devoid of fat but has numerous hair follicles and sweat and sebaceous glands (and so is a common site for the development of sebaceous cysts).

Deep to the skin lie the **dartos fascia** and **dartos muscle**. The dartos is an involuntary smooth muscle supplied by **sympathetic fibres** of the genital branch of the **genitofemoral nerve**. This muscle controls corrugation of the scrotum, altering its surface area. Thus, in hot weather the dartos relaxes, increasing scrotal surface area for heat loss, while in cold weather, the contracted dartos will decrease scrotal surface and retain heat.

Note that the function of the dartos is entirely different from that of the **cremasteric muscle** (involved in the cremasteric reflex). Do not confuse the two! (*Vide infra*)

Continuous with **Scarpa's fascia** of the abdominal wall is the superficial fascia of the perineum (**Colles' fascia**). This fascia covers the bulb of the penis (see **Figure 6.18**) and is attached to the ischiopubic rami on either side and to the perineal membrane posteriorly. This fascia is continuous with the dartos layer of muscle and fascia.

The **external spermatic fascia** is derived from the aponeurosis of the external oblique muscle. Deep to that is the **cremasteric fascia and muscle**, derived from the internal oblique and responsible for the cremasteric reflex.

The cremasteric reflex, by touching the skin of the medial thigh area, may result in the retraction of the testes to the top of the scrotum, or even to the distal inguinal canal, as the cremaster muscle contracts. The **femoral branch** of the **genitofemoral nerve** provides sensory innervation to the skin of the medial thigh, and the **genital branch** of the same nerve is motor to the cremaster muscle and sensory to the skin of the scrotum. The cremaster reflex can lead to diagnostic confusion, particularly in young boys, who can be misdiagnosed with **cryptorchidism** (undescended testis).

Deep to the cremasteric fascia is the **internal spermatic fascia**, formed by an extension of the transversalis fascia of the anterior abdominal wall at the deep inguinal ring.

Surrounding each testis is the **tunica vaginalis**, which is a remnant of the **processus vaginalis** of the parietal peritoneum. The tunica vaginalis has parietal and visceral layers with a potential space between them (see information on hydroceles below).

During testicular descent, the peritoneum bulges through the anterior abdominal wall as the processus vaginalis. The part of the processus vaginalis continuous with the abdominal peritoneum closes after testicular descent, with the remnant (distal) part forming the tunica vaginalis into which the testis invaginates (see **Figure 6.24**). With descent into the scrotum, the testes are enveloped by the successive tissue layers of the anterior abdominal wall, forming the spermatic fascial layers. All layers of the anterior abdominal wall contribute to the enveloping layers of the testis. A useful mnemonic is given in **Table 6.5** to help you remember the order of the tissue layers of the scrotum.

What Are the Layers of the Scrotum?

(**Figure 6.24**, **Table 6.5**)

Blood supply to the scrotum is from the superficial and deep external pudendal arteries (branches of the femoral artery). Additional blood supply is from the perineal branch of the internal pudendal artery and the cremasteric artery, a branch of the inferior epigastric artery (to the cremasteric muscle and spermatic cord coverings).

Venous drainage follows the previously named arteries.

Lymphatic drainage of the scrotum is to the ipsilateral superficial inguinal lymph nodes.

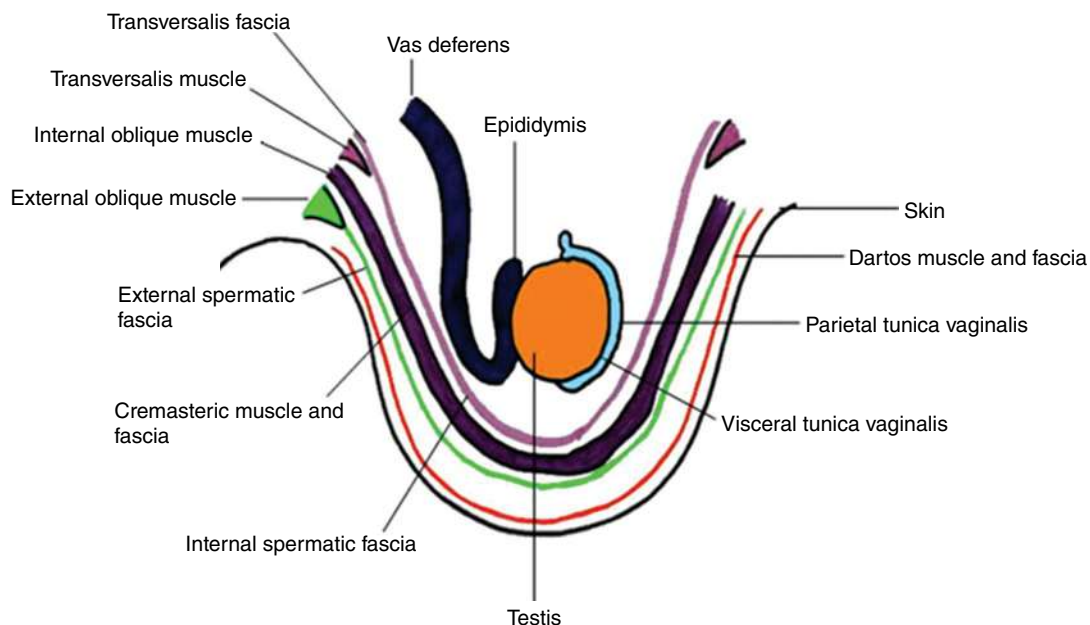


FIGURE 6.24 Midsagittal scrotum section. (Courtesy of Aditya Mavinkurve.)

TABLE 6.5: Layers of the scrotum

Layers of the Scrotum	
Skin	Some
Dartos muscle and fascia	Dangerous
External spermatic fascia, from the external oblique	Englishman
Cremasteric muscle and fascia, from the internal oblique	Called
Internal spermatic fascia, from the transversalis fascia	It
Tunica vaginalis, from the processus vaginalis of the parietal peritoneum	The
Testes	Testes

Sensory Innervation of the Scrotum

The anterior third of the scrotum is supplied by the ilioinguinal nerve (L1) via its anterior scrotal branch. The anterior scrotum also receives innervation from the genital branch of the genitofemoral nerve (L1, L2).

The posterior two-thirds are supplied by the posterior scrotal branches of the perineal branch of the pudendal nerve (S2–S4, see earlier).

The posterior femoral cutaneous nerve of the thigh (S1–S3) also contributes to supply the posterior two-thirds of the scrotum.

Testes

The testes are the male gonads and the site of spermatogenesis. As endocrine organs, the testes produce androgens, such as testosterone, from Leydig cells. During development, the testes are high up, retroperitoneally on the posterior abdominal wall. The exact mechanism of testicular descent remains largely unknown, but it has been attributed to many factors, including the influence of gonadotropin released from the placenta and testosterone produced by the fetal testes, the development of the gubernaculum, and the increase in intra-abdominal pressure.

The testes start their descent by week 12 of gestation, with the **gubernaculum**, a fibrous cord that attaches to the inferior pole of the testis, gradually shortening and pulling the testes down. At 28 weeks, the testes migrate through the inguinal canal, arriving in the scrotum by approximately 32 weeks' gestation (96% of cases) (Nemec et al., 2011). Failure of descent can occur at any stage. Thus, the testes should be within the scrotum, by birth, with the lumen of the processus vaginalis having been obliterated. Persistence of the processus vaginalis predisposes individuals to the development of indirect inguinal hernias, with or without hydrocele (Figure 6.25).

The Coverings of the Testis

- The **tunica vasculosa** is a network of blood vessels which forms the innermost layer of the testicular coverings.
- The **tunica albuginea** (*Latin*: “white coat”) is fibrous in nature, with thick, white criss-crossing fibres. It tightly encases the anterior and lateral sides of the testis and sends partitions between the seminiferous tubules. Posteriorly, the tunica albuginea is thicker and projects as a fibrous septum called the **mediastinum testis**. The mediastinum testis is considered portal to the testis, where blood vessels, lymphatics, and genital ducts enter or leave.
- The tunica vaginalis has a parietal and visceral layer.

Radiating from the **mediastinum testis** are numerous **septa**, which divide the testis into 200 to 300 lobules, each of which contains one to four highly convoluted **seminiferous tubules**, in which the spermatozoa are produced. The total number of the

tubules may reach 900. The production of spermatozoa (spermatogenesis) involves **spermatogonia** forming primary, and then secondary, **spermatocytes** which then form **spermatids** (haploid), which metamorphose into **spermatozoa**.

The seminiferous tubules are classed as straight or convoluted by their shape, and spermatogenesis occurs in the convoluted tubules. They become less convoluted distally (tubuli recti) and open into the mediastinum testis.

The **rete testis** is formed by the anastomosing tubuli recti and is found in the mediastinum testis.

The rete testis is connected to the head of the **epididymis** by approximately 12 efferent ductules.

In the early embryonic life both the paramesonephric and Wolffian ducts (mesonephric ducts) are present and develop on the mesonephros. The paramesonephric ducts regress under the effect of the testis-derived androgens. The Wolffian duct gives rise to the epididymis, vas deferens, and seminal vesicles.

The epididymis is situated on the posterolateral side of the testis and is a highly coiled tube (total length of about 6 to 7 m) which acts as a conduit for the sperm cells to the vas deferens. It has head (caput), body (corpus), and tail (cauda) segments (see Figure 6.25). The tail is continuous with the ductus (vas) deferens. The epididymis receives arterial blood from the testicular artery, and its venous drainage is the same as for the testis. The remnants of the paramesonephric duct form the “**appendix epididymis**” and because, in most cases, it has a stalk, it is liable to twist and clinically resembles testicular torsion.

The appendix testis (hydatid of Morgagni) is a vestigial remnant of the proximal portion of the paramesonephric duct and is attached to the upper pole of the testis. Again, its twisting can mimic testicular torsion (part of the differential diagnosis of acute scrotum).

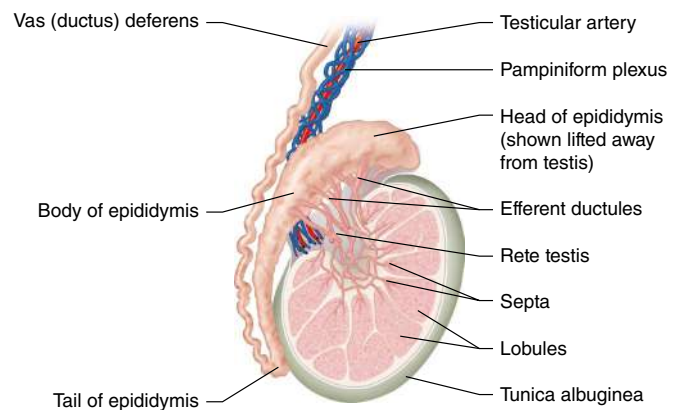


FIGURE 6.25 Midsagittal section of the testis. (Courtesy of Gabriela Barzyk.)

Testicular Blood Supply

The testes develop high up on the posterior abdominal wall and migrate downwards, bringing their blood supply with them; hence, the testicular arteries arise from the abdominal aorta at L1–L2, inferior to the origin of the renal arteries. This is the major testicular arterial supply, which is supplemented by another two arteries (the artery to the vas deferens, from the superior vesical artery, and the cremasteric artery, from the inferior epigastric artery).

The venous drainage starts as venules from the testis which form the pampiniform plexus (from *pampinus*, *Latin*: “tendrill”) around

the artery. The left testicular vein drains into the left renal vein, whilst the right testicular vein drains into the inferior vena cava.

Learning Point

Penile and scrotal skin lymphatics drain to the inguinal lymph nodes. The testicular lymphatics drain to the para-aortic lymph nodes, following the arterial supply. This is important in cases of malignancy of the testes if lymph node clearance is planned.

CLINICAL NOTES

- **Undescended testis (cryptorchidism)**, from the Greek *kryptos* for hidden and *orchis* for testis) is when one or both testes fail to descend into the scrotum, usually by the age of 6 months. The majority of undescended testes occur at the inguinal canal. The consequences of this condition include infertility and increased risk of testicular cancer, often associated with indirect inguinal hernia and psychological impact. It is the most common male genital anomaly and requires early surgery (usually within the first year) to bring the testis/testes down into the scrotum (orchidopexy) to avoid irreversible damage to spermatogenesis.
- **Varicocele** is an abnormal dilation of the pampiniform plexus. Clinical signs include a scrotum that feels like a “bag of worms” in addition to testicular discomfort or pain. The majority of varicoceles are left-sided, possibly due to the sharply angled junction of the left testicular and renal veins.
- **Hydrocele** is an accumulation of serous fluid, between the parietal and visceral layers of the tunica vaginalis, such that the testis is surrounded by fluid. The transillumination test (a light shone through the scrotum) is positive for a hydrocele and is the characteristic clinical sign. On palpation, it is possible to “get above” the swelling, in contrast to an inguino-scrotal hernia. Scrotal ultrasound examination is an important preoperative diagnostic tool to exclude the presence of testicular pathologies such as malignancy, which, rarely, could be the underlying cause of hydrocele.
- In **testicular torsion**, the testis twists around its pedicle (the spermatic cord), which can occlude the blood supply. Unless treated within the “golden” 6 hours, this can lead to testicular ischaemia and gangrene. There are two main types of torsion, but the most common is **intravaginal** (twisting of the testis within the tunica vaginalis). The “bell clapper” testis is a congenital anomaly where the tunica vaginalis attaches high on the spermatic cord, allowing testicular twisting. The **extravaginal** type is where torsion occurs outside the tunica vaginalis. The main symptom is sudden acute testicular pain. Testicular torsion is a surgical emergency, and when clinical suspicion arises, an expert urological opinion must be sought to avoid misdiagnosis and irreversible testicular infarction. General practitioners and clinicians in A&E should think twice before they put forth a diagnosis

of epididymo-orchitis in adolescent and young men (see later).

- The majority of **testicular tumours** are malignant and can metastasise to the para-aortic lymph nodes. This is the most common malignancy in United Kingdom in men between the ages of 20 and 34 (BMJ Best Practice, 2020). Types of testicular cancers include most commonly germ cell cancers, such as seminomas, accounting for 45% of testicular cancers. The rest are non-seminomas, such as teratoma and choriocarcinoma. Because testicular cancer can spread to the para-aortic lymph nodes, an abdominal and pelvis CT is performed, in addition to an ultrasound scan of the scrotum, and checking of the tumour markers (serum alpha fetoprotein and beta-human chorionic gonadotrophin). Biopsy is usually not indicated due to the fear of cancer cells seeding.
- **Orchidectomy** is the operation of surgical removal of the testis. When indicated for testicular cancer, it is performed through the inguinal canal to avoid cancer dissemination if performed through a scrotal approach.
- **Epididymo-orchitis** (inflammation of the testis and epididymis) usually presents with scrotal pain and swelling. The testis and epididymis are tender on palpation. This condition can be caused by STIs, UTIs, and the mumps virus. **Ruling out testicular torsion is vital, as both conditions present with scrotal pain and swelling.**

QUIZ QUESTION

Q. What is meant by acute scrotum? What is the differential diagnosis for a 10-year-old boy who presents with severe, acute left-sided scrotal pain and swelling?

The Inguinal Canal

This is an intermuscular slit approximately 4 cm in length in adults, extending from the **deep** to **superficial inguinal rings** in the medial lower portion of the anterior abdominal wall, parallel to the inguinal ligament (**Figures 6.26** and **6.27**):

- The **deep ring** is an opening in the transversalis fascia. It is found 1.5 cm superior to the inguinal ligament, at the midpoint between the ASIS and the pubic tubercle (i.e., the midpoint of the inguinal ligament), **lateral to the inferior epigastric vessels** (see **Figure 6.26**).
- The **superficial ring** is an inverted V-shaped opening in the **external oblique aponeurosis**. It marks the end of the inguinal canal and lies **superior and lateral to the pubic tubercle**. It has lateral and medial crura.

The inguinal canal is bounded:

- **Anteriorly**: the lower part of the **aponeurosis of the external oblique** and **internal oblique muscle**
- **Posteriorly**: the **conjoint tendon** medially and **transversalis fascia** laterally, in addition to the extension of the rolled-up part of the inguinal ligament

- *Superiorly:* roof is the arching fibres of the **conjoint tendon** with fibres from the **internal oblique** and **transversus abdominis**
- *Inferiorly:* floor is gutter-like and formed by the “rolling up” of the **inguinal ligament**

Note that the description of the inguinal canal doesn't apply to neonates and very young children, as the external ring overlies the internal ring. This is of surgical importance when operating

to repair their hernias, in the form of excision of the proximal part of the peritoneal sac (patent processus vaginalis), classically known as herniotomy.

The spermatic cord (in males) and the round ligament of the uterus (in females) pass through the inguinal canal, in addition to the ilioinguinal nerve, which penetrates the posterior wall of the canal.

The **spermatic cord** is a bundle of structures passing from and to the testis through the inguinal canal (**Table 6.6**).

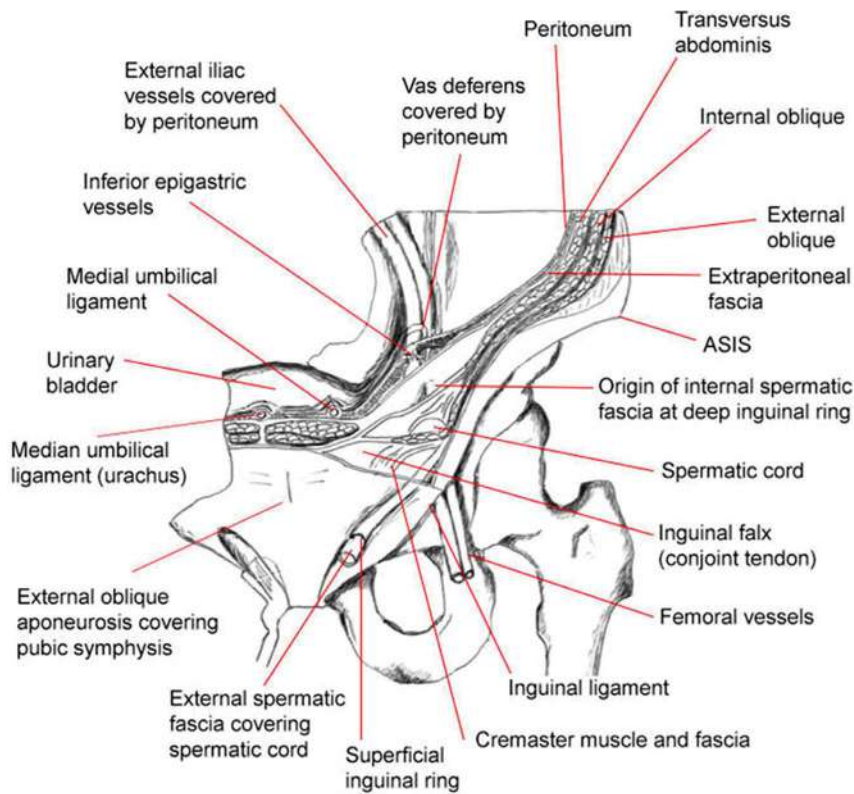


FIGURE 6.26 Left inguinal canal and related anatomy. (Courtesy of Alina Humdani.)

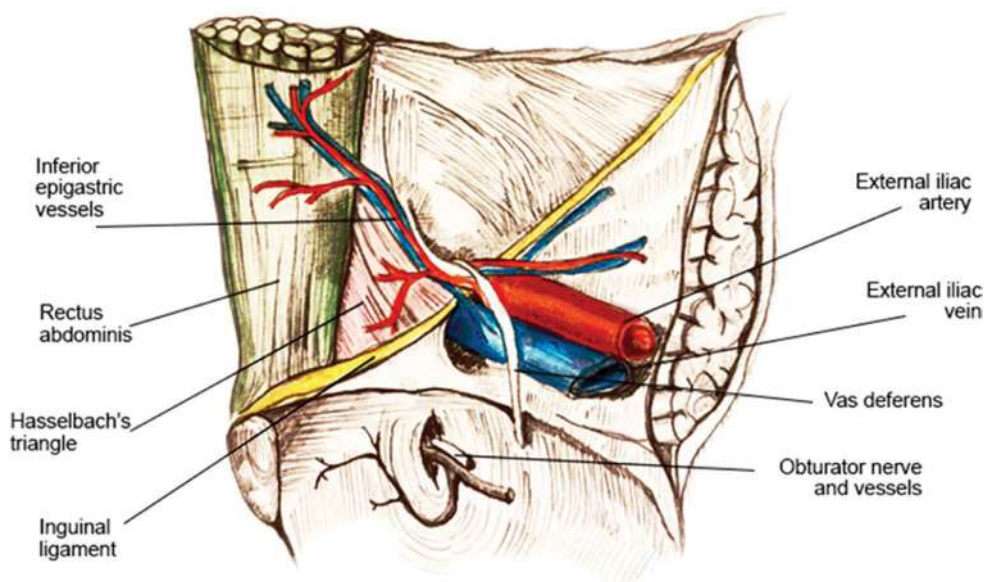


FIGURE 6.27 Posterior view of the right side of the anterior abdominal wall. (Courtesy of Calum Harrington-Vogt.)

TABLE 6.6: Contents of the spermatic cord

Three coverings (sleeves):	Three arteries:
<ul style="list-style-type: none"> • External spermatic fascia (prolongation from the external oblique aponeurosis at the superficial ring) • Cremasteric fascia and muscle (from the internal oblique muscle) • Internal spermatic fascia (prolongation from the transversalis fascia) 	<ul style="list-style-type: none"> • Testicular artery from the abdominal aorta • Cremasteric artery from the inferior epigastric artery • Artery to the vas deferens from either the superior or inferior vesical arteries
Three nerves:	Three tubes:
<ul style="list-style-type: none"> • Sympathetic testicular nerves • Genital branch of the genitofemoral nerve (L1–L2) • Ilioinguinal nerve (L1) (travels in the inguinal canal but not through the deep ring) 	<ul style="list-style-type: none"> • Vas deferens • Remnant of the processus vaginalis • Lymphatics to para-aortic lymph nodes

Learning Points

- **Inguinal ligament** = Between the ASIS and pubic tubercle
- **Midinguinal point** = Halfway between the ASIS and pubic symphysis (not to be confused with the mid-point of the inguinal ligament!)

Direct and Indirect Inguinal Hernias

An **inguinal hernia** is a protrusion of part of the contents of the abdominal cavity, commonly the bowel, within a sac of peritoneum, through the inguinal canal. It constitutes the most common type of abdominal wall hernia.

There are some clinical terms when we speak about hernias in general:

- **Sac** of the hernia is the protruding or outpouching part of the peritoneum
- **Contents** of the hernia (small or large bowel, omentum, bladder, rarely the ovary, can descend within the hernial sac)
- **Neck** of the hernia, whether it is wide or tight, which will determine the liability to incarceration and strangulation
- **Reducible or irreducible** hernia (in examinations do not attempt to reduce the hernia, and always ask the patient to reduce it while lying down)
- **Incarcerated hernia** (Figure 6.28): the contents are not easily returned to the abdominal cavity and may progress to strangulation



FIGURE 6.28 Incarcerated left inguinoscrotal hernia. (Courtesy of Ali M. Hasan.)

- **Strangulated hernia** (Figure 6.29): with cut-off blood supply and possibility of developing gangrene of the contents (commonly the small bowel) if not treated as a matter of urgency



FIGURE 6.29 Strangulated right inguinal hernia (usually of indirect type) containing non-viable small bowel loops. (Courtesy of Mohammed H. Aldabbagh.)

There are two major types of inguinal hernias:

- **Direct inguinal hernia** is the protrusion of the peritoneal hernial sac, which occurs **medial** to the inferior epigastric vessels, through Hesselbach's triangle.
- **Indirect hernia**, in contrast, is a protrusion which occurs **lateral** to the inferior epigastric vessels, via the deep inguinal ring. The peritoneal sac is usually the pre-existing processus vaginalis (see discussion on testicular descent).
- In comparison to indirect hernias, direct hernias are less liable to complications such as incarceration and strangulation, due to their wide neck.
- Indirect inguinal hernias are more likely to pass into the scrotum to form an inguinoscrotal hernia.
- An inguinal hernia usually presents as a lump in the groin and needs differentiating from a femoral hernia (*vide infra*) and other causes of groin swellings.
- The patient is examined in the standing position, with full exposure of both groins, and then asked to cough. A visible swelling suggests the presence of hernia with a palpable cough impulse.
- The **occlusion test** is one of the clinical tests used to differentiate between the two main types of inguinal hernias. The test involves asking a patient to lie on the examination couch and reducing the hernia. The next step is applying digital pressure on the deep ring and asking the patient to cough. If the hernial content is controlled (remaining within the peritoneal cavity), the patient is likely to have an indirect hernia. However, if it remains protruding, the patient is said to be suffering from the direct type.
- **Examination of the scrotum is mandatory to rule out the presence of undescended testes and other causes of scrotal swellings.**

Surgical repair of inguinal hernias can be via an open or laparoscopic approach, depending on the expertise and available

facilities. For adults with inguinal hernias, tension-free mesh repair is indicated to strengthen the weak posterior wall of the inguinal canal.

Differential diagnosis of a groin lump includes:

- Inguinal hernia (direct and indirect)
- Femoral hernia
- Inguinal lymphadenopathy
- Undescended testis
- Saphena varix (dilation of the terminal part of the long saphenous vein, before it joins the femoral vein)
- Femoral artery aneurysm (see [Section 7, Lower Limb](#))
- Psoas abscess (TB of the lumbar vertebrae with cold abscess formation along the psoas major muscle, which presents as a lump in the groin)

QUIZ QUESTION

Q. What is the differential diagnosis of scrotal swelling in the above patient ([Figure 6.28](#))?

Learning Points

- **Strangulated groin hernias are among the most common causes of bowel obstruction.**
- **Inguinal hernia is the most common type of hernia in males of all age groups.**
- **Groin hernia repair is amongst the most common general surgical procedures worldwide.**
- **Laparoscopic (keyhole) surgery is increasingly performed to treat groin hernias, especially in the elective setting.**
- **Femoral hernias occur *below and lateral* to the pubic tubercle, whilst inguinal hernias occur *above and medial* to the pubic tubercle (see [Section 7, Lower Limb](#)) and are liable to strangulation in view of the non-yielding space, especially on its medial side, where it is bounded by the sharp edge of the lacunar ligament**

Male Internal Genitalia

- Vas deferens (proximal to the deep inguinal ring)
- Seminal vesicles
- Prostate gland
- Bulbourethral glands (Cowper's glands)
- Urethra

The Vas Deferens

This is a fibromuscular duct which transports spermatozoa from the epididymis to the ejaculatory duct and is palpable in the scrotum. The vas (or ductus) deferens is 30 to 45 cm in length and **arises from the tail region of the epididymis**. It is situated on the posteromedial aspect of the testis and travels, as part of the spermatic cord, from the testis to the pelvic cavity, via the inguinal canal, entering the pelvis at the deep inguinal ring. The vas has a very narrow lumen.

The vas deferens then passes medially around the lateral side of the inferior epigastric artery, crossing the external iliac vessels, and enters the pelvic cavity. At the posterior aspect of the

bladder, the vas deferens courses inferomedially **above the ureter** (important to identify during open and endoscopic surgery), joining with **the duct of the seminal vesicle**, to form the **ejaculatory duct**.

A **vasectomy** is one of the methods used for male contraception and can be performed under local anaesthetic. On each side, the vas deferens is identified by palpating the upper part of the scrotum, and a segment of the vas is excised and sent for histopathological examination to prove the correct structure has been removed (this is a medicolegal requirement). The two ends of the vas are then cauterised or ligated.

The Seminal Vesicles

These are paired sac-like structures, situated on the inferoposterior aspect (base) of the bladder, which function by producing approximately 70% of the ejaculate volume. Embryologically, they are outgrowths of the ductus deferens. The seminal vesicles produce a neutral-to-alkaline fluid to neutralise the acidic environment of the vagina, so that the spermatozoa can survive there, **but the seminal vesicles are not a store for the sperm**. The secreted fluid is rich in fructose and prostaglandins.

On both the left and right, the duct of the seminal vesicle joins the vas deferens to form the ejaculatory duct. The two ejaculatory ducts open into the prostatic urethra on each side of the seminal colliculus. Sympathetic innervation is responsible for contraction of the seminal vesicles during ejaculation. Clinically, inflamed seminal vesicles can be palpated by DRE.

The Prostate Gland

This is an unpaired, fibromuscular, glandular organ, which is located **inferior to the bladder**, has a capsule, and is in the shape of an inverted cone, the apex of which is surrounded by the **urogenital diaphragm** (the prostate gland sits on the pelvic floor; see earlier discussion on the pubococcygeus muscle). The prostate develops from the urogenital sinus. It measures about 4 cm in width at its base, 3 cm in height, and 2 cm in depth. **The base of the prostate is related to the bladder neck.**

It develops rapidly during puberty in the male. The prostate has an anterior, posterior, and two inferolateral surfaces. **The prostate is traversed by the prostatic urethra** which emerges immediately above and anterior to its apex to continue as the membranous urethra.

The prostate is related anteriorly to the lower border of the pubic symphysis and pubic arch and connected to it by the **puboprostatic ligaments**. The space posterior to the pubic symphysis and anterior to the urinary bladder is called the retropubic space (pre-vesical space or cave of Retzius). Posteriorly, it is related to the ampulla of the rectum, and it can be felt on DRE or PR examination (see information on Denonvillier's fascia earlier).

The main function of the prostate is the generation of prostatic fluid, which is produced by the branching ducts surrounded by the stroma. It contributes approximately 20% of the ejaculate, by volume, and it also produces many of the constituents of semen.

Blood supply of the prostate gland: the arterial supply is from the inferior vesical and middle rectal arteries (branches of the internal iliac artery). The **venous return** is via the prostatic venous plexus, which drains to the internal iliac vein and also receives the deep dorsal vein of the penis. The prostatic venous plexus also communicates with the venous plexus of

the vertebral column, which is of clinical significance in the potential metastasis of cancer of the prostate (see **Section 5, Abdomen**).

Nerve supply is from the **inferior hypogastric plexus**. The sympathetic supply innervates the muscle, and the parasympathetic innervates the gland (see the discussion on mechanisms of erection and ejaculation earlier).

Lymphatic drainage follows the arterial blood supply to the internal iliac lymph nodes.

In current terminology, the prostate is divided into **zones**, each accounting for different-sized segments of the prostate: the **peripheral, transitional, and central zones**.

The **peripheral zone** is the largest zone of the prostate gland, comprising some 70% of the prostatic tissue and containing most of the glandular tissue of the prostate. **It is the most common site for the development of prostate cancer.** Approximately 75% of prostate cancers originate in the peripheral zone.

The **central zone** is a small area of prostatic tissue that surrounds the ejaculatory ducts. The central zone accounts for about 25% of the prostatic tissue, yet only 5% of prostate cancers.

The **transitional zone** is the area which surrounds the preprostatic urethra and is most commonly the site of benign prostatic hyperplasia (BPH). Despite accounting for only 5% of the prostatic tissue, approximately 20% of prostate cancers originate from the transitional zone.

Benign Prostatic Hyperplasia

While the prostate gland weighs about 8 gm in youth, it enlarges with progressive age due to excessive proliferation of the epithelial cells of the prostate's **transitional zone**.

BPH is a non-cancerous disease, but the enlarged prostate can obstruct urine flow in the urethra. This can present with symptoms of lower urinary tract symptoms (LUTS): frequent micturition, dysuria, urge incontinence, hesitancy, poor stream, post-micturition dribbling, difficulty initiating urination, and nocturia. It can also lead to acute urine retention, which is a medical emergency, and which usually requires the insertion of a bladder catheter.

Clinically, an enlarged prostate gland can be palpated PR. Prostate cancers feel hard and lumpy on palpation anteriorly via the rectum. In BPH the prostate feels enlarged but is smooth.

Prostate cancer is one of the most common cancers in men, with frequent metastasis, via the prostatic venous plexus and lymphatics of the pelvis, typically to the spine and lungs. Note that the TNM (Tumour, Nodes, and Metastases) and "cancer staging" systems are used for assessing cancer progression.

A prostate-specific antigen (PSA) test measures the protein produced by cells of the prostate. Any abnormal rise may be a sign of prostate cancer, BPH, or prostatitis. Due to the many causes of raised PSA, the test is not used for screening or diagnosis of prostate cancer – an ultrasound-guided transrectal biopsy is used instead. The reliability of the PSA test is doubtful, as there can be false-positives and false-negatives; both are a source of inaccuracy and anxiety for patients.

Inflammation of the prostate (prostatitis) can be of acute onset (acute prostatitis), most commonly due to infection by *Escherichia coli* or an STD (usually from direct spread of urethritis), or of the chronic type (usually non-bacterial).

Bulbourethral (Cowper's) Glands

These are paired pea-sized glands which develop during the 12th week of gestation and are located inferior to the prostate, posterolateral to the membranous urethra in the deep perineal space, above the perineal membrane. Each gland connects to the bulbar urethra via a duct that crosses the perineal membrane to reach the superficial perineal space. The bulbourethral glands are the male equivalent of the greater vestibular (Bartholin's) glands in the female.

Cowper's glands make up about 5% to 10% of the ejaculate volume, lubricating the spongy urethra and neutralising urine acidity. The blood supply to Cowper's glands is from the bulbourethral arteries, with equivalent venous drainage. Lymphatic drainage is to the internal and external iliac lymph nodes. Cowper's glands may become inflamed in cases of infection; symptoms include fever and severe perineal pain.

Female Reproductive Organs

The **female reproductive tract is subdivided into the upper and lower genital tracts**. The lower genital tract includes the cervix, vagina, and vulva. The upper genital tract consists of the uterus, uterine tubes, and ovaries.

Embryology

Developmentally, the genital tract arises from the **paramesonephric (Mullerian) ducts** of the mesodermal germ layer and is closely related to the development of the urinary tract. This means that an anomaly in one system can be associated with an anomaly in another. The para-mesonephric ducts fuse to form the uterine tubes, uterus, cervix, and upper third of the vagina. The lower two-thirds of the vagina develop from the urogenital sinus.

The pelvic cavity in the female:

- Projects **posteriorly** from the abdominal cavity towards the buttocks.
- Has a **pelvic inlet** that is bounded by the **pelvic brim** and is oval in shape (transverse diameter is greater than the AP diameter).
- The pelvic brim delineates the **true** (lesser) from the **false** (greater) pelvis.
- The **pelvic outlet** is diamond-shaped and bounded by the symphysis pubis, inferior pubic rami, ischial rami, ischial tuberosities, sacrotuberous ligaments, and coccyx.
- True pelvis contains pelvic organs (genital, urinary, and intestinal tracts) and is assessed clinically by per vaginam (PV)/PR examination.
- The pelvic floor in the female is traversed by the urethra, vagina, and rectum.
- The pelvic diaphragm supports the pelvic viscera and directs the fetal head anteriorly.

The Female Lower Genital Tract

The **external female genitalia (vulva)** consists of the mons pubis, labia majora, labia minora, and vestibule and incorporates the structures shown in **Figure 6.30**.

Blood supply: superficial and deep external pudendal artery (branches of the femoral artery) and the perineal artery (a branch of the internal pudendal artery). The venous drainage is to the corresponding veins (external pudendal veins), which join the long saphenous vein.

Nerve supply: the anterior one-third of the labium majus is supplied by the ilioinguinal nerve (from the lumbar plexus), whilst the posterior two-thirds are supplied by branches of the pudendal nerve (S3) and the perineal branch of the posterior cutaneous nerve of the thigh (S2). The mons pubis is innervated by the genital branch of the genitofemoral nerve (L1–L2 from the lumbar plexus).

Lymphatic drainage: lymph from the skin of the vulva drains into the superficial inguinal and then to deep inguinal lymph nodes (medial to the femoral vein). Lymphatic vessels from the clitoris drain directly into the deep inguinal lymph nodes.

Labia Minora (*Singular: labium minus*)

Fat-free, hairless skin folds that contain some erectile tissue. They pass anteriorly to form the frenulum and prepuce of the clitoris. Posteriorly, they unite to form the frenulum of the labia minora (fourchette). The skin is non-keratinised squamous epithelium, with no sweat glands or sebaceous glands.

Vestibule

This is the space between the labia minora and contains the opening of the urethra, the introitus of the vagina surrounded by the hymen, and the openings of the vestibular glands (lesser and greater).

Clitoris

This consists of erectile tissue which has a midline glans, covered by a foreskin (or prepuce), a body, and two crura extending along the ischiopubic rami and covered by the ischiocavernosus muscles. It is innervated by the dorsal branch of the perineal nerve

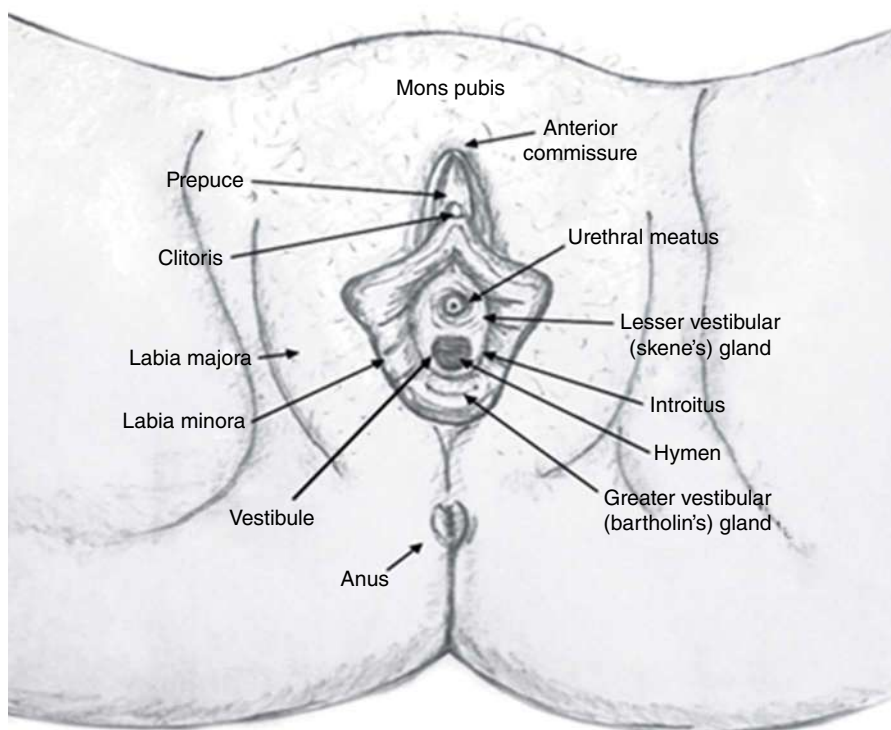


FIGURE 6.30 Diagram of the female external genitalia. (Courtesy of Naomi Bartholomew.)

Mons Pubis

The mons pubis refers to the anterior fatty eminence overlying the pubic symphysis. It is lined by keratinised, squamous epithelium with hair follicles and sebaceous and apocrine glands.

Labia Majora (*Singular: labium majus*)

Two longitudinal skin folds that extend from the mons pubis to the perineum, covered with hair on their lateral surface, and smooth and highly vascularised on the medial side. The two folds meet anteriorly at the anterior commissure. Posteriorly they do not join, and the area of skin between them is called the **posterior commissure**, which marks the posterior limit of the vulva.

(S2). The bulb of the clitoris is divided into two parts because of the intervening vagina.

Urethral Meatus

Also known as the external urethral orifice, through which urine exits the body. It is located approximately 2.5 cm behind the clitoris and in front of the vaginal orifice, in the vulval vestibule (important to remember whilst catheterising the bladder). The meatus is lined by non-keratinised, squamous epithelium, with a stroma that is highly vascularised, like the corpora cavernosa of the penis.

Bartholin's (Greater Vestibular) Glands

These are paired, pea-sized, mucus-secreting glands lying posterior to the bulb of the vestibule and posterolateral to the opening

of the vagina, superficial to the hymen. They produce secretions during arousal. It is possible for the Bartholin's glands to become blocked (resulting in a Bartholin's cyst, which can form an abscess). Bartholin's gland carcinoma is rare and only occurs in 1% of vulval cancers.

Skene's (Lesser Vestibular) Glands

Also known as the paraurethral glands. These are located on the anterior wall of the vagina, around the lower end of the urethra. They drain into the urethra, near the urethral opening, and may be near or a part of the so-called G-spot. They are surrounded with tissue (including part of the clitoris) that extends inside the vagina and swells with blood during sexual arousal. They are the female equivalent of the prostate gland.

Hymen

This is a membranous fold of skin that lines the vaginal opening. It has no known biological function; however, during a female's first experience of sexual intercourse, the hymen is torn, and only fragments of the hymen remain along the margins of the vaginal opening. The hymen may be imperforate, which leads to accumulation of the products of menstruation in the vagina and the uterus (haematocolpos). In some communities there is too much emphasis on the integrity of the hymen as a proof of virginity, which sadly has caused unfortunate loss of female lives in the name of "honour killing".

Physiological changes that occur during sexual arousal:

- Vaginal lubrication by increased secretions from the Bartholin's and Skene's glands, in addition to transudation from the engorged blood vessels related to the inner vaginal layer
- Enlargement of the external genitalia, involving the swelling of the clitoris and the labia
- Increased darkening or redness of the skin in these areas
- Increased heart rate and blood pressure, with flushing across the chest and upper body
- Increased blood flow to the nipples, vulva, clitoris, and vaginal walls

The **neurological control** of this is from:

- Afferent stimuli from the labia minora and clitoris via the ilioinguinal nerves (L1) and the dorsal nerves of the clitoris (from the pudendal nerve).
- Central pre-ganglionic stimuli descend the spinal cord to the sympathetic outflow (T1–L1) and then reach the sympathetic ganglia, where they synapse and give rise to post-ganglionic fibres which stimulate the smooth muscle of the vagina leading to their contraction.
- The external muscles (bulbospongiosus and ischiocavernosus) contract in response to stimulation from efferent fibres in the pudendal nerve.

Female genital mutilation, as defined by the World Health Organization (WHO), comprises all procedures that involve partial or total removal of the external female genitalia or other injury to the female genital organs for non-medical reasons. Unfortunately, it is still practised in many countries, mainly in Africa, the Middle East, and Asia, and is a violation of human rights of girls and women.

Vagina

This is a fibromuscular tube, which is expandable to allow passage of the fetus and for the passage of the menstrual flow. It is lined by

stratified, non-keratinised squamous epithelium that extends to the uterine cervix. The upper half passes inferiorly, through the pelvic floor, and the lower half is within the perineum and opens into the vestibule, enclosed by the labia minora. The lower end is surrounded by the remnants of the hymen (vaginal orifice) forming the introitus. Note that the posterior wall is longer than the anterior (about 9 to 7.5 cm for the anterior wall). The rectouterine pouch separates the upper vagina from the rectum. Below the pouch, the vagina is related to the ampulla of the rectum, separated by the Denonvillier's fascia, in its middle part. The perineal body separates the anal canal from the lower vagina.

Anteriorly the vagina is related to the base of the bladder and urethra.

Blood Supply

The vaginal artery can arise from different origins, but commonly arises from the internal iliac artery and anastomoses with the vaginal branches of the uterine artery, forming the azygos arteries of the vagina.

Vaginal veins drain into the internal iliac veins.

Lymphatic Drainage

External and internal iliac lymph nodes (upper portion) and superficial inguinal lymph nodes (lower portion).

Nerve supply

- *Autonomic*: inferior fibres of uterovaginal plexus, derived from inferior hypogastric plexus
- *Somatic*: deep branch of the perineal nerve, a branch of the pudendal nerve

The vagina contains no glands, and so is lubricated by cervical mucus and secretions of the Bartholin's and Skene's glands. The plane of the vaginal canal is 60 degrees to the horizontal in the standing position (the same as the angle of the pelvic inlet).

The upper vagina is supported by the action of the pelvic diaphragm and the fibromuscular connective tissue (endopelvic fascia).

CLINICAL NOTES

During **pelvic organ prolapse** there is weakness of the supporting ligaments, fascia, and pelvic floor muscles. It can lead to descent of the anterior vaginal wall (cystocele), posterior vaginal wall (rectocele), or descent of the upper portion of the vagina into the vaginal canal after a hysterectomy (vault prolapse).

A **caudal block** will not completely anaesthetise the vulva because of the dual nerve supply. The anterior portion is supplied by the ilioinguinal (L1) and genital branch of the genitofemoral nerve (L1–L2) from the lumbar plexus, with the posterior part being supplied by the pudendal nerve (S2–S4) and the posterior femoral cutaneous nerve of the thigh, from the sacral plexus. The upper part of the vagina and the intravaginal portion of the cervix can be examined visually by inserting a vaginal speculum.

QUIZ QUESTION

Q. *What structures can be palpated on a PV exam?*

Upper Genital Tract

Three tracts pass through the female pelvis, namely the urinary, reproductive, and gastrointestinal (GI) tracts. The genital tract forms a “**genital septum**” between the GI and urinary tracts, created during development by the fusion of the two **paramesonephric (Mullerian) ducts**.

Posterior to the genital septum is the **rectouterine pouch** (of Douglas), between the anterior rectum and the posterior wall of the uterus, whilst anterior to the genital septum is the **vesicouterine pouch**, which is between the anterior surface of the uterus and the bladder.

CLINICAL NOTES

The peritoneal cavity is not completely closed in females, as it is open at the ostia of the uterine tubes. This means that organisms can spread to the peritoneal cavity, causing pelvic inflammatory disease (PID).

The close association between the rectouterine pouch (which is the lowest point of the peritoneal cavity in females in the standing position) and the posterior wall of the vagina allows for **culdocentesis**, a procedure where peritoneal fluids (e.g., blood or pus) can be aspirated from the pouch of Douglas in female patients. It involves the introduction of a needle through the posterior fornix of the vagina.

During pregnancy, the cervix has the consistency of the lips, whereas normally, it has the consistency of the nose.

The uterus has the following parts:

- **Fundus**: the part above the orifices of the uterine/fallopian tubes.
- **Corpus uteri (body)**: the part below the entrance of the uterine tubes. At its superior lateral border, the body of the uterus narrows into an angle or **cornu** (Latin, “horn”) on either side. The narrow portion, situated between the corpus and cervix, is known as the **isthmus** and lies at the level of the uterine artery and the **internal os** of the cervix.
- **Cervix uteri**: the narrow neck-like passage, which is generally 2 to 3 cm long and protrudes into the upper end of the vagina, creating a sulcus around the cervix and the **vaginal fornices** (*Singular*: fornix), anterior, posterior, and two laterals. The endocervical canal extends from the external os to the internal os and is lined with mucus-secreting columnar epithelium.

The cervix can be divided into **supravaginal** and **intravaginal** portions. The intravaginal portion is surrounded by the vaginal fornices and covered with non-keratinising squamous epithelium.

During pregnancy, the cervix serves to retain and protect the developing conceptus. At the early stage of pregnancy, the cervix shortens as a result of an increase in the volume of the lower amniotic cavity. At later stages, the cervix undergoes remodeling, where it softens and dilates.

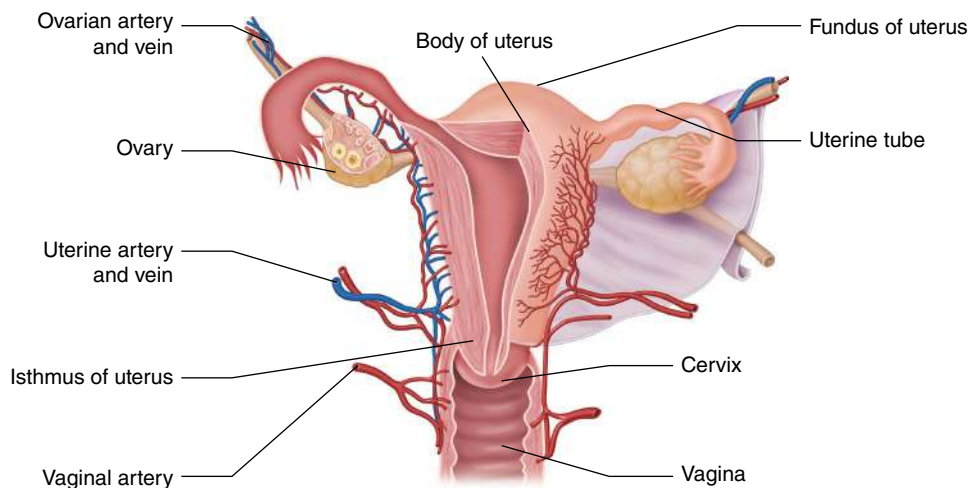


FIGURE 6.31 Diagram of the vagina, uterus, uterine tubes, uterine arteries, and ovaries. (Courtesy of Julian Bartholomew.)

Uterus

This is a hollow, pear-shaped, intraperitoneal, muscular organ, approximately 7 to 8 cm long that incubates the developing fetus for 38 weeks once an oocyte has been fertilised. The uterine wall has three components: **endometrium** (mucosal), **myometrium** (smooth muscle), and **parametrium** (mesothelial layer) (**Figure 6.31**).

The uterus allows implantation of the fertilised zygote, once it has reached the blastocyst stage, to provide an environment for the development of the fetus.

Relations:

- Base of bladder lies anterior to the cervix.
- Posterior fornix is deepest and is anterior to the rectouterine pouch.
- Nerve supply is via the pelvic splanchnic nerves (S2–S4).

Normally, the uterus and the cervix are described as **anteverted** (cervix is tilted anteriorly towards the bladder) and **anteflexed** (fundus of the uterus is directed forward). **Retroversion** means the cervix tilts posteriorly towards the spine. **Retroflexed** is when

the uterine fundus is directed posteriorly, towards the rectum. Anteriorly, the bladder lies over the isthmus and the cervix.

Important relations of the uterus:

- *Anterior:* uterovesical pouch
- *Posterior:* rectouterine pouch (of Douglas)
- *Lateral:* broad ligaments
- Supravaginal cervix sits directly on top of the bladder

The ureter is an important structure related to the lateral fornx and may be palpable on clinical examination. One of the traditional questions in surgical fellowship exams was “where can you feel a stone in the lower ureter?”

At 10 to 12 weeks, the pregnant uterus becomes palpable, per abdomen, and at 20 weeks the uterus reaches the level of the umbilicus.

Blood supply

- The uterine artery is a branch of the anterior division of the internal iliac artery.
- The uterine artery is positioned superolateral to the lateral fornx and gives rise to dorsal and ventral branches.
- The ureter passes under the uterine artery.
- The uterine artery divides into ascending branches (along the lateral wall of the uterus and inferior to the uterine tube), which anastomose with the ovarian artery, from the abdominal aorta, and descending branches (along the cervix and lateral wall of the vagina) to anastomose with the vaginal arteries on the anterior and posterior surfaces of the vagina (see [Figure 6.31](#)).

Venous drainage: venous plexus in the broad ligament finally drains into the internal iliac veins (communicates with veins of the vagina and bladder).

Lymphatic drainage: the uterus and upper two-thirds of the vagina drain through lymph vessels that accompany the blood vessels to the internal and external iliac, obturator, and aortic lymph nodes. The lower third of the vagina and the vulva drain to inguinal lymph nodes. Some lymphatics accompany the round ligament and drain to the superficial inguinal lymph nodes.

Nerve supply

- *Sympathetic:* uterovaginal plexus mainly from the anterior and middle fibres of the inferior hypogastric plexus (sympathetic outflow from T12 to L1)

- *Parasympathetic:* pelvic splanchnic nerve (S2–S4)
- *Sensory afferents:* inferior hypogastric plexus via T10–12 and L1 nerve fibres (sympathetic)

Ligaments of the Uterus

The uterus is held on its superior aspect by the broad ligament and the round ligaments. The **broad ligament is a double sheet of peritoneum** connected to the uterus and ovaries. It can be divided into three sections:

- *Mesometrium:* surrounds the uterus and is the largest subsection of the broad ligament running laterally to cover the external iliac vessels; it also encloses the proximal part of the round ligament of the uterus.
- *Mesovarium:* associated with the ovaries, it projects from the posterior surface of the broad ligament and attaches to the hilum of the ovary, enclosing its neurovascular supply. It does not cover the surface of the ovary itself.
- *Mesosalpinx:* originates superior to the mesovarium and surrounds the uterine tubes and contains the anastomosis between the uterine and the ovarian arteries.

The **round ligaments** extend from the anterosuperior surface of the uterus, below the uterine tubes, through the deep inguinal rings and through the inguinal canals and continue to the labia majora. They are continuations of the **ligaments of the ovary**, and together, they represent the female equivalent of the gubernaculum in the male.

On its middle aspect, the uterus is supported by the cardinal, pubocervical, and uterosacral ligaments. These are condensations of endopelvic fascia.

Cardinal ligaments (Mackenrodt’s or transverse cervical ligaments) form the base of the broad ligament and attach the cervix to the pelvic side wall, into the fascia of the obturator internus. The cardinal ligaments are, collectively, named the parametrium.

Pubocervical ligaments pass from the posterior aspect of the pubic bones, diverging around the urethra to the lower cervix and upper vagina.

Uterosacral ligaments run from the posterior aspect of the cervix at the level of the internal os to the anterior sacrum (S2–S4 vertebrae) ([Figure 6.32](#)).

The ligaments that support the uterus are, predominantly, the cardinal and uterosacral ligaments, with some assistance from the round ligament. However, the uterus is primarily aided by the pelvic diaphragm, perineal body, and urogenital diaphragm.

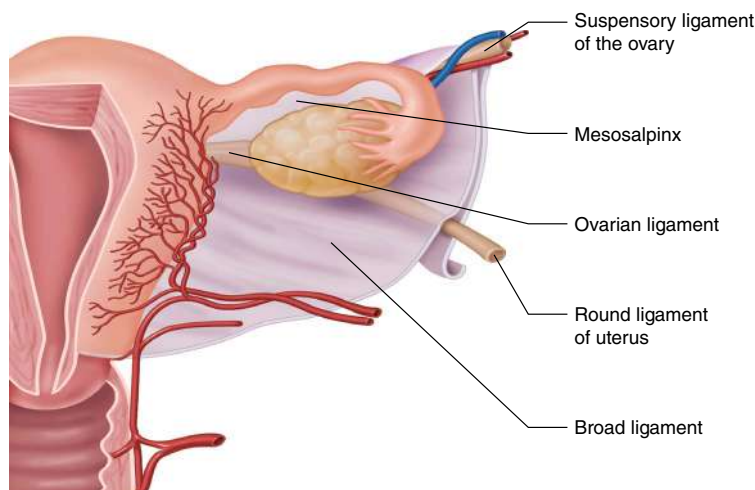


FIGURE 6.32 Diagram of the ligaments of the uterus and ovaries. (Courtesy of Julian Bartholomew.)

CLINICAL NOTES

One or both ureters may be injured or inadvertently ligated during hysterectomy, especially during an emergency procedure. Also, the ureter/ureters can become obstructed in malignant tumours of the cervix, leading to hydronephrosis and hydronephrosis.

Uterine abnormalities result from the abnormal fusion of the paramesonephric duct(s) during embryogenesis. Problems may include repeated miscarriage, preterm delivery, abnormal lie of the fetus, infertility, or menstrual problems, depending on the severity of the malformation (Figure 6.33).

Examples:

- *Uterus arcuatus*: the internal surface of the single endometrial cavity shows a shallow groove.
- *Septate uterus*: there are two uterine cavities divided by a longitudinal septum, but they look normal on the outside; the most common uterine anomaly.
- *Bicornuate uterus*: the uterus is divided into two horns.
- *Uterus unicornuate*: one rudimentary horn and only half of the uterus develop from a single Mullerian duct.
- *Uterus didelphys*: this is a type of anomaly in which the two halves of the uterus develop completely separately, with a double vagina, due to complete failure of fusion of the paramesonephric ducts.
- *Atresia* of cervix/vagina (atresia is failure of canalisation) showing as a transverse vaginal septum.
- *Agenesis of the uterus*: the uterus fails to develop.

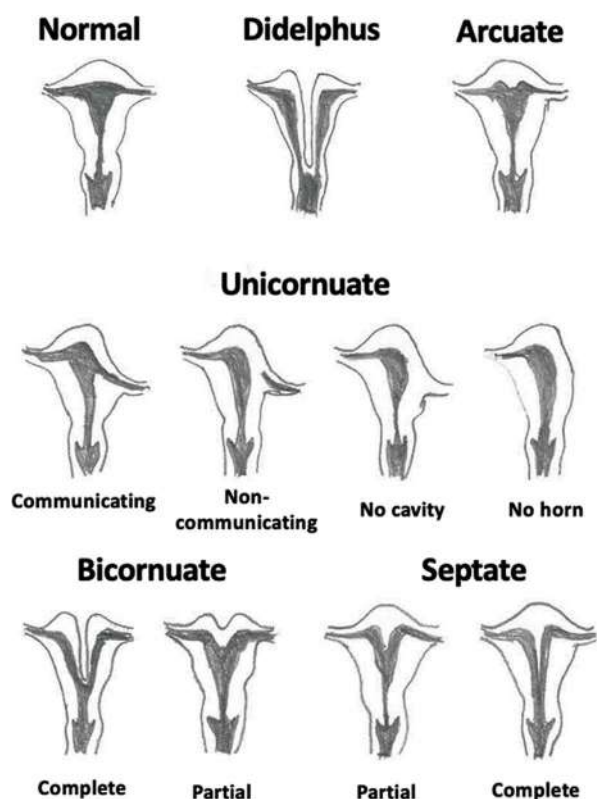


FIGURE 6.33 Diagram showing congenital abnormalities of the female genital tract. (Courtesy of Hatidzhe Masteva.)

CLINICAL NOTES

The term adnexa refers to the structures adjacent to the uterus, i.e., ovaries and fallopian tubes.

Lymphatic drainage is surgically relevant in the treatment of malignant tumours of the uterus.

Hysterectomy is the surgical removal of the uterus, coming from the Greek, *hystera*, for “womb” and *ektome*, “to cut out”.

Menstrual disorders, such as menorrhagia (excessive bleeding), dysmenorrhoea (painful bleeding), and oligomenorrhoea (infrequent bleeding), are common.

Uterine prolapse occurs when the ligaments stretch or become weak so that the uterus descends into the vagina:

- *Grade 1*: uterus may descend slightly and remain above the introitus (vaginal opening)
- *Grade 2*: descent such that the cervix/lower portion of the uterus reaches the introitus
- *Grade 3*: cervix or even the entire uterus descends beyond the introitus

Uterine fibroids are benign tumours of the myometrium and are the most common tumours of the female reproductive tract (found in approximately one-third of women).

Endometriosis is when endometrial tissue is found outside the uterine cavity. Symptoms include painful periods (dysmenorrhea), pain during intercourse (dyspareunia), and excessive bleeding. Endometriosis in the myometrium is known as adenomyosis (endometriosis interna).

QUIZ QUESTION

Q. Can uterine cancer spread to the superficial inguinal lymph nodes?

Uterine Tubes (Fallopian Tubes/Oviducts)

These are muscular tubes developed from the paramesonephric duct or Mullerian duct that lie on the upper border of the broad ligament and extend laterally from the uterus (Figure 6.34).

At about 10 cm long, they are divided into four sections, medial to lateral:

- *Intramural part (shortest part)*: within the myometrium.
- *Isthmus (narrowest part)*: about 2 to 3 cm in length.
- *Ampulla*: about 5 cm in length, where fertilisation takes place. The widest part of the tube and the most common site for ectopic gestation and gonococcal salpingitis.
- *Infundibulum*: the funnel-shaped or trumpet-like part, with fimbriae (finger-like projections to direct the released ovum towards the infundibulum).

Blood supply: from both uterine and ovarian arteries with free anastomosis between the two:

Venous drainage: uterine and ovarian veins

Lymphatic drainage: iliac, sacral, and para-aortic lymph nodes

Ova from the ovaries are transported to the uterus through the uterine tubes during the latter half of the menstrual cycle. This happens through the contraction of smooth muscle and the wafting action of the ciliated cells on the inner layer, the mucosa. The

smooth muscle layer is sensitive to sex steroids, so peristalsis is greatest in the presence of a high amount of oestrogen.

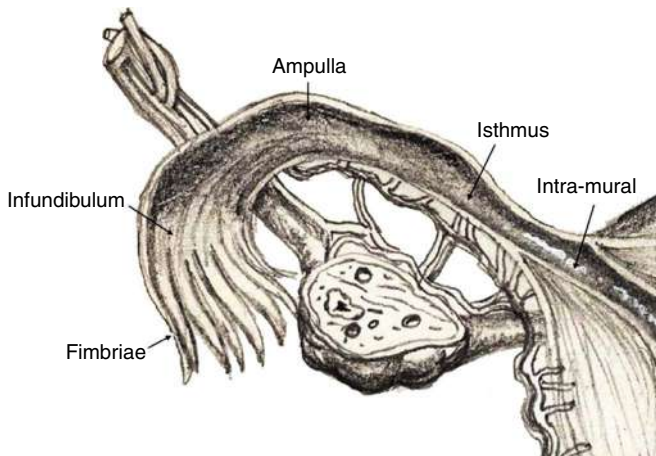


FIGURE 6.34 Parts of the uterine tube. (Courtesy of Julian Bartholomew.)

CLINICAL NOTES

The patency of the tubes/uterine cavity can be checked by a procedure called **hysterosalpingography (HSG)** by taking images after injecting a radio-opaque dye through the external cervical os.

Ectopic gestation occurs when the embryo implants outside the uterine cavity, usually in the ampulla. This is a medical emergency, as the uterine tube can rupture causing internal bleeding and hypovolaemic shock.

Pelvic Inflammatory Disease (PID) is infection of the uterus, uterine tubes, and sometimes the ovaries and pelvic peritoneum. This is mostly due to STIs (mainly *Neisseria gonococcus* and *Chlamydia trachomatis*) and mostly affects young women. Clinically manifested as bilateral lower abdominal pain, dyspareunia (painful coitus), and vaginal discharge. Its sequelae include tubal damage, higher risk of ectopic pregnancy, and chronic pelvic pain.

Salpingitis is inflammation of the uterine tubes (usually due to bacterial infection) and is a common cause of infertility in females due to the damage it causes to the tubes.

Hydrosalpinx/pyosalpinx/haematosalpinx refers to a uterine tube, which is dilated with fluid, pus, or blood, respectively, due to distal blockage.

“Chandelier sign” or **“cervical excitation”** is extreme tenderness on pelvic examination of the cervix, uterus, and ovaries such that women will “reach for the chandelier” to seek relief from the discomfort.

Tubal ligation is one of the methods of contraception which can be performed as an open procedure or laparoscopically (keyhole surgery).

Recent evidence suggests that many tumours thought to be ovarian in origin were in fact tubal in origin.

Ovaries

The ovaries are paired, oval organs attached to the posterior surface of the broad ligament by the mesovarium and measuring about $4 \times 2 \times 1$ cm, though they atrophy with age. Histologically,

the ovary is divided into the outer **cortex** and the inner **medulla**. The cortex contains **ovarian follicles**. The cortex has about 1 million oocytes at birth, but releases around 500 ova during life. The medulla consists of connective tissue with the neurovascular supply of the ovary. The cortex is lined by the germinal epithelium, which consists of cuboidal cells. The ovaries are not covered by peritoneum, but by the **germinal epithelium**.

The **ovarian fossa** is the depression on the lateral pelvic wall in which the ovary sits, below the external iliac vessels.

The ovaries develop from the **genital ridge** (mesodermal in origin) and descend from high up on the posterior abdominal wall to the level of the pelvic brim. Their function is to produce female **gametes (ova)** for fertilisation and to produce oestrogen and progesterone (sex steroids). The ovaries are closely related to the lateral pelvic wall, and the obturator nerve (L2–L4, a branch of the lumbar plexus) descends from the pelvic brim towards the obturator foramen to supply the adductor compartment of the thigh and both the knee and hip joints. Consequently, ovarian pathology, and even ovulation, can cause referred pain in the medial aspect of thigh and these joints.

Ovarian ligaments:

- **Suspensory ligament (infundibulo-pelvic ligament):** a double fold of peritoneum which contains the neurovascular supply (ovarian artery, vein, lymphatics, and sympathetic nerves) and extends from the lateral pelvic wall to the ovary; it must be divided during removal of the ovary (**oophorectomy**).
- **Ovarian ligament:** attaches the medial pole of the ovary to the fundus of the uterus, inferior to the origin of the uterine tube (posteriorly) and continues as the round ligament of the uterus (anteriorly).
- **Mesovarium:** see above.

Note that the ovaries are not directly attached to the uterine tubes.

Blood supply: ovarian arteries arise from the abdominal aorta, inferior to the renal artery, at the level of L2, to cross the pelvic brim and pass into the suspensory ligament and then enter the ovarian hilum; they also give rise to branches to the uterine tube, ureter, and round ligament of the uterus.

Venous drainage: at the ovarian hilum a pampiniform plexus forms the ovarian vein on each side. The left drains into the left renal vein; the right drains directly into the inferior vena cava (compare with the venous drainage of the testes).

Lymphatic drainage: to para-aortic nodes (compare with the lymphatic drainage of the testes).

Nerve supply: sympathetic fibres from T10 via the aortic plexus.

CLINICAL NOTES

There may be remnants of the **mesonephric (Wolffian) ducts**, which may appear as epo-ophorons and paro-ophorons, which are vestigial structures within the broad ligament. Although rare, these may develop into cysts and need surgical excision. Persistence of the lower cord of the mesonephric duct may present as a cyst in the lateral wall of the vagina (Gartner’s duct cyst).

Ovarian cancer: most (80%) are epithelial in origin (the most common is serous carcinoma), whilst the remainder are stromal (10%) and germ cell (10%). Epithelial tumours originate in the cells covering the ovaries and can present as abdominal swelling.

According to the statistics from Cancer Research UK, there are around 7500 new ovarian cancer cases in the UK every year (2016–2018 statistics). Note that ovarian cancers have a poor prognosis due to late diagnosis. CT scan of the pelvis and abdomen is considered the best imaging modality to assess the spread of ovarian cancer.

Ovarian cysts: fluid-filled masses derived from graafian follicles in the ovary, which occur commonly. Most are benign (such as follicular and luteal cysts), but they might be malignant, especially with advancing age. Larger cysts may cause bleeding within the cyst and pain (Figure 6.35). Cyst complications include rupture, haemorrhage, and torsion and come under the differential diagnosis of acute abdomen.

Polycystic ovaries: the most common endocrine disorder affecting women of reproductive age. It is caused by increased androgen production by the ovaries. Symptoms include hormone dysfunction and infertility.



FIGURE 6.35 Large ovarian cyst draining 4 litres from it. (Courtesy of Paul Carter.)

Revision Questions

The Pelvic Girdle

- Q1. What structure delineates the true (lesser) pelvis from the false (greater) pelvis?
- Iliac crest
 - Ischial spines
 - Ischial tuberosity
 - Pelvic brim
 - sacral promontory
- Q2. Which of the following muscles DOES NOT attach to the external lip of the iliac crest?
- External oblique
 - Internal oblique
 - Latissimus dorsi
 - Tensor fasciae latae
 - Transverse abdominis
- Q3. Which artery is a branch of the posterior division of the internal iliac artery?
- Inferior gluteal artery
 - Middle rectal artery
 - Obturator artery
 - Superior gluteal artery
 - Umbilical artery
- Q4. What is the widest dimension of the pelvic *inlet* in a female?
- Anterior-posterior diameter
 - Conjugate diameter
 - Interspinous diameter
 - Transverse diameter
- Q5. Which pelvis type is most suitable for childbirth?
- Android
 - Anthropoid
 - Gynaecoid
 - Platypelloid
- Q6. Why is it very rare to develop diverticula in the rectum?
- The taenia coli in the rectum protect against them
 - The rectum has a complete longitudinal muscle layer
 - The rectum has a complete circular muscle layer
 - The rectum is too short to develop them
- Q7. What is the embryological origin of the epithelial lining of the upper anal canal (above the dentate line)?
- Ectodermal
 - Endodermal
 - Endodermal and mesodermal
 - Mesodermal
 - Mesodermal and ectodermal

Answers

- A1. d
 A2. e
 A3. d
 A4. d
 A5. c
 A6. b
 A7. b

Male Genital Organs

- Q1. Developmentally, which structure gives rise to the vas deferens?
- Gubernaculum
 - Mesonephric duct
 - Paramesonephric duct
 - Processus vaginalis
 - Urachus
- Q2. What is the male equivalent of the labia majora?
- Bulbourethral gland
 - Corpus cavernosum
 - Corpus spongiosum
 - Glans penis
 - Scrotum
- Q3. Which structure is closely related to the ischial spine?
- Ilioinguinal nerve
 - Obturator externus muscle
 - Obturator nerve
 - Pudendal nerve
 - Sacrospinous ligament
- Q4. The posterior two-thirds of the scrotum are mainly supplied by which nerve?
- Genitofemoral nerve
 - Ilioinguinal nerve
 - Obturator nerve
 - Posterior femoral cutaneous nerve
 - Pudendal nerve
- Q5. Which structure is the bulb of the penis the proximal part of?
- Corpus cavernosum
 - Corpus spongiosum
 - Glans penis
 - Prepuce
 - Root of the penis
- Q6. From which anterior abdominal layer does the cremasteric muscle arise?
- External oblique
 - Internal oblique
 - Peritoneum
 - Subcutaneous fascia
 - Transversalis fascia
- Q7. In which part of the prostate does benign prostate hyperplasia arise?
- Capsule
 - Central zone
 - Peripheral zone
 - Prostatic urethra
 - Transitional zone
- Q8. What is the parasympathetic innervation to the internal urethral sphincter, and what does it do?
- Nervi erigentes* (S2–S4) will constrict the internal urethral sphincter
 - Nervi erigentes* (S2–S4) will relax the internal urethral sphincter
 - Pudendal nerve (S2–S4) will constrict the internal urethral sphincter
 - Pudendal nerve (S2–S4) will relax the internal urethral sphincter
 - Sacral splanchnic nerves relax the internal urethral sphincter

- Q9. In left testicular torsion, the testicular artery is occluded. What is the origin of the left testicular artery?
- Aorta (directly)
 - External iliac artery
 - Internal iliac artery
 - Internal pudendal artery
 - Left renal artery
- Q10. Which layer of the anterior abdominal wall does not contribute to the layers of the scrotum?
- External oblique
 - Internal oblique
 - Parietal peritoneum
 - Transversalis fascia
 - Transversalis muscle

Answers

- A1. b
 A2. e
 A3. d
 A4. e
 A5. b
 A6. b
 A7. e
 A8. b
 A9. a
 A10. e

The Female Genital Tract

Q1.



(Courtesy of Department of Anatomical Sciences, SGUL.)

- Q1. What is the structure indicated by the red arrow?
- Cervix
 - Fornix
 - Ovary
 - Uterus
 - Vagina
- Q2. What structure is closely related to the lateral fornix and can be injured during a hysterectomy?
- Bladder
 - Iliac artery
 - Rectum
 - Ureter
 - Urethra

Q3.



(Courtesy of Department of Anatomical Sciences, SGUL.)

Q3. What type of image is this?

- CT scan
- MRI scan
- PET scan
- Ultrasound
- X-ray

Q4. The image in question 3 shows an ovary. What is the pathology shown?

- Ectopic gestation
- Endometriosis
- Fibroid
- Ovarian carcinoma
- Polycystic ovary

Answers

- d
- d
- d
- e

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7

ANATOMY OF THE LOWER LIMB

Reviewed by Philip J. Addis and Joanna Tomlinson

Learning Objectives

- Anatomy of the gluteal region
- Osteology and arthrology of the bones and joints of the lower limb and clinical application of their injuries
- Thigh compartments and their neurovascular supply
- Muscles, neurovascular structures, and lymphatic drainage of the lower limb
- Clinical importance of lower limb ischaemia and compartment syndrome
- Common clinical conditions affecting the venous system, e.g., varicose veins and deep venous thrombosis
- Anatomy of the foot, vascular examination and diabetic foot, and common clinical problems
- Revision questions

The Gluteal Region (Figure 7.1)

- The gluteal region is a transition zone posteriorly between the trunk and the lower extremity.

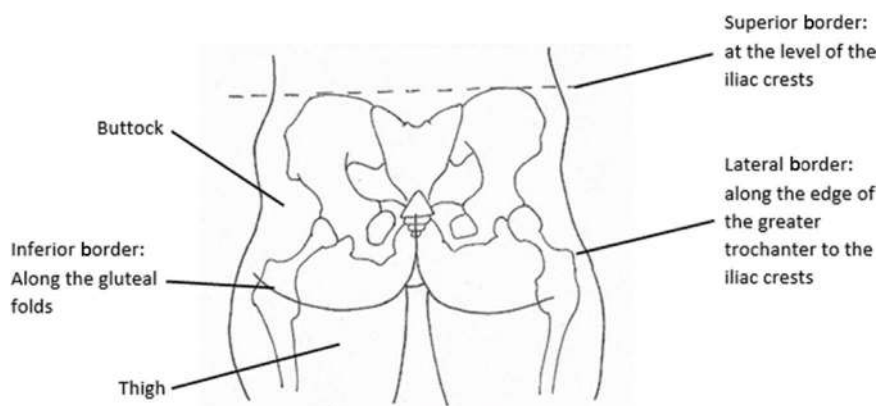


FIGURE 7.1 Boundaries of the gluteal region. (Courtesy of Calum Harrington-Vogt.)

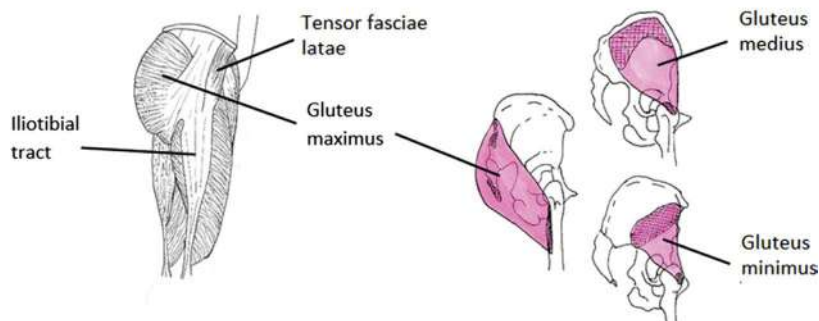


FIGURE 7.2 The main lateral muscles of the thigh and the buttock. (Courtesy of Calum Harrington-Vogt.)

- It is bounded by the iliac crests superiorly, the inferior gluteal folds inferiorly, and the lateral thigh from the iliac crest down to the greater trochanter of the femur laterally.

Muscles of the Gluteal Region

The two broad categories of gluteal muscles are:

1. Superficial abductors and extensors of the hip (Table 7.1 and Figure 7.2). These include:

- Gluteus maximus*
- Gluteus medius*
- Gluteus minimus*
- Tensor fasciae latae

(*These muscles form the main bulk of the buttock. The gluteus maximus is the thickest muscle in the body.)

2. Deep lateral rotators of the thigh and hip. These include:

- Quadratus femoris
- Piriformis
- Gemellus superior
- Gemellus inferior
- Obturator internus

The gluteus medius holds the pelvis steady, preventing pelvic drop. The Trendelenburg's sign is a useful indicator of nerve damage to this muscle, discussed in more detail later.

Iliotibial tract syndrome is common in young athletes (long-distance runners and cyclists) and is due to friction of the iliotibial tract against the lateral femoral epicondyle.

For information on the deep gluteal muscles, see [Table 7.2](#).

TABLE 7.1: The superficial abductors and extensors of the hip

Name	Origin	Insertion	Action	Innervation
<i>Gluteus maximus</i> : the most superficial and the largest of the gluteal muscles It is also the thickest muscle in the body	Posterior surfaces of the ilium (below the posterior gluteal line), sacrum, coccyx, and the sacrotuberous ligament	The iliotibial tract and the gluteal tuberosity on the posterior surface of the femur	Powerful extensor of the hip and assists with lateral rotation Causes the body to regain the erect position after initially stooping, when standing on one leg	Inferior gluteal nerve, arises from the ventral rami of L5–S1 and S2 of the sacral plexus
<i>Gluteus medius</i> : deep to the gluteus maximus, superficial to the gluteus minimus	The gluteal surface of the ilium	Greater trochanter of femur	Hip abductor, medial hip rotator (anterior fibres), lateral rotation and hip extension (posterior fibres)	Superior gluteal nerve, arises from nerve roots L4–S1 of the sacral plexus
<i>Gluteus minimus</i> : deep to the gluteus maximus and medius	The gluteal surface of the ilium	Greater trochanter of femur	Abducts and medially rotates the hip joint and holds the pelvis secure when walking	Superior gluteal nerve
<i>Tensor fasciae latae</i> : the most superficial gluteal muscle, which lies to the anterior of the iliac crest	Anterior iliac crest and the ASIS	The iliotibial tract (a fibrous reinforcement of the fascia lata)	Abduction and medial rotation of the lower limb Supports gait cycle, stabilises knee in extension	Superior gluteal nerve
The iliotibial tract or band (ITT or ITB)	Anterolateral iliac tubercle portion of the external lip of the iliac crest	Lateral condyle of the tibia (Gerdy's tubercle)	Continuation of tensor fasciae latae, part of the insertion of gluteus maximus Maintains knee stability in hyperextension Hip flexor and medial rotator	Inferior gluteal nerve (L5–S2)

TABLE 7.2: Deep gluteal muscles

Name	Origin	Insertion	Action	Innervation
<i>Piriformis</i> (from the Latin word for "pear-shaped"): the most superior of the deep gluteal muscles	Anterior aspect of the sacrum	Greater trochanter (via greater sciatic foramen)	Lateral rotation and abduction of the hip joint	Nerve to piriformis, arises from the posterior divisions of the ventral rami from L5, S1, and S2 of the sacral plexus
<i>The gemelli</i> : two thin muscles, a superior and an inferior gemellus muscle	<i>Superior gemellus</i> : ischial spine <i>Inferior gemellus</i> : ischial tuberosity	Greater trochanter of femur	Lateral rotation and abduction of the hip joint	<i>Superior gemellus</i> : nerve to obturator internus <i>Inferior gemellus</i> : nerve to quadratus femoris
<i>Quadratus femoris</i> : the most inferior deep gluteal muscle Small, flat, and square	Lateral aspect of the ischial tuberosity of the pelvis	Quadratus tubercle on the intertrochanteric crest of the femur	Lateral rotation of the hip joint	Nerve to quadratus femoris, which arises from ventral divisions of the roots L4–S1 of the sacral plexus
<i>Obturator externus</i> : makes up part of the anterior wall of the pelvic cavity and is sometimes considered part of the medial thigh compartment rather than the gluteal region	External border of the obturator foramen	Posterior femur at the trochanteric fossa	Laterally rotates and adducts the hip joint	Posterior branch of the obturator nerve (L3 and L4)
<i>Obturator internus</i> : makes up the lateral walls of the pelvic cavity; forms the triceps coxae with the two gemelli muscles; the levator ani muscle also originates from the tendinous arch of the obturator internus	Pubis and ischium at the obturator foramen of the pelvis through the obturator membrane	Greater trochanter of femur (via lesser sciatic foramen)	Lateral rotation and abduction of the hip joint	Nerve to obturator internus, which arises from ventral divisions of the roots L5–S1 and S2 of the sacral plexus

Learning Point

PIRIFORMIS

The piriformis is an important landmark of the gluteal region. It divides the region into superior and inferior areas after passing through the greater sciatic foramen.

- A number of vessels and nerves are named after this division and the corresponding area to which they supply, such as the inferior gluteal nerve, which passes inferiorly to the piriformis and supplies the gluteus maximus.
- The piriformis is also useful in identifying the sciatic nerve in specimens as the nerve enters the gluteal region just inferior to the piriformis (Figure 7.3).
- A common question is “What are the structures that pass underneath the piriformis muscle?”

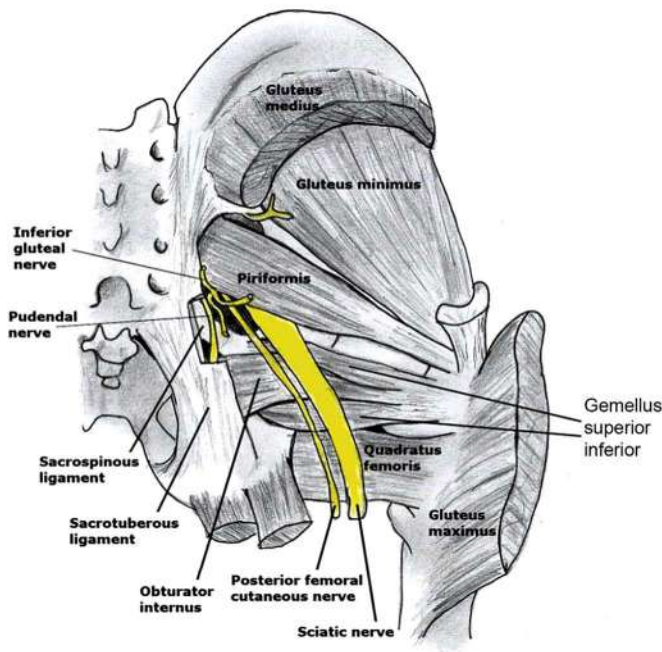


FIGURE 7.3 The main nerves of the sacral plexus and their relations with the piriformis muscle. (Courtesy of Gabriela Barzyk.)

Nerves in the Gluteal Region

These primarily arise from the sacral plexus (discussed in more detail in Section 6, Pelvis and Perineum) and traverse or supply the gluteal region.

Superior gluteal nerve

- **Roots:** L4–S1
- **Course:** passes through the greater sciatic foramen superior to the piriformis. Passes anterolaterally between the gluteus minimus and medius, both of which it supplies, as well as the tensor fasciae latae muscle.

CLINICAL NOTES

DAMAGE TO SUPERIOR GLUTEAL NERVE

The gluteus minimus and medius play an important role in securing the pelvis when walking. They also contract when standing with the opposite leg raised in order to prevent pelvic drop. Damage to the nerve causes paralysis of these muscles and can result in pelvic drop, a positive Trendelenburg's sign, and a characteristic lurching (or waddling) gait.

TRENDELENBURG'S SIGN

Trendelenburg's sign is tested by asking the patient to stand unassisted on each leg in turn, while the practitioner observes the level of the patient's two iliac crests. Pelvic drop would occur on the unsupported leg in a positive test and could therefore be indicative of superior gluteal nerve damage (Figure 7.4).

Inferior gluteal nerve

- **Roots:** L5–S2
- **Course:** crosses the greater sciatic foramen inferior to the piriformis and supplies the gluteus maximus.

Pudendal nerve

- **Roots:** S2–S4
- **Course:** passes through the gluteal region. Can be seen just inferior to the piriformis before it exits the pelvis through the lesser sciatic foramen, over the sacrospinous ligament and under the sacrotuberous ligament. It travels through Alcock's canal (*vide infra*) before dividing into three branches: inferior rectal, perineal, and clitoral or penile branches.
- **Alcock's canal** (or pudendal canal) is defined as a passage formed by the separation of the obturator fascia. It contains the pudendal nerve and internal pudendal vessels. Entrapment of the pudendal nerve can occur here.
- The nerve carries sensory, autonomic, and motor signals to and from the genitals, anus, and urethra.
- For more details on the course of the pudendal nerve, see Section 6, Pelvis and Perineum.

The posterior femoral cutaneous nerve

- **Roots:** S1–S3
- **Course:** passes through the greater sciatic foramen inferior to the piriformis. It runs deep to the gluteus maximus in the gluteal region and runs down to the calf muscles. The nerve provides innervation to the skin of the posterior thigh and leg and the posterior part of the perineum.

The sciatic nerve

- The largest and thickest nerve in the body.
- **Roots:** L4–S3
- Divides into tibial and common peroneal nerves.
- **Course:** passes through the greater sciatic foramen and deep to the piriformis. The nerve courses inferiorly, deep to the gluteus maximus, before continuing down the middle of the posterior thigh.

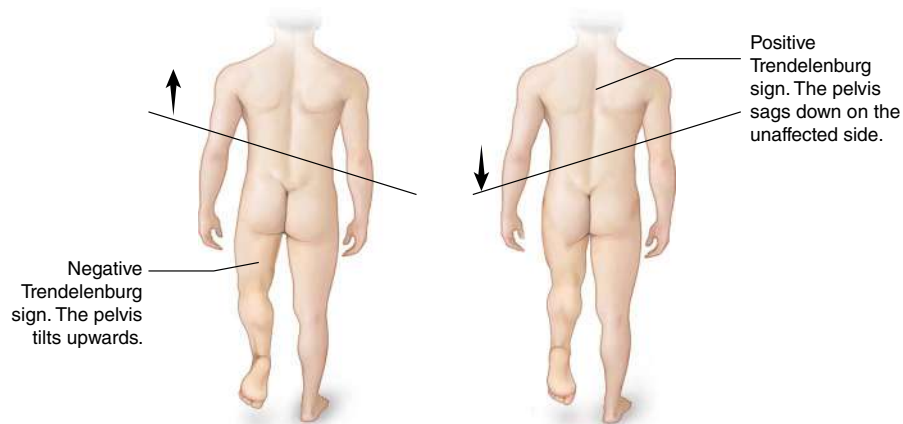


FIGURE 7.4 The image on the left shows a “normal” Trendelenburg’s sign and on the right a “positive” sign. (Courtesy of Calum Harrington-Vogt.)

CLINICAL NOTES

SCIATICA

- A condition characterised by lower back pain and pain going down one or both legs.
- *Cause:* most of the cases are caused by intervertebral disc herniation, which then presses against one or more of the lumbar or sacral nerve roots (commonly L4–L5 or L5–S1). Other causes can be spinal stenosis, pelvic tumours, and compression of nerve roots by the fetus during pregnancy.

The *straight-leg-raising (SLR) test*: a positive test is when the leg is raised by a practitioner while the patient is lying on their back, pain shoots down to below the knee. Knee and ankle jerks could also be weak, depending on the nerve roots affected.

INTRAMUSCULAR INJECTIONS

The superolateral quadrant of the buttock is often used to administer intramuscular injections, as the area is relatively “nerve free”, which is particularly useful as it avoids the sciatic nerve but still gives access to the very muscular gluteal region (**Figure 7.5**).

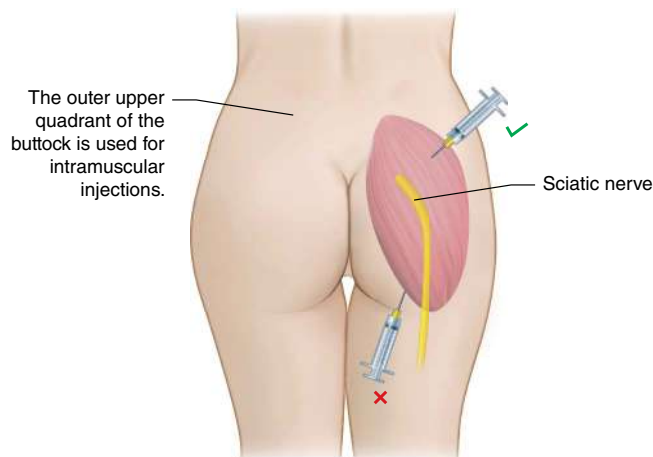


FIGURE 7.5 The safe area for intramuscular injection on the gluteal region. (Courtesy of Calum Harrington-Vogt.)

Blood Supply to the Gluteal Region

These are the superior and inferior gluteal arteries; both arise from the internal iliac artery (see **Section 6**, Pelvis and Perineum). The superior gluteal artery, the largest branch of the internal iliac artery, accompanies the superior gluteal nerve and divides into deep and superficial branches that supply the gluteus maximus and the gluteus medius and minimus, respectively. The inferior gluteal artery accompanies the inferior gluteal nerve and gives rise to a companion artery to the sciatic nerve. The gluteal veins accompany the arteries and drain into the internal iliac vein.

An anastomosis around the hip (the trochanteric anastomosis) is formed by the superior gluteal, inferior gluteal, and medial and lateral femoral circumflex arteries.

CLINICAL NOTES

SUPERIOR GLUTEAL ARTERY PERFORATOR (SGAP) FLAP

Skin and fat from the upper to middle buttock can be removed, as well as the superior gluteal artery and vein (which supply the area via perforators through the gluteus maximus). This section of skin can be used in reconstructive breast surgery as a skin donor site and is a growing field in microsurgery.

Anatomy of the Hip (Acetabulofemoral) Joint

The function of the femoral head is to articulate with the acetabulum and form what is commonly known as the hip joint.

- A multiaxial, ball and socket synovial joint.
- The socket (Latin: *acetabulum*, or “vinegar cup”) is a deep depression formed by the unification of the ilium, pubis, and ischium of the pelvis, fused together by the triradiate cartilage, which keeps the three bones separate until they fuse by the age of 25 years. The acetabulum is deepened by the attached fibrocartilaginous acetabular labrum.
- Primarily functions to support the individual’s weight in both static and dynamic postures.

The hip joint capsule, also known as the articular capsule, is very strong and dense. It is attached to the rim of the acetabulum superiorly, and surrounds the neck of the femur inferiorly. The attachment of the hip joint capsule is on the intertrochanteric line anteriorly and posteriorly attaches more proximal to the intertrochanteric crest.

The surface of the acetabulum differs in texture. The smoother lunate surface articulates with the head of the femur and is covered by hyaline cartilage. This is where all the weight is loaded. The deeper part, the acetabular fossa, is non-weight-bearing and is filled with fat.

There are four main ligaments of the hip joint, of which one is intracapsular.

The intracapsular ligament is the ligamentum teres (round ligament). Functionally, in our day-to-day activities, this ligament is not as important as the other three, as it is attached to the rim of the acetabulum and to a depression on the femoral head (the fovea capitis) and keeps the two fixed together, rather than affecting our ability to move. It also encloses a branch of the obturator artery, which is a part of the arterial supply of the hip joint.

The Extracapsular Ligaments of the Hip

There are three main ligaments which are continuous with the outer surface of the hip joint capsule.

Iliofemoral Ligament

This is the **strongest ligament in the body** and runs between the anterior inferior iliac spine and the intertrochanteric line of the femur and has a Y shape. Its role is to prevent hyperextension of the hip joint. It loosens on flexion of the hip, but gets twisted on standing and hip extension; this movement then draws the femur towards the ilium, so it keeps the head of the femur in the acetabulum and therefore contributes to hip stability.

Pubofemoral Ligament

The pubofemoral ligament extends between the superior pubic rami and the intertrochanteric line of the femur. It has a triangular shape. Its role is to prevent excessive abduction and extension and to resist external rotation.

Ischiofemoral Ligament

Spans between the body of the ischium and the greater trochanter of the femur. It has a spiral orientation (spirals around the neck to attach to the intertrochanteric line). Its role is to prevent excessive extension and resist internal rotation.

Blood Supply of the Femoral Head

The blood supply to the femoral head travels proximally from the distal side along the reflected part of the capsule (retinaculum), and therefore fractures of the neck of the femur can prevent blood flow to the head of the femur.

The hip joint is supplied by the medial circumflex and lateral circumflex femoral arteries, which are branches of the profunda femoris. There are numerous anatomical variations in which one or both arteries may arise from the femoral artery.

CLINICAL NOTES

POSTERIOR HIP DISLOCATION

This is the most common type of hip dislocation (contrast with shoulder joint dislocation, where the majority of dislocations are anterior/inferior). It could also result in fracture of the posterior lip of the acetabulum (**Figure 7.6a**).



FIGURE 7.6a Right posterior hip dislocation. (Courtesy of Salam Ismael.)

It usually follows severe injury to the flexed hip, e.g., where the knee is driven back in dashboard injuries. Clinically, the affected lower limb is shortened, adducted, and internally rotated.

CONGENITAL HIP DISLOCATION (CHD)

CHD, or developmental dysplasia of the hip, occurs when a child is born with an unstable hip. It is due to the malformation of the hip during early fetal development. The child may suffer from dislocation of the joint. In CHD, the cup-shaped hip socket is too shallow and the femoral head can move, as it is not held tightly in place, which can result in the femoral head lying completely outside the socket.

It can affect one or both hips; however, it is much more common in the left hip. According to National Health Service (NHS) statistics, 1 in every 1000 babies is born with developmental dysplasia of the hip. Without proper treatment, it can lead to developing a limp, chronic hip pain, and stiff joints due to osteoarthritis.

ARTHROPLASTY

This is the surgical reconstruction or replacement of a joint. The hip joint can deteriorate for many reasons, such as osteoarthritis. Total hip replacement (THR) (replacement of the femoral head and acetabulum with synthetic materials) is a choice when all other methods have been tried and tested (**Figure 7.6b**).



FIGURE 7.6b Total hip replacement (THR), preoperative and postoperative plain film X-rays. (Courtesy of Philip J. Addis.)

Osteology of the Femur

The femur is the longest bone in the body, measuring at about a quarter of an individual's height (Figure 7.7). It consists of the head, neck, shaft, and lower end (femoral condyles). The anatomy of the head of the femur has been described with anatomy of the hip joint (see earlier).

The **neck of the femur (NOF)** is cylindrical in nature and attaches to the femoral shaft at an angle of approximately 130 degrees.

Fractures in the NOF are classified as **either intracapsular (subcapital) or extracapsular (trochanteric)**, and it is important to identify which fracture has taken place in the patient, as that will determine the possible consequences of the fracture, as well as potential treatment options. If the fracture has occurred above the intertrochanteric line, then it is an intracapsular fracture. If the fracture has occurred on or below this line, then it is classified as an extracapsular fracture.

Intracapsular fractures can cause a disruption to the blood supply to the head of the femur and potentially cause avascular necrosis requiring hip replacement surgery. Extracapsular fractures, although they are far more common, are less likely to cause disruption to the blood supply to the neck and head of the femur.

Fracture of the femoral neck is clinically manifested by inability of the patient to move the lower limb, which is shorter on the affected side and externally rotated.

Avascular necrosis (trauma-related avascular necrosis), also known as an osteonecrosis, is where there is interruption of blood supply to the head of the femur, which will cause necrosis and eventual collapse of the bone. It may follow hip dislocation or fracture of the NOF.

Lateral to the lower end of the neck of the femur is the **greater trochanter**, which is a projection on both anterior and posterior aspects and forms the insertion site of the muscles of the gluteal region, including the piriformis, except for the gluteus maximus, which is mainly inserted into the iliotibial tract.

On the medial side the **lesser trochanter** can be found inferior and posterior to the NOF. This is the site of attachment

for the iliacus and psoas muscles (iliopsoas); both are flexors of the hip.

A bony ridge known as the **intertrochanteric line** runs anteriorly from the greater trochanter to the lesser trochanter in an inferomedial direction, and this is the site of attachment for the iliofemoral ligament. On the posterior surface of the upper femur, the intertrochanteric line continues as the pectineal line once it passes the lesser trochanter in the inferolateral direction. The **intertrochanteric crest** is found on the posterior aspect at the junction between the femoral neck and shaft.

A rounded tubercle, known as the **quadratus tubercle**, can be found on the superior half of the crest itself. This is the site of attachment for the quadratus femoris muscle.

The Linea Aspera

On the posterior aspect of the femur, the now descending pectineal line on the medial side and the gluteal tuberosity on the lateral side (where part of the gluteus maximus attaches, unlike the other gluteal muscles) meet and form a longitudinal single line of ridged bone known as the linea aspera ("rough line" in Latin), on the posterior aspect of the femoral shaft. The linea aspera gives attachment to the lateral and medial vasti muscles and adductor magnus.

The medial and lateral borders of the linea aspera diverge inferiorly to become the medial and lateral supracondylar lines, and eventually become part of the floor of the popliteal fossa. Again, it is important to observe the termination of these lines; unlike the lateral line, the medial supracondylar line stops at the adductor tubercle, and it is here where the adductor magnus attaches.

The area between the two femoral condyles is called the intercondylar fossa, which is part of the floor of the popliteal fossa and gives attachment to the anterior and posterior cruciate ligaments of the knee joint.

Blood Supply of the Femur

The femur is supplied generally by the femoral artery. This gives rise to the lateral and medial circumflex arteries (from the profunda or deep femoral artery); see above.

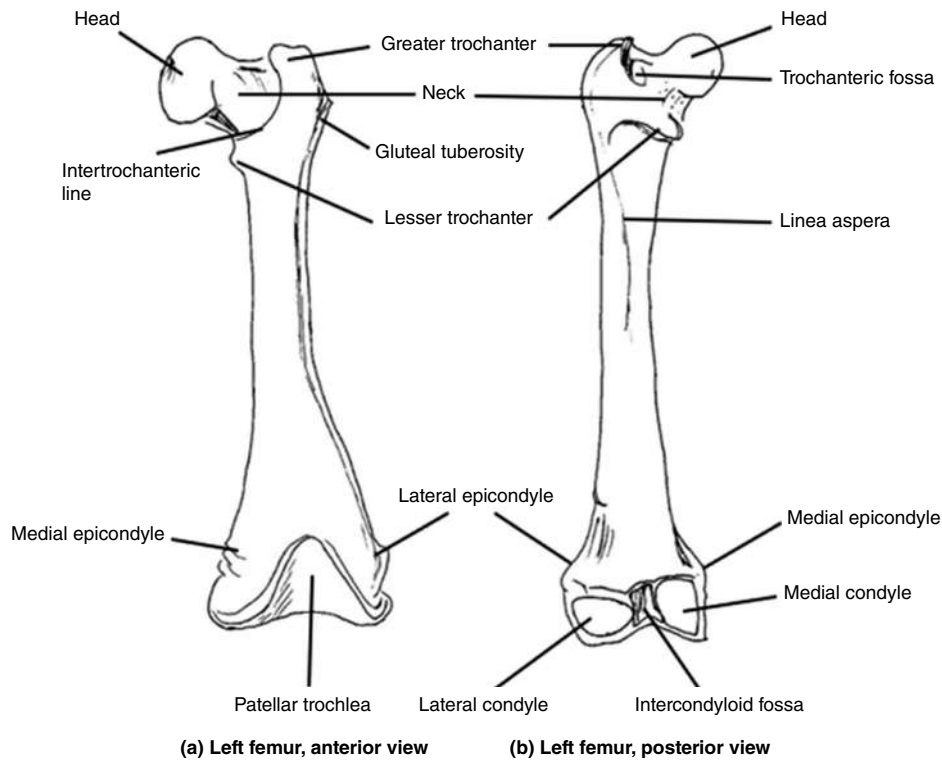


FIGURE 7.7 Anterior and posterior view of the femur. (Courtesy of Alina Humdani.)

CLINICAL NOTES

FRACTURE OF THE SHAFT OF THE FEMUR

Fractures of the shaft of this bone require very high-energy traumas such as high-speed car crashes or a pedestrian being hit by a car, gunshot wounds, etc. (Figures 7.8 and 7.9).

Another entity is a pathological fracture, which is where an already damaged area of a bone breaks due to other pathologies, such as metastatic tumours from other primaries (commonly from breast, lung, and prostate), infections,

and osteoporosis (more commonly in elderly people who have weaker bones, falling over in a low-force incident).

In patients with fracture of the femur note that:

- **Significant blood loss can accompany femoral shaft fractures**, as the fractured bones can be very sharp and could tear a major artery such as the deep femoral artery, leading to significant blood loss.
- **The integrity of the neurovascular bundle of the lower limb should always be checked.**



FIGURE 7.8 Anteroposterior (AP) and lateral views of a plain film radiograph of the right thigh of a 16-year-old female, who fell from a third-floor window, showing a closed transverse fracture of the midshaft of the right femur. (Courtesy of Radiology Department at St. George's Hospital NHS Trust.)



FIGURE 7.9 Plain film X-ray of the right lower limb of a 27-year-old male motorcyclist who was involved in a road traffic collision with an oncoming car. Two images have been taken: anteroposterior (AP) view of the right femur (*left image*) and an AP view of the right femur and knee joint (*right image*). There are two closed transverse fractures in the mid third of the shaft of the right femur. (Courtesy of Radiology Department at St. George's Hospital NHS Trust.)

Femoral Triangle (Figure 7.10)

The boundaries of the femoral triangle, which contains the femoral vessels and nerve (which is located laterally) and the vein medial to the artery (important when taking venous

sample in patients with difficult peripheral venous access) include the following:

- *Superior border:* the inguinal ligament
- *Lateral border:* the medial border of the sartorius
- *Medial border:* formed by the medial border of the adductor longus muscle. The rest of this muscle forms part of the floor of the triangle
- *Roof:* fascia lata (deep fascia of the thigh)
- *Floor:* pectineus, iliopsoas, and adductor longus

CLINICAL NOTES

THE FEMORAL TRIANGLE

- The femoral artery is an important clinical landmark for vascular examination and for catheterization, such as in angiogram procedures (injection of dye to delineate the arterial tree for blockages or narrowing of arteries, like the coronary arteries) and other interventional procedures, such as stenting or balloon angioplasty, and has been linked to injuries of butchers' thighs whose meat cleavers can slip and lacerate the artery.
- The femoral artery is explored within the femoral triangle in patients with acute lower limb ischaemia where emboli or thrombosis occlude the artery (embolectomy).
- Inguinal lymph node biopsy. See "Sentinel Node Biopsy".
- Exploration of the saphenofemoral junction in surgical treatment of varicose veins (ligation of the long saphenous vein at its connection to the femoral vein in addition to its tributaries at the junction).

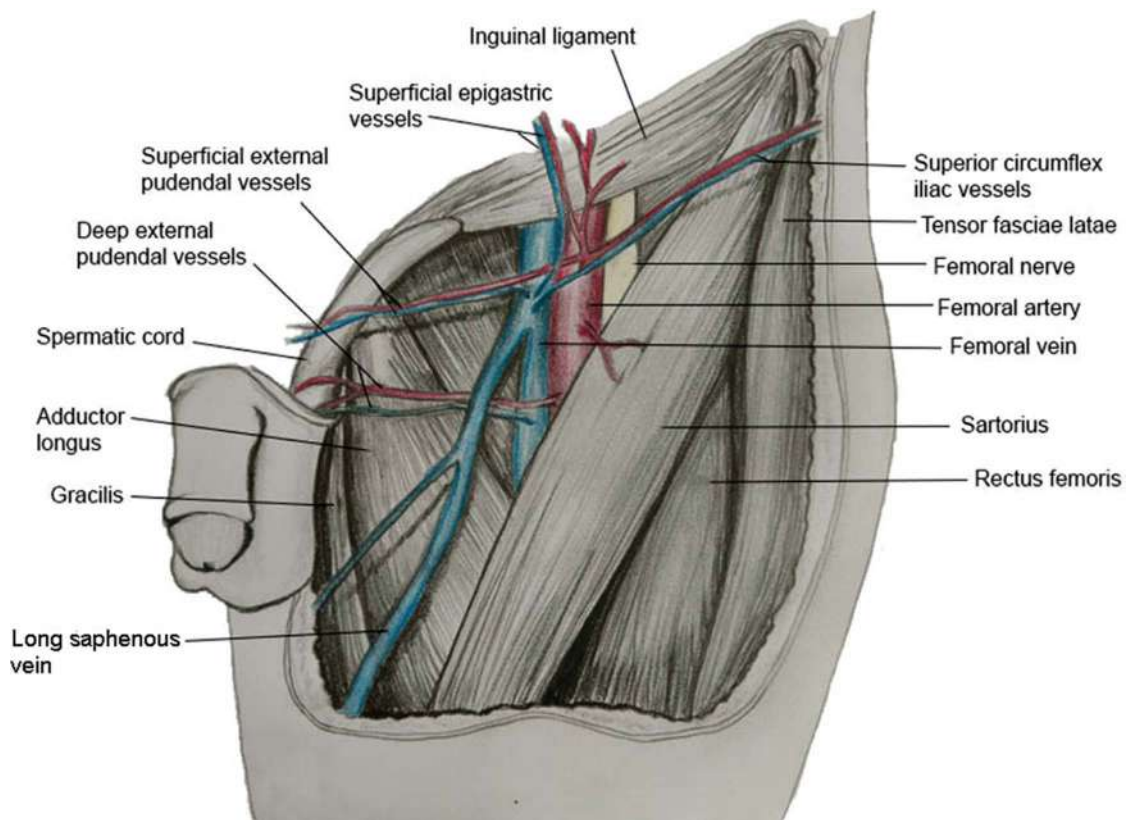


FIGURE 7.10 The femoral triangle. (Courtesy of Neha Gadiyar.)

The Femoral Canal

This is a small canal (1.5 cm in length) which passes medial to the femoral vein, at the upper end of the femoral triangle. The proximal end is called the femoral ring. It is filled with extraperitoneal connective tissue. The femoral canal is wider in females because they have a wider bony pelvis (adapted for childbirth).

Relations:

- *Anterior:* inguinal ligament
- *Posterior:* pectineal ligament, superior ramus of the pubic bone, and the pectineus muscle
- *Medial:* lacunar ligament
- *Lateral:* femoral vein

The femoral canal, femoral vein, and femoral artery are all enclosed in a fascial sheath (**femoral sheath**), which is bounded anteriorly by the transversalis fascia and posteriorly by the iliac fascia (which covers the psoas and iliacus muscles). There is a lymph node within the canal (Cloquet’s node).

CLINICAL NOTE

Herniation through the femoral canal from the peritoneal cavity is called a **femoral hernia**, a protrusion of a pouch of peritoneal sac, which may contain an intra-abdominal organ, like the small bowel, through the femoral canal. This type of hernia is more common in females and can be easily missed on physical examination of the groin; it is more liable to strangulation and bowel ischaemia. However, among females, the inguinal hernia is more common.

Pes Anserinus (Latin: “Goose’s Foot”)

This is the arrangement of the three tendons of the sartorius, gracilis, and semitendinosus as they insert anteromedially into the proximal tibia.

Pes anserine bursitis is inflammation of the bursa underneath the common tendon and is characterised by pain and swelling on

the medial aspect of the knee, commonly in athletes following overexercise.

Muscles of the Anterior Thigh (Figure 7.11)

The muscles of the anterior thigh are innervated by the femoral nerve.

The **femoral nerve** (L2–L4) is a mixed nerve and one of the branches of the posterior divisions of the lumbar plexus. It emerges underneath the inguinal ligament (lateral to the femoral artery) and supplies motor branches to the sartorius, pectineus, and quadriceps femoris. It supplies sensory branches to the anterior and medial aspects of the thigh (the intermediate and medial femoral nerves of the thigh) and continues as the saphenous nerve (see later, **Table 7.3**).

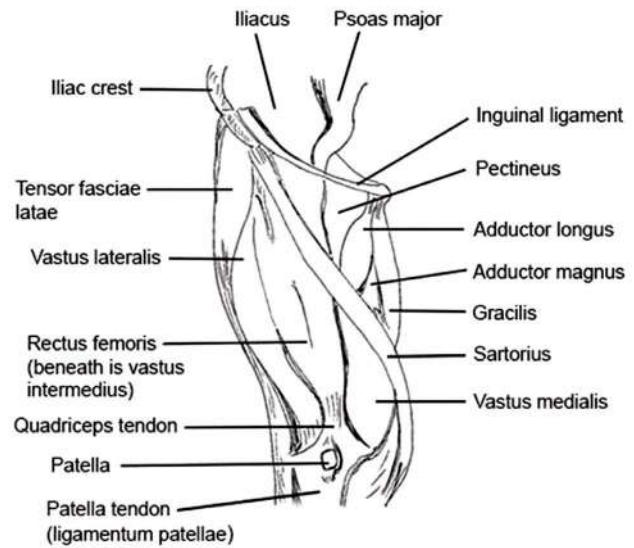


FIGURE 7.11 Musculature of the anterior compartment of the right thigh. (Courtesy of Alina Humdani.)

TABLE 7.3: Muscles of the anterior thigh*

Name	Origin	Insertion	Action
Sartorius (the longest muscle in the body)	Anterior superior iliac spine (ASIS)	Medial aspect of upper tibia (pes anserinus)	Flexion, abduction, and lateral rotation of the thigh, flexion of the knee
Rectus femoris (note that this muscle has two heads and crosses two joints)	<i>Straight head:</i> from the anterior inferior iliac spine (AIIS) <i>Reflected head:</i> along the upper part of the acetabulum at the ilium	Quadriceps tendon along with the three vasti muscles into the patella and through the patellar tendon to the tibial tuberosity	Hip flexion and knee extension
Iliacus	Iliac fossa	Lesser trochanter <i>Note:</i> before insertion, this muscle unites with the psoas major behind the inguinal ligament to form the iliopsoas	Medial rotation of thigh and hip joint flexion
Vastus lateralis (the largest of the quadriceps femoris)	Upper part of the intertrochanteric line; the greater trochanter, the outer border of the gluteal tuberosity, and outer border of the linea aspera	Lateral side of the quadriceps tendon, joining with the rectus femoris	Extends the knee. Allows the body to stand up from a squatting position
Vastus intermedius	Anterior and lateral aspects of the upper part of the femoral shaft	Quadriceps tendon into the tibial tuberosity	Extends the knee
Vastus medialis	Medial part of the intertrochanteric line and the medial lip of the linea aspera	Medial side of the quadriceps tendon into the tibial tuberosity and some fibres to the medial patellar retinaculum	Extends the knee; the lower fibres prevent lateral displacement of the patella

* Quadriceps femoris consists of rectus femoris, vastus lateralis, vastus intermedius, and vastus medialis.

Medial Compartment of the Thigh

Hip Adductors (Figure 7.12 and Table 7.4)

The medial thigh consists of muscles known together as the hip adductors:

- Gracilis
- Obturator externus
- Adductor longus
- Adductor brevis
- Adductor magnus

Some authors consider the pectineus one of the adductors. For details of the pectineus, see Section 6, Pelvis and Perineum.

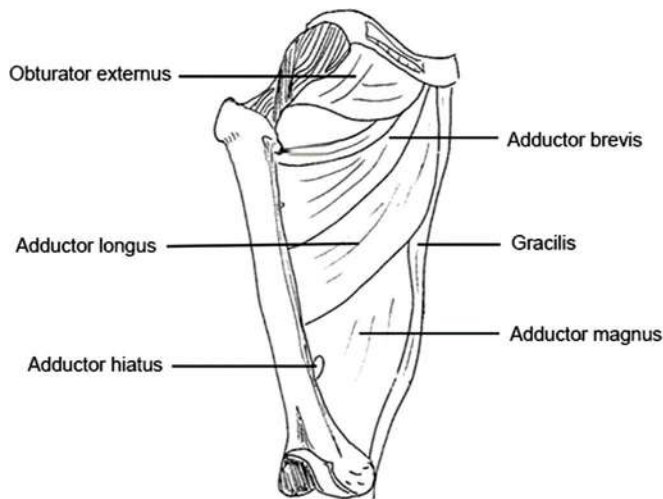


FIGURE 7.12 Musculature of the medial compartment of the thigh. (Courtesy of Alina Humdani.)

The medial thigh muscles are innervated by the obturator nerve (L2–L4); the hamstring portion of the adductor magnus is supplied by the tibial component of the sciatic nerve.

The arterial supply is the obturator artery plus profunda femoris.

The **obturator nerve** (L2–L4) enters the pelvis medial to the psoas major muscle to pass into the obturator canal and then divides into anterior and posterior divisions. It supplies sensory fibres to the medial aspect of the thigh and knee in addition

to an articular branch to the knee joint (for referred pain, see Section 6, Pelvis and Perineum) and motor branches to the adductors (see earlier).

CLINICAL NOTES

“GROIN STRAIN”

“Groin strain” arises from strain in the adductor muscles. Usually, the most affected areas are the proximal part, where they tear near their attachments in the pelvis. Groin injuries usually occur during sports where sudden or extreme stretching leads to strain. The normal presentation in patients involves pain gradually increasing in the deep groin and proximal to the origins of the adductor muscles. The diagnosis is made clinically, but chronic pain involves utilisation of imaging.

TRANSPLANTATION

The gracilis is popularly used in reconstructive surgery, usually for muscle transfer or soft tissue coverage. The gracilis may be used to cover a damaged area in the hand or forearm. Patients with stress incontinence may have a vascularised pedicle flap transferred around the neck of the bladder, thereby strengthening it.

Another use is a free gracilis flap (through microsurgical anastomosis) to treat facial palsy. A small section is used in the face and attached to either the hypoglossal nerve or to a cross-facial nerve graft. This allows it to act as a motor muscle in the face.

OBTURATOR NERVE ENTRAPMENT SYNDROME

Obturator nerve entrapment syndrome is when the obturator nerve gets compressed. Patients consequently present with loss of sensation to the medial thigh, usually accompanied by weakness in thigh adduction. Causes include childbirth and pelvic tumours such as ovarian cysts.

Usually, obturator nerve entrapment can be diagnosed by the gold-standard electromyography or magnetic resonance imaging (MRI), which highlight the atrophy of the adductor longus and brevis muscles.

TABLE 7.4: Hip adductors

Name	Origin	Insertion	Action
Adductor longus (most anteriorly placed)	Body of pubic bone, underneath the pubic tubercle	Linea aspera of femur (broad insertion)	Adduction, flexion of the thigh
Adductor brevis (posterior to the adductor longus)	Body and inferior ramus of pubis	Linea aspera	Adduction, flexion of the thigh
Adductor magnus* Posterior to the adductor brevis	<i>Adductor portion:</i> inferior ramus of pubis, ramus of ischium <i>Hamstring portion:</i> ischial tuberosity	Adductor portion: gluteal tuberosity, inner lip of linea aspera <i>Hamstring portion:</i> adductor tubercle	Strong adductor of thigh <i>Adductor portion:</i> weak flexion and lateral rotation of the thigh <i>Hamstring portion:</i> extension and lateral rotation of the thigh
Gracilis (the most superficial of the adductor muscles)	Body and inferior ramus of pubis	Medial upper portion of tibia, inferior to medial condyle (pes anserinus)	Adduction and medial rotation of thigh, flexion of the knee joint
Obturator externus	Membrane of the obturator foramen	Posterior aspect of greater trochanter	Adduction and lateral rotation of the thigh

* The adductor magnus can be split into two parts – the adductor portion (superior) and the hamstring portion (inferior).

Posterior Thigh Compartment (Figure 7.13 and Table 7.5)

Hamstrings

The hamstrings are a group of muscles located in the posterior compartment of the thigh. The hamstrings consist of the semimembranosus, semitendinosus, biceps femoris (consists of a long and short head), and part of the adductor magnus. Their main function is hip extension and knee flexion. The posterior compartment of the thigh is supplied by the sciatic nerve (L4, L5, S1, S2, and S3).

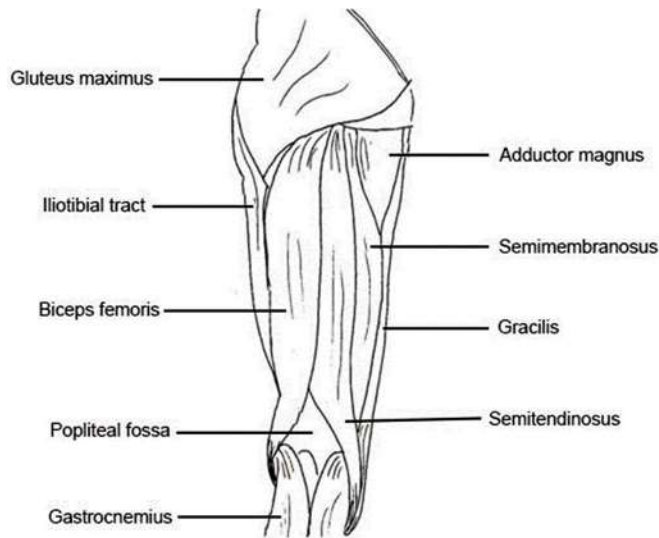


FIGURE 7.13 Musculature of the posterior compartment of the left thigh. (Courtesy of Alina Humdani.)

Vasculature of the Lower Limb

Introduction

The lower limb vasculature comprises arteries, veins, and lymphatics. In this section the lower limb vasculature is examined from the level of the inguinal ligament, beginning in the arterial system with the femoral artery. Venous vasculature is especially important, as pathologies such as deep venous thrombosis (DVT) and varicose veins commonly present in clinical settings across the population.

Arterial Supply of the Lower Limb

Femoral Artery

The continuation of the external iliac artery as it enters the thigh deep to the inguinal ligament, midway between the anterior superior iliac spine (ASIS) and the pubic symphysis. It is the main arterial supply to the lower limb and lies enclosed within the femoral sheath alongside the femoral vein and femoral canal.

The femoral artery continues deep to sartorius after giving rise to the profunda femoris (deep femoral artery). It descends along the anteromedial aspect of the thigh, passing down the adductor (sub-sartorial) canal to the adductor hiatus (an opening in the adductor magnus), where it becomes the popliteal artery (**Figure 7.14**).

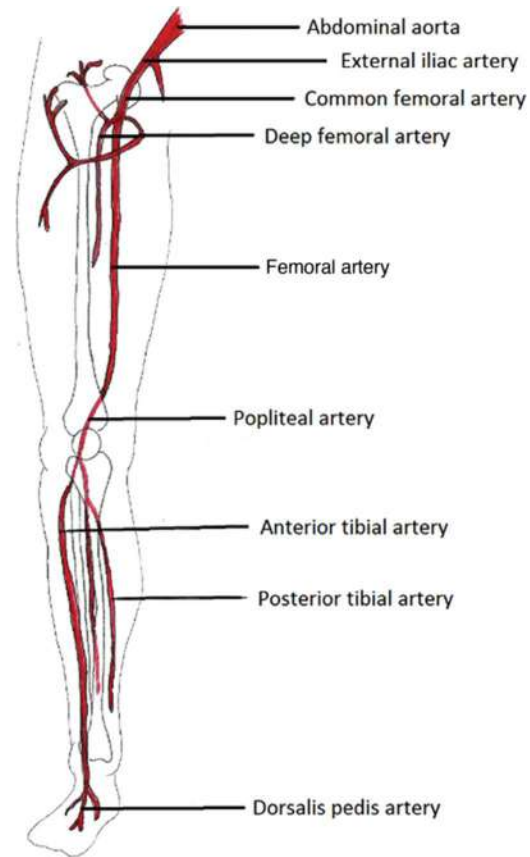


FIGURE 7.14 Arterial system of the lower limb. (Courtesy of Calum Harrington-Vogt.)

TABLE 7.5: Muscles of the posterior thigh and their innervation

Muscle	Origin	Insertion	Innervation	Function	Further Information
Semitendinosus	Upper part of the posterior surface of the ischial tuberosity	<i>Pes anserinus</i> : upper part of the medial surface of the tibia, behind the attachment of sartorius	Tibial nerve (L5–S2)	Extension of the hip and flexion of the knee	It has a very long tendon that is sometimes used for anterior cruciate ligament (ACL) reconstruction
Semimembranosus (deep to the semitendinosus)	Ischial tuberosity	Posterior aspect of the medial condyle of the tibia	Tibial nerve (L5–S2)	Extension of the hip and flexion of the knee	Superiorly becomes thin like a membrane, hence the name
Biceps femoris	<i>Long head</i> : ischial tuberosity <i>Short head</i> : lateral lip of the linea aspera and lateral supracondylar line	Head of the fibula	<i>Long head</i> : tibial nerve (L5, S1) <i>Short head</i> : common peroneal division of sciatic nerve (L5, S1)	Knee flexion, external rotation, and extension of the hip	Has a long and short head (short head acts on the knee joint only)

Six significant branches of the femoral artery include the:

- Superficial circumflex iliac
- Superficial epigastric
- Superficial and deep external pudendal
- Deep femoral (profunda femoris)
- Descending genicular

CLINICAL NOTES

ANGIOGRAPHY

The femoral artery is the most common site for angiography (Figure 7.15). This is a method of injecting contrast dye into the femoral artery to delineate the arterial tree, particularly the coronary arteries of the heart. During this procedure the femoral artery is cannulated using the **Seldinger's technique**, in which a catheter is guided sequentially through the external iliac artery, common iliac artery, aorta, and into the coronary arteries. Seldinger's technique is one of the most commonly used procedures and was invented by Dr Sven Ivar Seldinger (a Swedish radiologist) to access the vascular system and hollow organs (see the chest drain insertion, Section 4A, Thorax, for more information). The first step is getting access through insertion of a trocar and then threading a guide wire and removing the trocar. The next step is passing a wide-bore catheter or cannula over the guide wire. The guide wire is then removed, leaving the procedure done by passing different catheters and appliances through the introducer sheath.

Common examples include:

- Angiography (balloon angioplasty and stenting may be needed as well; see later). In leaking cerebral aneurysms, a coil may be inserted to stop the bleeding. Endovascular aneurysmal repair (EVAR) is another example of vascular intervention through the use of Seldinger's technique.
- Insertion of chest drains and catheters to drain collections and abscesses.
- Percutaneous endoscopic gastrostomy (PEG); see Section 5, Abdomen.

BALLOON ANGIOPLASTY

Balloon angioplasty is the use of an inflatable balloon to dilate occluded vessels. This procedure may also include the insertion of a stent, a mesh wire tube-like structure that continues to keep the vessel patent.

LOWER LIMB ACUTE ISCHAEMIA

Lower limb ischaemia can be caused by thrombosis (most cases), embolus, and other causes such as arterial trauma.

An embolus (*Plural: emboli*, Greek, "wedge") is any mass that travels through the bloodstream. Common emboli are blood clots (thromboembolism). In this case they commonly form in the left side of the heart (for example, due to atrial fibrillation) or within the arterial system and lodge at the common femoral artery. Acute

(Continued)

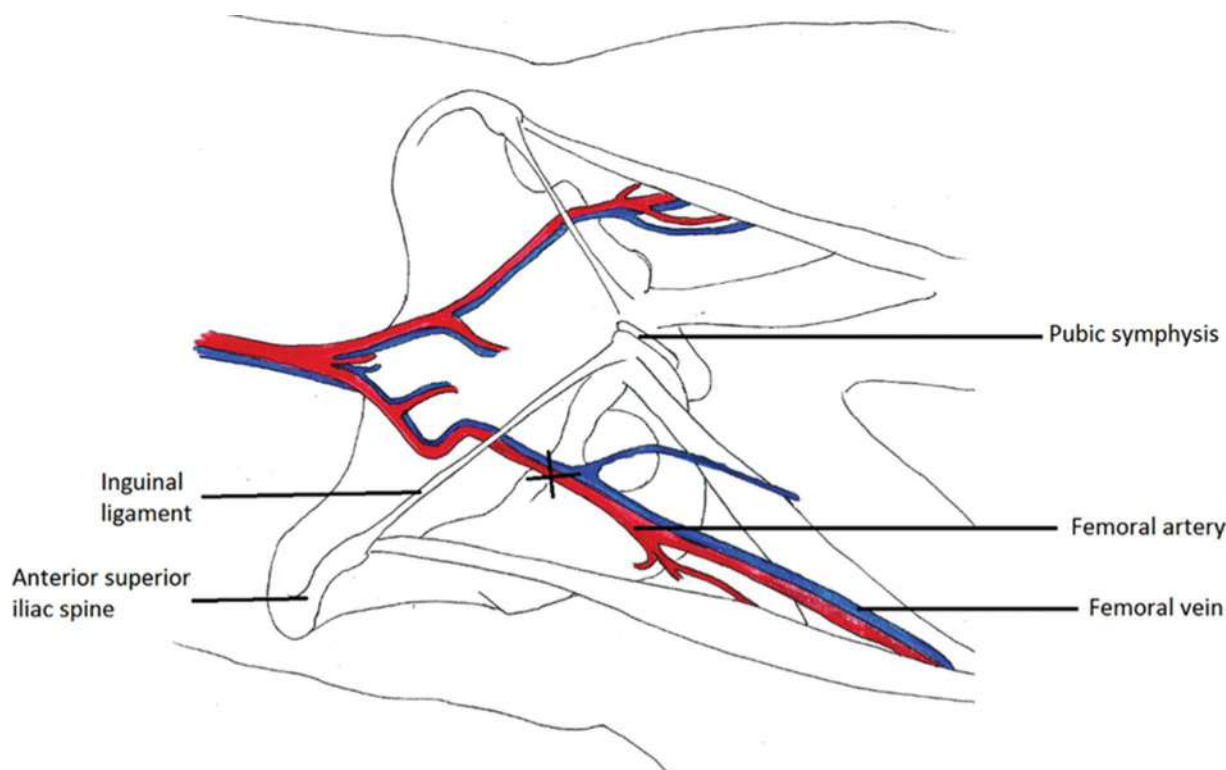


FIGURE 7.15 Location of femoral arterial puncture. (Courtesy of Calum Harrington-Vogt.)

lower limb ischaemia (ALI) is a serious condition, which can be missed, with a delay in diagnosis and treatment. On clinical suspicion of acute ischaemia, advice from the vascular surgery team is urgently needed, as the limb may still be salvageable.

It presents with the classical clinical symptoms and signs of the “6Ps” distal to the site of the blockage:

1. Pain
2. Pallor
3. Perishing cold (temperature of affected tissue is no longer controlled due to lack of perfusion, so normalises with external ambient temperature)
4. Paraesthesia (sensation of tingling “pins and needles”)
5. Pulselessness (no peripheral pulses, i.e., popliteal, dorsalis pedis, posterior tibial)
6. Paralysis

The mere presence of the first three Ps, (sudden, severe pain; pallor; and perishing coldness) should trigger the alarm, alerting the clinician to this possibility and leading to diagnosis at this early stage, before the progression to sensory and motor deficit (the patient can usually wiggle their toes, meaning that there is time to request arterial imaging, and definitive treatment can be performed by either interventional radiology or surgery in the form of an emergency thromboembolectomy).*

FEMORAL ARTERY PSEUDOANEURYSM

The artery can become dilated (identified as an aneurysm if the dilatation of the diameter of an artery is more than 50%). Following penetrating injuries, including intra-arterial drug abuse, a pseudoaneurysm or false aneurysm may form and can be felt as an expansile swelling in the groin.

FEMORAL VENEPUNCTURE

A venous blood sample can be taken about 1 cm medial to the pulse of the femoral artery and about 1 cm inferior to the inguinal ligament. This point is useful for access to the central venous system when other veins are unavailable. A useful mnemonic to remember the relative location of the femoral vein is **NAVeL (Nerve, Artery, Vein, Lymphatics)**, which describes the femoral area from lateral to medial (lymphatics always being the most medial).

* Personal communication with Prof. M. I. Aldoori.

Profunda Femoris (Deep Femoral) Artery

This arises posterolaterally in the femoral triangle as the largest branch of the femoral artery, about 3.5 cm distal to the inguinal ligament. It passes posterior to the adductor longus muscle.

The profunda femoris gives rise to the following significant branches:

- Medial and lateral circumflex femoral arteries
- Descending branch of the lateral circumflex artery
- Perforating branches that supply the posterior and medial compartments of the thigh

The **subsartorial canal, or adductor (Hunter’s) canal**, was named for John Hunter, a Scottish surgeon who worked at St George’s Hospital, London. The femoral vessels leave the femoral triangle and enter this tendinous canal and leave at the hiatus (opening) in the adductor magnus. Its boundaries are:

- *Anteriorly*: sartorius muscle (hence the name)
- *Laterally*: vastus medialis
- *Posteromedially*: adductor longus and adductor magnus

The other contents are the saphenous nerve and the femoral nerve supply to the vastus medialis.

The **saphenous nerve** is a sensory cutaneous branch of the femoral nerve which gives rise to an articular branch to the knee joint and to the skin over the patella (the infrapatellar branch). It runs on the medial aspect of the leg alongside the long saphenous vein and supplies the medial and anterior aspects of the leg and the medial aspect of the foot down to the base of the big toe (bunion area) and is the longest nerve in the body. It might get injured during venesection of the long saphenous nerve (see later), above and anterior to the medial malleolus.

Popliteal Fossa

This is a diamond-shaped area behind the knee. The boundaries of the popliteal fossa are as follows:

- *Upper lateral*: biceps femoris
- *Upper medial*: semitendinosus and semimembranosus
- *Lower lateral and medial*: the two heads of the gastrocnemius
- *Roof*: formed by the tough deep fascia and a floor which is the posterior aspect of the knee joint capsule, popliteus muscle, and posterior surface of the lower femur (**Figure 7.16**)

The popliteal fossa contains the **popliteal vein, popliteal artery, and nerves**; the sciatic and its two terminal branches; and the tibial and common peroneal (fibular), although the sciatic nerve may bifurcate more proximally.

The **sural nerve** is a cutaneous nerve that runs over the posterior aspect of the leg and is formed by roots from both the tibial and common peroneal nerves.

The **short saphenous vein (SSV)** drains into the popliteal vein. It runs superficial to the crural fascia before piercing the popliteal fascia to join the popliteal vein (important when dealing with varicose veins of the SSV).

The popliteal artery is the deepest structure (but the most anterior) and clinically not easy to palpate.

Popliteal Artery

This is the continuation of the femoral artery at the adductor hiatus, at the junction of the middle and lower thirds of the thigh.

The popliteal artery branches into two significant arteries, the anterior and posterior tibial arteries, at the inferior border of the popliteus.

It is the major contributor to the blood supply of the knee joint, by giving five genicular (related to the knee) branches

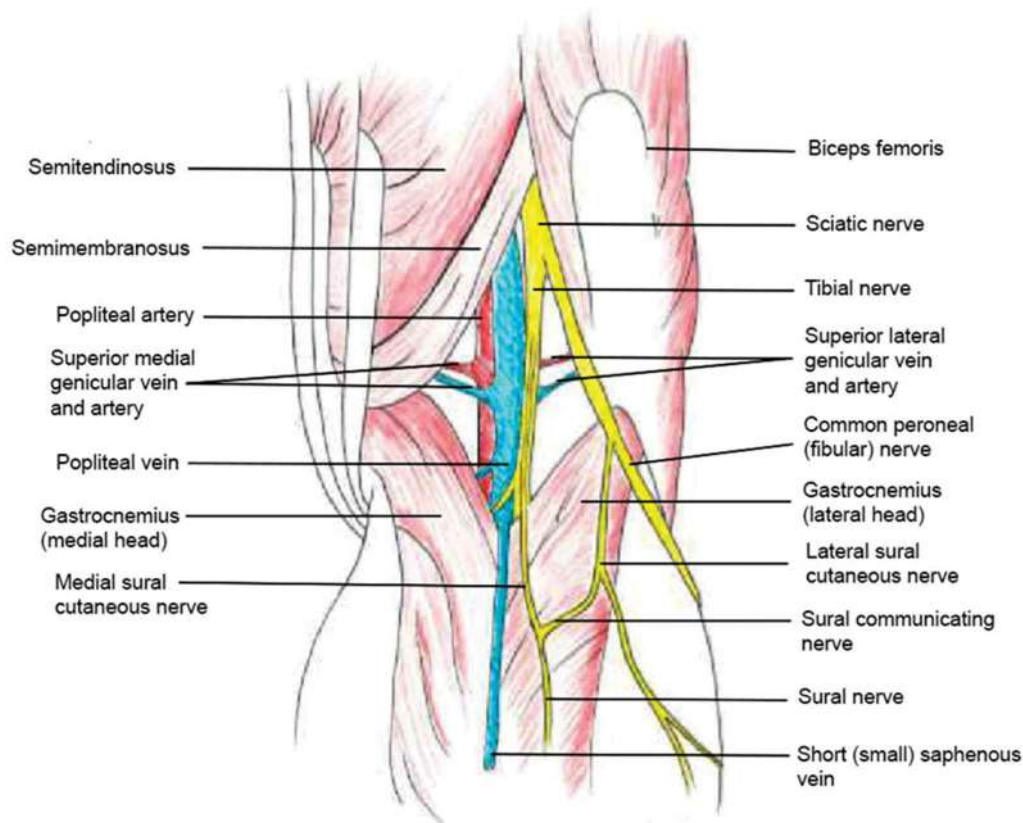


FIGURE 7.16 Structures within the popliteal fossa. (Courtesy of Xi Ming Zhu.)

(in addition to the muscular arterial branches to the hamstrings and gastrocnemii):

- Superior medial and lateral genicular
- Inferior medial and lateral genicular
- Middle genicular

The two nerves (tibial and common peroneal) are the most superficial structures. The common peroneal nerve follows the biceps femoris tendon.

Learning Point

Always check both sides, as about 50% of popliteal aneurysms are bilateral.

CLINICAL NOTES

The “**fem-pop**” (femoro-popliteal) bypass graft is one of the most common vascular operations to improve the arterial blood supply to the leg following blockage of the femoral artery.

POPLITEAL ANEURYSM

A dilation in the popliteal artery can lead to compression of other structures in the popliteal fossa, including compression of the tibial nerve, which leads to foot/posterolateral leg paraesthesia (abnormal sensation, typically “pins and needles”) and weak/absent plantar flexion. A distinction between a popliteal aneurysm and other masses can be made by applying a stethoscope to the site to detect turbulent blood flow (bruit); an aneurysm can be determined by palpable pulsation (thrill).

Popliteal Block

Block of the sciatic nerve (L4–S3).

Site location is identified at a point 5 cm above the popliteal skin crease and 1 cm lateral to the line bifurcating the popliteal fossa. Usually performed under ultrasound guidance. This nerve block is performed in foot and ankle surgery.

Anterior Tibial Artery

This vessel originates posterior to the tibia at the distal aspect of the popliteus and supplies the anterior compartment of the leg and dorsal surface of the foot. Its course is between the tibia and fibula, through an oval opening at the superior aspect of the interosseous membrane. After leaving the interosseous membrane, the artery descends between the tibialis anterior and extensor digitorum longus. As it passes the anterior aspect of the ankle joint, it becomes the dorsalis pedis artery.

Posterior Tibial Artery

This artery passes deep to the gastrocnemius and soleus and supplies the posterior and lateral compartments of the leg and

plantar surface of the foot. It gives rise to a large branch, the **peroneal (fibular) artery**, close to its origin from the popliteal artery, about 2.5 cm below the lower border of the popliteus, which supplies the lateral leg compartment. It then passes behind the medial malleolus (*vide infra*) and divides into the medial and lateral plantar arteries.

Dorsalis Pedis Artery

Supplies the dorsal surface of the foot as a continuation of the anterior tibial artery; arises at the anterior aspect of the ankle joint (midway between the malleoli). Runs on the dorsum of the foot to the proximal part of the first intermetatarsal space, where it divides into two branches, the **first dorsal metatarsal artery** and the **deep plantar artery**, which joins the lateral plantar artery of the posterior tibial artery, forming the plantar arch.

Pulse points in the lower limb (Figure 7.17):

- *Femoral pulse:* palpate the artery as it enters the femoral triangle. This can be found at the midinguinal point (midway between the ASIS and pubic symphysis).
- *Popliteal pulse:* this is more technically challenging to palpate. Can be found by deep palpation of the popliteal fossa; flexion of the knee can assist by relaxing surrounding fascia.

- *Dorsalis pedis pulse:* found by palpation lateral to the extensor hallucis longus tendon on the dorsum of the foot.
- *Posterior tibial pulse:* palpable behind and below the medial malleolus.

Venous Drainage of the Lower Limb

The venous drainage is by both deep and superficial veins (**Figure 7.18**).

Dorsal Venous Arch

A superficial vein that connects the short and great saphenous veins. It courses superficial to the metatarsal bones across the dorsal aspect of the foot. Lies midway between the malleoli and metatarsophalangeal joints.

Long (Great) Saphenous Vein (LSV)

The LSV is the longest vein in the body, running from the hallux to the femoral triangle. It drains the medial side of the dorsal venous arch then courses **anterior to the medial malleolus**, on the medial aspect of the leg, then posterior to the medial aspect of the patella. Ascends superficially along the medial aspect of the thigh to end in the femoral vein in the femoral triangle, after piercing the cribriform fascia (2-3 cm below the pubic tubercle). Here, it usually receives four tributary veins: the superficial epigastric, deep external pudendal, superficial external pudendal, and superficial circumflex iliac.

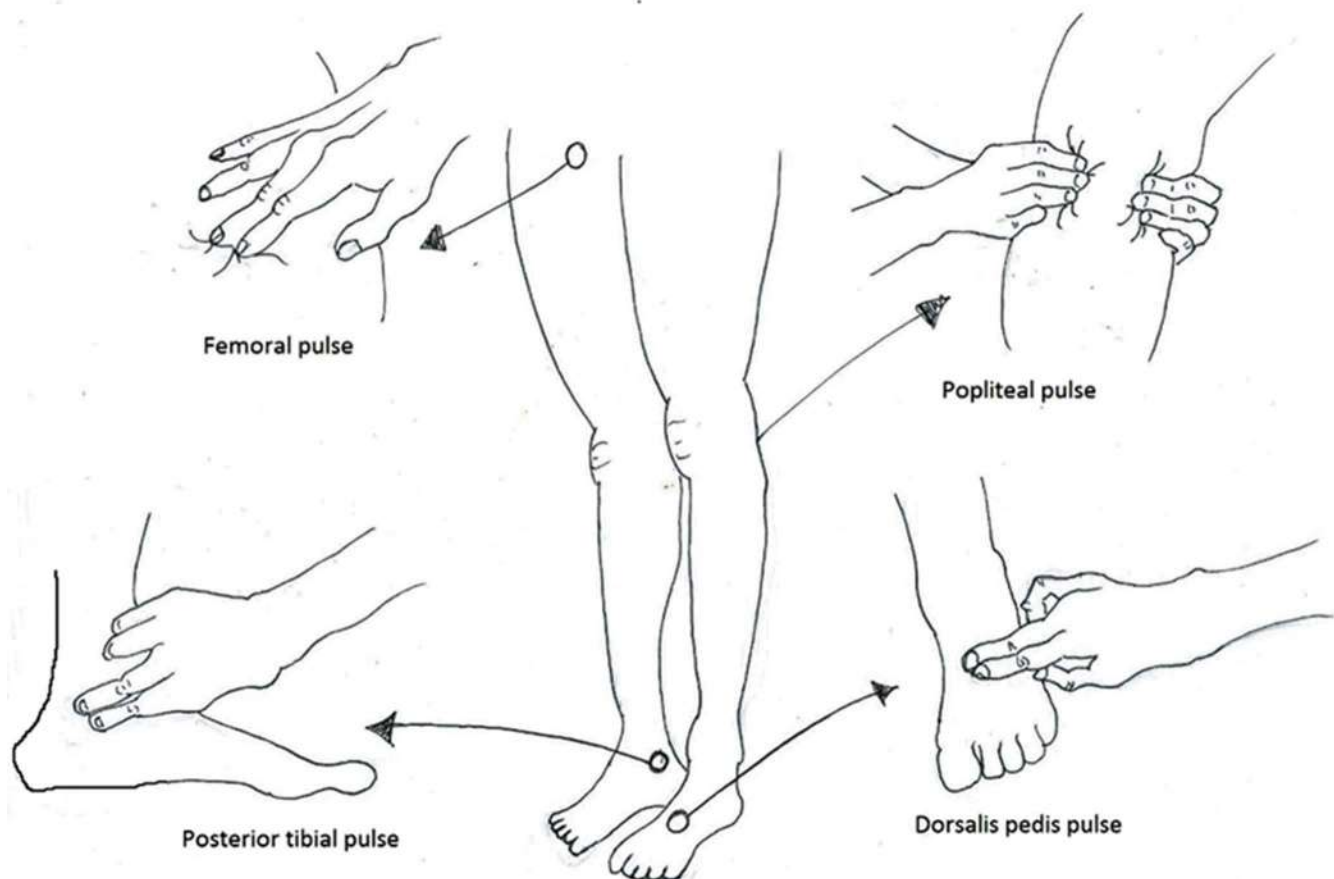


FIGURE 7.17 Pulse points in the lower limb. (Courtesy of Calum Harrington-Vogt.)

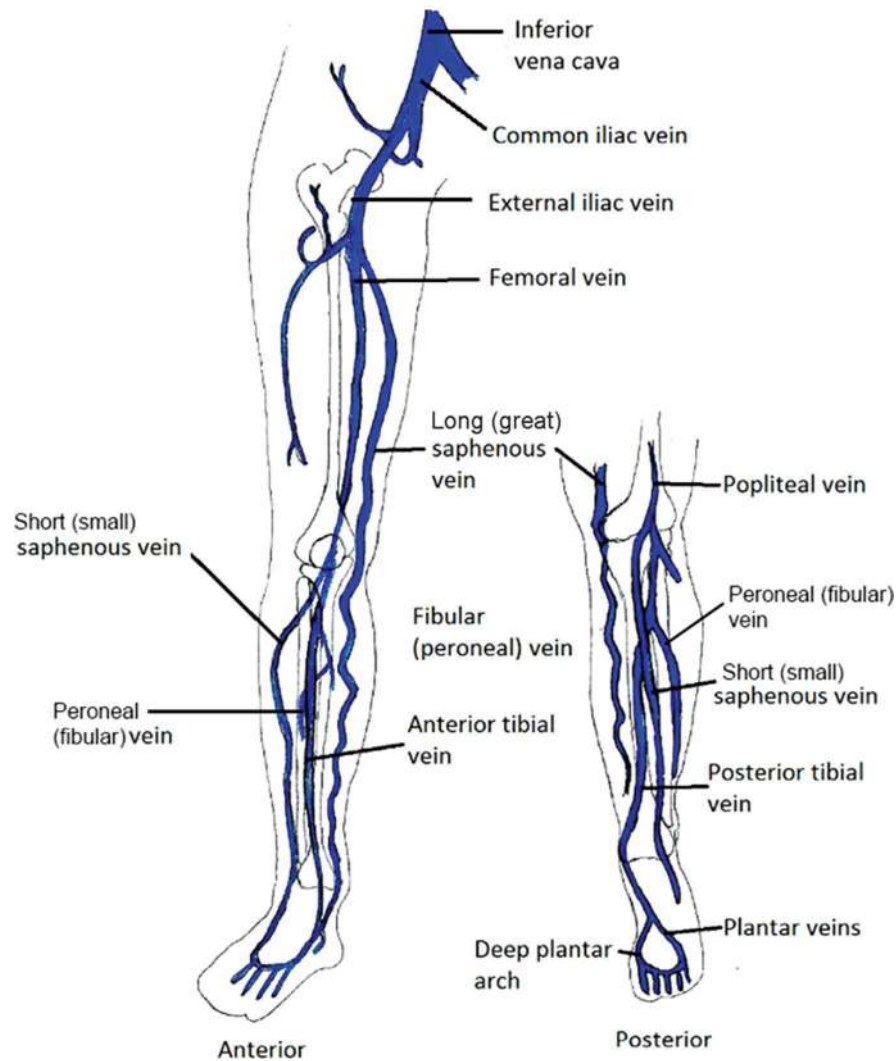


FIGURE 7.18 The venous drainage system of the lower limb. (Courtesy of Calum Harrington-Vogt.)

Short Saphenous Vein (SSV) (Figure 7.19)

Begins posterior to the lateral malleolus as it drains the lateral side of the dorsal venous arch. Ascends superficially at the midline of the posterior leg, to flow into the popliteal vein at the popliteal fossa, after piercing the deep fascia. (Saphenous: probably from the Greek *saphaina*, “to be clearly seen”).

CLINICAL NOTES

CORONARY ARTERY BYPASS GRAFT (CABG)

A major operation that harvests segments of the long and/or short saphenous veins to be used for bypass grafting in the heart, which aims to alleviate cardiac ischaemia by bypassing blockage of the coronary arteries. This is not a first-line treatment and is only considered if balloon angioplasty or stenting fails.

Note: Due to the presence of valves in these veins, these vessels must be placed in the right orientation when grafted to the heart.

Deep veins of the leg occur as *venae comitantes*, pairs of veins that tightly adhere to the arteries to drain deeper structures. Pulsation of the artery, and movement of the surrounding muscles, work alongside the valves to increase pressure to return the venous blood to the heart. Other veins are less intimately related and do not occur as *venae comitantes*.

The soleal venous plexus is formed within the soleus muscle and contributes to the calf muscle pump. It drains into the popliteal vein. DVT (*vide infra*) usually starts within this plexus and spreads proximally.

Popliteal Vein

Formed by the anterior tibial and posterior tibial *venae comitantes*. It lies more superficial than the popliteal artery. It becomes the femoral vein as it passes through the adductor hiatus.

The SSV drains into the popliteal vein, in addition to the genicular veins, which correspond to the five genicular arteries mentioned earlier.

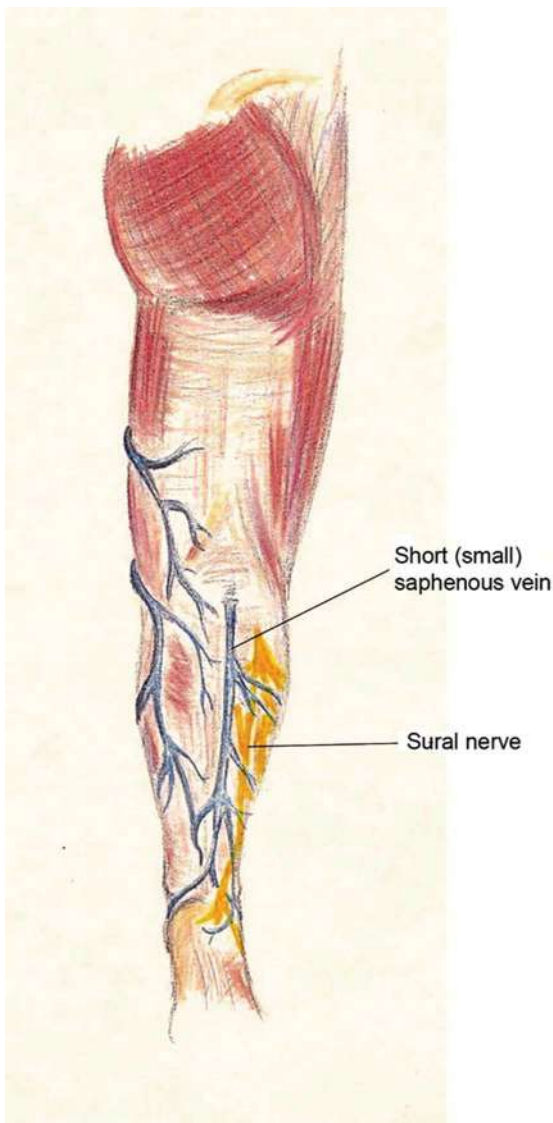


FIGURE 7.19 The posterior aspect of the leg and course of the short saphenous vein. (Courtesy of Kathryn DeMarre.)

Femoral Vein

Begins at the hiatus of the adductor canal as the continuation of the popliteal vein. Runs alongside the medial side of the femoral artery in the femoral sheath. It becomes the external iliac vein as it passes deep to the inguinal ligament.

Drains significant veins such as the profunda femoris vein and LSV, at the saphenofemoral junction.

Lower Limb Lymphatics

There are both superficial and deep lymphatic vessels which drain into superficial and deep inguinal lymph nodes, respectively (**Figure 7.20**).

Deep Lymphatic Vessels

Note: *these vessels are not related to the deep inguinal lymph nodes.*

Terminate in the popliteal lymph nodes and accompany deep arteries of the lower leg only (anterior tibial artery, posterior tibial artery, peroneal artery).

Superficial Lymphatic Vessels

The superficial lymphatic vessels are more numerous and are classified into medial or lateral lymphatics (**Figure 7.21**).

Medial Superficial Lymph Vessels

Terminate in the superficial inguinal lymph nodes (lymph node positions are given relative to the saphenofemoral junction in the femoral triangle) and closely follow the course of the LSV.

Drain:

- Anteromedial lower leg (to inferior superficial inguinal nodes)
- Medial side of the gluteal region and lower abdominal wall (to superolateral superficial inguinal nodes)
- Perineum and external genitalia (to superomedial superficial inguinal nodes)

Lateral Superficial Lymph Vessels

Terminate in the popliteal lymph nodes. Closely follow the course of the SSV.

Drain:

- Superficial regions of the posterolateral aspect of the leg
- Plantar aspect of the foot

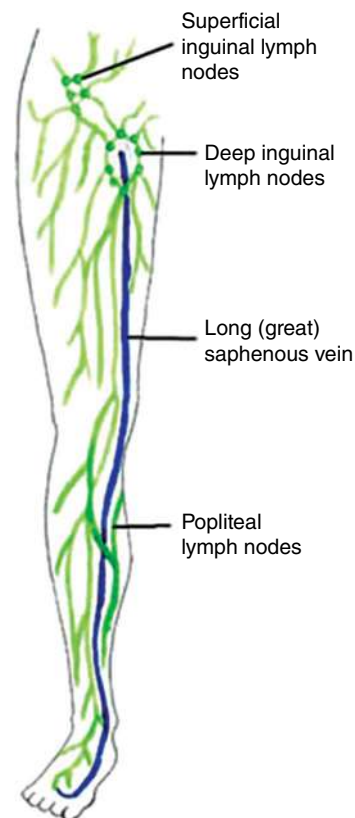


FIGURE 7.20 Lymphatics of the lower limb. (Courtesy of Calum Harrington-Vogt.)

Inguinal Lymph Nodes

Deep Inguinal Lymph Nodes

Located deep to the cribriform fascia of the saphenofemoral junction and arranged medial to the femoral vein. These three to five

nodes drain the glans penis or clitoris) and superficial inguinal lymph nodes. The deep inguinal lymph nodes drain to the external iliac lymph nodes (this is relevant to cancer metastasis).

CLINICAL NOTE

SENTINEL NODE BIOPSY

Cloquet's node is the most superomedial node of the deep inguinal lymph nodes, within the femoral canal medial to the femoral vein. It is considered to be the most often involved of the inguinal nodes in metastasis. Involvement of this node is often used to determine the extent of metastasis and whether further surgery is necessary to excise cancerous lymph nodes. Penile cancer and malignant melanoma of the skin of the lower limb are examples of the use of this lymph node to predict metastasis.

For more details on sentinel node biopsy, see [Section 4, The Breast](#).

Superficial Inguinal Lymph Nodes

Located deep to the superficial fascia, within the femoral triangle. These nodes form a chain that overlies the femoral vessels and lie in a T-shape arrangement (lateral, medial and vertical) [Figure 7.21](#). The roughly 10 nodes that comprise this group drain the structures of the lower limb, including the lower back up to the level of the iliac crests, anterior abdominal wall below the umbilicus, the anus below the dentate line, and the external genitalia (except the testes).

CLINICAL NOTES

Lymphadenopathy is the enlargement of lymph nodes due to different causes such as cancers and infections of the drainage area. This is because lymph nodes are a part of the immune system.

Lymphoedema of the lower limb is due to inadequate lymphatic drainage and presents as unilateral or bilateral lower limb swelling. It can be due to primary causes (congenital such as Milroy's disease) or secondary to parasitic infection by the nematode *Wuchereria bancrofti*, malignancies such as lymphomas, surgical excision of lymph nodes, and postoperative radiotherapy.

DEEP VEIN THROMBOSIS

Occurs as a result of blood clotting in the deep veins of the lower limb (mainly in the soleal venous plexus). This can be a result of inactivity (less muscle movement means less pressure exerted on veins to propel blood, leading to stasis, and thus clotting), especially after major surgical procedures; old age; certain blood disorders; and intake of certain medications (see Virchow's triad, [Section 4A, Thorax](#)). These factors are particularly important postoperatively, when damage to veins during surgery is likely to occur, for example, pressure on the calf while the patient is anaesthetised; this is the reason for applying thromboembolic deterrent (TED) stockings and the use of intraoperative electrical stimulation of the calf muscles and avoiding trauma to the calf muscle, in addition to the use of low-molecular-weight heparin subcutaneous injections, for example, enoxaparin (Clexane).

Pulmonary embolism (PE) can be a life-threatening condition that can complicate DVT. The clots are transported via the deep veins of the leg and pelvis to the inferior vena cava, and ultimately to the right atrium and ventricle. Massive emboli may block the main pulmonary artery and prove fatal.

Varicose veins

Varicose veins are tortuous and dilated superficial veins. The pathology of varicose veins is mainly related to leaking valves at the junctions between superficial and deep venous systems, usually occurring in the superficial veins of the leg (especially the saphenous veins). This condition is not life-threatening, primarily presenting as a cosmetic issue that can be painful in some patients. Complications of varicose veins include the development of venous ulcers (typically over the medial malleolus at the point of the highest venous pressure) and thrombophlebitis (inflammation of the veins).

Learning Point

DVT should be highly suspected and excluded (clinically and by Doppler studies) in patients with a swollen/painful leg following surgery, childbirth, and a long stay in bed for different reasons.

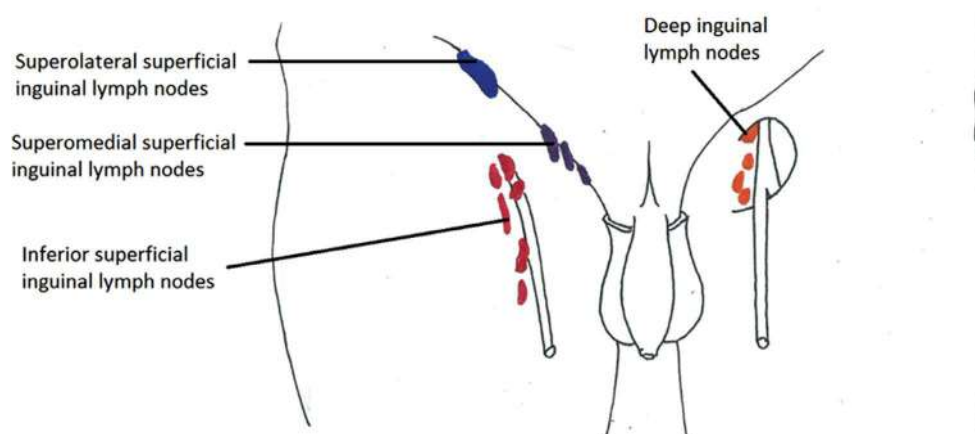


FIGURE 7.21 Inguinal lymph node clusters. (Courtesy of Calum Harrington-Vogt.)

The Knee Joint

Overview:

- The knee is a synovial joint of a modified hinge type, which is formed between the femoral condyles and the corresponding condyles of the tibia and anteriorly between the patella and the patellar surface of the femur (the latter forming the patellofemoral joint). The articular surfaces of the tibia, femur, and patella are covered by hyaline articular cartilage.
- It allows a range of motion (flexion, extension, and knee rotation) to occur in the leg, which is crucial for locomotion and allows bipedal movement.
- Extension is limited at the knee joint, but it allows a great range of flexion; this is important in the gait cycle.
- The knee joint is extended by the quadriceps femoris; flexed by hamstring muscles; and assisted by the gracilis, sartorius, and popliteus. Medial rotation is accomplished by the semitendinosus, gracilis, and sartorius, while lateral rotation is produced by the biceps femoris.
- The main stability of the knee joint depends on the muscles acting on the joint, specifically the quadriceps femoris.
- The knee joint receives innervation from the femoral, obturator, tibial, and common peroneal nerves.

The knee joint “locks” in full extension, creating a close-packed joint that requires very little energy to maintain the body in a standing position (see the discussion on the popliteus muscle later).

Osteology

The femur is categorised as a long bone; it is the longest and strongest bone in the body.

The fibula does not articulate directly with the femur; however, it articulates with the tibia and has a ligament that links it to the distal femur (the lateral collateral ligament), and thus it plays a role in stabilising the knee joint.

The patella is the smallest bone in the knee joint (see later). It plays a crucial role in bringing stability to the knee joint. The patella is a sesamoid bone that lies within the tendon of the quadriceps femoris muscle.

Capsule

A strong capsule covers the bony surfaces of the lower femur and upper tibia. Anteriorly, the capsule attaches to the edges of the quadriceps tendon, patella, and patellar tendon. The capsule receives reinforcements on the two sides, medially and laterally, from the tendons of the vastus medialis and vastus lateralis (medial and lateral retinacula, respectively) on each side of the patella. Posteriorly, it receives a reflection from the tendon of the semimembranosus (forming the oblique popliteal ligament).

The **synovial membrane** lines the inside of the joint but has an anterior pouch which extends upwards deep to the lower part of the quadriceps muscle, above the patella, forming the **suprapatellar bursa**, in addition to prepatellar and infrapatellar bursae.

The synovial cavity can also communicate with the semimembranosus bursa on the back of the knee joint (if enlarged, it is called Baker’s cyst or popliteal cyst), which can present as a mass in the popliteal fossa (other masses, such as an aneurysm of the popliteal artery, must be excluded by proper clinical assessment and ultrasound imaging).

Ligaments

Like the hip joint, the knee joint has both intracapsular and extracapsular ligaments (Figure 7.22).

Anteriorly, the **ligamentum patellae** (patellar tendon) is the name given to the lower part of the tendon of the quadriceps muscle between the lower patella and the tibial tuberosity.

This structure is where the clinician detects the **knee jerk reflex** by eliciting contraction of the quadriceps after striking with the patella hammer (checking L2–L4 spinal segments). The knee jerk is a monosynaptic reflex between the stretch receptors in the tendon (afferent nerves), which synapse with anterior horn cells in the spinal cord, causing contraction of the quadriceps muscle.

The **popliteus** is a small muscle within the posterior knee. It arises from the lateral femoral condyle and inserts into the posterior surface of the tibia and is used for “unlocking” the knee when initiating walking. It does this by medially rotating the tibia during the closed portion of the gait cycle. Locking the knee during standing still allows the body to conserve energy. The tendon of the popliteus muscle separates the lateral collateral ligament from the lateral meniscus. Its nerve supply comes from the tibial nerve.

The Intracapsular Ligaments

Cruciate ligaments are named according to their attachment to the articular surface of the tibia. They are named from their resemblance to a cross (*crux* in Latin). The cruciate ligaments are intracapsular but outside the synovial membrane.

Anterior Cruciate Ligament (ACL)

The ACL is a diagonal ligament (runs down and medially) from the lateral femoral condyle to the anterior intercondylar eminence on the tibial plateau. With the knee flexed, it resists anterior translation of the tibia and posterior displacement of the femoral condyle. The anterior drawer test allows us to check whether damage has been inflicted to this ligament.

Posterior Cruciate Ligament (PCL)

The PCL is a diagonal (runs down and laterally) ligament running from the medial femoral condyle to the posterior part of the intercondylar eminence on the tibial plateau. It resists posterior translation of the tibia and anterior displacement of the femoral condyle when the knee is flexed, and it can be tested using the posterior drawer test. ACL injuries are more common than PCL injuries.

The Extracapsular Ligaments

Collateral Ligaments

Alongside the two cruciate ligaments are the medial and lateral collateral ligaments of the knee joint. Both exist to prevent excess varus and valgus stress on the knee.

- The **medial** (or tibial) **collateral ligament** is attached to the medial epicondyle of the femur proximally and to the medial condyle of the tibia distally and acts to prevent valgus stress on the knee joint, i.e., it prevents forces from acting medially on the joint. The medial side of the knee is responsible for bearing most of the force of weight on the knee joint and provides medial stability to the knee joint. This fibrous and broad ligament forms part of the “unhappy triad” and is more commonly injured when compared to its counterpart, due to excess valgus stress placed upon this ligament, with the knee in a slightly flexed position, causing injury.
- The **lateral** (or fibular) **collateral ligament** is a strong fibrous band, narrower than its counterpart, attached to the lateral epicondyle of the femur proximally and to the head of the fibula distally, where it splits the tendon of the biceps femoris at its insertion. It acts to prevent excess varus stress on the joint, i.e., it prevents forces acting laterally on the joint.

Menisci (Semilunar Cartilages)

The menisci are C-shaped fibrocartilage structures firmly attached to the upper surface of the tibial condyles (tibial plateau). Each meniscus is formed of a thick peripheral part and a thin concave inner part and has anterior and posterior horns. Their function is to deepen the articular surface of the tibial condyles and act as cushions between the femoral and tibial condyles.

The medial meniscus is attached to the medial collateral ligament, and its anterior horn blends with the ACL. Consequently, it is less mobile and more prone to injuries.

Osteology of the Patella

The patella (kneecap or “flat dish” in Latin) is the largest sesamoid bone in the body. It has a wide upper border and pointed lower border (patellar apex) and is located within the tendon of the

quadriceps femoris. The posterior surface has articular facets that articulate with the distal femur (lateral and medial condyles). The lateral femoral condyle projects farther forward than the medial condyle, as a bony obstacle to lateral movements of the patella.

Blood Supply

The knee joint has a rich blood supply from the anterior and posterior tibial, popliteal (the five genicular arteries, see earlier), and femoral arteries and the descending branch of the lateral circumflex artery (from the femoral).

Nerve Supply of the Knee Joint

From the saphenous nerve (a branch of the femoral nerve), both tibial and common peroneal nerves, in addition to an articular branch of the obturator nerve.

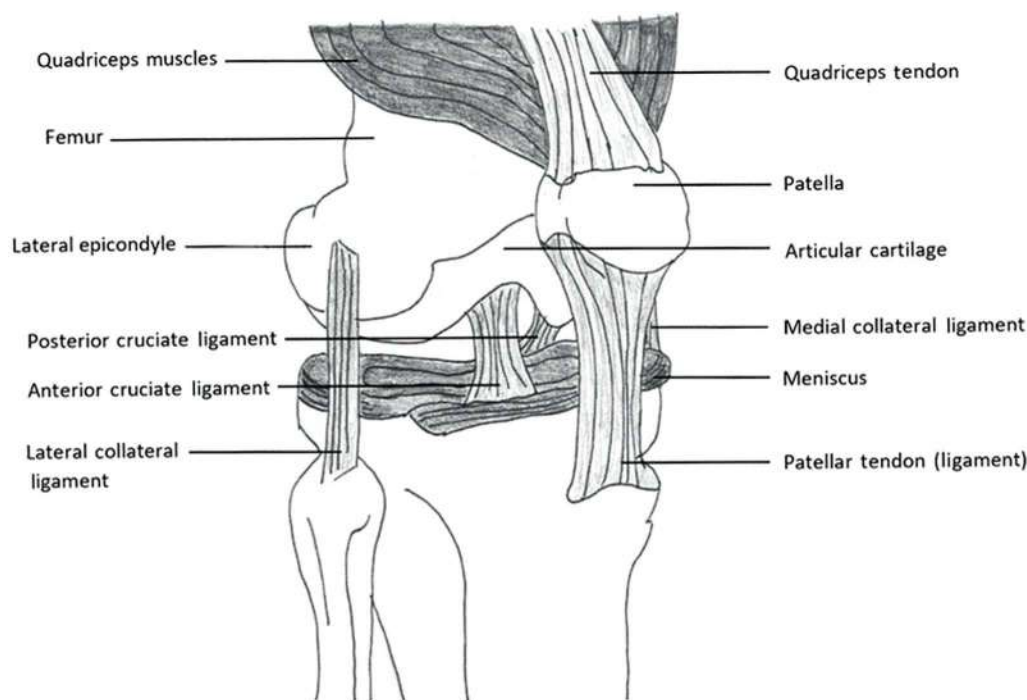


FIGURE 7.22 Structures within the knee joint. (Courtesy of Alina Humdani.)

CLINICAL NOTES

McMURRAY'S TEST

This is one of the clinical tests for meniscal injury. With the patient in the supine position, the examiner holds the heel with one hand and the knee in the other hand. It is elicited by bending the knee first, then straightening it and rotating the lower leg on both lateral and medial sides. With a palpable or audible click on these movements, the test is considered positive for a torn meniscus.

MENISCAL INJURIES

Most injuries follow sports such as football (squat and twist knee) with sudden pain in the knee and sometimes locking of the knee.

Degenerative changes in the menisci occur with aging and can follow previous knee injury.

THE UNHAPPY TRIAD

The “unhappy triad” or “O’Donoghue triad” is an injury to the ACL, medial collateral ligament, and medial meniscus. It is the among the most common injuries to the knee and can be sustained during sports such as football and rugby. It occurs as a result of excess lateral (valgus) stress to the knee. Repair often involves surgery and reconstruction of the ligaments.

ARTHROSCOPY

Arthroscopy is the surgical procedure to visualise the inside of the joint by inserting a telescope attached to a

(Continued)

camera. It is both diagnostic (for meniscal and cruciate ligament injury) and therapeutic (joint irrigation, suturing of cruciate ligament rupture, meniscectomy).

DEFORMITIES OF THE KNEE JOINT

Valgus and varus deformities can occur at the knee joint. In a valgus deformity, the distal part of the leg is deviated outward, resulting in a knock-kneed appearance. Conversely, a varus deformity occurs when the distal leg is deviated inwards, leading to a bowlegged appearance.

SWOLLEN KNEE

1. *Generalised swelling*: joint effusion (excessive fluid collection) seen in rheumatoid arthritis, osteoarthritis, septic arthritis, and haemarthrosis
2. *Localised swellings*: prepatellar bursa (anteriorly), Baker's cyst posteriorly

HAEMARTHROSIS

Collection of blood in the joint cavity. It usually follows severe trauma to the knee and can be a feature of haemophilia following a trivial trauma. It involves heavy bleeding into the joint; this can cause extreme pain and cause clots to form within the joint.

SEPTIC ARTHRITIS

Septic arthritis is defined as the deep infection of a joint, and the knee joint is the most commonly affected joint. The causative bacteria are mostly *Staphylococcus aureus* (especially in patients with previous joint implants and the immunocompromised). In young people, gonococcal arthritis is an important cause. In septic arthritis the knee joint will become inflamed (red), swollen, hot, and painful. It is a medical emergency, and prompt treatment is required to avoid septicaemia and possible death. The treatment involves an urgent referral to hospital and intravenous (IV) antibiotics along with joint aspiration.

OSTEOARTHRITIS

The knee joint is commonly affected by osteoarthritis, a type of non-inflammatory arthritis. It is generally caused by "wear and tear" and usually affects the more elderly population. However, with the increased prevalence of obesity, osteoarthritis has been affecting younger people. This condition can be extremely painful.

ABOVE- AND BELOW-KNEE AMPUTATIONS

These common operations are indicated for different reasons:

- Critical limb ischaemia, commonly due to diabetes and atherosclerosis (this the most common cause for above- or below-knee amputations)
- Severe trauma to the leg, where vascularity is irreversibly compromised
- Severe infections of the leg
- Malignant conditions of the leg

The decision between above- and below-knee amputation depends on the clinical assessment, especially making sure of enough blood supply to the skin flaps.

OSGOOD-SCHLATTER DISEASE

Osgood-Schlatter disease is inflammation of the patellar ligament at the tibial tuberosity due to repeated tension on the growth plate of the upper tibia which usually affects teenagers. It presents with a tender bump below the knee that is worse with activity and better with rest. These episodes of pain can last up to a few months. Both knees can be affected. Risk factors include excessive sports such as running and jumping. X-rays can show either a normal or fragmented attachment area.

The patella has more tendency to dislocate laterally, counteracted by the horizontally oriented fibres of the lower part of the vastus medialis.

Fractures of the patella can be of the comminuted or transverse type and impair proper knee extension.

Osteology of the Tibia

The tibia is the second longest bone in the body, found on the medial aspect of the leg. It consists of an upper end, shaft, and lower end.

The upper end of the tibia has a semi-flat articular surface on both medial and lateral tibial condyles (which is called the tibial plateau). The condyles are separated by the **intercondylar eminence**, which has anterior and posterior areas that mark the sites where the cruciate ligaments attach.

The tibial condyles articulate with the femoral condyles within the knee joint. The lateral tibial condyle below the plateau articulates with the head of the fibula (forming the superior tibiofibular joint).

The tibial plateau also forms attachment points for the medial and lateral menisci. The medial condyle forms an attachment point for the semimembranosus tendon, whereas the iliotibial tract and the popliteus tendon attach to the lateral condyle. Anteriorly, beneath the condyles is the **tibial tuberosity**, which serves as an attachment point for the patellar tendon (ligamentum patellae), a continuation of the quadriceps tendon.

Connecting the proximal and distal portions of the tibia is the **tibial shaft**, triangular in cross-section. It has an anterior, medial, and lateral (interosseus) border and three surfaces (lateral, medial, and posterior). The anterior border and the medial surface (the shin) are subcutaneous, and fractures at this site are more likely to be of the compound type (open and exposed to infection). The soleus muscle is attached to the **soleal line** posteriorly, in addition to its origin on the posterior fibular shaft. The tendons of the sartorius, gracilis, and semitendinosus attach to its upper medial surface at the *pes anserinus*. The popliteus muscle is attached posteriorly to the tibial shaft above the soleal line. The lateral surface is occupied by the muscles of the anterior compartment (see later).

The tibial shaft provides attachment points for the tibialis anterior on its lateral surface and the plantar flexors (flexor digitorum longus, tibialis posterior) and soleus posteriorly. The interosseous membrane (composed of tough, fibrous tissue) connects the lateral tibial border with the medial fibular border; some books consider it the middle tibiofibular joint.

Distally, the tibia on its medial surface forms the medial malleolus, which articulates with the talus (talocrural joint). The lateral part of the lower end (fibular notch) articulates with the fibula (lower tibiofibular joint) (Figure 7.23).

Osteology of the Fibula

Thinner in diameter than the tibia, the fibula is a long, non-weight-bearing bone located laterally to the tibia in the leg. The **head of the fibula** (proximal end) is oval in shape and articulates with the lateral aspect of the lateral tibial condyle and forms an attachment point for the lateral collateral ligament and the biceps femoris.

The **common peroneal nerve (a branch of the sciatic nerve)** wraps around the neck of the fibula, which is clinically significant, as the nerve may be damaged in fractures of the fibular neck or via plaster cast treatment. The common peroneal nerve also divides here into its superficial and deep branches. The **shaft of the fibula** provides attachment points for the peroneus (fibularis) longus and brevis muscles, in addition to the extensor digitorum longus and extensor hallucis longus anteriorly, and the plantar flexors tibialis posterior and flexor hallucis longus, on its posterior surface.

The **lower end of the fibula** continues as the lateral malleolus distally, which projects farther than the medial malleolus and articulates with the talus. The lateral malleolus provides attachment points for the lateral ligaments of the ankle joints, including the anterior and posterior talofibular ligaments and the calcaneofibular ligament. The tendons of the peroneus (fibularis) longus and brevis pass posterior to the lateral malleolus to their attachment points at the base of the fifth metatarsal (brevis) and medial cuneiform and first metatarsal (longus) (Figure 7.23).

CLINICAL NOTES

FRACTURES OF THE TIBIA AND FIBULA (“TIB AND FIB”)

Combined fractures of the tibia and fibula are common and may follow direct injury to the leg due to road traffic accidents (bumper fracture, for example) and contact sports (Figures 7.24–7.26).

The following should be noticed in patients who sustain tibial and fibular fractures:

- Neurovascular injuries, such as injury to the popliteal artery or common peroneal nerve (see “Osteology of the Fibula” above).
- The development of compartment syndrome (*vide infra*).
- Fractures of the subcutaneous anterior border and the medial aspect of the tibia are more likely to be of the compound type (liable for contamination and development of osteomyelitis if not treated properly).
- Delayed union and non-union, specifically of tibial fractures, are well-known long-term complications.

See Figures 7.24 and 7.25, where two views have been taken: an anteroposterior (AP) view (left image) and a lateral view (right image).

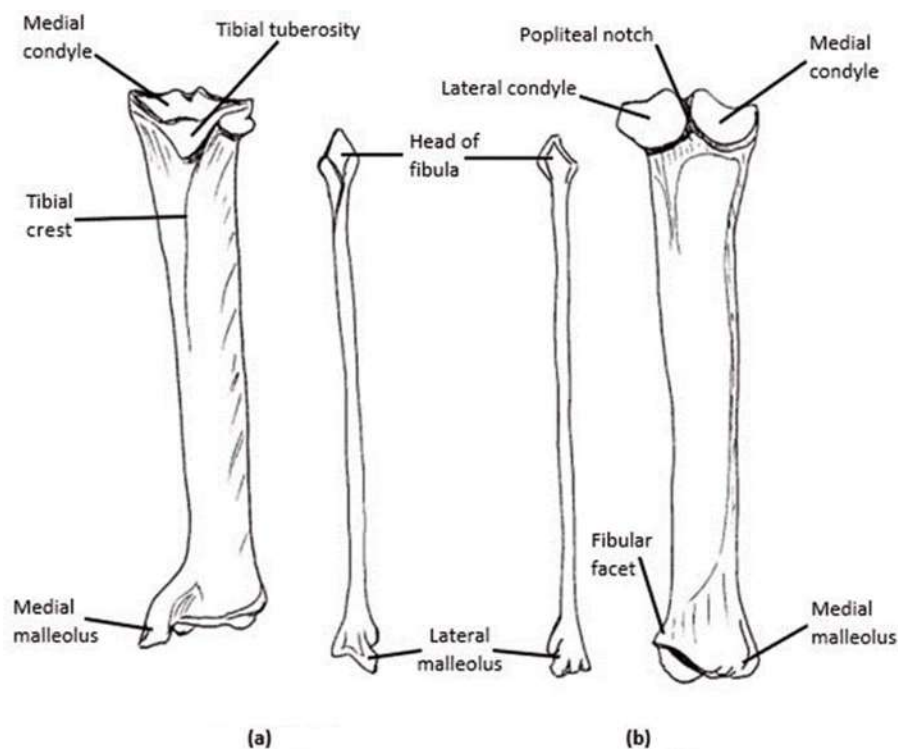


FIGURE 7.23 (a) Anterior and (b) posterior views of the left tibia and fibula. (Courtesy of Alina Humdani.)

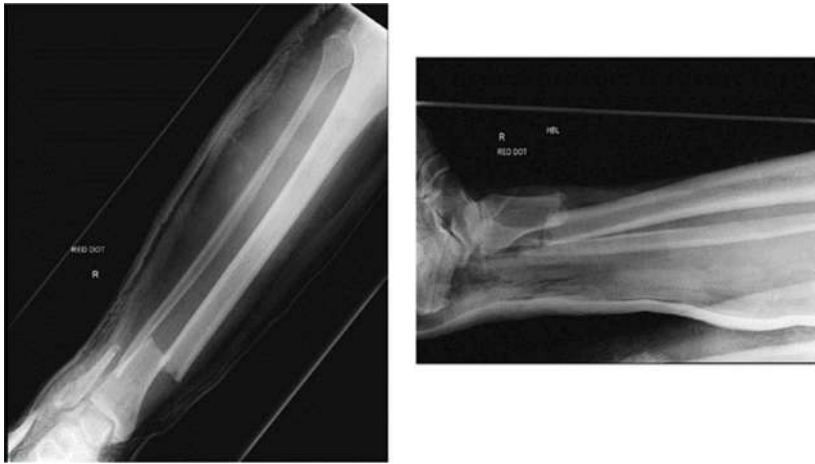


FIGURE 7.24 AP and lateral views, plain film X-ray of the right lower limb of a 21-year-old male who fell on to his right lower leg and sustained fractures of lower parts of the tibia and fibula. (Courtesy of Radiology Dept. at St. George's Hospital NHS Trust.)



FIGURE 7.25 AP and lateral views, plain film X-ray of the right lower limb of a 36-year-old male pedestrian who was involved in a road traffic collision with an oncoming car. Closed comminuted fracture of the proximal midshaft of the right tibia and fibula. Multiple fragments can be seen of both the tibia and fibula. (Courtesy of Radiology Dept. at St. George's Hospital NHS Trust.)



FIGURE 7.26 AP and lateral views, plain X-rays of the same patient in [Figure 4.25](#) showing closed transverse fracture of the distal third of the right tibia and fibula and no involvement of the talocrural joint or subtalar joints. (Courtesy of Radiology Department at St. George's Hospital NHS Trust.)

Musculature of the Leg

The muscles are divided into three distinct compartments: anterior, lateral, and posterior, which have common actions in each compartment (Figure 7.27).

Anterior Compartment of the Leg (Table 7.6)

All of the muscles in this compartment are innervated by the deep peroneal (fibular) nerve (L4–S1), supplied by the anterior tibial artery, and all dorsiflex the foot. Note that L4/L5 segments

innervate the tibialis anterior and L5/S1 segments innervate the rest of the muscles in the anterior compartment. The deep fascia, which covers the extensor compartment, is tough and thick.

The **common peroneal (common fibular) nerve (L4, L5, S1, S2)** is the smaller of the two divisions of the sciatic nerve at the upper part of the popliteal fossa, behind the biceps femoris (of which it supplies the short head). It gives articular branches to the knee and the superior tibiofibular joint. It also contributes to the sural nerve, which supplies the posterolateral aspect of the lower leg.

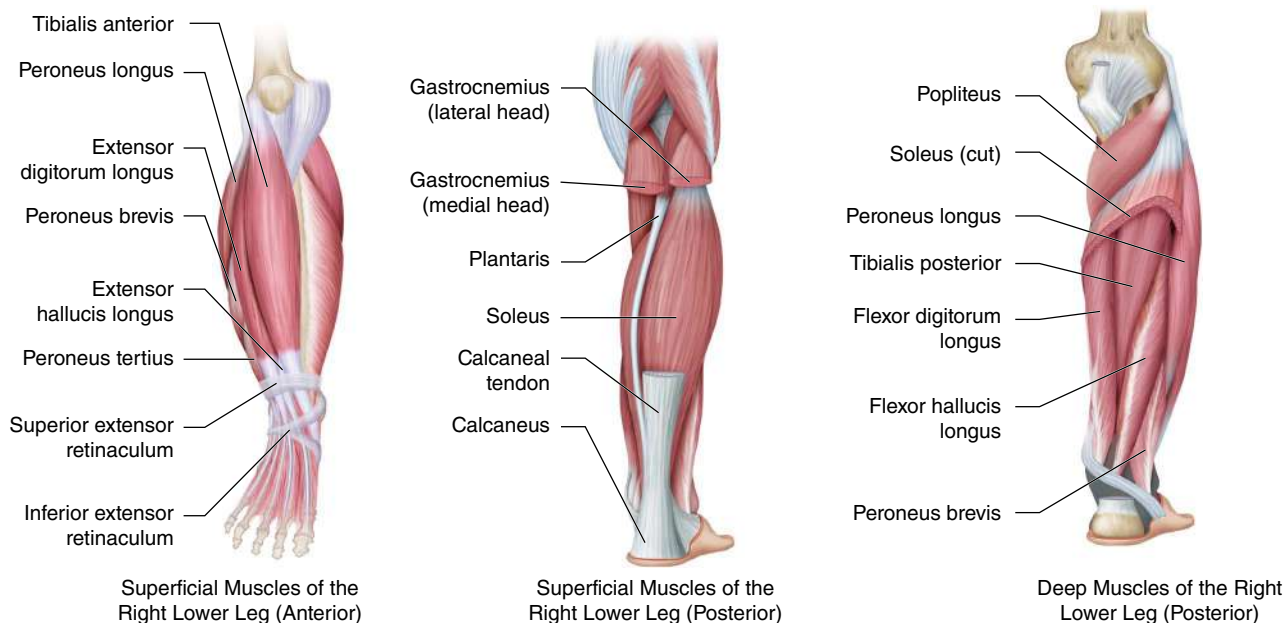


FIGURE 7.27 Muscles of the leg compartments. (Courtesy of Alina Humdani.)

TABLE 7.6: Muscles of the anterior compartment of the leg

Muscle	Attachments	Action
Tibialis anterior	Originates from the lateral surface of the lateral tibial condyle and upper part of the tibial shaft and interosseous membrane; to base of first metatarsal and to the medial cuneiform	Dorsiflexion of the ankle and inversion of the foot at the subtalar joint
Extensor digitorum longus (EDL)	Originates from the lateral condyle of the tibia and medial aspect of the fibula and interosseous membrane; converges into a tendon which splits into four and inserts into the middle and distal phalanges of the lateral four toes	Dorsiflexion of the ankle and extension of lateral four toes
Extensor hallucis longus (EHL)	Originates on the medial surface of the fibula and adjacent interosseous membrane, between the tibialis anterior and EDL; attaches to base of distal phalanx of the big toe	Dorsiflexion of the ankle, extension of the big toe
Peroneus tertius (fibularis tertius)	Originates with the EDL and attaches to the base of the fifth metatarsal	(Weak) dorsiflexion of the ankle and eversion of the foot

The **common peroneal (fibular) nerve winds around the neck of the fibula** in quite a superficial location, which makes it vulnerable to injuries like fractures and following the application of tight casts resulting in loss of eversion and dorsiflexion of the foot. Within the substance of the peroneus longus, it divides into superficial and deep peroneal nerves. The superficial peroneal supplies motor branches to the peroneus longus and brevis and sensation to the anterolateral aspect of the leg and the whole dorsum of the foot, except for the web area between the big and second toes and the lateral side of the big toe and second toe, which are supplied by the deep branch.

The deep peroneal nerve, accompanied by the anterior tibial vessels, enters the extensor compartment, deep to the extensor digitorum longus, to supply all the extensors and dorsiflexors. It enters the foot deep to the extensor retinaculum and supplies motor branches to the extensor hallucis brevis and extensor digitorum brevis.

In clinical examination of a patient with suspected common peroneal nerve injury, ask the patient to walk and check their gait for slapping gait and foot drop. Heel walking checks the dorsiflexors, while toe walking checks the tibial and superficial peroneal nerves.

The next to be checked are the tone and power of the anterior and lateral compartments, and lastly the sensation on the lateral aspect of the leg and foot and dorsum of the foot, for both light and sharp sensation compared with the uninjured side.

The Posterior Compartment of the Leg

The posterior compartment is the largest of the three compartments of the leg. Muscles in this compartment are either within the superficial or deep layer; see [Table 7.7](#).

The nerve supply of the posterior compartment is the tibial nerve, one of the terminal branches of the sciatic nerve. The tibial nerve passes anterior to the superficial muscles (gastrocnemius and soleus) on the posterior surface of tibia posterior. It then

passes with the posterior tibial vessels and the tendons of the flexor digitorum longus, flexor hallucis longus, and tibia posterior behind the medial malleolus.

The tibial nerve divides into medial and lateral plantar nerves.

The posterior tibial artery is larger than the anterior tibial and continues in the foot as the medial and lateral plantar arteries. Palpating the artery is a common question in clinical exams to assess the blood supply to the foot (see “Diabetic Foot”).

TABLE 7.7: Muscles of the posterior compartment of the leg

Layer	Muscle	Attachments	Action
Superficial All muscles in this group are innervated by S1/S2 segments of the tibial nerve (the three muscles are termed the triceps surae)	Gastrocnemius (responsible for most of the bulge of the calf)	Lateral head originates from lateral femoral condyle, and the medial head arises superior to the medial femoral condyle, on the posterior surface of the femur Both insert via the calcaneal tendon on to the posterior surface of the calcaneus	Gastrocnemius and soleus are powerful plantar flexors of the ankle joint and provide the forward propulsive force to raise the heel off the ground in walking and running They are also flexors of the knee joint
	Plantaris	Originates from the lateral supracondylar line of the femur and oblique popliteal ligament Has a long slender tendon which inserts on to the calcaneus, medial to the calcaneal tendon	Assists in plantarflexion of the ankle joint and (weak) flexion of the knee joint
	Soleus	Originates from soleal line of tibia, posterior aspect of fibula and the tendinous arch between tibial and fibular attachments Inserts on to the calcaneal tendon	Plantarflexion of the ankle
Deep The superficial and deep groups are separated by the deep transverse fascia	Tibialis posterior (innervated by L4/L5)	Originates between the tibia and fibula and the posterior surface of the interosseous membrane and attaches to the plantar surface of the medial tarsal bones (navicular, medial cuneiform) and bases of second, third, and fourth metatarsals	Its main action is plantarflexion of the foot at the ankle joint and inversion of the foot at the subtalar joint Supports medial longitudinal foot arch when walking
	Flexor digitorum longus FDL (innervated by S2/S3)	Originates from the medial surface of the tibia and attaches to the plantar surface of the bases of the distal phalanges of the lateral four toes	Flexor of the distal phalanges of the lateral four toes and plantarflexion at the ankle joint, in addition to supporting the medial and lateral longitudinal foot arches
	Flexor hallucis longus FHL (innervated by S2/S3)	From the posterior surface of the fibula In the foot crosses medially to the base of the distal phalanx of the big toe	Plantarflexion of the distal phalanx of the big toe and the foot and supports the medial longitudinal foot arch Note that the tendon of the FDL crosses under the tendon of FHL at the “knot of Henry”
	Popliteus (supplied by L4, L5, and S1)	Within the articular capsule from the lateral femoral condyle to the upper part of the posterior tibia Its tendon passes between the lateral meniscus and the lateral collateral ligament of the knee joint	It has a rotatory function on the knee to slacken its ligaments (unlocking of the knee) by laterally rotating the femur on the tibia at the onset of knee flexion

CLINICAL NOTES

RUPTURE OF ACHILLES TENDON

The Achilles tendon (or tendocalcaneus) is the strongest tendon in the body. Its rupture is usually due to a direct insult or trauma, sustained during forceful plantarflexion of the foot, and usually occurs about 4 cm above its insertion into the calcaneus. The rupture can be complete or partial. Common symptoms from patients who have experienced a ruptured Achilles tendon include the patients felt like they “were shot or kicked in the ankle”, as well as intense pain. The affected foot will be permanently dorsiflexed and cannot plantarflex.

ANKLE JERK REFLEX

Tapping the Achilles tendon with a rubber tendon hammer with the foot dorsiflexed results in contraction of the gastrocnemius and soleus and plantar flexion (S1 spinal segment). This is a stretch reflex and classically very slow in patients with hypothyroidism.

Negative ankle jerk can be a feature of a prolapsed intervertebral disc at the L5–S1 level.

FLEXOR RETINACULUM (TARSAL TUNNEL)

The flexor retinaculum is made up of connective tissue attaching from above the medial malleolus to the inferomedial margin of the calcaneus; this retinaculum is continuous superiorly with the deep fascia of the leg and inferiorly with the plantar aponeurosis of the foot. The flexor retinaculum forms the roof of the tarsal tunnel. The tarsal tunnel transmits the neurovascular bundle, which contains the posterior tibial artery and vein and tibial nerve and the flexor tendons. These structures run behind the medial malleolus; the tendon of the tibialis posterior is the most anterior, then that of flexor digitorum longus, the neurovascular bundle, and most posteriorly is the tendon of flexor hallucis longus (Figure 7.28).

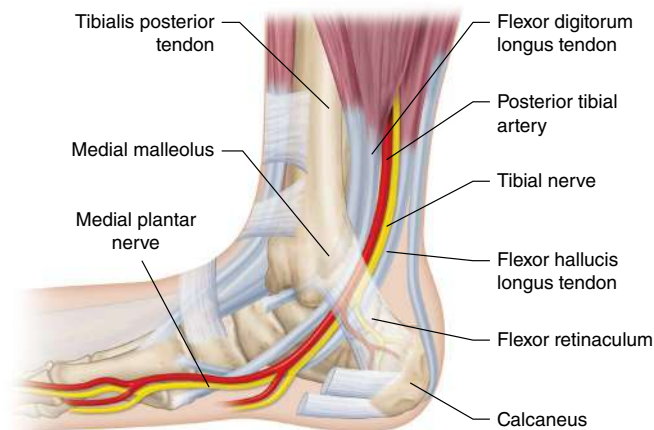


FIGURE 7.28 Structures near the medial malleolus. (Courtesy of Alina Humdani.)

TARSAL TUNNEL SYNDROME

Compression of the tibial nerve at this site is called tarsal tunnel syndrome (compare with the more common carpal tunnel syndrome in the hand).

KEY STRUCTURES NEAR THE MEDIAL MALLEOLUS

Tom Dick and A Very Nervous Harry

Key when learning how different vessels and tendons enter the foot from the lower limb, the area of the medial malleolus provides a well-documented pathway for three tendons along with an artery, vein, and nerve to enter the foot, through the tarsal tunnel, deep to the **flexor retinaculum**. To learn the precise order of the tendons and vessels, **Tom Dick and A Very Nervous Harry** is an excellent mnemonic to recall the structures.

From superior to inferior:

- Tom = (tendon of) **t**ibialis posterior
- Dick = (tendon of) **f**lexor **d**igitorum longus
- and **A** = posterior tibial **a**rtery
- Very = posterior tibial **v**ein (sometimes not included in mnemonic)
- Nervous = tibial **n**erve
- Harry = (tendon of) **f**lexor **h**allucis longus

Lateral Compartment of the Leg (Table 7.8)

The lateral compartment of the leg is the smallest of the three muscular compartments.

Lateral compartment muscles are supplied by the superficial peroneal nerve (L5–S1).

The tendons of the peroneus longus and brevis pass behind the lateral malleolus. **The tendon of the peroneus tertius passes anterior to the lateral malleolus.**

TABLE 7.8: Muscles of the lateral compartment of the leg

Muscle	Attachments	Action
Peroneus (fibularis) longus	Originates from the head and lateral surface of the fibula, converges into a tendon, entering the foot posterior to the lateral malleolus, attaching medially underneath the foot to base of the first metatarsal	Eversion at the subtalar joint and plantarflexion of the ankle. Also supports the lateral longitudinal and transverse arches of the foot
Peroneus (fibularis) brevis	Similar in course to the peroneus longus, but attaches from the lower two-thirds of the lateral aspect of the fibula to the lateral aspect of the base of the fifth metatarsal	Eversion of the foot

CLINICAL NOTES

- **Acute compartment syndrome (ACS)** describes the build-up of pressure within the tight fascio-osseous muscle compartments. Mostly due to trauma (tibia and fibula fracture, soft tissue injury) leading to post-traumatic oedema/bleeding, which impedes the blood flow and decreases tissue perfusion to the muscles and the neurovascular structures. Other causes include burns, tight casts (this is why a slab is used first for initial management of leg injuries while waiting for the swelling to subside, to be replaced by a complete cast later), envenomation (snake bite), and use of anticoagulants (bleeding tendency). This is an orthopaedic emergency and should be diagnosed early by use of the 6Ps (see above). The earliest sign is severe pain in the leg which is out of proportion to the injury with passive stretching. The distal pedal pulses are normal in the early phase. Pulselessness, pallor, and paralysis are late signs. Failure to recognise compartment syndrome leads to irreversible damage to the muscles (myonecrosis), sepsis, amputation, and contractures (see Volkmann's ischaemic contractures).
- **Fasciotomy** is the surgical procedure to decrease the pressure inside the compartment by incising the deep fascia to allow the muscles to pop out.
- A prolapsed intervertebral disc at L5–S1 can lead to foot drop, a palsy of the common peroneal nerve innervating the anterior and lateral compartments of the leg.
- The leg is a common site for skin ulceration.

Causes of leg ulcers (Courtesy of Mr Sam Andrews, FRCS, Medway NHS Foundation Trust):

- Venous (varicose veins, post-phlebitic*, gravitational)
- Arterial (atherosclerosis), lack of blood supply
- Neuropathic, due to loss of sensation (diabetic, cerebrovascular accident [CVA], spina bifida, pressure sores)
- Trauma (including plaster of Paris application, injections, burns)
- Allergic reaction
- Vasculitic and vasospastic (rheumatoid, SLE*, PAN*, scleroderma, Raynaud's syndrome)
- Malignancy (BCC*, SCC*, malignant melanoma, skin metastases, Marjolin's ulcer – SCC change in previous venous ulcer)
- Infective (TB, HIV)
- Artefactual (patient-induced, like injection of noxious material, or iatrogenic)
- Malnutrition (scurvy, ulcerative colitis)
- Lymphatic obstruction (infection, trauma)

* Post-phlebitic: following DVT.

SLE, systemic lupus erythematosus; PAN, polyarteritis nodosa, SCC, squamous cell carcinoma; BCC, basal cell carcinoma.

The Anatomy of the Foot

Introduction

This review will include an overview of the anatomy of the foot, including osteology, ligaments, joints of the foot, important muscles, and their attachments, as well as clinical conditions relevant to the anatomy.

Osteology of the Foot

To begin learning about the anatomy of the foot, it is important to learn first about the osteology of the foot and the functions each bone plays in forming the foot. By learning the osteology, joint and ligamentous attachments become easier to identify, as well as identifying the potential consequences of fractures or ligamentous tears or sprains in the foot. Also, key areas to learn in this section are structures deep to the medial and lateral malleoli and their organisation.

There are three sets of bones in the foot, from proximal to distal: **tarsals, metatarsals, and phalanges**. This is similar to the composition of the bones of the hand (in that the metacarpals are homologous to the metatarsals and the sequence of the phalanges in the foot are similar to the hand); the tarsals, however, vary from the carpals (**Figures 7.29 and 7.30, Table 7.9**).

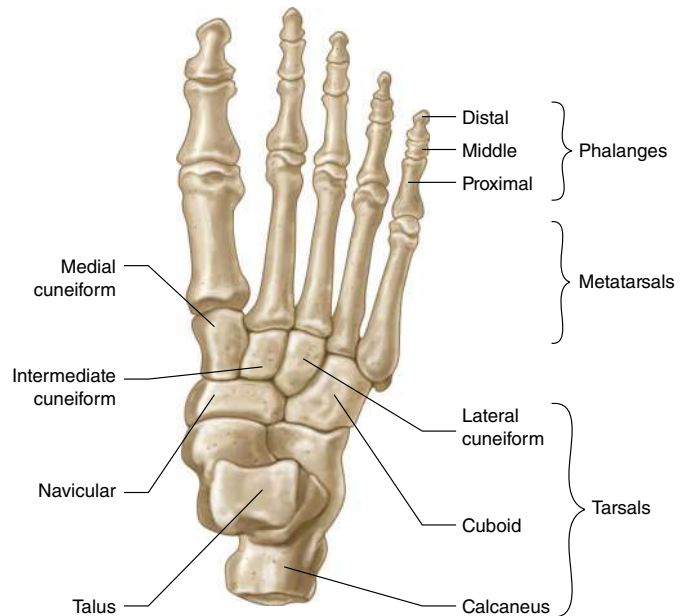


FIGURE 7.29 Osteology of the foot. (Courtesy of Gabriela Barzyk.)

The bones of the foot are arranged in longitudinal and transverse arches. When standing, the lateral margin of the foot, the ball of the foot, and the pads of the toes are the only parts of the foot that make contact with the ground.

Tarsals

There are seven bones which make up the tarsals (proximal to distal).

The articular surface of the trochlea of the talus is wider anteriorly than posteriorly. This is of significance, as the stability of the foot varies with its position: dorsiflexion is more stable than plantarflexion. The talocrural (ankle) joint is stabilised due to the wider anterior side immobilised by the articulation with the tibia. In plantarflexion, the narrower posterior part is articulating, allowing greater movement but less stability.

An important ligament which **maintains the medial foot arch**, the spring ligament or plantar calcaneonavicular ligament, passes underneath the head of the talus for its attachments to the navicular (anterior).

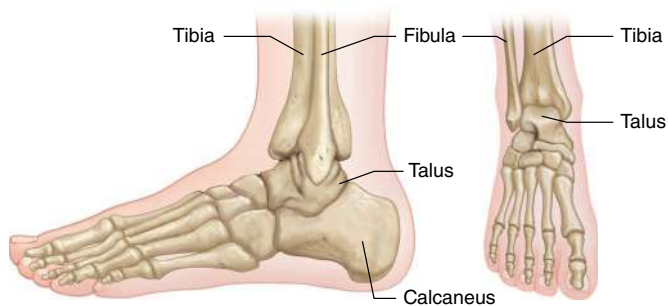


FIGURE 7.30 Lateral and anterior view of osteology of the foot. (Courtesy of Gabriela Barzyk.)

The Ankle Joint (Talocrural)

The ankle joint, known as the talocrural joint, is a synovial hinge joint and is formed by the distal ends of the tibia and fibula and the proximal end of the talus. This hinge joint allows the movements of dorsiflexion (by muscles in the anterior compartment of the lower leg) and plantarflexion of the foot (posterior compartment of the lower leg). Due to the arrangement of the bony articulation, the ankle joint is considered a mortise joint (the talus fits snugly in between the lower ends of the tibia and fibula).

Ligaments within the Ankle Joint

To maintain the stability of the talocrural joint and ensure the foot arches are maintained, there are various ligaments on both the medial and lateral aspects of the ankle joint, attaching from the distal ends of the tibia or fibula to the individual tarsal bones. Important ligaments to recognise on a specimen or model are noted here, along with their points of attachment and functions.

TABLE 7.9: Bones of the foot

Bone	Location	Shape	Articulations	Important Structures
Talus	Superior to calcaneus	Trochlea of talus articulates with the distal ends of the fibula and tibia superiorly; head and neck articulate with the navicular anteriorly	Head of the talus articulates with the navicular anteriorly; body of the talus articulates with the calcaneus inferiorly Articulations with the distal ends of the tibia and fibula form the talocrural joint (ankle joint)	No muscle is attached to this bone
Calcaneus = "heel bone"	Forms the base of the foot, inferior to the talus and posterior to the cuboid The largest bone in the foot	Irregularly shaped, projects backwards to form the skeletal framework (heel) and forwards, which contains articulating surfaces	Achilles (calcaneal) tendon attaches to the posterior surface of the calcaneus Articulates with the talus superiorly and the cuboid and navicular anteriorly Also, there is an attachment for the calcaneonavicular ligament on the medial surface of the calcaneus	Stability of the foot; forms the skeletal framework of the heel. The medial surface contains a shelf-like structure called the sustentaculum tali The tendons of the peroneus longus and brevis pass on its lateral surface, separated by the peroneal tubercle
Navicular	Located on the medial side of the foot	Boat-shaped	Articulates posteriorly with the talus and anteriorly and laterally with the cuboid and cuneiform bones	Involved in the transverse tarsal (midtarsal joint), as well as an attachment point for the spring ligament Gives attachment for tibialis posterior tendon
Cuneiforms (Medial, intermediate, and lateral)	Three cuneiform bones, part of the intermediate/ distal tarsal bones	Wedge-shaped	Articulate posteriorly with the navicular and anteriorly with the bases of the three medial metatarsals	Provides attachment points for tibialis anterior and posterior, peroneus longus, and flexor hallucis brevis
Cuboid	Anterior to the calcaneus, lateral to the lateral cuneiform	Cube-shaped	<i>Points of articulation:</i> • Posteriorly with calcaneus • Anteriorly with bases of lateral two metatarsals • Medially with lateral cuneiform	Provides a groove for peroneus longus to pass through to reach the first metatarsal and cuneiform bones
Metatarsals	Five metatarsals, proximal to the phalanges	Each has a head distally and a base proximally joined by a shaft	Head articulates with proximal phalanx of a toe; base articulates with either cuboid or cuneiforms	Involved in the tarsometatarsal joints
Phalanges	Toes 2 to 5 have three phalanges (proximal, middle, and distal); the hallux only has proximal and distal phalanges	Each has a head distally and a base proximally joined by a shaft	Head of the distal phalanx is non-articular; base of the proximal phalanx articulates with corresponding metatarsal	Dexterity and movement

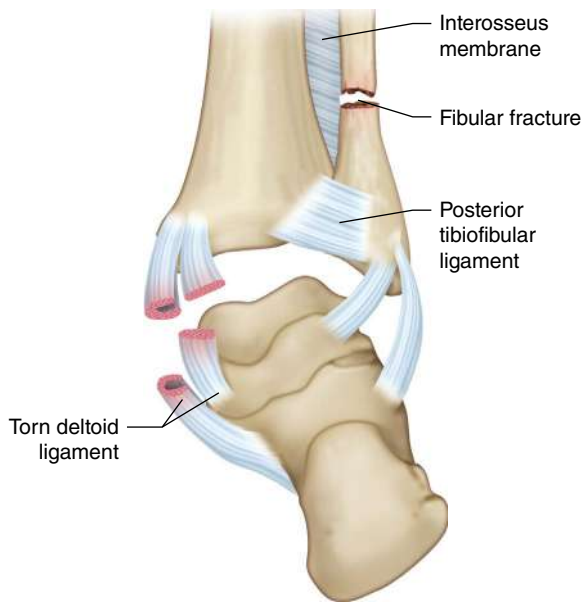


FIGURE 7.31 Ligaments of the ankle joint. (Courtesy of Gabriela Barzyk.)

Medial Aspect of the Ankle

The main ligament to be aware of is the **deltoid ligament**. This is an extremely strong ligament attaching from the medial malleolus superiorly to the navicular and talus inferiorly, which prevents excess eversion of the ankle joint. Made up of four individual ligaments, all collate to form a strong ligament and complete the same function – resisting over eversion of the ankle joint (**Figures 7.31** and **7.32**).

Lateral Aspect of the Ankle

Key ligaments to be aware of in this area are summarised in **Table 7.10**. The main function of the collective lateral ligaments is to prevent excess inversion of the ankle joint (**Figure 7.33**).

Between the Distal Ends of the Tibia and Fibula

The anterior tibiofibular ligament connects the anterior surface of the distal end of the tibia and the fibula; the posterior tibiofibular ligament connects the posterior surface of the distal end of the tibia and the fibula.

Key structures near the lateral malleolus are shown in **Figure 7.34**.

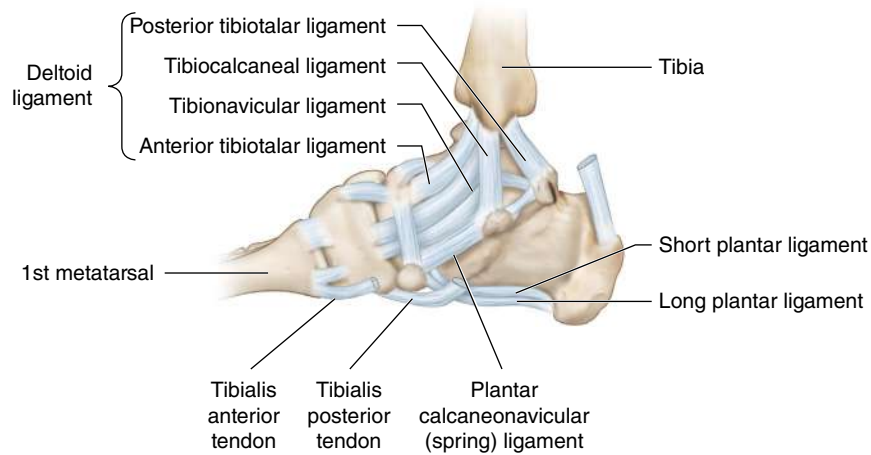


FIGURE 7.32 Ligaments, medial aspect of the ankle. (Courtesy of Alina Humdani.)

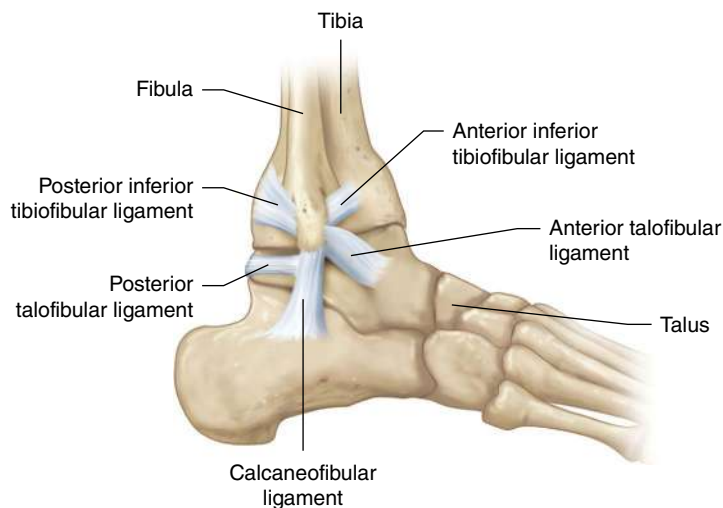


FIGURE 7.33 Ligaments of the lateral aspect of the ankle. (Courtesy of Alina Humdani.)

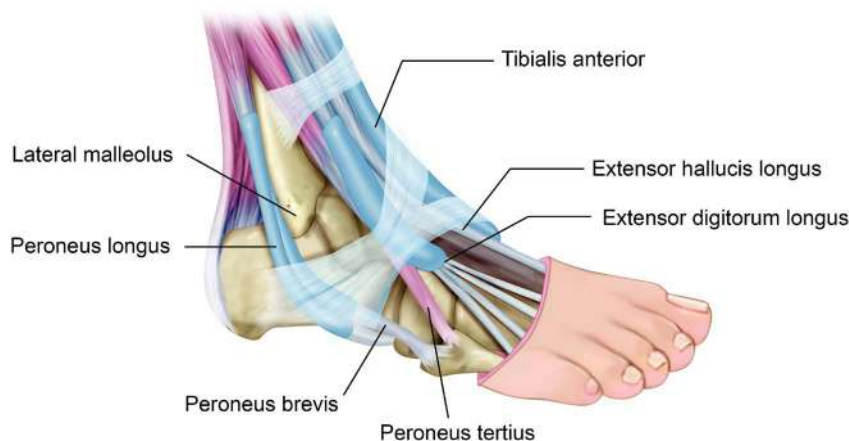


FIGURE 7.34 Key structures next to the lateral malleolus. (Courtesy of Alina Humdani.)

TABLE 7.10: Ligaments of the lateral aspect of the ankle joint

Ligament	Attachments
Anterior talofibular	From the lateral malleolus to the lateral aspect of the talus
Posterior talofibular	From the lateral malleolus to the posterior aspect of the talus
Calcaneofibular	Runs from the posteromedial side of the lateral malleolus to the lateral surface of the calcaneus

Extensor Retinacula

The extensor retinacula are made up of the superior extensor retinaculum and the inferior extensor retinaculum, both of which bind the extensor tendons to the foot during extension of the ankle (dorsiflexion) and toes.

The superior extensor retinaculum is superior to the ankle joint and attaches to the anterior borders of the tibia and the fibula.

The inferior extensor retinaculum is Y-shaped and is attached laterally to the upper surface of the calcaneus and medially to both the medial malleolus with one arm of the Y and to the medial side of the plantar aponeurosis with the other arm of the Y (**Figure 7.35**).

Arrangement of structures on the dorsal surface of the foot (lateral to medial):

- (Tendon of) peroneus tertius
- (Tendons of) extensor digitorum longus
- Dorsalis pedis artery
- (Tendon of) extensor hallucis longus
- (Tendon of) tibialis anterior

Fibular Retinacula

Also made up of superior and inferior portions, the fibular retinacula bind the peroneus brevis and longus tendons. Both parts extend from the calcaneus, with the superior portion terminating at the lateral malleolus and the inferior portion terminating at the inferior extensor retinaculum.

Nerve and blood supply of the ankle joint is from the tibial and deep and superficial peroneal nerves. The blood supply comes from the three major arteries (anterior and posterior tibial and the peroneal).

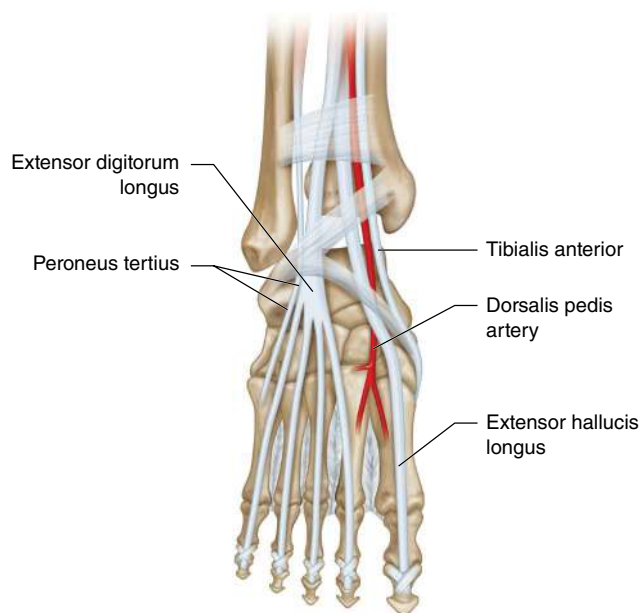


FIGURE 7.35 Anterior surface of the foot. (Courtesy of Alina Humdani). Note that the structures on the dorsal surface of the foot are encased by the extensor retinacula (*shaded*).

CLINICAL NOTES

POTT'S FRACTURE DISLOCATION

Also known as a bimalleolar ankle fracture, this occurs after forcible foot eversion, pulling on the medial deltoid ligament and producing an avulsion fracture of the medial malleolus. An avulsion fracture indicates an injury to the bone where a ligament or tendon attaches to the bone in a specific location, and when a fracture occurs, the tendon or ligaments pulls off a piece of bone also (**Figure 7.36**).

As the talus is not held in place medially due to fracture of the bony articulation with the medial ligament, the talus moves laterally, shearing off the lateral malleolus and breaking the fibula superior to the inferior tibiofibular joint.

(Continued)



FIGURE 7.36 Fractures of the medial and lateral malleoli. (Courtesy of Salam Ismael.)

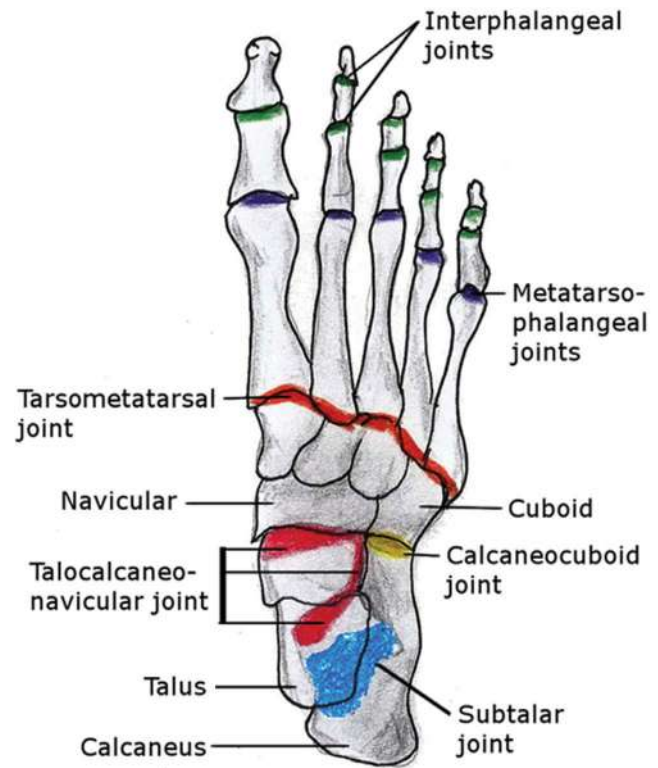


FIGURE 7.37 Joints of the foot. (Courtesy of Gabriella Barzyk.)

Note: The movements of inversion/eversion differ from movements of supination/pronation. Inversion/eversion are in a linear plane, whereas supination/pronation involves degrees of inward and outward rotation.

INVERSION AND EVERSION INJURIES

Approximately 90% of all ankle sprains are inversion injuries, which overstretch the lateral ligaments, including the anterior and posterior talofibular ligaments and the calcaneofibular ligament, generally weaker than the medial ligaments. The anterior talofibular ligament is the most common to be affected. The most common injuries occur in a plantarflexed foot which has been excessively inverted.

If a patient has an eversion injury, it is commonly caused by overstretching and tearing of the medial deltoid ligament, which is normally very strong and resists over eversion. Either inversion or eversion injuries can cause a sprained ankle if there is a partial or complete tear in its corresponding ligaments.

Joints within the Foot

The subtalar joint allows for inversion and eversion. **Other joints** which are important to identify as they are involved with the key movements of the foot are listed in [Table 7.11](#) and [Figure 7.37](#).

CLINICAL NOTES

Boot top fracture: often sustained by skiers when they are unable to keep their balance and fall forward on top of their ski boot. The proximal tibia is bent forwards as the person falls forwards, compressive stresses and strains act on the anterior surface of the tibia due to the presence of the rigid ski boot, and the tibia and fibula become fractured at the top of the boot. The fracture is often comminuted, i.e., the bone is broken into many pieces.

Stress fracture: caused by repetitive stresses over time on an area of bone, which results in weakening of the bone and a small crack or bruising forming within the bone. These types of fractures are often seen in athletes and runners. As bones within the foot must bear the weight of the entirety of the body, stress fractures most commonly occur here, usually in the second, third, and fourth metatarsals. Moreover, non-athletes who experience a sudden change of activity or who may be using an improper technique to complete their exercises, such as doing an excessive amount of exercise too soon, may also be vulnerable to stress fractures ([Figure 7.38](#)) (Continues below [Table 7.11](#)).

TABLE 7.11: Joints of the foot

Joint Name	Type	Articulations	Movements
Subtalar (also known as the talocalcaneal joint)	Plane synovial	Two points of articulation between the talus and the calcaneus, anterior and posterior attachments	Allows for inversion and eversion of the foot. Also allows for supination and pronation of the foot
Transverse tarsal (also known as the midtarsal joint or Chopart's joint)	Joint between the midfoot and the hindfoot, comprises the talocalcaneonavicular joint and the calcaneocuboid joint	Formed by the articulation of the calcaneus with the cuboid (calcaneocuboid joint) and the articulation of the talus with the navicular (talocalcaneonavicular joint)	Joint rotates slightly to allow inversion (during plantarflexion) or eversion (during dorsiflexion)
Talocalcaneonavicular	Ball-and-socket joint	Rounded head of the talus articulates with the posterior surface of the navicular and the anterior surface of the calcaneus	Inversion and eversion of the foot. Forms the transverse tarsal joint with the calcaneocuboid joint.
Calcaneocuboid	Saddle joint	Anterior end of the calcaneus articulates with the posterior surface of the cuboidal bone	Small degree of mobility but does carry out inversion and eversion of the foot (5) Forms the transverse tarsal joint with the talocalcaneonavicular joint
Tarsometatarsal	Synovial plane joints that allow gliding (arthrodial joint)	Articulations between base of the metatarsals and the anterior surfaces of the cuneiforms and the cuboid bone	Gliding of the tarsal and metatarsal bones upon each other
Metatarsophalangeal (MTP)	<i>Condylloid joint</i> : an oval-shaped end is received into a congruent elliptical cavity	Articulations between the anterior surface of the metatarsal bones and the posterior surfaces of the proximal phalanges	Flexion, extension, abduction, and adduction of the phalanges
Interphalangeal	Hinge joint	Articulations between the head of the proximal phalanx and the end of the distal phalanx	Flexion and extension of the phalanges

**FIGURE 7.38** Stress fracture of the second metatarsal with callus formation.

Signs of alleviation of pain when resting, exacerbation of pain when using the fractured area, or tenderness at the site of the fracture may be experienced by the individual, requiring medical attention.

LISFRANC INJURY

Also known as a midfoot injury, this results from torn ligaments or fractured tarsal bones in the midfoot.

The midfoot is formed by the three cuneiform bones, cuboidal bone, and navicular bone, along with their ligaments, which are vital to maintain the arch and are also vital for walking. The Lisfranc joint describes the many individual joints between the midfoot tarsal bones and the proximal attachment of the midfoot bones to the forefoot (metatarsal) bones. Any fracture or dislocation to bone in this area or ligamentous tear will cause a Lisfranc injury (**Figure 7.39**).

Unlike stress fractures, which are commonly seen in athletes and runners, Lisfranc injuries do not require repetitive movements to cause a fracture, and instead can be caused by a twist of the foot downwards and then falling. Bruising on both surfaces of the foot, but especially the plantar surface, indicates a differential of a Lisfranc injury. Although non-surgical treatments may be recommended for individuals whose Lisfranc injury is due to a sprained ligament and nothing else, surgery is recommended for injuries involving fractures or dislocations of the bones in the midfoot or torn ligaments.

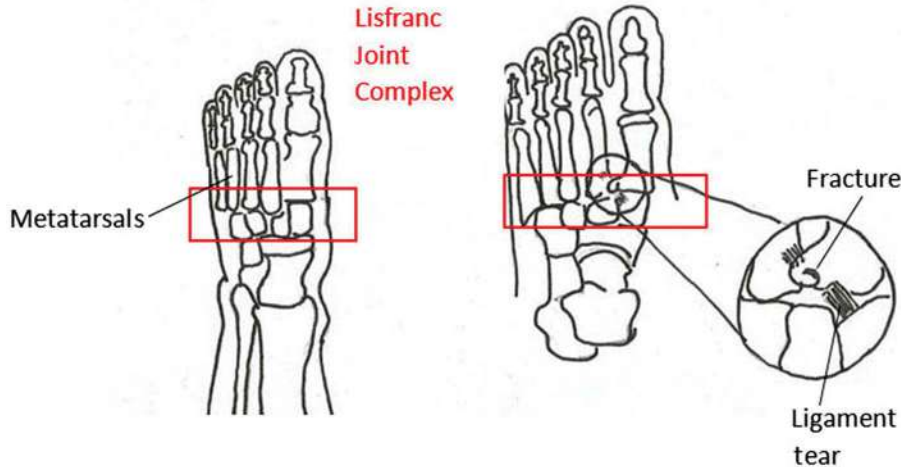


FIGURE 7.39 Lisfranc injury. (Courtesy of Alina Humdani.)

Other Anatomical Anomalies

Hammer toe: Hammer toe describes a phalanx that is permanently pushed downwards, normally as a result of pressure from the wrong size or type of footwear. The joints usually involved are the proximal interphalangeal joints from the second to the fourth toes.

Bunions: bunions are also an important finding at the base of the hallux (big toe). A bunion is a bony deformity of the joint, which may cause hallux valgus – an abnormal valgus alignment of the big toe.

Individuals with hallux valgus may notice some changes with their gait, as the hallux valgus causes a reduction in dorsiflexion when walking (Figure 7.40).

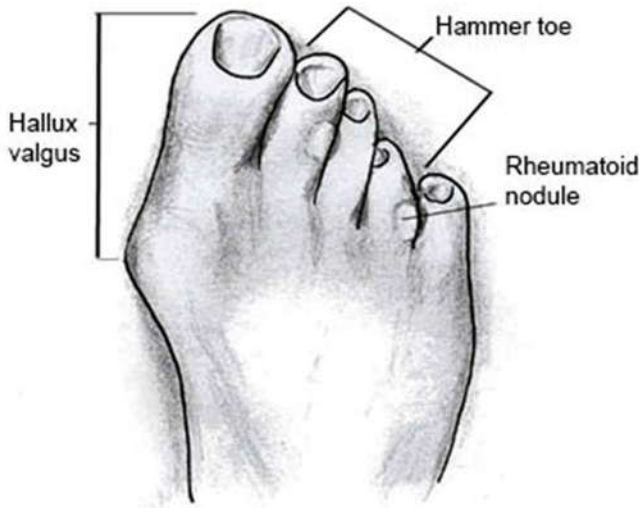


FIGURE 7.40 Abnormalities of the forefoot. (Courtesy of Gabriela Barzyk.)

Gout Affecting the Metatarsophalangeal Joints

Gout is a form of arthritis which is caused by a highly elevated level of uric acid in the blood. The uric acid then crystallises and is deposited within joints, causing them to become inflamed. A common area for gout to develop in the body is at the metatarsophalangeal

joints in the foot, commonly at the first metatarsophalangeal joint, at the base of the big toe. This condition is called podagra.

Remember the five signs of inflammation: redness (*rubor*), Pain (*dolor*), Heat (*calor*), Swelling (*tumor*), and Loss of function (*functio laesa*).

The Spring Ligament (Figure 7.32)

Also known as the plantar calcaneonavicular ligament, it connects the navicular to the calcaneus and also supports the head of the talus. This ligament is especially important, as it helps maintain the medial arch of the foot and, by supporting the head of the talus through its attachments from the calcaneus and the navicular, bears most of the body weight.

Arches of the Foot (Figure 7.41)

To help the foot maintain its concave shape, the medial, lateral, and transverse foot arches act like a spring network to bear the weight of the body and absorb the shock produced during movement.

- The medial longitudinal foot arch is supported by the spring (calcaneonavicular ligament) and the plantar ligaments and is the higher of the two longitudinal foot arches. This arch spans over the calcaneus to the first three metatarsal bones.

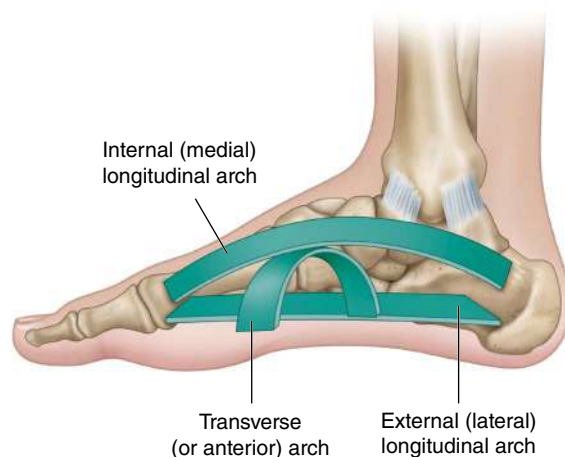


FIGURE 7.41 Arches of the foot. (Courtesy of Gabriella Barzyk.)

- The lateral longitudinal arch is slightly flatter and spans from the calcaneus to the fourth and fifth metatarsals. Similarly supported by the plantar ligaments, it is connected to the medial arch via the anterior transverse foot arch.
- The transverse foot arch lies coronally and is attached to the metatarsal bases and cuneiform bones. Supported by the plantar ligaments, it forms a connection between both longitudinal arches.

The Use of High-Heeled Shoes

Unwise, less stable, and more prone to collapse is the consequence of wearing high-heeled shoes. When a person attempts to step in high heels, the tibia moves posteriorly, pulling on the talus due to the talocrural joint. The spring ligament is attached to the talus, causing the medial foot arch (normally maintained by the spring ligament and plantar ligaments of the foot) to collapse and be less stable.

Muscles Contributing to Movements of the Foot

Movements of the foot are completed by the muscles of the lower leg (anterior, lateral, and posterior compartments), of which it is vital to recognise and identify the points of origin and insertions for each of the muscles contributing to movements of the foot, but also their innervation, blood supply, and action.

Intrinsic Muscles of the Foot

For the basic clinical sciences student, it is important to recognise that the intrinsic muscles of the foot on the plantar side are organised into four layers. Similar in composition to the intrinsic muscles of the hand, i.e., both the hand and the foot have interossei on their dorsal and ventral sides (in the case of the foot, on their dorsal and plantar sides), the toes are also equipped with lumbricals; what is important to take away is that the intrinsic muscles of the foot modify actions of the long tendons and generate fine movements of the toes.

Blood Supply and Innervation of the Foot

The foot is mainly supplied by branches of the posterior tibial artery and the dorsalis pedis artery.

The Posterior Tibial Artery

This artery enters the plantar aspect of the foot, posterior to the medial malleolus, and branches into the medial and lateral plantar arteries. The lateral plantar artery (the largest branch) turns medially and joins with the dorsalis pedis artery at the first intermetatarsal space to form the plantar arch to supply the digital branches to the toes. The medial plantar artery supplies the medial side of the big toe.

The Dorsalis Pedis Artery

Anterior to begin with, this artery passes inferiorly past the cuneiform bones, lateral to the extensor hallucis longus tendon, to join the plantar arch. It supplies the dorsum of the foot and both sides of the big toe.

Innervation of the Foot (Figure 7.42)

There are five nerves which innervate the skin of the foot:

- *Tibial nerve*: it runs through the calcaneal branches to the heel, medial plantar nerve to skin on the medial side of the sole, and medial three and half toes including their nail beds. The lateral plantar nerve supplies the skin on the lateral aspect of the sole and fifth toe and lateral aspect of the fourth toe including their nail beds (compare with the distribution of the median and the ulnar nerves in the hand).
- *Deep fibular (deep peroneal)*: see above.
- *Superficial fibular (superficial peroneal)*: see above.
- *Sural nerve*: it supplies the lateral aspect of the dorsum of the foot.
- *Saphenous nerve*: running with the LSV, this is a terminal branch of the femoral nerve and is sensory in function and found in subcutaneous tissue; it supplies the medial aspect of the dorsum of the foot to the base of the hallux.

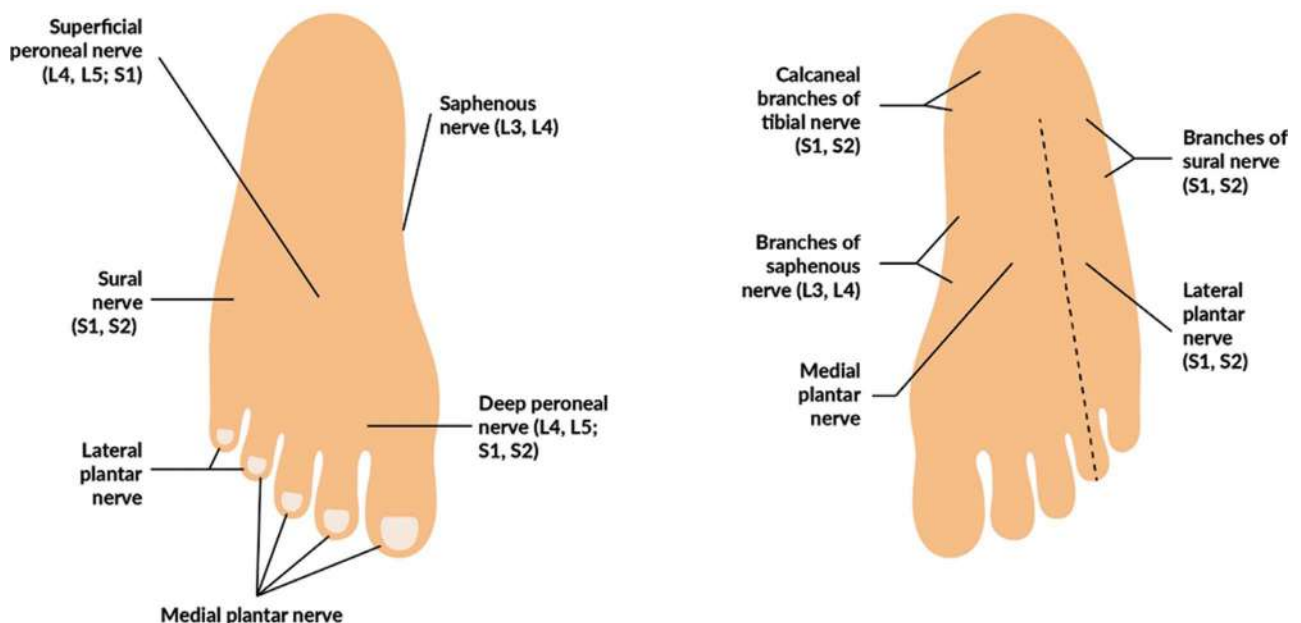


FIGURE 7.42 Sensory innervation of the foot, dorsal and plantar surfaces. (Courtesy of Ali Baker.)

An important rule to adhere to here is that the muscles of the foot are mainly innervated by the tibial nerve (via its lateral and medial plantar nerves), except for the extensor digitorum brevis, extensor hallucis brevis, and the first two dorsal interossei, which are innervated by the deep peroneal nerve.

CLINICAL NOTE

PLANTAR FASCIITIS

Plantar fasciitis is also known as a common cause in the UK of “heel pain”. It is caused by the straining and inflammation of the plantar aponeurosis and can result from high-energy exercises such as running or high-impact aerobics. This may be further exacerbated by patients wearing inappropriate footwear such as worn-out shoes.

Patients present to the physician with a “stabbing or knife-like” heel pain, relieved with rest and aggravated with activity – both core symptoms for a diagnosis of plantar fasciitis. Patients may often experience post-static dyskinesia, the medical term for pain being felt upon walking the first few steps after rising from a seated or lying position.

Ankle Examination and Testing the Movements of the Foot

Four main movements of the foot are clinically tested in the musculoskeletal ankle examination, through both active, passive, and resisted movements. The following commands next to the movements are the recognised method to test for active movements of the ankle joint:

- *Dorsiflexion*: ask the patient to point their toes up to the ceiling.
- *Plantarflexion*: ask the patient to point their toes to the ground.
- *Inversion*: ask the patient to turn their feet inwards together.
- *Eversion*: ask the patient to turn their feet outwards.

After asking the patient to complete these movements on the examiner’s command and unaided, the examiner will then do these movements on the patient whilst the patient remains relaxed. This is called passive movement. The examiner will then ask the patient to “stop me doing these movements” or “push against me”. As the examiner is performing a movement, e.g., dorsiflexion, they will ask the patient to “push against my hand”. This is to test resisted movement of the foot.

Any weakness in any of these movements will indicate which group of muscles or which area has potentially been affected and/or injured.

Assessing for the Integrity of the Achilles Tendon

As part of the ankle examination in the clinic, to test the function of muscles of the posterior compartment (plantarflexion) and the integrity of the Achilles tendon, the Simmonds-Thompson test can be performed. One of the techniques to do this test is by asking the patient to kneel one leg on the chair, with the other leg hanging down. The clinician then squeezes the back of the leg, and if the Achilles tendon is intact, the suspended foot should

plantarflex. Feeling a gap within the tendon is another way to check the integrity of the calcaneal tendon.

Vascular Examination of the Foot

Palpate the dorsalis pedis artery as noted earlier. The posterior tibial artery is usually palpated halfway between the medial malleolus and the calcaneus on the medial side, where its coverings is at its thinnest.

Palpation points are clinically significant, as these locations are heavily used in the peripheral vasculature examination to assess the blood supply to the distal ends of the lower limbs, which may be commonly affected by microvascular disease, often caused by poorly controlled diabetes mellitus.

Furthermore, the ankle brachial pressure index (ABPI) can also be performed as part of the peripheral vasculature medical examination to assess for peripheral arterial disease. ABPI compares the blood pressure at the ankle to the blood pressure in the brachium (arm). If there is a narrowing of the lower limb arteries, the systolic pressure in the arteries of the foot will be reduced.

ABPI = highest foot systolic blood pressure/brachial systolic blood pressure (**Table 7.12**).

Values are acquired by measuring the blood pressure over the brachium and the ankle separately, listening for turbulent blood flow when the cuff is inflated by using Doppler ultrasound both times. When acquiring a value for the highest systolic blood pressure in the ankle, two values are taken: one for the dorsalis pedis

TABLE 7.12: Ankle brachial pressure index (ABPI)

Description	Value
Normal	> 1.0
Intermittent claudication (obstruction of the arteries, usually during exercise, causing pain)	0.5–0.95
Rest pain	0.3–0.5
Critical ischaemia	< 0.2

and another for the posterior tibial, and the highest systolic blood pressure is used.

Diabetic Foot

The umbrella term “diabetic foot” describes a pathology of the foot, such as ulceration, peripheral neuropathy, or microvascular disease, resulting from poorly controlled diabetes mellitus and its complications.

There are three main components to the development of diabetic foot:

- Neuropathy of the sensory, motor, and autonomic nerves. Sensory neuropathy leads to impaired skin sensation and susceptibility to injury. Motor neuropathy causes dysfunction of the intrinsic foot muscles and deformities. Autonomic neuropathy results in impaired sweating of the foot and crack formation.
- Angiopathy of the arteries of the foot causes reduced blood supply and delayed healing of ulcers.
- Immunosuppression (diabetic patients show more susceptibility to develop infections) (**Figure 7.43**).

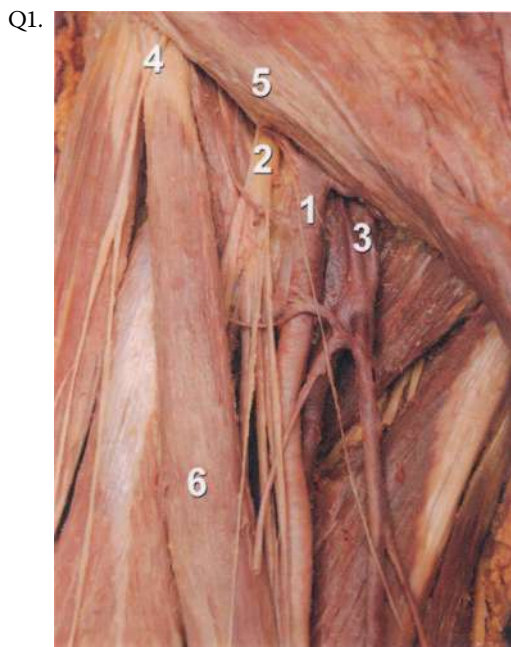
Remember, diabetes mellitus is a systemic disease and can affect other organs such as the retina (diabetic retinopathy) or kidneys (diabetic nephropathy).

In addition to these factors, poor footwear makes things worse. Patients with poorly controlled diabetic foot are at risk of leg amputations.



FIGURE 7.43 Advanced gangrene of the right foot due to uncontrolled diabetes mellitus. (Courtesy of Aqeel S. Mahmood.)

Revision Questions



(Courtesy of Department of Anatomical Sciences, SGUL.)

- Q1. Which vessel is indicated by the number 1 in the image?
- Femoral artery
 - Femoral vein
 - Long saphenous vein
 - Popliteal artery
 - Short saphenous vein
- Q2. What is the clinical significance of the indicated vessel?
- Can be palpated for a pulse
 - Can be harvested for use in a CABG operation
 - Is a common site for development of thrombi
 - Is prone to enlarging and becoming an aneurysm
 - Is often used for taking bloods when venous access on the upper limb is impaired



(Courtesy of Department of Anatomical Sciences, SGUL.)

- Q3. Which of the following best describes the enlarged lymph node shown in the image?
- Deep inguinal lymph node
 - External iliac lymph node
 - Internal iliac lymph node
 - Para-aortic lymph node
 - Superficial inguinal lymph node
- Q4. Where does this structure drain to?
- Deep inguinal lymph nodes
 - External iliac lymph nodes
 - Internal iliac lymph nodes
 - Para-aortic lymph nodes
 - Superficial inguinal lymph nodes



(Courtesy of Department of Anatomical Sciences, SGUL.)

- Q5. Which vessel is indicated in the image?
- Dorsalis pedis artery
 - Dorsal venous arch
 - Medial plantar artery
 - Lateral plantar artery
 - Posterior tibial artery

- Q6. What is the clinical significance of the indicated vessel?
- Most commonly affected by DVT
 - Related to incidence of arterial ulcers
 - Used to take the pulse from the lower limb
 - Used in coronary angiography
 - Used in reconstructive surgery grafting
- Q7A. A 40-year-old man presented to mountaineering emergency services with a fracture sustained while skiing. The patient commented that he is a novice skier and remembered falling forwards over a rock in his path. The patient is in excruciating pain and is unable to weight-bear on his left foot.
- Which sort of injury is consistent with this presentation?
- Left malleolar fracture
 - Lisfranc injury
 - Pott's fracture
 - Stress fracture
- Q7B. Which is the most common site for this injury to occur?
- First metatarsophalangeal joint
 - Within the second and third metatarsals
 - Proximal interphalangeal joints, from the second to the fourth digit
 - Medial aspect of talus
- Q8. An elderly female patient presented to A&E complaining of pain in her left calf, which is also heavy, achy, and warm. The doctor in charge of her care is concerned that she may be experiencing deep venous thrombosis and would like to send her for an ultrasound scan.
- Where does the long saphenous vein drain to?
- Femoral vein
 - Internal iliac vein
 - Popliteal vein
 - Small saphenous vein
- Q9. A 20-year-old male cross-country runner sustained a fracture in his forefoot. The patient has been training for the past 4 months for this race and is in severe pain when he tries to continue running. This pain reduced after rest.
- Q9A. Which sort of injury is consistent with this presentation?
- Lisfranc injury
 - Navicular bone fracture
 - Pott's fracture
 - Stress fracture
- Q9B. Which is the most common site for this injury to occur?
- First metatarsophalangeal joint
 - Within the second and third metatarsals
 - Proximal interphalangeal joints, from the second to the fourth digit
 - Anterior surface of the distal aspect of the tibia
- Q10. A group of middle-aged women were walking in Oxford Street, shopping at the nearby department stores. All were wearing stiletto high heels and were complaining of discomfort when walking and were unable to walk stably.
- Which ligament has been pulled to cause the medial foot arch to collapse?
- Calcaneofibular ligament
 - Deltoid ligament
 - Plantar calcaneonavicular (spring) ligament
 - Talocrural ligament

- Q11. What are the causes of acute compartment syndrome and its earliest sign? (See text.)
- Q12. What are the structures that leave the pelvis to enter the gluteal region under the piriformis muscle? (See text.)
- Q13. What are the main factors which lead to the development of diabetic foot? (See text.)
- Q14. What are the lower limb injuries which possibly occur following a fall from a height?
- Q15. List three dashboard injuries that may happen to a front seat occupant.



(Courtesy of Salam Ismael.)

- Q16. A 21-year-old male with a history of a twisting injury of the right foot over the edge of a curb. He sustained a fifth metatarsal fracture that is minimally displaced. The risk with these fractures is non-union due to the pulling effect of the muscles attached to it. Name the two muscles attached to the fifth metatarsal that can cause non-union by their pulling action.

Answers

- A1. a
 A2. a
 A3. e
 A4. a
 A5. a
 A6. c
 A7A. b
 A7B. b
 A8. a
 A9A. d
 A9B. b
 A10. c
 A11,12,13. See text
 A14. Fracture of the calcaneus, tibial plateau, shaft of femur, acetabular fracture (central hip dislocation).
 A15. Fracture of the patella, femoral shaft, and posterior hip dislocation.
 A16. Peroneus tertius and peroneus brevis.

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INDEX

Note: Locators in *italics* represent figures and **bold** indicate tables in the text.

A

AAA, *see* Abdominal aortic aneurysm

Abdomen

- anterior abdominal wall, 149–155
- blood supply, 158, 160
- colon, 182–185
- duodenum, 164–166
- gallbladder and biliary system, 173–176
- gut, 158–159
- ileum and jejunum, 176–180
- kidneys, 190–193
- large bowel/large intestine, 180–182
- liver, 170–173
- lumbar plexus, 187–189
- nerve supply, gut and pelvic organs, 159–160
- nerve supply and lymph drainage, 161–164
- pancreas, 166–168
- peritoneum, 155–158
- posterior abdominal wall, 185–187
- retroperitoneal space, 189–190
- spleen, 168–170

Abdominal aorta, 158

Abdominal aortic aneurysm (AAA), 158

Abdominal policeman, 156

Abducens nerve (CN VI), 51

ABPI, *see* Ankle brachial pressure index

ACA, *see* Anterior cerebral artery

Accessory nerve (CN XI), 52–53

Acetabulofemoral joint, *see* Hip joint

Achalasia, 161, 162

Achilles tendon, 259

ACL, *see* Anterior cruciate ligament

Acoustic neuroma, 45

ACS, *see* Acute compartment syndrome

ACTH, *see* Adrenocorticotropic hormone

Acute compartment syndrome (ACS), 260

Acute pancreatitis, 167, 167

Acute poliomyelitis, 27

Acute respiratory distress syndrome (ARDS), 127

Acute urinary retention, 207

Adamkiewicz, artery of, 24, 29

Adnexa, 229

Adolescent idiopathic scoliosis (AIS), 116

Adrenocorticotropic hormone (ACTH), 5, 190

AF, *see* Atrial fibrillation

Afferent pain fibres, 136

Age-related calcification, normal valve, 140

AIS, *see* Adolescent idiopathic scoliosis

Alar and basal plates, 15–17, 29

Alcock's canal, 213, 236

Allergic rhinitis, 47

Amygdala, 4

Anal canal; *see also* Pelvic organs

anal cushions, 210

anal valves, 210

conjoint longitudinal muscle, 211

continence, 211

dentate, 210

external anal sphincter, 210

haemorrhoids, 211

internal sphincter, 210

lower rectum, 210

painful perianal conditions, 211

pectinate, 210

PR examination, 211

upper and lower, 210, 210

Angina pectoris, 136

Angiography, 245

Ankle brachial pressure index (ABPI), 268, 268

Ankle jerk reflex, 259

Ankle joint

deltoid ligament, 262

examination, 268

lateral aspect, 262, 262, 263

ligaments, 261–262, 262

medial aspect, 262, 262

ANS, *see* Autonomic nervous system

Ansa cervicalis, 53, 60, 61, 63, 77

Anterior abdominal wall

anomalies, 153

blood supply, 152

burst abdomen, 154, 155

divisions, 149, 149

flat muscles, 151, 152

hernia, 153

intertubercular plane, 149

layers, 149

muscles, 150

necrotising fasciitis, 154

pyramidalis, 150

rectus abdominis, 150

rectus sheath, 150, 150–151

skin, 149

superficial fascia, 149

surgical incisions, 154

transpyloric (Addison's) plane, 149

Anterior cerebral artery (ACA), 13, 32

Anterior cord syndrome, 26

Anterior cruciate ligament (ACL), 252

Anterior superior iliac spine (ASIS), 197, 198, 244

Antral cancer, 164

Aorta, 122, 122, 140

Aortic aneurysms, 123

Aponeurosis, 33

Arachnoid mater, 11

ARDS, *see* Acute respiratory distress syndrome

Arterial vasculature, brain

ACA, 13

anterior circulation, 12

CCA, 12

circle of Willis, 12, 13, 13

ICAs, 12, 13

MCA, 13

posterior circulation, 12

stroke, 13

Arteria pancreatica magna, 169

Arteries, anterior forearm

anatomical snuffbox, 95

radial artery, 95, 96

ulnar artery, 95

Arthroplasty, 238

Arthroscopy, 253–254

Ascending tracts

dorsal column and spinothalamic, 22, 22

neuronal arrangement, 23

nociceptive flexion reflex, 22

Ascites, 157

ASD, *see* Atrial septal defect

ASIS, *see* Anterior superior iliac spine

Asthma, 127

Atresia, 229

Atrial fibrillation (AF), 137

Atrial septal defect (ASD), 138

Auerbach's/myenteric plexus, 162

Auriculotemporal nerve, 50

Autonomic nervous system (ANS), spinal cord

dermatome, 20, 20, 21

movements, 20

myotome, 20

opposing effects, SNS and PNS, 20

PNS, 20

SNS, 19–20

Avascular necrosis, 239

Axilla

axillary artery, 105–106

axillary lymph nodes, 106, 106, 106

axillary vein, 106

boundaries, 105

brachial plexus, 106, 107

contents, 105

muscles, 105, 106

surgical importance, 107

Axillary nerve, 83, 85, 86, 87

Azygos system, 124, 133, 140, 196

B

Babinski's sign, 22

Bachmann's bundle, 136

Balloon angioplasty, 136, 241, 245

Barrett's oesophagus, 161

Bartholin's (greater vestibular) glands, 225–226

Basal ganglia

caudate nucleus, 6

dopamine, 6

internal capsule, 6

lentiform nucleus, 6

Mulligan's stain, 6

nucleus accumbens, 6

striatum, 6

subthalamic nucleus, 6

and thalamocortical circuits, 7

Batson's plexus, 187

BCS, *see* Breast-conserving surgery

Beck's triad, 134

Bell's palsy, 52

Benign prostatic hyperplasia (BPH), 224

Bicipital aponeurosis, 90

Bicuspid aortic valve, 140

Bilharziasis, 169, 173, 208

Bimalleolar ankle fracture, 263

BI-RADS, *see* Breast Imaging Reporting and Data System

- Bladder
 acute urinary retention, 207
 cystitis, 207
 cystoscopy, 208, 208
 detrusor muscle, 207
 distended, 207
 haematuria, 208
 injuries, 208
 micturate, urge to, 207
 stone formation, 208, 209
 suprapubic cystostomy, 207
 trigone, 208
 tumours, 207
 urothelium, 207
- Blastocyst, 15
- Blood supply, spinal cord
 segmental arteries, 24, 25
 venous drainage, 25
 vertical arteries, 24
- Boot top fracture, 264
- BPH, *see* Benign prostatic hyperplasia
- Brachial artery, 90, 91
- Brachial plexus, 84
 axillary sheath, 84
 cords, 85
 distal aspect of forearm injury, 88
 inferior to elbow injury, 88
 middle part of upper arm injury, 87
 musculocutaneous nerve injury, 87
 nerves, 85
 radial nerve injury, axilla, 87
 roots, 85
 sensory distribution, 86
 terminal branches, 85–86
- Brain, anatomy of
 arterial vasculature, 12–13
 basal ganglia, 6, 7
 brainstem, 7, 7–8
 cerebellum, 4, 5
 cerebrum, 1–4
 cranial nerves, 8, 9, 10
 CSF circulation and ventricular system, 11–12
 diencephalon, 5
 embryology, 1
 medulla oblongata, 8
 midbrain, 7–8
 pons, 8
 sagittal section, 2
 skull base, 11
 venous vasculature, 13–14
- Brainstem, 7, 7
 interpeduncular fossa, 7
 medulla oblongata, 8
 midbrain, 7–8
 parts, 7
 pons, 8
 surface features, 7
 tectal plate, 7
- Branchial cyst, 72, 72
- Breast
 anterior view, 141
 blood supply, 142, 142
 boundaries, 141–142
 cancer, 143, 143–144
 Cooper's ligaments, 142
 NAC, 142
 sagittal section, 141
 triple assessment, 143–144, 144
- Breast-conserving surgery (BCS), 144
- Breast Imaging Reporting and Data System (BI-RADS), 144
- Broca's area, 3
- Brown-Séquard syndrome, 25–26
- Buck's fascia, 214, 215
- Bulbourethral glands, 224
- Bunions, 266
- Burst abdomen, 154
- C**
- CABG, *see* Coronary artery bypass graft
- CABG surgery, *see* Coronary artery bypass graft
- CAD, *see* Coronary artery disease
- Caecum
 acute appendicitis, 182
 inflamed distended appendix, 182
 retrocaecal appendicitis, 182
 taeniae coli, 182
 vermiform appendix, 182
- Calot's triangle, 174
- Camper's chiasm, 95, 95
- Camper's fascia, 149
- Cannonball metastatic lung cancer, 128
- Cardiac plexus, 120
- Cardiac tamponade, 133–134
- Carpal tunnel syndrome, 100
- Cataracts, 41
- Cauda equina syndrome, 27
- Cavernous sinus thrombosis, 14
- CCA, *see* Common carotid artery
- Central cord syndrome, 26, 27
- Cerebellum
 anatomical lobes, 4
 anterior view, 5
 arbor vitae, 4
 peduncles, 4
 vermis, the, 4
- Cerebrospinal fluid (CSF)
 choroid plexus, 11
 circulation, 11–12
- Cerebrum
 anatomical lobes, 1, 2
 corpuscallosum, 2, 2
 frontal lobe, 3
 functions, lobe, 1
 gyri, 2
 limbic lobe, 4
 longitudinal fissure, 1
 occipital lobe, 4, 4
 parietal lobe, 4
 sulcus, 2
 temporal lobe, 3
- Cervical excitation, 230
- Cervical lymph nodes, 71
- Cervical oesophagus
 anatomical relations, 75
 blood supply, 75
 dysphagia, 75, 76
 lymphatic drainage, 75
 nerve supply, 75
- Cervical rib, 115
- Cervical spine injury, 59–60
- Cervical sympathetic trunk, 60–61
- Chancre, 216
- Chassaignac's (carotid) tubercle, 60
- CHD, *see* Congenital hip dislocation
- Chest drains, 130
- Cholecystectomy, 156
- Cholecystostomy, 175
- Cholelithiasis, 175
- Choroid plexus, 11
- Chronic obstructive pulmonary disease (COPD), 127
- Chylothorax, 130
- Cingulate sulcus, 4
- Circle of Willis, 12, 13
- Clavicle (collar bone)
 conoid tubercle, 80
 roles, 80
 superior and inferior surfaces, 80
- Clitoris, 225
- Coeliac plexus, 160
- Collateral ligaments, knee, 252
- Colles' fascia, 149
- Colles' fracture, 92, 92
- Colon
 ascending, 183
 caecum, 182–183
 colostomy, 183
 CRC, 183
 descending, 183
 diverticulosis, 184, 184
 Hirschsprung's disease, 184, 185
 ileostomy, 183
 ischaemic colitis, 184
 sigmoid, 183
 sigmoid volvulus, 184, 185
 stomas, 183
 transverse, 183
- Colorectal cancer, 210
- Colorectal carcinoma (CRC), 183
- Colostomy, 183
- Common carotid artery (CCA), 12, 52
 carotid body, 63, 63
 carotid sinus, 63, 63, 64
 endarterectomy, 63, 63
- Congenital diaphragmatic hernia, 119
- Congenital hip dislocation (CHD), 238
- Congenital pyloric stenosis, 164, 164
- Conjunctivitis, 41
- Cooper's ligaments, 142
- COPD, *see* Chronic obstructive pulmonary disease
- Coronary angiogram, 136
- Coronary artery bypass graft (CABG) surgery, 116, 133, 136, 249
- Coronary artery disease (CAD), 137
- Coronary circulation
 left coronary artery, 134
 right coronary artery, 134
- Coronavirus disease 2019 (COVID-19), 127–128
- Corpus cavernosum, 214
- Corpus spongiosum, 214, 232
- Corticobulbar tract fibres
 facial nucleus, 24
 LMNs, 23
 pseudobulbar palsy, 24
- Corticospinal tract
 lateral, 23
 lesions, 24
 LMNs, 23, 24
 medulla, 22–23

- neurons, 29
 - UMNs, 23, 24
 - Costochondritis, 115
 - Coverings, spinal cord
 - bony, 18
 - denticulate ligaments, 17
 - epidural space, 17
 - meningeal, 17, 19
 - pia mater, 17
 - sub-arachnoid space, 17
 - Cowper's glands, 224
 - Cranial nerves, 8, 10
 - brain, anatomy of, 8, 9, 10
 - cavity, internal view, 9
 - CN III (oculomotor), 50
 - CN II (optic), 49
 - CN I (olfactory), 49
 - CN IV (trochlear), 50
 - CN IX (glossopharyngeal), 52
 - CN VI (abducens), 51
 - CN VII (facial), 51–52
 - CN VIII (vestibulocochlear), 52
 - CN V3 (mandibular), 50
 - CN V2 (maxillary), 50
 - CN V (trigeminal), 50
 - CN XI (accessory), 52–53
 - CN XII (hypoglossal), 53
 - CN X (vagus), 52
 - CV, V1 (ophthalmic), 50
 - function and path, 10
 - recurrent laryngeal, 52
 - roots II to XII, 9
 - Craniosynostosis, 34
 - CRC, *see* Colorectal carcinoma
 - Cricothyroidotomy, 67
 - Crista terminalis, 136, 137
 - Crohn's disease, 179, 179
 - Cryptorchidism, 218, 220
 - CSF, *see* Cerebrospinal fluid
 - Cubital fossa, 90
 - Cubital tunnel syndrome, 97
 - Culdocentesis, 227
 - Cushing's syndrome, 190
 - Cystic hygroma, 72
 - Cystitis, 207
 - Cystogastrostomy, 167
 - Cystoscopy, 208, 208
- D**
- Dacryoadenitis, 41
 - Deafness, 45
 - Deep inferior epigastric perforator (DIEP) flap, 154
 - Deep vein thrombosis (DVT), 128, 251
 - Degeneration, spinal, 27
 - Degenerative disc disease, 187
 - Denonvillier's fascia, 209, 226
 - Denticulate ligaments, 17
 - Dermatome, 20, 20, 21
 - Descending tracts
 - corticobulbar, 23–24
 - corticospinal, 22, 23, 23
 - Developmental dysplasia, hip, 238
 - Diabetic foot, 268–269, 269
 - Diaphragm
 - abdominal surface, 118
 - attachments, 117
 - embryology, 116–117
 - ligaments, 117
 - motor innervation, 117
 - phrenic nerve, 117, 119
 - respiration, 119
 - Diaphragma sellae, 11
 - Diencephalon, 5, 5
 - DIEP flap, *see* Deep inferior epigastric perforator
 - Digital rectal examination (DRE), 211
 - Digits
 - extensors, 102
 - pulley system of, 101–102
 - DIP joint, *see* Distal interphalangeal (DIP) joint
 - Distal interphalangeal (DIP) joint, 95
 - Distal radio-ulnar joint, 93–94
 - Diverticulosis, colon, 184, 184
 - Dopamine, 5
 - Dorsal venous arch, lower limb, 248
 - Down's syndrome, 138
 - DRE, *see* Digital rectal examination
 - DU, *see* Duodenal ulceration
 - Duodenal ulceration (DU), 165
 - Duodenum
 - blood supply and venous drainage, 166
 - D1, superior part, 165
 - D2, descending part, 166
 - D3, inferior part, 166
 - D4, ascending part, 166
 - nerve supply and lymphatic drainage, 166
 - parts, 164, 165
 - peptic ulcer, 165, 165
 - Dura mater, 11, 13, 17
 - DVT, *see* Deep vein thrombosis
 - Dysphagia
 - causes of, 76
 - definition, 75
- E**
- Ear
 - anatomy, 45
 - auditory ossicles, 43
 - auditory tube, 43
 - auricle/pinna, 41, 42
 - blood supply, 42, 44, 45
 - canal, 42
 - cochlea, 44
 - external, 41–42, 42
 - hearing loss, 45
 - infections, 44
 - inner, 44, 44–45
 - innervation, 42, 44, 45
 - labyrinth, 44–45
 - mastoiditis, 44
 - middle, 43, 43–44
 - muscles, middle, 43
 - otitis externa, 42
 - scala vestibuli, 44
 - tympenic membrane, 43
 - EBUS, *see* Endobronchial ultrasound bronchoscopy
 - Ectopic gestation, 230
 - Elbow
 - dislocation, 93
 - joint, 93, 93
 - Embolism, 13, 32
 - Emphysema, 129
 - EMR, *see* Endoscopic mucosal resection
 - Endobronchial ultrasound bronchoscopy (EBUS), 123
 - Endocardium, 134
 - Endometriosis, 229
 - Endoscopic mucosal resection (EMR), 164
 - Endoscopic retrograde cholangiopancreatography (ERCP), 174, 174, 175
 - Endoscopic thoracic sympathectomy, 121
 - Endotracheal intubation, 67
 - ENS, *see* Enteric nervous system
 - Enteric nervous system (ENS), 160
 - Epicardium, 134
 - Epididymo-orchitis, 220
 - Epidural space, 17
 - Epidural vs. spinal anaesthesia, 27–28
 - Epigastric hernia, 153
 - Epiglottitis, 67
 - Epispadias, 217
 - Epistaxis, 48
 - ERCP, *see* Endoscopic retrograde cholangiopancreatography
 - External carotid artery, 64
 - Extracapsular ligaments, hip, 238
 - Eye
 - accommodation reflex, 39
 - aqueous humour chambers, 39
 - arterial supply, 39
 - cataracts, 41
 - ciliary ganglion, 39
 - conjunctivitis, 41
 - dacryoadenitis, 41
 - exophthalmos, 39, 39
 - extraocular muscles, 39–40, 40, 40
 - glaucoma, 41
 - innervation, 38–39
 - intrinsic muscles, 40
 - lacrimal gland, 40
 - layers, 37, 37–38
 - lymphatics, 39
 - occlusion, retinal artery, 39
 - oculomotor nerve (CN III), 38, 40
 - open angle glaucoma, 76
 - ophthalmic artery, 76
 - optic disc, 38
 - optic nerve (CN II), 38, 38
 - optic neuritis, 41
 - orbital blowout fracture, 41
 - pituitary adenoma, 41
 - pupillary light reflex, 38
 - retinal detachment, 41
 - retinoblastoma, 41
 - venous drainage, 39
- F**
- Facial nerve (CN VII), 51–52
 - Fallopian tubes/oviducts, 229–230, 230
 - False/pseudoaneurysm, 158
 - Falx cerebri, 11
 - Fascia, neck
 - ansa cervicalis, 61
 - cervical plexus, 61
 - cervical sympathetic trunk, 61
 - deep cervical, 60
 - infrahyoid muscles, 60, 61
 - nerves, 61

- phrenic nerve (C3–C5), 61
 - suprahyoid muscles, 60
 - vagus nerve (CN X), 61
 - Fasciculus cuneatus, 22
 - Fasciculus gracilis, 22
 - Fasciotomy, 260
 - FDP, *see* Flexor digitorum profundus
 - Felon, 103
 - Female genital mutilation, 226
 - Female lower genital tract, 225
 - Bartholin's (greater vestibular) glands, 225–226
 - blood supply, 225
 - caudal block, 226
 - clitoris, 225
 - hymen, 226
 - labia majora, 225
 - labia minora, 225
 - lymphatic drainage, 225
 - mons pubis, 225
 - nerve supply, 225
 - paraurethral glands, 226
 - pelvic organ prolapse, 226
 - posterior commissure, 225
 - Skene's (lesser vestibular) glands, 226
 - urethral meatus, 225
 - vagina, 226
 - vestibule, 225
 - Female reproductive organs
 - embryology, 224
 - lower genital tract, 224–226
 - upper genital tract, 227–231
 - Female upper genital tract
 - culdocentesis, 227
 - ovaries, 230–231
 - rectouterine pouch, 227
 - uterine tubes, 229–230
 - uterus, 227–229
 - Femoral artery, 244
 - Femoral artery pseudoaneurysm, 246
 - Femoral nerve (L2–L4), 188, 242
 - Femoral venepuncture, 246
 - Femoro-popliteal bypass graft, 247
 - Femur
 - aneurysms, 246
 - anterior and posterior view, 240
 - blood supply, 239
 - canal, 242
 - femoral artery, 241
 - femoral ring, 242
 - fractures, shaft, 240, 240, 241
 - greater trochanter, 239
 - hernia, 242
 - intercondylar fossa, 239
 - intertrochanteric crest, 239
 - intertrochanteric line, 239
 - intra-capsular fractures, 239
 - lesser trochanter, 239
 - linea aspera, 239
 - NOF, 239
 - quadrate tubercle, 239
 - triangle, 241, 241
 - Fibula
 - anterior and posterior view, 255
 - fractures, 255, 256
 - lower end, 255
 - peroneal nerve, 255
 - shaft of, 255
 - Filum terminale, 17
 - Flail chest, 116
 - Flat muscles
 - conjoint tendon, 151
 - external oblique, 151, 151
 - internal oblique, 151
 - lateral abdominal wall, 152
 - right transversus abdominis, 151
 - Flexion-distraction fractures, 187
 - Flexor digitorum profundus (FDP), 95
 - Flexor retinaculum, 259, 259
 - Follicle-stimulating hormone (FSH), 5
 - Foot
 - anatomical anomalies, 266
 - ankle joint, 261–262
 - anterior surface, 263
 - arches, 266, 266–267
 - blood supply, 267
 - bones, 261
 - diabetic, 268–269, 269
 - extensor retinacula, 263, 263
 - fibular retinacula, 263
 - forefoot, abnormalities of, 266
 - high-heeled shoes, use of, 267
 - innervation, 267, 267–268
 - intrinsic muscles, 267
 - joints, 264, 264, 265
 - muscles and movements, 267
 - osteology, 260, 260, 261
 - plantar fasciitis, 268
 - tarsals, 260–261
 - vascular examination, 268
 - Forearm and wrist
 - arteries, 95–96
 - bones, 91, 91
 - Colles' fracture, 92, 92
 - distal radio-ulnar joint, 93–94
 - elbow joint, 93, 93
 - Galeazzi's fracture, 92
 - Monteggia's fracture, 92, 93
 - muscles, anterior compartment, 94, 94, 94–95
 - nerve, 96–97
 - neurovascular structures, 95–99
 - posterior compartment, 97–99
 - radius, 91–92
 - Smith's fracture, 92
 - ulna, 92
 - veins, 96
 - Fossa ovalis, 138
 - Fournier's gangrene, 154
 - Froment's test, 97
 - FSH, *see* Follicle-stimulating hormone
 - Funny bone, 85
- G**
- Galeazzi's fracture, 92
 - Gallbladder and biliary system
 - biliary obstruction, 175–176
 - biliary tree, 174
 - blood supply, 174
 - cholelithiasis, 175
 - divisions, 173
 - ERCP, 174, 174–175, 175
 - extra hepatic biliary system, 174
 - gallstones, 175, 175, 176
 - Hartmann's pouch, 173, 174
 - hepatobiliary triangle, 174
 - jaundice, 176, 176
 - lymphatic drainage, 174
 - Murphy's sign, 175
 - nerve supply, 174
 - post-hepatic (obstructive) jaundice, 175
 - Gangrene, 269
 - Gastric cancers, 164
 - Gastro-oesophageal reflux disease (GORD), 161
 - Gastroschisis, 153
 - Gastrostomy feeding, 164
 - Gastrulation, 15
 - GBS, *see* Guillain-Barré syndrome
 - Genitofemoral nerve, 188
 - GH, *see* Growth hormone
 - Glaucoma, 41
 - Glisson's capsule, 170
 - Glossopharyngeal nerve (CN IX), 44, 52, 54, 55, 56, 63, 73, 78
 - Gluteal region
 - blood supply, 237
 - boundaries, 234
 - deep gluteal muscles, 235, 235
 - gluteus minimus and medius, 236
 - lateral muscles, thigh and buttock, 234
 - muscles, 234–235
 - nerve, 236
 - superficial abductors and extensors of hip, 234, 235
 - Trendelenburg's sign, 236, 237
 - Goitre, 69
 - GORD, *see* Gastro-oesophageal reflux disease
 - Gout, 266
 - Gracilis, 243
 - Gridiron (McBurney's) incision, 154
 - Groin lump, 223
 - Groin strain, 243
 - Growth hormone (GH), 5
 - G-spot, 226
 - Guillain-Barré syndrome (GBS), 27
 - Gut
 - coeliac trunk, 159
 - divisions, 159
 - duodenum, 158
 - foregut, 159, 159
 - mesenteries, 159
 - midgut, 158, 159
 - nerve supply, 159–160
 - omphalomesenteric duct, 159
 - splanchnic nerves, 159, 160
 - stomach, 158
- H**
- Haemarthrosis, 254
 - Haematuria, 208
 - Haemoperitoneum, 157
 - Haemorrhage, 13, 32
 - Haemorrhoids, 211
 - Haemothorax, 130
 - Hammer toe, 266
 - Hamstrings, 244
 - Hand; *see also* Wrist and hand
 - anatomical snuffbox, 99, 99
 - arches, 104
 - arteries, 101
 - bones, 101
 - carpometacarpal joints, 101

- digits, 101–102
 - felon, 103
 - grips, 104, 104
 - infections, 103
 - intercarpal joints, 101
 - intrinsic muscles, 102–103
 - IP joints, 101
 - joints, 101
 - metacarpophalangeal joints, 101, 101
 - nerves, 103–104
 - neurovasculature, 103–104
 - skin, 101
 - tenosynovitis, 103
 - wrist (radiocarpal) joint, 101
 - Hay fever, 47
 - Head and neck
 - arterial supply, 63–64
 - cervical oesophagus, 75–76
 - cranial nerves, 49–53
 - ear, 41–45
 - eye, 37–41
 - hyoid bone, 65
 - larynx, 65–67
 - lymphatic drainage, 71
 - nose, 45–49
 - oral cavity/mouth, 53–56
 - orbit, 36–37
 - parathyroid glands, 70
 - pharynx, 73–75
 - salivary glands, 56–58
 - scalp, 33
 - skull, bones of, 34, 34–36
 - thyroid gland, 67–70
 - trachea, 67
 - venous drainage, 64
 - Hearing loss, 45
 - Heart
 - AF, 137
 - angina, 136
 - apex beat, 132
 - attack, 136
 - block, 137
 - borders, 132
 - conductive system, 136, 137
 - coronary arteries, 135
 - coronary circulation, 134–136
 - coronary sinus, 134
 - coronary veins, 135
 - cross-section, 139
 - electrical conduction diagnosis, 136, 137
 - great vessels, 140
 - internal cardiac anatomy, 137–138
 - mitral valve, 139
 - murmurs, 139–140
 - myocardial infarction, 136
 - nerve supply, 136–137
 - pericardium, 132–133
 - surfaces and borders, 132
 - tissue, 134
 - valves, 139, 139–140
 - VF, 137
 - Helicine arteries, 216
 - Hepatic plexus, 172
 - Hepatomegaly, 172, 172
 - Hernia, 153
 - colon, 115, 115
 - femoral, 242
 - hiatus, 161, 161
 - inguinal, 222–223
 - Hiatus hernia, 161, 161
 - Hilum, 125, 125
 - Hip adductors, 243, 243, 243
 - Hip joint
 - articular capsule, 237
 - blood supply, femoral head, 238
 - CHD, 238
 - dislocation, 238, 238
 - extracapsular ligaments, 238
 - ligaments, 238
 - socket, 237
 - THR, 238, 239
 - Hippocampus, 4
 - Hirschsprung's disease, 184, 185
 - Horner's syndrome, 128
 - Houston's valves, 209
 - HSG, *see* Hysterosalpingography
 - Humerus
 - anatomical features, 82
 - bony landmarks, 81, 82
 - brachial plexus, 84–88
 - glenohumeral joint (shoulder joint), 83, 84
 - ligaments, 81, 83
 - Hunter's canal, 246
 - Hydrocele, 220
 - Hydrocephalus, 12
 - Hydronephrosis, 229
 - Hydrosalpinx/pyosalpinx/haematosalpinx, 230
 - Hydrothorax, 130
 - Hydroureter, 229
 - Hymen, 226
 - Hyoid bone, 65
 - Hyperparathyroidism, 70
 - Hypogastric plexus, 160
 - Hypoglossal nerve (CN XII), 53
 - Hypoperfusion, 13, 32
 - Hypospadias, 217
 - Hypotension, 28
 - Hypothalamus, 5
 - Hysterectomy, 229
 - Hysterosalpingography (HSG), 230
- I**
- IBD, *see* Inflammatory bowel disease
 - ICA, *see* Internal carotid artery
 - Ileostomy, 183
 - Ileum and jejunum, 176–177
 - Crohn's disease, 179
 - differences, 178
 - IBD, 179, 179
 - intussusception, 180, 180
 - lymphatic drainage, 177
 - Meckel's diverticulum, 179–180, 180
 - nerve supply, 177
 - SMA, 177, 179, 179
 - small bowel obstruction, 177, 179
 - Iliofemoral ligament, 238
 - Ilioinguinal nerve, 188
 - Iliotibial tract syndrome, 235
 - Incisional hernia, 153
 - Inferior alveolar nerve, 50
 - Inferior gluteal nerve, 236
 - Inferior hypogastric plexus, 160
 - Inferior turbinate hypertrophy, 50
 - Inferior vena cava (IVC), 136, 158, 201
 - Inflammatory bowel disease (IBD), 179, 179
 - Inguinal canal
 - deep ring, 220
 - hernias, 225–223
 - left, 221
 - posterior view, right side, 221
 - spermatic cord, 221, 222
 - superficial ring, 220
 - Inguinal lymph nodes
 - deep, 250
 - superficial, 250
 - Innominate/coxal bone (*os coxa*), 197–198
 - Intercondylar fossa, 239
 - Intercostal nerve block, 116
 - Internal cardiac anatomy
 - ASD, 38
 - atria, 137–138
 - ventricles, 138
 - Internal carotid artery (ICA), 12, 13, 14, 32, 52
 - Internal jugular vein (IJV), 52
 - Intracerebral aneurysm, 11
 - Intracranial bleeding, 11, 12
 - Intramuscular injections, 237, 237
 - Intrinsic muscles, hand
 - adductor pollicis, 102
 - dorsal interossei, 102
 - hypothener eminence, 103
 - lumbricals, 102
 - palmar aponeurosis (palmar fascia), 103
 - palmar interossei, 102
 - palmaris brevis, 102
 - thenar eminence, 102
 - Intussusception, 180, 180
 - Inversion and eversion injuries, 264
 - Ischaemic colitis, 184
 - Ischial spine, 199, 232
 - Ischioanal fossa, 213
 - Ischioavernosus muscles, 216
 - Ischiofemoral ligament, 238
 - Ischium
 - greater sciatic notch, 199
 - ischial spine, 199
 - ischial tuberosity, 199
 - lesser sciatic notch, 199
 - parts, 198–199
 - Isthmus, 227
 - IVC, *see* Inferior vena cava
- J**
- Jejuno-ileum, *see* Ileum and jejunum
 - Jobe's test, 88
 - Jugular venous pressure (JVP), 64
 - JVP, *see* Jugular venous pressure
- K**
- Kidney
 - agenesis, 192
 - anatomical relations, 191–192
 - arterial blood supply, 191, 192
 - developmental anomalies, 191
 - embryology, 190, 190
 - examination, 193
 - functions, 191
 - horseshoe, 192, 193
 - infections, 192
 - injuries, 192

lymphatic drainage, 192
 measurements, 190
 mesonephros, 190
 metanephros, 191
 nerve supply, 192
 palpation, 193
 pelvic, 192
 polycystic, 192, 193
 pronephros, 190
 renal artery stenosis, 192
 supernumerary arteries, 192
 transplantation, 193
 tumours, 192
 urogenital ridge, 190

Killian's triangle, 74–75, 75

Knee joint
 amputations, 254
 blood supply, 253
 capsule, 252
 deformities, 254
 extracapsular ligaments, 252, 253
 haemarthrosis, 254
 intracapsular ligaments, 252, 253
 ligamentum patellae, 252
 menisci (semilunar cartilages), 253
 nerve supply, 253
 osteology, 252
 patella, 253
 popliteus, 252
 swollen knee, 254

Kocher's incision, 154
 Kocher's manoeuvre, 166

Kyphoscoliosis, 116, 117
 Kyphosis, 116

L

Labia majora, 225
 Labia minora, 225
 Lacrimal gland, 40
 LAD arteries, *see* Left anterior descending
 Laminectomy, 187
 Lanz's incision, 154
 Laparoscopic cholecystectomy, 174, 176

Large bowel/intestine
 arterial supply, colon, 181
 colon layers, 180–181
 function, 180
 lymphatic drainage, 182
 marginal artery of Drummond, 181
 rectum, 181
 small bowel, differentiation from, 182
taeniae coli, 181

Larry's point, 133

Laryngeal cancer, 67, 67
 Laryngeal obstruction, 67
 Laryngeal papillomatosis, 67
 Laryngopharynx, 74

Larynx
 anterior, posterior, and lateral views, 65
 arytenoid cartilage, 65
 cricoid cartilage, 65
 cricothyroid membrane, 66
 epiglottis, 65
 hyoepiglottic ligament, 66
 innervation, 66
 ligaments of, 65–66
 muscles of, 66

quadrangular membrane, 66
 rima glottidis, 66
 superior laryngeal aperture, 66
 suprahyoid muscles, 66
 thyrohyoid membrane, 65
 thyroid cartilage, 65
 vallecula, 66
 vocal cord, 66, 66

Latissimus dorsi (LD), 116
 LD, *see* Latissimus dorsi

Left anterior descending (LAD) arteries, 134

Leg, musculature of, 257
 Achilles tendon, 259
 anterior compartment, 257, 257
 lateral compartment, 259, 259
 posterior compartment, 258, 258

Leg ulcers, causes of, 260

Levator ani muscle, 199

Levator palpebrae superioris, 37, 38, 39, 77

Ligament of Treitz, 166

Linea alba, 150

Linea aspera, 239, 240

Lingual nerve, 50

Lisfranc injury, 265, 266

Liver
 anatomical relations, 170
 blood supply, 171
 functions, 170
 Glisson's capsule, 170
 gross anatomy, 170–171
 hepatomegaly, 172, 172
 lobes, 170, 171
 lymphatic drainage, 172
 metastasis, 173
 nerve supply, 172
 peritoneal recesses, 171
 porta hepatis, 170
 portal hypertension, 173
 segments, 171, 171
 transjugular liver biopsy, 173
 transplant, 173
 visceral surface, 172

LMNs, *see* Lower motor neurons

Long saphenous vein (LSV), 248

Lordosis, 116

LOS, *see* Lower oesophageal sphincter

Lower GI bleeding, 166

Lower limb
 anterior thigh, 242, 242
 anterior tibial artery, 247–248
 arterial supply, 244, 244–248
 dorsalis pedis artery, 248
 femoral artery, 244, 244–245
 femoral vein, 250
 femur, 239–242
 fibula, 255–256
 foot, 260–269
 gluteal region, 234–237
 hip (acetabulofemoral) joint, 237–239
 inguinal lymph nodes, 250–251
 ischaemia, 245–246
 knee joint, 252–254
 lymphatics, 250, 250
 musculature, 257–260
 pes anserinus, 254
 piriformis, 236
 popliteal artery, 246–247
 popliteal block, 247

popliteal fossa, 246, 247
 popliteal vein, 249
 posterior thigh, 244, 244, 244
 posterior tibial artery, 248
 profunda femoris (deep femoral)
 artery, 246
 pulse points, 248
 thigh, 243–244
 tibia, 254–255
 vasculature, 244–251
 venous drainage, 248–249

Lower motor neurons (LMNs), 23, 24

Lower oesophageal sphincter (LOS), 160, 161

Lower urinary tract symptoms (LUTS), 224

LSV, *see* Long saphenous vein

Ludwig's angina, 63

Lumbar plexus
 branches, 188
 femoral nerve, 188
 genitofemoral nerve, 188
 ilioinguinal nerve, 188
 nerves, 188, 189
 obturator nerve, 188
 saphenous nerve, 188

Lumbar puncture, 27, 28

Lumbar sympathetic trunk, 159

Lumpectomy, 144

Lungs
 apex, 124
 ARDS, 127–128, 128
 asthma, 127
 borders, 124
 cancer, 127, 128, 128
 COPD, 127
 innervation, 126
 lobes, 124, 124
 lymphatic drainage, 127
 PE, 128
 pleura, 127, 129
 pleural recesses, 127
 pneumonia, 127
 pulmonary oedema, 127
 respiratory tree, 125–126
 right and left, comparison, 124
 root and hilum, 125, 125
 safe triangle, 130, 130
 surfaces, 124
 trachea, 125, 125–126

LUTS, *see* Lower urinary tract symptoms

Lymphadenopathy, 72, 251

Lymphatic drainage, 67

Lymphoedema, 251

M

Main pancreatic duct (MPD), 167

Male external genitalia
 penis, 214–216
 scrotum, 218–219
 testes, 219–220

Male genital tract
 external anatomy, 213, 213
 inguinal canal, 220–223

Male internal genitalia
 bulbourethral (Cowper's) glands, 224
 prostate gland, 223–224
 seminal vesicles, 223
 vas deferens, 223

- Malignant melanoma, 131
Mandibular nerve (CN V3), 50, 56, 77
Marginal artery of Drummond, 181
Masseter muscles, 50, 56, 77
Mastectomy, 144
Mastoiditis, 44
Maxillary nerve (CN V2), 50
Maxillary sinus, 36, 48, 49, 77, 78
Maxillary sinusitis, 49, 49
MCA, *see* Middle cerebral artery
McBurney's incision, 154, 154
McMurray's test, 253
Meckel's diverticulum, 179–180, 180
Medial lemniscus, 22
Medial malleolus, 246, 248, 251, 255, 258, 259, 259, 262, 263, 267, 268
Median nerve (C5–C8, T1), 85
Mediastinal tumours
 EBUS, 123
 mediastinitis, 123
 mediastinoscopy, 123
 neurogenic neoplasms, 123
 perforated oesophagus, 123
 retrosternal goitre, 123
Mediastinitis, 123
Mediastinoscopy, 123
Mediastinum
 anterior, 120, 121
 inferior, 120
 middle, 121
 posterior, 120, 121
 superior, 120–121
 thoracic oesophagus, 121–122
 thoracic sympathetic trunks, 120–121
Medulla oblongata/medulla, 8
Meissner's plexus, 162
Melanocyte-stimulating hormone, 5
Meningitis, 11
Meningocele, 16–17, 17
Meniscal injury, 253
Menisci (semilunar cartilages), 253
Menstrual disorders, 229
Mesenteries, 157
Mesonephric duct, 230, 232
Mesorectum, 209
MI, *see* Myocardial infarction
Midbrain
 cerebral aqueduct, 7
 substantia nigra, 8, 8
 tectum, 7
 tegmentum, 8
Middle cerebral artery (MCA), 13
Midfoot injury, *see* Lisfranc injury
Mirizzi's syndrome, 175
Mitral valve, 139
Modified Allen's test, 96
Mons pubis, 225
Monteggia's fracture, 92, 93
Montgomery's tubercles, 142
Mouth, *see* Oral cavity
MPD, *see* Main pancreatic duct
MS, *see* Multiple sclerosis
Multiple sclerosis (MS), 27
Mumps, 57
Murphy's sign, 175
Muscles of mastication, 56
Musculocutaneous nerve, 85
Myelomeningocele, 17, 17
Myocardial infarction (MI), 136
Myocardium, 134
Myotome, 20
- ## N
- NAC, *see* Nipple-areola complex
Nasal septum deviation, 47
Nasopharynx, 74
National Health Service (NHS), 238
NAVeL, *see* Nerve, Artery, Vein, Lymphatics
Neck; *see also* Head and neck
 atlas (C1), 58, 58
 axis (C2), 58, 59
 cervical degenerative diseases, 60
 cervical spine injury, 59–60
 cervical vertebrae, 58
 fascia, 60
 lump, 72–73
 lymphatic drainage, 71, 71–72
 swellings, 71–72
 triangles, 61–63
 vertebra prominens (C7), 58, 59
Neck of the femur (NOF), 239
Necrotising fasciitis, 154
Needle thoracostomy, 130
Nerve, Artery, Vein, Lymphatics (NAVeL), 246
Nerve root compression, 26–27
Nerves, forearm and wrist
 median, 96
 motor innervation, 96–97
 sensory innervation, 97
 ulnar nerve (C8–T1), 97
Nerves, named
 abducens nerve (CN VI), 51
 accessory nerve (CN XI), 52–53
 auriculotemporal nerve, 50
 axillary nerve, 83, 85, 86, 87
 brachial plexus, 85
 genitofemoral nerve, 218
 ilioinguinal nerve, 188
 inferior alveolar nerve, 50
 inferior gluteal nerve, 236
 mandibular nerve (CN V3), 50, 56, 78
 maxillary nerve (CN V2), 50
 median nerve (C5–C8, T1), 85
 musculocutaneous nerve, 85
 obturator nerve, 188
 oculomotor nerve (CN III), 36–40, 50, 77
 olfactory nerve (CN I), 49
 ophthalmic nerve (CV, V1), 50
 optic nerve (CN II), 38, 38, 49
 phrenic nerve, 120
 accessory, 117
 C5 part, 117
 paralysis of, 119
 posterior femoral cutaneous nerve, 236
 pudendal nerve, 204, 204, 232, 236
 radial nerve, 86
 saphenous nerve, 188, 246, 267
 sciatic nerve, 202, 204, 236, 237
 splanchnic nerves, 121, 159, 160
 sural nerve, 246, 267
 sympathetic visceral nerves, 159
 tibial nerve, 267
 trigeminal nerve (CN V), 50
 trochlear nerve (CN IV), 50
 ulnar nerve (C8–T1), 85
 cubital tunnel syndrome, 97
 cutaneous branches, 97
 Froment's test, 97
 function, 97
 injury, 97
 vagus nerve (CN X), 44, 52, 120–121
 vestibulocochlear nerve (CN VIII), 45, 52
Nervi erigentes, S2–S4, 204, 209, 232
Nervus intermedius (CN VII), 45
Neurogenic neoplasms, 123
NHS, *see* National Health Service
Nipple-areola complex (NAC), 142
Nociceptive flexion reflex, 22
NOF, *see* Neck of the femur
Nose
 allergic rhinitis, 47
 blood supply, 46, 47–48
 conchae and meatuses, 46–47
 epistaxis, 48
 external part, 45
 foreign body trapped, 47, 47
 inferior turbinate hypertrophy, 47
 innervation, 48, 48
 Little's area, 48
 lymphatic drainage, 48
 maxillary sinusitis, 49, 49
 muscles, 45–46, 46
 nasal cavity and internal parts, 46, 46
 nasal septum, 46
 oro-antral fistula, 49
 paranasal sinuses, 48, 48, 49
 pituitary tumour removal, 49
 turbinate bones, 46
 venous drainage, 47–48
- ## O
- Obturator externus muscle, 199
Obturator foramen, 199
Obturator internus muscle, 199
Obturator nerve, 188
Obturator nerve entrapment syndrome, 243
Oculomotor nerve (CN III), 36–40, 50, 77
O'Donoghue triad, 253
Oedema, 152
Oesophageal cancer, 76
Oesophagogastrroduodenoscopy (OGD), 160
Oesophagus
 cancer, 76, 161, 161
 distal end, 160
 LOS, 160
 lymph drainage, 161
 perforated, 123
 thoracic, 121–122
OGD, *see* Oesophagogastrroduodenoscopy
Olfactory nerve (CN I), 49
Olfactory sulcus, 3
Omphalocele, 153
Ophthalmic nerve (CV, V1), 50
OPSS, *see* Overwhelming post-splenectomy sepsis
Optic nerve (CN II), 38, 38, 49
Optic neuritis, 41
Oral cavity
 divisions, 53
 muscles of mastication, 56

- palate, 55–56
- papillae, 53
- tongue, 53–55
- Orbit
 - boundaries, 36, 36
 - eyelids, 37
 - foramina, 36–37
 - inferior orbital fissure, 36, 37
 - optic canal, 37
 - superior orbital fissure, 37
- Orbital blowout fracture, 41
- Orbitofrontal cortex, 3
- Orchidectomy, 220
- Oro-antral fistula, 49
- Oropharynx, 75
- Osgood-Schlatter disease, 254
- Osteoarthritis, 60, 254
- Osteonecrosis, 239
- Otitis externa, 42
- Ovarian cancer, 231
- Ovarian cysts, 231, 231
- Ovaries
 - blood supply, 230
 - cancer, 231
 - cortex, 230
 - cysts, 231
 - function, 230
 - germinal epithelium, 230
 - ligaments, 230
 - lymphatic drainage, 230
 - mesonephric duct, 230
 - nerve supply, 230
 - polycystic, 231
 - venous drainage, 230
- Overwhelming post-splenectomy sepsis (OPSS), 170
- P**
- Paget's disease, 143, 143
- Painful arc syndrome, 88
- Palate
 - cleft, 56, 56
 - hard, 55
 - soft, 55, 55
- Palatine tonsils, 55, 71, 72, 74, 75, 78
- Pancoast syndrome, 128
- Pancreas
 - accessory pancreatic duct, 167
 - acute pancreatitis, 167, 167
 - blood supply and lymphatic drainage, 167
 - cancer, 167–168, 176
 - duct system, 167
 - nerve supply, 167
 - pancreaticoduodenectomy, 168
 - pancreatic pseudocyst, 167
 - parts, 166, 166–167
 - Whipple's procedure, 168
- Pancreaticoduodenectomy, 168
- Parahippocampal gyrus, 4
- Paramesonephric (Mullerian) ducts, 227
- Paraphimosis, 216
- Parasympathetic nervous system (PNS), 20, 21
- Parathyroid glands, 70
- Paraumbilical hernia, 153, 153
- Paraurethral glands, 226
- Parotid gland, 56–57
- Patent ductus arteriosus (PDA), 140
- Patent foramen ovale, 138
- PCL, *see* Posterior cruciate ligament
- PD, *see* Peritoneal dialysis
- PDA, *see* Patent ductus arteriosus
- PE, *see* Pulmonary embolism
- Pectineus muscle, 198
- Pectoral girdle
 - clavicle, 80, 80
 - scapula, 81, 81
- Pectus carinatum, 115
- Pectus excavatum, 115
- PEG, *see* Percutaneous endoscopic gastrostomy
- Pelvic floor/diaphragm
 - iliococcygeus, 205
 - ischiococcygeus, 205
 - levator ani, 205
 - male, 205
 - nerve supply, 205
 - pubococcygeus, 205
 - puborectalis, 205
- Pelvic inflammatory disease (PID), 227
- Pelvic organs
 - anal canal, 210–211
 - bladder, 207, 207–208
 - embryology, 205
 - rectum, 209–210
 - ureter, 205–206, 206, 207
- Pelvis, 197
 - ala, the, 197
 - arcuate line, 198
 - arterial blood supply, 200, 201
 - brim, 197
 - components, 197
 - female, 201–202
 - female reproductive organs, 224–231
 - floor, 205, 205
 - fracture, 200
 - functions, 197
 - inguinal canal, 220–223
 - innervation, 202–204
 - innominate/coxal bone, 197–198
 - ischium, 198–199
 - lateral pelvic wall, 199
 - lymphatics, 201
 - male genital tract and inguinal canal, 213, 213
 - male internal genitalia, 223–224
 - organs, 205–211
 - outlet, 197
 - penis, 214–216
 - perineum, 212–213
 - pubic bone, 198
 - pudendal nerve block, 204, 204
 - sacral plexus, 202–204
 - sacrum, 199, 199–200
 - sciatic nerve, 202, 204
 - scrotum, 218–219
 - sympathetic innervation, pelvic part of, 204
 - testes, 219–220
 - types, 202
 - upper genital tract, 227–231
 - urethra, 216–217
 - venous return, 201
- Penile carcinoma, 216
- Penis
 - blood supply, 214, 215
 - bulb, 214
 - bulbospongiosus muscles, 214
 - chancre, 216
 - corpora, 214
 - corpora cavernosa, 214
 - crura, 214
 - ejaculation, 216
 - erection mechanism, 216
 - glans, 214
 - lymphatic drainage, 215
 - nerve supply, 216
 - paraphimosis, 216
 - penile carcinoma, 216
 - phimosis, 216
 - prepuce (foreskin), 216
 - priapism, 216
 - root (radix), 214
 - shaft of, 214
 - suspensory ligaments, 214
 - syphilis, 216
 - venous drainage, 214–215
- Percutaneous endoscopic gastrostomy (PEG), 164
- Percutaneous image-guided liver biopsy, 172
- Perforated oesophagus, 123
- Pericardial effusion, 133
- Pericardial rub, 133
- Pericarditis, 133
- Pericardium
 - blood supply, 133
 - cardiac tamponade, 133–134
 - innervation, 133
 - internal serous layer, 132
 - Larry's point, 133
 - layers, 132, 133
 - pericardial effusion, 133
 - pericardial sinuses, 133, 133
 - pericarditis, 133
- Perineum
 - anterior urogenital triangle, 212
 - boundaries, 212
 - divisions, 212
 - female, 212, 212
 - male, 212–213
 - perineal body, 212
 - posterior (anal) triangle, 212
- Periosteum (pericranium), 33
- Peritoneal dialysis (PD), 157
- Peritoneal ligaments
 - bare area, the, 158
 - coronary (crown-like) ligament, 158
 - falciform ligament, 157
 - ligamentum venosum, 158
 - round ligament, 157
- Peritoneum
 - ascites, 157
 - epiploic foramen, 156
 - greater omentum, 156
 - haemoperitoneum, 157
 - intraperitoneal organs, 155
 - lesser omentum, 156
 - mesentery, 156, 157
 - mesoappendix, 157
 - omentum, 156
 - PD, 157
 - peritoneal attachment, 156, 156
 - peritoneal cavity, 155, 156
 - peritoneal ligaments, 157–158
 - peritonitis, 157
 - retroperitoneal organs, 155–156

- sigmoid mesocolon, 157
 - transverse mesocolon, 157
 - umbilical folds, 158
 - visceral and parietal layers, 155
 - Peritonitis, 157
 - Per rectum (PR) examination, 211
 - Pes anserine bursitis, 242
 - Pharynx
 - blood supply, 75
 - circular muscles, 73
 - inferior constrictor muscle, 73
 - inner and outer muscles, 73, 74
 - Killian's triangle, 74–75, 75
 - laryngopharynx, 75
 - layers, 73
 - longitudinal muscles, 73
 - middle constrictor muscle, 73
 - nasopharynx, 74
 - oropharynx, 74
 - palatopharyngeus, 74
 - parts, 74–75, 75
 - pharyngeal cancer, 74
 - salpingopharyngeus, 73
 - stylopharyngeus, 73
 - superior constrictor muscle, 73
 - Phimosis, 216
 - Phrenic nerve, 120
 - accessory, 117
 - C5 part, 117
 - paralysis of, 119
 - Pia mater, 11, 29
 - PICA, *see* Posterior inferior cerebellar artery
 - PID, *see* Pelvic inflammatory disease
 - Pineal gland, 5
 - PIP joint, *see* Proximal interphalangeal
 - Piriformis, 236
 - Pituitary adenoma, 41
 - Pituitary gland, 5
 - Plantar calcaneonavicular ligament, 266
 - Plantar fasciitis, 268
 - Pleomorphic adenoma, 57
 - Pleura
 - cervical, 129
 - layers, 127
 - nerve supply, 127
 - recesses, 127
 - Pleural effusion, 130, 131
 - Plummer-Vinson syndrome, 76
 - Pneumonia, 127
 - Pneumothorax, 129, 129
 - PNS, *see* Parasympathetic nervous system
 - Poland syndrome, 107
 - Polycystic ovaries, 231, 233
 - Pons, 8
 - Popliteal aneurysm, 247
 - Popliteal artery, 246–247
 - Popliteal block, 247
 - Popliteal fossa, 246, 247
 - Popliteal vein, 249
 - Portal hypertension, 160, 173
 - Posterior abdominal wall
 - anatomical planes, 187
 - flexion-distraction fractures, 187
 - intervertebral disc, 185, 186
 - laminectomy, 187
 - ligamenta flava, 185, 186
 - lumbar vertebrae, 185, 186
 - psoas abscess, 187
 - psoas major, 187
 - quadratus lumborum, 187
 - spondylosis, 187
 - Posterior commissure, 225
 - Posterior cord syndrome, 26
 - Posterior cricoarytenoid muscle, 65, 67, 78
 - Posterior cruciate ligament (PCL), 252
 - Posterior femoral cutaneous nerve, 236
 - Posterior superior iliac spine (PSIS), 197, 198
 - Posterior inferior cerebellar artery (PICA), 24
 - Post-hepatic (obstructive) jaundice, 175
 - Pott's fracture dislocation, 263
 - Precentral gyrus, 3
 - Presacral fascia, 209
 - PR examination, *see* Per rectum
 - Priapism, 216
 - Pringle's manoeuvre, 156
 - Prostate cancer, 224
 - Prostate gland, 223
 - Prostate-specific antigen (PSA) test, 224
 - Proximal interphalangeal (PIP) joint, 95
 - PSA test, *see* Prostate-specific antigen
 - Pseudoaneurysm, 246
 - Pseudobulbar palsy, 24
 - PSIS, *see* Posterior superior iliac spine
 - Psoas abscess, 187
 - Psoas major, 187
 - Pubic symphysis, 244
 - Pubofemoral ligament, 238
 - Pudendal nerve, 204, 204, 232, 236
 - Pulmonary embolism (PE), 128, 251
 - Pulmonary oedema, 127
 - Pulmonary plexus, 121
 - Purkinje fibres, 136
 - Pyloric stenosis, 164
 - Pyothorax, 130
 - Pyramidalis, 150
- Q**
- Quadrangular space, 86, 87
 - Quadrate tubercle, 239
 - Quadratus lumborum, 187
- R**
- Radial nerve, 86
 - Radial pulse, 96
 - Radius
 - articulations, 91–92
 - neck of, 91
 - radial styloid process, 91
 - shaft, 91
 - surfaces, 91
 - Rectal ampulla, 209
 - Rectosigmoid junction, 209
 - Rectum
 - blood supply, 209
 - colorectal cancer, 210
 - Denonvillier's fascia, 209
 - Houston's valves, 209
 - longitudinal muscle layer, 209
 - lymphatic drainage, 210
 - mesorectum, 209
 - nerve supply, 209
 - presacral fascia, 209
 - rectal ampulla, 209
 - rectosigmoid junction, 209
 - related fascial layers, 209–210
 - venous drainage, 209
 - Waldeyer's fascia, 209
 - Rectus abdominis, 150
 - Rectus sheath, 150, 150–151
 - Rectus sheath haematoma, 154
 - Recurrent laryngeal nerve (RLN), 52, 69, 70, 120
 - Recurrent papillomatosis, 67
 - Reflexes
 - Babinski's sign, 22
 - deep tendon, 21
 - muscle spindles, 21
 - plantar, 22
 - Renal artery stenosis, 192
 - Respiratory tree, 125–126
 - Retinal artery occlusion, 39
 - Retinal detachment, 41
 - Retinoblastoma, 41
 - Retroperitoneal space
 - blood supply, 190
 - contents, 189
 - lumbar region, cross-section of, 189
 - suprarenal glands, 190
 - Retropubic space, 223
 - Retrosternal goitre, 68, 69, 123
 - Rheumatic heart disease, 140
 - Ribs
 - atypical, 112
 - cervical, 115
 - false, 110
 - floating, 110
 - fracture, 115
 - head of, 110
 - neck of, 110
 - subclavian vessels and brachial plexus, 111, 111
 - true, 110, 111
 - tubercle, 110, 111
 - RIF, *see* Right iliac fossa
 - Right dominance, 134
 - Right iliac fossa (RIF), 156
 - RLN, *see* Recurrent laryngeal nerve
- S**
- Sacral plexus
 - branches, 202, 203
 - inferior hypogastric plexus, 203
 - lumbosacral trunk, 202
 - nervi erigentes, 204
 - sciatic nerve, 202
 - superior hypogastric plexus, 203
 - Salivary glands
 - parotid gland, 56–57
 - sublingual, 57
 - submandibular, 57
 - Salpingitis, 230
 - Saphenous nerve, 188, 246, 267
 - Scalp
 - arterial supply, 33
 - innervation, 33
 - layers, 33
 - venous drainage, 33
 - Scapular anastomosis, 81
 - Scapula (shoulder blade), 81, 81
 - Scarpa's fascia, 149, 218
 - Sciatica, 237
 - Sciatic nerve, 202, 204, 236, 237

- Scoliosis, 116
- Scrotum, 218, 232
 - cremasteric reflex, 218
 - cryptorchidism, 218
 - dartos fascia, 218
 - dartos muscle, 218
 - external spermatic fascia, 218
 - layers, 218, 219
 - midline raphe, 218
 - Scarpa's fascia, 218
 - sensory innervation, 219
 - tunica vaginalis, 218
- Seldinger's technique, 130, 245
- Seminal vesicles, 223
- Sentinel lymph node biopsy, 144, 144
- Sentinel node biopsy, 251
- Septicaemia, 175
- Septic arthritis, 254
- Sexually transmitted infections (STIs), 217
- SGAP flap, *see* Superior gluteal artery perforator
- Short saphenous vein (SSV), 246, 249, 250
- Shoulder
 - deltoid muscle, 88, 88
 - rotator cuff muscle, 88, 88
- Sigmoid mesocolon, 157
- Sigmoid volvulus, 184, 185
- Skene's (lesser vestibular) glands, 226
- Skull
 - base, 11, 34
 - bones of, 34, 34–36
 - cranial fossae, 35, 35
 - fontanelles, 34
 - foramina, 36
 - fossae, 34, 35
 - fractures, 35, 35–36
 - neurocranium, 34
 - pterion, 34
 - sutures, 34
- SLR test, *see* Straight-leg-raising
- Small bowel obstruction, 177, 179, 179
- Smith's fracture, 92
- SNS, *see* Sympathetic nervous system
- Solar plexus, 160
- Somatostatin, 5
- Sonic hedgehog protein, 15
- Spermatozoa, 219
- Sphenoethmoidal recess, 8
- Sphenoid sinus, 5, 48, 49, 78
- Spigelian hernia, 153, 153
- Spina bifida occulta, 16, 17
- Spinal anaesthesia, 27–28, 28
- Spinal cord, anatomy of, 18
 - alar and basal plates, 15–17
 - ascending tracts, 22, 22, 23
 - autonomic nervous system, 19–21
 - blood supply, 24–25
 - bony covering, 18
 - coverings, 17, 18, 19
 - cross-section, 19, 19
 - damage, traumatic causes of, 25–26
 - descending tracts, 22–24
 - development, 15–17
 - epidural vs. spinal anaesthesia, 27–28
 - gastrulation, 15
 - germ layers, 15, 15
 - injuries, epidemiology of, 26
 - injury/defect, compressive causes of, 26–27
 - injury/defect, non-traumatic causes of, 27
 - ischaemia, 25
 - L1/L2 vertebra, 17
 - lumbar puncture, 27
 - neural tube, 15, 16
 - pathology, 25–27
 - reflexes, 21–22
 - segments, 17
- Spinal stenosis, 27
- Spinal tap, 27
- Spinothalamic tract, 22, 29
- Splanchnic nerves, 121, 159, 160
- Spleen
 - arteria pancreatica magna, 169
 - blood supply and drainage, 169
 - diaphragmatic and visceral surface, 168, 168
 - gastrosplenic ligament, 169
 - lienorenal ligament, 169
 - nerve supply and lymph drainage, 169
 - OPSS, 170
 - peritoneal ligament, 169
 - splenectomy, 169–170
 - splenic notch, 168
 - splenomegaly, 169
 - splenorrhaphy, 170
 - surface anatomy, 168
- Splenectomy, 169–170
- Splenomegaly, 169
- Splenorrhaphy, 170
- Spondylolisthesis, 187
- Spondylosis, 60, 187
- Spring ligament, 266
- SSS, *see* Superior sagittal sinus
- SSV, *see* Short saphenous vein
- Stellate ganglion, 121
- Sternotomy, 116
- Sternum
 - bony anatomy, 110
 - manubriosternal joint, 109, 110
 - suprasternal/jugular notch, 109
 - xiphisternal, 109, 110
- Stertor, 67
- STIs, *see* Sexually transmitted infections
- Stomach
 - anatomical relations, 162
 - arterial blood supply and venous drainage, 163, 163
 - cardia, 162
 - functions, 162
 - fundus, 162
 - gastric cancers, 164
 - gastric wall layers, 162
 - gastrostomy feeding, 164
 - greater curvature, 162
 - layers, 163
 - lesser curvature, 162
 - lymph drainage, 164
 - nerve supply, 164
 - pyloric region, 162
 - pyloric stenosis, 164
 - rugae, 162
- Stomas, 183
- Straight-leg-raising (SLR) test, 237
- Stress fracture, 264, 265
- Stria of Gennari, 4, 4
- Stria terminalis, 4
- Stridor, 67, 70
- Stroke, causes, 13, 32
- Subacute infective endocarditis, 140
- Subarachnoid space, 11
- Subclavian
 - artery, 64
 - vein, 64
- Submandibular salivary glands, 57
- Sulcus limitans, 15
- Superficial forearm flexor muscles, 94
- Superior gluteal artery perforator (SGAP) flap, 237
- Superior hypogastric plexus, 160
- Superior sagittal sinus (SSS), 13
- Superior vena cava (SVC), 140
- Supracondylar fracture, 91, 91
- Suprapubic cystostomy, 207
- Suprarenal glands, 190
- Sural nerve, 246, 267
- SVC, *see* Superior vena cava
- Sylvian fissure, 3
- Sympathetic nervous system (SNS), 19–20, 29
- Sympathetic visceral nerves, 159
- Syphilis, 216
- Syringomyelia, 27
- Systemic sclerosis, 76, 76
- T**
- Talocrural joint, *see* Ankle joint
- Tarsal tunnel syndrome, 259
- TEE, *see* Transoesophageal echocardiography
- Tenosynovitis, 103
- Tension pneumothorax, 129, 130
- Tentorium cerebelli, 11
- Testes
 - appendix, 219
 - blood supply, 219–220
 - coverings, 219
 - epididymis, 219
 - epididymo-orchitis, 220
 - gubernaculum, 219
 - hydrocele, 220
 - mediastinum, 219
 - midsagittal section, 219
 - orchidectomy, 220
 - rete, 219
 - torsion, 220
 - tumours, 220
 - undescended, 220
 - varicocele, 220
- Testicular torsion, 220
- Tetralogy of Fallot, 138, 138
- Thalamus, 5
- Thigh
 - medial compartment, 243, 243
 - muscles, anterior, 242, 242
 - posterior compartment, 244, 244, 244
- Thoracic cavity
 - mediastinal tumours, 123
 - mediastinum, 119–122
 - right and left pleural cavities, 119

- Thoracic duct, 121
 Thoracic oesophagus, 121
 Thoracic outlet syndrome, 115
 Thoracic wall
 accessory muscles, respiration, 112
 auscultation, 115
 azygos venous system, 113, 114
 components, 109
 costochondritis, 115
 diaphragm, 116–119
 endothoracic fascia, 113
 flail chest, 116
 functions, 109, 110
 hemiazzygos vein, 114
 innervation, chest wall, 114
 intercostal muscles, 112, 112, 113
 intercostal nerve block, 116
 lymphatic drainage, 114
 muscles, 116, 117, 118
 musculature, 112–113
 pectus carinatum, 116
 pectus excavatum, 115
 ribs, 110–112
 skeleton and joints, 109
 sternotomy, 116
 sternum, 109–110, 116
 superior thoracic aperture, 109
 thoracic spine, 116
 thoracotomy, 116
 vasculature and innervation, 113–114
 venous drainage, posterior intercostal veins, 113
 vertebrae, 112, 112
 Thoracotomy, 116
 THR, *see* Total hip replacement
 Thrombosis, 13, 32
 Thymus gland, 121
 Thyroid gland
 arterial supply, 68, 68
 cancer, 68
 embryology, 67–68
 goitre, 68, 68, 69
 laryngoscopy, 70
 retrosternal goitre, 68, 69
 surface anatomy, 68
 surgery, 69
 thyroglossal cyst, 70, 70
 thyrotoxicosis, 69
 venous drainage, 68
 Thyroid-stimulating hormone (TSH), 5
 Tibia
 anterior and posterior views, 255
 condyles, 254
 fractures, 255, 256
 intercondylar eminence, 254
 plateau, 254
 soleus muscle, 254
 tibial shaft, 254
 tibial tuberosity, 254
 Tibial nerve, 267
 Tietze's syndrome, 115
 TIPSS, *see* Transjugular intrahepatic portosystemic shunt
 Tongue
 blood supply, 54
 divisions, 53
 examination, 54
 extrinsic muscles, 53, 54, 54
 hypoglossal nerve paralysis, 55
 intrinsic muscles, 53, 54
 lymphatic drainage, 54
 papillae, 53
 sensory supply, 54
 sublingual absorption, drugs, 54
 ulcers, 55
 Total hip replacement (THR), 238, 239
 Trachea, 67
 bifurcation, 125, 126
 breathing, control of, 126
 bronchial arteries, 126
 bronchial veins, 126
 bronchopulmonary segments, 126
 bronchoscopy, 126
 tracheobronchial tree, 126
 Tracheostomy, 67, 70
 TRAM flap, *see* Transverse rectus abdominis myocutaneous
 Transjugular intrahepatic portosystemic shunt (TIPSS), 173
 Transjugular liver biopsy, 173
 Transoesophageal echocardiography (TEE), 139, 140
 Transverse mesocolon, 157
 Transverse myelitis, 27
 Transverse rectus abdominis myocutaneous (TRAM) flap, 154
 Trapezius muscles, 53, 60, 61, 62, 77, 80, 81, 109, 117
 Traumatic diaphragmatic hernia, 115
 Trendelenburg's sign, 235, 236, 237
 Triangles, neck
 anterior, 62–63
 posterior, 61–62, 62
 scalene muscles, 62, 62
 Trigeminal nerve (CN V), 50
 Trigeminal neuralgia, 50
 Trochlear nerve (CN IV), 50
 Trophectoderm, 15
 Tubal ligation, 230
 U
 UC, *see* Ulcerative colitis
 Ulcerative colitis (UC), 179, 179
 Ulna, 92
 Ulnar nerve (C8–T1), 85
 cubital tunnel syndrome, 97
 cutaneous branches, 97
 Froment's test, 97
 function, 97
 injury, 97
 Umbilical folds, 158, 195
 Umbilical hernias, 153
 Umbilicus, 150
 UMN's, *see* Upper motor neurons
 Undescended testis, 220
 Unhappy triad, 253
 Upper arm
 arterial supply, 90
 brachial artery, 90, 91
 muscles, 89, 89, 89–90
 posterior compartment, 89, 90
 Upper GI bleeding, 166
 Upper limb
 arterial supply and venous drainage, arm, 90
 axilla, 105–107
 bicipital aponeurosis, 90–91
 brachial plexus, 84–88
 cubital fossa, 90
 forearm and wrist, 91–99
 hand, functional anatomy of, 104–105
 humerus, 81–84
 neurovasculature, hand, 103–104
 pectoral girdle, 80–81
 shoulder, 88
 upper arm, 89–90
 wrist and hand, 99–103
 Upper motor neurons (UMNs), 23, 24
 Urachus, 158
 Ureter, 205–206, 206, 207
 Urethra
 anterior, 217
 external urethral sphincter, 216
 hypospadias, 217
 inflammation, 217
 innervation, 216
 internal urethral sphincter, 216
 male, 215, 216
 posterior, 216–217
 urethral rupture, 217
 Urethral meatus, 225
 Urethritis, 217
 Urogenital triangle, 212
 Uterine fibroids, 229
 Uterine prolapse, 229
 Uterine tubes, 229–230, 230
 Uterus, 227, 232
 blood supply, 228
 cervix uteri, 227
 congenital abnormalities, 229
 corpus uteri, 227
 endometrium, 227
 fundus, 227
 ligaments of, 228, 228
 myometrium, 227
 nerve supply, 228
 parametrium, 227
 relations, 228
 retroflexed, 227–228
 retroversion, 227
 ureter, 228
 V
 Vagina, 226
 Vagus nerve (CN X), 44, 52, 120–121
 Valvular disease, 140
 Varicocele, 220
 Varicose veins, 251
 Vasculature, brain
 arterial, 12–13
 venous, 13–14
 Vas deferens, 223, 232
 Vasectomy, 223
 Venous vasculature, brain
 cavernous sinus thrombosis, 14
 drainage, 14
 ICA, 14
 SSS, 13
 Ventral hernias, 153
 Ventricular fibrillation (VF), 137
 Ventricular septal defect (VSD), 138

Ventricular system, 11–12
Vestibule, 225
Vestibulocochlear nerve (CN VIII),
45, 52
VF, *see* [Ventricular fibrillation](#)
Viral encephalitis, 52, 52
Virchow's triad, 137
Vocal cord nodules (singer's nodules), 67
Volvulus, sigmoid colon, 184, 185
VSD, *see* [Ventricular septal defect](#)

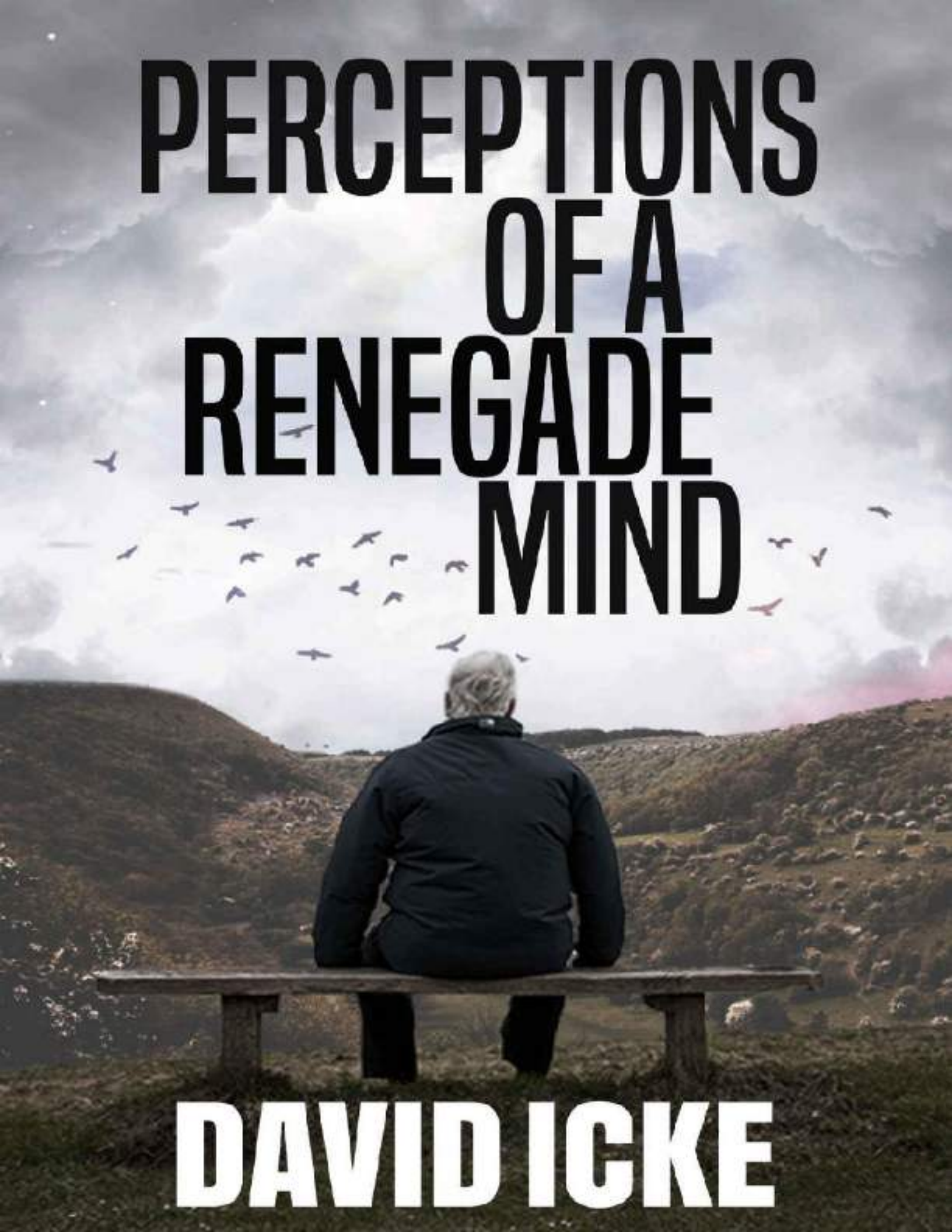
W

Waldeyer's fascia, 209
Waldeyer's ring, 71
Wartenberg's syndrome, 88
Wernicke's area, 3
Whipple's procedure, 168
Wolffian ducts, 230
Wrist and hand
anatomical snuffbox, 99, 99
bones, 99

carpal tunnel, 100
and digits, 101–102
scaphoid, 99, 99

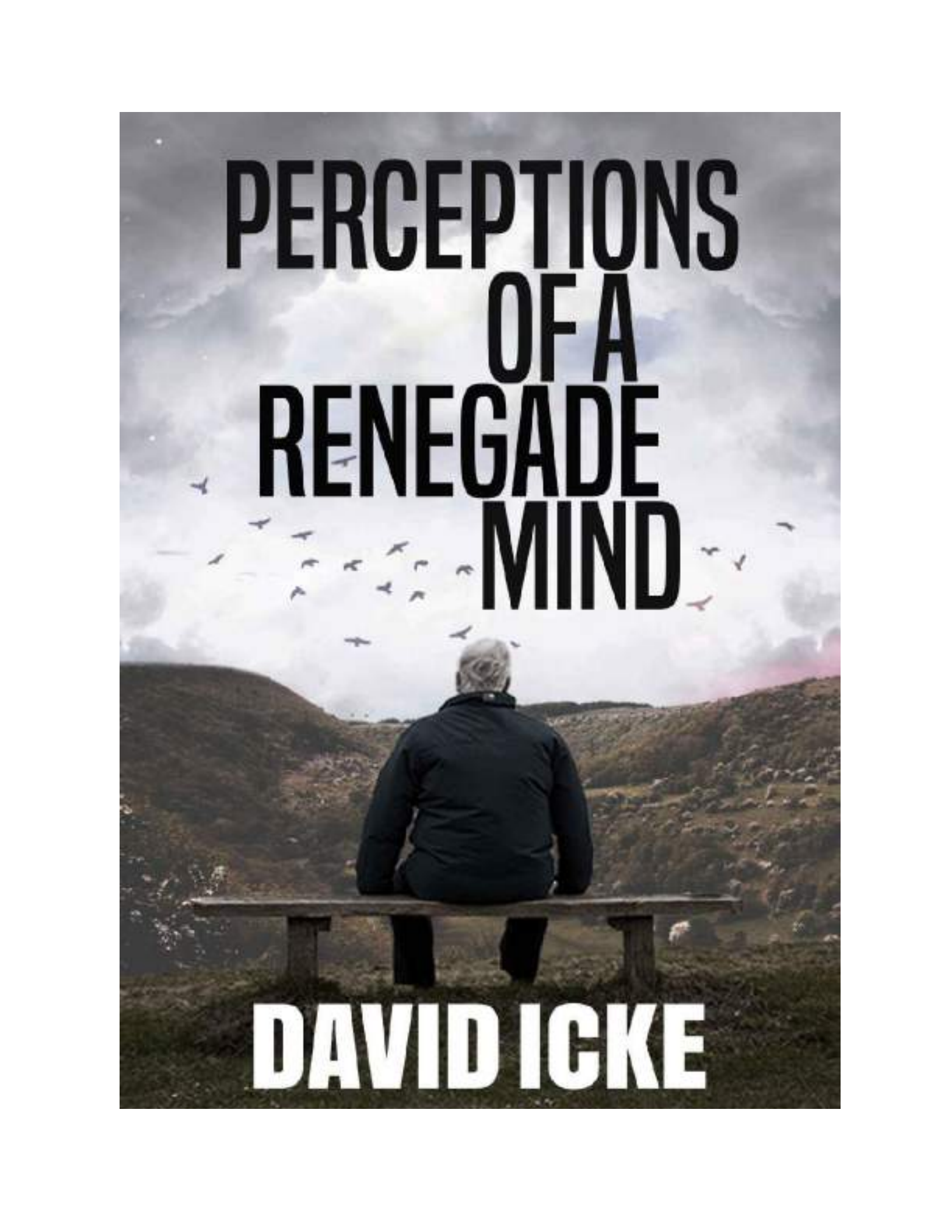
Z

Zenker's diverticulum, 74
Zona fasciculata, 190
Zona glomerulosa, 190
Zona reticularis, 190

A person with grey hair, wearing a dark jacket, is seen from behind, sitting on a wooden bench. They are looking out over a vast, open landscape of rolling hills under a cloudy sky. Numerous birds are flying in the sky, scattered across the upper half of the image. The overall mood is contemplative and serene.

PERCEPTIONS OF A RENEGADE MIND

DAVID ICKE



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**PERCEPTIONS
OF A
RENEGADE
MIND**

A flock of small, dark birds is scattered around the bottom half of the title text, appearing to fly in various directions.

DAVID ICKE

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Renegade:

Adjective

'Having rejected tradition: Unconventional.'

Merriam-Webster Dictionary

Acquiescence to tyranny is the death of the spirit

You may be 38 years old, as I happen to be. And one day, some great opportunity stands before you and calls you to stand up for some great principle, some great issue, some great cause. And you refuse to do it because you are afraid ... You refuse to do it because you want to live longer ... You're afraid that you will lose your job, or you are afraid that you will be criticised or that you will lose your popularity, or you're afraid that somebody will stab you, or shoot at you or bomb your house; so you refuse to take the stand.

Well, you may go on and live until you are 90, but you're just as dead at 38 as you would be at 90. And the cessation of breathing in your life is but the belated announcement of an earlier death of the spirit.

Martin Luther King

**How the few control the many and always have – the many do
whatever they're told**

'Forward, the Light Brigade!'
Was there a man dismayed?
Not though the soldier knew
Someone had blundered.
Theirs not to make reply,
Theirs not to reason why,
Theirs but to do and die.
Into the valley of Death
Rode the six hundred.

Cannon to right of them,
Cannon to left of them,
Cannon in front of them
Volleyed and thundered;
Stormed at with shot and shell,
Boldly they rode and well,
Into the jaws of Death,
Into the mouth of hell
Rode the six hundred

Alfred Lord Tennyson (1809-1892)

The mist is lifting slowly
I can see the way ahead
And I've left behind the empty streets
That once inspired my life
And the strength of the emotion
Is like thunder in the air
'Cos the promise that we made each other
Haunts me to the end

The secret of your beauty
And the mystery of your soul
I've been searching for in everyone I meet
And the times I've been mistaken
It's impossible to say
And the grass is growing
Underneath our feet

The words that I remember
From my childhood still are true
That there's none so blind
As those who will not see
And to those who lack the courage
And say it's dangerous to try
Well they just don't know
That love eternal will not be denied

I know you're out there somewhere
Somewhere, somewhere
I know you're out there somewhere

Somewhere you can hear my voice
I know I'll find you somehow
Somehow, somehow
I know I'll find you somehow
And somehow I'll return again to you

The Moody Blues

Are you a gutless wonder - or a Renegade Mind?

Monuments put from pen to paper,
Turns me into a gutless wonder,
And if you tolerate this,
Then your children will be next.
Gravity keeps my head down,
Or is it maybe shame ...

Manic Street Preachers

Rise like lions after slumber
In unvanquishable number.
Shake your chains to earth like dew
Which in sleep have fallen on you.
Ye are many – they are few.

Percy Shelley

Contents

CHAPTER 1	'I'm thinking' – Oh, but <i>are</i> you?
CHAPTER 2	Renegade perception
CHAPTER 3	The Pushbacker sting
CHAPTER 4	'Covid': The calculated catastrophe
CHAPTER 5	There <i>is no</i> 'virus'
CHAPTER 6	Sequence of deceit
CHAPTER 7	War on your mind
CHAPTER 8	'Reframing' insanity
CHAPTER 9	We must have it? So what is it?
CHAPTER 10	Human 2.0
CHAPTER 11	Who controls the Cult?
CHAPTER 12	Escaping Wetiko
POSTSCRIPT	
APPENDIX	Cowan-Kaufman-Morell Statement on Virus Isolation
BIBLIOGRAPHY	
INDEX	

CHAPTER ONE

I'm thinking' – Oh, but *are* you?

Think for yourself and let others enjoy the privilege of doing so too
Voltaire

French-born philosopher, mathematician and scientist René Descartes became famous for his statement in Latin in the 17th century which translates into English as: 'I think, therefore I am.'

On the face of it that is true. Thought reflects perception and perception leads to both behaviour and self-identity. In that sense 'we' are what we think. But who or what is doing the thinking and is thinking the only route to perception? Clearly, as we shall see, 'we' are not always the source of 'our' perception, indeed with regard to humanity as a whole this is rarely the case; and thinking is far from the only means of perception. Thought is the village idiot compared with other expressions of consciousness that we all have the potential to access and tap into. This has to be true when we *are* those other expressions of consciousness which are infinite in nature. We have forgotten this, or, more to the point, been manipulated to forget.

These are not just the esoteric musings of the navel. The whole foundation of human control and oppression is control of perception. Once perception is hijacked then so is behaviour which is dictated by perception. Collective perception becomes collective behaviour and collective behaviour is what we call human society. Perception is all and those behind human control know that which is

why perception is the target 24/7 of the psychopathic manipulators that I call the Global Cult. They know that if they dictate perception they will dictate behaviour and collectively dictate the nature of human society. They are further aware that perception is formed from information received and if they control the circulation of information they will to a vast extent direct human behaviour. Censorship of information and opinion has become globally Nazi-like in recent years and never more blatantly than since the illusory 'virus pandemic' was triggered out of China in 2019 and across the world in 2020. Why have billions submitted to house arrest and accepted fascistic societies in a way they would have never believed possible? Those controlling the information spewing from government, mainstream media and Silicon Valley (all controlled by the same Global Cult networks) told them they were in danger from a 'deadly virus' and only by submitting to house arrest and conceding their most basic of freedoms could they and their families be protected. This monumental and provable lie became the *perception* of the billions and therefore the *behaviour* of the billions. In those few words you have the whole structure and modus operandi of human control. Fear is a perception – False Emotion Appearing Real – and fear is the currency of control. In short ... get them by the balls (or give them the impression that you have) and their hearts and minds will follow. Nothing grips the dangly bits and freezes the rear-end more comprehensively than fear.

World number 1

There are two 'worlds' in what appears to be one 'world' and the prime difference between them is knowledge. First we have the mass of human society in which the population is maintained in coldly-calculated ignorance through control of information and the 'education' (indoctrination) system. That's all you really need to control to enslave billions in a perceptual delusion in which what are perceived to be *their* thoughts and opinions are ever-repeated mantras that the system has been downloading all their lives through 'education', media, science, medicine, politics and academia

in which the personnel and advocates are themselves overwhelmingly the perceptual products of the same repetition. Teachers and academics in general are processed by the same programming machine as everyone else, but unlike the great majority they never leave the 'education' program. It gripped them as students and continues to grip them as programmers of subsequent generations of students. The programmed become the programmers – the programmed programmers. The same can largely be said for scientists, doctors and politicians and not least because as the American writer Upton Sinclair said: 'It is difficult to get a man to understand something when his salary depends upon his not understanding it.' If your career and income depend on thinking the way the system demands then you will – bar a few free-minded exceptions – concede your mind to the Perceptual Mainframe that I call the Postage Stamp Consensus. This is a tiny band of perceived knowledge and possibility 'taught' (downloaded) in the schools and universities, pounded out by the mainstream media and on which all government policy is founded. Try thinking, and especially speaking and acting, outside of the 'box' of consensus and see what that does for your career in the Mainstream Everything which bullies, harasses, intimidates and ridicules the population into compliance. Here we have the simple structure which enslaves most of humanity in a perceptual prison cell for an entire lifetime and I'll go deeper into this process shortly. Most of what humanity is taught as fact is nothing more than programmed belief. American science fiction author Frank Herbert was right when he said: 'Belief can be manipulated. Only knowledge is dangerous.' In the 'Covid' age belief is promoted and knowledge is censored. It was always so, but never to the extreme of today.

World number 2

A 'number 2' is slang for 'doing a poo' and how appropriate that is when this other 'world' is doing just that on humanity every minute of every day. World number 2 is a global network of secret societies and semi-secret groups dictating the direction of society via

governments, corporations and authorities of every kind. I have spent more than 30 years uncovering and exposing this network that I call the Global Cult and knowing its agenda is what has made my books so accurate in predicting current and past events. Secret societies are secret for a reason. They want to keep their hoarded knowledge to themselves and their chosen initiates and to hide it from the population which they seek through ignorance to control and subdue. The whole foundation of the division between World 1 and World 2 is *knowledge*. What number 1 knows number 2 must not. Knowledge they have worked so hard to keep secret includes (a) the agenda to enslave humanity in a centrally-controlled global dictatorship, and (b) the nature of reality and life itself. The latter (b) must be suppressed to allow the former (a) to prevail as I shall be explaining. The way the Cult manipulates and interacts with the population can be likened to a spider's web. The 'spider' sits at the centre in the shadows and imposes its will through the web with each strand represented in World number 2 by a secret society, satanic or semi-secret group, and in World number 1 – the world of the seen – by governments, agencies of government, law enforcement, corporations, the banking system, media conglomerates and Silicon Valley (Fig 1 overleaf). The spider and the web connect and coordinate all these organisations to pursue the same global outcome while the population sees them as individual entities working randomly and independently. At the level of the web governments *are* the banking system *are* the corporations *are* the media *are* Silicon Valley *are* the World Health Organization working from their inner cores as one unit. Apparently unconnected countries, corporations, institutions, organisations and people are on the *same team* pursuing the same global outcome. Strands in the web immediately around the spider are the most secretive and exclusive secret societies and their membership is emphatically restricted to the Cult inner-circle emerging through the generations from particular bloodlines for reasons I will come to. At the core of the core you would get them in a single room. That's how many people are dictating the direction of human society and its transformation

through the 'Covid' hoax and other means. As the web expands out from the spider we meet the secret societies that many people will be aware of – the Freemasons, Knights Templar, Knights of Malta, Opus Dei, the inner sanctum of the Jesuit Order, and such like. Note how many are connected to the Church of Rome and there is a reason for that. The Roman Church was established as a revamp, a rebranding, of the relocated 'Church' of Babylon and the Cult imposing global tyranny today can be tracked back to Babylon and Sumer in what is now Iraq.



Figure 1: The global web through which the few control the many. (Image Neil Hague.)

Inner levels of the web operate in the unseen away from the public eye and then we have what I call the cusp organisations located at the point where the hidden meets the seen. They include a series of satellite organisations answering to a secret society founded in London in the late 19th century called the Round Table and among them are the Royal Institute of International Affairs (UK, founded in 1920); Council on Foreign Relations (US, 1921); Bilderberg Group (worldwide, 1954); Trilateral Commission (US/worldwide, 1972); and the Club of Rome (worldwide, 1968) which was created to exploit environmental concerns to justify the centralisation of global power to 'save the planet'. The Club of Rome instigated with others the human-caused climate change hoax which has led to all the 'green

new deals' demanding that very centralisation of control. Cusp organisations, which include endless 'think tanks' all over the world, are designed to coordinate a single global policy between political and business leaders, intelligence personnel, media organisations and anyone who can influence the direction of policy in their own sphere of operation. Major players and regular attenders will know what is happening – or some of it – while others come and go and are kept overwhelmingly in the dark about the big picture. I refer to these cusp groupings as semi-secret in that they can be publicly identified, but what goes on at the inner-core is kept very much 'in house' even from most of their members and participants through a fiercely-imposed system of compartmentalisation. Only let them know what they need to know to serve your interests and no more. The structure of secret societies serves as a perfect example of this principle. Most Freemasons never get higher than the bottom three levels of 'degree' (degree of knowledge) when there are 33 official degrees of the Scottish Rite. Initiates only qualify for the next higher 'compartment' or degree if those at that level choose to allow them. Knowledge can be carefully assigned only to those considered 'safe'. I went to my local Freemason's lodge a few years ago when they were having an 'open day' to show how cuddly they were and when I chatted to some of them I was astonished at how little the rank and file knew even about the most ubiquitous symbols they use. The mushroom technique – keep them in the dark and feed them bullshit – applies to most people in the web as well as the population as a whole. Sub-divisions of the web mirror in theme and structure transnational corporations which have a headquarters somewhere in the world dictating to all their subsidiaries in different countries. Subsidiaries operate in their methodology and branding to the same centrally-dictated plan and policy in pursuit of particular ends. The Cult web functions in the same way. Each country has its own web as a subsidiary of the global one. They consist of networks of secret societies, semi-secret groups and bloodline families and their job is to impose the will of the spider and the global web in their particular country. Subsidiary networks control and manipulate the national political system, finance, corporations, media, medicine, etc. to

ensure that they follow the globally-dictated Cult agenda. These networks were the means through which the 'Covid' hoax could be played out with almost every country responding in the same way.

The 'Yessir' pyramid

Compartmentalisation is the key to understanding how a tiny few can dictate the lives of billions when combined with a top-down sequence of imposition and acquiescence. The inner core of the Cult sits at the peak of the pyramidal hierarchy of human society (Fig 2 overleaf). It imposes its will – its agenda for the world – on the level immediately below which acquiesces to that imposition. This level then imposes the Cult will on the level below them which acquiesces and imposes on the next level. Very quickly we meet levels in the hierarchy that have no idea there even is a Cult, but the sequence of imposition and acquiescence continues down the pyramid in just the same way. 'I don't know why we are doing this but the order came from "on-high" and so we better just do it.' Alfred Lord Tennyson said of the cannon fodder levels in his poem *The Charge of the Light Brigade*: 'Theirs not to reason why; theirs but to do and die.' The next line says that 'into the valley of death rode the six hundred' and they died because they obeyed without question what their perceived 'superiors' told them to do. In the same way the population capitulated to 'Covid'. The whole hierarchical pyramid functions like this to allow the very few to direct the enormous many.

Eventually imposition-acquiescence-imposition-acquiescence comes down to the mass of the population at the foot of the pyramid. If they acquiesce to those levels of the hierarchy imposing on them (governments/law enforcement/doctors/media) a circuit is completed between the population and the handful of super-psychopaths in the Cult inner core at the top of the pyramid. Without a circuit-breaking refusal to obey, the sequence of imposition and acquiescence allows a staggeringly few people to impose their will upon the entirety of humankind. We are looking at the very sequence that has subjugated billions since the start of 2020. Our freedom has not been taken from us. Humanity has given it

away. Fascists do not impose fascism because there are not enough of them. Fascism is imposed by the population acquiescing to fascism. Put another way allowing their perceptions to be programmed to the extent that leads to the population giving their freedom away by giving their perceptions – their mind – away. If this circuit is not broken by humanity ceasing to cooperate with their own enslavement then nothing can change. For that to happen people have to critically think and see through the lies and window dressing and then summon the backbone to act upon what they see. The Cult spends its days working to stop either happening and its methodology is systematic and highly detailed, but it can be overcome and that is what this book is all about.

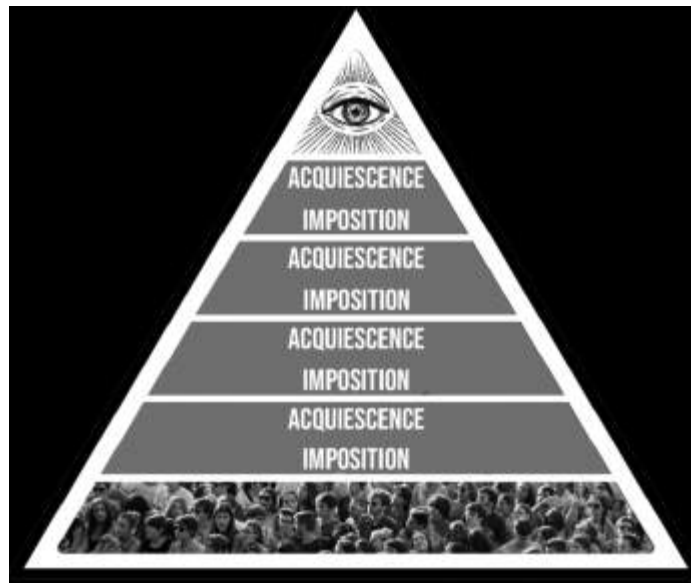


Figure 2: The simple sequence of imposition and compliance that allows a handful of people at the peak of the pyramid to dictate the lives of billions.

The Life Program

Okay, back to world number 1 or the world of the 'masses'. Observe the process of what we call 'life' and it is a perceptual download from cradle to grave. The Cult has created a global structure in which perception can be programmed and the program continually topped-up with what appears to be constant confirmation that the program is indeed true reality. The important word here is 'appears'.

This is the structure, the fly-trap, the Postage Stamp Consensus or Perceptual Mainframe, which represents that incredibly narrow band of perceived possibility delivered by the 'education' system, mainstream media, science and medicine. From the earliest age the download begins with parents who have themselves succumbed to the very programming their children are about to go through. Most parents don't do this out of malevolence and mostly it is quite the opposite. They do what they believe is best for their children and that is what the program has told them is best. Within three or four years comes the major transition from parental programming to full-blown state (Cult) programming in school, college and university where perceptually-programmed teachers and academics pass on their programming to the next generations. Teachers who resist are soon marginalised and their careers ended while children who resist are called a problem child for whom Ritalin may need to be prescribed. A few years after entering the 'world' children are under the control of authority figures representing the state telling them when they have to be there, when they can leave and when they can speak, eat, even go to the toilet. This is calculated preparation for a lifetime of obeying authority in all its forms. Reflex-action fear of authority is instilled by authority from the start. Children soon learn the carrot and stick consequences of obeying or defying authority which is underpinned daily for the rest of their life. Fortunately I daydreamed through this crap and never obeyed authority simply because it told me to. This approach to my alleged 'betters' continues to this day. There can be consequences of pursuing open-minded freedom in a world of closed-minded conformity. I spent a lot of time in school corridors after being ejected from the classroom for not taking some of it seriously and now I spend a lot of time being ejected from Facebook, YouTube and Twitter. But I can tell you that being true to yourself and not compromising your self-respect is far more exhilarating than bowing to authority for authority's sake. You don't have to be a sheep to the shepherd (authority) and the sheep dog (fear of not obeying authority).

The perceptual download continues throughout the formative years in school, college and university while script-reading 'teachers', 'academics' 'scientists', 'doctors' and 'journalists' insist that ongoing generations must be as programmed as they are. Accept the program or you will not pass your 'exams' which confirm your 'degree' of programming. It is tragic to think that many parents pressure their offspring to work hard at school to download the program and qualify for the next stage at college and university. The late, great, American comedian George Carlin said: 'Here's a bumper sticker I'd like to see: We are proud parents of a child who has resisted his teachers' attempts to break his spirit and bend him to the will of his corporate masters.' Well, the best of luck finding many of those, George. Then comes the moment to leave the formal programming years in academia and enter the 'adult' world of work. There you meet others in your chosen or prescribed arena who went through the same Postage Stamp Consensus program before you did. There is therefore overwhelming agreement between almost everyone on the basic foundations of Postage Stamp reality and the rejection, even contempt, of the few who have a mind of their own and are prepared to use it. This has two major effects. Firstly, the consensus confirms to the programmed that their download is really how things are. I mean, everyone knows that, right? Secondly, the arrogance and ignorance of Postage Stamp adherents ensure that anyone questioning the program will have unpleasant consequences for seeking their own truth and not picking their perceptions from the shelf marked: 'Things you must believe without question and if you don't you're a dangerous lunatic conspiracy theorist and a harebrained nutter'.

Every government, agency and corporation is founded on the same Postage Stamp prison cell and you can see why so many people believe the same thing while calling it their own 'opinion'. Fusion of governments and corporations in pursuit of the same agenda was the definition of fascism described by Italian dictator Benito Mussolini. The pressure to conform to perceptual norms downloaded for a lifetime is incessant and infiltrates society right

down to family groups that become censors and condemners of their own 'black sheep' for not, ironically, being sheep. We have seen an explosion of that in the 'Covid' era. Cult-owned global media unleashes its propaganda all day every day in support of the Postage Stamp and targets with abuse and ridicule anyone in the public eye who won't bend their mind to the will of the tyranny. Any response to this is denied (certainly in my case). They don't want to give a platform to expose official lies. Cult-owned-and-created Internet giants like Facebook, Google, YouTube and Twitter delete you for having an unapproved opinion. Facebook boasts that its AI censors delete 97-percent of 'hate speech' before anyone even reports it. Much of that 'hate speech' will simply be an opinion that Facebook and its masters don't want people to see. Such perceptual oppression is widely known as fascism. Even Facebook executive Benny Thomas, a 'CEO Global Planning Lead', said in comments secretly recorded by investigative journalism operation Project Veritas that Facebook is 'too powerful' and should be broken up:

I mean, no king in history has been the ruler of two billion people, but Mark Zuckerberg is ... And he's 36. That's too much for a 36-year-old ... You should not have power over two billion people. I just think that's wrong.

Thomas said Facebook-owned platforms like Instagram, Oculus, and WhatsApp needed to be separate companies. 'It's too much power when they're all one together'. That's the way the Cult likes it, however. We have an executive of a Cult organisation in Benny Thomas that doesn't know there is a Cult such is the compartmentalisation. Thomas said that Facebook and Google 'are no longer companies, they're countries'. Actually they are more powerful than countries on the basis that if you control information you control perception and control human society.

I love my oppressor

Another expression of this psychological trickery is for those who realise they are being pressured into compliance to eventually

convince themselves to believe the official narratives to protect their self-respect from accepting the truth that they have succumbed to meek and subservient compliance. Such people become some of the most vehement defenders of the system. You can see them everywhere screaming abuse at those who prefer to think for themselves and by doing so reminding the compliers of their own capitulation to conformity. 'You are talking dangerous nonsense you Covidiot!!' Are you trying to convince me or yourself? It is a potent form of Stockholm syndrome which is defined as: 'A psychological condition that occurs when a victim of abuse identifies and attaches, or bonds, positively with their abuser.' An example is hostages bonding and even 'falling in love' with their kidnappers. The syndrome has been observed in domestic violence, abused children, concentration camp inmates, prisoners of war and many and various Satanic cults. These are some traits of Stockholm syndrome listed at goodtherapy.org:

- Positive regard towards perpetrators of abuse or captor [see 'Covid'].
- Failure to cooperate with police and other government authorities when it comes to holding perpetrators of abuse or kidnapping accountable [or in the case of 'Covid' cooperating with the police to enforce and defend their captors' demands].
- Little or no effort to escape [see 'Covid'].
- Belief in the goodness of the perpetrators or kidnappers [see 'Covid'].
- Appeasement of captors. This is a manipulative strategy for maintaining one's safety. As victims get rewarded – perhaps with less abuse or even with life itself – their appeasing behaviours are reinforced [see 'Covid'].
- Learned helplessness. This can be akin to 'if you can't beat 'em, join 'em'. As the victims fail to escape the abuse or captivity, they may start giving up and soon realize it's just easier for everyone if they acquiesce all their power to their captors [see 'Covid'].

- Feelings of pity toward the abusers, believing they are actually victims themselves. Because of this, victims may go on a crusade or mission to 'save' [protect] their abuser [see the venom unleashed on those challenging the official 'Covid' narrative].
- Unwillingness to learn to detach from their perpetrators and heal. In essence, victims may tend to be less loyal to themselves than to their abuser [*definitely* see 'Covid'].

Ponder on those traits and compare them with the behaviour of great swathes of the global population who have defended governments and authorities which have spent every minute destroying their lives and livelihoods and those of their children and grandchildren since early 2020 with fascistic lockdowns, house arrest and employment deletion to 'protect' them from a 'deadly virus' that their abusers' perceptually created to bring about this very outcome. We are looking at mass Stockholm syndrome. All those that agree to concede their freedom will believe those perceptions are originating in their own independent 'mind' when in fact by conceding their reality to Stockholm syndrome they have by definition conceded any independence of mind. Listen to the 'opinions' of the acquiescing masses in this 'Covid' era and what gushes forth is the repetition of the official version of everything delivered unprocessed, unfiltered and unquestioned. The whole programming dynamic works this way. I must be free because I'm told that I am and so I think that I am.

You can see what I mean with the chapter theme of 'I'm thinking – Oh, but *are* you?' The great majority are not thinking, let alone for themselves. They are repeating what authority has told them to believe which allows them to be controlled. Weaving through this mentality is the fear that the 'conspiracy theorists' are right and this again explains the often hysterical abuse that ensues when you dare to contest the official narrative of anything. Denial is the mechanism of hiding from yourself what you don't want to be true. Telling people what they want to hear is easy, but it's an infinitely greater challenge to tell them what they would rather not be happening.

One is akin to pushing against an open door while the other is met with vehement resistance no matter what the scale of evidence. I don't want it to be true so I'll convince myself that it's not. Examples are everywhere from the denial that a partner is cheating despite all the signs to the reflex-action rejection of any idea that world events in which country after country act in exactly the same way are centrally coordinated. To accept the latter is to accept that a force of unspeakable evil is working to destroy your life and the lives of your children with nothing too horrific to achieve that end. Who the heck wants that to be true? But if we don't face reality the end is duly achieved and the consequences are far worse and ongoing than breaking through the walls of denial today with the courage to make a stand against tyranny.

Connect the dots – but how?

A crucial aspect of perceptual programming is to portray a world in which everything is random and almost nothing is connected to anything else. Randomness cannot be coordinated by its very nature and once you perceive events as random the idea they could be connected is waved away as the rantings of the tinfoil-hat brigade. You can't plan and coordinate random you idiot! No, you can't, but you can hide the coldly-calculated and long-planned behind the *illusion* of randomness. A foundation manifestation of the Renegade Mind is to scan reality for patterns that connect the apparently random and turn pixels and dots into pictures. This is the way I work and have done so for more than 30 years. You look for similarities in people, modus operandi and desired outcomes and slowly, then ever quicker, the picture forms. For instance: There would seem to be no connection between the 'Covid pandemic' hoax and the human-caused global-warming hoax and yet they are masks (appropriately) on the same face seeking the same outcome. Those pushing the global warming myth through the Club of Rome and other Cult agencies are driving the lies about 'Covid' – Bill Gates is an obvious one, but they are endless. Why would the same people be involved in both when they are clearly not connected? Oh, but they

are. Common themes with personnel are matched by common goals. The 'solutions' to both 'problems' are centralisation of global power to impose the will of the few on the many to 'save' humanity from 'Covid' and save the planet from an 'existential threat' (we need 'zero Covid' and 'zero carbon emissions'). These, in turn, connect with the 'dot' of globalisation which was coined to describe the centralisation of global power in every area of life through incessant political and corporate expansion, trading blocks and superstates like the European Union. If you are the few and you want to control the many you have to centralise power and decision-making. The more you centralise power the more power the few at the centre will have over the many; and the more that power is centralised the more power those at the centre have to centralise even quicker. The momentum of centralisation gets faster and faster which is exactly the process we have witnessed. In this way the hoaxed 'pandemic' and the fakery of human-caused global warming serve the interests of globalisation and the seizure of global power in the hands of the Cult inner-circle which is behind 'Covid', 'climate change' and globalisation. At this point random 'dots' become a clear and obvious picture or pattern.

Klaus Schwab, the classic Bond villain who founded the Cult's Gates-funded World Economic Forum, published a book in 2020, *The Great Reset*, in which he used the 'problem' of 'Covid' to justify a total transformation of human society to 'save' humanity from 'climate change'. Schwab said: 'The pandemic represents a rare but narrow window of opportunity to reflect, reimagine, and reset our world.' What he didn't mention is that the Cult he serves is behind both hoaxes as I show in my book *The Answer*. He and the Cult don't have to reimagine the world. They know precisely what they want and that's why they destroyed human society with 'Covid' to 'build back better' in their grand design. Their job is not to imagine, but to get humanity to imagine and agree with their plans while believing it's all random. It must be pure coincidence that 'The Great Reset' has long been the Cult's code name for the global imposition of fascism and replaced previous code-names of the 'New World

Order' used by Cult frontmen like Father George Bush and the 'New Order of the Ages' which emerged from Freemasonry and much older secret societies. New Order of the Ages appears on the reverse of the Great Seal of the United States as 'Novus ordo seclorum' underneath the Cult symbol used since way back of the pyramid and all seeing-eye (Fig 3). The pyramid is the hierarchy of human control headed by the illuminated eye that symbolises the force behind the Cult which I will expose in later chapters. The term 'Annuit Coeptis' translates as 'He favours our undertaking'. We are told the 'He' is the Christian god, but 'He' is not as I will be explaining.



Figure 3: The all-seeing eye of the Cult 'god' on the Freemason-designed Great Seal of the United States and also on the dollar bill.

Having you on

Two major Cult techniques of perceptual manipulation that relate to all this are what I have called since the 1990s Problem-Reaction-Solution (PRS) and the Totalitarian Tiptoe (TT). They can be uncovered by the inquiring mind with a simple question: Who benefits? The answer usually identifies the perpetrators of a given action or happening through the concept of 'he who most benefits from a crime is the one most likely to have committed it'. The Latin 'Cue bono?' – Who benefits? – is widely attributed to the Roman orator and statesman Marcus Tullius Cicero. No wonder it goes back so far when the concept has been relevant to human behaviour since

history was recorded. Problem-Reaction-Solution is the technique used to manipulate us every day by covertly creating a problem (or the illusion of one) and offering the solution to the problem (or the illusion of one). In the first phase you create the problem and blame someone or something else for why it has happened. This may relate to a financial collapse, terrorist attack, war, global warming or pandemic, anything in fact that will allow you to impose the 'solution' to change society in the way you desire at that time. The 'problem' doesn't have to be real. PRS is manipulation of perception and all you need is the population to believe the problem is real. Human-caused global warming and the 'Covid pandemic' only have to be *perceived* to be real for the population to accept the 'solutions' of authority. I refer to this technique as NO-Problem-Reaction-Solution. Billions did not meekly accept house arrest from early 2020 because there was a real deadly 'Covid pandemic' but because they perceived – believed – that to be the case. The antidote to Problem-Reaction-Solution is to ask who benefits from the proposed solution. Invariably it will be anyone who wants to justify more control through deletion of freedom and centralisation of power and decision-making.

The two world wars were Problem-Reaction-Solutions that transformed and realigned global society. Both were manipulated into being by the Cult as I have detailed in books since the mid-1990s. They dramatically centralised global power, especially World War Two, which led to the United Nations and other global bodies thanks to the overt and covert manipulations of the Rockefeller family and other Cult bloodlines like the Rothschilds. The UN is a stalking horse for full-blown world government that I will come to shortly. The land on which the UN building stands in New York was donated by the Rockefellers and the same Cult family was behind Big Pharma scalpel and drug 'medicine' and the creation of the World Health Organization as part of the UN. They have been stalwarts of the eugenics movement and funded Hitler's race-purity expert' Ernst Rudin. The human-caused global warming hoax has been orchestrated by the Club of Rome through the UN which is

manufacturing both the 'problem' through its Intergovernmental Panel on Climate Change and imposing the 'solution' through its Agenda 21 and Agenda 2030 which demand the total centralisation of global power to 'save the world' from a climate hoax the United Nations is itself perpetrating. What a small world the Cult can be seen to be particularly among the inner circles. The bedfellow of Problem-Reaction-Solution is the Totalitarian Tiptoe which became the Totalitarian Sprint in 2020. The technique is fashioned to hide the carefully-coordinated behind the cover of apparently random events. You start the sequence at 'A' and you know you are heading for 'Z'. You don't want people to know that and each step on the journey is presented as a random happening while all the steps strung together lead in the same direction. The speed may have quickened dramatically in recent times, but you can still see the incremental approach of the Tiptoe in the case of 'Covid' as each new imposition takes us deeper into fascism. Tell people they have to do this or that to get back to 'normal', then this and this and this. With each new demand adding to the ones that went before the population's freedom is deleted until it disappears. The spider wraps its web around the flies more comprehensively with each new diktat. I'll highlight this in more detail when I get to the 'Covid' hoax and how it has been pulled off. Another prime example of the Totalitarian Tiptoe is how the Cult-created European Union went from a 'free-trade zone' to a centralised bureaucratic dictatorship through the Tiptoe of incremental centralisation of power until nations became mere administrative units for Cult-owned dark suits in Brussels.

The antidote to ignorance is knowledge which the Cult seeks vehemently to deny us, but despite the systematic censorship to that end the Renegade Mind can overcome this by vociferously seeking out the facts no matter the impediments put in the way. There is also a method of thinking and perceiving – *knowing* – that doesn't even need names, dates, place-type facts to identify the patterns that reveal the story. I'll get to that in the final chapter. All you need to know about the manipulation of human society and to what end is still out there – *at the time of writing* – in the form of books, videos

and websites for those that really want to breach the walls of programmed perception. To access this knowledge requires the abandonment of the mainstream media as a source of information in the awareness that this is owned and controlled by the Cult and therefore promotes mass perceptions that suit the Cult. Mainstream media lies all day, every day. That is its function and very reason for being. Where it does tell the truth, here and there, is only because the truth and the Cult agenda very occasionally coincide. If you look for fact and insight to the BBC, CNN and virtually all the rest of them you are asking to be conned and perceptually programmed.

Know the outcome and you'll see the journey

Events seem random when you have no idea where the world is being taken. Once you do the random becomes the carefully planned. Know the outcome and you'll see the journey is a phrase I have been using for a long time to give context to daily happenings that appear unconnected. Does a problem, or illusion of a problem, trigger a proposed 'solution' that further drives society in the direction of the outcome? Invariably the answer will be yes and the random – *abracadabra* – becomes the clearly coordinated. So what is this outcome that unlocks the door to a massively expanded understanding of daily events? I will summarise its major aspects – the fine detail is in my other books – and those new to this information will see that the world they thought they were living in is a very different place. The foundation of the Cult agenda is the incessant centralisation of power and all such centralisation is ultimately in pursuit of Cult control on a global level. I have described for a long time the planned world structure of top-down dictatorship as the Hunger Games Society. The term obviously comes from the movie series which portrayed a world in which a few living in military-protected hi-tech luxury were the overlords of a population condemned to abject poverty in isolated 'sectors' that were not allowed to interact. 'Covid' lockdowns and travel bans anyone? The 'Hunger Games' pyramid of structural control has the inner circle of the Cult at the top with pretty much the entire

population at the bottom under their control through dependency for survival on the Cult. The whole structure is planned to be protected and enforced by a military-police state (Fig 4).

Here you have the reason for the global lockdowns of the fake pandemic to coldly destroy independent incomes and livelihoods and make everyone dependent on the 'state' (the Cult that controls the 'states'). I have warned in my books for many years about the plan to introduce a 'guaranteed income' – a barely survivable pittance – designed to impose dependency when employment was destroyed by AI technology and now even more comprehensively at great speed by the 'Covid' scam. Once the pandemic was played and lockdown consequences began to delete independent income the authorities began to talk right on cue about the need for a guaranteed income and a 'Great Reset'. Guaranteed income will be presented as benevolent governments seeking to help a desperate people – desperate as a direct result of actions of the same governments. The truth is that such payments are a trap. You will only get them if you do exactly what the authorities demand including mass vaccination (genetic manipulation). We have seen this theme already in Australia where those dependent on government benefits have them reduced if parents don't agree to have their children vaccinated according to an insane health-destroying government-dictated schedule. Calculated economic collapse applies to governments as well as people. The Cult wants rid of countries through the creation of a world state with countries broken up into regions ruled by a world government and super states like the European Union. Countries must be bankrupted, too, to this end and it's being achieved by the trillions in 'rescue packages' and furlough payments, trillions in lost taxation, and money-no-object spending on 'Covid' including constant all-medium advertising (programming) which has made the media dependent on government for much of its income. The day of reckoning is coming – as planned – for government spending and given that it has been made possible by printing money and not by production/taxation there is inflation on the way that has the

potential to wipe out monetary value. In that case there will be no need for the Cult to steal your money. It just won't be worth anything (see the German Weimar Republic before the Nazis took over). Many have been okay with lockdowns while getting a percentage of their income from so-called furlough payments without having to work. Those payments are dependent, however, on people having at least a theoretical job with a business considered non-essential and ordered to close. As these business go under because they are closed by lockdown after lockdown the furlough stops and it will for everyone eventually. Then what? The 'then what?' is precisely the idea.



Figure 4: The Hunger Games Society structure I have long warned was planned and now the 'Covid' hoax has made it possible. This is the real reason for lockdowns.

Hired hands

Between the Hunger Games Cult elite and the dependent population is planned to be a vicious military-police state (a fusion of the two into one force). This has been in the making for a long time with police looking ever more like the military and carrying weapons to match. The pandemic scam has seen this process accelerate so fast as

lockdown house arrest is brutally enforced by carefully recruited fascist minds and gormless system-servers. The police and military are planned to merge into a centrally-directed world army in a global structure headed by a world government which wouldn't be elected even by the election fixes now in place. The world army is not planned even to be human and instead wars would be fought, primarily against the population, using robot technology controlled by artificial intelligence. I have been warning about this for decades and now militaries around the world are being transformed by this very AI technology. The global regime that I describe is a particular form of fascism known as a technocracy in which decisions are not made by clueless and co-opted politicians but by unelected technocrats – scientists, engineers, technologists and bureaucrats. Cult-owned-and-controlled Silicon Valley giants are examples of technocracy and they already have far more power to direct world events than governments. They are with their censorship *selecting* governments. I know that some are calling the 'Great Reset' a Marxist communist takeover, but fascism and Marxism are different labels for the same tyranny. Tell those who lived in fascist Germany and Stalinist Russia that there was a difference in the way their freedom was deleted and their lives controlled. I could call it a fascist technocracy or a Marxist technocracy and they would be equally accurate. The Hunger Games society with its world government structure would oversee a world army, world central bank and single world cashless currency imposing its will on a microchipped population (Fig 5). Scan its different elements and see how the illusory pandemic is forcing society in this very direction at great speed. Leaders of 23 countries and the World Health Organization (WHO) backed the idea in March, 2021, of a global treaty for 'international cooperation' in 'health emergencies' and nations should 'come together as a global community for peaceful cooperation that extends beyond this crisis'. Cut the Orwellian bullshit and this means another step towards global government. The plan includes a cashless digital money system that I first warned about in 1993. Right at the start of 'Covid' the deeply corrupt Tedros

Adhanom Ghebreyesus, the crooked and merely gofer 'head' of the World Health Organization, said it was possible to catch the 'virus' by touching cash and it was better to use cashless means. The claim was ridiculous nonsense and like the whole 'Covid' mind-trick it was nothing to do with 'health' and everything to do with pushing every aspect of the Cult agenda. As a result of the Tedros lie the use of cash has plummeted. The Cult script involves a single world digital currency that would eventually be technologically embedded in the body. China is a massive global centre for the Cult and if you watch what is happening there you will know what is planned for everywhere. The Chinese government is developing a digital currency which would allow fines to be deducted immediately via AI for anyone caught on camera breaking its fantastic list of laws and the money is going to be programmable with an expiry date to ensure that no one can accrue wealth except the Cult and its operatives.



Figure 5: The structure of global control the Cult has been working towards for so long and this has been enormously advanced by the 'Covid' illusion.

Serfdom is so smart

The Cult plan is far wider, extreme, and more comprehensive than even most conspiracy researchers appreciate and I will come to the true depths of deceit and control in the chapters 'Who controls the

Cult?’ and ‘Escaping Wetiko’. Even the world that we know is crazy enough. We are being deluged with ever more sophisticated and controlling technology under the heading of ‘smart’. We have smart televisions, smart meters, smart cards, smart cars, smart driving, smart roads, smart pills, smart patches, smart watches, smart skin, smart borders, smart pavements, smart streets, smart cities, smart communities, smart environments, smart growth, smart planet ... smart *everything* around us. Smart technologies and methods of operation are designed to interlock to create a global Smart Grid connecting the entirety of human society including human minds to create a centrally-dictated ‘hive’ mind. ‘Smart cities’ is code for densely-occupied megacities of total surveillance and control through AI. Ever more destructive frequency communication systems like 5G have been rolled out without any official testing for health and psychological effects (colossal). 5G/6G/7G systems are needed to run the Smart Grid and each one becomes more destructive of body and mind. Deleting independent income is crucial to forcing people into these AI-policed prisons by ending private property ownership (except for the Cult elite). The Cult’s Great Reset now openly foresees a global society in which no one will own any possessions and everything will be rented while the Cult would own literally everything under the guise of government and corporations. The aim has been to use the lockdowns to destroy sources of income on a mass scale and when the people are destitute and in unrepayable amounts of debt (problem) Cult assets come forward with the pledge to write-off debt in return for handing over all property and possessions (solution). Everything – literally everything including people – would be connected to the Internet via AI. I was warning years ago about the coming Internet of Things (IoT) in which all devices and technology from your car to your fridge would be plugged into the Internet and controlled by AI. Now we are already there with much more to come. The next stage is the Internet of Everything (IoE) which is planned to include the connection of AI to the human brain and body to replace the human mind with a centrally-controlled AI mind. Instead of perceptions

being manipulated through control of information and censorship those perceptions would come direct from the Cult through AI. What do you think? You think whatever AI decides that you think. In human terms there would be no individual 'think' any longer. Too incredible? The ravings of a lunatic? Not at all. Cult-owned crazies in Silicon Valley have been telling us the plan for years without explaining the real motivation and calculated implications. These include Google executive and 'futurist' Ray Kurzweil who highlights the year 2030 for when this would be underway. He said:

Our thinking ... will be a hybrid of biological and non-biological thinking ... humans will be able to extend their limitations and 'think in the cloud' ... We're going to put gateways to the cloud in our brains ... We're going to gradually merge and enhance ourselves ... In my view, that's the nature of being human – we transcend our limitations.

As the technology becomes vastly superior to what we are then the small proportion that is still human gets smaller and smaller and smaller until it's just utterly negligible.

The sales-pitch of Kurzweil and Cult-owned Silicon Valley is that this would make us 'super-human' when the real aim is to make us post-human and no longer 'human' in the sense that we have come to know. The entire global population would be connected to AI and become the centrally-controlled 'hive-mind' of externally-delivered perceptions. The Smart Grid being installed to impose the Cult's will on the world is being constructed to allow particular locations – even one location – to control the whole global system. From these prime control centres, which absolutely include China and Israel, anything connected to the Internet would be switched on or off and manipulated at will. Energy systems could be cut, communication via the Internet taken down, computer-controlled driverless autonomous vehicles driven off the road, medical devices switched off, the potential is limitless given how much AI and Internet connections now run human society. We have seen nothing yet if we allow this to continue. Autonomous vehicle makers are working with law enforcement to produce cars designed to automatically pull over if they detect a police or emergency vehicle flashing from up to 100 feet away. At a police stop the car would be unlocked and the

window rolled down automatically. Vehicles would only take you where the computer (the state) allowed. The end of petrol vehicles and speed limiters on all new cars in the UK and EU from 2022 are steps leading to electric computerised transport over which ultimately you have no control. The picture is far bigger even than the Cult global network or web and that will become clear when I get to the nature of the 'spider'. There is a connection between all these happenings and the instigation of DNA-manipulating 'vaccines' (which aren't 'vaccines') justified by the 'Covid' hoax. That connection is the unfolding plan to transform the human body from a biological to a synthetic biological state and this is why synthetic biology is such a fast-emerging discipline of mainstream science. 'Covid vaccines' are infusing self-replicating synthetic genetic material into the cells to cumulatively take us on the Totalitarian Tiptoe from Human 1.0 to the synthetic biological Human 2.0 which will be physically and perceptually attached to the Smart Grid to one hundred percent control every thought, perception and deed. Humanity needs to wake up and *fast*.

This is the barest explanation of where the 'outcome' is planned to go but it's enough to see the journey happening all around us. Those new to this information will already see 'Covid' in a whole new context. I will add much more detail as we go along, but for the minutiae evidence see my mega-works, *The Answer*, *The Trigger* and *Everything You Need to Know But Have Never Been Told*.

Now – how does a Renegade Mind see the 'world'?

CHAPTER TWO

Renegade Perception

It is one thing to be clever and another to be wise

George R.R. Martin

A simple definition of the difference between a programmed mind and a Renegade Mind would be that one sees only dots while the other connects them to see the picture. Reading reality with accuracy requires the observer to (a) know the planned outcome and (b) realise that everything, but *everything*, is connected.

The entirety of infinite reality is connected – that’s its very nature – and with human society an expression of infinite reality the same must apply. Simple cause and effect is a connection. The effect is triggered by the cause and the effect then becomes the cause of another effect. Nothing happens in isolation because it *can’t*. Life in whatever reality is simple choice and consequence. We make choices and these lead to consequences. If we don’t like the consequences we can make different choices and get different consequences which lead to other choices and consequences. The choice and the consequence are not only connected they are indivisible. You can’t have one without the other as an old song goes. A few cannot control the world unless those being controlled allow that to happen – cause and effect, choice and consequence. Control – who has it and who doesn’t – is a two-way process, a symbiotic relationship, involving the controller and controlled. ‘They took my freedom away!!’ Well, yes, but you also gave it to them. Humanity is

subjected to mass control because humanity has acquiesced to that control. This is all cause and effect and literally a case of give and take. In the same way world events of every kind are connected and the Cult works incessantly to sell the illusion of the random and coincidental to maintain the essential (to them) perception of dots that hide the picture. Renegade Minds know this and constantly scan the world for patterns of connection. This is absolutely pivotal in understanding the happenings in the world and without that perspective clarity is impossible. First you know the planned outcome and then you identify the steps on the journey – the day-by-day apparently random which, when connected in relation to the outcome, no longer appear as individual events, but as the proverbial *chain* of events leading in the same direction. I'll give you some examples:

Political puppet show

We are told to believe that politics is 'adversarial' in that different parties with different beliefs engage in an endless tussle for power. There may have been some truth in that up to a point – and only a point – but today divisions between 'different' parties are rhetorical not ideological. Even the rhetorical is fusing into one-speak as the parties eject any remaining free thinkers while others succumb to the ever-gathering intimidation of anyone with the 'wrong' opinion. The Cult is not a new phenomenon and can be traced back thousands of years as my books have documented. Its intergenerational initiatives have been manipulating events with increasing effect the more that global power has been centralised. In ancient times the Cult secured control through the system of monarchy in which 'special' bloodlines (of which more later) demanded the right to rule as kings and queens simply by birthright and by vanquishing others who claimed the same birthright. There came a time, however, when people had matured enough to see the unfairness of such tyranny and demanded a say in who governed them. Note the word – *governed* them. Not served them – *governed* them, hence government defined as 'the political direction and control exercised over the

actions of the members, citizens, or inhabitants of communities, societies, and states; direction of the affairs of a state, community, etc.' Governments exercise control over rather than serve just like the monarchies before them. Bizarrely there are still countries like the United Kingdom which are ruled by a monarch *and* a government that officially answers to the monarch. The UK head of state and that of Commonwealth countries such as Canada, Australia and New Zealand is 'selected' by who in a *single family* had unprotected sex with whom and in what order. Pinch me it can't be true. Ouch! Shit, it is. The demise of monarchies in most countries offered a potential vacuum in which some form of free and fair society could arise and the Cult had that base covered. Monarchies had served its interests but they couldn't continue in the face of such widespread opposition and, anyway, replacing a 'royal' dictatorship that people could see with a dictatorship 'of the people' hiding behind the concept of 'democracy' presented far greater manipulative possibilities and ways of hiding coordinated tyranny behind the illusion of 'freedom'.

Democracy is quite wrongly defined as government selected by the population. This is not the case at all. It is government selected by *some* of the population (and then only in theory). This 'some' doesn't even have to be the majority as we have seen so often in first-past-the-post elections in which the so-called majority party wins fewer votes than the 'losing' parties combined. Democracy can give total power to a party in government from a minority of the votes cast. It's a sleight of hand to sell tyranny as freedom. Seventy-four million Trump-supporting Americans didn't vote for the 'Democratic' Party of Joe Biden in the distinctly dodgy election in 2020 and yet far from acknowledging the wishes and feelings of that great percentage of American society the Cult-owned Biden government set out from day one to destroy them and their right to a voice and opinion. Empty shell Biden and his Cult handlers said they were doing this to 'protect democracy'. Such is the level of lunacy and sickness to which politics has descended. Connect the dots and relate them to the desired outcome – a world government run by self-appointed technocrats and no longer even elected

politicians. While operating through its political agents in government the Cult is at the same time encouraging public disdain for politicians by putting idiots and incompetents in theoretical power on the road to deleting them. The idea is to instil a public reaction that says of the technocrats: 'Well, they couldn't do any worse than the pathetic politicians.' It's all about controlling perception and Renegade Minds can see through that while programmed minds cannot when they are ignorant of both the planned outcome and the manipulation techniques employed to secure that end. This knowledge can be learned, however, and fast if people choose to get informed.

Politics may at first sight appear very difficult to control from a central point. I mean look at the 'different' parties and how would you be able to oversee them all and their constituent parts? In truth, it's very straightforward because of their structure. We are back to the pyramid of imposition and acquiescence. Organisations are structured in the same way as the system as a whole. Political parties are not open forums of free expression. They are hierarchies. I was a national spokesman for the British Green Party which claimed to be a different kind of politics in which influence and power was devolved; but I can tell you from direct experience – and it's far worse now – that Green parties are run as hierarchies like all the others however much they may try to hide that fact or kid themselves that it's not true. A very few at the top of all political parties are directing policy and personnel. They decide if you are elevated in the party or serve as a government minister and to do that you have to be a yes man or woman. Look at all the maverick political thinkers who never ascended the greasy pole. If you want to progress within the party or reach 'high-office' you need to fall into line and conform. Exceptions to this are rare indeed. Should you want to run for parliament or Congress you have to persuade the local or state level of the party to select you and for that you need to play the game as dictated by the hierarchy. If you secure election and wish to progress within the greater structure you need to go on conforming to what is acceptable to those running the hierarchy

from the peak of the pyramid. Political parties are perceptual gulags and the very fact that there are party 'Whips' appointed to 'whip' politicians into voting the way the hierarchy demands exposes the ridiculous idea that politicians are elected to serve the people they are supposed to represent. Cult operatives and manipulation has long seized control of major parties that have any chance of forming a government and at least most of those that haven't. A new party forms and the Cult goes to work to infiltrate and direct. This has reached such a level today that you see video compilations of 'leaders' of all parties whether Democrats, Republicans, Conservative, Labour and Green parroting the same Cult mantra of 'Build Back Better' and the 'Great Reset' which are straight off the Cult song-sheet to describe the transformation of global society in response to the Cult-instigated hoaxes of the 'Covid pandemic' and human-caused 'climate change'. To see Caroline Lucas, the Green Party MP that I knew when I was in the party in the 1980s, speaking in support of plans proposed by Cult operative Klaus Schwab representing the billionaire global elite is a real head-shaker.

Many parties – one master

The party system is another mind-trick and was instigated to change the nature of the dictatorship by swapping 'royalty' for dark suits that people believed – though now ever less so – represented their interests. Understanding this trick is to realise that a single force (the Cult) controls all parties either directly in terms of the major ones or through manipulation of perception and ideology with others. You don't need to manipulate Green parties to demand your transformation of society in the name of 'climate change' when they are obsessed with the lie that this is essential to 'save the planet'. You just give them a platform and away they go serving your interests while believing they are being environmentally virtuous. America's political structure is a perfect blueprint for how the two or multi-party system is really a one-party state. The Republican Party is controlled from one step back in the shadows by a group made up of billionaires and their gofers known as neoconservatives or Neocons.

I have exposed them in fine detail in my books and they were the driving force behind the policies of the imbecilic presidency of Boy George Bush which included 9/11 (see *The Trigger* for a comprehensive demolition of the official story), the subsequent 'war on terror' (war of terror) and the invasions of Afghanistan and Iraq. The latter was a No-Problem-Reaction-Solution based on claims by Cult operatives, including Bush and British Prime Minister Tony Blair, about Saddam Hussein's 'weapons of mass destruction' which did not exist as war criminals Bush and Blair well knew.



Figure 6: Different front people, different parties – same control system.

The Democratic Party has its own 'Neocon' group controlling from the background which I call the 'Democons' and here's the penny-drop – the Neocons and Democons answer to the same masters one step further back into the shadows (Fig 6). At that level of the Cult the Republican and Democrat parties are controlled by the same people and no matter which is in power the Cult is in power. This is how it works in almost every country and certainly in Britain with Conservative, Labour, Liberal Democrat and Green parties now all on the same page whatever the rhetoric may be in their feeble attempts to appear different. Neocons operated at the time of Bush through a think tank called The Project for the New American Century which in September, 2000, published a document entitled *Rebuilding America's Defenses: Strategies, Forces, and Resources*

For a New Century demanding that America fight ‘multiple, simultaneous major theatre wars’ as a ‘core mission’ to force regime-change in countries including Iraq, Libya and Syria. Neocons arranged for Bush (‘Republican’) and Blair (‘Labour Party’) to front-up the invasion of Iraq and when they departed the Democons orchestrated the targeting of Libya and Syria through Barack Obama (‘Democrat’) and British Prime Minister David Cameron (‘Conservative Party’). We have ‘different’ parties and ‘different’ people, but the same unfolding script. The more the Cult has seized the reigns of parties and personnel the more their policies have transparently pursued the same agenda to the point where the fascist ‘Covid’ impositions of the Conservative junta of Jackboot Johnson in Britain were opposed by the Labour Party because they were not fascist enough. The Labour Party is likened to the US Democrats while the Conservative Party is akin to a British version of the Republicans and on both sides of the Atlantic they all speak the same language and support the direction demanded by the Cult although some more enthusiastically than others. It’s a similar story in country after country because it’s all centrally controlled. Oh, but what about Trump? I’ll come to him shortly. Political ‘choice’ in the ‘party’ system goes like this: You vote for Party A and they get into government. You don’t like what they do so next time you vote for Party B and they get into government. You don’t like what they do when it’s pretty much the same as Party A and why wouldn’t that be with both controlled by the same force? Given that only two, sometimes three, parties have any chance of forming a government to get rid of Party B that you don’t like you have to vote again for Party A which ... you don’t like. This, ladies and gentlemen, is what they call ‘democracy’ which we are told – wrongly – is a term interchangeable with ‘freedom’.

The cult of cults

At this point I need to introduce a major expression of the Global Cult known as Sabbatian-Frankism. Sabbatian is also spelt as Sabbatean. I will summarise here. I have published major exposés

and detailed background in other works. Sabbatian-Frankism combines the names of two frauds posing as 'Jewish' men, Sabbatai Zevi (1626-1676), a rabbi, black magician and occultist who proclaimed he was the Jewish messiah; and Jacob Frank (1726-1791), the Polish 'Jew', black magician and occultist who said he was the reincarnation of 'messiah' Zevi and biblical patriarch Jacob. They worked across two centuries to establish the Sabbatian-Frankist cult that plays a major, indeed central, role in the manipulation of human society by the Global Cult which has its origins much further back in history than Sabbatai Zevi. I should emphasise two points here in response to the shrill voices that will scream 'anti-Semitism': (1) Sabbatian-Frankists are NOT Jewish and only pose as such to hide their cult behind a Jewish façade; and (2) my information about this cult has come from Jewish sources who have long realised that their society and community has been infiltrated and taken over by interloper Sabbatian-Frankists. Infiltration has been the foundation technique of Sabbatian-Frankism from its official origin in the 17th century. Zevi's Sabbatian sect attracted a massive following described as the biggest messianic movement in Jewish history, spreading as far as Africa and Asia, and he promised a return for the Jews to the 'Promised Land' of Israel. Sabbatianism was not Judaism but an inversion of everything that mainstream Judaism stood for. So much so that this sinister cult would have a feast day when Judaism had a fast day and whatever was forbidden in Judaism the Sabbatians were encouraged and even commanded to do. This included incest and what would be today called Satanism. Members were forbidden to marry outside the sect and there was a system of keeping their children ignorant of what they were part of until they were old enough to be trusted not to unknowingly reveal anything to outsiders. The same system is employed to this day by the Global Cult in general which Sabbatian-Frankism has enormously influenced and now largely controls.

Zevi and his Sabbatians suffered a setback with the intervention by the Sultan of the Islamic Ottoman Empire in the Middle East and what is now the Republic of Turkey where Zevi was located. The

Sultan gave him the choice of proving his 'divinity', converting to Islam or facing torture and death. Funnily enough Zevi chose to convert or at least appear to. Some of his supporters were disillusioned and drifted away, but many did not with 300 families also converting – only in theory – to Islam. They continued behind this Islamic smokescreen to follow the goals, rules and rituals of Sabbatianism and became known as 'crypto-Jews' or the 'Dönme' which means 'to turn'. This is rather ironic because they didn't 'turn' and instead hid behind a fake Islamic persona. The process of appearing to be one thing while being very much another would become the calling card of Sabbatianism especially after Zevi's death and the arrival of the Satanist Jacob Frank in the 18th century when the cult became Sabbatian-Frankism and plumbed still new depths of depravity and infiltration which included – still includes – human sacrifice and sex with children. Wherever Sabbatians go paedophilia and Satanism follow and is it really a surprise that Hollywood is so infested with child abuse and Satanism when it was established by Sabbatian-Frankists and is still controlled by them? Hollywood has been one of the prime vehicles for global perceptual programming and manipulation. How many believe the version of 'history' portrayed in movies when it is a travesty and inversion (again) of the truth? Rabbi Marvin Antelman describes Frankism in his book, *To Eliminate the Opiate*, as 'a movement of complete evil' while Jewish professor Gershom Scholem said of Frank in *The Messianic Idea in Judaism*: 'In all his actions [he was] a truly corrupt and degenerate individual ... one of the most frightening phenomena in the whole of Jewish history.' Frank was excommunicated by traditional rabbis, as was Zevi, but Frank was undeterred and enjoyed vital support from the House of Rothschild, the infamous banking dynasty whose inner-core are Sabbatian-Frankists and not Jews. Infiltration of the Roman Church and Vatican was instigated by Frank with many Dönme 'turning' again to convert to Roman Catholicism with a view to hijacking the reins of power. This was the ever-repeating modus operandi and continues to be so. Pose as an advocate of the religion, culture or country that you want to control and then

manipulate your people into the positions of authority and influence largely as advisers, administrators and Svengalis for those that appear to be in power. They did this with Judaism, Christianity (Christian Zionism is part of this), Islam and other religions and nations until Sabbatian-Frankism spanned the world as it does today.

Sabbatian Saudis and the terror network

One expression of the Sabbatian-Frankist Dönme within Islam is the ruling family of Saudi Arabia, the House of Saud, through which came the vile distortion of Islam known as Wahhabism. This is the violent creed followed by terrorist groups like Al-Qaeda and ISIS or Islamic State. Wahhabism is the hand-chopping, head-chopping 'religion' of Saudi Arabia which is used to keep the people in a constant state of fear so the interloper House of Saud can continue to rule. Al-Qaeda and Islamic State were lavishly funded by the House of Saud while being created and directed by the Sabbatian-Frankist network in the United States that operates through the Pentagon, CIA and the government in general of whichever 'party'. The front man for the establishment of Wahhabism in the middle of the 18th century was a Sabbatian-Frankist 'crypto-Jew' posing as Islamic called Muhammad ibn Abd al-Wahhab. His daughter would marry the son of Muhammad bin Saud who established the first Saudi state before his death in 1765 with support from the British Empire. Bin Saud's successors would establish modern Saudi Arabia in league with the British and Americans in 1932 which allowed them to seize control of Islam's major shrines in Mecca and Medina. They have dictated the direction of Sunni Islam ever since while Iran is the major centre of the Shiite version and here we have the source of at least the public conflict between them. The Sabbatian network has used its Wahhabi extremists to carry out Problem-Reaction-Solution terrorist attacks in the name of 'Al-Qaeda' and 'Islamic State' to justify a devastating 'war on terror', ever-increasing surveillance of the population and to terrify people into compliance. Another insight of the Renegade Mind is the streetwise understanding that

just because a country, location or people are attacked doesn't mean that those apparently representing that country, location or people are not behind the attackers. Often they are *orchestrating* the attacks because of the societal changes that can be then justified in the name of 'saving the population from terrorists'.

I show in great detail in *The Trigger* how Sabbatian-Frankists were the real perpetrators of 9/11 and not '19 Arab hijackers' who were blamed for what happened. Observe what was justified in the name of 9/11 alone in terms of Middle East invasions, mass surveillance and control that fulfilled the demands of the Project for the New American Century document published by the Sabbatian Neocons. What appear to be enemies are on the deep inside players on the same Sabbatian team. Israel and Arab 'royal' dictatorships are all ruled by Sabbatians and the recent peace agreements between Israel and Saudi Arabia, the United Arab Emirates (UAE) and others are only making formal what has always been the case behind the scenes. Palestinians who have been subjected to grotesque tyranny since Israel was bombed and terrorised into existence in 1948 have never stood a chance. Sabbatian-Frankists have controlled Israel (so the constant theme of violence and war which Sabbatians love) and they have controlled the Arab countries that Palestinians have looked to for real support that never comes. 'Royal families' of the Arab world in Saudi Arabia, Bahrain, UAE, etc., are all Sabbatians with allegiance to the aims of the cult and not what is best for their Arabic populations. They have stolen the oil and financial resources from their people by false claims to be 'royal dynasties' with a genetic right to rule and by employing vicious militaries to impose their will.

Satanic 'illumination'

The Satanist Jacob Frank formed an alliance in 1773 with two other Sabbatians, Mayer Amschel Rothschild (1744-1812), founder of the Rothschild banking dynasty, and Jesuit-educated fraudulent Jew, Adam Weishaupt, and this led to the formation of the Bavarian Illuminati, firstly under another name, in 1776. The Illuminati would

be the manipulating force behind the French Revolution (1789-1799) and was also involved in the American Revolution (1775-1783) before and after the Illuminati's official creation. Weishaupt would later become (in public) a Protestant Christian in archetypal Sabbatian style. I read that his name can be decoded as Adam-Weishaupt or 'the first man to lead those who know'. He wasn't a leader in the sense that he was a subordinate, but he did lead those below him in a crusade of transforming human society that still continues today. The theme was confirmed as early as 1785 when a horseman courier called Lanz was reported to be struck by lightning and extensive Illuminati documents were found in his saddlebags. They made the link to Weishaupt and detailed the plan for world takeover. Current events with 'Covid' fascism have been in the making for a very long time. Jacob Frank was jailed for 13 years by the Catholic Inquisition after his arrest in 1760 and on his release he headed for Frankfurt, Germany, home city and headquarters of the House of Rothschild where the alliance was struck with Mayer Amschel Rothschild and Weishaupt. Rothschild arranged for Frank to be given the title of Baron and he became a wealthy nobleman with a big following of Jews in Germany, the Austro-Hungarian Empire and other European countries. Most of them would have believed he was on their side.

The name 'Illuminati' came from the Zohar which is a body of works in the Jewish mystical 'bible' called the Kabbalah. 'Zohar' is the foundation of Sabbatian-Frankist belief and in Hebrew 'Zohar' means 'splendour', 'radiance', 'illuminated', and so we have 'Illuminati'. They claim to be the 'Illuminated Ones' from their knowledge systematically hidden from the human population and passed on through generations of carefully-chosen initiates in the global secret society network or Cult. Hidden knowledge includes an awareness of the Cult agenda for the world and the nature of our collective reality that I will explore later. Cult 'illumination' is symbolised by the torch held by the Statue of Liberty which was gifted to New York by French Freemasons in Paris who knew exactly what it represents. 'Liberty' symbolises the goddess worshipped in

Babylon as Queen Semiramis or Ishtar. The significance of this will become clear. Notice again the ubiquitous theme of inversion with the Statue of 'Liberty' really symbolising mass control (Fig 7). A mirror-image statute stands on an island in the River Seine in Paris from where New York Liberty originated (Fig 8). A large replica of the Liberty flame stands on top of the Pont de l'Alma tunnel in Paris where Princess Diana died in a Cult ritual described in *The Biggest Secret*. Lucifer 'the light bringer' is related to all this (and much more as we'll see) and 'Lucifer' is a central figure in Sabbatian-Frankism and its associated Satanism. Sabbatians reject the Jewish Torah, or Pentateuch, the 'five books of Moses' in the Old Testament known as Genesis, Exodus, Leviticus, Numbers, and Deuteronomy which are claimed by Judaism and Christianity to have been dictated by 'God' to Moses on Mount Sinai. Sabbatians say these do not apply to them and they seek to replace them with the Zohar to absorb Judaism and its followers into their inversion which is an expression of a much greater global inversion. They want to delete all religions and force humanity to worship a one-world religion – Sabbatian Satanism that also includes worship of the Earth goddess. Satanic themes are being more and more introduced into mainstream society and while Christianity is currently the foremost target for destruction the others are planned to follow.



Figure 7: The Cult goddess of Babylon disguised as the Statue of Liberty holding the flame of Lucifer the 'light bringer'.



Figure 8: Liberty's mirror image in Paris where the New York version originated.

Marx brothers

Rabbi Marvin Antelman connects the Illuminati to the Jacobins in *To Eliminate the Opiate* and Jacobins were the force behind the French Revolution. He links both to the Bund der Gerechten, or League of the Just, which was the network that inflicted communism/Marxism on the world. Antelman wrote:

The original inner circle of the Bund der Gerechten consisted of born Catholics, Protestants and Jews [Sabbatian-Frankist infiltrators], and those representatives of respective subdivisions formulated schemes for the ultimate destruction of their faiths. The heretical Catholics laid plans which they felt would take a century or more for the ultimate destruction of the church; the apostate Jews for the ultimate destruction of the Jewish religion.

Sabbatian-created communism connects into this anti-religion agenda in that communism does not allow for the free practice of religion. The Sabbatian 'Bund' became the International Communist Party and Communist League and in 1848 'Marxism' was born with the Communist Manifesto of Sabbatian assets Karl Marx and Friedrich Engels. It is absolutely no coincidence that Marxism, just a different name for fascist and other centrally-controlled tyrannies, is being imposed worldwide as a result of the 'Covid' hoax and nor that Marxist/fascist China was the place where the hoax originated. The reason for this will become very clear in the chapter 'Covid: The calculated catastrophe'. The so-called 'Woke' mentality has hijacked

traditional beliefs of the political left and replaced them with far-right make-believe 'social justice' better known as Marxism. Woke will, however, be swallowed by its own perceived 'revolution' which is really the work of billionaires and billionaire corporations feigning being 'Woke'. Marxism is being touted by Wokers as a replacement for 'capitalism' when we don't have 'capitalism'. We have cartelism in which the market is stitched up by the very Cult billionaires and corporations bankrolling Woke. Billionaires love Marxism which keeps the people in servitude while they control from the top. Terminally naïve Wokers think they are 'changing the world' when it's the Cult that is doing the changing and when they have played their vital part and become surplus to requirements they, too, will be targeted. The Illuminati-Jacobins were behind the period known as 'The Terror' in the French Revolution in 1793 and 1794 when Jacobin Maximillian de Robespierre and his Orwellian 'Committee of Public Safety' killed 17,000 'enemies of the Revolution' who had once been 'friends of the Revolution'. Karl Marx (1818-1883), whose Sabbatian creed of Marxism has cost the lives of at least 100 million people, is a hero once again to Wokers who have been systematically kept ignorant of real history by their 'education' programming. As a result they now promote a Sabbatian 'Marxist' abomination destined at some point to consume them. Rabbi Antelman, who spent decades researching the Sabbatian plot, said of the League of the Just and Karl Marx:

Contrary to popular opinion Karl Marx did not originate the Communist Manifesto. He was paid for his services by the League of the Just, which was known in its country of origin, Germany, as the Bund der Geächteten.

Antelman said the text attributed to Marx was the work of other people and Marx 'was only repeating what others already said'. Marx was 'a hired hack – lackey of the wealthy Illuminists'. Marx famously said that religion was the 'opium of the people' (part of the Sabbatian plan to demonise religion) and Antelman called his books, *To Eliminate the Opiate*. Marx was born Jewish, but his family converted to Christianity (Sabbatian modus operandi) and he

attacked Jews, not least in his book, *A World Without Jews*. In doing so he supported the Sabbatian plan to destroy traditional Jewishness and Judaism which we are clearly seeing today with the vindictive targeting of orthodox Jews by the Sabbatian government of Israel over 'Covid' laws. I don't follow any religion and it has done much damage to the world over centuries and acted as a perceptual straightjacket. Renegade Minds, however, are always asking *why* something is being done. It doesn't matter if they agree or disagree with what is happening – *why* is it happening is the question. The 'why?' can be answered with regard to religion in that religions create interacting communities of believers when the Cult wants to dismantle all discourse, unity and interaction (see 'Covid' lockdowns) and the ultimate goal is to delete all religions for a one-world religion of Cult Satanism worshipping their 'god' of which more later. We see the same 'why?' with gun control in America. I don't have guns and don't want them, but why is the Cult seeking to disarm the population at the same time that law enforcement agencies are armed to their molars and why has every tyrant in history sought to disarm people before launching the final takeover? They include Hitler, Stalin, Pol Pot and Mao who followed confiscation with violent seizing of power. You know it's a Cult agenda by the people who immediately race to the microphones to exploit dead people in multiple shootings. Ultra-Zionist Cult lackey Senator Chuck Schumer was straight on the case after ten people were killed in Boulder, Colorado in March, 2121. Simple rule ... if Schumer wants it the Cult wants it and the same with his ultra-Zionist mate the wild-eyed Senator Adam Schiff. At the same time they were calling for the disarmament of Americans, many of whom live a long way from a police response, Schumer, Schiff and the rest of these pampered clowns were sitting on Capitol Hill behind a razor-wired security fence protected by thousands of armed troops in addition to their own armed bodyguards. Mom and pop in an isolated home? They're just potential mass shooters.

Zion Mainframe

Sabbatian-Frankists and most importantly the Rothschilds were behind the creation of 'Zionism', a political movement that demanded a Jewish homeland in Israel as promised by Sabbatai Zevi. The very symbol of Israel comes from the German meaning of the name Rothschild. Dynasty founder Mayer Amschel Rothschild changed the family name from Bauer to Rothschild, or 'Red-Shield' in German, in deference to the six-pointed 'Star of David' hexagram displayed on the family's home in Frankfurt. The symbol later appeared on the flag of Israel after the Rothschilds were centrally involved in its creation. Hexagrams are not a uniquely Jewish symbol and are widely used in occult ('hidden') networks often as a symbol for Saturn (see my other books for why). Neither are Zionism and Jewishness interchangeable. Zionism is a political movement and philosophy and not a 'race' or a people. Many Jews oppose Zionism and many non-Jews, including US President Joe Biden, call themselves Zionists as does Israel-centric Donald Trump. America's support for the Israel government is pretty much a gimme with ultra-Zionist billionaires and corporations providing fantastic and dominant funding for both political parties. Former Congresswoman Cynthia McKinney has told how she was approached immediately she ran for office to 'sign the pledge' to Israel and confirm that she would always vote in that country's best interests. All American politicians are approached in this way. Anyone who refuses will get no support or funding from the enormous and all-powerful Zionist lobby that includes organisations like mega-lobby group AIPAC, the American Israel Public Affairs Committee. Trump's biggest funder was ultra-Zionist casino and media billionaire Sheldon Adelson while major funders of the Democratic Party include ultra-Zionist George Soros and ultra-Zionist financial and media mogul, Haim Saban. Some may reel back at the suggestion that Soros is an Israel-firster (Sabbatian-controlled Israel-firster), but Renegade Minds watch the actions not the words and everywhere Soros donates his billions the Sabbatian agenda benefits. In the spirit of Sabbatian inversion Soros pledged \$1 billion for a new university network to promote 'liberal values and tackle intolerance'. He made the announcement during his annual speech

at the Cult-owned World Economic Forum in Davos, Switzerland, in January, 2020, after his 'harsh criticism' of 'authoritarian rulers' around the world. You can only laugh at such brazen mendacity. How *he* doesn't laugh is the mystery. Translated from the Orwellian 'liberal values and tackle intolerance' means teaching non-white people to hate white people and for white people to loathe themselves for being born white. The reason for that will become clear.

The 'Anti-Semitism' fraud

Zionists support the Jewish homeland in the land of Palestine which has been the Sabbatian-Rothschild goal for so long, but not for the benefit of Jews. Sabbatians and their global Anti-Semitism Industry have skewed public and political opinion to equate opposing the violent extremes of Zionism to be a blanket attack and condemnation of all Jewish people. Sabbatians and their global Anti-Semitism Industry have skewed public and political opinion to equate opposing the violent extremes of Zionism to be a blanket attack and condemnation of all Jewish people. This is nothing more than a Sabbatian protection racket to stop legitimate investigation and exposure of their agendas and activities. The official definition of 'anti-Semitism' has more recently been expanded to include criticism of Zionism – a *political movement* – and this was done to further stop exposure of Sabbatian infiltrators who created Zionism as we know it today in the 19th century. Renegade Minds will talk about these subjects when they know the shit that will come their way. People must decide if they want to know the truth or just cower in the corner in fear of what others will say. Sabbatians have been trying to label me as 'anti-Semitic' since the 1990s as I have uncovered more and more about their background and agendas. Useless, gutless, fraudulent 'journalists' then just repeat the smears without question and on the day I was writing this section a pair of unquestioning repeaters called Ben Quinn and Archie Bland (how appropriate) outright called me an 'anti-Semite' in the establishment propaganda sheet, the London *Guardian*, with no supporting evidence. The

Sabbatian Anti-Semitism Industry said so and who are they to question that? They wouldn't dare. Ironically 'Semitic' refers to a group of languages in the Middle East that are almost entirely Arabic. 'Anti-Semitism' becomes 'anti-Arab' which if the consequences of this misunderstanding were not so grave would be hilarious. Don't bother telling Quinn and Bland. I don't want to confuse them, bless 'em. One reason I am dubbed 'anti-Semitic' is that I wrote in the 1990s that Jewish operatives (Sabbatians) were heavily involved in the Russian Revolution when Sabbatians overthrew the Romanov dynasty. This apparently made me 'anti-Semitic'. Oh, really? Here is a section from *The Trigger*:

British journalist Robert Wilton confirmed these themes in his 1920 book *The Last Days of the Romanovs* when he studied official documents from the Russian government to identify the members of the Bolshevik ruling elite between 1917 and 1919. The Central Committee included 41 Jews among 62 members; the Council of the People's Commissars had 17 Jews out of 22 members; and 458 of the 556 most important Bolshevik positions between 1918 and 1919 were occupied by Jewish people. Only 17 were Russian. Then there were the 23 Jews among the 36 members of the vicious Cheka Soviet secret police established in 1917 who would soon appear all across the country.

Professor Robert Service of Oxford University, an expert on 20th century Russian history, found evidence that ['Jewish'] Leon Trotsky had sought to make sure that Jews were enrolled in the Red Army and were disproportionately represented in the Soviet civil bureaucracy that included the Cheka which performed mass arrests, imprisonment and executions of 'enemies of the people'. A US State Department Decimal File (861.00/5339) dated November 13th, 1918, names [Rothschild banking agent in America] Jacob Schiff and a list of ultra-Zionists as funders of the Russian Revolution leading to claims of a 'Jewish plot', but the key point missed by all is they were not 'Jews' – they were Sabbatian-Frankists.

Britain's Winston Churchill made the same error by mistake or otherwise. He wrote in a 1920 edition of the *Illustrated Sunday Herald* that those behind the Russian revolution were part of a 'worldwide conspiracy for the overthrow of civilisation and for the reconstitution of society on the basis of arrested development, of envious malevolence, and impossible equality' (see 'Woke' today because that has been created by the same network). Churchill said there was no need to exaggerate the part played in the creation of Bolshevism and in the actual bringing about of the Russian

Revolution 'by these international and for the most part atheistical Jews' ['atheistical Jews' = Sabbatians]. Churchill said it is certainly a very great one and probably outweighs all others: 'With the notable exception of Lenin, the majority of the leading figures are Jews.' He went on to describe, knowingly or not, the Sabbatian modus operandi of placing puppet leaders nominally in power while they control from the background:

Moreover, the principal inspiration and driving power comes from the Jewish leaders. Thus Tchitcherin, a pure Russian, is eclipsed by his nominal subordinate, Litvinoff, and the influence of Russians like Bukharin or Lunacharski cannot be compared with the power of Trotsky, or of Zinovieff, the Dictator of the Red Citadel (Petrograd), or of Krassin or Radek – all Jews. In the Soviet institutions the predominance of Jews is even more astonishing. And the prominent, if not indeed the principal, part in the system of terrorism applied by the Extraordinary Commissions for Combatting Counter-Revolution has been taken by Jews, and in some notable cases by Jewesses.

What I said about seriously disproportionate involvement in the Russian Revolution by Jewish 'revolutionaries' (Sabbatians) is provable fact, but truth is no defence against the Sabbatian Anti-Semitism Industry, its repeater parrots like Quinn and Bland, and the now breathtaking network of so-called 'Woke' 'anti-hate' groups with interlocking leaderships and funding which have the role of discrediting and silencing anyone who gets too close to exposing the Sabbatians. We have seen 'truth is no defence' confirmed in legal judgements with the Saskatchewan Human Rights Commission in Canada decreeing this: 'Truthful statements can be presented in a manner that would meet the definition of hate speech, and not all truthful statements must be free from restriction.' Most 'anti-hate' activists, who are themselves consumed by hatred, are too stupid and ignorant of the world to know how they are being used. They are far too far up their own virtue-signalling arses and it's far too dark for them to see anything.

The 'revolution' game

The background and methods of the 'Russian' Revolution are straight from the Sabbatian playbook seen in the French Revolution

and endless others around the world that appear to start as a revolution of the people against tyrannical rule and end up with a regime change to more tyrannical rule overtly or covertly. Wars, terror attacks and regime overthrows follow the Sabbatian cult through history with its agents creating them as Problem-Reaction-Solutions to remove opposition on the road to world domination. Sabbatian dots connect the Rothschilds with the Illuminati, Jacobins of the French Revolution, the 'Bund' or League of the Just, the International Communist Party, Communist League and the Communist Manifesto of Karl Marx and Friedrich Engels that would lead to the Rothschild-funded Russian Revolution. The sequence comes under the heading of 'creative destruction' when you advance to your global goal by continually destroying the status quo to install a new status quo which you then also destroy. The two world wars come to mind. With each new status quo you move closer to your planned outcome. Wars and mass murder are to Sabbatians a collective blood sacrifice ritual. They are obsessed with death for many reasons and one is that death is an inversion of life. Satanists and Sabbatians are obsessed with death and often target churches and churchyards for their rituals. Inversion-obsessed Sabbatians explain the use of inverted symbolism including the *inverted* pentagram and *inverted* cross. The inversion of the cross has been related to targeting Christianity, but the cross was a religious symbol long before Christianity and its inversion is a statement about the Sabbatian mentality and goals more than any single religion.

Sabbatians operating in Germany were behind the rise of the occult-obsessed Nazis and the subsequent Jewish exodus from Germany and Europe to Palestine and the United States after World War Two. The Rothschild dynasty was at the forefront of this both as political manipulators and by funding the operation. Why would Sabbatians help to orchestrate the horrors inflicted on Jews by the Nazis and by Stalin after they organised the Russian Revolution? Sabbatians hate Jews and their religion, that's why. They pose as Jews and secure positions of control within Jewish society and play the 'anti-Semitism' card to protect themselves from exposure

through a global network of organisations answering to the Sabbatian-created-and-controlled globe-spanning intelligence network that involves a stunning web of military-intelligence operatives and operations for a tiny country of just nine million. Among them are Jewish assets who are not Sabbatians but have been convinced by them that what they are doing is for the good of Israel and the Jewish community to protect them from what they have been programmed since childhood to believe is a Jew-hating hostile world. The Jewish community is just a highly convenient cover to hide the true nature of Sabbatians. Anyone getting close to exposing their game is accused by Sabbatian place-people and gofers of 'anti-Semitism' and claiming that all Jews are part of a plot to take over the world. I am not saying that. I am saying that Sabbatians – the *real* Jew-haters – have infiltrated the Jewish community to use them both as a cover and an 'anti-Semitic' defence against exposure. Thus we have the Anti-Semitism Industry targeted researchers in this way and most Jewish people think this is justified and genuine. They don't know that their 'Jewish' leaders and institutions of state, intelligence and military are not controlled by Jews at all, but cultists and stooges of Sabbatian-Frankism. I once added my name to a pro-Jewish freedom petition online and the next time I looked my name was gone and text had been added to the petition blurb to attack me as an 'anti-Semite' such is the scale of perceptual programming.

Moving on America

I tell the story in *The Trigger* and a chapter called 'Atlantic Crossing' how particularly after Israel was established the Sabbatians moved in on the United States and eventually grasped control of government administration, the political system via both Democrats and Republicans, the intelligence community like the CIA and National Security Agency (NSA), the Pentagon and mass media. Through this seriously compartmentalised network Sabbatians and their operatives in Mossad, Israeli Defense Forces (IDF) and US agencies pulled off 9/11 and blamed it on 19 'Al-Qaeda hijackers' dominated by men from, or connected to, Sabbatian-ruled Saudi

Arabia. The '19' were not even on the planes let alone flew those big passenger jets into buildings while being largely incompetent at piloting one-engine light aircraft. 'Hijacker' Hani Hanjour who is said to have flown American Airlines Flight 77 into the Pentagon with a turn and manoeuvre most professional pilots said they would have struggled to do was banned from renting a small plane by instructors at the Freeway Airport in Bowie, Maryland, just *six weeks* earlier on the grounds that he was an incompetent pilot. The Jewish population of the world is just 0.2 percent with even that almost entirely concentrated in Israel (75 percent Jewish) and the United States (around two percent). This two percent and globally 0.2 percent refers to *Jewish* people and not Sabbatian interlopers who are a fraction of that fraction. What a sobering thought when you think of the fantastic influence on world affairs of tiny Israel and that the Project for the New America Century (PNAC) which laid out the blueprint in September, 2000, for America's war on terror and regime change wars in Iraq, Libya and Syria was founded and dominated by Sabbatians known as 'Neocons'. The document conceded that this plan would not be supported politically or publicly without a major attack on American soil and a Problem-Reaction-Solution excuse to send troops to war across the Middle East. Sabbatian Neocons said:

... [The] process of transformation ... [war and regime change] ... is likely to be a long one, absent some catastrophic and catalysing event – like a new Pearl Harbor.

Four months later many of those who produced that document came to power with their inane puppet George Bush from the long-time Sabbatian Bush family. They included Sabbatian Dick Cheney who was officially vice-president, but really de-facto president for the entirety of the 'Bush' government. Nine months after the 'Bush' inauguration came what Bush called at the time 'the Pearl Harbor of the 21st century' and with typical Sabbatian timing and symbolism 2001 was the 60th anniversary of the attack in 1941 by the Japanese Air Force on Pearl Harbor, Hawaii, which allowed President Franklin Delano Roosevelt to take the United States into a Sabbatian-

instigated Second World War that he said in his election campaign that he never would. The evidence is overwhelming that Roosevelt and his military and intelligence networks knew the attack was coming and did nothing to stop it, but they did make sure that America's most essential naval ships were not in Hawaii at the time. Three thousand Americans died in the Pearl Harbor attacks as they did on September 11th. By the 9/11 year of 2001 Sabbatians had widely infiltrated the US government, military and intelligence operations and used their compartmentalised assets to pull off the 'Al-Qaeda' attacks. If you read *The Trigger* it will blow your mind to see the utterly staggering concentration of 'Jewish' operatives (Sabbatian infiltrators) in essential positions of political, security, legal, law enforcement, financial and business power before, during, and after the attacks to make them happen, carry them out, and then cover their tracks – and I do mean *staggering* when you think of that 0.2 percent of the world population and two percent of Americans which are Jewish while Sabbatian infiltrators are a fraction of that. A central foundation of the 9/11 conspiracy was the hijacking of government, military, Air Force and intelligence computer systems in real time through 'back-door' access made possible by Israeli (Sabbatian) 'cyber security' software. Sabbatian-controlled Israel is on the way to rivalling Silicon Valley for domination of cyberspace and is becoming the dominant force in cyber-security which gives them access to entire computer systems and their passcodes across the world. Then add to this that Zionists head (officially) Silicon Valley giants like Google (Larry Page and Sergey Brin), Google-owned YouTube (Susan Wojcicki), Facebook (Mark Zuckerberg and Sheryl Sandberg), and Apple (Chairman Arthur D. Levinson), and that ultra-Zionist hedge fund billionaire Paul Singer has a \$1 billion stake in Twitter which is only nominally headed by 'CEO' pothead Jack Dorsey. As cable news host Tucker Carlson said of Dorsey: 'There used to be debate in the medical community whether dropping a ton of acid had permanent effects and I think that debate has now ended.' Carlson made the comment after Dorsey told a hearing on Capitol Hill (if you cut through his bullshit) that he

believed in free speech so long as he got to decide what you can hear and see. These 'big names' of Silicon Valley are only front men and women for the Global Cult, not least the Sabbatians, who are the true controllers of these corporations. Does anyone still wonder why these same people and companies have been ferociously censoring and banning people (like me) for exposing any aspect of the Cult agenda and especially the truth about the 'Covid' hoax which Sabbatians have orchestrated?

The Jeffrey Epstein paedophile ring was a Sabbatian operation. He was officially 'Jewish' but he was a Sabbatian and women abused by the ring have told me about the high number of 'Jewish' people involved. The Epstein horror has Sabbatian written all over it and matches perfectly their modus operandi and obsession with sex and ritual. Epstein was running a Sabbatian blackmail ring in which famous people with political and other influence were provided with young girls for sex while everything was being filmed and recorded on hidden cameras and microphones at his New York house, Caribbean island and other properties. Epstein survivors have described this surveillance system to me and some have gone public. Once the famous politician or other figure knew he or she was on video they tended to do whatever they were told. Here we go again ...when you've got them by the balls their hearts and minds will follow. Sabbatians use this blackmail technique on a wide scale across the world to entrap politicians and others they need to act as demanded. Epstein's private plane, the infamous 'Lolita Express', had many well-known passengers including Bill Clinton while Bill Gates has flown on an Epstein plane and met with him four years after Epstein had been jailed for paedophilia. They subsequently met many times at Epstein's home in New York according to a witness who was there. Epstein's infamous side-kick was Ghislaine Maxwell, daughter of Mossad agent and ultra-Zionist mega-crooked British businessman, Bob Maxwell, who at one time owned the *Daily Mirror* newspaper. Maxwell was murdered at sea on his boat in 1991 by Sabbatian-controlled Mossad when he became a liability with his

business empire collapsing as a former Mossad operative has confirmed (see *The Trigger*).

Money, money, money, funny money ...

Before I come to the Sabbatian connection with the last three US presidents I will lay out the crucial importance to Sabbatians of controlling banking and finance. Sabbatian Mayer Amschel Rothschild set out to dominate this arena in his family's quest for total global control. What is freedom? It is, in effect, choice. The more choices you have the freer you are and the fewer your choices the more you are enslaved. In the global structure created over centuries by Sabbatians the biggest decider and restrictor of choice is ... money. Across the world if you ask people what they would like to do with their lives and why they are not doing that they will reply 'I don't have the money'. This is the idea. A global elite of multi-billionaires are described as 'greedy' and that is true on one level; but control of money – who has it and who doesn't – is not primarily about greed. It's about control. Sabbatians have seized ever more control of finance and sucked the wealth of the world out of the hands of the population. We talk now, after all, about the 'One-percent' and even then the wealthiest are a lot fewer even than that. This has been made possible by a money scam so outrageous and so vast it could rightly be called the scam of scams founded on creating 'money' out of nothing and 'loaning' that with interest to the population. Money out of nothing is called 'credit'. Sabbatians have asserted control over governments and banking ever more completely through the centuries and secured financial laws that allow banks to lend hugely more than they have on deposit in a confidence trick known as fractional reserve lending. Imagine if you could lend money that doesn't exist and charge the recipient interest for doing so. You would end up in jail. Bankers by contrast end up in mansions, private jets, Malibu and Monaco.

Banks are only required to keep a fraction of their deposits and wealth in their vaults and they are allowed to lend 'money' they don't have called 'credit'. Go into a bank for a loan and if you succeed

the banker will not move any real wealth into your account. They will type into your account the amount of the agreed 'loan' – say £100,000. This is not wealth that really exists; it is non-existent, fresh-air, created-out-of-nothing 'credit' which has never, does not, and will never exist except in theory. Credit is backed by nothing except wind and only has buying power because people think that it has buying power and accept it in return for property, goods and services. I have described this situation as like those cartoon characters you see chasing each other and when they run over the edge of a cliff they keep running forward on fresh air until one of them looks down, realises what's happened, and they all crash into the ravine. The whole foundation of the Sabbatian financial system is to stop people looking down except for periodic moments when they want to crash the system (as in 2008 and 2020 ongoing) and reap the rewards from all the property, businesses and wealth their borrowers had signed over as 'collateral' in return for a 'loan' of fresh air. Most people think that money is somehow created by governments when it comes into existence from the start as a debt through banks 'lending' illusory money called credit. Yes, the very currency of exchange is a *debt* from day one issued as an interest-bearing loan. Why don't governments create money interest-free and lend it to their people interest-free? Governments are controlled by Sabbatians and the financial system is controlled by Sabbatians for whom interest-free money would be a nightmare come true. Sabbatians underpin their financial domination through their global network of central banks, including the privately-owned US Federal Reserve and Britain's Bank of England, and this is orchestrated by a privately-owned central bank coordination body called the Bank for International Settlements in Basle, Switzerland, created by the usual suspects including the Rockefellers and Rothschilds. Central bank chiefs don't answer to governments or the people. They answer to the Bank for International Settlements or, in other words, the Global Cult which is dominated today by Sabbatians.

Built-in disaster

There are so many constituent scams within the overall banking scam. When you take out a loan of thin-air credit only the amount of that loan is theoretically brought into circulation to add to the amount in circulation; but you are paying back the principle plus interest. The additional interest is not created and this means that with every 'loan' there is a shortfall in the money in circulation between what is borrowed and what has to be paid back. There is never even close to enough money in circulation to repay all outstanding public and private debt including interest. Coldly weaved in the very fabric of the system is the certainty that some will lose their homes, businesses and possessions to the banking 'lender'. This is less obvious in times of 'boom' when the amount of money in circulation (and the debt) is expanding through more people wanting and getting loans. When a downturn comes and the money supply contracts it becomes painfully obvious that there is not enough money to service all debt and interest. This is less obvious in times of 'boom' when the amount of money in circulation (and the debt) is expanding through more people wanting and getting loans. When a downturn comes and the money supply contracts and it becomes painfully obvious – as in 2008 and currently – that there is not enough money to service all debt and interest. Sabbatian banksters have been leading the human population through a calculated series of booms (more debt incurred) and busts (when the debt can't be repaid and the banks get the debtor's tangible wealth in exchange for non-existent 'credit'). With each 'bust' Sabbatian bankers have absorbed more of the world's tangible wealth and we end up with the One-percent. Governments are in bankruptcy levels of debt to the same system and are therefore owned by a system they do not control. The Federal Reserve, 'America's central bank', is privately-owned and American presidents only nominally appoint its chairman or woman to maintain the illusion that it's an arm of government. It's not. The 'Fed' is a cartel of private banks which handed billions to its associates and friends after the crash of 2008 and has been Sabbatian-controlled since it was manipulated into being in 1913 through the covert trickery of Rothschild banking agents Jacob Schiff and Paul

Warburg, and the Sabbatian Rockefeller family. Somehow from a Jewish population of two-percent and globally 0.2 percent (Sabbatian interlopers remember are far smaller) ultra-Zionists headed the Federal Reserve for 31 years between 1987 and 2018 in the form of Alan Greenspan, Bernard Bernanke and Janet Yellen (now Biden's Treasury Secretary) with Yellen's deputy chairman a Israeli-American dual citizen and ultra-Zionist Stanley Fischer, a former governor of the Bank of Israel. Ultra-Zionist Fed chiefs spanned the presidencies of Ronald Reagan ('Republican'), Father George Bush ('Republican'), Bill Clinton ('Democrat'), Boy George Bush ('Republican') and Barack Obama ('Democrat'). We should really add the pre-Greenspan chairman, Paul Adolph Volcker, 'appointed' by Jimmy Carter ('Democrat') who ran the Fed between 1979 and 1987 during the Carter and Reagan administrations before Greenspan took over. Volcker was a long-time associate and business partner of the Rothschilds. No matter what the 'party' officially in power the United States economy was directed by the same force. Here are members of the Obama, Trump and Biden administrations and see if you can make out a common theme.

Barack Obama ('Democrat')

Ultra-Zionists Robert Rubin, Larry Summers, and Timothy Geithner ran the US Treasury in the Clinton administration and two of them reappeared with Obama. Ultra-Zionist Fed chairman Alan Greenspan had manipulated the crash of 2008 through deregulation and jumped ship just before the disaster to make way for ultra-Zionist Bernard Bernanke to hand out trillions to Sabbatian 'too big to fail' banks and businesses, including the ubiquitous ultra-Zionist Goldman Sachs which has an ongoing revolving door operation between itself and major financial positions in government worldwide. Obama inherited the fallout of the crash when he took office in January, 2009, and fortunately he had the support of his ultra-Zionist White House Chief of Staff Rahm Emmanuel, son of a terrorist who helped to bomb Israel into being in 1948, and his ultra-Zionist senior adviser David Axelrod, chief strategist in Obama's two

successful presidential campaigns. Emmanuel, later mayor of Chicago and former senior fundraiser and strategist for Bill Clinton, is an example of the Sabbatian policy after Israel was established of migrating insider families to America so their children would be born American citizens. 'Obama' chose this financial team throughout his administration to respond to the Sabbatian-instigated crisis:

Timothy Geithner (ultra-Zionist) Treasury Secretary; Jacob J. Lew, Treasury Secretary; Larry Summers (ultra-Zionist), director of the White House National Economic Council; Paul Adolph Volcker (Rothschild business partner), chairman of the Economic Recovery Advisory Board; Peter Orszag (ultra-Zionist), director of the Office of Management and Budget overseeing all government spending; Penny Pritzker (ultra-Zionist), Commerce Secretary; Jared Bernstein (ultra-Zionist), chief economist and economic policy adviser to Vice President Joe Biden; Mary Schapiro (ultra-Zionist), chair of the Securities and Exchange Commission (SEC); Gary Gensler (ultra-Zionist), chairman of the Commodity Futures Trading Commission (CFTC); Sheila Bair (ultra-Zionist), chair of the Federal Deposit Insurance Corporation (FDIC); Karen Mills (ultra-Zionist), head of the Small Business Administration (SBA); Kenneth Feinberg (ultra-Zionist), Special Master for Executive [bail-out] Compensation. Feinberg would be appointed to oversee compensation (with strings) to 9/11 victims and families in a campaign to stop them having their day in court to question the official story. At the same time ultra-Zionist Bernard Bernanke was chairman of the Federal Reserve and these are only some of the ultra-Zionists with allegiance to Sabbatian-controlled Israel in the Obama government. Obama's biggest corporate donor was ultra-Zionist Goldman Sachs which had employed many in his administration.

Donald Trump ('Republican')

Trump claimed to be an outsider (he wasn't) who had come to 'drain the swamp'. He embarked on this goal by immediately appointing ultra-Zionist Steve Mnuchin, a Goldman Sachs employee for 17

years, as his Treasury Secretary. Others included Gary Cohn (ultra-Zionist), chief operating officer of Goldman Sachs, his first Director of the National Economic Council and chief economic adviser, who was later replaced by Larry Kudlow (ultra-Zionist). Trump's senior adviser throughout his four years in the White House was his sinister son-in-law Jared Kushner, a life-long friend of Israel Prime Minister Benjamin Netanyahu. Kushner is the son of a convicted crook who was pardoned by Trump in his last days in office. Other ultra-Zionists in the Trump administration included: Stephen Miller, Senior Policy Adviser; Avrahm Berkowitz, Deputy Adviser to Trump and his Senior Adviser Jared Kushner; Ivanka Trump, Adviser to the President, who converted to Judaism when she married Jared Kushner; David Friedman, Trump lawyer and Ambassador to Israel; Jason Greenblatt, Trump Organization executive vice president and chief legal officer, who was made Special Representative for International Negotiations and the Israeli-Palestinian Conflict; Rod Rosenstein, Deputy Attorney General; Elliot Abrams, Special Representative for Venezuela, then Iran; John Eisenberg, National Security Council Legal Adviser and Deputy Council to the President for National Security Affairs; Anne Neuberger, Deputy National Manager, National Security Agency; Ezra Cohen-Watnick, Acting Under Secretary of Defense for Intelligence; Elan Carr, Special Envoy to monitor and combat anti-Semitism; Len Khodorkovsky, Deputy Special Envoy to monitor and combat anti-Semitism; Reed Cordish, Assistant to the President, Intragovernmental and Technology Initiatives. Trump Vice President Mike Pence and Secretary of State Mike Pompeo, both Christian Zionists, were also vehement supporters of Israel and its goals and ambitions.

Donald 'free-speech believer' Trump pardoned a number of financial and violent criminals while ignoring calls to pardon Julian Assange and Edward Snowden whose crimes are revealing highly relevant information about government manipulation and corruption and the widespread illegal surveillance of the American people by US 'security' agencies. It's so good to know that Trump is on the side of freedom and justice and not mega-criminals with

allegiance to Sabbatian-controlled Israel. These included a pardon for Israeli spy Jonathan Pollard who was jailed for life in 1987 under the Espionage Act. Aviem Sella, the Mossad agent who recruited Pollard, was also pardoned by Trump while Assange sat in jail and Snowden remained in exile in Russia. Sella had 'fled' (was helped to escape) to Israel in 1987 and was never extradited despite being charged under the Espionage Act. A Trump White House statement said that Sella's clemency had been 'supported by Benjamin Netanyahu, Ron Dermer, Israel's US Ambassador, David Friedman, US Ambassador to Israel and Miriam Adelson, wife of leading Trump donor Sheldon Adelson who died shortly before. Other friends of Jared Kushner were pardoned along with Sholom Weiss who was believed to be serving the longest-ever white-collar prison sentence of more than 800 years in 2000. The sentence was commuted of Ponzi-schemer Eliyahu Weinstein who defrauded Jews and others out of \$200 million. I did mention that Assange and Snowden were ignored, right? Trump gave Sabbatians almost everything they asked for in military and political support, moving the US Embassy from Tel Aviv to Jerusalem with its critical symbolic and literal implications for Palestinian statehood, and the 'deal of the Century' designed by Jared Kushner and David Friedman which gave the Sabbatian Israeli government the green light to substantially expand its already widespread program of building illegal Jewish-only settlements in the occupied land of the West Bank. This made a two-state 'solution' impossible by seizing all the land of a potential Palestinian homeland and that had been the plan since 1948 and then 1967 when the Arab-controlled Gaza Strip, West Bank, Sinai Peninsula and Syrian Golan Heights were occupied by Israel. All the talks about talks and road maps and delays have been buying time until the West Bank was physically occupied by Israeli real estate. Trump would have to be a monumentally ill-informed idiot not to see that this was the plan he was helping to complete. The Trump administration was in so many ways the Kushner administration which means the Netanyahu administration which means the Sabbatian administration. I understand why many opposing Cult fascism in all its forms gravitated to Trump, but he

was a crucial part of the Sabbatian plan and I will deal with this in the next chapter.

Joe Biden ('Democrat')

A barely cognitive Joe Biden took over the presidency in January, 2021, along with his fellow empty shell, Vice-President Kamala Harris, as the latest Sabbatian gofers to enter the White House. Names on the door may have changed and the 'party' – the force behind them remained the same as Zionists were appointed to a stream of pivotal areas relating to Sabbatian plans and policy. They included: Janet Yellen, Treasury Secretary, former head of the Federal Reserve, and still another ultra-Zionist running the US Treasury after Mnuchin (Trump), Lew and Geithner (Obama), and Summers and Rubin (Clinton); Anthony Blinken, Secretary of State; Wendy Sherman, Deputy Secretary of State (so that's 'Biden's' Sabbatian foreign policy sorted); Jeff Zients, White House coronavirus coordinator; Rochelle Walensky, head of the Centers for Disease Control; Rachel Levine, transgender deputy health secretary (that's 'Covid' hoax policy under control); Merrick Garland, Attorney General; Alejandro Mayorkas, Secretary of Homeland Security; Cass Sunstein, Homeland Security with responsibility for new immigration laws; Avril Haines, Director of National Intelligence; Anne Neuberger, National Security Agency cybersecurity director (note, cybersecurity); David Cohen, CIA Deputy Director; Ronald Klain, Biden's Chief of Staff (see Rahm Emanuel); Eric Lander, a 'leading geneticist', Office of Science and Technology Policy director (see Smart Grid, synthetic biology agenda); Jessica Rosenworcel, acting head of the Federal Communications Commission (FCC) which controls Smart Grid technology policy and electromagnetic communication systems including 5G. How can it be that so many pivotal positions are held by two-percent of the American population and 0.2 percent of the world population administration after administration no matter who is the president and what is the party? It's a coincidence? Of course it's not and this is why Sabbatians have built their colossal global web of interlocking 'anti-

hate' hate groups to condemn anyone who asks these glaring questions as an 'anti-Semite'. The way that Jewish people horrifically abused in Sabbatian-backed Nazi Germany are exploited to this end is stomach-turning and disgusting beyond words.

Political fusion

Sabbatian manipulation has reversed the roles of Republicans and Democrats and the same has happened in Britain with the Conservative and Labour Parties. Republicans and Conservatives were always labelled the 'right' and Democrats and Labour the 'left', but look at the policy positions now and the Democrat-Labour 'left' has moved further to the 'right' than Republicans and Conservatives under the banner of 'Woke', the Cult-created far-right tyranny. Where once the Democrat-Labour 'left' defended free speech and human rights they now seek to delete them and as I said earlier despite the 'Covid' fascism of the Jackboot Johnson Conservative government in the UK the Labour Party of leader Keir Starmer demanded even more extreme measures. The Labour Party has been very publicly absorbed by Sabbatians after a political and media onslaught against the previous leader, the weak and inept Jeremy Corbyn, over made-up allegations of 'anti-Semitism' both by him and his party. The plan was clear with this 'anti-Semite' propaganda and what was required in response was a swift and decisive 'fuck off' from Corbyn and a statement to expose the Anti-Semitism Industry (Sabbatian) attempt to silence Labour criticism of the Israeli government (Sabbatians) and purge the party of all dissent against the extremes of ultra-Zionism (Sabbatians). Instead Corbyn and his party fell to their knees and appeased the abusers which, by definition, is impossible. Appeasing one demand leads only to a new demand to be appeased until takeover is complete. Like I say – 'fuck off' would have been a much more effective policy and I have used it myself with great effect over the years when Sabbatians are on my case which is most of the time. I consider that fact a great compliment, by the way. The outcome of the Labour Party capitulation is that we now have a Sabbatian-controlled

Conservative Party 'opposed' by a Sabbatian-controlled Labour Party in a one-party Sabbatian state that hurtles towards the extremes of tyranny (the Sabbatian cult agenda). In America the situation is the same. Labour's Keir Starmer spends his days on his knees with his tongue out pointing to Tel Aviv, or I guess now Jerusalem, while Boris Johnson has an 'anti-Semitism czar' in the form of former Labour MP John Mann who keeps Starmer company on his prayer mat.

Sabbatian influence can be seen in Jewish members of the Labour Party who have been ejected for criticism of Israel including those from families that suffered in Nazi Germany. Sabbatians despise real Jewish people and target them even more harshly because it is so much more difficult to dub them 'anti-Semitic' although in their desperation they do try.

CHAPTER THREE

The Pushbacker sting

Until you realize how easy it is for your mind to be manipulated, you remain the puppet of someone else's game

Evita Ochel

I will use the presidencies of Trump and Biden to show how the manipulation of the one-party state plays out behind the illusion of political choice across the world. No two presidencies could – on the face of it – be more different and apparently at odds in terms of direction and policy.

A Renegade Mind sees beyond the obvious and focuses on outcomes and consequences and not image, words and waffle. The Cult embarked on a campaign to divide America between those who blindly support its agenda (the mentality known as 'Woke') and those who are pushing back on where the Cult and its Sabbatians want to go. This presents infinite possibilities for dividing and ruling the population by setting them at war with each other and allows a perceptual ring fence of demonisation to encircle the Pushbackers in a modern version of the Little Big Horn in 1876 when American cavalry led by Lieutenant Colonel George Custer were drawn into a trap, surrounded and killed by Native American tribes defending their land of thousands of years from being seized by the government. In this modern version the roles are reversed and it's those defending themselves from the Sabbatian government who are surrounded and the government that's seeking to destroy them. This trap was set years ago and to explain how we must return to 2016

and the emergence of Donald Trump as a candidate to be President of the United States. He set out to overcome the best part of 20 other candidates in the Republican Party before and during the primaries and was not considered by many in those early stages to have a prayer of living in the White House. The Republican Party was said to have great reservations about Trump and yet somehow he won the nomination. When you know how American politics works – politics in general – there is no way that Trump could have become the party's candidate unless the Sabbatian-controlled 'Neocons' that run the Republican Party wanted that to happen. We saw the proof in emails and documents made public by WikiLeaks that the Democratic Party hierarchy, or Democons, systematically undermined the campaign of Bernie Sanders to make sure that Sabbatian gofer Hillary Clinton won the nomination to be their presidential candidate. If the Democons could do that then the Neocons in the Republican Party could have derailed Trump in the same way. But they didn't and at that stage I began to conclude that Trump could well be the one chosen to be president. If that was the case the 'why' was pretty clear to see – the goal of dividing America between Cult agenda-supporting Wokers and Pushbackers who gravitated to Trump because he was telling them what they wanted to hear. His constituency of support had been increasingly ignored and voiceless for decades and profoundly through the eight years of Sabbatian puppet Barack Obama. Now here was someone speaking their language of pulling back from the incessant globalisation of political and economic power, the exporting of American jobs to China and elsewhere by 'American' (Sabbatian) corporations, the deletion of free speech, and the mass immigration policies that had further devastated job opportunities for the urban working class of all races and the once American heartlands of the Midwest.

Beware the forked tongue

Those people collectively sighed with relief that at last a political leader was apparently on their side, but another trait of the Renegade Mind is that you look even harder at people telling you

what you want to hear than those who are telling you otherwise. Obviously as I said earlier people wish what they want to hear to be true and genuine and they are much more likely to believe that than someone saying what they don't want to hear and don't want to be true. Sales people are taught to be skilled in eliciting by calculated questioning what their customers want to hear and repeating that back to them as their own opinion to get their targets to like and trust them. Assets of the Cult are also sales people in the sense of selling perception. To read Cult manipulation you have to play the long and expanded game and not fall for the Vaudeville show of party politics. Both American parties are vehicles for the Cult and they exploit them in different ways depending on what the agenda requires at that moment. Trump and the Republicans were used to be the focus of dividing America and isolating Pushbackers to open the way for a Biden presidency to become the most extreme in American history by advancing the full-blown Woke (Cult) agenda with the aim of destroying and silencing Pushbackers now labelled Nazi Trump supporters and white supremacists.

Sabbatians wanted Trump in office for the reasons described by ultra-Zionist Saul Alinsky (1909-1972) who was promoting the Woke philosophy through 'community organising' long before anyone had heard of it. In those days it still went by its traditional name of Marxism. The reason for the manipulated Trump phenomenon was laid out in Alinsky's 1971 book, *Rules for Radicals*, which was his blueprint for overthrowing democratic and other regimes and replacing them with Sabbatian Marxism. Not surprisingly his to-do list was evident in the Sabbatian French and Russian 'Revolutions' and that in China which will become very relevant in the next chapter about the 'Covid' hoax. Among Alinsky's followers have been the deeply corrupt Barack Obama, House Speaker Nancy Pelosi and Hillary Clinton who described him as a 'hero'. All three are Sabbatian stooges with Pelosi personifying the arrogant corrupt idiocy that so widely fronts up for the Cult inner core. Predictably as a Sabbatian advocate of the 'light-bringer' Alinsky features Lucifer on the dedication page of his book as the original radical who gained

his own kingdom ('Earth' as we shall see). One of Alinsky's golden radical rules was to pick an individual and focus all attention, hatred and blame on them and not to target faceless bureaucracies and corporations. *Rules for Radicals* is really a Sabbatian handbook with its contents repeatedly employed all over the world for centuries and why wouldn't Sabbatians bring to power their designer-villain to be used as the individual on which all attention, hatred and blame was bestowed? This is what they did and the only question for me is how much Trump knew that and how much he was manipulated. A bit of both, I suspect. This was Alinsky's Trump technique from a man who died in 1972. The technique has spanned history:

Pick the target, freeze it, personalize it, polarize it. Don't try to attack abstract corporations or bureaucracies. Identify a responsible individual. Ignore attempts to shift or spread the blame.

From the moment Trump came to illusory power everything was about him. It wasn't about Republican policy or opinion, but all about Trump. Everything he did was presented in negative, derogatory and abusive terms by the Sabbatian-dominated media led by Cult operations such as CNN, MSNBC, *The New York Times* and the Jeff Bezos-owned *Washington Post* – 'Pick the target, freeze it, personalize it, polarize it.' Trump was turned into a demon to be vilified by those who hated him and a demi-god loved by those who worshipped him. This, in turn, had his supporters, too, presented as equally demonic in preparation for the punchline later down the line when Biden was about to take office. It was here's a Trump, there's a Trump, everywhere a Trump, Trump. Virtually every news story or happening was filtered through the lens of 'The Donald'. You loved him or hated him and which one you chose was said to define you as Satan's spawn or a paragon of virtue. Even supporting some Trump policies or statements and not others was enough for an assault on your character. No shades of grey were or are allowed. Everything is black and white (literally and figuratively). A Californian I knew had her head utterly scrambled by her hatred for Trump while telling people they should love each other. She was so totally consumed by

Trump Derangement Syndrome as it became to be known that this glaring contradiction would never have occurred to her. By definition anyone who criticised Trump or praised his opponents was a hero and this lady described Joe Biden as 'a kind, honest gentleman' when he's a provable liar, mega-crook and vicious piece of work to boot. Sabbatians had indeed divided America using Trump as the fall-guy and all along the clock was ticking on the consequences for his supporters.

In hock to his masters

Trump gave Sabbatians via Israel almost everything they wanted in his four years. Ask and you shall receive was the dynamic between himself and Benjamin Netanyahu orchestrated by Trump's ultra-Zionist son-in-law Jared Kushner, his ultra-Zionist Ambassador to Israel, David Friedman, and ultra-Zionist 'Israel adviser', Jason Greenblatt. The last two were central to the running and protecting from collapse of his business empire, the Trump Organisation, and colossal business failures made him forever beholding to Sabbatian networks that bailed him out. By the start of the 1990s Trump owed \$4 billion to banks that he couldn't pay and almost \$1 billion of that was down to him personally and not his companies. This mega-disaster was the result of building two new casinos in Atlantic City and buying the enormous Taj Mahal operation which led to crippling debt payments. He had borrowed fantastic sums from 72 banks with major Sabbatian connections and although the scale of debt should have had him living in a tent alongside the highway they never foreclosed. A plan was devised to lift Trump from the mire by BT Securities Corporation and Rothschild Inc. and the case was handled by Wilber Ross who had worked for the Rothschilds for 27 years. Ross would be named US Commerce Secretary after Trump's election. Another crucial figure in saving Trump was ultra-Zionist 'investor' Carl Icahn who bought the Taj Mahal casino. Icahn was made special economic adviser on financial regulation in the Trump administration. He didn't stay long but still managed to find time to make a tidy sum of a reported \$31.3 million when he sold his

holdings affected by the price of steel three days before Trump imposed a 235 percent tariff on steel imports. What amazing bits of luck these people have. Trump and Sabbatian operatives have long had a close association and his mentor and legal adviser from the early 1970s until 1986 was the dark and genetically corrupt ultra-Zionist Roy Cohn who was chief counsel to Senator Joseph McCarthy's 'communist' witch-hunt in the 1950s. *Esquire* magazine published an article about Cohn with the headline 'Don't mess with Roy Cohn'. He was described as the most feared lawyer in New York and 'a ruthless master of dirty tricks ... [with] ... more than one Mafia Don on speed dial'. Cohn's influence, contacts, support and protection made Trump a front man for Sabbatians in New York with their connections to one of Cohn's many criminal employers, the 'Russian' Sabbatian Mafia. Israel-centric media mogul Rupert Murdoch was introduced to Trump by Cohn and they started a long friendship. Cohn died in 1986 weeks after being disbarred for unethical conduct by the Appellate Division of the New York State Supreme Court. The wheels of justice do indeed run slow given the length of Cohn's crooked career.

QAnon-sense

We are asked to believe that Donald Trump with his fundamental connections to Sabbatian networks and operatives has been leading the fight to stop the Sabbatian agenda for the fascistic control of America and the world. Sure he has. A man entrapped during his years in the White House by Sabbatian operatives and whose biggest financial donor was casino billionaire Sheldon Adelson who was Sabbatian to his DNA?? Oh, do come on. Trump has been used to divide America and isolate Pushbackers on the Cult agenda under the heading of 'Trump supporters', 'insurrectionists' and 'white supremacists'. The US Intelligence/Mossad Psyop or psychological operation known as QAnon emerged during the Trump years as a central pillar in the Sabbatian campaign to lead Pushbackers into the trap set by those that wished to destroy them. I knew from the start that QAnon was a scam because I had seen the same scenario many

times before over 30 years under different names and I had written about one in particular in the books. 'Not again' was my reaction when QAnon came to the fore. The same script is pulled out every few years and a new name added to the letterhead. The story always takes the same form: 'Insiders' or 'the good guys' in the government-intelligence-military 'Deep State' apparatus were going to instigate mass arrests of the 'bad guys' which would include the Rockefellers, Rothschilds, Barack Obama, Hillary Clinton, George Soros, etc., etc. Dates are given for when the 'good guys' are going to move in, but the dates pass without incident and new dates are given which pass without incident. The central message to Pushbackers in each case is that they don't have to do anything because there is 'a plan' and it is all going to be sorted by the 'good guys' on the inside. 'Trust the plan' was a QAnon mantra when the only plan was to misdirect Pushbackers into putting their trust in a Psyop they believed to be real. Beware, beware, those who tell you what you want to hear and always check it out. Right up to Biden's inauguration QAnon was still claiming that 'the Storm' was coming and Trump would stay on as president when Biden and his cronies were arrested and jailed. It was never going to happen and of course it didn't, but what did happen as a result provided that punchline to the Sabbatian Trump/QAnon Psyop.

On January 6th, 2021, a very big crowd of Trump supporters gathered in the National Mall in Washington DC down from the Capitol Building to protest at what they believed to be widespread corruption and vote fraud that stopped Trump being re-elected for a second term as president in November, 2020. I say as someone that does not support Trump or Biden that the evidence is clear that major vote-fixing went on to favour Biden, a man with cognitive problems so advanced he can often hardly string a sentence together without reading the words written for him on the Teleprompter. Glaring ballot discrepancies included serious questions about electronic voting machines that make vote rigging a comparative cinch and hundreds of thousands of paper votes that suddenly appeared during already advanced vote counts and virtually all of

them for Biden. Early Trump leads in crucial swing states suddenly began to close and disappear. The pandemic hoax was used as the excuse to issue almost limitless numbers of mail-in ballots with no checks to establish that the recipients were still alive or lived at that address. They were sent to streams of people who had not even asked for them. Private organisations were employed to gather these ballots and who knows what they did with them before they turned up at the counts. The American election system has been manipulated over decades to become a sick joke with more holes than a Swiss cheese for the express purpose of dictating the results. Then there was the criminal manipulation of information by Sabbatian tech giants like Facebook, Twitter and Google-owned YouTube which deleted pro-Trump, anti-Biden accounts and posts while everything in support of Biden was left alone. Sabbatians wanted Biden to win because after the dividing of America it was time for full-on Woke and every aspect of the Cult agenda to be unleashed.

Hunter gatherer

Extreme Silicon Valley bias included blocking information by the *New York Post* exposing a Biden scandal that should have ended his bid for president in the final weeks of the campaign. Hunter Biden, his monumentally corrupt son, is reported to have sent a laptop to be repaired at a local store and failed to return for it. Time passed until the laptop became the property of the store for non-payment of the bill. When the owner saw what was on the hard drive he gave a copy to the FBI who did nothing even though it confirmed widespread corruption in which the Joe Biden family were using his political position, especially when he was vice president to Obama, to make multiple millions in countries around the world and most notably Ukraine and China. Hunter Biden's one-time business partner Tony Bobulinski went public when the story broke in the *New York Post* to confirm the corruption he saw and that Joe Biden not only knew what was going on he also profited from the spoils. Millions were handed over by a Chinese company with close

connections – like all major businesses in China – to the Chinese communist party of President Xi Jinping. Joe Biden even boasted at a meeting of the Cult's World Economic Forum that as vice president he had ordered the government of Ukraine to fire a prosecutor. What he didn't mention was that the same man just happened to be investigating an energy company which was part of Hunter Biden's corrupt portfolio. The company was paying him big bucks for no other reason than the influence his father had. Overnight Biden's presidential campaign should have been over given that he had lied publicly about not knowing what his son was doing. Instead almost the entire Sabbatian-owned mainstream media and Sabbatian-owned Silicon Valley suppressed circulation of the story. This alone went a mighty way to rigging the election of 2020. Cult assets like Mark Zuckerberg at Facebook also spent hundreds of millions to be used in support of Biden and vote 'administration'.

The Cult had used Trump as the focus to divide America and was now desperate to bring in moronic, pliable, corrupt Biden to complete the double-whammy. No way were they going to let little things like the will of the people thwart their plan. Silicon Valley widely censored claims that the election was rigged because it *was* rigged. For the same reason anyone claiming it was rigged was denounced as a 'white supremacist' including the pathetically few Republican politicians willing to say so. Right across the media where the claim was mentioned it was described as a 'false claim' even though these excuses for 'journalists' would have done no research into the subject whatsoever. Trump won seven million more votes than any sitting president had ever achieved while somehow a cognitively-challenged soon to be 78-year-old who was hidden away from the public for most of the campaign managed to win more votes than any presidential candidate in history. It makes no sense. You only had to see election rallies for both candidates to witness the enthusiasm for Trump and the apathy for Biden. Tens of thousands would attend Trump events while Biden was speaking in empty car parks with often only television crews attending and framing their shots to hide the fact that no one was there. It was pathetic to see

footage come to light of Biden standing at a podium making speeches only to TV crews and party fixers while reading the words written for him on massive Teleprompter screens. So, yes, those protestors on January 6th had a point about election rigging, but some were about to walk into a trap laid for them in Washington by the Cult Deep State and its QAnon Psyop. This was the Capitol Hill riot ludicrously dubbed an 'insurrection'.

The spider and the fly

Renegade Minds know there are not two 'sides' in politics, only one side, the Cult, working through all 'sides'. It's a stage show, a puppet show, to direct the perceptions of the population into focusing on diversions like parties and candidates while missing the puppeteers with their hands holding all the strings. The Capitol Hill 'insurrection' brings us back to the Little Big Horn. Having created two distinct opposing groupings – Woke and Pushbackers – the trap was about to be sprung. Pushbackers were to be encircled and isolated by associating them all in the public mind with Trump and then labelling Trump as some sort of Confederate leader. I knew immediately that the Capitol riot was a set-up because of two things. One was how easy the rioters got into the building with virtually no credible resistance and secondly I could see – as with the 'Covid' hoax in the West at the start of 2020 – how the Cult could exploit the situation to move its agenda forward with great speed. My experience of Cult techniques and activities over more than 30 years has showed me that while they do exploit situations they haven't themselves created this never happens with events of fundamental agenda significance. Every time major events giving cultists the excuse to rapidly advance their plan you find they are manipulated into being for the specific reason of providing that excuse – Problem-Reaction-Solution. Only a tiny minority of the huge crowd of Washington protestors sought to gain entry to the Capitol by smashing windows and breaching doors. That didn't matter. The whole crowd and all Pushbackers, even if they did not support Trump, were going to be lumped together as dangerous

insurrectionists and conspiracy theorists. The latter term came into widespread use through a CIA memo in the 1960s aimed at discrediting those questioning the nonsensical official story of the Kennedy assassination and it subsequently became widely employed by the media. It's still being used by inept 'journalists' with no idea of its origin to discredit anyone questioning anything that authority claims to be true. When you are perpetrating a conspiracy you need to discredit the very word itself even though the dictionary definition of conspiracy is merely 'the activity of secretly planning with other people to do something bad or illegal' and 'a general agreement to keep silent about a subject for the purpose of keeping it secret'. On that basis there are conspiracies almost wherever you look. For obvious reasons the Cult and its lapdog media have to claim there are no conspiracies even though the word appears in state laws as with conspiracy to defraud, to murder, and to corrupt public morals.

Agent provocateurs are widely used by the Cult Deep State to manipulate genuine people into acting in ways that suit the desired outcome. By genuine in this case I mean protestors genuinely supporting Trump and claims that the election was stolen. In among them, however, were agents of the state wearing the garb of Trump supporters and QAnon to pump-prime the Capital riot which some genuine Trump supporters naively fell for. I described the situation as 'Come into my parlour said the spider to the fly'. Leaflets appeared through the Woke paramilitary arm Antifa, the anti-fascist fascists, calling on supporters to turn up in Washington looking like Trump supporters even though they hated him. Some of those arrested for breaching the Capitol Building were sourced to Antifa and its stable mate Black Lives Matter. Both organisations are funded by Cult billionaires and corporations. One man charged for the riot was according to his lawyer a former FBI agent who had held top secret security clearance for 40 years. Attorney Thomas Plofchan said of his client, 66-year-old Thomas Edward Caldwell:

He has held a Top Secret Security Clearance since 1979 and has undergone multiple Special Background Investigations in support of his clearances. After retiring from the Navy, he

worked as a section chief for the Federal Bureau of Investigation from 2009-2010 as a GS-12 [mid-level employee].

He also formed and operated a consulting firm performing work, often classified, for U.S government customers including the US. Drug Enforcement Agency, Department of Housing and Urban Development, the US Coast Guard, and the US Army Personnel Command.

A judge later released Caldwell pending trial in the absence of evidence about a conspiracy or that he tried to force his way into the building. *The New York Post* reported a 'law enforcement source' as saying that 'at least two known Antifa members were spotted' on camera among Trump supporters during the riot while one of the rioters arrested was John Earle Sullivan, a seriously extreme Black Lives Matter Trump-hater from Utah who was previously arrested and charged in July, 2020, over a BLM-Antifa riot in which drivers were threatened and one was shot. Sullivan is the founder of Utah-based Insurgence USA which is an affiliate of the Cult-created-and-funded Black Lives Matter movement. Footage appeared and was then deleted by Twitter of Trump supporters calling out Antifa infiltrators and a group was filmed changing into pro-Trump clothing before the riot. Security at the building was *pathetic* – as planned. Colonel Leroy Fletcher Prouty, a man with long experience in covert operations working with the US security apparatus, once described the tell-tale sign to identify who is involved in an assassination. He said:

No one has to direct an assassination – it happens. The active role is played secretly by permitting it to happen. This is the greatest single clue. Who has the power to call off or reduce the usual security precautions?

This principle applies to many other situations and certainly to the Capitol riot of January 6th, 2021.

The sting

With such a big and potentially angry crowd known to be gathering near the Capitol the security apparatus would have had a major police detail to defend the building with National Guard troops on

standby given the strength of feeling among people arriving from all over America encouraged by the QAnon Psyop and statements by Donald Trump. Instead Capitol Police 'security' was flimsy, weak, and easily breached. The same number of officers was deployed as on a regular day and that is a blatant red flag. They were not staffed or equipped for a possible riot that had been an obvious possibility in the circumstances. No protective and effective fencing worth the name was put in place and there were no contingency plans. The whole thing was basically a case of standing aside and waving people in. Once inside police mostly backed off apart from one Capitol police officer who ridiculously shot dead unarmed Air Force veteran protestor Ashli Babbitt without a warning as she climbed through a broken window. The 'investigation' refused to name or charge the officer after what must surely be considered a murder in the circumstances. They just lifted a carpet and swept. The story was endlessly repeated about five people dying in the 'armed insurrection' when there was no report of rioters using weapons. Apart from Babbitt the other four died from a heart attack, strokes and apparently a drug overdose. Capitol police officer Brian Sicknick was reported to have died after being bludgeoned with a fire extinguisher when he was alive after the riot was over and died later of what the Washington Medical Examiner's Office said was a stroke. Sicknick had no external injuries. The lies were delivered like rapid fire. There was a narrative to build with incessant repetition of the lie until the lie became the accepted 'everybody knows that' truth. The 'Big Lie' technique of Nazi Propaganda Minister Joseph Goebbels is constantly used by the Cult which was behind the Nazis and is today behind the 'Covid' and 'climate change' hoaxes. Goebbels said:

If you tell a lie big enough and keep repeating it, people will eventually come to believe it. The lie can be maintained only for such time as the State can shield the people from the political, economic and/or military consequences of the lie. It thus becomes vitally important for the State to use all of its powers to repress dissent, for the truth is the mortal enemy of the lie, and thus by extension, the truth is the greatest enemy of the State.

Most protestors had a free run of the Capitol Building. This allowed pictures to be taken of rioters in iconic parts of the building including the Senate chamber which could be used as propaganda images against all Pushbackers. One Congresswoman described the scene as 'the worst kind of non-security anybody could ever imagine'. Well, the first part was true, but someone obviously did imagine it and made sure it happened. Some photographs most widely circulated featured people wearing QAnon symbols and now the Psyop would be used to dub all QAnon followers with the ubiquitous fit-all label of 'white supremacist' and 'insurrectionists'. When a Muslim extremist called Noah Green drove his car at two police officers at the Capitol Building killing one in April, 2021, there was no such political and media hysteria. They were just disappointed he wasn't white.

The witch-hunt

Government prosecutor Michael Sherwin, an aggressive, dark-eyed, professional Rottweiler led the 'investigation' and to call it over the top would be to understate reality a thousand fold. Hundreds were tracked down and arrested for the crime of having the wrong political views and people were jailed who had done nothing more than walk in the building, committed no violence or damage to property, took a few pictures and left. They were labelled a 'threat to the Republic' while Biden sat in the White House signing executive orders written for him that were dismantling 'the Republic'. Even when judges ruled that a mother and son should not be in jail the government kept them there. Some of those arrested have been badly beaten by prison guards in Washington and lawyers for one man said he suffered a fractured skull and was made blind in one eye. Meanwhile a woman is shot dead for no reason by a Capitol Police officer and we are not allowed to know who he is never mind what has happened to him although that will be *nothing*. The Cult's QAnon/Trump sting to identify and isolate Pushbackers and then target them on the road to crushing and deleting them was a resounding success. You would have thought the Russians had

invaded the building at gunpoint and lined up senators for a firing squad to see the political and media reaction. Congresswoman Alexandria Ocasio-Cortez is a child in a woman's body, a terrible-tvos, me, me, me, Woker narcissist of such proportions that words have no meaning. She said she thought she was going to die when 'insurrectionists' banged on her office door. It turned out she wasn't even in the Capitol Building when the riot was happening and the 'banging' was a Capitol Police officer. She referred to herself as a 'survivor' which is an insult to all those true survivors of violent and sexual abuse while she lives her pampered and privileged life talking drivel for a living. Her Woke colleague and fellow mega-narcissist Rashida Tlaib broke down describing the devastating effect on her, too, of *not being* in the building when the rioters were there. Ocasio-Cortez and Tlaib are members of a fully-Woke group of Congresswomen known as 'The Squad' along with Ilhan Omar and Ayanna Pressley. The Squad from what I can see can be identified by its vehement anti-white racism, anti-white men agenda, and, as always in these cases, the absence of brain cells on active duty.

The usual suspects were on the riot case immediately in the form of Democrat ultra-Zionist senators and operatives Chuck Schumer and Adam Schiff demanding that Trump be impeached for 'his part in the insurrection'. The same pair of prats had led the failed impeachment of Trump over the invented 'Russia collusion' nonsense which claimed Russia had helped Trump win the 2016 election. I didn't realise that Tel Aviv had been relocated just outside Moscow. I must find an up-to-date map. The Russia hoax was a Sabbatian operation to keep Trump occupied and impotent and to stop any rapport with Russia which the Cult wants to retain as a perceptual enemy to be pulled out at will. Puppet Biden began attacking Russia when he came to office as the Cult seeks more upheaval, division and war across the world. A two-year stage show 'Russia collusion inquiry' headed by the not-very-bright former 9/11 FBI chief Robert Mueller, with support from 19 lawyers, 40 FBI agents plus intelligence analysts, forensic accountants and other

staff, devoured tens of millions of dollars and found no evidence of Russia collusion which a ten-year-old could have told them on day one. Now the same moronic Schumer and Schiff wanted a second impeachment of Trump over the Capitol 'insurrection' (riot) which the arrested development of Schumer called another 'Pearl Harbor' while others compared it with 9/11 in which 3,000 died and, in the case of CNN, with the Rwandan genocide in the 1990s in which an estimated 500,000 to 600,000 were murdered, between 250,000 and 500,000 women were raped, and populations of whole towns were hacked to death with machetes. To make those comparisons purely for Cult political reasons is beyond insulting to those that suffered and lost their lives and confirms yet again the callous inhumanity that we are dealing with. Schumer is a monumental idiot and so is Schiff, but they serve the Cult agenda and do whatever they're told so they get looked after. Talking of idiots – another inane man who spanned the Russia and Capitol impeachment attempts was Senator Eric Swalwell who had the nerve to accuse Trump of collusion with the Russians while sleeping with a Chinese spy called Christine Fang or 'Fang Fang' which is straight out of a Bond film no doubt starring Klaus Schwab as the bloke living on a secret island and controlling laser weapons positioned in space and pointing at world capitals. Fang Fang plays the part of Bond's infiltrator girlfriend which I'm sure she would enjoy rather more than sharing a bed with the brainless Swalwell, lying back and thinking of China. The FBI eventually warned Swalwell about Fang Fang which gave her time to escape back to the Chinese dictatorship. How very thoughtful of them. The second Trump impeachment also failed and hardly surprising when an impeachment is supposed to remove a sitting president and by the time it happened Trump was no longer president. These people are running your country America, well, officially anyway. Terrifying isn't it?

Outcomes tell the story - always

The outcome of all this – and it's the *outcome* on which Renegade Minds focus, not the words – was that a vicious, hysterical and

obviously pre-planned assault was launched on Pushbackers to censor, silence and discredit them and even targeted their right to earn a living. They have since been condemned as 'domestic terrorists' that need to be treated like Al-Qaeda and Islamic State. 'Domestic terrorists' is a label the Cult has been trying to make stick since the period of the Oklahoma bombing in 1995 which was blamed on 'far-right domestic terrorists'. If you read *The Trigger* you will see that the bombing was clearly a Problem-Reaction-Solution carried out by the Deep State during a Bill Clinton administration so corrupt that no dictionary definition of the term would even nearly suffice. Nearly 30, 000 troops were deployed from all over America to the empty streets of Washington for Biden's inauguration. Ten thousand of them stayed on with the pretext of protecting the capital from insurrectionists when it was more psychological programming to normalise the use of the military in domestic law enforcement in support of the Cult plan for a police-military state. Biden's fascist administration began a purge of 'wrong-thinkers' in the military which means anyone that is not on board with Woke. The Capitol Building was surrounded by a fence with razor wire and the Land of the Free was further symbolically and literally dismantled. The circle was completed with the installation of Biden and the exploitation of the QAnon Psyop.

America had never been so divided since the civil war of the 19th century, Pushbackers were isolated and dubbed terrorists and now, as was always going to happen, the Cult immediately set about deleting what little was left of freedom and transforming American society through a swish of the hand of the most controlled 'president' in American history leading (officially at least) the most extreme regime since the country was declared an independent state on July 4th, 1776. Biden issued undebated, dictatorial executive orders almost by the hour in his opening days in office across the whole spectrum of the Cult wish-list including diluting controls on the border with Mexico allowing thousands of migrants to illegally enter the United States to transform the demographics of America and import an election-changing number of perceived Democrat

voters. Then there were Biden deportation amnesties for the already illegally resident (estimated to be as high as 20 or even 30 million). A bill before Congress awarded American citizenship to anyone who could prove they had worked in agriculture for just 180 days in the previous two years as 'Big Ag' secured its slave labour long-term. There were the plans to add new states to the union such as Puerto Rico and making Washington DC a state. They are all parts of a plan to ensure that the Cult-owned Woke Democrats would be permanently in power.

Border – what border?

I have exposed in detail in other books how mass immigration into the United States and Europe is the work of Cult networks fuelled by the tens of billions spent to this and other ends by George Soros and his global Open Society (open borders) Foundations. The impact can be seen in America alone where the population has increased by *100 million* in little more than 30 years mostly through immigration. I wrote in *The Answer* that the plan was to have so many people crossing the southern border that the numbers become unstoppable and we are now there under Cult-owned Biden. El Salvador in Central America puts the scale of what is happening into context. A third of the population now lives in the United States, much of it illegally, and many more are on the way. The methodology is to crush Central and South American countries economically and spread violence through machete-wielding psychopathic gangs like MS-13 based in El Salvador and now operating in many American cities. Biden-imposed lax security at the southern border means that it is all but open. He said before his 'election' that he wanted to see a surge towards the border if he became president and that was the green light for people to do just that after election day to create the human disaster that followed for both America and the migrants. When that surge came the imbecilic Alexandria Ocasio-Cortez said it wasn't a 'surge' because they are 'children, not insurgents' and the term 'surge' (used by Biden) was a claim of 'white supremacists'.

This disingenuous lady may one day enter the realm of the most basic intelligence, but it won't be any time soon.

Sabbatians and the Cult are in the process of destroying America by importing violent people and gangs in among the genuine to terrorise American cities and by overwhelming services that cannot cope with the sheer volume of new arrivals. Something similar is happening in Europe as Western society in general is targeted for demographic and cultural transformation and upheaval. The plan demands violence and crime to create an environment of intimidation, fear and division and Soros has been funding the election of district attorneys across America who then stop prosecuting many crimes, reduce sentences for violent crimes and free as many violent criminals as they can. Sabbatians are creating the chaos from which order – their order – can respond in a classic Problem-Reaction-Solution. A Freemasonic motto says 'Ordo Ab Chao' (Order out of Chaos) and this is why the Cult is constantly creating chaos to impose a new 'order'. Here you have the reason the Cult is constantly creating chaos. The 'Covid' hoax can be seen with those entering the United States by plane being forced to take a 'Covid' test while migrants flooding through southern border processing facilities do not. Nothing is put in the way of mass migration and if that means ignoring the government's own 'Covid' rules then so be it. They know it's all bullshit anyway. Any pushback on this is denounced as 'racist' by Wokers and Sabbatian fronts like the ultra-Zionist Anti-Defamation League headed by the appalling Jonathan Greenblatt which at the same time argues that Israel should not give citizenship and voting rights to more Palestinian Arabs or the 'Jewish population' (in truth the Sabbatian network) will lose control of the country.

Society-changing numbers

Biden's masters have declared that countries like El Salvador are so dangerous that their people must be allowed into the United States for humanitarian reasons when there are fewer murders in large parts of many Central American countries than in US cities like

Baltimore. That is not to say Central America cannot be a dangerous place and Cult-controlled American governments have been making it so since way back, along with the dismantling of economies, in a long-term plan to drive people north into the United States. Parts of Central America are very dangerous, but in other areas the story is being greatly exaggerated to justify relaxing immigration criteria. Migrants are being offered free healthcare and education in the United States as another incentive to head for the border and there is no requirement to be financially independent before you can enter to prevent the resources of America being drained. You can't blame migrants for seeking what they believe will be a better life, but they are being played by the Cult for dark and nefarious ends. The numbers since Biden took office are huge. In February, 2021, more than 100,000 people were known to have tried to enter the US illegally through the southern border (it was 34,000 in the same month in 2020) and in March it was 170,000 – a 418 percent increase on March, 2020. These numbers are only known people, not the ones who get in unseen. The true figure for migrants illegally crossing the border in a single month was estimated by one congressman at 250,000 and that number will only rise under Biden's current policy. Gangs of murdering drug-running thugs that control the Mexican side of the border demand money – thousands of dollars – to let migrants cross the Rio Grande into America. At the same time gun battles are breaking out on the border several times a week between rival Mexican drug gangs (which now operate globally) who are equipped with sophisticated military-grade weapons, grenades and armoured vehicles. While the Capitol Building was being 'protected' from a non-existent 'threat' by thousands of troops, and others were still deployed at the time in the Cult Neocon war in Afghanistan, the southern border of America was left to its fate. This is not incompetence, it is cold calculation.

By March, 2021, there were 17,000 unaccompanied children held at border facilities and many of them are ensnared by people traffickers for paedophile rings and raped on their journey north to America. This is not conjecture – this is fact. Many of those designated

children are in reality teenage boys or older. Meanwhile Wokers posture their self-purity for encouraging poor and tragic people to come to America and face this nightmare both on the journey and at the border with the disgusting figure of House Speaker Nancy Pelosi giving disingenuous speeches about caring for migrants. The woman's evil. Wokers condemned Trump for having children in cages at the border (so did Obama, *Shhhh*), but now they are sleeping on the floor without access to a shower with one border facility 729 percent over capacity. The Biden insanity even proposed flying migrants from the southern border to the northern border with Canada for 'processing'. The whole shambles is being overseen by ultra-Zionist Secretary of Homeland Security, the moronic liar Alejandro Mayorkas, who banned news cameras at border facilities to stop Americans seeing what was happening. Mayorkas said there was not a ban on news crews; it was just that they were not allowed to film. Alongside him at Homeland Security is another ultra-Zionist Cass Sunstein appointed by Biden to oversee new immigration laws. Sunstein despises conspiracy researchers to the point where he suggests they should be banned or *taxed* for having such views. The man is not bonkers or anything. He's perfectly well-adjusted, but adjusted to what is the question. Criticise what is happening and you are a 'white supremacist' when earlier non-white immigrants also oppose the numbers which effect their lives and opportunities. Black people in poor areas are particularly damaged by uncontrolled immigration and the increased competition for work opportunities with those who will work for less. They are also losing voting power as Hispanics become more dominant in former black areas. It's a downward spiral for them while the billionaires behind the policy drone on about how much they care about black people and 'racism'. None of this is about compassion for migrants or black people – that's just wind and air. Migrants are instead being mercilessly exploited to transform America while the countries they leave are losing their future and the same is true in Europe. Mass immigration may now be the work of Woke Democrats, but it can be traced back to the 1986 Immigration Reform and Control Act (it

wasn't) signed into law by Republican hero President Ronald Reagan which gave amnesty to millions living in the United States illegally and other incentives for people to head for the southern border. Here we have the one-party state at work again.

Save me syndrome

Almost every aspect of what I have been exposing as the Cult agenda was on display in even the first days of 'Biden' with silencing of Pushbackers at the forefront of everything. A Renegade Mind will view the Trump years and QAnon in a very different light to their supporters and advocates as the dots are connected. The QAnon/Trump Psyop has given the Cult all it was looking for. We may not know how much, or little, that Trump realised he was being used, but that's a side issue. This pincer movement produced the desired outcome of dividing America and having Pushbackers isolated. To turn this around we have to look at new routes to empowerment which do not include handing our power to other people and groups through what I will call the 'Save Me Syndrome' – 'I want someone else to do it so that I don't have to'. We have seen this at work throughout human history and the QAnon/Trump Psyop is only the latest incarnation alongside all the others. Religion is an obvious expression of this when people look to a 'god' or priest to save them or tell them how to be saved and then there are 'save me' politicians like Trump. Politics is a diversion and not a 'saviour'. It is a means to block positive change, not make it possible.

Save Me Syndrome always comes with the same repeating theme of handing your power to whom or what you believe will save you while your real 'saviour' stares back from the mirror every morning. Renegade Minds are constantly vigilant in this regard and always asking the question 'What can I do?' rather than 'What can someone else do for me?' Gandhi was right when he said: 'You must be the change you want to see in the world.' We are indeed the people we have been waiting for. We are presented with a constant raft of reasons to concede that power to others and forget where the real power is. Humanity has the numbers and the Cult does not. It has to

use diversion and division to target the unstoppable power that comes from unity. Religions, governments, politicians, corporations, media, QAnon, are all different manifestations of this power-diversion and dilution. Refusing to give your power to governments and instead handing it to Trump and QAnon is not to take a new direction, but merely to recycle the old one with new names on the posters. I will explore this phenomenon as we proceed and how to break the cycles and recycles that got us here through the mists of repeating perception and so repeating history.

For now we shall turn to the most potent example in the entire human story of the consequences that follow when you give your power away. I am talking, of course, of the 'Covid' hoax.

CHAPTER FOUR

'Covid': Calculated catastrophe

Facts are threatening to those invested in fraud
DaShanne Stokes

We can easily unravel the real reason for the 'Covid pandemic' hoax by employing the Renegade Mind methodology that I have outlined this far. We'll start by comparing the long-planned Cult outcome with the 'Covid pandemic' outcome. Know the outcome and you'll see the journey.

I have highlighted the plan for the Hunger Games Society which has been in my books for so many years with the very few controlling the very many through ongoing dependency. To create this dependency it is essential to destroy independent livelihoods, businesses and employment to make the population reliant on the state (the Cult) for even the basics of life through a guaranteed pittance income. While independence of income remained these Cult ambitions would be thwarted. With this knowledge it was easy to see where the 'pandemic' hoax was going once talk of 'lockdowns' began and the closing of all but perceived 'essential' businesses to 'save' us from an alleged 'deadly virus'. Cult corporations like Amazon and Walmart were naturally considered 'essential' while mom and pop shops and stores had their doors closed by fascist decree. As a result with every new lockdown and new regulation more small and medium, even large businesses not owned by the Cult, went to the wall while Cult giants and their frontmen and women grew financially fatter by the second. Mom and pop were

denied an income and the right to earn a living and the wealth of people like Jeff Bezos (Amazon), Mark Zuckerberg (Facebook) and Sergei Brin and Larry Page (Google/Alphabet) have reached record levels. The Cult was increasing its own power through further dramatic concentrations of wealth while the competition was being destroyed and brought into a state of dependency. Lockdowns have been instigated to secure that very end and were never anything to do with health. My brother Paul spent 45 years building up a bus repair business, but lockdowns meant buses were running at a fraction of normal levels for months on end. Similar stories can be told in their hundreds of millions worldwide. Efforts of a lifetime coldly destroyed by Cult multi-billionaires and their lackeys in government and law enforcement who continued to earn their living from the taxation of the people while denying the right of the same people to earn theirs. How different it would have been if those making and enforcing these decisions had to face the same financial hardships of those they affected, but they never do.

Gates of Hell

Behind it all in the full knowledge of what he is doing and why is the psychopathic figure of Cult operative Bill Gates. His puppet Tedros at the World Health Organization declared 'Covid' a pandemic in March, 2020. The WHO had changed the definition of a 'pandemic' in 2009 just a month before declaring the 'swine flu pandemic' which would not have been so under the previous definition. The same applies to 'Covid'. The definition had included... 'an infection by an infectious agent, occurring simultaneously in different countries, with a significant mortality rate relative to the proportion of the population infected'. The new definition removed the need for 'significant mortality'. The 'pandemic' has been fraudulent even down to the definition, but Gates demanded economy-destroying lockdowns, school closures, social distancing, mandatory masks, a 'vaccination' for every man, woman and child on the planet and severe consequences and restrictions for those that refused. Who gave him this power? The

Cult did which he serves like a little boy in short trousers doing what his daddy tells him. He and his psychopathic missus even smiled when they said that much worse was to come (what they knew was planned to come). Gates responded in the matter-of-fact way of all psychopaths to a question about the effect on the world economy of what he was doing:

Well, it won't go to zero but it will shrink. Global GDP is probably going to take the biggest hit ever [Gates was smiling as he said this] ... in my lifetime this will be the greatest economic hit. But you don't have a choice. People act as if you have a choice. People don't feel like going to the stadium when they might get infected ... People are deeply affected by seeing these stats, by knowing they could be part of the transmission chain, old people, their parents and grandparents, could be affected by this, and so you don't get to say ignore what is going on here.

There will be the ability to open up, particularly in rich countries, if things are done well over the next few months, but for the world at large normalcy only returns when we have largely vaccinated the entire population.

The man has no compassion or empathy. How could he when he's a psychopath like all Cult players? My own view is that even beyond that he is very seriously mentally ill. Look in his eyes and you can see this along with his crazy flailing arms. You don't do what he has done to the world population since the start of 2020 unless you are mentally ill and at the most extreme end of psychopathic. You especially don't do it when to you know, as we shall see, that cases and deaths from 'Covid' are fakery and a product of monumental figure massaging. 'These stats' that Gates referred to are based on a 'test' that's not testing for the 'virus' as he has known all along. He made his fortune with big Cult support as an infamously ruthless software salesman and now buys global control of 'health' (death) policy without the population he affects having any say. It's a breathtaking outrage. Gates talked about people being deeply affected by fear of 'Covid' when that was because of *him* and his global network lying to them minute-by-minute supported by a lying media that he seriously influences and funds to the tune of hundreds of millions. He's handed big sums to media operations including the BBC, NBC, Al Jazeera, Univision, *PBS NewsHour*,

ProPublica, National Journal, The Guardian, The Financial Times, The Atlantic, Texas Tribune, USA Today publisher Gannett, Washington Monthly, Le Monde, Center for Investigative Reporting, Pulitzer Center on Crisis Reporting, National Press Foundation, International Center for Journalists, Solutions Journalism Network, the Poynter Institute for Media Studies, and many more. Gates is everywhere in the 'Covid' hoax and the man must go to prison – or a mental facility – for the rest of his life and his money distributed to those he has taken such enormous psychopathic pleasure in crushing.

The Muscle

The Hunger Games global structure demands a police-military state – a fusion of the two into one force – which viciously imposes the will of the Cult on the population and protects the Cult from public rebellion. In that regard, too, the 'Covid' hoax just keeps on giving. Often unlawful, ridiculous and contradictory 'Covid' rules and regulations have been policed across the world by moronic automatons and psychopaths made faceless by face-nappy masks and acting like the Nazi SS and fascist blackshirts and brownshirts of Hitler and Mussolini. The smallest departure from the rules decreed by the psychos in government and their clueless gofers were jumped upon by the face-nappy fascists. Brutality against public protestors soon became commonplace even on girls, women and old people as the brave men with the batons – the Face-Nappies as I call them – broke up peaceful protests and handed out fines like confetti to people who couldn't earn a living let alone pay hundreds of pounds for what was once an accepted human right. Robot Face-Nappies of Nottingham police in the English East Midlands fined one group £11,000 for attending a child's birthday party. For decades I charted the transformation of law enforcement as genuine, decent officers were replaced with psychopaths and the brain dead who would happily and brutally do whatever their masters told them. Now they were let loose on the public and I would emphasise the point that none of this just happened. The step-by-step change in the dynamic between police and public was orchestrated from the shadows by

those who knew where this was all going and the same with the perceptual reframing of those in all levels of authority and official administration through 'training courses' by organisations such as Common Purpose which was created in the late 1980s and given a massive boost in Blair era Britain until it became a global phenomenon. Supposed public 'servants' began to view the population as the enemy and the same was true of the police. This was the start of the explosion of behaviour manipulation organisations and networks preparing for the all-war on the human psyche unleashed with the dawn of 2020. I will go into more detail about this later in the book because it is a core part of what is happening.

Police desecrated beauty spots to deter people gathering and arrested women for walking in the countryside alone 'too far' from their homes. We had arrogant, clueless sergeants in the Isle of Wight police where I live posting on Facebook what they insisted the population must do or else. A schoolmaster sergeant called Radford looked young enough for me to ask if his mother knew he was out, but he was posting what he *expected* people to do while a Sergeant Wilkinson boasted about fining lads for meeting in a McDonald's car park where they went to get a lockdown takeaway. Wilkinson added that he had even cancelled their order. What a pair of prats these people are and yet they have increasingly become the norm among Jackboot Johnson's Yellowshirts once known as the British police. This was the theme all over the world with police savagery common during lockdown protests in the United States, the Netherlands, and the fascist state of Victoria in Australia under its tyrannical and again moronic premier Daniel Andrews. Amazing how tyrannical and moronic tend to work as a team and the same combination could be seen across America as arrogant, narcissistic Woke governors and mayors such as Gavin Newsom (California), Andrew Cuomo (New York), Gretchen Whitmer (Michigan), Lori Lightfoot (Chicago) and Eric Garcetti (Los Angeles) did their Nazi and Stalin impressions with the full support of the compliant brutality of their enforcers in uniform as they arrested small business owners defying

fascist shutdown orders and took them to jail in ankle shackles and handcuffs. This happened to bistro owner Marlena Pavlos-Hackney in Gretchen Whitmer's fascist state of Michigan when police arrived to enforce an order by a state-owned judge for 'putting the community at risk' at a time when other states like Texas were dropping restrictions and migrants were pouring across the southern border without any 'Covid' questions at all. I'm sure there are many officers appalled by what they are ordered to do, but not nearly enough of them. If they were truly appalled they would not do it. As the months passed every opportunity was taken to have the military involved to make their presence on the streets ever more familiar and 'normal' for the longer-term goal of police-military fusion.

Another crucial element to the Hunger Games enforcement network has been encouraging the public to report neighbours and others for 'breaking the lockdown rules'. The group faced with £11,000 in fines at the child's birthday party would have been dobbed-in by a neighbour with a brain the size of a pea. The technique was most famously employed by the Stasi secret police in communist East Germany who had public informants placed throughout the population. A police chief in the UK says his force doesn't need to carry out 'Covid' patrols when they are flooded with so many calls from the public reporting other people for visiting the beach. Dorset police chief James Vaughan said people were so enthusiastic about snitching on their fellow humans they were now operating as an auxiliary arm of the police: 'We are still getting around 400 reports a week from the public, so we will respond to reports ... We won't need to be doing hotspot patrols because people are very quick to pick the phone up and tell us.' Vaughan didn't say that this is a pillar of all tyrannies of whatever complexion and the means to hugely extend the reach of enforcement while spreading distrust among the people and making them wary of doing anything that might get them reported. Those narcissistic Isle of Wight sergeants Radford and Wilkinson never fail to add a link to their Facebook posts where the public can inform on their fellow slaves.

Neither would be self-aware enough to realise they were imitating the Stasi which they might well never have heard of. Government psychologists that I will expose later laid out a policy to turn communities against each other in the same way.

A coincidence? Yep, and I can knit fog

I knew from the start of the alleged pandemic that this was a Cult operation. It presented limitless potential to rapidly advance the Cult agenda and exploit manipulated fear to demand that every man, woman and child on the planet was 'vaccinated' in a process never used on humans before which infuses self-replicating *synthetic* material into human cells. Remember the plan to transform the human body from a biological to a synthetic biological state. I'll deal with the 'vaccine' (that's not actually a vaccine) when I focus on the genetic agenda. Enough to say here that mass global 'vaccination' justified by this 'new virus' set alarms ringing after 30 years of tracking these people and their methods. The 'Covid' hoax officially beginning in China was also a big red flag for reasons I will be explaining. The agenda potential was so enormous that I could dismiss any idea that the 'virus' appeared naturally. Major happenings with major agenda implications never occur without Cult involvement in making them happen. My questions were twofold in early 2020 as the media began its campaign to induce global fear and hysteria: Was this alleged infectious agent released on purpose by the Cult or did it even exist at all? I then did what I always do in these situations. I sat, observed and waited to see where the evidence and information would take me. By March and early April synchronicity was strongly – and ever more so since then – pointing me in the direction of *there is no 'virus'*. I went public on that with derision even from swathes of the alternative media that voiced a scenario that the Chinese government released the 'virus' in league with Deep State elements in the United States from a top-level bio-lab in Wuhan where the 'virus' is said to have first appeared. I looked at that possibility, but I didn't buy it for several reasons. Deaths from the 'virus' did not in any way match what they

would have been with a 'deadly bioweapon' and it is much more effective if you sell the *illusion* of an infectious agent rather than having a real one unless you can control through injection who has it and who doesn't. Otherwise you lose control of events. A made-up 'virus' gives you a blank sheet of paper on which you can make it do whatever you like and have any symptoms or mutant 'variants' you choose to add while a real infectious agent would limit you to what it actually does. A phantom disease allows you to have endless ludicrous 'studies' on the 'Covid' dollar to widen the perceived impact by inventing ever more 'at risk' groups including one study which said those who walk slowly may be almost four times more likely to die from the 'virus'. People are in psychiatric wards for less.

A real 'deadly bioweapon' can take out people in the hierarchy that are not part of the Cult, but essential to its operation. Obviously they don't want that. Releasing a real disease means you immediately lose control of it. Releasing an illusory one means you don't. Again it's vital that people are extra careful when dealing with what they want to hear. A bioweapon unleashed from a Chinese laboratory in collusion with the American Deep State may fit a conspiracy narrative, but is it true? Would it not be far more effective to use the excuse of a 'virus' to justify the real bioweapon – the 'vaccine'? That way your disease agent does not have to be transmitted and arrives directly through a syringe. I saw a French virologist Luc Montagnier quoted in the alternative media as saying he had discovered that the alleged 'new' severe acute respiratory syndrome coronavirus , or SARS-CoV-2, was made artificially and included elements of the human immunodeficiency 'virus' (HIV) and a parasite that causes malaria. SARS-CoV-2 is alleged to trigger an alleged illness called Covid-19. I remembered Montagnier's name from my research years before into claims that an HIV 'retrovirus' causes AIDs – claims that were demolished by Berkeley virologist Peter Duesberg who showed that no one had ever proved that HIV causes acquired immunodeficiency syndrome or AIDS. Claims that become accepted as fact, publicly and medically, with no proof whatsoever are an ever-recurring story that profoundly applies to

'Covid'. Nevertheless, despite the lack of proof, Montagnier's team at the Pasteur Institute in Paris had a long dispute with American researcher Robert Gallo over which of them discovered and isolated the HIV 'virus' and with *no evidence* found it to cause AIDS. You will see later that there is also no evidence that any 'virus' causes any disease or that there is even such a thing as a 'virus' in the way it is said to exist. The claim to have 'isolated' the HIV 'virus' will be presented in its real context as we come to the shocking story – and it is a story – of SARS-CoV-2 and so will Montagnier's assertion that he identified the full SARS-CoV-2 genome.

Hoax in the making

We can pick up the 'Covid' story in 2010 and the publication by the Rockefeller Foundation of a document called 'Scenarios for the Future of Technology and International Development'. The inner circle of the Rockefeller family has been serving the Cult since John D. Rockefeller (1839-1937) made his fortune with Standard Oil. It is less well known that the same Rockefeller – the Bill Gates of his day – was responsible for establishing what is now referred to as 'Big Pharma', the global network of pharmaceutical companies that make outrageous profits dispensing scalpel and drug 'medicine' and are obsessed with pumping vaccines in ever-increasing number into as many human arms and backsides as possible. John D. Rockefeller was the driving force behind the creation of the 'education' system in the United States and elsewhere specifically designed to program the perceptions of generations thereafter. The Rockefeller family donated exceptionally valuable land in New York for the United Nations building and were central in establishing the World Health Organization in 1948 as an agency of the UN which was created from the start as a Trojan horse and stalking horse for world government. Now enter Bill Gates. His family and the Rockefellers have long been extremely close and I have seen genealogy which claims that if you go back far enough the two families fuse into the same bloodline. Gates has said that the Bill and Melinda Gates Foundation was inspired by the Rockefeller Foundation and why not

when both are serving the same Cult? Major tax-exempt foundations are overwhelmingly criminal enterprises in which Cult assets fund the Cult agenda in the guise of 'philanthropy' while avoiding tax in the process. Cult operatives can become mega-rich in their role of front men and women for the psychopaths at the inner core and they, too, have to be psychopaths to knowingly serve such evil. Part of the deal is that a big percentage of the wealth gleaned from representing the Cult has to be spent advancing the ambitions of the Cult and hence you have the Rockefeller Foundation, Bill and Melinda Gates Foundation (and *so* many more) and people like George Soros with his global Open Society Foundations spending their billions in pursuit of global Cult control. Gates is a global public face of the Cult with his interventions in world affairs including Big Tech influence; a central role in the 'Covid' and 'vaccine' scam; promotion of the climate change shakedown; manipulation of education; geoengineering of the skies; and his food-control agenda as the biggest owner of farmland in America, his GMO promotion and through other means. As one writer said: 'Gates monopolizes or wields disproportionate influence over the tech industry, global health and vaccines, agriculture and food policy (including biopiracy and fake food), weather modification and other climate technologies, surveillance, education and media.' The almost limitless wealth secured through Microsoft and other not-allowed-to-fail ventures (including vaccines) has been ploughed into a long, long list of Cult projects designed to enslave the entire human race. Gates and the Rockefellers have been working as one unit with the Rockefeller-established World Health Organization leading global 'Covid' policy controlled by Gates through his mouth-piece Tedros. Gates became the WHO's biggest funder when Trump announced that the American government would cease its donations, but Biden immediately said he would restore the money when he took office in January, 2021. The Gates Foundation (the Cult) owns through limitless funding the world health system and the major players across the globe in the 'Covid' hoax.

Okay, with that background we return to that Rockefeller Foundation document of 2010 headed 'Scenarios for the Future of Technology and International Development' and its 'imaginary' epidemic of a virulent and deadly influenza strain which infected 20 percent of the global population and killed eight million in seven months. The Rockefeller scenario was that the epidemic destroyed economies, closed shops, offices and other businesses and led to governments imposing fierce rules and restrictions that included mandatory wearing of face masks and body-temperature checks to enter communal spaces like railway stations and supermarkets. The document predicted that even after the height of the Rockefeller-envisaged epidemic the authoritarian rule would continue to deal with further pandemics, transnational terrorism, environmental crises and rising poverty. Now you may think that the Rockefellers are our modern-day seers or alternatively, and rather more likely, that they well knew what was planned a few years further on. Fascism had to be imposed, you see, to 'protect citizens from risk and exposure'. The Rockefeller scenario document said:

During the pandemic, national leaders around the world flexed their authority and imposed airtight rules and restrictions, from the mandatory wearing of face masks to body-temperature checks at the entries to communal spaces like train stations and supermarkets. Even after the pandemic faded, this more authoritarian control and oversight of citizens and their activities stuck and even intensified. In order to protect themselves from the spread of increasingly global problems – from pandemics and transnational terrorism to environmental crises and rising poverty – leaders around the world took a firmer grip on power.

At first, the notion of a more controlled world gained wide acceptance and approval. Citizens willingly gave up some of their sovereignty – and their privacy – to more paternalistic states in exchange for greater safety and stability. Citizens were more tolerant, and even eager, for top-down direction and oversight, and national leaders had more latitude to impose order in the ways they saw fit.

In developed countries, this heightened oversight took many forms: biometric IDs for all citizens, for example, and tighter regulation of key industries whose stability was deemed vital to national interests. In many developed countries, enforced cooperation with a suite of new regulations and agreements slowly but steadily restored both order and, importantly, economic growth.

There we have the prophetic Rockefellers in 2010 and three years later came their paper for the Global Health Summit in Beijing, China, when government representatives, the private sector, international organisations and groups met to discuss the next 100 years of 'global health'. The Rockefeller Foundation-funded paper was called 'Dreaming the Future of Health for the Next 100 Years and more prophecy ensued as it described a dystopian future: 'The abundance of data, digitally tracking and linking people may mean the 'death of privacy' and may replace physical interaction with transient, virtual connection, generating isolation and raising questions of how values are shaped in virtual networks.' Next in the 'Covid' hoax preparation sequence came a 'table top' simulation in 2018 for another 'imaginary' pandemic of a disease called Clade X which was said to kill 900 million people. The exercise was organised by the Gates-funded Johns Hopkins University's Center for Health Security in the United States and this is the very same university that has been compiling the disgustingly and systematically erroneous global figures for 'Covid' cases and deaths. Similar Johns Hopkins health crisis scenarios have included the Dark Winter exercise in 2001 and Atlantic Storm in 2005.

Nostradamus 201

For sheer predictive genius look no further prophecy-watchers than the Bill Gates-funded Event 201 held only six weeks before the 'coronavirus pandemic' is supposed to have broken out in China and Event 201 was based on a scenario of a global 'coronavirus pandemic'. Melinda Gates, the great man's missus, told the BBC that he had 'prepared for years' for a coronavirus pandemic which told us what we already knew. Nostradamugates had predicted in a TED talk in 2015 that a pandemic was coming that would kill a lot of people and demolish the world economy. My god, the man is a machine – possibly even literally. Now here he was only weeks before the real thing funding just such a simulated scenario and involving his friends and associates at Johns Hopkins, the World Economic Forum Cult-front of Klaus Schwab, the United Nations,

Johnson & Johnson, major banks, and officials from China and the Centers for Disease Control in the United States. What synchronicity – Johns Hopkins would go on to compile the fraudulent ‘Covid’ figures, the World Economic Forum and Schwab would push the ‘Great Reset’ in response to ‘Covid’, the Centers for Disease Control would be at the forefront of ‘Covid’ policy in the United States, Johnson & Johnson would produce a ‘Covid vaccine’, and everything would officially start just weeks later in China. Spooky, eh? They were even accurate in creating a simulation of a ‘virus’ pandemic because the ‘real thing’ would also be a simulation. Event 201 was not an exercise preparing for something that might happen; it was a rehearsal for what those in control knew was *going* to happen and very shortly. Hours of this simulation were posted on the Internet and the various themes and responses mirrored what would soon be imposed to transform human society. News stories were inserted and what they said would be commonplace a few weeks later with still more prophecy perfection. Much discussion focused on the need to deal with misinformation and the ‘anti-vax movement’ which is exactly what happened when the ‘virus’ arrived – was said to have arrived – in the West.

Cult-owned social media banned criticism and exposure of the official ‘virus’ narrative and when I said there *was* no ‘virus’ in early April, 2020, I was banned by one platform after another including YouTube, Facebook and later Twitter. The mainstream broadcast media in Britain was in effect banned from interviewing me by the Tony-Blair-created government broadcasting censor Ofcom headed by career government bureaucrat Melanie Dawes who was appointed just as the ‘virus’ hoax was about to play out in January, 2020. At the same time the Ickonic media platform was using Vimeo, another ultra-Zionist-owned operation, while our own player was being created and they deleted in an instant hundreds of videos, documentaries, series and shows to confirm their unbelievable vindictiveness. We had copies, of course, and they had to be restored one by one when our player was ready. These people have no class. Sabbatian Facebook promised free advertisements for the Gates-

controlled World Health Organization narrative while deleting ‘false claims and conspiracy theories’ to stop ‘misinformation’ about the alleged coronavirus. All these responses could be seen just a short while earlier in the scenarios of Event 201. Extreme censorship was absolutely crucial for the Cult because the official story was so ridiculous and unsupportable by the evidence that it could never survive open debate and the free-flow of information and opinion. If you can’t win a debate then don’t have one is the Cult’s approach throughout history. Facebook’s little boy front man – front boy – Mark Zuckerberg equated ‘credible and accurate information’ with official sources and exposing their lies with ‘misinformation’.

Silencing those that can see

The censorship dynamic of Event 201 is now the norm with an army of narrative-supporting ‘fact-checker’ organisations whose entire reason for being is to tell the public that official narratives are true and those exposing them are lying. One of the most appalling of these ‘fact-checkers’ is called NewsGuard founded by ultra-Zionist Americans Gordon Crovitz and Steven Brill. Crovitz is a former publisher of *The Wall Street Journal*, former Executive Vice President of Dow Jones, a member of the Council on Foreign Relations (CFR), and on the board of the American Association of Rhodes Scholars. The CFR and Rhodes Scholarships, named after Rothschild agent Cecil Rhodes who plundered the gold and diamonds of South Africa for his masters and the Cult, have featured widely in my books. NewsGuard don’t seem to like me for some reason – I really can’t think why – and they have done all they can to have me censored and discredited which is, to quote an old British politician, like being savaged by a dead sheep. They are, however, like all in the censorship network, very well connected and funded by organisations themselves funded by, or connected to, Bill Gates. As you would expect with anything associated with Gates NewsGuard has an offshoot called HealthGuard which ‘fights online health care hoaxes’. How very kind. Somehow the NewsGuard European Managing Director Anna-Sophie Harling, a remarkably young-

looking woman with no broadcasting experience and little hands-on work in journalism, has somehow secured a position on the 'Content Board' of UK government broadcast censor Ofcom. An executive of an organisation seeking to discredit dissidents of the official narratives is making decisions for the government broadcast 'regulator' about content?? Another appalling 'fact-checker' is Full Fact funded by George Soros and global censors Google and Facebook.

It's amazing how many activists in the 'fact-checking', 'anti-hate', arena turn up in government-related positions – people like UK Labour Party activist Imran Ahmed who heads the Center for Countering Digital Hate founded by people like Morgan McSweeney, now chief of staff to the Labour Party's hapless and useless 'leader' Keir Starmer. Digital Hate – which is what it really is – uses the American spelling of Center to betray its connection to a transatlantic network of similar organisations which in 2020 shapeshifted from attacking people for 'hate' to attacking them for questioning the 'Covid' hoax and the dangers of the 'Covid vaccine'. It's just a coincidence, you understand. This is one of Imran Ahmed's hysterical statements: 'I would go beyond calling anti-vaxxers conspiracy theorists to say they are an extremist group that pose a national security risk.' No one could ever accuse this prat of understatement and he's including in that those parents who are now against vaccines after their children were damaged for life or killed by them. He's such a nice man. Ahmed does the rounds of the Woke media getting soft-ball questions from spineless 'journalists' who never ask what right he has to campaign to destroy the freedom of speech of others while he demands it for himself. There also seems to be an overrepresentation in Ofcom of people connected to the narrative-worshipping BBC. This incredible global network of narrative-support was super-vital when the 'Covid' hoax was played in the light of the mega-whopper lies that have to be defended from the spotlight cast by the most basic intelligence.

Setting the scene

The Cult plays the long game and proceeds step-by-step ensuring that everything is in place before major cards are played and they don't come any bigger than the 'Covid' hoax. The psychopaths can't handle events where the outcome isn't certain and as little as possible – preferably nothing – is left to chance. Politicians, government and medical officials who would follow direction were brought to illusory power in advance by the Cult web whether on the national stage or others like state governors and mayors of America. For decades the dynamic between officialdom, law enforcement and the public was changed from one of service to one of control and dictatorship. Behaviour manipulation networks established within government were waiting to impose the coming 'Covid' rules and regulations specifically designed to subdue and rewire the psyche of the people in the guise of protecting health. These included in the UK the Behavioural Insights Team part-owned by the British government Cabinet Office; the Scientific Pandemic Insights Group on Behaviours (SPI-B); and a whole web of intelligence and military groups seeking to direct the conversation on social media and control the narrative. Among them are the cyberwarfare (on the people) 77th Brigade of the British military which is also coordinated through the Cabinet Office as civilian and military leadership continues to combine in what they call the Fusion Doctrine. The 77th Brigade is a British equivalent of the infamous Israeli (Sabbatian) military cyberwarfare and Internet manipulation operation Unit 8200 which I expose at length in *The Trigger*. Also carefully in place were the medical and science advisers to government – many on the payroll past or present of Bill Gates – and a whole alternative structure of unelected government stood by to take control when elected parliaments were effectively closed down once the 'Covid' card was slammed on the table. The structure I have described here and so much more was installed in every major country through the Cult networks. The top-down control hierarchy looks like this: The Cult – Cult-owned Gates – the World Health Organization and Tedros – Gates-funded or controlled chief medical officers and science 'advisers' (dictators) in each country –

political 'leaders' – law enforcement – The People. Through this simple global communication and enforcement structure the policy of the Cult could be imposed on virtually the entire human population so long as they acquiesced to the fascism. With everything in place it was time for the button to be pressed in late 2019/early 2020.

These were the prime goals the Cult had to secure for its will to prevail:

1) Locking down economies, closing all but designated 'essential' businesses (Cult-owned corporations were 'essential'), and putting the population under house arrest was an imperative to destroy independent income and employment and ensure dependency on the Cult-controlled state in the Hunger Games Society. Lockdowns had to be established as the global blueprint from the start to respond to the 'virus' and followed by pretty much the entire world.

2) The global population had to be terrified into believing in a deadly 'virus' that didn't actually exist so they would unquestioningly obey authority in the belief that authority must know how best to protect them and their families. Software salesman Gates would suddenly morph into the world's health expert and be promoted as such by the Cult-owned media.

3) A method of testing that wasn't testing for the 'virus', but was only claimed to be, had to be in place to provide the illusion of 'cases' and subsequent 'deaths' that had a very different cause to the 'Covid-19' that would be scribbled on the death certificate.

4) Because there was no 'virus' and the great majority testing positive with a test not testing for the 'virus' would have no symptoms of anything the lie had to be sold that people without symptoms (without the 'virus') could still pass it on to others. This was crucial to justify for the first time quarantining – house arresting – healthy people. Without this the economy-destroying lockdown of *everybody* could not have been credibly sold.

5) The 'saviour' had to be seen as a vaccine which beyond evil drug companies were working like angels of mercy to develop as quickly as possible, with all corners cut, to save the day. The public must absolutely not know that the 'vaccine' had nothing to do with a 'virus' or that the contents were ready and waiting with a very different motive long before the 'Covid' card was even lifted from the pack.

I said in March, 2020, that the 'vaccine' would have been created way ahead of the 'Covid' hoax which justified its use and the following December an article in the New York *Intelligencer* magazine said the Moderna 'vaccine' had been 'designed' by

January, 2020. This was 'before China had even acknowledged that the disease could be transmitted from human to human, more than a week before the first confirmed coronavirus case in the United States'. The article said that by the time the first American death was announced a month later 'the vaccine had already been manufactured and shipped to the National Institutes of Health for the beginning of its Phase I clinical trial'. The 'vaccine' was actually 'designed' long before that although even with this timescale you would expect the article to ask how on earth it could have been done that quickly. Instead it asked why the 'vaccine' had not been rolled out then and not months later. Journalism in the mainstream is truly dead. I am going to detail in the next chapter why the 'virus' has never existed and how a hoax on that scale was possible, but first the foundation on which the Big Lie of 'Covid' was built.

The test that doesn't test

Fraudulent 'testing' is the bottom line of the whole 'Covid' hoax and was the means by which a 'virus' that did not exist *appeared* to exist. They could only achieve this magic trick by using a test not testing for the 'virus'. To use a test that *was* testing for the 'virus' would mean that every test would come back negative given there was no 'virus'. They chose to exploit something called the RT-PCR test invented by American biochemist Kary Mullis in the 1980s who said publicly that his PCR test ... *cannot detect infectious disease*. Yes, the 'test' used worldwide to detect infectious 'Covid' to produce all the illusory 'cases' and 'deaths' compiled by Johns Hopkins and others *cannot detect infectious disease*. This fact came from the mouth of the man who invented PCR and was awarded the Nobel Prize in Chemistry in 1993 for doing so. Sadly, and incredibly conveniently for the Cult, Mullis died in August, 2019, at the age of 74 just before his test would be fraudulently used to unleash fascism on the world. He was said to have died from pneumonia which was an irony in itself. A few months later he would have had 'Covid-19' on his death certificate. I say the timing of his death was convenient because had he lived Mullis, a brilliant, honest and decent man, would have been

vociferously speaking out against the use of his test to detect 'Covid' when it was never designed, or able, to do that. I know that to be true given that Mullis made the same point when his test was used to 'detect' – not detect – HIV. He had been seriously critical of the Gallo/Montagnier claim to have isolated the HIV 'virus' and shown it to cause AIDS for which Mullis said there was no evidence. AIDS is actually not a disease but a series of diseases from which people die all the time. When they die from those *same diseases* after a positive 'test' for HIV then AIDS goes on their death certificate. I think I've heard that before somewhere. Countries instigated a policy with 'Covid' that anyone who tested positive with a test not testing for the 'virus' and died of any other cause within 28 days and even longer 'Covid-19' had to go on the death certificate. Cases have come from the test that can't test for infectious disease and the deaths are those who have died of *anything* after testing positive with a test not testing for the 'virus'. I'll have much more later about the death certificate scandal.

Mullis was deeply dismissive of the now US 'Covid' star Anthony Fauci who he said was a liar who didn't know anything about anything – 'and I would say that to his face – nothing.' He said of Fauci: 'The man thinks he can take a blood sample, put it in an electron microscope and if it's got a virus in there you'll know it – he doesn't understand electron microscopy and he doesn't understand medicine and shouldn't be in a position like he's in.' That position, terrifyingly, has made him the decider of 'Covid' fascism policy on behalf of the Cult in his role as director since 1984 of the National Institute of Allergy and Infectious Diseases (NIAID) while his record of being wrong is laughable; but being wrong, so long as it's the *right kind* of wrong, is why the Cult loves him. He'll say anything the Cult tells him to say. Fauci was made Chief Medical Adviser to the President immediately Biden took office. Biden was installed in the White House by Cult manipulation and one of his first decisions was to elevate Fauci to a position of even more control. This is a coincidence? Yes, and I identify as a flamenco dancer called Lola. How does such an incompetent criminal like Fauci remain in that

pivotal position in American health since *the 1980s*? When you serve the Cult it looks after you until you are surplus to requirements. Kary Mullis said prophetically of Fauci and his like: 'Those guys have an agenda and it's not an agenda we would like them to have ... they make their own rules, they change them when they want to, and Tony Fauci does not mind going on television in front of the people who pay his salary and lie directly into the camera.' Fauci has done that almost daily since the 'Covid' hoax began. Lying is in Fauci's DNA. To make the situation crystal clear about the PCR test this is a direct quote from its inventor Kary Mullis:

It [the PCR test] doesn't tell you that you're sick and doesn't tell you that the thing you ended up with was really going to hurt you ...'

Ask yourself why governments and medical systems the world over have been using this very test to decide who is 'infected' with the SARS-CoV-2 'virus' and the alleged disease it allegedly causes, 'Covid-19'. The answer to that question will tell you what has been going on. By the way, here's a little show-stopper – the 'new' SARS-CoV-2 'virus' was 'identified' as such right from the start using ... *the PCR test not testing for the 'virus'*. If you are new to this and find that shocking then stick around. I have hardly started yet. Even worse, other 'tests', like the 'Lateral Flow Device' (LFD), are considered so useless that they have to be *confirmed* by the PCR test! Leaked emails written by Ben Dyson, adviser to UK 'Health' Secretary Matt Hancock, said they were 'dangerously unreliable'. Dyson, executive director of strategy at the Department of Health, wrote: 'As of today, someone who gets a positive LFD result in (say) London has at best a 25 per cent chance of it being a true positive, but if it is a self-reported test potentially as low as 10 per cent (on an optimistic assumption about specificity) or as low as 2 per cent (on a more pessimistic assumption).' These are the 'tests' that schoolchildren and the public are being urged to have twice a week or more and have to isolate if they get a positive. Each fake positive goes in the statistics as a 'case' no matter how ludicrously inaccurate and the

'cases' drive lockdown, masks and the pressure to 'vaccinate'. The government said in response to the email leak that the 'tests' were accurate which confirmed yet again what shocking bloody liars they are. The real false positive rate is *100 percent* as we'll see. In another 'you couldn't make it up' the UK government agreed to pay £2.8 billion to California's Innova Medical Group to supply the irrelevant lateral flow tests. The company's primary test-making centre is in China. Innova Medical Group, established in March, 2020, is owned by Pasaca Capital Inc, chaired by Chinese-American millionaire Charles Huang who was born in Wuhan.

How it works – and how it doesn't

The RT-PCR test, known by its full title of Polymerase chain reaction, is used across the world to make millions, even billions, of copies of a DNA/RNA genetic information sample. The process is called 'amplification' and means that a tiny sample of genetic material is amplified to bring out the detailed content. I stress that it is not testing for an infectious disease. It is simply amplifying a sample of genetic material. In the words of Kary Mullis: 'PCR is ... just a process that's used to make a whole lot of something out of something.' To emphasise the point companies that make the PCR tests circulated around the world to 'test' for 'Covid' warn on the box that it can't be used to detect 'Covid' or infectious disease and is for research purposes only. It's okay, rest for a minute and you'll be fine. This is the test that produces the 'cases' and 'deaths' that have been used to destroy human society. All those global and national medical and scientific 'experts' demanding this destruction to 'save us' *KNOW* that the test is not testing for the 'virus' and the cases and deaths they claim to be real are an almost unimaginable fraud. Every one of them and so many others including politicians and psychopaths like Gates and Tedros must be brought before Nuremburg-type trials and jailed for the rest of their lives. The more the genetic sample is amplified by PCR the more elements of that material become sensitive to the test and by that I don't mean sensitive for a 'virus' but for elements of the genetic material which

is *naturally* in the body or relates to remnants of old conditions of various kinds lying dormant and causing no disease. Once the amplification of the PCR reaches a certain level *everyone* will test positive. So much of the material has been made sensitive to the test that everyone will have some part of it in their body. Even lying criminals like Fauci have said that once PCR amplifications pass 35 cycles everything will be a false positive that cannot be trusted for the reasons I have described. I say, like many proper doctors and scientists, that 100 percent of the 'positives' are false, but let's just go with Fauci for a moment.

He says that any amplification over 35 cycles will produce false positives and yet the US Centers for Disease Control (CDC) and Food and Drug Administration (FDA) have recommended up to 40 *cycles* and the National Health Service (NHS) in Britain admitted in an internal document for staff that it was using 45 *cycles* of amplification. A long list of other countries has been doing the same and at least one 'testing' laboratory has been using 50 *cycles*. Have you ever heard a doctor, medical 'expert' or the media ask what level of amplification has been used to claim a 'positive'. The 'test' comes back 'positive' and so you have the 'virus', end of story. Now we can see how the government in Tanzania could send off samples from a goat and a pawpaw fruit under human names and both came back positive for 'Covid-19'. Tanzania president John Magufuli mocked the 'Covid' hysteria, the PCR test and masks and refused to import the DNA-manipulating 'vaccine'. The Cult hated him and an article sponsored by the Bill Gates Foundation appeared in the London *Guardian* in February, 2021, headed 'It's time for Africa to rein in Tanzania's anti-vaxxer president'. Well, 'reined in' he shortly was. Magufuli appeared in good health, but then, in March, 2021, he was dead at 61 from 'heart failure'. He was replaced by Samia Hassan Suhulu who is connected to Klaus Schwab's World Economic Forum and she immediately reversed Magufuli's 'Covid' policy. A sample of cola tested positive for 'Covid' with the PCR test in Germany while American actress and singer-songwriter Erykah Badu tested positive in one nostril and negative in the other. Footballer Ronaldo called

the PCR test 'bullshit' after testing positive three times and being forced to quarantine and miss matches when there was nothing wrong with him. The mantra from Tedros at the World Health Organization and national governments (same thing) has been test, test, test. They know that the more tests they can generate the more fake 'cases' they have which go on to become 'deaths' in ways I am coming to. The UK government has its Operation Moonshot planned to test multiple millions every day in workplaces and schools with free tests for everyone to use twice a week at home in line with the Cult plan from the start to make testing part of life. A government advertisement for an 'Interim Head of Asymptomatic Testing Communication' said the job included responsibility for delivering a 'communications strategy' (propaganda) 'to support the expansion of asymptomatic testing that *'normalises testing as part of everyday life'*'. More tests means more fake 'cases', 'deaths' and fascism. I have heard of, and from, many people who booked a test, couldn't turn up, and yet got a positive result through the post for a test they'd never even had. The whole thing is crazy, but for the Cult there's method in the madness. Controlling and manipulating the level of amplification of the test means the authorities can control whenever they want the number of apparent 'cases' and 'deaths'. If they want to justify more fascist lockdown and destruction of livelihoods they keep the amplification high. If they want to give the illusion that lockdowns and the 'vaccine' are working then they lower the amplification and 'cases' and 'deaths' will appear to fall. In January, 2021, the Cult-owned World Health Organization suddenly warned laboratories about over-amplification of the test and to lower the threshold. Suddenly headlines began appearing such as: 'Why ARE "Covid" cases plummeting?' This was just when the vaccine rollout was underway and I had predicted months before they would make cases appear to fall through amplification tampering when the 'vaccine' came. These people are so predictable.

Cow vaccines?

The question must be asked of what is on the test swabs being poked far up the nose of the population to the base of the brain? A nasal swab punctured one woman's brain and caused it to leak fluid. Most of these procedures are being done by people with little training or medical knowledge. Dr Lorraine Day, former orthopaedic trauma surgeon and Chief of Orthopaedic Surgery at San Francisco General Hospital, says the tests are really a 'vaccine'. Cows have long been vaccinated this way. She points out that masks have to cover the nose and the mouth where it is claimed the 'virus' exists in saliva. Why then don't they take saliva from the mouth as they do with a DNA test instead of pushing a long swab up the nose towards the brain? The ethmoid bone separates the nasal cavity from the brain and within that bone is the cribriform plate. Dr Day says that when the swab is pushed up against this plate and twisted the procedure is 'depositing things back there'. She claims that among these 'things' are nanoparticles that can enter the brain. Researchers have noted that a team at the Gates-funded Johns Hopkins have designed tiny, star-shaped micro-devices that can latch onto intestinal mucosa and release drugs into the body. Mucosa is the thin skin that covers the inside surface of parts of the body such as *the nose* and mouth and produces mucus to protect them. The Johns Hopkins micro-devices are called 'theragrippers' and were 'inspired' by a parasitic worm that digs its sharp teeth into a host's intestines. Nasal swabs are also coated in the sterilisation agent ethylene oxide. The US National Cancer Institute posts this explanation on its website:

At room temperature, ethylene oxide is a flammable colorless gas with a sweet odor. It is used primarily to produce other chemicals, including antifreeze. In smaller amounts, ethylene oxide is used as a pesticide and a sterilizing agent. The ability of ethylene oxide to damage DNA makes it an effective sterilizing agent but also accounts for its cancer-causing activity.

The Institute mentions lymphoma and leukaemia as cancers most frequently reported to be associated with occupational exposure to ethylene oxide along with stomach and breast cancers. How does anyone think this is going to work out with the constant testing

regime being inflicted on adults and children at home and at school that will accumulate in the body anything that's on the swab?

Doctors know best

It is vital for people to realise that 'hero' doctors 'know' only what the Big Pharma-dominated medical authorities tell them to 'know' and if they refuse to 'know' what they are told to 'know' they are out the door. They are mostly not physicians or healers, but repeaters of the official narrative – or else. I have seen alleged professional doctors on British television make shocking statements that we are supposed to take seriously. One called 'Dr' Amir Khan, who is actually telling patients how to respond to illness, said that men could take the birth pill to 'help slow down the effects of Covid-19'. In March, 2021, another ridiculous 'Covid study' by an American doctor proposed injecting men with the female sex hormone progesterone as a 'Covid' treatment. British doctor Nighat Arif told the BBC that face coverings were now going to be part of ongoing normal. Yes, the vaccine protects you, she said (evidence?) ... but the way to deal with viruses in the community was always going to come down to hand washing, face covering and keeping a physical distance. That's not what we were told before the 'vaccine' was circulating. Arif said she couldn't imagine ever again going on the underground or in a lift without a mask. I was just thanking my good luck that she was not my doctor when she said – in March, 2021 – that if 'we are *behaving* and we are doing all the right things' she thought we could 'have our nearest and dearest around us at home ... around *Christmas* and *New Year!* Her patronising delivery was the usual school teacher talking to six-year-olds as she repeated every government talking point and probably believed them all. If we have learned anything from the 'Covid' experience surely it must be that humanity's perception of doctors needs a fundamental rethink. NHS 'doctor' Sara Kayat told her television audience that the 'Covid vaccine' would '100 percent prevent hospitalisation and death'. Not even Big Pharma claimed that. We have to stop taking 'experts' at their word without question when so many of them are

clueless and only repeating the party line on which their careers depend. That is not to say there are not brilliant doctors – there are and I have spoken to many of them since all this began – but you won't see them in the mainstream media or quoted by the psychopaths and yes-people in government.

Remember the name – Christian Drosten

German virologist Christian Drosten, Director of Charité Institute of Virology in Berlin, became a national star after the pandemic hoax began. He was feted on television and advised the German government on 'Covid' policy. Most importantly to the wider world Drosten led a group that produced the 'Covid' testing protocol for the PCR test. What a remarkable feat given the PCR cannot test for infectious disease and even more so when you think that Drosten said that his method of testing for SARS-CoV-2 was developed 'without having virus material available'. *He developed a test for a 'virus' that he didn't have and had never seen.* Let that sink in as you survey the global devastation that came from what he did. The whole catastrophe of Drosten's 'test' was based on the alleged genetic sequence published by Chinese scientists on the Internet. We will see in the next chapter that this alleged 'genetic sequence' has never been produced by China or anyone and cannot be when there *is no* SARS-CoV-2. Drosten, however, doesn't seem to let little details like that get in the way. He was the lead author with Victor Corman from the same Charité Hospital of the paper 'Detection of 2019 novel coronavirus (2019-nCoV) by real-time PCR' published in a magazine called *Eurosurveillance*. This became known as the Corman-Drosten paper. In November, 2020, with human society devastated by the effects of the Corman-Drosten test baloney, the protocol was publicly challenged by 22 international scientists and independent researchers from Europe, the United States, and Japan. Among them were senior molecular geneticists, biochemists, immunologists, and microbiologists. They produced a document headed 'External peer review of the RTPCR test to detect SARS-Cov-2 Reveals 10 Major Flaws At The Molecular and Methodological Level: Consequences

For False-Positive Results'. The flaws in the Corman-Drosten test included the following:

- The test is non-specific because of erroneous design
- Results are enormously variable
- The test is unable to discriminate between the whole 'virus' and viral fragments
- It doesn't have positive or negative controls
- The test lacks a standard operating procedure
- It is unsupported by proper peer view

The scientists said the PCR 'Covid' testing protocol was not founded on science and they demanded the Corman-Drosten paper be retracted by *Eurosurveillance*. They said all present and previous Covid deaths, cases, and 'infection rates' should be subject to a massive retroactive inquiry. Lockdowns and travel restrictions should be reviewed and relaxed and those diagnosed through PCR to have 'Covid-19' should not be forced to isolate. Dr Kevin Corbett, a health researcher and nurse educator with a long academic career producing a stream of peer-reviewed publications at many UK universities, made the same point about the PCR test debacle. He said of the scientists' conclusions: 'Every scientific rationale for the development of that test has been totally destroyed by this paper. It's like Hiroshima/Nagasaki to the Covid test.' He said that China hadn't given them an isolated 'virus' when Drosten developed the test. Instead they had developed the test from *a sequence in a gene bank*.' Put another way ... *they made it up!* The scientists were supported in this contention by a Portuguese appeals court which ruled in November, 2020, that PCR tests are unreliable and it is unlawful to quarantine people based solely on a PCR test. The point about China not providing an isolated virus must be true when the 'virus' has never been isolated to this day and the consequences of that will become clear. Drosten and company produced this useless 'protocol' right on cue in January, 2020, just as the 'virus' was said to

be moving westward and it somehow managed to successfully pass a peer-review in 24 hours. In other words there was no peer-review for a test that would be used to decide who had 'Covid' and who didn't across the world. The Cult-created, Gates-controlled World Health Organization immediately recommended all its nearly 200 member countries to use the Drosten PCR protocol to detect 'cases' and 'deaths'. The sting was underway and it continues to this day.

So who is this Christian Drosten that produced the means through which death, destruction and economic catastrophe would be justified? His education background, including his doctoral thesis, would appear to be somewhat shrouded in mystery and his track record is dire as with another essential player in the 'Covid' hoax, the Gates-funded Professor Neil Ferguson at the Gates-funded Imperial College in London of whom more shortly. Drosten predicted in 2003 that the alleged original SARS 'virus' (SARS-1) was an epidemic that could have serious effects on economies and an effective vaccine would take at least two years to produce. Drosten's answer to every alleged 'outbreak' is a vaccine which you won't be shocked to know. What followed were just 774 official deaths worldwide and none in Germany where there were only nine cases. That is even if you believe there ever was a SARS 'virus' when the evidence is zilch and I will expand on this in the next chapter. Drosten claims to be co-discoverer of 'SARS-1' and developed a test for it in 2003. He was screaming warnings about 'swine flu' in 2009 and how it was a widespread infection far more severe than any dangers from a vaccine could be and people should get vaccinated. It would be helpful for Drosten's vocal chords if he simply recorded the words 'the virus is deadly and you need to get vaccinated' and copies could be handed out whenever the latest made-up threat comes along. Drosten's swine flu epidemic never happened, but Big Pharma didn't mind with governments spending hundreds of millions on vaccines that hardly anyone bothered to use and many who did wished they hadn't. A study in 2010 revealed that the risk of dying from swine flu, or H1N1, was no higher than that of the annual seasonal flu which is what at least most of 'it' really was as in

the case of 'Covid-19'. A media investigation into Drosten asked how with such a record of inaccuracy he could be *the* government adviser on these issues. The answer to that question is the same with Drosten, Ferguson and Fauci – they keep on giving the authorities the 'conclusions' and 'advice' they want to hear. Drosten certainly produced the goods for them in January, 2020, with his PCR protocol garbage and provided the foundation of what German internal medicine specialist Dr Claus Köhnlein, co-author of *Virus Mania*, called the 'test pandemic'. The 22 scientists in the *Eurosurveillance* challenge called out conflicts of interest within the Drosten 'protocol' group and with good reason. Olfert Landt, a regular co-author of Drosten 'studies', owns the biotech company TIB Molbiol Syntheselabor GmbH in Berlin which manufactures and sells the tests that Drosten and his mates come up with. They have done this with SARS, Enterotoxigenic E. coli (ETEC), MERS, Zika 'virus', yellow fever, and now 'Covid'. Landt told the *Berliner Zeitung* newspaper:

The testing, design and development came from the Charité [Drosten and Corman]. We simply implemented it immediately in the form of a kit. And if we don't have the virus, which originally only existed in Wuhan, we can make a synthetic gene to simulate the genome of the virus. That's what we did very quickly.

This is more confirmation that the Drosten test was designed without access to the 'virus' and only a synthetic simulation which is what SARS-CoV-2 really is – a computer-generated synthetic fiction. It's quite an enterprise they have going here. A Drosten team decides what the test for something should be and Landt's biotech company flogs it to governments and medical systems across the world. His company must have made an absolute fortune since the 'Covid' hoax began. Dr Reiner Fuellmich, a prominent German consumer protection trial lawyer in Germany and California, is on Drosten's case and that of Tedros at the World Health Organization for crimes against humanity with a class-action lawsuit being prepared in the United States and other legal action in Germany.

Why China?

Scamming the world with a 'virus' that doesn't exist would seem impossible on the face of it, but not if you have control of the relatively few people that make policy decisions and the great majority of the global media. Remember it's not about changing 'real' reality it's about controlling *perception* of reality. You don't have to make something happen you only have to make people *believe* that it's happening. Renegade Minds understand this and are therefore much harder to swindle. 'Covid-19' is not a 'real' 'virus'. It's a mind virus, like a computer virus, which has infected the minds, not the bodies, of billions. It all started, publically at least, in China and that alone is of central significance. The Cult was behind the revolution led by its asset Mao Zedong, or Chairman Mao, which established the People's Republic of China on October 1st, 1949. It should have been called The Cult's Republic of China, but the name had to reflect the recurring illusion that vicious dictatorships are run by and for the people (see all the 'Democratic Republics' controlled by tyrants). In the same way we have the 'Biden' Democratic Republic of America officially ruled by a puppet tyrant (at least temporarily) on behalf of Cult tyrants. The creation of Mao's merciless communist/fascist dictatorship was part of a frenzy of activity by the Cult at the conclusion of World War Two which, like the First World War, it had instigated through its assets in Germany, Britain, France, the United States and elsewhere. Israel was formed in 1948; the Soviet Union expanded its 'Iron Curtain' control, influence and military power with the Warsaw Pact communist alliance in 1955; the United Nations was formed in 1945 as a Cult precursor to world government; and a long list of world bodies would be established including the World Health Organization (1948), World Trade Organization (1948 under another name until 1995), International Monetary Fund (1945) and World Bank (1944). Human society was redrawn and hugely centralised in the global Problem-Reaction-Solution that was World War Two. All these changes were significant. Israel would become the headquarters of the Sabbatians

and the revolution in China would prepare the ground and control system for the events of 2019/2020.

Renegade Minds know there are no borders except for public consumption. The Cult is a seamless, borderless global entity and to understand the game we need to put aside labels like borders, nations, countries, communism, fascism and democracy. These delude the population into believing that countries are ruled within their borders by a government of whatever shade when these are mere agencies of a global power. America's illusion of democracy and China's communism/fascism are subsidiaries – vehicles – for the same agenda. We may hear about conflict and competition between America and China and on the lower levels that will be true; but at the Cult level they are branches of the same company in the way of the McDonald's example I gave earlier. I have tracked in the books over the years support by US governments of both parties for Chinese Communist Party infiltration of American society through allowing the sale of land, even military facilities, and the acquisition of American business and university influence. All this is underpinned by the infamous stealing of intellectual property and technological know-how. Cult-owned Silicon Valley corporations waive their fraudulent 'morality' to do business with human-rights-free China; Cult-controlled Disney has become China's PR department; and China in effect owns 'American' sports such as basketball which depends for much of its income on Chinese audiences. As a result any sports player, coach or official speaking out against China's horrific human rights record is immediately condemned or fired by the China-worshipping National Basketball Association. One of the first acts of China-controlled Biden was to issue an executive order telling federal agencies to stop making references to the 'virus' by the 'geographic location of its origin'. Long-time Congressman Jerry Nadler warned that criticising China, America's biggest rival, leads to hate crimes against Asian people in the United States. So shut up you bigot. China is fast closing in on Israel as a country that must not be criticised which is apt, really, given that Sabbatians control them both. The two countries have

developed close economic, military, technological and strategic ties which include involvement in China's 'Silk Road' transport and economic initiative to connect China with Europe. Israel was the first country in the Middle East to recognise the establishment of Mao's tyranny in 1950 months after it was established.

Project Wuhan – the 'Covid' Psyop

I emphasise again that the Cult plays the long game and what is happening to the world today is the result of centuries of calculated manipulation following a script to take control step-by-step of every aspect of human society. I will discuss later the common force behind all this that has spanned those centuries and thousands of years if the truth be told. Instigating the Mao revolution in China in 1949 with a 2020 'pandemic' in mind is not only how they work – the 71 years between them is really quite short by the Cult's standards of manipulation preparation. The reason for the Cult's Chinese revolution was to create a fiercely-controlled environment within which an extreme structure for human control could be incubated to eventually be unleashed across the world. We have seen this happen since the 'pandemic' emerged from China with the Chinese control-structure founded on AI technology and tyrannical enforcement sweep across the West. Until the moment when the Cult went for broke in the West and put its fascism on public display Western governments had to pay some lip-service to freedom and democracy to not alert too many people to the tyranny-in-the-making. Freedoms were more subtly eroded and power centralised with covert government structures put in place waiting for the arrival of 2020 when that smokescreen of 'freedom' could be dispensed with. The West was not able to move towards tyranny before 2020 anything like as fast as China which was created as a tyranny and had no limits on how fast it could construct the Cult's blueprint for global control. When the time came to impose that structure on the world it was the same Cult-owned Chinese communist/fascist government that provided the excuse – the 'Covid pandemic'. It was absolutely crucial to the Cult plan for the Chinese response to the 'pandemic' –

draconian lockdowns of the entire population – to become the blueprint that Western countries would follow to destroy the livelihoods and freedom of their people. This is why the Cult-owned, Gates-owned, WHO Director-General Tedros said early on:

The Chinese government is to be congratulated for the extraordinary measures it has taken to contain the outbreak. China is actually setting a new standard for outbreak response and it is not an exaggeration.

Forbes magazine said of China: ‘... those measures protected untold millions from getting the disease’. The Rockefeller Foundation ‘epidemic scenario’ document in 2010 said ‘prophetically’:

However, a few countries did fare better – China in particular. The Chinese government’s quick imposition and enforcement of mandatory quarantine for all citizens, as well as its instant and near-hermetic sealing off of all borders, saved millions of lives, stopping the spread of the virus far earlier than in other countries and enabling a swifter post-pandemic recovery.

Once again – *spooky*.

The first official story was the ‘bat theory’ or rather the bat diversion. The source of the ‘virus outbreak’ we were told was a ‘wet market’ in Wuhan where bats and other animals are bought and eaten in horrifically unhygienic conditions. Then another story emerged through the alternative media that the ‘virus’ had been released on purpose or by accident from a BSL-4 (biosafety level 4) laboratory in Wuhan not far from the wet market. The lab was reported to create and work with lethal concoctions and bioweapons. Biosafety level 4 is the highest in the World Health Organization system of safety and containment. Renegade Minds are aware of what I call designer manipulation. The ideal for the Cult is for people to buy its prime narrative which in the opening salvos of the ‘pandemic’ was the wet market story. It knows, however, that there is now a considerable worldwide alternative media of researchers sceptical of anything governments say and they are often given a version of events in a form they can perceive as credible while misdirecting them from the real truth. In this case let them

think that the conspiracy involved is a 'bioweapon virus' released from the Wuhan lab to keep them from the real conspiracy – *there is no 'virus'*. The WHO's current position on the source of the outbreak at the time of writing appears to be: 'We haven't got a clue, mate.' This is a good position to maintain mystery and bewilderment. The inner circle will know where the 'virus' came from – *nowhere*. The bottom line was to ensure the public believed there *was* a 'virus' and it didn't much matter if they thought it was natural or had been released from a lab. The belief that there was a 'deadly virus' was all that was needed to trigger global panic and fear. The population was terrified into handing their power to authority and doing what they were told. They had to or they were 'all gonna die'.

In March, 2020, information began to come my way from real doctors and scientists and my own additional research which had my intuition screaming: 'Yes, that's it! *There is no virus.*' The 'bioweapon' was not the 'virus'; it was the '*vaccine*' already being talked about that would be the bioweapon. My conclusion was further enhanced by happenings in Wuhan. The 'virus' was said to be sweeping the city and news footage circulated of people collapsing in the street (which they've never done in the West with the same 'virus'). The Chinese government was building 'new hospitals' in a matter of ten days to 'cope with demand' such was the virulent nature of the 'virus'. Yet in what seemed like no time the 'new hospitals' closed – even if they even opened – and China declared itself 'virus-free'. It was back to business as usual. This was more propaganda to promote the Chinese draconian lockdowns in the West as the way to 'beat the virus'. Trouble was that we subsequently had lockdown after lockdown, but never business as usual. As the people of the West and most of the rest of the world were caught in an ever-worsening spiral of lockdown, social distancing, masks, isolated old people, families forced apart, and livelihood destruction, it was party-time in Wuhan. Pictures emerged of thousands of people enjoying pool parties and concerts. It made no sense until you realised there never was a 'virus' and the

whole thing was a Cult set-up to transform human society out of one its major global strongholds – China.

How is it possible to deceive virtually the entire world population into believing there is a deadly virus when there is not even a 'virus' let alone a deadly one? It's nothing like as difficult as you would think and that's clearly true because it happened.

Postscript: See end of book Postscript for more on the 'Wuhan lab virus release' story which the authorities and media were pushing heavily in the summer of 2021 to divert attention from the truth that the 'Covid virus' is pure invention.

CHAPTER FIVE

There is no 'virus'

You can fool some of the people all of the time, and all of the people some of the time, but you cannot fool all of the people all of the time

Abraham Lincoln

The greatest form of mind control is repetition. The more you repeat the same mantra of alleged 'facts' the more will accept them to be true. It becomes an 'everyone knows that, mate'. If you can also censor any other version or alternative to your alleged 'facts' you are pretty much home and cooking.

By the start of 2020 the Cult owned the global mainstream media almost in its entirety to spew out its 'Covid' propaganda and ignore or discredit any other information and view. Cult-owned social media platforms in Cult-owned Silicon Valley were poised and ready to unleash a campaign of ferocious censorship to obliterate all but the official narrative. To complete the circle many demands for censorship by Silicon Valley were led by the mainstream media as 'journalists' became full-out enforcers for the Cult both as propagandists and censors. Part of this has been the influx of young people straight out of university who have become 'journalists' in significant positions. They have no experience and a headful of programmed perceptions from their years at school and university at a time when today's young are the most perceptually-targeted generations in known human history given the insidious impact of technology. They enter the media perceptually prepared and ready to repeat the narratives of the system that programmed them to

repeat its narratives. The BBC has a truly pathetic 'specialist disinformation reporter' called Marianna Spring who fits this bill perfectly. She is clueless about the world, how it works and what is really going on. Her role is to discredit anyone doing the job that a proper journalist would do and system-serving hacks like Spring wouldn't dare to do or even see the need to do. They are too busy licking the arse of authority which can never be wrong and, in the case of the BBC propaganda programme, *Panorama*, contacting payments systems such as PayPal to have a donations page taken down for a film company making documentaries questioning vaccines. Even the BBC soap opera *EastEnders* included a disgracefully biased scene in which an inarticulate white working class woman was made to look foolish for questioning the 'vaccine' while a well-spoken black man and Asian woman promoted the government narrative. It ticked every BBC box and the fact that the black and minority community was resisting the 'vaccine' had nothing to do with the way the scene was written. The BBC has become a disgusting tyrannical propaganda and censorship operation that should be defunded and disbanded and a free media take its place with a brief to stop censorship instead of demanding it. A BBC 'interview' with Gates goes something like: 'Mr Gates, sir, if I can call you sir, would you like to tell our audience why you are such a great man, a wonderful humanitarian philanthropist, and why you should absolutely be allowed as a software salesman to decide health policy for approaching eight billion people? Thank you, sir, please sir.' Propaganda programming has been incessant and merciless and when all you hear is the same story from the media, repeated by those around you who have only heard the same story, is it any wonder that people on a grand scale believe absolute mendacious garbage to be true? You are about to see, too, why this level of information control is necessary when the official 'Covid' narrative is so nonsensical and unsupportable by the evidence.

Structure of Deceit

The pyramid structure through which the 'Covid' hoax has been manifested is very simple and has to be to work. As few people as possible have to be involved with full knowledge of what they are doing – and why – or the real story would get out. At the top of the pyramid are the inner core of the Cult which controls Bill Gates who, in turn, controls the World Health Organization through his pivotal funding and his puppet Director-General mouthpiece, Tedros. Before he was appointed Tedros was chair of the Gates-founded Global Fund to 'fight against AIDS, tuberculosis and malaria', a board member of the Gates-funded 'vaccine alliance' GAVI, and on the board of another Gates-funded organisation. Gates owns him and picked him for a specific reason – Tedros is a crook and worse. 'Dr' Tedros (he's not a medical doctor, the first WHO chief not to be) was a member of the tyrannical Marxist government of Ethiopia for decades with all its human rights abuses. He has faced allegations of corruption and misappropriation of funds and was exposed three times for covering up cholera epidemics while Ethiopia's health minister. Tedros appointed the mass-murdering genocidal Zimbabwe dictator Robert Mugabe as a WHO goodwill ambassador for public health which, as with Tedros, is like appointing a psychopath to run a peace and love campaign. The move was so ridiculous that he had to drop Mugabe in the face of widespread condemnation. American economist David Steinman, a Nobel peace prize nominee, lodged a complaint with the International Criminal Court in The Hague over alleged genocide by Tedros when he was Ethiopia's foreign minister. Steinman says Tedros was a 'crucial decision maker' who directed the actions of Ethiopia's security forces from 2013 to 2015 and one of three officials in charge when those security services embarked on the 'killing' and 'torturing' of Ethiopians. You can see where Tedros is coming from and it's sobering to think that he has been the vehicle for Gates and the Cult to direct the global response to 'Covid'. Think about that. A psychopathic Cult dictates to psychopath Gates who dictates to psychopath Tedros who dictates how countries of the world must respond to a 'Covid virus' never scientifically shown to exist. At the same time psychopathic Cult-owned Silicon Valley information

giants like Google, YouTube, Facebook and Twitter announced very early on that they would give the Cult/Gates/Tedros/WHO version of the narrative free advertising and censor those who challenged their intelligence-insulting, mendacious story.

The next layer in the global 'medical' structure below the Cult, Gates and Tedros are the chief medical officers and science 'advisers' in each of the WHO member countries which means virtually all of them. Medical officers and arbiters of science (they're not) then take the WHO policy and recommended responses and impose them on their country's population while the political 'leaders' say they are deciding policy (they're clearly not) by 'following the science' on the advice of the 'experts' – the same medical officers and science 'advisers' (dictators). In this way with the rarest of exceptions the entire world followed the same policy of lockdown, people distancing, masks and 'vaccines' dictated by the psychopathic Cult, psychopathic Gates and psychopathic Tedros who we are supposed to believe give a damn about the health of the world population they are seeking to enslave. That, amazingly, is all there is to it in terms of crucial decision-making. Medical staff in each country then follow like sheep the dictates of the shepherds at the top of the national medical hierarchies – chief medical officers and science 'advisers' who themselves follow like sheep the shepherds of the World Health Organization and the Cult. Shepherds at the national level often have major funding and other connections to Gates and his Bill and Melinda Gates Foundation which carefully hands out money like confetti at a wedding to control the entire global medical system from the WHO down.

Follow the money

Christopher Whitty, Chief Medical Adviser to the UK Government at the centre of 'virus' policy, a senior adviser to the government's Scientific Advisory Group for Emergencies (SAGE), and Executive Board member of the World Health Organization, was gifted a grant of \$40 million by the Bill and Melinda Gates Foundation for malaria research in Africa. The BBC described the unelected Whitty as 'the

official who will probably have the greatest impact on our everyday lives of any individual policymaker in modern times' and so it turned out. What Gates and Tedros have said Whitty has done like his equivalents around the world. Patrick Vallance, co-chair of SAGE and the government's Chief Scientific Adviser, is a former executive of Big Pharma giant GlaxoSmithKline with its fundamental financial and business connections to Bill Gates. In September, 2020, it was revealed that Vallance owned a deferred bonus of shares in GlaxoSmithKline worth £600,000 while the company was 'developing' a 'Covid vaccine'. Move along now – nothing to see here – what could possibly be wrong with that? Imperial College in London, a major player in 'Covid' policy in Britain and elsewhere with its 'Covid-19' Response Team, is funded by Gates and has big connections to China while the now infamous Professor Neil Ferguson, the useless 'computer modeller' at Imperial College is also funded by Gates. Ferguson delivered the dramatically inaccurate excuse for the first lockdowns (much more in the next chapter). The Institute for Health Metrics and Evaluation (IHME) in the United States, another source of outrageously false 'Covid' computer models to justify lockdowns, is bankrolled by Gates who is a vehement promotor of lockdowns. America's version of Whitty and Vallance, the again now infamous Anthony Fauci, has connections to 'Covid vaccine' maker Moderna as does Bill Gates through funding from the Bill and Melinda Gates Foundation. Fauci is director of the National Institute of Allergy and Infectious Diseases (NIAID), a major recipient of Gates money, and they are very close. Deborah Birx who was appointed White House Coronavirus Response Coordinator in February, 2020, is yet another with ties to Gates. Everywhere you look at the different elements around the world behind the coordination and decision making of the 'Covid' hoax there is Bill Gates and his money. They include the World Health Organization; Centers for Disease Control (CDC) in the United States; National Institutes of Health (NIH) of Anthony Fauci; Imperial College and Neil Ferguson; the London School of Hygiene where Chris Whitty worked; Regulatory agencies like the UK Medicines & Healthcare products Regulatory Agency (MHRA)

which gave emergency approval for 'Covid vaccines'; Wellcome Trust; GAVI, the Vaccine Alliance; the Coalition for Epidemic Preparedness Innovations (CEPI); Johns Hopkins University which has compiled the false 'Covid' figures; and the World Economic Forum. A [Nationalfile.com](https://www.nationalfile.com) article said:

Gates has a lot of pull in the medical world, he has a multi-million dollar relationship with Dr. Fauci, and Fauci originally took the Gates line supporting vaccines and casting doubt on [the drug hydroxychloroquine]. Coronavirus response team member Dr. Deborah Birx, appointed by former president Obama to serve as United States Global AIDS Coordinator, also sits on the board of a group that has received billions from Gates' foundation, and Birx reportedly used a disputed Bill Gates-funded model for the White House's Coronavirus effort. Gates is a big proponent for a population lockdown scenario for the Coronavirus outbreak.

Another funder of Moderna is the Defense Advanced Research Projects Agency (DARPA), the technology-development arm of the Pentagon and one of the most sinister organisations on earth. DARPA had a major role with the CIA covert technology-funding operation In-Q-Tel in the development of Google and social media which is now at the centre of global censorship. Fauci and Gates are extremely close and openly admit to talking regularly about 'Covid' policy, but then why wouldn't Gates have a seat at every national 'Covid' table after his Foundation committed \$1.75 billion to the 'fight against Covid-19'. When passed through our Orwellian Translation Unit this means that he has bought and paid for the Cult-driven 'Covid' response worldwide. Research the major 'Covid' response personnel in your own country and you will find the same Gates funding and other connections again and again. Medical and science chiefs following World Health Organization 'policy' sit atop a medical hierarchy in their country of administrators, doctors and nursing staff. These 'subordinates' are told they must work and behave in accordance with the policy delivered from the 'top' of the national 'health' pyramid which is largely the policy delivered by the WHO which is the policy delivered by Gates and the Cult. The whole 'Covid' narrative has been imposed on medical staff by a climate of fear although great numbers don't even need that to comply. They do so through breathtaking levels of ignorance and

include doctors who go through life simply repeating what Big Pharma and their hierarchical masters tell them to say and believe. No wonder Big Pharma 'medicine' is one of the biggest killers on Planet Earth.

The same top-down system of intimidation operates with regard to the Cult Big Pharma cartel which also dictates policy through national and global medical systems in this way. The Cult and Big Pharma agendas are the same because the former controls and owns the latter. 'Health' administrators, doctors, and nursing staff are told to support and parrot the dictated policy or they will face consequences which can include being fired. How sad it's been to see medical staff meekly repeating and imposing Cult policy without question and most of those who can see through the deceit are only willing to speak anonymously off the record. They know what will happen if their identity is known. This has left the courageous few to expose the lies about the 'virus', face masks, overwhelmed hospitals that aren't, and the dangers of the 'vaccine' that isn't a vaccine. When these medical professionals and scientists, some renowned in their field, have taken to the Internet to expose the truth their articles, comments and videos have been deleted by Cult-owned Facebook, Twitter and YouTube. What a real head-shaker to see YouTube videos with leading world scientists and highly qualified medical specialists with an added link underneath to the notorious Cult propaganda website *Wikipedia* to find the 'facts' about the same subject.

HIV – the 'Covid' trial-run

I'll give you an example of the consequences for health and truth that come from censorship and unquestioning belief in official narratives. The story was told by PCR inventor Kary Mullis in his book *Dancing Naked in the Mind Field*. He said that in 1984 he accepted as just another scientific fact that Luc Montagnier of France's Pasteur Institute and Robert Gallo of America's National Institutes of Health had independently discovered that a 'retrovirus' dubbed HIV (human immunodeficiency virus) caused AIDS. They

were, after all, Mullis writes, specialists in retroviruses. This is how the medical and science pyramids work. Something is announced or *assumed* and then becomes an everybody-knows-that purely through repetition of the assumption as if it is fact. Complete crap becomes accepted truth with no supporting evidence and only repetition of the crap. This is how a 'virus' that doesn't exist became the 'virus' that changed the world. The HIV-AIDS fairy story became a multi-billion pound industry and the media poured out propaganda terrifying the world about the deadly HIV 'virus' that caused the lethal AIDS. By then Mullis was working at a lab in Santa Monica, California, to detect retroviruses with his PCR test in blood donations received by the Red Cross. In doing so he asked a virologist where he could find a reference for HIV being the cause of AIDS. 'You don't need a reference,' the virologist said ... '*Everybody knows it.*' Mullis said he wanted to quote a reference in the report he was doing and he said he felt a little funny about not knowing the source of such an important discovery when everyone else seemed to. The virologist suggested he cite a report by the Centers for Disease Control and Prevention (CDC) on morbidity and mortality. Mullis read the report, but it only said that an organism had been identified and did not say how. The report did not identify the original scientific work. Physicians, however, *assumed* (key recurring theme) that if the CDC was convinced that HIV caused AIDS then proof must exist. Mullis continues:

I did computer searches. Neither Montagnier, Gallo, nor anyone else had published papers describing experiments which led to the conclusion that HIV probably caused AIDS. I read the papers in *Science* for which they had become well known as AIDS doctors, but all they had said there was that they had found evidence of a past infection by something which was probably HIV in some AIDS patients.

They found antibodies. Antibodies to viruses had always been considered evidence of past disease, not present disease. Antibodies signaled that the virus had been defeated. The patient had saved himself. There was no indication in these papers that this virus caused a disease. They didn't show that everybody with the antibodies had the disease. In fact they found some healthy people with antibodies.

Mullis asked why their work had been published if Montagnier and Gallo hadn't really found this evidence, and why had they been fighting so hard to get credit for the discovery? He says he was hesitant to write 'HIV is the probable cause of AIDS' until he found published evidence to support that. 'Tens of thousands of scientists and researchers were spending billions of dollars a year doing research based on this idea,' Mullis writes. 'The reason had to be there somewhere; otherwise these people would not have allowed their research to settle into one narrow channel of investigation.' He said he lectured about PCR at numerous meetings where people were always talking about HIV and he asked them how they knew that HIV was the cause of AIDS:

Everyone said something. Everyone had the answer at home, in the office, in some drawer. They all knew, and they would send me the papers as soon as they got back. But I never got any papers. Nobody ever sent me the news about how AIDS was caused by HIV.

Eventually Mullis was able to ask Montagnier himself about the reference proof when he lectured in San Diego at the grand opening of the University of California AIDS Research Center. Mullis says this was the last time he would ask his question without showing anger. Montagnier said he should reference the CDC report. 'I read it', Mullis said, and it didn't answer the question. 'If Montagnier didn't know the answer who the hell did?' Then one night Mullis was driving when an interview came on National Public Radio with Peter Duesberg, a prominent virologist at Berkeley and a California Scientist of the Year. Mullis says he finally understood why he could not find references that connected HIV to AIDS – *there weren't any!* No one had ever proved that HIV causes AIDS even though it had spawned a multi-billion pound global industry and the media was repeating this as fact every day in their articles and broadcasts terrifying the shit out of people about AIDS and giving the impression that a positive test for HIV (see 'Covid') was a death sentence. Duesberg was a threat to the AIDS gravy train and the agenda that underpinned it. He was therefore abused and castigated after he told the Proceedings of the National Academy of Sciences

there was no good evidence implicating the new 'virus'. Editors rejected his manuscripts and his research funds were deleted. Mullis points out that the CDC has defined AIDS as one of more than 30 diseases *if accompanied* by a positive result on a test that detects antibodies to HIV; but those same diseases are not defined as AIDS cases when antibodies are not detected:

If an HIV-positive woman develops uterine cancer, for example, she is considered to have AIDS. If she is not HIV positive, she simply has uterine cancer. An HIV-positive man with tuberculosis has AIDS; if he tests negative he simply has tuberculosis. If he lives in Kenya or Colombia, where the test for HIV antibodies is too expensive, he is simply presumed to have the antibodies and therefore AIDS, and therefore he can be treated in the World Health Organization's clinic. It's the only medical help available in some places. And it's free, because the countries that support WHO are worried about AIDS.

Mullis accuses the CDC of continually adding new diseases (see ever more 'Covid symptoms') to the grand AIDS definition and of virtually doctoring the books to make it appear as if the disease continued to spread. He cites how in 1993 the CDC enormously broadened its AIDS definition and county health authorities were delighted because they received \$2,500 per year from the Federal government for every reported AIDS case. Ladies and gentlemen, I have just described, via Kary Mullis, the 'Covid pandemic' of 2020 and beyond. Every element is the same and it's been pulled off in the same way by the same networks.

The 'Covid virus' exists? Okay – prove it. Er ... still waiting

What Kary Mullis described with regard to 'HIV' has been repeated with 'Covid'. A claim is made that a new, or 'novel', infection has been found and the entire medical system of the world repeats that as fact exactly as they did with HIV and AIDS. No one in the mainstream asks rather relevant questions such as 'How do you know?' and 'Where is your proof?' The SARS-Cov-2 'virus' and the 'Covid-19 disease' became an overnight 'everybody-knows-that'. The origin could be debated and mulled over, but what you could not suggest was that 'SARS-Cov-2' didn't exist. That would be

ridiculous. 'Everybody knows' the 'virus' exists. Well, I didn't for one along with American proper doctors like Andrew Kaufman and Tom Cowan and long-time American proper journalist Jon Rappaport. We dared to pursue the obvious and simple question: 'Where's the evidence?' The overwhelming majority in medicine, journalism and the general public did not think to ask that. After all, *everyone knew* there was a new 'virus'. Everyone was saying so and I heard it on the BBC. Some would eventually argue that the 'deadly virus' was nothing like as deadly as claimed, but few would venture into the realms of its very existence. Had they done so they would have found that the evidence for that claim had gone AWOL as with HIV causes AIDS. In fact, not even that. For something to go AWOL it has to exist in the first place and scientific proof for a 'SARS-Cov-2' can be filed under nothing, nowhere and zilch.

Dr Andrew Kaufman is a board-certified forensic psychiatrist in New York State, a Doctor of Medicine and former Assistant Professor and Medical Director of Psychiatry at SUNY Upstate Medical University, and Medical Instructor of Hematology and Oncology at the Medical School of South Carolina. He also studied biology at the Massachusetts Institute of Technology (MIT) and trained in Psychiatry at Duke University. Kaufman is retired from allopathic medicine, but remains a consultant and educator on natural healing, I saw a video of his very early on in the 'Covid' hoax in which he questioned claims about the 'virus' in the absence of any supporting evidence and with plenty pointing the other way. I did everything I could to circulate his work which I felt was asking the pivotal questions that needed an answer. I can recommend an excellent pull-together interview he did with the website The Last Vagabond entitled *Dr Andrew Kaufman: Virus Isolation, Terrain Theory and Covid-19* and his website is andrewkaufmanmd.com. Kaufman is not only a forensic psychiatrist; he is forensic in all that he does. He always reads original scientific papers, experiments and studies instead of second-third-fourth-hand reports about the 'virus' in the media which are repeating the repeated repetition of the narrative. When he did so with the original Chinese 'virus' papers Kaufman

realised that there was no evidence of a 'SARS-Cov-2'. They had never – from the start – shown it to exist and every repeat of this claim worldwide was based on the accepted existence of proof that was nowhere to be found – see Kary Mullis and HIV. Here we go again.

Let's postulate

Kaufman discovered that the Chinese authorities immediately concluded that the cause of an illness that broke out among about 200 initial patients in Wuhan was a 'new virus' when there were no grounds to make that conclusion. The alleged 'virus' was not isolated from other genetic material in their samples and then shown through a system known as Koch's postulates to be the causative agent of the illness. The world was told that the SARS-Cov-2 'virus' caused a disease they called 'Covid-19' which had 'flu-like' symptoms and could lead to respiratory problems and pneumonia. If it wasn't so tragic it would almost be funny. *'Flu-like' symptoms? Pneumonia? Respiratory disease?* What in CHINA and particularly in Wuhan, one of the most polluted cities in the world with a resulting epidemic of respiratory disease?? Three hundred thousand people get pneumonia in China every year and there are nearly a billion cases worldwide of 'flu-like symptoms'. These have a whole range of causes – including pollution in Wuhan – but no other possibility was credibly considered in late 2019 when the world was told there was a new and deadly 'virus'. The global prevalence of pneumonia and 'flu-like systems' gave the Cult networks unlimited potential to re-diagnose these other causes as the mythical 'Covid-19' and that is what they did from the very start. Kaufman revealed how Chinese medical and science authorities (all subordinates to the Cult-owned communist government) took genetic material from the lungs of only a few of the first patients. The material contained their own cells, bacteria, fungi and other microorganisms living in their bodies. The only way you could prove the existence of the 'virus' and its responsibility for the alleged 'Covid-19' was to isolate the virus from all the other material – a process also known as 'purification' – and

then follow the postulates sequence developed in the late 19th century by German physician and bacteriologist Robert Koch which became the 'gold standard' for connecting an alleged causation agent to a disease:

1. The microorganism (bacteria, fungus, virus, etc.) must be present in every case of the disease and all patients must have the same symptoms. It must also *not be present in healthy individuals*.
2. The microorganism must be isolated from the host with the disease. If the microorganism is a bacteria or fungus it must be grown in a pure culture. If it is a virus, it must be purified (i.e. containing no other material except the virus particles) from a clinical sample.
3. The specific disease, with all of its characteristics, must be reproduced when the infectious agent (the purified virus or a pure culture of bacteria or fungi) is inoculated into a healthy, susceptible host.
4. The microorganism must be recoverable from the experimentally infected host as in step 2.

Not one of these criteria has been met in the case of 'SARS-Cov-2' and 'Covid-19'. Not ONE. EVER. Robert Koch refers to bacteria and not viruses. What are called 'viral particles' are so minute (hence masks are useless by any definition) that they could only be seen after the invention of the electron microscope in the 1930s and can still only be observed through that means. American bacteriologist and virologist Thomas Milton Rivers, the so-called 'Father of Modern Virology' who was very significantly director of the Rockefeller Institute for Medical Research in the 1930s, developed a less stringent version of Koch's postulates to identify 'virus' causation known as 'Rivers criteria'. 'Covid' did not pass that process either. Some even doubt whether any 'virus' can be isolated from other particles containing genetic material in the Koch method. Freedom of Information requests in many countries asking for scientific proof that the 'Covid virus' has been purified and isolated and shown to exist have all come back with a 'we don't have that' and when this happened with a request to the UK Department of Health they added this comment:

However, outside of the scope of the [Freedom of Information Act] and on a discretionary basis, the following information has been advised to us, which may be of interest. Most infectious diseases are caused by viruses, bacteria or fungi. Some bacteria or fungi have the capacity to grow on their own in isolation, for example in colonies on a petri dish. Viruses are different in that they are what we call 'obligate pathogens' – that is, they cannot survive or reproduce without infecting a host ...

... For some diseases, it is possible to establish causation between a microorganism and a disease by isolating the pathogen from a patient, growing it in pure culture and reintroducing it to a healthy organism. These are known as 'Koch's postulates' and were developed in 1882. However, as our understanding of disease and different disease-causing agents has advanced, these are no longer the method for determining causation [Andrew Kaufman asks why in that case are there two published articles falsely claiming to satisfy Koch's postulates].

It has long been known that viral diseases cannot be identified in this way as viruses cannot be grown in 'pure culture'. When a patient is tested for a viral illness, this is normally done by looking for the presence of antigens, or viral genetic code in a host with molecular biology techniques [Kaufman asks how you could know the origin of these chemicals without having a pure culture for comparison].

For the record 'antigens' are defined so:

Invading microorganisms have antigens on their surface that the human body can recognise as being foreign – meaning not belonging to it. When the body recognises a foreign antigen, lymphocytes (white blood cells) produce antibodies, which are complementary in shape to the antigen.

Notwithstanding that this is open to question in relation to 'SARS-Cov-2' the presence of 'antibodies' can have many causes and they are found in people that are perfectly well. Kary Mullis said: 'Antibodies ... had always been considered evidence of past disease, not present disease.'

'Covid' really is a *computer* 'virus'

Where the UK Department of Health statement says 'viruses' are now 'diagnosed' through a 'viral genetic code in a host with molecular biology techniques', they mean ... *the PCR test* which its inventor said cannot test for infectious disease. They have no credible method of connecting a 'virus' to a disease and we will see that there is no scientific proof that any 'virus' causes any disease or there is any such thing as a 'virus' in the way that it is described. Tenacious Canadian researcher Christine Massey and her team made

some 40 Freedom of Information requests to national public health agencies in different countries asking for proof that SARS-CoV-2 has been isolated and not one of them could supply that information. Massey said of her request in Canada: 'Freedom of Information reveals Public Health Agency of Canada has no record of 'SARS-COV-2' isolation performed by anyone, anywhere, ever.' If you accept the comment from the UK Department of Health it's because they can't isolate a 'virus'. Even so many 'science' papers claimed to have isolated the 'Covid virus' until they were questioned and had to admit they hadn't. A reply from the Robert Koch Institute in Germany was typical: 'I am not aware of a paper which purified isolated SARS-CoV-2.' So what the hell was Christian Drosten and his gang using to design the 'Covid' testing protocol that has produced all the illusory Covid' cases and 'Covid' deaths when the head of the Chinese version of the CDC admitted there was a problem right from the start in that the 'virus' had never been isolated/purified? Breathe deeply: What they are calling 'Covid' is actually created by a *computer program* i.e. *they made it up* – er, that's it. They took lung fluid, with many sources of genetic material, from one single person alleged to be infected with Covid-19 by a PCR test which they *claimed*, without clear evidence, contained a 'virus'. They used several computer programs to create a model of a theoretical virus genome sequence from more than fifty-six million small sequences of RNA, each of an unknown source, assembling them like a puzzle with no known solution. The computer filled in the gaps with sequences from bits in the gene bank to make it look like a bat SARS-like coronavirus! A wave of the magic wand and poof, an *in silico* (computer-generated) genome, a scientific fantasy, was created. UK health researcher Dr Kevin Corbett made the same point with this analogy:

... It's like giving you a few bones and saying that's your fish. It could be any fish. Not even a skeleton. Here's a few fragments of bones. That's your fish ... It's all from gene bank and the bits of the virus sequence that weren't there they made up.

They synthetically created them to fill in the blanks. That's what genetics is; it's a code. So it's ABBCCDDDD and you're missing some what you think is EEE so you put it in. It's all

synthetic. You just manufacture the bits that are missing. This is the end result of the geneticization of virology. This is basically a computer virus.

Further confirmation came in an email exchange between British citizen journalist Frances Leader and the government's Medicines & Healthcare Products Regulatory Agency (the Gates-funded MHRA) which gave emergency permission for untested 'Covid vaccines' to be used. The agency admitted that the 'vaccine' is not based on an isolated 'virus', but comes from a *computer-generated model*. Frances Leader was naturally banned from Cult-owned fascist Twitter for making this exchange public. The process of creating computer-generated alleged 'viruses' is called 'in silico' or 'in silicon' – computer chips – and the term 'in silico' is believed to originate with biological experiments using only a computer in 1989. 'Vaccines' involved with 'Covid' are also produced 'in silico' or by computer not a natural process. If the original 'virus' is nothing more than a made-up computer model how can there be 'new variants' of something that never existed in the first place? They are not new 'variants'; they are new *computer models* only minutely different to the original program and designed to further terrify the population into having the 'vaccine' and submitting to fascism. You want a 'new variant'? Click, click, enter – there you go. Tell the medical profession that you have discovered a 'South African variant', 'UK variants' or a 'Brazilian variant' and in the usual HIV-causes-AIDS manner they will unquestioningly repeat it with no evidence whatsoever to support these claims. They will go on television and warn about the dangers of 'new variants' while doing nothing more than repeating what they have been told to be true and knowing that any deviation from that would be career suicide. Big-time insiders will know it's a hoax, but much of the medical community is clueless about the way they are being played and themselves play the public without even being aware they are doing so. What an interesting 'coincidence' that AstraZeneca and Oxford University were conducting 'Covid vaccine trials' in the three countries – the UK, South Africa and Brazil – where the first three 'variants' were claimed to have 'broken out'.

Here's your 'virus' – it's a unicorn

Dr Andrew Kaufman presented a brilliant analysis describing how the 'virus' was imagined into fake existence when he dissected an article published by *Nature* and written by 19 authors detailing *alleged* 'sequencing of a complete viral genome' of the 'new SARS-CoV-2 virus'. This computer-modelled *in silico* genome was used as a template for all subsequent genome sequencing experiments that resulted in the so-called variants which he said now number more than 6,000. The fake genome was constructed from more than 56 million individual short strands of RNA. Those little pieces were assembled into longer pieces by finding areas of overlapping sequences. The computer programs created over two million possible combinations from which the authors simply chose the longest one. They then compared this to a 'bat virus' and the computer 'alignment' rearranged the sequence and filled in the gaps! They called this computer-generated abomination the 'complete genome'. Dr Tom Cowan, a fellow medical author and collaborator with Kaufman, said such computer-generation constitutes scientific fraud and he makes this superb analogy:

Here is an equivalency: A group of researchers claim to have found a unicorn because they found a piece of a hoof, a hair from a tail, and a snippet of a horn. They then add that information into a computer and program it to re-create the unicorn, and they then claim this computer re-creation is the real unicorn. Of course, they had never actually seen a unicorn so could not possibly have examined its genetic makeup to compare their samples with the actual unicorn's hair, hooves and horn.

The researchers claim they decided which is the real genome of SARS-CoV-2 by 'consensus', sort of like a vote. Again, different computer programs will come up with different versions of the imaginary 'unicorn', so they come together as a group and decide which is the real imaginary unicorn.

This is how the 'virus' that has transformed the world was brought into fraudulent 'existence'. Extraordinary, yes, but as the Nazis said the bigger the lie the more will believe it. Cowan, however, wasn't finished and he went on to identify what he called the real blockbuster in the paper. He quotes this section from a paper written

by virologists and published by the CDC and then explains what it means:

Therefore, we examined the capacity of SARS-CoV-2 to infect and replicate in several common primate and human cell lines, including human adenocarcinoma cells (A549), human liver cells (HUH 7.0), and human embryonic kidney cells (HEK-293T). In addition to Vero E6 and Vero CCL81 cells. ... Each cell line was inoculated at high multiplicity of infection and examined 24h post-infection.

No CPE was observed in any of the cell lines except in Vero cells, which grew to greater than 10 to the 7th power at 24 h post-infection. In contrast, HUH 7.0 and 293T showed only modest viral replication, and A549 cells were incompatible with SARS CoV-2 infection.

Cowan explains that when virologists attempt to prove infection they have three possible 'hosts' or models on which they can test. The first was humans. Exposure to humans was generally not done for ethical reasons and has never been done with SARS-CoV-2 or any coronavirus. The second possible host was animals. Cowan said that forgetting for a moment that they never actually use purified virus when exposing animals they do use solutions that they *claim* contain the virus. Exposure to animals has been done with SARS-CoV-2 in an experiment involving mice and this is what they found: *None of the wild (normal) mice got sick.* In a group of genetically-modified mice, a statistically insignificant number lost weight and had slightly bristled fur, but they experienced nothing like the illness called 'Covid-19'. Cowan said the third method – the one they mostly rely on – is to inoculate solutions they *say* contain the virus onto a variety of tissue cultures. This process had never been shown to kill tissue *unless* the sample material was starved of nutrients and poisoned as *part of the process*. Yes, incredibly, in tissue experiments designed to show the 'virus' is responsible for killing the tissue they starve the tissue of nutrients and add toxic drugs including antibiotics and they do not have control studies to see if it's the starvation and poisoning that is degrading the tissue rather than the 'virus' they allege to be in there somewhere. You want me to pinch you? Yep, I understand. Tom Cowan said this about the whole nonsensical farce as he explains what that quote from the CDC paper really means:

The shocking thing about the above quote is that using their own methods, the virologists found that solutions containing SARS-CoV-2 – even in high amounts – were NOT, I repeat NOT, infective to any of the three human tissue cultures they tested. In plain English, this means they proved, on their terms, that this ‘new coronavirus’ is not infectious to human beings. It is ONLY infective to monkey kidney cells, and only then when you add two potent drugs (gentamicin and amphotericin), known to be toxic to kidneys, to the mix.

My friends, read this again and again. These virologists, published by the CDC, performed a clear proof, on their terms, showing that the SARS-CoV-2 virus is harmless to human beings. That is the only possible conclusion, but, unfortunately, this result is not even mentioned in their conclusion. They simply say they can provide virus stocks cultured only on monkey Vero cells, thanks for coming.

Cowan concluded: ‘If people really understood how this “science” was done, I would hope they would storm the gates and demand honesty, transparency and truth.’ Dr Michael Yeadon, former Vice President and Chief Scientific Adviser at drug giant Pfizer has been a vocal critic of the ‘Covid vaccine’ and its potential for multiple harm. He said in an interview in April, 2021, that ‘not one [vaccine] has the virus. He was asked why vaccines normally using a ‘dead’ version of a disease to activate the immune system were not used for ‘Covid’ and instead we had the synthetic methods of the ‘mRNA Covid vaccine’. Yeadon said that to do the former ‘you’d have to have some of [the virus] wouldn’t you?’ He added: ‘No-one’s got any – seriously.’ Yeadon said that surely they couldn’t have fooled the whole world for a year without having a virus, ‘but oddly enough ask around – no one’s got it’. He didn’t know why with all the ‘great labs’ around the world that the virus had not been isolated – ‘Maybe they’ve been too busy running bad PCR tests and vaccines that people don’t need.’ What is today called ‘science’ is not ‘science’ at all. Science is no longer what is, but whatever people can be manipulated to *believe* that it is. Real science has been hijacked by the Cult to dispense and produce the ‘expert scientists’ and contentions that suit the agenda of the Cult. How big-time this has happened with the ‘Covid’ hoax which is entirely based on fake science delivered by fake ‘scientists’ and fake ‘doctors’. The human-caused climate change hoax is also entirely based on fake science delivered by fake ‘scientists’ and fake ‘climate experts’. In both cases real

scientists, climate experts and doctors have their views suppressed and deleted by the Cult-owned science establishment, media and Silicon Valley. This is the 'science' that politicians claim to be 'following' and a common denominator of 'Covid' and climate are Cult psychopaths Bill Gates and his mate Klaus Schwab at the Gates-funded World Economic Forum. But, don't worry, it's all just a coincidence and absolutely nothing to worry about. Zzzzzzzzz.

What is a 'virus' REALLY?

Dr Tom Cowan is one of many contesting the very existence of viruses let alone that they cause disease. This is understandable when there is no scientific evidence for a disease-causing 'virus'. German virologist Dr Stefan Lanka won a landmark case in 2017 in the German Supreme Court over his contention that there is no such thing as a measles virus. He had offered a big prize for anyone who could prove there is and Lanka won his case when someone sought to claim the money. There is currently a prize of more than 225,000 euros on offer from an Isolate Truth Fund for anyone who can prove the isolation of SARS-CoV-2 and its genetic substance. Lanka wrote in an article headed 'The Misconception Called Virus' that scientists think a 'virus' is causing tissue to become diseased and degraded when in fact it is the *processes they are using* which do that – not a 'virus'. Lanka has done an important job in making this point clear as Cowan did in his analysis of the CDC paper. Lanka says that all claims about viruses as disease-causing pathogens are wrong and based on 'easily recognisable, understandable and verifiable misinterpretations.' Scientists believed they were working with 'viruses' in their laboratories when they were really working with 'typical particles of specific dying tissues or cells ...' Lanka said that the tissue decaying process claimed to be caused by a 'virus' still happens when no alleged 'virus' is involved. It's the *process* that does the damage and not a 'virus'. The genetic sample is deprived of nutrients, removed from its energy supply through removal from the body and then doused in toxic antibiotics to remove any bacteria. He confirms again that establishment scientists do not (pinch me)

conduct control experiments to see if this is the case and if they did they would see the claims that 'viruses' are doing the damage is nonsense. He adds that during the measles 'virus' court case he commissioned an independent laboratory to perform just such a control experiment and the result was that the tissues and cells died in the exact same way as with alleged 'infected' material. This is supported by a gathering number of scientists, doctors and researchers who reject what is called 'germ theory' or the belief in the body being infected by contagious sources emitted by other people. Researchers Dawn Lester and David Parker take the same stance in their highly-detailed and sourced book *What Really Makes You Ill – Why everything you thought you knew about disease is wrong* which was recommended to me by a number of medical professionals genuinely seeking the truth. Lester and Parker say there is no provable scientific evidence to show that a 'virus' can be transmitted between people or people and animals or animals and people:

The definition also claims that viruses are the cause of many diseases, as if this has been definitively proven. But this is not the case; there is no original scientific evidence that definitively demonstrates that any virus is the cause of any disease. The burden of proof for any theory lies with those who proposed it; but none of the existing documents provides 'proof' that supports the claim that 'viruses' are pathogens.

Dr Tom Cowan employs one of his clever analogies to describe the process by which a 'virus' is named as the culprit for a disease when what is called a 'virus' is only material released by cells detoxing themselves from infiltration by chemical or radiation poisoning. The tidal wave of technologically-generated radiation in the 'smart' modern world plus all the toxic food and drink are causing this to happen more than ever. Deluded 'scientists' misread this as a gathering impact of what they wrongly label 'viruses'.

Paper can infect houses

Cowan said in an article for davidicke.com – with his tongue only mildly in his cheek – that he believed he had made a tremendous

discovery that may revolutionise science. He had discovered that small bits of paper are alive, 'well alive-ish', can 'infect' houses, and then reproduce themselves inside the house. The result was that this explosion of growth in the paper inside the house causes the house to explode, blowing it to smithereens. His evidence for this new theory is that in the past months he had carefully examined many of the houses in his neighbourhood and found almost no scraps of paper on the lawns and surrounds of the house. There was an occasional stray label, but nothing more. Then he would return to these same houses a week or so later and with a few, not all of them, particularly the old and decrepit ones, he found to his shock and surprise they were littered with stray bits of paper. He knew then that the paper had infected these houses, made copies of itself, and blew up the house. A young boy on a bicycle at one of the sites told him he had seen a demolition crew using dynamite to explode the house the previous week, but Cowan dismissed this as the idle thoughts of silly boys because 'I was on to something big'. He was on to how 'scientists' mistake genetic material in the detoxifying process for something they call a 'virus'. Cowan said of his house and paper story:

If this sounds crazy to you, it's because it should. This scenario is obviously nuts. But consider this admittedly embellished, for effect, current viral theory that all scientists, medical doctors and virologists currently believe.

He takes the example of the 'novel SARS-Cov2' virus to prove the point. First they take someone with an undefined illness called 'Covid-19' and don't even attempt to find any virus in their sputum. Never mind the scientists still describe how this 'virus', which they have not located attaches to a cell receptor, injects its genetic material, in 'Covid's' case, RNA, into the cell. The RNA once inserted exploits the cell to reproduce itself and makes 'thousands, nay millions, of copies of itself ... Then it emerges victorious to claim its next victim':

If you were to look in the scientific literature for proof, actual scientific proof, that uniform SARS-CoV2 viruses have been properly isolated from the sputum of a sick person, that actual spike proteins could be seen protruding from the virus (which has not been found), you would find that such evidence doesn't exist.

If you go looking in the published scientific literature for actual pictures, proof, that these spike proteins or any viral proteins are ever attached to any receptor embedded in any cell membrane, you would also find that no such evidence exists. If you were to look for a video or documented evidence of the intact virus injecting its genetic material into the body of the cell, reproducing itself and then emerging victorious by budding off the cell membrane, you would find that no such evidence exists.

The closest thing you would find is electron micrograph pictures of cellular particles, possibly attached to cell debris, both of which to be seen were stained by heavy metals, a process that completely distorts their architecture within the living organism. This is like finding bits of paper stuck to the blown-up bricks, thereby proving the paper emerged by taking pieces of the bricks on its way out.

The Enders baloney

Cowan describes the 'Covid' story as being just as make-believe as his paper story and he charts back this fantasy to a Nobel Prize winner called John Enders (1897-1985), an American biomedical scientist who has been dubbed 'The Father of Modern Vaccines'. Enders is claimed to have 'discovered' the process of the viral culture which 'proved' that a 'virus' caused measles. Cowan explains how Enders did this 'by using the EXACT same procedure that has been followed by every virologist to find and characterize every new virus since 1954'. Enders took throat swabs from children with measles and immersed them in 2ml of milk. Penicillin (100u/ml) and the antibiotic streptomycin (50,g/ml) were added and the whole mix was centrifuged – rotated at high speed to separate large cellular debris from small particles and molecules as with milk and cream, for example. Cowan says that if the aim is to find little particles of genetic material ('viruses') in the snot from children with measles it would seem that the last thing you would do is mix the snot with other material – milk –that also has genetic material. 'How are you ever going to know whether whatever you found came from the snot or the milk?' He points out that streptomycin is a 'nephrotoxic' or poisonous-to-the-kidney drug. You will see the relevance of that

shortly. Cowan says that it gets worse, much worse, when Enders describes the culture medium upon which the virus 'grows': 'The culture medium consisted of bovine amniotic fluid (90%), beef embryo extract (5%), horse serum (5%), antibiotics and phenol red as an indicator of cell metabolism.' Cowan asks incredulously: 'Did he just say that the culture medium also contained fluids and tissues that are themselves rich sources of genetic material?' The genetic cocktail, or 'medium', is inoculated onto tissue and cells from rhesus monkey *kidney* tissue. This is where the importance of streptomycin comes in and currently-used antimicrobials and other drugs that are *poisonous to kidneys* and used in ALL modern viral cultures (e.g. gentamicin, streptomycin, and amphotericin). Cowan asks: 'How are you ever going to know from this witch's brew where any genetic material comes from as we now have five different sources of rich genetic material in our mix?' Remember, he says, that all genetic material, whether from monkey kidney tissues, bovine serum, milk, etc., is made from the exact same components. The same central question returns: 'How are you possibly going to know that it was the virus that killed the kidney tissue and not the toxic antibiotic and starvation rations on which you are growing the tissue?' John Enders answered the question himself – *you can't*:

A second agent was obtained from an uninoculated culture of monkey kidney cells. The cytopathic changes [death of the cells] it induced in the unstained preparations could not be distinguished with confidence from the viruses isolated from measles.

The death of the cells ('cytopathic changes') happened in exactly the same manner, whether they inoculated the kidney tissue with the measles snot or not, Cowan says. 'This is evidence that the destruction of the tissue, the very proof of viral causation of illness, was not caused by anything in the snot because they saw the same destructive effect when the snot was not even used ... the cytopathic, i.e., cell-killing, changes come from the process of the culture itself, not from any virus in any snot, period.' Enders quotes in his 1957 paper a virologist called Ruckle as reporting similar findings 'and in addition has isolated an agent from monkey kidney tissue that is so

far indistinguishable from human measles virus'. In other words, Cowan says, these particles called 'measles viruses' are simply and clearly breakdown products of the starved and poisoned tissue. For measles 'virus' see all 'viruses' including the so-called 'Covid virus'. Enders, the 'Father of Modern Vaccines', also said:

There is a potential risk in employing cultures of primate cells for the production of vaccines composed of attenuated virus, since the presence of other agents possibly latent in primate tissues cannot be definitely excluded by any known method.

Cowan further quotes from a paper published in the journal *Viruses* in May, 2020, while the 'Covid pandemic' was well underway in the media if not in reality. 'EVs' here refers to particles of genetic debris from our own tissues, such as exosomes of which more in a moment: 'The remarkable resemblance between EVs and viruses has caused quite a few problems in the studies focused on the analysis of EVs released during viral infections.' Later the paper adds that to date a reliable method that can actually guarantee a complete separation (of EVs from viruses) DOES NOT EXIST. This was published at a time when a fairy tale 'virus' was claimed in total certainty to be causing a fairy tale 'viral disease' called 'Covid-19' – a fairy tale that was already well on the way to transforming human society in the image that the Cult has worked to achieve for so long. Cowan concludes his article:

To summarize, there is no scientific evidence that pathogenic viruses exist. What we think of as 'viruses' are simply the normal breakdown products of dead and dying tissues and cells. When we are well, we make fewer of these particles; when we are starved, poisoned, suffocated by wearing masks, or afraid, we make more.

There is no engineered virus circulating and making people sick. People in laboratories all over the world are making genetically modified products to make people sick. These are called vaccines. There is no virome, no 'ecosystem' of viruses, viruses are not 8%, 50% or 100 % of our genetic material. These are all simply erroneous ideas based on the misconception called a virus.

What is 'Covid'? Load of bollocks

The background described here by Cowan and Lanka was emphasised in the first video presentation that I saw by Dr Andrew Kaufman when he asked whether the 'Covid virus' was in truth a natural defence mechanism of the body called 'exosomes'. These are released by cells when in states of toxicity – see the same themes returning over and over. They are released ever more profusely as chemical and radiation toxicity increases and think of the potential effect therefore of 5G alone as its destructive frequencies infest the human energetic information field with a gathering pace (5G went online in Wuhan in 2019 as the 'virus' emerged). I'll have more about this later. Exosomes transmit a warning to the rest of the body that 'Houston, we have a problem'. Kaufman presented images of exosomes and compared them with 'Covid' under an electron microscope and the similarity was remarkable. They both attach to the same cell receptors (*claimed* in the case of 'Covid'), contain the same genetic material in the form of RNA or ribonucleic acid, and both are found in 'viral cell cultures' with damaged or dying cells. James Hildreth MD, President and Chief Executive Officer of the Meharry Medical College at Johns Hopkins, said: 'The virus is fully an exosome in every sense of the word.' Kaufman's conclusion was that there is no 'virus': 'This entire pandemic is a completely manufactured crisis ... there is no evidence of anyone dying from [this] illness.' Dr Tom Cowan and Sally Fallon Morell, authors of *The Contagion Myth*, published a statement with Dr Kaufman in February, 2021, explaining why the 'virus' does not exist and you can read it that in full in the Appendix.

'Virus' theory can be traced to the 'cell theory' in 1858 of German physician Rudolf Virchow (1821-1920) who contended that disease originates from a single cell infiltrated by a 'virus'. Dr Stefan Lanka said that findings and insights with respect to the structure, function and central importance of tissues in the creation of life, which were already known in 1858, comprehensively refute the cell theory. Virchow ignored them. We have seen the part later played by John Enders in the 1950s and Lanka notes that infection theories were only established as a global dogma through the policies and

eugenics of the Third Reich in Nazi Germany (creation of the same Sabbatian cult behind the 'Covid' hoax). Lanka said: 'Before 1933, scientists dared to contradict this theory; after 1933, these critical scientists were silenced'. Dr Tom Cowan's view is that ill-health is caused by too much of something, too little of something, or toxification from chemicals and radiation – not contagion. We must also highlight as a major source of the 'virus' theology a man still called the 'Father of Modern Virology' – Thomas Milton Rivers (1888-1962). There is no way given the Cult's long game policy that it was a coincidence for the 'Father of Modern Virology' to be director of the Rockefeller Institute for Medical Research from 1937 to 1956 when he is credited with making the Rockefeller Institute a leader in 'viral research'. Cult Rockefeller were the force behind the creation of Big Pharma 'medicine', established the World Health Organisation in 1948, and have long and close associations with the Gates family that now runs the WHO during the pandemic hoax through mega-rich Cult gofer and psychopath Bill Gates.

Only a Renegade Mind can see through all this bullshit by asking the questions that need to be answered, not taking 'no' or prevarication for an answer, and certainly not hiding from the truth in fear of speaking it. Renegade Minds have always changed the world for the better and they will change this one no matter how bleak it may currently appear to be.

CHAPTER SIX

Sequence of deceit

If you tell the truth, you don't have to remember anything
Mark Twain

Against the background that I have laid out this far the sequence that took us from an invented 'virus' in Cult-owned China in late 2019 to the fascist transformation of human society can be seen and understood in a whole new context.

We were told that a deadly disease had broken out in Wuhan and the world media began its campaign (coordinated by behavioural psychologists as we shall see) to terrify the population into unquestioning compliance. We were shown images of Chinese people collapsing in the street which never happened in the West with what was supposed to be the same condition. In the earliest days when alleged cases and deaths were few the fear register was hysterical in many areas of the media and this would expand into the common media narrative across the world. The real story was rather different, but we were never told that. The Chinese government, one of the Cult's biggest centres of global operation, said they had discovered a new illness with flu-like and pneumonia-type symptoms in a city with such toxic air that it is overwhelmed with flu-like symptoms, pneumonia and respiratory disease. Chinese scientists said it was a new – 'novel' – coronavirus which they called Sars-Cov-2 and that it caused a disease they labelled 'Covid-19'. There was no evidence for this and the 'virus' has never to this day been isolated, purified and its genetic code established from that. It

was from the beginning a computer-generated fiction. Stories of Chinese whistleblowers saying the number of deaths was being suppressed or that the 'new disease' was related to the Wuhan bio-lab misdirected mainstream and alternative media into cul-de-sacs to obscure the real truth – there was no 'virus'.

Chinese scientists took genetic material from the lung fluid of just a few people and said they had found a 'new' disease when this material had a wide range of content. There was no evidence for a 'virus' for the very reasons explained in the last two chapters. The 'virus' has never been shown to (a) exist and (b) cause any disease. People were diagnosed on symptoms that are so widespread in Wuhan and polluted China and with a PCR test that can't detect infectious disease. On this farce the whole global scam was sold to the rest of the world which would also diagnose respiratory disease as 'Covid-19' from symptoms alone or with a PCR test not testing for a 'virus'. Flu miraculously disappeared *worldwide* in 2020 and into 2021 as it was redesignated 'Covid-19'. It was really the same old flu with its 'flu-like' symptoms attributed to 'flu-like' 'Covid-19'. At the same time with very few exceptions the Chinese response of draconian lockdown and fascism was the chosen weapon to respond across the West as recommended by the Cult-owned Tedros at the Cult-owned World Health Organization run by the Cult-owned Gates. All was going according to plan. Chinese scientists – everything in China is controlled by the Cult-owned government – compared their contaminated RNA lung-fluid material with other RNA sequences and said it appeared to be just under 80 percent identical to the SARS-CoV-1 'virus' claimed to be the cause of the SARS (severe acute respiratory syndrome) 'outbreak' in 2003. They decreed that because of this the 'new virus' had to be related and they called it SARS-CoV-2. There are some serious problems with this assumption and *assumption* was all it was. Most 'factual' science turns out to be assumptions repeated into everyone-knows-that. A match of under 80-percent is meaningless. Dr Kaufman makes the point that there's a 96 percent genetic correlation between humans and chimpanzees, but 'no one would say our genetic material is part

of the chimpanzee family'. Yet the Chinese authorities were claiming that a much lower percentage, less than 80 percent, proved the existence of a new 'coronavirus'. For goodness sake human DNA is 60 percent similar to a *banana*.

You are feeling sleepy

The entire 'Covid' hoax is a global Psyop, a psychological operation to program the human mind into believing and fearing a complete fantasy. A crucial aspect of this was what *appeared* to happen in Italy. It was all very well streaming out daily images of an alleged catastrophe in Wuhan, but to the Western mind it was still on the other side of the world in a very different culture and setting. A reaction of 'this could happen to me and my family' was still nothing like as intense enough for the mind-doctors. The Cult needed a Western example to push people over that edge and it chose Italy, one of its major global locations going back to the Roman Empire. An Italian 'Covid' crisis was manufactured in a particular area called Lombardy which just happens to be notorious for its toxic air and therefore respiratory disease. Wuhan, China, *déjà vu*. An hysterical media told horror stories of Italians dying from 'Covid' in their droves and how Lombardy hospitals were being overrun by a tidal wave of desperately ill people needing treatment after being struck down by the 'deadly virus'. Here was the psychological turning point the Cult had planned. Wow, if this is happening in Italy, the Western mind concluded, this indeed could happen to me and my family. Another point is that Italian authorities responded by following the Chinese blueprint so vehemently recommended by the Cult-owned World Health Organization. They imposed fascistic lockdowns on the whole country viciously policed with the help of surveillance drones sweeping through the streets seeking out anyone who escaped from mass house arrest. Livelihoods were destroyed and psychology unravelled in the way we have witnessed since in all lockdown countries. Crucial to the plan was that Italy responded in this way to set the precedent of suspending freedom and imposing fascism in a 'Western liberal democracy'. I emphasised in an

animated video explanation on davidicke.com posted in the summer of 2020 how important it was to the Cult to expand the Chinese lockdown model across the West. Without this, and the bare-faced lie that non-symptomatic people could still transmit a 'disease' they didn't have, there was no way locking down the whole population, sick and not sick, could be pulled off. At just the right time and with no evidence Cult operatives and gofers claimed that people without symptoms could pass on the 'disease'. In the name of protecting the 'vulnerable' like elderly people, who lockdowns would kill by the tens of thousands, we had for the first time healthy people told to isolate as well as the sick. The great majority of people who tested positive had no symptoms because there was nothing wrong with them. It was just a trick made possible by a test not testing for the 'virus'.

Months after my animated video the Gates-funded Professor Neil Ferguson at the Gates-funded Imperial College confirmed that I was right. He didn't say it in those terms, naturally, but he did say it. Ferguson will enter the story shortly for his outrageously crazy 'computer models' that led to Britain, the United States and many other countries following the Chinese and now Italian methods of response. Put another way, following the Cult script. Ferguson said that SAGE, the UK government's scientific advisory group which has controlled 'Covid' policy from the start, wanted to follow the Chinese lockdown model (while they all continued to work and be paid), but they wondered if they could possibly, in Ferguson's words, 'get away with it in Europe'. 'Get away with it'? Who the hell do these moronic, arrogant people think they are? This appalling man Ferguson said that once Italy went into national lockdown they realised they, too, could mimic China:

It's a communist one-party state, we said. We couldn't get away with it in Europe, we thought ... and then Italy did it. And we realised we could. Behind this garbage from Ferguson is a simple fact: Doing the same as China in every country was the plan from the start and Ferguson's 'models' would play a central role in achieving that. It's just a coincidence, of course, and absolutely nothing to worry your little head about.

Oops, sorry, our mistake

Once the Italian segment of the Psyop had done the job it was designed to do a very different story emerged. Italian authorities revealed that 99 percent of those who had 'died from Covid-19' in Italy had one, two, three, or more 'co-morbidities' or illnesses and health problems that could have ended their life. The US Centers for Disease Control and Prevention (CDC) published a figure of 94 percent for Americans dying of 'Covid' while having other serious medical conditions – on average two to three (some five or six) other potential causes of death. In terms of death from an unproven 'virus' I say it is 100 percent. The other one percent in Italy and six percent in the US would presumably have died from 'Covid's' flu-like symptoms with a range of other possible causes in conjunction with a test not testing for the 'virus'. Fox News reported that even more startling figures had emerged in one US county in which 410 of 422 deaths attributed to 'Covid-19' had other potentially deadly health conditions. The Italian National Health Institute said later that the average age of people dying with a 'Covid-19' diagnosis in Italy was about 81. Ninety percent were over 70 with ten percent over 90. In terms of other reasons to die some 80 percent had two or more chronic diseases with half having three or more including cardiovascular problems, diabetes, respiratory problems and cancer. Why is the phantom 'Covid-19' said to kill overwhelmingly old people and hardly affect the young? Old people continually die of many causes and especially respiratory disease which you can re-diagnose 'Covid-19' while young people die in tiny numbers by comparison and rarely of respiratory disease. Old people 'die of Covid' because they die of other things that can be redesignated 'Covid' and it really is that simple.

Flu has flown

The blueprint was in place. Get your illusory 'cases' from a test not testing for the 'virus' and redesignate other causes of death as 'Covid-19'. You have an instant 'pandemic' from something that is nothing more than a computer-generated fiction. With near-on a

billion people having 'flu-like' symptoms every year the potential was limitless and we can see why flu quickly and apparently miraculously disappeared *worldwide* by being diagnosed 'Covid-19'. The painfully bloody obvious was explained away by the childlike media in headlines like this in the UK '*Independent*': 'Not a single case of flu detected by Public Health England this year as Covid restrictions suppress virus'. I kid you not. The masking, social distancing and house arrest that did not make the 'Covid virus' disappear somehow did so with the 'flu virus'. Even worse the article, by a bloke called Samuel Lovett, suggested that maybe the masking, sanitising and other 'Covid' measures should continue to keep the flu away. With a ridiculousness that disturbs your breathing (it's 'Covid-19') the said Lovett wrote: 'With widespread social distancing and mask-wearing measures in place throughout the UK, the usual routes of transmission for influenza have been blocked.' He had absolutely no evidence to support that statement, but look at the consequences of him acknowledging the obvious. With flu not disappearing at all and only being relabelled 'Covid-19' he would have to contemplate that 'Covid' was a hoax on a scale that is hard to imagine. You need guts and commitment to truth to even go there and that's clearly something Samuel Lovett does not have in abundance. He would never have got it through the editors anyway.

Tens of thousands die in the United States alone every winter from flu including many with pneumonia complications. CDC figures record *45 million* Americans diagnosed with flu in 2017-2018 of which 61,000 died and some reports claim 80,000. Where was the same hysteria then that we have seen with 'Covid-19'? Some 250,000 Americans are admitted to hospital with pneumonia every year with about 50,000 cases proving fatal. About 65 million suffer respiratory disease every year and three million deaths makes this the third biggest cause of death worldwide. You only have to redesignate a portion of all these people 'Covid-19' and you have an instant global pandemic or the *appearance* of one. Why would doctors do this? They are told to do this and all but a few dare not refuse those who must be obeyed. Doctors in general are not researching their own

knowledge and instead take it direct and unquestioned from the authorities that own them and their careers. The authorities say they must now diagnose these symptoms 'Covid-19' and not flu, or whatever, and they do it. Dark suits say put 'Covid-19' on death certificates no matter what the cause of death and the doctors do it. Renegade Minds don't fall for the illusion that doctors and medical staff are all highly-intelligent, highly-principled, seekers of medical truth. *Some are*, but not the majority. They are repeaters, gofers, and yes sir, no sir, purveyors of what the system demands they purvey. The 'Covid' con is not merely confined to diseases of the lungs. Instructions to doctors to put 'Covid-19' on death certificates for anyone dying of *anything* within 28 days (or much more) of a positive test not testing for the 'virus' opened the floodgates. The term dying *with* 'Covid' and not *of* 'Covid' was coined to cover the truth. Whether it was a *with* or an *of* they were all added to the death numbers attributed to the 'deadly virus' compiled by national governments and globally by the Gates-funded Johns Hopkins operation in the United States that was so involved in those 'pandemic' simulations. Fraudulent deaths were added to the ever-growing list of fraudulent 'cases' from false positives from a false test. No wonder Professor Walter Ricciardi, scientific advisor to the Italian minister of health, said after the Lombardy hysteria had done its job that 'Covid' death rates were due to Italy having the second oldest population in the world and to *how hospitals record deaths*:

The way in which we code deaths in our country is very generous in the sense that all the people who die in hospitals with the coronavirus are deemed to be dying of the coronavirus. On re-evaluation by the National Institute of Health, only 12 per cent of death certificates have shown a direct causality from coronavirus, while 88 per cent of patients who have died have at least one pre-morbidity – many had two or three.

This is extraordinary enough when you consider the propaganda campaign to use Italy to terrify the world, but how can they even say twelve percent were genuine when the 'virus' has not been shown to exist, its 'code' is a computer program, and diagnosis comes from a test not testing for it? As in China, and soon the world, 'Covid-19' in

Italy was a redesignation of diagnosis. Lies and corruption were to become the real 'pandemic' fuelled by a pathetically-compliant medical system taking its orders from the tiny few at the top of their national hierarchy who answered to the World Health Organization which answers to Gates and the Cult. Doctors were told – ordered – to diagnose a particular set of symptoms 'Covid-19' and put that on the death certificate for any cause of death if the patient had tested positive with a test not testing for the virus or had 'Covid' symptoms like the flu. The United States even introduced big financial incentives to manipulate the figures with hospitals receiving £4,600 from the Medicare system for diagnosing someone with regular pneumonia, \$13,000 if they made the diagnosis from the same symptoms 'Covid-19' pneumonia, and \$39,000 if they put a 'Covid' diagnosed patient on a ventilator that would almost certainly kill them. A few – painfully and pathetically few – medical whistleblowers revealed (before Cult-owned YouTube deleted their videos) that they had been instructed to 'let the patient crash' and put them straight on a ventilator instead of going through a series of far less intrusive and dangerous methods as they would have done before the pandemic hoax began and the financial incentives kicked in. We are talking cold-blooded murder given that ventilators are so damaging to respiratory systems they are usually the last step before heaven awaits. Renegade Minds never fall for the belief that people in white coats are all angels of mercy and cannot be full-on psychopaths. I have explained in detail in *The Answer* how what I am describing here played out across the world coordinated by the World Health Organization through the medical hierarchies in almost every country.

Medical scientist calls it

Information about the non-existence of the 'virus' began to emerge for me in late March, 2020, and mushroomed after that. I was sent an email by Sir Julian Rose, a writer, researcher, and organic farming promotor, from a medical scientist friend of his in the United States. Even at that early stage in March the scientist was able to explain

how the 'Covid' hoax was being manipulated. He said there were no reliable tests for a specific 'Covid-19 virus' and nor were there any reliable agencies or media outlets for reporting numbers of actual 'Covid-19' cases. We have seen in the long period since then that he was absolutely right. 'Every action and reaction to Covid-19 is based on totally flawed data and we simply cannot make accurate assessments,' he said. Most people diagnosed with 'Covid-19' were showing nothing more than cold and flu-like symptoms 'because most coronavirus strains *are* nothing more than cold/flu-like symptoms'. We had farcical situations like an 84-year-old German man testing positive for 'Covid-19' and his nursing home ordered to quarantine only for him to be found to have a common cold. The scientist described back then why PCR tests and what he called the 'Mickey Mouse test kits' were useless for what they were claimed to be identifying. 'The idea these kits can isolate a specific virus like Covid-19 is nonsense,' he said. Significantly, he pointed out that 'if you want to create a totally false panic about a totally false pandemic – pick a coronavirus'. This is exactly what the Cult-owned Gates, World Economic Forum and Johns Hopkins University did with their Event 201 'simulation' followed by their real-life simulation called the 'pandemic'. The scientist said that all you had to do was select the sickest of people with respiratory-type diseases in a single location – 'say Wuhan' – and administer PCR tests to them. You can then claim that anyone showing 'viral sequences' similar to a coronavirus 'which will inevitably be quite a few' is suffering from a 'new' disease:

Since you already selected the sickest flu cases a fairly high proportion of your sample will go on to die. You can then say this 'new' virus has a CFR [case fatality rate] higher than the flu and use this to infuse more concern and do more tests which will of course produce more 'cases', which expands the testing, which produces yet more 'cases' and so on and so on. Before long you have your 'pandemic', and all you have done is use a simple test kit trick to convert the worst flu and pneumonia cases into something new that doesn't ACTUALLY EXIST [my emphasis].

He said that you then 'just run the same scam in other countries' and make sure to keep the fear message running high 'so that people

will feel panicky and less able to think critically'. The only problem to overcome was the fact *there is no* actual new deadly pathogen and only regular sick people. This meant that deaths from the 'new deadly pathogen' were going to be way too low for a real new deadly virus pandemic, but he said this could be overcome in the following ways – all of which would go on to happen:

1. You can claim this is just the beginning and more deaths are imminent [you underpin this with fantasy 'computer projections']. Use this as an excuse to quarantine everyone and then claim the quarantine prevented the expected millions of dead.
2. You can [say that people] 'minimizing' the dangers are irresponsible and bully them into not talking about numbers.
3. You can talk crap about made up numbers hoping to blind people with pseudoscience.
4. You can start testing well people (who, of course, will also likely have shreds of coronavirus [RNA] in them) and thus inflate your 'case figures' with 'asymptomatic carriers' (you will of course have to spin that to sound deadly even though any virologist knows the more symptom-less cases you have the less deadly is your pathogen).

The scientist said that if you take these simple steps 'you can have your own entirely manufactured pandemic up and running in weeks'. His analysis made so early in the hoax was brilliantly prophetic of what would actually unfold. Pulling all the information together in these recent chapters we have this is simple 1, 2, 3, of how you can delude virtually the entire human population into believing in a 'virus' that doesn't exist:

- A 'Covid case' is someone who tests positive with a test not testing for the 'virus'.
- A 'Covid death' is someone who dies of *any cause* within 28 days (or much longer) of testing positive with a test not testing for the 'virus'.
- Asymptomatic means there is nothing wrong with you, but they claim you can pass on what you don't have to justify locking

down (quarantining) healthy people in totality.

The foundations of the hoax are that simple. A study involving ten million people in Wuhan, published in November, 2020, demolished the whole lie about those without symptoms passing on the 'virus'. They found '300 asymptomatic cases' and traced their contacts to find that not one of them was detected with the 'virus'.

'Asymptomatic' patients and their contacts were isolated for no less than two weeks and nothing changed. I know it's all crap, but if you are going to claim that those without symptoms can transmit 'the virus' then you must produce evidence for that and they never have. Even World Health Organization official Dr Maria Van Kerkhove, head of the emerging diseases and zoonosis unit, said as early as June, 2020, that she doubted the validity of asymptomatic transmission. She said that 'from the data we have, it still seems to be rare that an asymptomatic person actually transmits onward to a secondary individual' and by 'rare' she meant that she couldn't cite any case of asymptomatic transmission.

The Ferguson factor

The problem for the Cult as it headed into March, 2020, when the script had lockdown due to start, was that despite all the manipulation of the case and death figures they still did not have enough people alleged to have died from 'Covid' to justify mass house arrest. This was overcome in the way the scientist described: 'You can claim this is just the beginning and more deaths are imminent ... Use this as an excuse to quarantine everyone and then claim the quarantine prevented the expected millions of dead.' Enter one Professor Neil Ferguson, the Gates-funded 'epidemiologist' at the Gates-funded Imperial College in London. Ferguson is Britain's Christian Drosten in that he has a dire record of predicting health outcomes, but is still called upon to advise government on the next health outcome when another 'crisis' comes along. This may seem to be a strange and ridiculous thing to do. Why would you keep turning for policy guidance to people who have a history of being

monumentally wrong? Ah, but it makes sense from the Cult point of view. These 'experts' keep on producing predictions that suit the Cult agenda for societal transformation and so it was with Neil Ferguson as he revealed his horrific (and clearly insane) computer model predictions that allowed lockdowns to be imposed in Britain, the United States and many other countries. Ferguson does not have even an A-level in biology and would appear to have no formal training in computer modelling, medicine or epidemiology, according to Derek Winton, an MSc in Computational Intelligence. He wrote an article somewhat aghast at what Ferguson did which included taking no account of respiratory disease 'seasonality' which means it is far worse in the winter months. Who would have thought that respiratory disease could be worse in the winter? Well, certainly not Ferguson.

The massively China-connected Imperial College and its bizarre professor provided the excuse for the long-incubated Chinese model of human control to travel westward at lightning speed. Imperial College confirms on its website that it collaborates with the Chinese Research Institute; publishes more than 600 research papers every year with Chinese research institutions; has 225 Chinese staff; 2,600 Chinese students – the biggest international group; 7,000 former students living in China which is the largest group outside the UK; and was selected for a tour by China's President Xi Jinping during his state visit to the UK in 2015. The college takes major donations from China and describes itself as the UK's number one university collaborator with Chinese research institutions. The China communist/fascist government did not appear phased by the woeful predictions of Ferguson and Imperial when during the lockdown that Ferguson induced the college signed a five-year collaboration deal with China tech giant Huawei that will have Huawei's indoor 5G network equipment installed at the college's West London tech campus along with an 'AI cloud platform'. The deal includes Chinese sponsorship of Imperial's Venture Catalyst entrepreneurship competition. Imperial is an example of the enormous influence the Chinese government has within British and North American

universities and research centres – and further afield. Up to 200 academics from more than a dozen UK universities are being investigated on suspicion of ‘unintentionally’ helping the Chinese government build weapons of mass destruction by ‘transferring world-leading research in advanced military technology such as aircraft, missile designs and cyberweapons’. Similar scandals have broken in the United States, but it’s all a coincidence. Imperial College serves the agenda in many other ways including the promotion of every aspect of the United Nations Agenda 21/2030 (the Great Reset) and produced computer models to show that human-caused ‘climate change’ is happening when in the real world it isn’t. Imperial College is driving the climate agenda as it drives the ‘Covid’ agenda (both Cult hoaxes) while Patrick Vallance, the UK government’s Chief Scientific Adviser on ‘Covid’, was named Chief Scientific Adviser to the UN ‘climate change’ conference known as COP26 hosted by the government in Glasgow, Scotland. ‘Covid’ and ‘climate’ are fundamentally connected.

Professor Woeful

From Imperial’s bosom came Neil Ferguson still advising government despite his previous disasters and it was announced early on that he and other key people like UK Chief Medical Adviser Chris Whitty had caught the ‘virus’ as the propaganda story was being sold. Somehow they managed to survive and we had Prime Minister Boris Johnson admitted to hospital with what was said to be a severe version of the ‘virus’ in this same period. His whole policy and demeanour changed when he returned to Downing Street. It’s a small world with these government advisors – especially in their communal connections to Gates – and Ferguson had partnered with Whitty to write a paper called ‘Infectious disease: Tough choices to reduce Ebola transmission’ which involved another scare-story that didn’t happen. Ferguson’s ‘models’ predicted that up to 150,000 could die from ‘mad cow disease’, or BSE, and its version in sheep if it was transmitted to humans. BSE was not transmitted and instead triggered by an organophosphate pesticide used to treat a pest on

cows. Fewer than 200 deaths followed from the human form. Models by Ferguson and his fellow incompetents led to the unnecessary culling of millions of pigs, cattle and sheep in the foot and mouth outbreak in 2001 which destroyed the lives and livelihoods of farmers and their families who had often spent decades building their herds and flocks. Vast numbers of these animals did not have foot and mouth and had no contact with the infection. Another 'expert' behind the cull was Professor Roy Anderson, a computer modeller at Imperial College specialising in the epidemiology of *human*, not animal, disease. Anderson has served on the Bill and Melinda Gates Grand Challenges in Global Health advisory board and chairs another Gates-funded organisation. Gates is everywhere.

In a precursor to the 'Covid' script Ferguson backed closing schools 'for prolonged periods' over the swine flu 'pandemic' in 2009 and said it would affect a third of the world population if it continued to spread at the speed he claimed to be happening. His mates at Imperial College said much the same and a news report said: 'One of the authors, the epidemiologist and disease modeller Neil Ferguson, who sits on the World Health Organisation's emergency committee for the outbreak, said the virus had "full pandemic potential".' Professor Liam Donaldson, the Chris Whitty of his day as Chief Medical Officer, said the worst case could see 30 percent of the British people infected by swine flu with 65,000 dying. Ferguson and Donaldson were indeed proved correct when at the end of the year the number of deaths attributed to swine flu was 392. The term 'expert' is rather liberally applied unfortunately, not least to complete idiots. Swine flu 'projections' were great for GlaxoSmithKline (GSK) as millions rolled in for its Pandemrix influenza vaccine which led to brain damage with children most affected. The British government (taxpayers) paid out more than £60 million in compensation after GSK was given immunity from prosecution. Yet another 'Covid' déjà vu. Swine flu was supposed to have broken out in Mexico, but Dr Wolfgang Wodarg, a German doctor, former member of parliament and critic of the 'Covid' hoax, observed 'the spread of swine flu' in Mexico City at the time. He

said: 'What we experienced in Mexico City was a very mild flu which did not kill more than usual – which killed even fewer people than usual.' Hying the fear against all the facts is not unique to 'Covid' and has happened many times before. Ferguson is reported to have over-estimated the projected death toll of bird flu (H5N1) by some three million-fold, but bird flu vaccine makers again made a killing from the scare. This is some of the background to the Neil Ferguson who produced the perfectly-timed computer models in early 2020 predicting that half a million people would die in Britain without draconian lockdown and 2.2 million in the United States. Politicians panicked, people panicked, and lockdowns of alleged short duration were instigated to 'flatten the curve' of cases gleaned from a test not testing for the 'virus'. I said at the time that the public could forget the 'short duration' bit. This was an agenda to destroy the livelihoods of the population and force them into mass control through dependency and there was going to be nothing 'short' about it. American researcher Daniel Horowitz described the consequences of the 'models' spewed out by Gates-funded Ferguson and Imperial College:

What led our government and the governments of many other countries into panic was a single Imperial College of UK study, funded by global warming activists, that predicted 2.2 million deaths if we didn't lock down the country. In addition, the reported 8-9% death rate in Italy scared us into thinking there was some other mutation of this virus that they got, which might have come here.

Together with the fact that we were finally testing and had the ability to actually report new cases, we thought we were headed for a death spiral. But again ... we can't flatten a curve if we don't know when the curve started.

How about it *never* started?

Giving them what they want

An investigation by German news outlet *Welt Am Sonntag* (*World on Sunday*) revealed how in March, 2020, the German government gathered together 'leading scientists from several research institutes and universities' and 'together, they were to produce a [modelling]

paper that would serve as legitimization for further tough political measures'. The Cult agenda was justified by computer modelling not based on evidence or reality; it was specifically constructed to justify the Cult demand for lockdowns all over the world to destroy the independent livelihoods of the global population. All these modellers and everyone responsible for the 'Covid' hoax have a date with a trial like those in Nuremberg after World War Two when Nazis faced the consequences of their war crimes. These corrupt-beyond-belief 'modellers' wrote the paper according to government instructions and it said that that if lockdown measures were lifted then up to one million Germans would die from 'Covid-19' adding that some would die 'agonizingly at home, gasping for breath' unable to be treated by hospitals that couldn't cope. All lies. No matter – it gave the Cult all that it wanted. What did long-time government 'modeller' Neil Ferguson say? If the UK and the United States didn't lockdown half a million would die in Britain and 2.2 million Americans. Anyone see a theme here? 'Modellers' are such a crucial part of the lockdown strategy that we should look into their background and follow the money. Researcher Rosemary Frei produced an excellent article headlined 'The Modelling-paper Mafiosi'. She highlights a guy called John Edmunds, a British epidemiologist, and professor in the Faculty of Epidemiology and Population Health at the London School of Hygiene & Tropical Medicine. He studied at Imperial College. Edmunds is a member of government 'Covid' advisory bodies which have been dictating policy, the New and Emerging Respiratory Virus Threats Advisory Group (NERVTAG) and the Scientific Advisory Group for Emergencies (SAGE).

Ferguson, another member of NERVTAG and SAGE, led the way with the original 'virus' and Edmunds has followed in the 'variant' stage and especially the so-called UK or Kent variant known as the 'Variant of Concern' (VOC) B.1.1.7. He said in a co-written report for the Centre for Mathematical modelling of Infectious Diseases at the London School of Hygiene and Tropical Medicine, with input from the Centre's 'Covid-19' Working Group, that there was 'a realistic

possibility that VOC B.1.1.7 is associated with an increased risk of death compared to non-VOC viruses'. Fear, fear, fear, get the vaccine, fear, fear, fear, get the vaccine. Rosemary Frei reveals that almost all the paper's authors and members of the modelling centre's 'Covid-19' Working Group receive funding from the Bill and Melinda Gates Foundation and/or the associated Gates-funded Wellcome Trust. The paper was published by e-journal *Medrx* *χiv* which only publishes papers not peer-reviewed and the journal was established by an organisation headed by Facebook's Mark Zuckerberg and his missus. What a small world it is. Frei discovered that Edmunds is on the Scientific Advisory Board of the Coalition for Epidemic Preparedness Innovations (CEPI) which was established by the Bill and Melinda Gates Foundation, Klaus Schwab's Davos World Economic Forum and Big Pharma giant Wellcome. CEPI was 'launched in Davos [in 2017] to develop vaccines to stop future epidemics', according to its website. 'Our mission is to accelerate the development of vaccines against emerging infectious diseases and enable equitable access to these vaccines for people during outbreaks.' What kind people they are. Rosemary Frei reveals that Public Health England (PHE) director Susan Hopkins is an author of her organisation's non-peer-reviewed reports on 'new variants'. Hopkins is a professor of infectious diseases at London's Imperial College which is gifted tens of millions of dollars a year by the Bill and Melinda Gates Foundation. Gates-funded modelling disaster Neil Ferguson also co-authors Public Health England reports and he spoke in December, 2020, about the potential danger of the B.1.1.7. 'UK variant' promoted by Gates-funded modeller John Edmunds. When I come to the 'Covid vaccines' the 'new variants' will be shown for what they are – bollocks.

Connections, connections

All these people and modellers are lockdown-obsessed or, put another way, they demand what the Cult demands. Edmunds said in January, 2021, that to ease lockdowns too soon would be a disaster and they had to 'vaccinate much, much, much more widely than the

elderly'. Rosemary Frei highlights that Edmunds is married to Jeanne Pimenta who is described in a LinkedIn profile as director of epidemiology at GlaxoSmithKline (GSK) and she held shares in the company. Patrick Vallance, co-chair of SAGE and the government's Chief Scientific Adviser, is a former executive of GSK and has a deferred bonus of shares in the company worth £600,000. GSK has serious business connections with Bill Gates and is collaborating with mRNA-'vaccine' company CureVac to make 'vaccines' for the new variants that Edmunds is talking about. GSK is planning a 'Covid vaccine' with drug giant Sanofi. Puppets Prime Minister Boris Johnson announced in the spring of 2021 that up to 60 million vaccine doses were to be made at the GSK facility at Barnard Castle in the English North East. Barnard Castle, with a population of just 6,000, was famously visited in breach of lockdown rules in April, 2020, by Johnson aide Dominic Cummings who said that he drove there 'to test his eyesight' before driving back to London. Cummings would be better advised to test his integrity – not that it would take long. The GSK facility had nothing to do with his visit then although I'm sure Patrick Vallance would have been happy to arrange an introduction and some tea and biscuits. Ruthless psychopath Gates has made yet another fortune from vaccines in collaboration with Big Pharma companies and gushes at the phenomenal profits to be made from vaccines – more than a 20-to-1 return as he told one interviewer. Gates also tweeted in December, 2019, with the foreknowledge of what was coming: 'What's next for our foundation? I'm particularly excited about what the next year could mean for one of the best buys in global health: vaccines.'

Modeller John Edmunds is a big promoter of vaccines as all these people appear to be. He's the dean of the London School of Hygiene & Tropical Medicine's Faculty of Epidemiology and Population Health which is primarily funded by the Bill and Melinda Gates Foundation and the Gates-established and funded GAVI vaccine alliance which is the Gates vehicle to vaccinate the world. The organisation Doctors Without Borders has described GAVI as being 'aimed more at supporting drug-industry desires to promote new

products than at finding the most efficient and sustainable means for fighting the diseases of poverty'. But then that's why the psychopath Gates created it. John Edmunds said in a video that the London School of Hygiene & Tropical Medicine is involved in every aspect of vaccine development including large-scale clinical trials. He contends that mathematical modelling can show that vaccines protect individuals and society. That's on the basis of shit in and shit out, I take it. Edmunds serves on the UK Vaccine Network as does Ferguson and the government's foremost 'Covid' adviser, the grim-faced, dark-eyed Chris Whitty. The Vaccine Network says it works 'to support the government to identify and shortlist targeted investment opportunities for the most promising vaccines and vaccine technologies that will help combat infectious diseases with epidemic potential, and to address structural issues related to the UK's broader vaccine infrastructure'. Ferguson is acting Director of the Imperial College Vaccine Impact Modelling Consortium which has funding from the Bill and Melina Gates Foundation and the Gates-created GAVI 'vaccine alliance'. Anyone wonder why these characters see vaccines as the answer to every problem? Ferguson is wildly enthusiastic in his support for GAVI's campaign to vaccinate children en masse in poor countries. You would expect someone like Gates who has constantly talked about the need to reduce the population to want to fund vaccines to keep more people alive. I'm sure that's why he does it. The John Edmunds London School of Hygiene & Tropical Medicine (LSHTM) has a Vaccines Manufacturing Innovation Centre which develops, tests and commercialises vaccines. Rosemary Frei writes:

The vaccines centre also performs affiliated activities like combating 'vaccine hesitancy'. The latter includes the Vaccine Confidence Project. The project's stated purpose is, among other things, 'to provide analysis and guidance for early response and engagement with the public to ensure sustained confidence in vaccines and immunisation'. The Vaccine Confidence Project's director is LSHTM professor Heidi Larson. For more than a decade she's been researching how to combat vaccine hesitancy.

How the bloody hell can blokes like John Edmunds and Neil Ferguson with those connections and financial ties model 'virus' case

and death projections for the government and especially in a way that gives their paymasters like Gates exactly what they want? It's insane, but this is what you find throughout the world.

'Covid' is not dangerous, oops, wait, yes it is

Only days before Ferguson's nightmare scenario made Jackboot Johnson take Britain into a China-style lockdown to save us from a deadly 'virus' the UK government website gov.uk was reporting something very different to Ferguson on a page of official government guidance for 'high consequence infectious diseases (HCID)'. It said this about 'Covid-19':

As of 19 March 2020, COVID-19 is no longer considered to be a high consequence infectious diseases (HCID) in the UK [my emphasis]. The 4 nations public health HCID group made an interim recommendation in January 2020 to classify COVID-19 as an HCID. This was based on consideration of the UK HCID criteria about the virus and the disease with information available during the early stages of the outbreak.

Now that more is known about COVID-19, the public health bodies in the UK have reviewed the most up to date information about COVID-19 against the UK HCID criteria. They have determined that several features have now changed; in particular, more information is available about mortality rates (low overall), and there is now greater clinical awareness and a specific and sensitive laboratory test, the availability of which continues to increase. The Advisory Committee on Dangerous Pathogens (ACDP) is also of the opinion that COVID-19 should no longer be classified as an HCID.

Soon after the government had been exposed for downgrading the risk they upgraded it again and everyone was back to singing from the same Cult hymn book. Ferguson and his fellow Gates clones indicated that lockdowns and restrictions would have to continue until a Gates-funded vaccine was developed. Gates said the same because Ferguson and his like were repeating the Gates script which is the Cult script. 'Flatten the curve' became an ongoing nightmare of continuing lockdowns with periods in between of severe restrictions in pursuit of destroying independent incomes and had nothing to do with protecting health about which the Cult gives not a shit. Why wouldn't Ferguson be pushing a vaccine 'solution' when he's owned by vaccine-obsessive Gates who makes a fortune from them and

when Ferguson heads the Vaccine Impact Modelling Consortium at Imperial College funded by the Gates Foundation and GAVI, the 'vaccine alliance', created by Gates as his personal vaccine promotion operation? To compound the human catastrophe that Ferguson's 'models' did so much to create he was later exposed for breaking his own lockdown rules by having sexual liaisons with his married girlfriend Antonia Staats at his home while she was living at another location with her husband and children. Staats was a 'climate' activist and senior campaigner at the Soros-funded Avaaz which I wouldn't trust to tell me that grass is green. Ferguson had to resign as a government advisor over this hypocrisy in May, 2020, but after a period of quiet he was back being quoted by the ridiculous media on the need for more lockdowns and a vaccine rollout. Other government-advising 'scientists' from Imperial College held the fort in his absence and said lockdown could be indefinite until a vaccine was found. The Cult script was being sung by the payrolled choir. I said there was no intention of going back to 'normal' when the 'vaccine' came because the 'vaccine' is part of a very different agenda that I will discuss in Human 2.0. Why would the Cult want to let the world go back to normal when destroying that normal forever was the whole point of what was happening? House arrest, closing businesses and schools through lockdown, (un)social distancing and masks all followed the Ferguson fantasy models. Again as I predicted (these people are so predictable) when the 'vaccine' arrived we were told that house arrest, lockdown, (un)social distancing and masks would still have to continue. I will deal with the masks in the next chapter because they are of fundamental importance.

Where's the 'pandemic'?

Any mildly in-depth assessment of the figures revealed what was really going on. Cult-funded and controlled organisations still have genuine people working within them such is the number involved. So it is with Genevieve Briand, assistant program director of the Applied Economics master's degree program at Johns Hopkins

University. She analysed the impact that 'Covid-19' had on deaths from *all* causes in the United States using official data from the CDC for the period from early February to early September, 2020. She found that allegedly 'Covid' *related*-deaths exceeded those from heart disease which she found strange with heart disease always the biggest cause of fatalities. Her research became even more significant when she noted the sudden decline in 2020 of *all* non-'Covid' deaths: 'This trend is completely contrary to the pattern observed in all previous years ... the total decrease in deaths by other causes almost exactly equals the increase in deaths by Covid-19.' This was such a game, set and match in terms of what was happening that Johns Hopkins University deleted the article on the grounds that it 'was being used to support false and dangerous inaccuracies about the impact of the pandemic'. No – because it exposed the scam from official CDC figures and this was confirmed when those figures were published in January, 2021. Here we can see the effect of people dying from heart attacks, cancer, road accidents and gunshot wounds – *anything* – having 'Covid-19' on the death certificate along with those diagnosed from 'symptoms' who had even not tested positive with a test not testing for the 'virus'. I am not kidding with the gunshot wounds, by the way. Brenda Bock, coroner in Grand County, Colorado, revealed that two gunshot victims tested positive for the 'virus' within the previous 30 days and were therefore classified as 'Covid deaths'. Bock said: 'These two people had tested positive for Covid, but that's not what killed them. A gunshot wound is what killed them.' She said she had not even finished her investigation when the state listed the gunshot victims as deaths due to the 'virus'. The death and case figures for 'Covid-19' are an absolute joke and yet they are repeated like parrots by the media, politicians and alleged medical 'experts'. The official Cult narrative is the only show in town.

Genevieve Briand found that deaths from all causes were not exceptional in 2020 compared with previous years and a Spanish magazine published figures that said the same about Spain which was a 'Covid' propaganda hotspot at one point. *Discovery Salud*, a

health and medicine magazine, quoted government figures which showed how 17,000 *fewer* people died in Spain in 2020 than in 2019 and more than 26,000 fewer than in 2018. The age-standardised mortality rate for England and Wales when age distribution is taken into account was significantly lower in 2020 than the 1970s, 80s and 90s, and was only the ninth highest since 2000. Where is the 'pandemic'?

Post mortems and autopsies virtually disappeared for 'Covid' deaths amid claims that 'virus-infected' bodily fluids posed a risk to those carrying out the autopsy. This was rejected by renowned German pathologist and forensic doctor Klaus Püschel who said that he and his staff had by then done 150 autopsies on 'Covid' patients with no problems at all. He said they were needed to know why some 'Covid' patients suffered blood clots and not severe respiratory infections. The 'virus' is, after all, called SARS or 'severe acute respiratory syndrome'. I highlighted in the spring of 2020 this phenomenon and quoted New York intensive care doctor Cameron Kyle-Sidell who posted a soon deleted YouTube video to say that they had been told to prepare to treat an infectious disease called 'Covid-19', but that was not what they were dealing with. Instead he likened the lung condition of the most severely ill patients to what you would expect with cabin depressurisation in a plane at 30,000 feet or someone dropped on the top of Everest without oxygen or acclimatisation. I have never said this is not happening to a small minority of alleged 'Covid' patients – I am saying this is not caused by a phantom 'contagious virus'. Indeed Kyle-Sidell said that 'Covid-19' was not the disease they were told was coming their way. 'We are operating under a medical paradigm that is untrue,' he said, and he believed they were treating the wrong disease: 'These people are being slowly starved of oxygen.' Patients would take off their oxygen masks in a state of fear and stress and while they were blue in the face on the brink of death. They did not look like patients dying of pneumonia. You can see why they don't want autopsies when their virus doesn't exist and there is another condition in some people that they don't wish to be uncovered. I should add here that

the 5G system of millimetre waves was being rapidly introduced around the world in 2020 and even more so now as they fire 5G at the Earth from satellites. At 60 gigahertz within the 5G range that frequency interacts with the oxygen molecule and stops people breathing in sufficient oxygen to be absorbed into the bloodstream. They are installing 5G in schools and hospitals. The world is not mad or anything. 5G can cause major changes to the lungs and blood as I detail in *The Answer* and these consequences are labelled 'Covid-19', the alleged symptoms of which can be caused by 5G and other electromagnetic frequencies as cells respond to radiation poisoning.

The 'Covid death' scam

Dr Scott Jensen, a Minnesota state senator and medical doctor, exposed 'Covid' Medicare payment incentives to hospitals and death certificate manipulation. He said he was sent a seven-page document by the US Department of Health 'coaching' him on how to fill out death certificates which had never happened before. The document said that he didn't need to have a laboratory test for 'Covid-19' to put that on the death certificate and that shocked him when death certificates are supposed to be about facts. Jensen described how doctors had been 'encouraged, if not pressured' to make a diagnosis of 'Covid-19' if they thought it was probable or '*presumed*'. No positive test was necessary – not that this would have mattered anyway. He said doctors were told to diagnose 'Covid' by symptoms when these were the same as colds, allergies, other respiratory problems, and certainly with influenza which 'disappeared' in the 'Covid' era. A common sniffle was enough to get the dreaded verdict. Ontario authorities decreed that a single care home resident with *one* symptom from a long list must lead to the isolation of the entire home. Other courageous doctors like Jensen made the same point about death figure manipulation and how deaths by other causes were falling while 'Covid-19 deaths' were rising at the same rate due to re-diagnosis. Their videos rarely survive long on YouTube with its Cult-supporting algorithms courtesy of CEO Susan Wojcicki and her bosses at Google. Figure-tampering was so glaring

and ubiquitous that even officials were letting it slip or outright saying it. UK chief scientific adviser Patrick Vallance said on one occasion that 'Covid' on the death certificate doesn't mean 'Covid' was the cause of death (so why the hell is it there?) and we had the rare sight of a BBC reporter telling the truth when she said: 'Someone could be successfully treated for Covid, in say April, discharged, and then in June, get run over by a bus and die ... That person would still be counted as a Covid death in England.' Yet the BBC and the rest of the world media went on repeating the case and death figures as if they were real. Illinois Public Health Director Dr Ngozi Ezike revealed the deceit while her bosses must have been clenching their buttocks:

If you were in a hospice and given a few weeks to live and you were then found to have Covid that would be counted as a Covid death. [There might be] a clear alternate cause, but it is still listed as a Covid death. So everyone listed as a Covid death doesn't mean that was the cause of the death, but that they had Covid at the time of death.

Yes, a 'Covid virus' never shown to exist and tested for with a test not testing for the 'virus'. In the first period of the pandemic hoax through the spring of 2020 the process began of designating almost everything a 'Covid' death and this has continued ever since. I sat in a restaurant one night listening to a loud conversation on the next table where a family was discussing in bewilderment how a relative who had no symptoms of 'Covid', and had died of a long-term problem, could have been diagnosed a death by the 'virus'. I could understand their bewilderment. If they read this book they will know why this medical fraud has been perpetrated the world over.

Some media truth shock

The media ignored the evidence of death certificate fraud until eventually one columnist did speak out when she saw it first-hand. Bel Mooney is a long-time national newspaper journalist in Britain currently working for the *Daily Mail*. Her article on February 19th, 2021, carried this headline: 'My dad Ted passed three Covid tests

and died of a chronic illness yet he's officially one of Britain's 120,000 victims of the virus and is far from alone ... so how many more are there?' She told how her 99-year-old father was in a care home with a long-standing chronic obstructive pulmonary disease and vascular dementia. Maybe, but he was still aware enough to tell her from the start that there was no 'virus' and he refused the 'vaccine' for that reason. His death was not unexpected given his chronic health problems and Mooney said she was shocked to find that 'Covid-19' was declared the cause of death on his death certificate. She said this was a 'bizarre and unacceptable untruth' for a man with long-time health problems who had tested negative twice at the home for the 'virus'. I was also shocked by this story although not by what she said. I had been highlighting the death certificate manipulation for ten months. It was the confirmation that a professional full-time journalist only realised this was going on when it affected her directly and neither did she know that whether her dad tested positive or negative was irrelevant with the test not testing for the 'virus'. Where had she been? She said she did not believe in 'conspiracy theories' without knowing I'm sure that this and 'conspiracy theorists' were terms put into widespread circulation by the CIA in the 1960s to discredit those who did not accept the ridiculous official story of the Kennedy assassination. A blanket statement of 'I don't believe in conspiracy theories' is always bizarre. The dictionary definition of the term alone means the world is drowning in conspiracies. What she said was even more daft when her dad had just been affected by the 'Covid' conspiracy. Why else does she think that 'Covid-19' was going on the death certificates of people who died of something else?

To be fair once she saw from personal experience what was happening she didn't mince words. Mooney was called by the care home on the morning of February 9th to be told her father had died in his sleep. When she asked for the official cause of death what came back was 'Covid-19'. Mooney challenged this and was told there had been deaths from Covid on the dementia floor (confirmed by a test not testing for the 'virus') so they considered it 'reasonable

to assume'. 'But doctor,' Mooney rightly protested, 'an assumption isn't a diagnosis.' She said she didn't blame the perfectly decent and sympathetic doctor – 'he was just doing his job'. Sorry, but that's *bullshit*. He wasn't doing his job at all. He was putting a false cause of death on the death certificate and that is a criminal offence for which he should be brought to account and the same with the millions of doctors worldwide who have done the same. They were not doing their job they were following orders and that must not wash at new Nuremberg trials any more than it did at the first ones. Mooney's doctor was 'assuming' (presuming) as he was told to, but 'just following orders' makes no difference to his actions. A doctor's job is to serve the patient and the truth, not follow orders, but that's what they have done all over the world and played a central part in making the 'Covid' hoax possible with all its catastrophic consequences for humanity. Shame on them and they must answer for their actions. Mooney said her disquiet worsened when she registered her father's death by telephone and was told by the registrar there had been very many other cases like hers where 'the deceased' had not tested positive for 'Covid' yet it was recorded as the cause of death. The test may not matter, but those involved at their level *think* it matters and it shows a callous disregard for accurate diagnosis. The pressure to do this is coming from the top of the national 'health' pyramids which in turn obey the World Health Organization which obeys Gates and the Cult. Mooney said the registrar agreed that this must distort the national figures adding that 'the strangest thing is that every winter we record countless deaths from flu, and this winter there have been none. Not one!' She asked if the registrar thought deaths from flu were being misdiagnosed and lumped together with 'Covid' deaths. The answer was a 'puzzled yes'. Mooney said that the funeral director said the same about 'Covid' deaths which had nothing to do with 'Covid'. They had lost count of the number of families upset by this and other funeral companies in different countries have had the same experience. Mooney wrote:

The nightly shroud-waving and shocking close-ups of pain imposed on us by the TV news bewildered and terrified the population into eager compliance with lockdowns. We were invited to 'save the NHS' and to grieve for strangers – the real-life loved ones behind those shocking death counts. Why would the public imagine what I now fear, namely that the way Covid-19 death statistics are compiled might make the numbers seem greater than they are?

Oh, just a little bit – like 100 percent.

Do the maths

Mooney asked why a country would wish to skew its mortality figures by wrongly certifying deaths? What had been going on? Well, if you don't believe in conspiracies you will never find the answer which is that *it's a conspiracy*. She did, however, describe what she had discovered as a 'national scandal'. In reality it's a global scandal and happening everywhere. Pillars of this conspiracy were all put into place before the button was pressed with the Drosten PCR protocol and high amplifications to produce the cases and death certificate changes to secure illusory 'Covid' deaths. Mooney notes that normally two doctors were needed to certify a death, with one having to know the patient, and how the rules were changed in the spring of 2020 to allow one doctor to do this. In the same period 'Covid deaths' were decreed to be all cases where Covid-19 was put on the death certificate even without a positive test or any symptoms. Mooney asked: 'How many of the 30,851 (as of January 15) care home resident deaths with Covid-19 on the certificate (32.4 per cent of all deaths so far) were based on an assumption, like that of my father? And what has that done to our national psyche?' All of them is the answer to the first question and it has devastated and dismantled the national psyche, actually the global psyche, on a colossal scale. In the UK case and death data is compiled by organisations like Public Health England (PHE) and the Office for National Statistics (ONS). Mooney highlights the insane policy of counting a death from any cause as 'Covid-19' if this happens within 28 days of a positive test (with a test not testing for the 'virus') and she points out that ONS statistics reflect deaths 'involving Covid' 'or due to Covid' which meant in practice any

death where 'Covid-19' was mentioned on the death certificate. She described the consequences of this fraud:

Most people will accept the narrative they are fed, so panicky governments here and in Europe witnessed the harsh measures enacted in totalitarian China and jumped into lockdown. Headlines about Covid deaths tolled like the knell that would bring doomsday to us all. Fear stalked our empty streets. Politicians parroted the frankly ridiculous aim of 'zero Covid' and shut down the economy, while most British people agreed that lockdown was essential and (astonishingly to me, as a patriotic Brit) even wanted more restrictions.

For what? Lies on death certificates? Never mind the grim toll of lives ruined, suicides, schools closed, rising inequality, depression, cancelled hospital treatments, cancer patients in a torture of waiting, poverty, economic devastation, loneliness, families kept apart, and so on. How many lives have been lost as a direct result of lockdown?

She said that we could join in a national chorus of shock and horror at reaching the 120,000 death toll which was surely certain to have been totally skewed all along, but what about the human cost of lockdown justified by these 'death figures'? *The British Medical Journal* had reported a 1,493 percent increase in cases of children taken to Great Ormond Street Hospital with abusive head injuries alone and then there was the effect on families:

Perhaps the most shocking thing about all this is that families have been kept apart – and obeyed the most irrational, changing rules at the whim of government – because they believed in the statistics. They succumbed to fear, which his generation rejected in that war fought for freedom. Dad (God rest his soul) would be angry. And so am I.

Another theme to watch is that in the winter months when there are more deaths from all causes they focus on 'Covid' deaths and in the summer when the British Lung Foundation says respiratory disease plummets by 80 percent they rage on about 'cases'. Either way fascism on population is always the answer.

Nazi eugenics in the 21st century

Elderly people in care homes have been isolated from their families month after lonely month with no contact with relatives and grandchildren who were banned from seeing them. We were told

that lockdown fascism was to 'protect the vulnerable' like elderly people. At the same time Do Not Resuscitate (DNR) orders were placed on their medical files so that if they needed resuscitation it wasn't done and 'Covid-19' went on their death certificates. Old people were not being 'protected' they were being culled – murdered in truth. DNR orders were being decreed for disabled and young people with learning difficulties or psychological problems. The UK Care Quality Commission, a non-departmental body of the Department of Health and Social Care, found that 34 percent of those working in health and social care were pressured into placing 'do not attempt cardiopulmonary resuscitation' orders on 'Covid' patients who suffered from disabilities and learning difficulties without involving the patient or their families in the decision. UK judges ruled that an elderly woman with dementia should have the DNA-manipulating 'Covid vaccine' against her son's wishes and that a man with severe learning difficulties should have the job despite his family's objections. Never mind that many had already died. The judiciary always supports doctors and government in fascist dictatorships. They wouldn't dare do otherwise. A horrific video was posted showing fascist officers from Los Angeles police forcibly giving the 'Covid' shot to women with special needs who were screaming that they didn't want it. The same fascists are seen giving the jab to a sleeping elderly woman in a care home. This is straight out of the Nazi playbook. Hitler's Nazis committed mass murder of the mentally ill and physically disabled throughout Germany and occupied territories in the programme that became known as Aktion T4, or just T4. Sabbatian-controlled Hitler and his grotesque crazies set out to kill those they considered useless and unnecessary. The Reich Committee for the Scientific Registering of Hereditary and Congenital Illnesses registered the births of babies identified by physicians to have 'defects'. By 1941 alone more than 5,000 children were murdered by the state and it is estimated that in total the number of innocent people killed in Aktion T4 was between 275,000 and 300,000. Parents were told their children had been sent away for 'special treatment' never to return. It is rather pathetic to see claims about plans for new extermination camps being dismissed today

when the same force behind current events did precisely that 80 years ago. Margaret Sanger was a Cult operative who used 'birth control' to sanitise her programme of eugenics. Organisations she founded became what is now Planned Parenthood. Sanger proposed that 'the whole dysgenic population would have its choice of segregation or sterilization'. These included epileptics, 'feeble-minded', and prostitutes. Sanger opposed charity because it perpetuated 'human waste'. She reveals the Cult mentality and if anyone thinks that extermination camps are a 'conspiracy theory' their naivety is touching if breathtakingly stupid.

If you don't believe that doctors can act with callous disregard for their patients it is worth considering that doctors and medical staff agreed to put government-decreed DNR orders on medical files and do nothing when resuscitation is called for. I don't know what you call such people in your house. In mine they are Nazis from the Josef Mengele School of Medicine. Phenomenal numbers of old people have died worldwide from the effects of lockdown, depression, lack of treatment, the 'vaccine' (more later) and losing the will to live. A common response at the start of the manufactured pandemic was to remove old people from hospital beds and transfer them to nursing homes. The decision would result in a mass cull of elderly people in those homes through lack of treatment – *not* 'Covid'. Care home whistleblowers have told how once the 'Covid' era began doctors would not come to their homes to treat patients and they were begging for drugs like antibiotics that often never came. The most infamous example was ordered by New York governor Andrew Cuomo, brother of a moronic CNN host, who amazingly was given an Emmy Award for his handling of the 'Covid crisis' by the ridiculous Wokers that hand them out. Just how ridiculous could be seen in February, 2021, when a Department of Justice and FBI investigation began into how thousands of old people in New York died in nursing homes after being discharged from hospital to make way for 'Covid' patients on Cuomo's say-so – and how he and his staff covered up these facts. This couldn't have happened to a nicer psychopath. Even then there was a 'Covid' spin. Reports said that

thousands of old people who tested positive for 'Covid' in hospital were transferred to nursing homes to both die of 'Covid' and transmit it to others. No – they were in hospital because they were ill and the fact that they tested positive with a test not testing for the 'virus' is irrelevant. They were ill often with respiratory diseases ubiquitous in old people near the end of their lives. Their transfer out of hospital meant that their treatment stopped and many would go on to die.

They're old. Who gives a damn?

I have exposed in the books for decades the Cult plan to cull the world's old people and even to introduce at some point what they call a 'demise pill' which at a certain age everyone would take and be out of here by law. In March, 2021, Spain legalised euthanasia and assisted suicide following the Netherlands, Belgium, Luxembourg and Canada on the Tiptoe to the demise pill. Treatment of old people by many 'care' homes has been a disgrace in the 'Covid' era. There are many, many, caring staff – I know some. There have, however, been legions of stories about callous treatment of old people and their families. Police were called when families came to take their loved ones home in the light of isolation that was killing them. They became prisoners of the state. Care home residents in insane, fascist Ontario, Canada, were not allowed to leave their *room* once the 'Covid' hoax began. UK staff have even wheeled elderly people away from windows where family members were talking with them. Oriana Criscuolo from Stockport in the English North West dropped off some things for her 80-year-old father who has Parkinson's disease and dementia and she wanted to wave to him through a ground-floor window. She was told that was 'illegal'. When she went anyway they closed the curtains in the middle of the day. Oriana said:

It's just unbelievable. I cannot understand how care home staff – people who are being paid to care – have become so uncaring. Their behaviour is inhumane and cruel. It's beyond belief.

She was right and this was not a one-off. What a way to end your life in such loveless circumstances. UK registered nurse Nicky Millen, a proper old school nurse for 40 years, said that when she started her career care was based on dignity, choice, compassion and empathy. Now she said 'the things that are important to me have gone out of the window.' She was appalled that people were dying without their loved ones and saying goodbye on iPads. Nicky described how a distressed 89-year-old lady stroked her face and asked her 'how many paracetamol would it take to finish me off'. Life was no longer worth living while not seeing her family. Nicky said she was humiliated in front of the ward staff and patients for letting the lady stroke her face and giving her a cuddle. Such is the dehumanisation that the 'Covid' hoax has brought to the surface. Nicky worked in care homes where patients told her they were being held prisoner. 'I want to live until I die', one said to her. 'I had a lady in tears because she hadn't seen her great-grandson.' Nicky was compassionate old school meeting psychopathic New Normal. She also said she had worked on a 'Covid' ward with no 'Covid' patients. Jewish writer Shai Held wrote an article in March, 2020, which was headlined 'The Staggering, Heartless Cruelty Toward the Elderly'. What he described was happening from the earliest days of lockdown. He said 'the elderly' were considered a group and not unique individuals (the way of the Woke). Shai Held said:

Notice how the all-too-familiar rhetoric of dehumanization works: 'The elderly' are bunched together as a faceless mass, all of them considered culprits and thus effectively deserving of the suffering the pandemic will inflict upon them. Lost entirely is the fact that the elderly are individual human beings, each with a distinctive face and voice, each with hopes and dreams, memories and regrets, friendships and marriages, loves lost and loves sustained.

'The elderly' have become another dehumanised group for which anything goes and for many that has resulted in cold disregard for their rights and their life. The distinctive face that Held talks about is designed to be deleted by masks until everyone is part of a faceless mass.

'War-zone' hospitals myth

Again and again medical professionals have told me what was really going on and how hospitals 'overrun like war zones' according to the media were virtually empty. The mantra from medical whistleblowers was please don't use my name or my career is over. Citizen journalists around the world sneaked into hospitals to film evidence exposing the 'war-zone' lie. They really *were* largely empty with closed wards and operating theatres. I met a hospital worker in my town on the Isle of Wight during the first lockdown in 2020 who said the only island hospital had never been so quiet. Lockdown was justified by the psychopaths to stop hospitals being overrun. At the same time that the island hospital was near-empty the military arrived here to provide *extra beds*. It was all propaganda to ramp up the fear to ensure compliance with fascism as were never-used temporary hospitals with thousands of beds known as Nightingales and never-used make-shift mortuaries opened by the criminal UK government. A man who helped to install those extra island beds attributed to the army said they were never used and the hospital was empty. Doctors and nurses 'stood around talking or on their phones, wandering down to us to see what we were doing'. There were no masks or social distancing. He accused the useless local island paper, the *County Press*, of 'pumping the fear as if our hospital was overrun and we only have one so it should have been'. He described ambulances parked up with crews outside in deck chairs. When his brother called an ambulance he was told there was a two-hour backlog which he called 'bullshit'. An old lady on the island fell 'and was in a bad way', but a caller who rang for an ambulance was told the situation wasn't urgent enough. Ambulance stations were working under capacity while people would hear ambulances with sirens blaring driving through the streets. When those living near the stations realised what was going on they would follow them as they left, circulated around an urban area with the sirens going, and then came back without stopping. All this was to increase levels of fear and the same goes for the 'ventilator shortage crisis' that cost tens of millions for hastily produced ventilators never to be used.

Ambulance crews that agreed to be exploited in this way for fear propaganda might find themselves a mirror. I wish them well with that. Empty hospitals were the obvious consequence of treatment and diagnoses of non-'Covid' conditions cancelled and those involved handed a death sentence. People have been dying at home from undiagnosed and untreated cancer, heart disease and other life-threatening conditions to allow empty hospitals to deal with a 'pandemic' that wasn't happening.

Death of the innocent

'War-zones' have been laying off nursing staff, even doctors where they can. There was no work for them. Lockdown was justified by saving lives and protecting the vulnerable they were actually killing with DNR orders and preventing empty hospitals being 'overrun'. In Britain the mantra of stay at home to 'save the NHS' was everywhere and across the world the same story was being sold when it was all lies. Two California doctors, Dan Erickson and Artin Massihi at Accelerated Urgent Care in Bakersfield, held a news conference in April, 2020, to say that intensive care units in California were 'empty, essentially', with hospitals shutting floors, not treating patients and laying off doctors. The California health system was working at minimum capacity 'getting rid of doctors because we just don't have the volume'. They said that people with conditions such as heart disease and cancer were not coming to hospital out of fear of 'Covid-19'. Their video was deleted by Susan Wojcicki's Cult-owned YouTube after reaching five million views. Florida governor Ron Desantis, who rejected the severe lockdowns of other states and is being targeted for doing so, said that in March, 2020, every US governor was given models claiming they would run out of hospital beds in days. That was never going to happen and the 'modellers' knew it. Deceit can be found at every level of the system. Urgent children's operations were cancelled including fracture repairs and biopsies to spot cancer. Eric Nicholls, a consultant paediatrician, said 'this is obviously concerning and we need to return to normal operating and to increase capacity as soon as possible'. Psychopaths

in power were rather less concerned *because* they are psychopaths. Deletion of urgent care and diagnosis has been happening all over the world and how many kids and others have died as a result of the actions of these cold and heartless lunatics dictating 'health' policy? The number must be stratospheric. Richard Sullivan, professor of cancer and global health at King's College London, said people feared 'Covid' more than cancer such was the campaign of fear. 'Years of lost life will be quite dramatic', Sullivan said, with 'a huge amount of avoidable mortality'. Sarah Woolnough, executive director for policy at Cancer Research UK, said there had been a 75 percent drop in urgent referrals to hospitals by family doctors of people with suspected cancer. Sullivan said that 'a lot of services have had to scale back – we've seen a dramatic decrease in the amount of elective cancer surgery'. Lockdown deaths worldwide has been absolutely fantastic with the *New York Post* reporting how data confirmed that 'lockdowns end more lives than they save':

There was a sharp decline in visits to emergency rooms and an increase in fatal heart attacks because patients didn't receive prompt treatment. Many fewer people were screened for cancer. Social isolation contributed to excess deaths from dementia and Alzheimer's.

Researchers predicted that the social and economic upheaval would lead to tens of thousands of "deaths of despair" from drug overdoses, alcoholism and suicide. As unemployment surged and mental-health and substance-abuse treatment programs were interrupted, the reported levels of anxiety, depression and suicidal thoughts increased dramatically, as did alcohol sales and fatal drug overdoses.

This has been happening while nurses and other staff had so much time on their hands in the 'war-zones' that Tic-Tok dancing videos began appearing across the Internet with medical staff dancing around in empty wards and corridors as people died at home from causes that would normally have been treated in hospital.

Mentions in dispatches

One brave and truth-committed whistleblower was Louise Hampton, a call handler with the UK NHS who made a viral Internet video saying she had done 'fuck all' during the 'pandemic'

which was 'a load of bollocks'. She said that 'Covid-19' was rebranded flu and of course she lost her job. This is what happens in the medical and endless other professions now when you tell the truth. Louise filmed inside 'war-zone' accident and emergency departments to show they were empty and I mean *empty* as in no one there. The mainstream media could have done the same and blown the gaff on the whole conspiracy. They haven't to their eternal shame. Not that most 'journalists' seem capable of manifesting shame as with the psychopaths they slavishly repeat without question. The relative few who were admitted with serious health problems were left to die alone with no loved ones allowed to see them because of 'Covid' rules and they included kids dying without the comfort of mum and dad at their bedside while the evil behind this couldn't give a damn. It was all good fun to them. A Scottish NHS staff nurse publicly quit in the spring of 2021 saying: 'I can no longer be part of the lies and the corruption by the government.' She said hospitals 'aren't full, the beds aren't full, beds have been shut, wards have been shut'. Hospitals were never busy throughout 'Covid'. The staff nurse said that Nicola Sturgeon, tragically the leader of the Scottish government, was on television saying save the hospitals and the NHS – 'but the beds are empty' and 'we've not seen flu, we always see flu every year'. She wrote to government and spoke with her union Unison (the unions are Cult-compromised and *useless*, but nothing changed. Many of her colleagues were scared of losing their jobs if they spoke out as they wanted to. She said nursing staff were being affected by wearing masks all day and 'my head is splitting every shift from wearing a mask'. The NHS is part of the fascist tyranny and must be dismantled so we can start again with human beings in charge. (Ironically, hospitals were reported to be busier again when official 'Covid' cases *fell* in spring/summer of 2021 and many other conditions required treatment at the same time as *the fake vaccine rollout*.)

I will cover the 'Covid vaccine' scam in detail later, but it is another indicator of the sickening disregard for human life that I am highlighting here. The DNA-manipulating concoctions do not fulfil

the definition of a 'vaccine', have never been used on humans before and were given only emergency approval because trials were not completed and they continued using the unknowing public. The result was what a NHS senior nurse with responsibility for 'vaccine' procedure said was 'genocide'. She said the 'vaccines' were not 'vaccines'. They had not been shown to be safe and claims about their effectiveness by drug companies were 'poetic licence'. She described what was happening as a 'horrid act of human annihilation'. The nurse said that management had instigated a policy of not providing a Patient Information Leaflet (PIL) before people were 'vaccinated' even though health care professionals are supposed to do this according to protocol. Patients should also be told that they are taking part in an ongoing clinical trial. Her challenges to what is happening had seen her excluded from meetings and ridiculed in others. She said she was told to 'watch my step ... or I would find myself surplus to requirements'. The nurse, who spoke anonymously in fear of her career, said she asked her NHS manager why he/she was content with taking part in genocide against those having the 'vaccines'. The reply was that everyone had to play their part and to 'put up, shut up, and get it done'. Government was 'leaning heavily' on NHS management which was clearly leaning heavily on staff. This is how the global 'medical' hierarchy operates and it starts with the Cult and its World Health Organization.

She told the story of a doctor who had the Pfizer jab and when questioned had no idea what was in it. The doctor had never read the literature. We have to stop treating doctors as intellectual giants when so many are moral and medical pygmies. The doctor did not even know that the 'vaccines' were not fully approved or that their trials were ongoing. They were, however, asking their patients if they minded taking part in follow-ups for research purposes – yes, the *ongoing clinical trial*. The nurse said the doctor's ignorance was not rare and she had spoken to a hospital consultant who had the jab without any idea of the background or that the 'trials' had not been completed. Nurses and pharmacists had shown the same ignorance.

'My NHS colleagues have forsaken their duty of care, broken their code of conduct – Hippocratic Oath – and have been brainwashed just the same as the majority of the UK public through propaganda ...' She said she had not been able to recruit a single NHS colleague, doctor, nurse or pharmacist to stand with her and speak out. Her union had refused to help. She said that if the genocide came to light she would not hesitate to give evidence at a Nuremberg-type trial against those in power who could have affected the outcomes but didn't.

And all for what?

To put the nonsense into perspective let's say the 'virus' does exist and let's go completely crazy and accept that the official manipulated figures for cases and deaths are accurate. *Even then* a study by Stanford University epidemiologist Dr John Ioannidis published on the World Health Organization website produced an average infection to fatality rate of ... *0.23 percent!* Ioannidis said: 'If one could sample equally from all locations globally, the median infection fatality rate might even be substantially lower than the 0.23% observed in my analysis.' For healthy people under 70 it was ... *0.05 percent!* This compares with the 3.4 percent claimed by the Cult-owned World Health Organization when the hoax was first played and maximum fear needed to be generated. An updated Stanford study in April, 2021, put the 'infection' to 'fatality' rate at just 0.15 percent. Another team of scientists led by Megan O'Driscoll and Henrik Salje studied data from 45 countries and published their findings on the Nature website. For children and young people the figure is so small it virtually does not register although authorities will be hyping dangers to the young when they introduce DNA-manipulating 'vaccines' for children. The O'Driscoll study produced an average infection-fatality figure of 0.003 for children from birth to four; 0.001 for 5 to 14; 0.003 for 15 to 19; and it was still only 0.456 up to 64. To claim that children must be 'vaccinated' to protect them from 'Covid' is an obvious lie and so there must be another reason and there is. What's more the average age of a 'Covid' death is akin

to the average age that people die in general. The average age of death in England is about 80 for men and 83 for women. The average age of death from alleged 'Covid' is between 82 and 83. California doctors, Dan Erickson and Artin Massihi, said at their April media conference that projection models of millions of deaths had been 'woefully inaccurate'. They produced detailed figures showing that Californians had a 0.03 chance of dying from 'Covid' based on the number of people who tested positive (with a test not testing for the 'virus'). Erickson said there was a 0.1 percent chance of dying from 'Covid' in the *state* of New York, not just the city, and a 0.05 percent chance in Spain, a centre of 'Covid-19' hysteria at one stage. The Stanford studies supported the doctors' data with fatality rate estimates of 0.23 and 0.15 percent. How close are these figures to my estimate of *zero*? Death-rate figures claimed by the World Health Organization at the start of the hoax were some 15 times higher. The California doctors said there was no justification for lockdowns and the economic devastation they caused. Everything they had ever learned about quarantine was that you quarantine the *sick* and not the healthy. They had never seen this before and it made no medical sense.

Why in the in the light of all this would governments and medical systems the world over say that billions must go under house arrest; lose their livelihood; in many cases lose their mind, their health and their life; force people to wear masks dangerous to health and psychology; make human interaction and even family interaction a criminal offence; ban travel; close restaurants, bars, watching live sport, concerts, theatre, and any activity involving human togetherness and discourse; and closing schools to isolate children from their friends and cause many to commit suicide in acts of hopelessness and despair? The California doctors said lockdown consequences included increased child abuse, partner abuse, alcoholism, depression, and other impacts they were seeing every day. Who would do that to the entire human race if not mentally-ill psychopaths of almost unimaginable extremes like Bill Gates? We must face the reality of what we are dealing with and come out of

denial. Fascism and tyranny are made possible only by the target population submitting and acquiescing to fascism and tyranny. The whole of human history shows that to be true. Most people naively and unquestioning believed what they were told about a 'deadly virus' and meekly and weakly submitted to house arrest. Those who didn't believe it – at least in total – still submitted in fear of the consequences of not doing so. For the rest who wouldn't submit draconian fines have been imposed, brutal policing by psychopaths *for* psychopaths, and condemnation from the meek and weak who condemn the Pushbackers on behalf of the very force that has them, too, in its gunights. 'Pathetic' does not even begin to suffice. Britain's brainless 'Health' Secretary Matt Hancock warned anyone lying to border officials about returning from a list of 'hotspot' countries could face a jail sentence of up to ten years which is more than for racially-aggravated assault, incest and attempting to have sex with a child under 13. Hancock is a lunatic, but he has the state apparatus behind him in a Cult-led chain reaction and the same with UK 'Vaccine Minister' Nadhim Zahawi, a prominent member of the mega-Cult secret society, Le Cercle, which featured in my earlier books. The Cult enforces its will on governments and medical systems; government and medical systems enforce their will on business and police; business enforces its will on staff who enforce it on customers; police enforce the will of the Cult on the population and play their essential part in creating a world of fascist control that their own children and grandchildren will have to live in their entire lives. It is a hierarchical pyramid of imposition and acquiescence and, yes indeed, of clinical insanity.

Does anyone bright enough to read this book have to ask what the answer is? I think not, but I will reveal it anyway in the fewest of syllables: Tell the psychos and their moronic lackeys to fuck off and let's get on with our lives. We are many – They are few.

CHAPTER SEVEN

War on your mind

One believes things because one has been conditioned to believe them

Aldous Huxley, Brave New World

I have described the 'Covid' hoax as a 'Psyop' and that is true in every sense and on every level in accordance with the definition of that term which is psychological warfare. Break down the 'Covid pandemic' to the foundation themes and it is psychological warfare on the human individual and collective mind.

The same can be said for the entire human belief system involving every subject you can imagine. Huxley was right in his contention that people believe what they are conditioned to believe and this comes from the repetition throughout their lives of the same falsehoods. They spew from government, corporations, media and endless streams of 'experts' telling you what the Cult wants you to believe and often believing it themselves (although *far* from always). 'Experts' are rewarded with 'prestigious' jobs and titles and as agents of perceptual programming with regular access to the media. The Cult has to control the narrative – control *information* – or they lose control of the vital, crucial, without-which-they-cannot-prevail public perception of reality. The foundation of that control today is the Internet made possible by the Defense Advanced Research Projects Agency (DARPA), the incredibly sinister technological arm of the Pentagon. The Internet is the result of military technology.

DARPA openly brags about establishing the Internet which has been a long-term project to lasso the minds of the global population. I have said for decades the plan is to control information to such an extreme that eventually no one would see or hear anything that the Cult does not approve. We are closing in on that end with ferocious censorship since the 'Covid' hoax began and in my case it started back in the 1990s in terms of books and speaking venues. I had to create my own publishing company in 1995 precisely because no one else would publish my books even then. I think they're all still running.

Cult Internet

To secure total control of information they needed the Internet in which pre-programmed algorithms can seek out 'unclean' content for deletion and even stop it being posted in the first place. The Cult had to dismantle print and non-Internet broadcast media to ensure the transfer of information to the appropriate-named 'Web' – a critical expression of the *Cult* web. We've seen the ever-quickening demise of traditional media and control of what is left by a tiny number of corporations operating worldwide. Independent journalism in the mainstream is already dead and never was that more obvious than since the turn of 2020. The Cult wants all information communicated via the Internet to globally censor and allow the plug to be pulled any time. Lockdowns and forced isolation has meant that communication between people has been through electronic means and no longer through face-to-face discourse and discussion. Cult psychopaths have targeted the bars, restaurants, sport, venues and meeting places in general for this reason. None of this is by chance and it's to stop people gathering in any kind of privacy or number while being able to track and monitor all Internet communications and block them as necessary. Even private messages between individuals have been censored by these fascists that control Cult fronts like Facebook, Twitter, Google and YouTube which are all officially run by Sabbatian place-people and from the background by higher-level Sabbatian place people.

Facebook, Google, Amazon and their like were seed-funded and supported into existence with money-no-object infusions of funds either directly or indirectly from DARPA and CIA technology arm In-Q-Tel. The Cult plays the long game and prepares very carefully for big plays like 'Covid'. Amazon is another front in the psychological war and pretty much controls the global market in book sales and increasingly publishing. Amazon's limitless funds have deleted fantastic numbers of independent publishers to seize global domination on the way to deciding which books can be sold and circulated and which cannot. Moves in that direction are already happening. Amazon's leading light Jeff Bezos is the grandson of Lawrence Preston Gise who worked with DARPA predecessor ARPA. Amazon has big connections to the CIA and the Pentagon. The plan I have long described went like this:

1. Employ military technology to establish the Internet.
2. Sell the Internet as a place where people can freely communicate without censorship and allow that to happen until the Net becomes the central and irreversible pillar of human society. If the Internet had been highly censored from the start many would have rejected it.
3. Fund and manipulate major corporations into being to control the circulation of information on your Internet using cover stories about geeks in garages to explain how they came about. Give them unlimited funds to expand rapidly with no need to make a profit for years while non-Cult companies who need to balance the books cannot compete. You know that in these circumstances your Googles, YouTubes, Facebooks and Amazons are going to secure near monopolies by either crushing or buying up the opposition.
4. Allow freedom of expression on both the Internet and communication platforms to draw people in until the Internet is the central and irreversible pillar of human society and your communication corporations have reached a stage of near monopoly domination.
5. Then unleash your always-planned frenzy of censorship on the basis of 'where else are you going to go?' and continue to expand that until nothing remains that the Cult does not want its human targets to see.

The process was timed to hit the 'Covid' hoax to ensure the best chance possible of controlling the narrative which they knew they had to do at all costs. They were, after all, about to unleash a 'deadly virus' that didn't really exist. If you do that in an environment of free-flowing information and opinion you would be dead in the

water before you could say Gates is a psychopath. The network was in place through which the Cult-created-and-owned World Health Organization could dictate the 'Covid' narrative and response policy slavishly supported by Cult-owned Internet communication giants and mainstream media while those telling a different story were censored. Google, YouTube, Facebook and Twitter openly announced that they would do this. What else would we expect from Cult-owned operations like Facebook which former executives have confirmed set out to make the platform more addictive than cigarettes and coldly manipulates emotions of its users to sow division between people and groups and scramble the minds of the young? If Zuckerberg lives out the rest of his life without going to jail for crimes against humanity, and most emphatically against the young, it will be a travesty of justice. Still, no matter, cause and effect will catch up with him eventually and the same with Sergey Brin and Larry Page at Google with its CEO Sundar Pichai who fix the Google search results to promote Cult narratives and hide the opposition. Put the same key words into Google and other search engines like DuckDuckGo and you will see how different results can be. Wikipedia is another intensely biased 'encyclopaedia' which skews its content to the Cult agenda. YouTube links to Wikipedia's version of 'Covid' and 'climate change' on video pages in which experts in their field offer a different opinion (even that is increasingly rare with Wojcicki censorship). Into this 'Covid' silence-them network must be added government media censors, sorry 'regulators', such as Ofcom in the UK which imposed tyrannical restrictions on British broadcasters that had the effect of banning me from ever appearing. Just to debate with me about my evidence and views on 'Covid' would mean breaking the fascistic impositions of Ofcom and its CEO career government bureaucrat Melanie Dawes. Gutless British broadcasters tremble at the very thought of fascist Ofcom.

Psychos behind 'Covid'

The reason for the 'Covid' catastrophe in all its facets and forms can be seen by whom and what is driving the policies worldwide in such a coordinated way. Decisions are not being made to protect health, but to target psychology. The dominant group guiding and 'advising' government policy are not medical professionals. They are psychologists and behavioural scientists. Every major country has its own version of this phenomenon and I'll use the British example to show how it works. In many ways the British version has been affecting the wider world in the form of the huge behaviour manipulation network in the UK which operates in other countries. The network involves private companies, government, intelligence and military. The Cabinet Office is at the centre of the government 'Covid' Psyop and part-owns, with 'innovation charity' Nesta, the Behavioural Insights Team (BIT) which claims to be independent of government but patently isn't. The BIT was established in 2010 and its job is to manipulate the psyche of the population to acquiesce to government demands and so much more. It is also known as the 'Nudge Unit', a name inspired by the 2009 book by two ultra-Zionists, Cass Sunstein and Richard Thaler, called *Nudge: Improving Decisions About Health, Wealth, and Happiness*. The book, as with the Behavioural Insights Team, seeks to 'nudge' behaviour (manipulate it) to make the public follow patterns of action and perception that suit those in authority (the Cult). Sunstein is so skilled at this that he advises the World Health Organization and the UK Behavioural Insights Team and was Administrator of the White House Office of Information and Regulatory Affairs in the Obama administration. Biden appointed him to the Department of Homeland Security – another ultra-Zionist in the fold to oversee new immigration laws which is another policy the Cult wants to control. Sunstein is desperate to silence anyone exposing conspiracies and co-authored a 2008 report on the subject in which suggestions were offered to ban 'conspiracy theorizing' or impose 'some kind of tax, financial or otherwise, on those who disseminate such theories'. I guess a psychiatrist's chair is out of the question?

Sunstein's mate Richard Thaler, an 'academic affiliate' of the UK Behavioural Insights Team, is a proponent of 'behavioural economics' which is defined as the study of 'the effects of psychological, cognitive, emotional, cultural and social factors on the decisions of individuals and institutions'. Study the effects so they can be manipulated to be what you want them to be. Other leading names in the development of behavioural economics are ultra-Zionists Daniel Kahneman and Robert J. Shiller and they, with Thaler, won the Nobel Memorial Prize in Economic Sciences for their work in this field. The Behavioural Insights Team is operating at the heart of the UK government and has expanded globally through partnerships with several universities including Harvard, Oxford, Cambridge, University College London (UCL) and Pennsylvania. They claim to have 'trained' (reframed) 20,000 civil servants and run more than 750 projects involving 400 randomised controlled trials in dozens of countries' as another version of mind reframers Common Purpose. BIT works from its office in New York with cities and their agencies, as well as other partners, across the United States and Canada – this is a company part-owned by the British government Cabinet Office. An executive order by President Cult-servant Obama established a US Social and Behavioral Sciences Team in 2015. They all have the same reason for being and that's to brainwash the population directly and by brainwashing those in positions of authority.

'Covid' mind game

Another prime aspect of the UK mind-control network is the 'independent' [joke] Scientific Pandemic Insights Group on Behaviours (SPI-B) which 'provides behavioural science advice aimed at anticipating and helping people adhere to interventions that are recommended by medical or epidemiological experts'. That means manipulating public perception and behaviour to do whatever government tells them to do. It's disgusting and if they really want the public to be 'safe' this lot should all be under lock and key. According to the government website SPI-B consists of

'behavioural scientists, health and social psychologists, anthropologists and historians' and advises the Whitty-Vallance-led Scientific Advisory Group for Emergencies (SAGE) which in turn advises the government on 'the science' (it doesn't) and 'Covid' policy. When politicians say they are being guided by 'the science' this is the rabble in each country they are talking about and that 'science' is dominated by behaviour manipulators to enforce government fascism through public compliance. The Behaviour Insight Team is headed by psychologist David Solomon Halpern, a visiting professor at King's College London, and connects with a national and global web of other civilian and military organisations as the Cult moves towards its goal of fusing them into one fascistic whole in every country through its 'Fusion Doctrine'. The behaviour manipulation network involves, but is not confined to, the Foreign Office; National Security Council; government communications headquarters (GCHQ); MI5; MI6; the Cabinet Office-based Media Monitoring Unit; and the Rapid Response Unit which 'monitors digital trends to spot emerging issues; including misinformation and disinformation; and identifies the best way to respond'.

There is also the 77th Brigade of the UK military which operates like the notorious Israeli military's Unit 8200 in manipulating information and discussion on the Internet by posing as members of the public to promote the narrative and discredit those who challenge it. Here we have the military seeking to manipulate *domestic* public opinion while the Nazis in government are fine with that. Conservative Member of Parliament Tobias Ellwood, an advocate of lockdown and control through 'vaccine passports', is a Lieutenant Colonel reservist in the 77th Brigade which connects with the military operation jHub, the 'innovation centre' for the Ministry of Defence and Strategic Command. jHub has also been involved with the civilian National Health Service (NHS) in 'symptom tracing' the population. The NHS is a key part of this mind control network and produced a document in December, 2020, explaining to staff how to use psychological manipulation with different groups and ages to get them to have the DNA-manipulating 'Covid vaccine'

that's designed to cumulatively rewrite human genetics. The document, called 'Optimising Vaccination Roll Out – Do's and Don'ts for all messaging, documents and "communications" in the widest sense', was published by NHS England and the NHS Improvement *Behaviour Change Unit* in partnership with Public Health England and Warwick Business School. I hear the mantra about 'save the NHS' and 'protect the NHS' when we need to scrap the NHS and start again. The current version is far too corrupt, far too anti-human and totally compromised by Cult operatives and their assets. UK government broadcast media censor Ofcom will connect into this web – as will the BBC with its tremendous Ofcom influence – to control what the public see and hear and dictate mass perception. Nuremberg trials must include personnel from all these organisations.

The fear factor

The 'Covid' hoax has led to the creation of the UK Cabinet Office-connected Joint Biosecurity Centre (JBC) which is officially described as providing 'expert advice on pandemics' using its independent [all Cult operations are 'independent'] analytical function to provide real-time analysis about infection outbreaks to identify and respond to outbreaks of Covid-19'. Another role is to advise the government on a response to spikes in infections – 'for example by closing schools or workplaces in local areas where infection levels have risen'. Put another way, promoting the Cult agenda. The Joint Biosecurity Centre is modelled on the Joint Terrorism Analysis Centre which analyses intelligence to set 'terrorism threat levels' and here again you see the fusion of civilian and military operations and intelligence that has led to military intelligence producing documents about 'vaccine hesitancy' and how it can be combated. Domestic civilian matters and opinions should not be the business of the military. The Joint Biosecurity Centre is headed by Tom Hurd, director general of the Office for Security and Counter-Terrorism from the establishment-to-its-fingertips Hurd family. His father is former Foreign Secretary Douglas Hurd. How coincidental that Tom

Hurd went to the elite Eton College and Oxford University with Boris Johnson. Imperial College with its ridiculous computer modeller Neil Ferguson will connect with this gigantic web that will itself interconnect with similar set-ups in other major and not so major countries. Compared with this Cult network the politicians, be they Boris Johnson, Donald Trump or Joe Biden, are bit-part players 'following the science'. The network of psychologists was on the 'Covid' case from the start with the aim of generating maximum fear of the 'virus' to ensure compliance by the population. A government behavioural science group known as SPI-B produced a paper in March, 2020, for discussion by the main government science advisory group known as SAGE. It was headed 'Options for increasing adherence to social distancing measures' and it said the following in a section headed 'Persuasion':

- A substantial number of people still do not feel sufficiently personally threatened; it could be that they are reassured by the low death rate in their demographic group, although levels of concern may be rising. Having a good understanding of the risk has been found to be positively associated with adoption of COVID-19 social distancing measures in Hong Kong.
- The perceived level of personal threat needs to be increased among those who are complacent, using hard-hitting evaluation of options for increasing social distancing emotional messaging. To be effective this must also empower people by making clear the actions they can take to reduce the threat.
- Responsibility to others: There seems to be insufficient understanding of, or feelings of responsibility about, people's role in transmitting the infection to others ... Messaging about actions need to be framed positively in terms of protecting oneself and the community, and increase confidence that they will be effective.
- Some people will be more persuaded by appeals to play by the rules, some by duty to the community, and some to personal risk.

All these different approaches are needed. The messaging also needs to take account of the realities of different people's lives. Messaging needs to take account of the different motivational levers and circumstances of different people.

All this could be achieved the SPI-B psychologists said by *using the media to increase the sense of personal threat* which translates as terrify the shit out of the population, including children, so they all do what we want. That's not happened has it? Those excuses for 'journalists' who wouldn't know journalism if it bit them on the arse (the great majority) have played their crucial part in serving this Cult-government Psyop to enslave their own kids and grandkids. How they live with themselves I have no idea. The psychological war has been underpinned by constant government 'Covid' propaganda in almost every television and radio ad break, plus the Internet and print media, which has pounded out the fear with taxpayers footing the bill for their own programming. The result has been people terrified of a 'virus' that doesn't exist or one with a tiny fatality rate even if you believe it does. People walk down the street and around the shops wearing face-nappies damaging their health and psychology while others report those who refuse to be that naïve to the police who turn up in their own face-nappies. I had a cameraman come to my flat and he was so frightened of 'Covid' he came in wearing a mask and refused to shake my hand in case he caught something. He had – naïveitis – and the thought that he worked in the mainstream media was both depressing and made his behaviour perfectly explainable. The fear which has gripped the minds of so many and frozen them into compliance has been carefully cultivated by these psychologists who are really psychopaths. If lives get destroyed and a lot of young people commit suicide it shows our plan is working. SPI-B then turned to compulsion on the public to comply. 'With adequate preparation, rapid change can be achieved', it said. Some countries had introduced mandatory self-isolation on a wide scale without evidence of major public unrest and a large majority of the UK's population appeared to be supportive of more coercive measures with 64 percent of adults saying they would

support putting London under a lockdown (watch the ‘polls’ which are designed to make people believe that public opinion is in favour or against whatever the subject in hand).

For ‘aggressive protective measures’ to be effective, the SPI-B paper said, special attention should be devoted to those population groups that are more at risk. Translated from the Orwellian this means making the rest of population feel guilty for not protecting the ‘vulnerable’ such as old people which the Cult and its agencies were about to kill on an industrial scale with lockdown, lack of treatment and the Gates ‘vaccine’. Psychopath psychologists sold their guilt-trip so comprehensively that Los Angeles County Supervisor Hilda Solis reported that children were apologising (from a distance) to their parents and grandparents for bringing ‘Covid’ into their homes and getting them sick. ‘... These apologies are just some of the last words that loved ones will ever hear as they die alone,’ she said. Gut-wrenchingly Solis then used this childhood tragedy to tell children to stay at home and ‘keep your loved ones alive’. Imagine heaping such potentially life-long guilt on a kid when it has absolutely nothing to do with them. These people are deeply disturbed and the psychologists behind this even more so.

Uncivil war – divide and rule

Professional mind-controllers at SPI-B wanted the media to increase a sense of responsibility to others (do as you’re told) and promote ‘positive messaging’ for those actions while in contrast to invoke ‘social disapproval’ by the unquestioning, obedient, community of anyone with a mind of their own. Again the compliant Goebbels-like media obliged. This is an old, old, trick employed by tyrannies the world over throughout human history. You get the target population to keep the target population in line – *your* line. SPI-B said this could ‘play an important role in preventing anti-social behaviour or discouraging failure to enact pro-social behaviour’. For ‘anti-social’ in the Orwellian parlance of SPI-B see any behaviour that government doesn’t approve. SPI-B recommendations said that ‘social disapproval’ should be accompanied by clear messaging and

promotion of strong collective identity – hence the government and celebrity mantra of ‘we’re all in this together’. Sure we are. The mind doctors have such contempt for their targets that they think some clueless comedian, actor or singer telling them to do what the government wants will be enough to win them over. We have had UK comedian Lenny Henry, actor Michael Caine and singer Elton John wheeled out to serve the propagandists by urging people to have the DNA-manipulating ‘Covid’ non-‘vaccine’. The role of Henry and fellow black celebrities in seeking to coax a ‘vaccine’ reluctant black community into doing the government’s will was especially stomach-turning. An emotion-manipulating script and carefully edited video featuring these black ‘celebs’ was such an insult to the intelligence of black people and where’s the self-respect of those involved selling their souls to a fascist government agenda? Henry said he heard black people’s ‘legitimate worries and concerns’, but people must ‘trust the facts’ when they were doing exactly that by not having the ‘vaccine’. They had to include the obligatory reference to Black Lives Matter with the line ... ‘Don’t let coronavirus cost even more black lives – because we matter’. My god, it was pathetic. ‘I know the vaccine is safe and what it does.’ How? ‘I’m a comedian and it says so in my script.’

SPI-B said social disapproval needed to be carefully managed to avoid victimisation, scapegoating and misdirected criticism, but they knew that their ‘recommendations’ would lead to exactly that and the media were specifically used to stir-up the divide-and-conquer hostility. Those who conform like good little baa, baas, are praised while those who have seen through the tidal wave of lies are ‘Covidiot’s’. The awake have been abused by the fast asleep for not conforming to fascism and impositions that the awake know are designed to endanger their health, dehumanise them, and tear asunder the very fabric of human society. We have had the curtain-twitchers and morons reporting neighbours and others to the face-napped police for breaking ‘Covid rules’ with fascist police delighting in posting links and phone numbers where this could be done. The Cult cannot impose its will without a compliant police

and military or a compliant population willing to play their part in enslaving themselves and their kids. The words of a pastor in Nazi Germany are so appropriate today:

First they came for the socialists and I did not speak out because I was not a socialist.

Then they came for the trade unionists and I did not speak out because I was not a trade unionist.

Then they came for the Jews and I did not speak out because I was not a Jew.

Then they came for me and there was no one left to speak for me.

Those who don't learn from history are destined to repeat it and so many are.

'Covid' rules: Rewiring the mind

With the background laid out to this gigantic national and global web of psychological manipulation we can put 'Covid' rules into a clear and sinister perspective. Forget the claims about protecting health. 'Covid' rules are about dismantling the human mind, breaking the human spirit, destroying self-respect, and then putting Humpty Dumpty together again as a servile, submissive slave. Social isolation through lockdown and distancing have devastating effects on the human psyche as the psychological psychopaths well know and that's the real reason for them. Humans need contact with each other, discourse, closeness and touch, or they eventually, and literally, go crazy. Masks, which I will address at some length, fundamentally add to the effects of isolation and the Cult agenda to dehumanise and de-individualise the population. To do this while knowing – in fact *seeking* – this outcome is the very epitome of evil and psychologists involved in this *are* the epitome of evil. They must like all the rest of the Cult demons and their assets stand trial for crimes against humanity on a scale that defies the imagination. Psychopaths in uniform use isolation to break enemy troops and agents and make them subservient and submissive to tell what they know. The technique is rightly considered a form of torture and

torture is most certainly what has been imposed on the human population.

Clinically-insane American psychologist Harry Harlow became famous for his isolation experiments in the 1950s in which he separated baby monkeys from their mothers and imprisoned them for months on end in a metal container or 'pit of despair'. They soon began to show mental distress and depression as any idiot could have predicted. Harlow put other monkeys in steel chambers for three, six or twelve months while denying them any contact with animals or humans. He said that the effects of total social isolation for six months were 'so devastating and debilitating that we had assumed initially that twelve months of isolation would not produce any additional decrement'; but twelve months of isolation 'almost obliterated the animals socially'. This is what the Cult and its psychopaths are doing to you and your children. Even monkeys in partial isolation in which they were not allowed to form relationships with other monkeys became 'aggressive and hostile, not only to others, but also towards their own bodies'. We have seen this in the young as a consequence of lockdown. UK government psychopaths launched a public relations campaign telling people not to hug each other even after they received the 'Covid-19 vaccine' which we were told with more lies would allow a return to 'normal life'. A government source told *The Telegraph*: 'It will be along the lines that it is great that you have been vaccinated, but if you are going to visit your family and hug your grandchildren there is a chance you are going to infect people you love.' The source was apparently speaking from a secure psychiatric facility. Janet Lord, director of Birmingham University's Institute of Inflammation and Ageing, said that parents and grandparents should avoid hugging their children. Well, how can I put it, Ms Lord? Fuck off. Yep, that'll do.

Destroying the kids – where are the parents?

Observe what has happened to people enslaved and isolated by lockdown as suicide and self-harm has soared worldwide,

particularly among the young denied the freedom to associate with their friends. A study of 49,000 people in English-speaking countries concluded that almost half of young adults are at clinical risk of mental health disorders. A national survey in America of 1,000 currently enrolled high school and college students found that 5 percent reported attempting suicide during the pandemic. Data from the US CDC's National Syndromic Surveillance Program from January 1st to October 17th, 2020, revealed a 31 percent increase in mental health issues among adolescents aged 12 to 17 compared with 2019. The CDC reported that America in general suffered the biggest drop in life expectancy since World War Two as it fell by a year in the first half of 2020 as a result of 'deaths of despair' – overdoses and suicides. Deaths of despair have leapt by more than 20 percent during lockdown and include the highest number of fatal overdoses ever recorded in a single year – 81,000. Internet addiction is another consequence of being isolated at home which lowers interest in physical activities as kids fall into inertia and what's the point? Children and young people are losing hope and giving up on life, sometimes literally. A 14-year-old boy killed himself in Maryland because he had 'given up' when his school district didn't reopen; an 11-year-old boy shot himself during a zoom class; a teenager in Maine succumbed to the isolation of the 'pandemic' when he ended his life after experiencing a disrupted senior year at school. Children as young as nine have taken their life and all these stories can be repeated around the world. Careers are being destroyed before they start and that includes those in sport in which promising youngsters have not been able to take part. The plan of the psycho-psychologists is working all right. Researchers at Cambridge University found that lockdowns cause significant harm to children's mental health. Their study was published in the *Archives of Disease in Childhood*, and followed 168 children aged between 7 and 11. The researchers concluded:

During the UK lockdown, children's depression symptoms have increased substantially, relative to before lockdown. The scale of this effect has direct relevance for the continuation of different elements of lockdown policy, such as complete or partial school closures ...

... Specifically, we observed a statistically significant increase in ratings of depression, with a medium-to-large effect size. Our findings emphasise the need to incorporate the potential impact of lockdown on child mental health in planning the ongoing response to the global pandemic and the recovery from it.

Not a chance when the Cult's psycho-psychologists were getting exactly what they wanted. The UK's Royal College of Paediatrics and Child Health has urged parents to look for signs of eating disorders in children and young people after a three to four fold increase. Specialists say the 'pandemic' is a major reason behind the rise. You don't say. The College said isolation from friends during school closures, exam cancellations, loss of extra-curricular activities like sport, and an increased use of social media were all contributory factors along with fears about the virus (psycho-psychologists again), family finances, and students being forced to quarantine. Doctors said young people were becoming severely ill by the time they were seen with 'Covid' regulations reducing face-to-face consultations. Nor is it only the young that have been devastated by the psychopaths. Like all bullies and cowards the Cult is targeting the young, elderly, weak and infirm. A typical story was told by a British lady called Lynn Parker who was not allowed to visit her husband in 2020 for the last ten and half months of his life 'when he needed me most' between March 20th and when he died on December 19th. This vacates the criminal and enters the territory of evil. The emotional impact on the immune system alone is immense as are the number of people of all ages worldwide who have died as a result of Cult-demanded, Gates-demanded, lockdowns.

Isolation is torture

The experience of imposing solitary confinement on millions of prisoners around the world has shown how a large percentage become 'actively psychotic and/or acutely suicidal'. Social isolation has been found to trigger 'a specific psychiatric syndrome, characterized by hallucinations; panic attacks; overt paranoia; diminished impulse control; hypersensitivity to external stimuli; and difficulties with thinking, concentration and memory'. Juan Mendez,

a United Nations rapporteur (investigator), said that isolation is a form of torture. Research has shown that even after isolation prisoners find it far more difficult to make social connections and I remember chatting to a shop assistant after one lockdown who told me that when her young son met another child again he had no idea how to act or what to do. Hannah Flanagan, Director of Emergency Services at Journey Mental Health Center in Dane County, Wisconsin, said: 'The specificity about Covid social distancing and isolation that we've come across as contributing factors to the suicides are really new to us this year.' But they are not new to those that devised them. They are getting the effect they want as the population is psychologically dismantled to be rebuilt in a totally different way. Children and the young are particularly targeted. They will be the adults when the full-on fascist AI-controlled technocracy is planned to be imposed and they are being prepared to meekly submit. At the same time older people who still have a memory of what life was like before – and how fascist the new normal really is – are being deleted. You are going to see efforts to turn the young against the old to support this geriatric genocide. Hannah Flanagan said the big increase in suicide in her county proved that social isolation is not only harmful, but deadly. Studies have shown that isolation from others is one of the main risk factors in suicide and even more so with women. Warnings that lockdown could create a 'perfect storm' for suicide were ignored. After all this was one of the *reasons* for lockdown. Suicide, however, is only the most extreme of isolation consequences. There are many others. Dr Dhruv Khullar, assistant professor of healthcare policy at Weill Cornell Medical College, said in a *New York Times* article in 2016 long before the fake 'pandemic':

A wave of new research suggests social separation is bad for us. Individuals with less social connection have disrupted sleep patterns, altered immune systems, more inflammation and higher levels of stress hormones. One recent study found that isolation increases the risk of heart disease by 29 percent and stroke by 32 percent. Another analysis that pooled data from 70 studies and 3.4 million people found that socially isolated individuals had a 30 percent higher risk of dying in the next seven years, and that this effect was largest in middle age.

Loneliness can accelerate cognitive decline in older adults, and isolated individuals are twice as likely to die prematurely as those with more robust social interactions. These effects start early: Socially isolated children have significantly poorer health 20 years later, even after controlling for other factors. All told, loneliness is as important a risk factor for early death as obesity and smoking.

There you have proof from that one article alone four years before 2020 that those who have enforced lockdown, social distancing and isolation knew what the effect would be and that is even more so with professional psychologists that have been driving the policy across the globe. We can go back even further to the years 2000 and 2003 and the start of a major study on the effects of isolation on health by Dr Janine Gronewold and Professor Dirk M. Hermann at the University Hospital in Essen, Germany, who analysed data on 4,316 people with an average age of 59 who were recruited for the long-term research project. They found that socially isolated people are more than 40 percent more likely to have a heart attack, stroke, or other major cardiovascular event and nearly 50 percent more likely to die from any cause. Given the financial Armageddon unleashed by lockdown we should note that the study found a relationship between increased cardiovascular risk and lack of financial support. After excluding other factors social isolation was still connected to a 44 percent increased risk of cardiovascular problems and a 47 percent increased risk of death by any cause. Lack of financial support was associated with a 30 percent increase in the risk of cardiovascular health events. Dr Gronewold said it had been known for some time that feeling lonely or lacking contact with close friends and family can have an impact on physical health and the study had shown that having strong social relationships is of high importance for heart health. Gronewold said they didn't understand yet why people who are socially isolated have such poor health outcomes, but this was obviously a worrying finding, particularly during these times of prolonged social distancing. Well, it can be explained on many levels. You only have to identify the point in the body where people feel loneliness and missing people they are parted from – it's in the centre of the chest where they feel the ache of loneliness and the ache of missing people. 'My heart aches for

you' ... 'My heart aches for some company.' I will explain this more in the chapter Escaping Wetiko, but when you realise that the body is the mind – they are expressions of each other – the reason why state of the mind dictates state of the body becomes clear.

American psychologist Ranjit Powar was highlighting the effects of lockdown isolation as early as April, 2020. She said humans have evolved to be social creatures and are wired to live in interactive groups. Being isolated from family, friends and colleagues could be unbalancing and traumatic for most people and could result in short or even long-term psychological and physical health problems. An increase in levels of anxiety, aggression, depression, forgetfulness and hallucinations were possible psychological effects of isolation. 'Mental conditions may be precipitated for those with underlying pre-existing susceptibilities and show up in many others without any pre-condition.' Powar said personal relationships helped us cope with stress and if we lost this outlet for letting off steam the result can be a big emotional void which, for an average person, was difficult to deal with. 'Just a few days of isolation can cause increased levels of anxiety and depression' – so what the hell has been the effect on the global population of *18 months* of this at the time of writing? Powar said: 'Add to it the looming threat of a dreadful disease being repeatedly hammered in through the media and you have a recipe for many shades of mental and physical distress.' For those with a house and a garden it is easy to forget that billions have had to endure lockdown isolation in tiny overcrowded flats and apartments with nowhere to go outside. The psychological and physical consequences of this are unimaginable and with lunatic and abusive partners and parents the consequences have led to tremendous increases in domestic and child abuse and alcoholism as people seek to shut out the horror. Ranjit Powar said:

Staying in a confined space with family is not all a rosy picture for everyone. It can be extremely oppressive and claustrophobic for large low-income families huddled together in small single-room houses. Children here are not lucky enough to have many board/electronic games or books to keep them occupied.

Add to it the deep insecurity of running out of funds for food and basic necessities. On the other hand, there are people with dysfunctional family dynamics, such as domineering, abusive or alcoholic partners, siblings or parents which makes staying home a period of trial. Incidence of suicide and physical abuse against women has shown a worldwide increase. Heightened anxiety and depression also affect a person's immune system, making them more susceptible to illness.

To think that Powar's article was published on April 11th, 2020.

Six-foot fantasy

Social (unsocial) distancing demanded that people stay six feet or two metres apart. UK government advisor Robert Dingwall from the New and Emerging Respiratory Virus Threats Advisory Group said in a radio interview that the two-metre rule was 'conjured up out of nowhere' and was not based on science. No, it was not based on *medical* science, but it didn't come out of nowhere. The distance related to *psychological* science. Six feet/two metres was adopted in many countries and we were told by people like the criminal Anthony Fauci and his ilk that it was founded on science. Many schools could not reopen because they did not have the space for six-foot distancing. Then in March, 2021, after a year of six-foot 'science', a study published in the *Journal of Infectious Diseases* involving more than 500,000 students and almost 100,000 staff over 16 weeks revealed no significant difference in 'Covid' cases between six feet and three feet and Fauci changed his tune. Now three feet was okay. There is no difference between six feet and three *inches* when there is no 'virus' and they got away with six feet for psychological reasons for as long as they could. I hear journalists and others talk about 'unintended consequences' of lockdown. They are not *unintended* at all; they have been coldly-calculated for a specific outcome of human control and that's why super-psychopaths like Gates have called for them so vehemently. Super-psychopath psychologists have demanded them and psychopathic or clueless, spineless, politicians have gone along with them by 'following the science'. But it's not science at all. 'Science' is not what is; it's only what people can be manipulated to believe it is. The whole 'Covid' catastrophe is

founded on mind control. Three word or three statement mantras issued by the UK government are a well-known mind control technique and so we've had 'Stay home/protect the NHS/save lives', 'Stay alert/control the virus/save lives' and 'hands/face/space'. One of the most vocal proponents of extreme 'Covid' rules in the UK has been Professor Susan Michie, a member of the British Communist Party, who is not a medical professional. Michie is the director of the Centre for Behaviour Change at University College London. She is a *behavioural psychologist* and another filthy rich 'Marxist' who praised China's draconian lockdown. She was known by fellow students at Oxford University as 'Stalin's nanny' for her extreme Marxism. Michie is an influential member of the UK government's Scientific Advisory Group for Emergencies (SAGE) and behavioural manipulation groups which have dominated 'Covid' policy. She is a consultant adviser to the World Health Organization on 'Covid-19' and behaviour. Why the hell are lockdowns anything to do with her when they are claimed to be about health? Why does a behavioural psychologist from a group charged with changing the behaviour of the public want lockdown, human isolation and mandatory masks? Does that question really need an answer? Michie *absolutely* has to explain herself before a Nuremberg court when humanity takes back its world again and even more so when you see the consequences of masks that she demands are compulsory. This is a Michie classic:

The benefits of getting primary school children to wear masks is that regardless of what little degree of transmission is occurring in those age groups it could help normalise the practice. Young children wearing masks may be more likely to get their families to accept masks.

Those words alone should carry a prison sentence when you ponder on the callous disregard for children involved and what a statement it makes about the mind and motivations of Susan Michie. What a lovely lady and what she said there encapsulates the mentality of the psychopaths behind the 'Covid' horror. Let us compare what Michie said with a countrywide study in Germany published at [researchsquare.com](https://www.researchsquare.com) involving 25,000 school children and 17,854 health complaints submitted by parents. Researchers

found that masks are harming children physically, psychologically, and behaviourally with 24 health issues associated with mask wearing. They include: shortness of breath (29.7%); dizziness (26.4%); increased headaches (53%); difficulty concentrating (50%); drowsiness or fatigue (37%); and malaise (42%). Nearly a third of children experienced more sleep issues than before and a quarter developed new fears. Researchers found health issues and other impairments in 68 percent of masked children covering their faces for an average of 4.5 hours a day. Hundreds of those taking part experienced accelerated respiration, tightness in the chest, weakness, and short-term impairment of consciousness. A reminder of what Michie said again:

The benefits of getting primary school children to wear masks is that regardless of what little degree of transmission is occurring in those age groups it could help normalise the practice. Young children wearing masks may be more likely to get their families to accept masks.

Psychopaths in government and psychology now have children and young people – plus all the adults – wearing masks for hours on end while clueless teachers impose the will of the psychopaths on the young they should be protecting. What the hell are parents doing?

Cult lab rats

We have some schools already imposing on students microchipped buzzers that activate when they get 'too close' to their pals in the way they do with lab rats. How apt. To the Cult and its brain-dead servants our children *are* lab rats being conditioned to be unquestioning, dehumanised slaves for the rest of their lives. Children and young people are being weaned and frightened away from the most natural human instincts including closeness and touch. I have tracked in the books over the years how schools were banning pupils from greeting each other with a hug and the whole Cult-induced Me Too movement has terrified men and boys from a relaxed and natural interaction with female friends and work colleagues to the point where many men try never to be in a room

alone with a woman that's not their partner. Airhead celebrities have as always played their virtue-signalling part in making this happen with their gross exaggeration. For every monster like Harvey Weinstein there are at least tens of thousands of men that don't treat women like that; but everyone must be branded the same and policy changed for them as well as the monster. I am going to be using the word 'dehumanise' many times in this chapter because that is what the Cult is seeking to do and it goes very deep as we shall see. Don't let them kid you that social distancing is planned to end one day. That's not the idea. We are seeing more governments and companies funding and producing wearable gadgets to keep people apart and they would not be doing that if this was meant to be short-term. A tech start-up company backed by GCHQ, the British Intelligence and military surveillance headquarters, has created a social distancing wrist sensor that alerts people when they get too close to others. The CIA has also supported tech companies developing similar devices. The wearable sensor was developed by Tended, one of a number of start-up companies supported by GCHQ (see the CIA and DARPA). The device can be worn on the wrist or as a tag on the waistband and will vibrate whenever someone wearing the device breaches social distancing and gets anywhere near natural human contact. The company had a lucky break in that it was developing a distancing sensor when the 'Covid' hoax arrived which immediately provided a potentially enormous market. How fortunate. The government in big-time Cult-controlled Ontario in Canada is investing \$2.5 million in wearable contact tracing technology that 'will alert users if they may have been exposed to the Covid-19 in the workplace and will beep or vibrate if they are within six feet of another person'. Facedrive Inc., the technology company behind this, was founded in 2016 with funding from the Ontario Together Fund and obviously they, too, had a prophet on the board of directors. The human surveillance and control technology is called TraceSCAN and would be worn by the human cyborgs in places such as airports, workplaces, construction sites, care homes and ... *schools*.

I emphasise schools with children and young people the prime targets. You know what is planned for society as a whole if you keep your eyes on the schools. They have always been places where the state program the next generation of slaves to be its compliant worker-ants – or Woker-ants these days; but in the mist of the ‘Covid’ madness they have been transformed into mind laboratories on a scale never seen before. Teachers and head teachers are just as programmed as the kids – often more so. Children are kept apart from human interaction by walk lanes, classroom distancing, staggered meal times, masks, and the rolling-out of buzzer systems. Schools are now physically laid out as a laboratory maze for lab-rats. Lunatics at a school in Anchorage, Alaska, who should be prosecuted for child abuse, took away desks and forced children to kneel (know your place) on a mat for five hours a day while wearing a mask and using their chairs as a desk. How this was supposed to impact on a ‘virus’ only these clinically insane people can tell you and even then it would be clap-trap. The school banned recess (interaction), art classes (creativity), and physical exercise (getting body and mind moving out of inertia). Everyone behind this outrage should be in jail or better still a mental institution. The behavioural manipulators are all for this dystopian approach to schools. Professor Susan Michie, the mind-doctor and British Communist Party member, said it was wrong to say that schools were safe. They had to be made so by ‘distancing’, masks and ventilation (sitting all day in the cold). I must ask this lady round for dinner on a night I know I am going to be out and not back for weeks. She probably wouldn’t be able to make it, anyway, with all the visits to her own psychologist she must have block-booked.

Masking identity

I know how shocking it must be for you that a behaviour manipulator like Michie wants everyone to wear masks which have long been a feature of mind-control programs like the infamous MKUltra in the United States, but, there we are. We live and learn. I spent many years from 1996 to right across the millennium

researching mind control in detail on both sides of the Atlantic and elsewhere. I met a large number of mind-control survivors and many had been held captive in body and mind by MKUltra. MK stands for mind-control, but employs the German spelling in deference to the Nazis spirited out of Germany at the end of World War Two by Operation Paperclip in which the US authorities, with help from the Vatican, transported Nazi mind-controllers and engineers to America to continue their work. Many of them were behind the creation of NASA and they included Nazi scientist and SS officer Wernher von Braun who swapped designing V-2 rockets to bombard London with designing the Saturn V rockets that powered the NASA moon programme's Apollo craft. I think I may have mentioned that the Cult has no borders. Among Paperclip escapees was Josef Mengele, the Angel of Death in the Nazi concentration camps where he conducted mind and genetic experiments on children often using twins to provide a control twin to measure the impact of his 'work' on the other. If you want to observe the Cult mentality in all its extremes of evil then look into the life of Mengele. I have met many people who suffered mercilessly under Mengele in the United States where he operated under the name Dr Greene and became a stalwart of MKUltra programming and torture. Among his locations was the underground facility in the Mojave Desert in California called the China Lake Naval Weapons Station which is almost entirely below the surface. My books *The Biggest Secret*, *Children of the Matrix* and *The Perception Deception* have the detailed background to MKUltra.

The best-known MKUltra survivor is American Cathy O'Brien. I first met her and her late partner Mark Phillips at a conference in Colorado in 1996. Mark helped her escape and deprogram from decades of captivity in an offshoot of MKUltra known as Project Monarch in which 'sex slaves' were provided for the rich and famous including Father George Bush, Dick Cheney and the Clintons. Read Cathy and Mark's book *Trance-Formation of America* and if you are new to this you will be shocked to the core. I read it in 1996 shortly before, with the usual synchronicity of my life, I found

myself given a book table at the conference right next to hers. MKUltra never ended despite being very publicly exposed (only a small part of it) in the 1970s and continues in other guises. I am still in touch with Cathy. She contacted me during 2020 after masks became compulsory in many countries to tell me how they were used as part of MKUltra programming. I had been observing 'Covid regulations' and the relationship between authority and public for months. I saw techniques that I knew were employed on individuals in MKUltra being used on the global population. I had read many books and manuals on mind control including one called *Silent Weapons for Quiet Wars* which came to light in the 1980s and was a guide on how to perceptually program on a mass scale. 'Silent Weapons' refers to mind-control. I remembered a line from the manual as governments, medical authorities and law enforcement agencies have so obviously talked to – or rather at – the adult population since the 'Covid' hoax began as if they are children. The document said:

If a person is spoken to by a T.V. advertiser as if he were a twelve-year-old, then, due to suggestibility, he will, with a certain probability, respond or react to that suggestion with the uncritical response of a twelve-year-old and will reach in to his economic reservoir and deliver its energy to buy that product on impulse when he passes it in the store.

That's why authority has spoken to adults like children since all this began.

Why did Michael Jackson wear masks?

Every aspect of the 'Covid' narrative has mind-control as its central theme. Cathy O'Brien wrote an article for davidicke.com about the connection between masks and mind control. Her daughter Kelly who I first met in the 1990s was born while Cathy was still held captive in MKUltra. Kelly was forced to wear a mask as part of her programming from the age of *two* to dehumanise her, target her sense of individuality and reduce the amount of oxygen her brain and body received. *Bingo*. This is the real reason for compulsory

masks, why they have been enforced en masse, and why they seek to increase the number they demand you wear. First one, then two, with one disgraceful alleged 'doctor' recommending four which is nothing less than a death sentence. Where and how often they must be worn is being expanded for the purpose of mass mind control and damaging respiratory health which they can call 'Covid-19'. Canada's government headed by the man-child Justin Trudeau, says it's fine for children of two and older to wear masks. An insane 'study' in Italy involving just 47 children concluded there was no problem for babies as young as *four months* wearing them. Even after people were 'vaccinated' they were still told to wear masks by the criminal that is Anthony Fauci. Cathy wrote that mandating masks is allowing the authorities literally to control the air we breathe which is what was done in MKUltra. You might recall how the singer Michael Jackson wore masks and there is a reason for that. He was subjected to MKUltra mind control through Project Monarch and his psyche was scrambled by these simpletons. Cathy wrote:

In MKUltra Project Monarch mind control, Michael Jackson had to wear a mask to silence his voice so he could not reach out for help. Remember how he developed that whisper voice when he wasn't singing? Masks control the mind from the outside in, like the redefining of words is doing. By controlling what we can and cannot say for fear of being labeled racist or beaten, for example, it ultimately controls thought that drives our words and ultimately actions (or lack thereof).

Likewise, a mask muffles our speech so that we are not heard, which controls voice ... words ... mind. This is Mind Control. Masks are an obvious mind control device, and I am disturbed so many people are complying on a global scale. Masks depersonalize while making a person feel as though they have no voice. It is a barrier to others. People who would never choose to comply but are forced to wear a mask in order to keep their job, and ultimately their family fed, are compromised. They often feel shame and are subdued. People have stopped talking with each other while media controls the narrative.

The 'no voice' theme has often become literal with train passengers told not to speak to each other in case they pass on the 'virus', singing banned for the same reason and bonkers California officials telling people riding roller coasters that they cannot shout and scream. Cathy said she heard every day from healed MKUltra survivors who cannot wear a mask without flashing back on ways

their breathing was controlled – ‘from ball gags and penises to water boarding’. She said that through the years when she saw images of people in China wearing masks ‘due to pollution’ that it was really to control their oxygen levels. ‘I knew it was as much of a population control mechanism of depersonalisation as are burkas’, she said. Masks are another Chinese communist/fascist method of control that has been swept across the West as the West becomes China at lightning speed since we entered 2020.

Mask-19

There are other reasons for mandatory masks and these include destroying respiratory health to call it ‘Covid-19’ and stunting brain development of children and the young. Dr Margarite Griesz-Brisson MD, PhD, is a Consultant Neurologist and Neurophysiologist and the Founder and Medical Director of the London Neurology and Pain Clinic. Her CV goes down the street and round the corner. She is clearly someone who cares about people and won’t parrot the propaganda. Griesz-Brisson has a PhD in pharmacology, with special interest in neurotoxicology, environmental medicine, neuroregeneration and neuroplasticity (the way the brain can change in the light of information received). She went public in October, 2020, with a passionate warning about the effects of mask-wearing laws:

The reinhalation of our exhaled air will without a doubt create oxygen deficiency and a flooding of carbon dioxide. We know that the human brain is very sensitive to oxygen deprivation. There are nerve cells for example in the hippocampus that can’t be longer than 3 minutes without oxygen – they cannot survive. The acute warning symptoms are headaches, drowsiness, dizziness, issues in concentration, slowing down of reaction time – reactions of the cognitive system.

Oh, I know, let’s tell bus, truck and taxi drivers to wear them and people working machinery. How about pilots, doctors and police? Griesz-Brisson makes the important point that while the symptoms she mentions may fade as the body readjusts this does not alter the fact that people continue to operate in oxygen deficit with long list of

potential consequences. She said it was well known that neurodegenerative diseases take years or decades to develop. 'If today you forget your phone number, the breakdown in your brain would have already started 20 or 30 years ago.' She said degenerative processes in your brain are getting amplified as your oxygen deprivation continues through wearing a mask. Nerve cells in the brain are unable to divide themselves normally in these circumstances and lost nerve cells will no longer be regenerated. 'What is gone is gone.' Now consider that people like shop workers and *schoolchildren* are wearing masks for hours every day. What in the name of sanity is going to be happening to them? 'I do not wear a mask, I need my brain to think', Griesz-Brisson said, 'I want to have a clear head when I deal with my patients and not be in a carbon dioxide-induced anaesthesia'. If you are told to wear a mask anywhere ask the organisation, police, store, whatever, for their risk assessment on the dangers and negative effects on mind and body of enforcing mask-wearing. They won't have one because it has never been done not even by government. All of them must be subject to class-action lawsuits as the consequences come to light. They don't do mask risk assessments for an obvious reason. They know what the conclusions would be and independent scientific studies that *have* been done tell a horror story of consequences.

'Masks are criminal'

Dr Griesz-Brisson said that for children and adolescents, masks are an absolute no-no. They had an extremely active and adaptive immune system and their brain was incredibly active with so much to learn. 'The child's brain, or the youth's brain, is thirsting for oxygen.' The more metabolically active an organ was, the more oxygen it required; and in children and adolescents every organ was metabolically active. Griesz-Brisson said that to deprive a child's or adolescent's brain of oxygen, or to restrict it in any way, was not only dangerous to their health, it was absolutely criminal. 'Oxygen deficiency inhibits the development of the brain, and the damage that has taken place as a result CANNOT be reversed.' Mind

manipulators of MKUltra put masks on two-year-olds they wanted to neurologically rewire and you can see why. Griesz-Brisson said a child needs the brain to learn and the brain needs oxygen to function. 'We don't need a clinical study for that. This is simple, indisputable physiology.' Consciously and purposely induced oxygen deficiency was an absolutely deliberate health hazard, and an absolute medical contraindication which means that 'this drug, this therapy, this method or measure should not be used, and is not allowed to be used'. To coerce an entire population to use an absolute medical contraindication by force, she said, there had to be definite and serious reasons and the reasons must be presented to competent interdisciplinary and independent bodies to be verified and authorised. She had this warning of the consequences that were coming if mask wearing continued:

When, in ten years, dementia is going to increase exponentially, and the younger generations couldn't reach their god-given potential, it won't help to say 'we didn't need the masks'. I know how damaging oxygen deprivation is for the brain, cardiologists know how damaging it is for the heart, pulmonologists know how damaging it is for the lungs. Oxygen deprivation damages every single organ. Where are our health departments, our health insurance, our medical associations? It would have been their duty to be vehemently against the lockdown and to stop it and stop it from the very beginning.

Why do the medical boards issue punishments to doctors who give people exemptions? Does the person or the doctor seriously have to prove that oxygen deprivation harms people? What kind of medicine are our doctors and medical associations representing? Who is responsible for this crime? The ones who want to enforce it? The ones who let it happen and play along, or the ones who don't prevent it?

All of the organisations and people she mentions there either answer directly to the Cult or do whatever hierarchical levels above them tell them to do. The outcome of both is the same. 'It's not about masks, it's not about viruses, it's certainly not about your health', Griesz-Brisson said. 'It is about much, much more. I am not participating. I am not afraid.' They were taking our air to breathe and there was no unfounded medical exemption from face masks. Oxygen deprivation was dangerous for every single brain. It had to be the free decision of every human being whether they want to

wear a mask that was absolutely ineffective to protect themselves from a virus. She ended by rightly identifying where the responsibility lies for all this:

The imperative of the hour is personal responsibility. We are responsible for what we think, not the media. We are responsible for what we do, not our superiors. We are responsible for our health, not the World Health Organization. And we are responsible for what happens in our country, not the government.

Halle-bloody-lujah.

But surgeons wear masks, right?

Independent studies of mask-wearing have produced a long list of reports detailing mental, emotional and physical dangers. What a definition of insanity to see police officers imposing mask-wearing on the public which will cumulatively damage their health while the police themselves wear masks that will cumulatively damage *their* health. It's utter madness and both public and police do this because 'the government says so' – yes a government of brain-donor idiots like UK Health Secretary Matt Hancock reading the 'follow the science' scripts of psychopathic, lunatic psychologists. The response you get from Stockholm syndrome sufferers defending the very authorities that are destroying them and their families is that 'surgeons wear masks'. This is considered the game, set and match that they must work and don't cause oxygen deficit. Well, actually, scientific studies have shown that they *do* and oxygen levels are monitored in operating theatres to compensate. Surgeons wear masks to stop spittle and such like dropping into open wounds – not to stop 'viral particles' which are so miniscule they can only be seen through an electron microscope. Holes in the masks are significantly bigger than 'viral particles' and if you sneeze or cough they will breach the mask. I watched an incredibly disingenuous 'experiment' that claimed to prove that masks work in catching 'virus' material from the mouth and nose. They did this with a slow motion camera and the mask did block big stuff which stayed inside the mask and

against the face to be breathed in or cause infections on the face as we have seen with many children. 'Viral particles', however, would never have been picked up by the camera as they came through the mask when they are far too small to be seen. The 'experiment' was therefore disingenuous *and* useless.

Studies have concluded that wearing masks in operating theatres (and thus elsewhere) make no difference to preventing infection while the opposite is true with toxic shite building up in the mask and this had led to an explosion in tooth decay and gum disease dubbed by dentists 'mask mouth'. You might have seen the Internet video of a furious American doctor urging people to take off their masks after a four-year-old patient had been rushed to hospital the night before and nearly died with a lung infection that doctors sourced to mask wearing. A study in the journal *Cancer Discovery* found that inhalation of harmful microbes can contribute to advanced stage lung cancer in adults and long-term use of masks can help breed dangerous pathogens. Microbiologists have said frequent mask wearing creates a moist environment in which microbes can grow and proliferate before entering the lungs. The Canadian Agency for Drugs and Technologies in Health, or CADTH, a Canadian national organisation that provides research and analysis to healthcare decision-makers, said this as long ago as 2013 in a report entitled 'Use of Surgical Masks in the Operating Room: A Review of the Clinical Effectiveness and Guidelines'. It said:

- No evidence was found to support the use of surgical face masks to reduce the frequency of surgical site infections
- No evidence was found on the effectiveness of wearing surgical face masks to protect staff from infectious material in the operating room.
- Guidelines recommend the use of surgical face masks by staff in the operating room to protect both operating room staff and patients (despite the lack of evidence).

We were told that the world could go back to 'normal' with the arrival of the 'vaccines'. When they came, fraudulent as they are, the story changed as I knew that it would. We are in the midst of transforming 'normal', not going back to it. Mary Ramsay, head of immunisation at Public Health England, echoed the words of US criminal Anthony Fauci who said masks and other regulations must stay no matter if people are vaccinated. The Fauci idiot continued to wear two masks – different colours so both could be clearly seen – after he *claimed* to have been vaccinated. Senator Rand Paul told Fauci in one exchange that his double-masks were 'theatre' and he was right. It's all theatre. Mary Ramsay back-tracked on the vaccine-return-to-normal theme when she said the public may need to wear masks and social-distance for years despite the jabs. 'People have got used to those lower-level restrictions now, and [they] can live with them', she said telling us what the idea has been all along. 'The vaccine does not give you a pass, even if you have had it, you must continue to follow all the guidelines' said a Public Health England statement which reneged on what we had been told before and made having the 'vaccine' irrelevant to 'normality' even by the official story. Spain's fascist government trumped everyone by passing a law mandating the wearing of masks on the beach and even when swimming in the sea. The move would have devastated what's left of the Spanish tourist industry, posed potential breathing dangers to swimmers and had Northern European sunbathers walking around with their forehead brown and the rest of their face white as a sheet. The ruling was so crazy that it had to be retracted after pressure from public and tourist industry, but it confirmed where the Cult wants to go with masks and how clinically insane authority has become. The determination to make masks permanent and hide the serious dangers to body and mind can be seen in the censorship of scientist Professor Denis Rancourt by Bill Gates-funded academic publishing website ResearchGate over his papers exposing the dangers and uselessness of masks. Rancourt said:

ResearchGate today has permanently locked my account, which I have had since 2015. Their reasons graphically show the nature of their attack against democracy, and their corruption of

science ... By their obscene non-logic, a scientific review of science articles reporting on harms caused by face masks has a 'potential to cause harm'. No criticism of the psychological device (face masks) is tolerated, if the said criticism shows potential to influence public policy.

This is what happens in a fascist world.

Where are the 'greens' (again)?

Other dangers of wearing masks especially regularly relate to the inhalation of minute plastic fibres into the lungs and the deluge of discarded masks in the environment and oceans. Estimates predicted that more than 1.5 billion disposable masks will end up in the world's oceans every year polluting the water with tons of plastic and endangering marine wildlife. Studies project that humans are using 129 billion face masks each month worldwide – about three million a minute. Most are disposable and made from plastic, non-biodegradable microfibers that break down into smaller plastic particles that become widespread in ecosystems. They are littering cities, clogging sewage channels and turning up in bodies of water. I have written in other books about the immense amounts of microplastics from endless sources now being absorbed into the body. Rolf Halden, director of the Arizona State University (ASU) Biodesign Center for Environmental Health Engineering, was the senior researcher in a 2020 study that analysed 47 human tissue samples and found microplastics in all of them. 'We have detected these chemicals of plastics in every single organ that we have investigated', he said. I wrote in *The Answer* about the world being deluged with microplastics. A study by the Worldwide Fund for Nature (WWF) found that people are consuming on average every week some 2,000 tiny pieces of plastic mostly through water and also through marine life and the air. Every year humans are ingesting enough microplastics to fill a heaped dinner plate and in a life-time of 79 years it is enough to fill two large waste bins. Marco Lambertini, WWF International director general said: 'Not only are plastics polluting our oceans and waterways and killing marine life – it's in all of us and we can't escape consuming plastics,' American

geologists found tiny plastic fibres, beads and shards in rainwater samples collected from the remote slopes of the Rocky Mountain National Park near Denver, Colorado. Their report was headed: 'It is raining plastic.' Rachel Adams, senior lecturer in Biomedical Science at Cardiff Metropolitan University, said that among health consequences are internal inflammation and immune responses to a 'foreign body'. She further pointed out that microplastics become carriers of toxins including mercury, pesticides and dioxins (a known cause of cancer and reproductive and developmental problems). These toxins accumulate in the fatty tissues once they enter the body through microplastics. Now this is being compounded massively by people putting plastic on their face and throwing it away.

Workers exposed to polypropylene plastic fibres known as 'flock' have developed 'flock worker's lung' from inhaling small pieces of the flock fibres which can damage lung tissue, reduce breathing capacity and exacerbate other respiratory problems. *Now ...* commonly used surgical masks have three layers of melt-blown textiles made of ... polypropylene. We have billions of people putting these microplastics against their mouth, nose and face for hours at a time day after day in the form of masks. How does anyone think that will work out? I mean – what could possibly go wrong? We posted a number of scientific studies on this at davidicke.com, but when I went back to them as I was writing this book the links to the science research website where they were hosted were dead. Anything that challenges the official narrative in any way is either censored or vilified. The official narrative is so unsupportable by the evidence that only deleting the truth can protect it. A study by Chinese scientists still survived – with the usual twist which it why it was still active, I guess. Yes, they found that virtually all the masks they tested increased the daily intake of microplastic fibres, but people should still wear them because the danger from the 'virus' was worse said the crazy 'team' from the Institute of Hydrobiology in Wuhan. Scientists first discovered microplastics in lung tissue of some patients who died of lung cancer

in the 1990s. Subsequent studies have confirmed the potential health damage with the plastic degrading slowly and remaining in the lungs to accumulate in volume. Wuhan researchers used a machine simulating human breathing to establish that masks shed up to nearly 4,000 microplastic fibres in a month with reused masks producing more. Scientists said some masks are laced with toxic chemicals and a variety of compounds seriously restricted for both health and environmental reasons. They include cobalt (used in blue dye) and formaldehyde known to cause watery eyes, burning sensations in the eyes, nose, and throat, plus coughing, wheezing and nausea. No – that must be ‘Covid-19’.

Mask ‘worms’

There is another and potentially even more sinister content of masks. Mostly new masks of different makes filmed under a microscope around the world have been found to contain strange black fibres or ‘worms’ that appear to move or ‘crawl’ by themselves and react to heat and water. The nearest I have seen to them are the self-replicating fibres that are pulled out through the skin of those suffering from Morgellons disease which has been connected to the phenomena of ‘chemtrails’ which I will bring into the story later on. Morgellons fibres continue to grow outside the body and have a form of artificial intelligence. Black ‘worm’ fibres in masks have that kind of feel to them and there is a nanotechnology technique called ‘worm micelles’ which carry and release drugs or anything else you want to deliver to the body. For sure the suppression of humanity by mind altering drugs is the Cult agenda big time and the more excuses they can find to gain access to the body the more opportunities there are to make that happen whether through ‘vaccines’ or masks pushed against the mouth and nose for hours on end.

So let us summarise the pros and cons of masks:

Against masks: Breathing in your own carbon dioxide; depriving the body and brain of sufficient oxygen; build-up of toxins in the mask that can be breathed into the lungs and cause rashes on the face and 'mask-mouth'; breathing microplastic fibres and toxic chemicals into the lungs; dehumanisation and deleting individualisation by literally making people faceless; destroying human emotional interaction through facial expression and deleting parental connection with their babies which look for guidance to their facial expression.

For masks: They don't protect you from a 'virus' that doesn't exist and even if it did 'viral' particles are so minute they are smaller than the holes in the mask.

Governments, police, supermarkets, businesses, transport companies, and all the rest who seek to impose masks have done no risk assessment on their consequences for health and psychology and are now open to group lawsuits when the impact becomes clear with a cumulative epidemic of respiratory and other disease. Authorities will try to exploit these effects and hide the real cause by dubbing them 'Covid-19'. Can you imagine setting out to force the population to wear health-destroying masks without doing any assessment of the risks? It is criminal and it is evil, but then how many people targeted in this way, who see their children told to wear them all day at school, have asked for a risk assessment? Billions can't be imposed upon by the few unless the billions allow it. Oh, yes, with just a tinge of irony, 85 percent of all masks made worldwide come from *China*.

Wash your hands in toxic shite

'Covid' rules include the use of toxic sanitisers and again the health consequences of constantly applying toxins to be absorbed through the skin is obvious to any level of Renegade Mind. America's Food and Drug Administration (FDA) said that sanitisers are drugs and issued a warning about 75 dangerous brands which contain

methanol used in antifreeze and can cause death, kidney damage and blindness. The FDA circulated the following warning even for those brands that it claims to be safe:

Store hand sanitizer out of the reach of pets and children, and children should use it only with adult supervision. Do not drink hand sanitizer. This is particularly important for young children, especially toddlers, who may be attracted by the pleasant smell or brightly colored bottles of hand sanitizer.

Drinking even a small amount of hand sanitizer can cause alcohol poisoning in children. (However, there is no need to be concerned if your children eat with or lick their hands after using hand sanitizer.) During this coronavirus pandemic, poison control centers have had an increase in calls about accidental ingestion of hand sanitizer, so it is important that adults monitor young children's use.

Do not allow pets to swallow hand sanitizer. If you think your pet has eaten something potentially dangerous, call your veterinarian or a pet poison control center right away. Hand sanitizer is flammable and should be stored away from heat and flames. When using hand sanitizer, rub your hands until they feel completely dry before performing activities that may involve heat, sparks, static electricity, or open flames.

There you go, perfectly safe, then, and that's without even a mention of the toxins absorbed through the skin. Come on kids – sanitise your hands everywhere you go. It will save you from the 'virus'. Put all these elements together of the 'Covid' normal and see how much health and psychology is being cumulatively damaged, even devastated, to 'protect your health'. Makes sense, right? They are only imposing these things because they care, right? *Right?*

Submitting to insanity

Psychological reframing of the population goes very deep and is done in many less obvious ways. I hear people say how contradictory and crazy 'Covid' rules are and how they are ever changing. This is explained away by dismissing those involved as idiots. It is a big mistake. The Cult is delighted if its cold calculation is perceived as incompetence and idiocy when it is anything but. Oh, yes, there are idiots within the system – lots of them – but they are *administering* the Cult agenda, mostly unknowingly. They are not deciding and dictating it. The bulwark against tyranny is self-

respect, always has been, always will be. It is self-respect that has broken every tyranny in history. By its very nature self-respect will not bow to oppression and its perpetrators. There is so little self-respect that it's always the few that overturn dictators. Many may eventually follow, but the few with the iron spines (self-respect) kick it off and generate the momentum. The Cult targets self-respect in the knowledge that once this has gone only submission remains. Crazy, contradictory, ever-changing 'Covid' rules are systematically applied by psychologists to delete self-respect. They *want* you to see that the rules make no sense. It is one thing to decide to do something when *you* have made the choice based on evidence and logic. You still retain your self-respect. It is quite another when you can see what you are being told to do is insane, ridiculous and makes no sense, and *yet you still do it*. Your self-respect is extinguished and this has been happening as ever more obviously stupid and nonsensical things have been demanded and the great majority have complied even when they can see they are stupid and nonsensical.

People walk around in face-nappies knowing they are damaging their health and make no difference to a 'virus'. They do it in fear of not doing it. I know it's daft, but I'll do it anyway. When that happens something dies inside of you and submissive reframing has begun. Next there's a need to hide from yourself that you have conceded your self-respect and you convince yourself that you have not really submitted to fear and intimidation. You begin to believe that you are complying with craziness because it's the right thing to do. When first you concede your self-respect of $2+2 = 4$ to $2+2 = 5$ you *know* you are compromising your self-respect. Gradually to avoid facing that fact you begin to *believe* that $2+2=5$. You have been reframed and I have been watching this process happening in the human psyche on an industrial scale. The Cult is working to break your spirit and one of its major tools in that war is humiliation. I read how former American soldier Bradley Manning (later Chelsea Manning after a sex-change) was treated after being jailed for supplying WikiLeaks with documents exposing the enormity of

government and elite mendacity. Manning was isolated in solitary confinement for eight months, put under 24-hour surveillance, forced to hand over clothing before going to bed, and stand naked for every roll call. This is systematic humiliation. The introduction of anal swab 'Covid' tests in China has been done for the same reason to delete self-respect and induce compliant submission. Anal swabs are mandatory for incoming passengers in parts of China and American diplomats have said they were forced to undergo the indignity which would have been calculated humiliation by the Cult-owned Chinese government that has America in its sights.

Government-people: An abusive relationship

Spirit-breaking psychological techniques include giving people hope and apparent respite from tyranny only to take it away again. This happened in the UK during Christmas, 2020, when the psychopsychologists and their political lackeys announced an easing of restrictions over the holiday only to reimpose them almost immediately on the basis of yet another lie. There is a big psychological difference between getting used to oppression and being given hope of relief only to have that dashed. Psychologists know this and we have seen the technique used repeatedly. Then there is traumatising people before you introduce more extreme regulations that require compliance. A perfect case was the announcement by the dark and sinister Whitty and Vallance in the UK that 'new data' predicted that 4,000 could die every day over the winter of 2020/2021 if we did not lockdown again. I think they call it lying and after traumatising people with that claim out came Jackboot Johnson the next day with new curbs on human freedom. Psychologists know that a frightened and traumatised mind becomes suggestable to submission and behaviour reframing. Underpinning all this has been to make people fearful and suspicious of each other and see themselves as a potential danger to others. In league with deleted self-respect you have the perfect psychological recipe for self-loathing. The relationship between authority and public is now demonstrably the same as that of

subservience to an abusive partner. These are signs of an abusive relationship explained by psychologist Leslie Becker-Phelps:

Psychological and emotional abuse: Undermining a partner's self-worth with verbal attacks, name-calling, and belittling. Humiliating the partner in public, unjustly accusing them of having an affair, or interrogating them about their every behavior. Keeping partner confused or off balance by saying they were just kidding or blaming the partner for 'making' them act this way ... Feigning in public that they care while turning against them in private. This leads to victims frequently feeling confused, incompetent, unworthy, hopeless, and chronically self-doubting. [Apply these techniques to how governments have treated the population since New Year, 2020, and the parallels are obvious.]

Physical abuse: The abuser might physically harm their partner in a range of ways, such as grabbing, hitting, punching, or shoving them. They might throw objects at them or harm them with a weapon. [Observe the physical harm imposed by masks, lockdown, and so on.]

Threats and intimidation: One way abusers keep their partners in line is by instilling fear. They might be verbally threatening, or give threatening looks or gestures. Abusers often make it known that they are tracking their partner's every move. They might destroy their partner's possessions, threaten to harm them, or threaten to harm their family members. Not surprisingly, victims of this abuse often feel anxiety, fear, and panic. [No words necessary.]

Isolation: Abusers often limit their partner's activities, forbidding them to talk or interact with friends or family. They might limit access to a car or even turn off their phone. All of this might be done by physically holding them against their will, but is often accomplished through psychological abuse and intimidation. The more isolated a person feels, the fewer resources they have to help gain perspective on their situation and to escape from it. [No words necessary.]

Economic abuse: Abusers often make their partners beholden to them for money by controlling access to funds of any kind. They might prevent their partner from getting a job or withhold access to money they earn from a job. This creates financial dependency that makes leaving the relationship very difficult. [See destruction of livelihoods and the proposed meagre 'guaranteed income' so long as you do whatever you are told.]

Using children: An abuser might disparage their partner's parenting skills, tell their children lies about their partner, threaten to take custody of their children, or threaten to harm their children. These tactics instil fear and often elicit compliance. [See reframed social service mafia and how children are being mercilessly abused by the state over 'Covid' while their parents look on too frightened to do anything.]

A further recurring trait in an abusive relationship is the abused blaming themselves for their abuse and making excuses for the abuser. We have the public blaming each other for lockdown abuse by government and many making excuses for the government while attacking those who challenge the government. How often we have heard authorities say that rules are being imposed or reimposed only because people have refused to 'behave' and follow the rules. We don't want to do it – it's *you*.

Renegade Minds are an antidote to all of these things. They will never concede their self-respect no matter what the circumstances. Even when apparent humiliation is heaped upon them they laugh in its face and reflect back the humiliation on the abuser where it belongs. Renegade Minds will never wear masks they know are only imposed to humiliate, suppress and damage both physically and psychologically. Consequences will take care of themselves and they will never break their spirit or cause them to concede to tyranny. UK newspaper columnist Peter Hitchens was one of the few in the mainstream media to speak out against lockdowns and forced vaccinations. He then announced he had taken the jab. He wanted to see family members abroad and he believed vaccine passports were inevitable even though they had not yet been introduced. Hitchens

has a questioning and critical mind, but not a Renegade one. If he had no amount of pressure would have made him concede. Hitchens excused his action by saying that the battle has been lost. Renegade Minds never accept defeat when freedom is at stake and even if they are the last one standing the self-respect of not submitting to tyranny is more important than any outcome or any consequence.

That's why Renegade Minds are the only minds that ever changed anything worth changing.

CHAPTER EIGHT

'Reframing' insanity

Insanity is relative. It depends on who has who locked in what cage
Ray Bradbury

Reframing' a mind means simply to change its perception and behaviour. This can be done subconsciously to such an extent that subjects have no idea they have been 'reframed' while to any observer changes in behaviour and attitudes are obvious.

Human society is being reframed on a ginormous scale since the start of 2020 and here we have the reason why psychologists rather than doctors have been calling the shots. Ask most people who have succumbed to 'Covid' reframing if they have changed and most will say 'no'; but they *have* and fundamentally. The Cult's long-game has been preparing for these times since way back and crucial to that has been to prepare both population and officialdom mentally and emotionally. To use the mind-control parlance they had to reframe the population with a mentality that would submit to fascism and reframe those in government and law enforcement to impose fascism or at least go along with it. The result has been the fact-deleted mindlessness of 'Wokeness' and officialdom that has either enthusiastically or unquestioningly imposed global tyranny demanded by reframed politicians on behalf of psychopathic and deeply evil cultists. 'Cognitive reframing' identifies and challenges the way someone sees the world in the form of situations, experiences and emotions and then restructures those perceptions to view the same set of circumstances in a different way. This can have

benefits if the attitudes are personally destructive while on the other side it has the potential for individual and collective mind control which the subject has no idea has even happened.

Cognitive therapy was developed in the 1960s by Aaron T. Beck who was born in Rhode Island in 1921 as the son of Jewish immigrants from the Ukraine. He became interested in the techniques as a treatment for depression. Beck's daughter Judith S. Beck is prominent in the same field and they founded the Beck Institute for Cognitive Behavior Therapy in Philadelphia in 1994. Cognitive reframing, however, began to be used worldwide by those with a very dark agenda. The Cult reframes politicians to change their attitudes and actions until they are completely at odds with what they once appeared to stand for. The same has been happening to government administrators at all levels, law enforcement, military and the human population. Cultists love mind control for two main reasons: It allows them to control what people think, do and say to secure agenda advancement and, by definition, it calms their legendary insecurity and fear of the unexpected. I have studied mind control since the time I travelled America in 1996. I may have been talking to next to no one in terms of an audience in those years, but my goodness did I gather a phenomenal amount of information and knowledge about so many things including the techniques of mind control. I have described this in detail in other books going back to *The Biggest Secret* in 1998. I met a very large number of people recovering from MKUltra and its offshoots and successors and I began to see how these same techniques were being used on the population in general. This was never more obvious than since the 'Covid' hoax began.

Reframing the enforcers

I have observed over the last two decades and more the very clear transformation in the dynamic between the police, officialdom and the public. I tracked this in the books as the relationship mutated from one of serving the public to seeing them as almost the enemy and certainly a lower caste. There has always been a class divide

based on income and always been some psychopathic, corrupt, and big-I-am police officers. This was different. Wholesale change was unfolding in the collective dynamic; it was less about money and far more about position and perceived power. An us-and-them was emerging. Noses were lifted skyward by government administration and law enforcement and their attitude to the public they were *supposed* to be serving changed to one of increasing contempt, superiority and control. The transformation was so clear and widespread that it had to be planned. Collective attitudes and dynamics do not change naturally and organically that quickly on that scale. I then came across an organisation in Britain called Common Purpose created in the late 1980s by Julia Middleton who would work in the office of Deputy Prime Minister John Prescott during the long and disastrous premiership of war criminal Tony Blair. When Blair speaks the Cult is speaking and the man should have been in jail a long time ago. Common Purpose proclaims itself to be one of the biggest 'leadership development' organisations in the world while functioning as a *charity* with all the financial benefits which come from that. It hosts 'leadership development' courses and programmes all over the world and claims to have 'brought together' what it calls 'leaders' from more than 100 countries on six continents. The modus operandi of Common Purpose can be compared with the work of the UK government's reframing network that includes the Behavioural Insights Team 'nudge unit' and 'Covid' reframing specialists at SPI-B. WikiLeaks described Common Purpose long ago as 'a hidden virus in our government and schools' which is unknown to the general public: 'It recruits and trains "leaders" to be loyal to the directives of Common Purpose and the EU, instead of to their own departments, which they then undermine or subvert, the NHS [National Health Service] being an example.' This is a vital point to understand the 'Covid' hoax. The NHS, and its equivalent around the world, has been utterly reframed in terms of administrators and much of the medical personnel with the transformation underpinned by recruitment policies. The outcome has been the criminal and psychopathic behaviour of the

NHS over 'Covid' and we have seen the same in every other major country. WikiLeaks said Common Purpose trainees are 'learning to rule without regard to democracy' and to usher in a police state (current events explained). Common Purpose operated like a 'glue' and had members in the NHS, BBC, police, legal profession, church, many of Britain's 7,000 quangos, local councils, the Civil Service, government ministries and Parliament, and controlled many RDA's (Regional Development Agencies). Here we have one answer for how and why British institutions and their like in other countries have changed so negatively in relation to the public. This further explains how and why the beyond-disgraceful reframed BBC has become a propaganda arm of 'Covid' fascism. They are all part of a network pursuing the same goal.

By 2019 Common Purpose was quoting a figure of 85,000 'leaders' that had attended its programmes. These 'students' of all ages are known as Common Purpose 'graduates' and they consist of government, state and local government officials and administrators, police chiefs and officers, and a whole range of others operating within the national, local and global establishment. Cressida Dick, Commissioner of the London Metropolitan Police, is the Common Purpose graduate who was the 'Gold Commander' that oversaw what can only be described as the murder of Brazilian electrician Jean Charles de Menezes in 2005. He was held down by psychopathic police and shot seven times in the head by a psychopathic lunatic after being mistaken for a terrorist when he was just a bloke going about his day. Dick authorised officers to pursue and keep surveillance on de Menezes and ordered that he be stopped from entering the underground train system. Police psychopaths took her at her word clearly. She was 'disciplined' for this outrage by being *promoted* – eventually to the top of the 'Met' police where she has been a disaster. Many Chief Constables controlling the police in different parts of the UK are and have been Common Purpose graduates. I have heard the 'graduate' network described as a sort of Mafia or secret society operating within the fabric of government at all levels pursuing a collective policy

ingrained at Common Purpose training events. Founder Julia Middleton herself has said:

Locally and internationally, Common Purpose graduates will be 'lighting small fires' to create change in their organisations and communities ... The Common Purpose effect is best illustrated by the many stories of small changes brought about by leaders, who themselves have changed.

A Common Purpose mission statement declared:

Common Purpose aims to improve the way society works by expanding the vision, decision-making ability and influence of all kinds of leaders. The organisation runs a variety of educational programmes for leaders of all ages, backgrounds and sectors, in order to provide them with the inspirational, information and opportunities they need to change the world.

Yes, but into what? Since 2020 the answer has become clear.

NLP and the Delphi technique

Common Purpose would seem to be a perfect name or would common programming be better? One of the foundation methods of reaching 'consensus' (group think) is by setting the agenda theme and then encouraging, cajoling or pressuring everyone to agree a 'consensus' in line with the core theme promoted by Common Purpose. The methodology involves the 'Delphi technique', or an adaptation of it, in which opinions are expressed that are summarised by a 'facilitator or change agent' at each stage. Participants are 'encouraged' to modify their views in the light of what others have said. Stage by stage the former individual opinions are merged into group consensus which just happens to be what Common Purpose wants them to believe. A key part of this is to marginalise anyone refusing to concede to group think and turn the group against them to apply pressure to conform. We are seeing this very technique used on the general population to make 'Covid' group-thinkers hostile to those who have seen through the bullshit. People can be reframed by using perception manipulation methods such as Neuro-Linguistic Programming (NLP) in which you change perception with the use of

carefully constructed language. An NLP website described the technique this way:

... A method of influencing brain behaviour (the 'neuro' part of the phrase) through the use of language (the 'linguistic' part) and other types of communication to enable a person to 'recode' the way the brain responds to stimuli (that's the 'programming') and manifest new and better behaviours. Neuro-Linguistic Programming often incorporates hypnosis and self-hypnosis to help achieve the change (or 'programming') that is wanted.

British alternative media operation UKColumn has done very detailed research into Common Purpose over a long period. I quoted co-founder and former naval officer Brian Gerrish in my book *Remember Who You Are*, published in 2011, as saying the following years before current times:

It is interesting that many of the mothers who have had children taken by the State speak of the Social Services people being icily cool, emotionless and, as two ladies said in slightly different words, '... like little robots'. We know that NLP is cumulative, so people can be given small imperceptible doses of NLP in a course here, another in a few months, next year etc. In this way, major changes are accrued in their personality, but the day by day change is almost unnoticeable.

In these and other ways 'graduates' have had their perceptions uniformly reframed and they return to their roles in the institutions of government, law enforcement, legal profession, military, 'education', the UK National Health Service and the whole swathe of the establishment structure to pursue a common agenda preparing for the 'post-industrial', 'post-democratic' society. I say 'preparing' but we are now there. 'Post-industrial' is code for the Great Reset and 'post-democratic' is 'Covid' fascism. UKColumn has spoken to partners of those who have attended Common Purpose 'training'. They have described how personalities and attitudes of 'graduates' changed very noticeably for the worse by the time they had completed the course. They had been 'reframed' and told they are the 'leaders' – the special ones – who know better than the population. There has also been the very demonstrable recruitment of psychopaths and narcissists into government administration at all

levels and law enforcement. If you want psychopathy hire psychopaths and you get a simple cause and effect. If you want administrators, police officers and 'leaders' to perceive the public as lesser beings who don't matter then employ narcissists. These personalities are identified using 'psychometrics' that identifies knowledge, abilities, attitudes and personality traits, mostly through carefully-designed questionnaires and tests. As this policy has passed through the decades we have had power-crazy, power-trippers appointed into law enforcement, security and government administration in preparation for current times and the dynamic between public and law enforcement/officialdom has been transformed. UKColumn's Brian Gerrish said of the narcissistic personality:

Their love of themselves and power automatically means that they will crush others who get in their way. I received a major piece of the puzzle when a friend pointed out that when they made public officials re-apply for their own jobs several years ago they were also required to do psychometric tests. This was undoubtedly the start of the screening process to get 'their' sort of people in post.

How obvious that has been since 2020 although it was clear what was happening long before if people paid attention to the changing public-establishment dynamic.

Change agents

At the centre of events in 'Covid' Britain is the National Health Service (NHS) which has behaved disgracefully in slavishly following the Cult agenda. The NHS management structure is awash with Common Purpose graduates or 'change agents' working to a common cause. Helen Bevan, a Chief of Service Transformation at the NHS Institute for Innovation and Improvement, co-authored a document called 'Towards a million change agents, a review of the social movements literature: implications for large scale change in the NHS'. The document compared a project management approach to that of change and social movements where 'people change

themselves and each other – peer to peer’. Two definitions given for a ‘social movement’ were:

A group of people who consciously attempt to build a radically new social order; involves people of a broad range of social backgrounds; and deploys politically confrontational and socially disruptive tactics – Cyrus Zirakzadeh 1997

Collective challenges, based on common purposes and social solidarities, in sustained interaction with elites, opponents, and authorities – Sidney Tarrow 1994

Helen Bevan wrote another NHS document in which she defined ‘framing’ as ‘the process by which leaders construct, articulate and put across their message in a powerful and compelling way in order to win people to their cause and call them to action’. I think I could come up with another definition that would be rather more accurate. The National Health Service and institutions of Britain and the wider world have been taken over by reframed ‘change agents’ and that includes everything from the United Nations to national governments, local councils and social services which have been kidnapping children from loving parents on an extraordinary and gathering scale on the road to the end of parenthood altogether. Children from loving homes are stolen and kidnapped by the state and put into the ‘care’ (inversion) of the local authority through council homes, foster parents and forced adoption. At the same time children are allowed to be abused without response while many are under council ‘care’. UKColumn highlighted the Common Purpose connection between South Yorkshire Police and Rotherham council officers in the case of the scandal in that area of the sexual exploitation of children to which the authorities turned not one blind eye, but both:

We were alarmed to discover that the Chief Executive, the Strategic Director of Children and Young People's Services, the Manager for the Local Strategic Partnership, the Community Cohesion Manager, the Cabinet Member for Cohesion, the Chief Constable and his predecessor had all attended Leadership training courses provided by the pseudo-charity Common Purpose.

Once 'change agents' have secured positions of hire and fire within any organisation things start to move very quickly. Personnel are then hired and fired on the basis of whether they will work towards the agenda the change agent represents. If they do they are rapidly promoted even though they may be incompetent. Those more qualified and skilled who are pre-Common Purpose 'old school' see their careers stall and even disappear. This has been happening for decades in every institution of state, police, 'health' and social services and all of them have been transformed as a result in their attitudes to their jobs and the public. Medical professions, including nursing, which were once vocations for the caring now employ many cold, callous and couldn't give a shit personality types. The UKColumn investigation concluded:

By blurring the boundaries between people, professions, public and private sectors, responsibility and accountability, Common Purpose encourages 'graduates' to believe that as new selected leaders, they can work together, outside of the established political and social structures, to achieve a paradigm shift or CHANGE – so called 'Leading Beyond Authority'. In doing so, the allegiance of the individual becomes 'reframed' on CP colleagues and their NETWORK.

Reframing the Face-Nappies

Nowhere has this process been more obvious than in the police where recruitment of psychopaths and development of unquestioning mind-controlled group-thinkers have transformed law enforcement into a politically-correct 'Woke' joke and a travesty of what should be public service. Today they wear their face-nappies like good little gofers and enforce 'Covid' rules which are fascism under another name. Alongside the specifically-recruited psychopaths we have software minds incapable of free thought. Brian Gerrish again:

An example is the policeman who would not get on a bike for a press photo because he had not done the cycling proficiency course. Normal people say this is political correctness gone mad. Nothing could be further from the truth. The policeman has been reframed, and in his reality it is perfect common sense not to get on the bike 'because he hasn't done the cycling course'.

Another example of this is where the police would not rescue a boy from a pond until they had taken advice from above on the 'risk assessment'. A normal person would have arrived, perhaps thought of the risk for a moment, and dived in. To the police now 'reframed', they followed 'normal' procedure.

There are shocking cases of reframed ambulance crews doing the same. Sheer unthinking stupidity of London Face-Nappies headed by Common Purpose graduate Cressida Dick can be seen in their behaviour at a vigil in March, 2021, for a murdered woman, Sarah Everard. A police officer had been charged with the crime. Anyone with a brain would have left the vigil alone in the circumstances. Instead they 'manhandled' women to stop them breaking 'Covid rules' to betray classic reframing. Minds in the thrall of perception control have no capacity for seeing a situation on its merits and acting accordingly. 'Rules is rules' is their only mind-set. My father used to say that rules and regulations are for the guidance of the intelligent and the blind obedience of the idiot. Most of the intelligent, decent, coppers have gone leaving only the other kind and a few old school for whom the job must be a daily nightmare. The combination of psychopaths and rule-book software minds has been clearly on public display in the 'Covid' era with automaton robots in uniform imposing fascistic 'Covid' regulations on the population without any personal initiative or judging situations on their merits. There are thousands of examples around the world, but I'll make my point with the infamous Derbyshire police in the English East Midlands – the ones who think pouring dye into beauty spots and using drones to track people walking in the countryside away from anyone is called 'policing'. To them there are rules decreed by the government which they have to enforce and in their bewildered state a group gathering in a closed space and someone walking alone in the countryside are the same thing. It is beyond idiocy and enters the realm of clinical insanity.

Police officers in Derbyshire said they were 'horrified' – *horrified* – to find 15 to 20 'irresponsible' kids playing a football match at a closed leisure centre 'in breach of coronavirus restrictions'. When they saw the police the kids ran away leaving their belongings behind and the reframed men and women of Derbyshire police were seeking to establish their identities with a view to fining their parents. The most natural thing for youngsters to do – kicking a ball about – is turned into a criminal activity and enforced by the moronic software programs of Derbyshire police. You find the same mentality in every country. These barely conscious 'horrified' officers said they had to take action because 'we need to ensure these rules are being followed' and 'it is of the utmost importance that you ensure your children are following the rules and regulations for Covid-19'. Had any of them done ten seconds of research to see if this parroting of their masters' script could be supported by any evidence? Nope. Reframed people don't think – others think for them and that's the whole idea of reframing. I have seen police officers one after the other repeating without question word for word what officialdom tells them just as I have seen great swathes of the public doing the same. Ask either for 'their' opinion and out spews what they have been told to think by the official narrative. Police and public may seem to be in different groups, but their mentality is the same. Most people do whatever they are told in fear not doing so or because they believe what officialdom tells them; almost the entirety of the police do what they are told for the same reason. Ultimately it's the tiny inner core of the global Cult that's telling both what to do.

So Derbyshire police were 'horrified'. Oh, really? Why did they think those kids were playing football? It was to relieve the psychological consequences of lockdown and being denied human contact with their friends and interaction, touch and discourse vital to human psychological health. Being denied this month after month has dismantled the psyche of many children and young people as depression and suicide have exploded. Were Derbyshire police *horrified by that*? Are you kidding? Reframed people don't have those

mental and emotional processes that can see how the impact on the psychological health of youngsters is far more dangerous than any 'virus' even if you take the mendacious official figures to be true. The reframed are told (programmed) how to act and so they do. The Derbyshire Chief Constable in the first period of lockdown when the black dye and drones nonsense was going on was Peter Goodman. He was the man who severed the connection between his force and the Derbyshire Constabulary *Male Voice* Choir when he decided that it was not inclusive enough to allow women to join. The fact it was a male voice choir making a particular sound produced by male voices seemed to elude a guy who terrifyingly ran policing in Derbyshire. He retired weeks after his force was condemned as disgraceful by former Supreme Court Justice Jonathan Sumption for their behaviour over extreme lockdown impositions. Goodman was replaced by his deputy Rachel Swann who was in charge when her officers were 'horrified'. The police statement over the boys committing the hanging-offence of playing football included the line about the youngsters being 'irresponsible in the times we are all living through' missing the point that the real relevance of the 'times we are all living through' is the imposition of fascism enforced by psychopaths and reframed minds of police officers playing such a vital part in establishing the fascist tyranny that their own children and grandchildren will have to live in their entire lives. As a definition of insanity that is hard to beat although it might be run close by imposing masks on people that can have a serious effect on their health while wearing a face nappy all day themselves. Once again public and police do it for the same reason – the authorities tell them to and who are they to have the self-respect to say no?

Workers in uniform

How reframed do you have to be to arrest a *six-year-old* and take him to court for *picking a flower* while waiting for a bus? Brain dead police and officialdom did just that in North Carolina where criminal proceedings happen regularly for children under nine. Attorney Julie Boyer gave the six-year-old crayons and a colouring book

during the 'flower' hearing while the 'adults' decided his fate. County Chief District Court Judge Jay Corpening asked: 'Should a child that believes in Santa Claus, the Easter Bunny and the tooth fairy be making life-altering decisions?' Well, of course not, but common sense has no meaning when you have a common purpose and a reframed mind. Treating children in this way, and police operating in American schools, is all part of the psychological preparation for children to accept a police state as normal all their adult lives. The same goes for all the cameras and biometric tracking technology in schools. Police training is focused on reframing them as snowflake Wokers and this is happening in the military. Pentagon top brass said that 'training sessions on extremism' were needed for troops who asked why they were so focused on the Capitol Building riot when Black Lives Matter riots were ignored. What's the difference between them some apparently and rightly asked. Actually, there is a difference. Five people died in the Capitol riot, only one through violence, and that was a police officer shooting an unarmed protestor. BLM riots killed at least 25 people and cost billions. Asking the question prompted the psychopaths and reframed minds that run the Pentagon to say that more 'education' (programming) was needed. Troop training is all based on psychological programming to make them fodder for the Cult – 'Military men are just dumb, stupid animals to be used as pawns in foreign policy' as Cult-to-his-DNA former Secretary of State Henry Kissinger famously said. Governments see the police in similar terms and it's time for those among them who can see this to defend the people and stop being enforcers of the Cult agenda upon the people.

The US military, like the country itself, is being targeted for destruction through a long list of Woke impositions. Cult-owned gaga 'President' Biden signed an executive order when he took office to allow taxpayer money to pay for transgender surgery for active military personnel and veterans. Are you a man soldier? No, I'm a LGBTQIA+ with a hint of Skoliosexual and Spectrasexual. Oh, good man. Bad choice of words you bigot. The Pentagon announced in March, 2021, the appointment of the first 'diversity and inclusion

officer' for US Special Forces. Richard Torres-Estrada arrived with the publication of a 'D&I Strategic Plan which will guide the enterprise-wide effort to institutionalize and sustain D&I'. If you think a Special Forces 'Strategic Plan' should have something to do with defending America you haven't been paying attention. Defending Woke is now the military's new role. Torres-Estrada has posted images comparing Donald Trump with Adolf Hitler and we can expect no bias from him as a representative of the supposedly non-political Pentagon. Cable news host Tucker Carlson said: 'The Pentagon is now the Yale faculty lounge but with cruise missiles.' Meanwhile Secretary of Defense Lloyd Austin, a board member of weapons-maker Raytheon with stock and compensation interests in October, 2020, worth \$1.4 million, said he was purging the military of the 'enemy within' – anyone who isn't Woke and supports Donald Trump. Austin refers to his targets as 'racist extremists' while in true Woke fashion being himself a racist extremist. Pentagon documents pledge to 'eradicate, eliminate and conquer all forms of racism, sexism and homophobia'. The definitions of these are decided by 'diversity and inclusion committees' peopled by those who see racism, sexism and homophobia in every situation and opinion. Woke (the Cult) is dismantling the US military and purging testosterone as China expands its military and gives its troops 'masculinity training'. How do we think that is going to end when this is all Cult coordinated? The US military, like the British military, is controlled by Woke and spineless top brass who just go along with it out of personal career interests.

'Woke' means fast asleep

Mind control and perception manipulation techniques used on individuals to create group-think have been unleashed on the global population in general. As a result many have no capacity to see the obvious fascist agenda being installed all around them or what 'Covid' is really all about. Their brains are firewalled like a computer system not to process certain concepts, thoughts and realisations that are bad for the Cult. The young are most targeted as the adults they

will be when the whole fascist global state is planned to be fully implemented. They need to be prepared for total compliance to eliminate all pushback from entire generations. The Cult has been pouring billions into taking complete control of 'education' from schools to universities via its operatives and corporations and not least Bill Gates as always. The plan has been to transform 'education' institutions into programming centres for the mentality of 'Woke'. James McConnell, professor of psychology at the University of Michigan, wrote in *Psychology Today* in 1970:

The day has come when we can combine sensory deprivation with drugs, hypnosis, and astute manipulation of reward and punishment, to gain almost absolute control over an individual's behaviour. It should then be possible to achieve a very rapid and highly effective type of brainwashing that would allow us to make dramatic changes in a person's behaviour and personality ...

... We should reshape society so that we all would be trained from birth to want to do what society wants us to do. We have the techniques to do it... no-one owns his own personality you acquired, and there's no reason to believe you should have the right to refuse to acquire a new personality if your old one is anti-social.

This was the potential for mass brainwashing in 1970 and the mentality there displayed captures the arrogant psychopathy that drives it forward. I emphasise that not all young people have succumbed to Woke programming and those that haven't are incredibly impressive people given that today's young are the most perceptually-targeted generations in history with all the technology now involved. Vast swathes of the young generations, however, have fallen into the spell – and that's what it is – of Woke. The Woke mentality and perceptual program is founded on *inversion* and you will appreciate later why that is so significant. Everything with Woke is inverted and the opposite of what it is claimed to be. Woke was a term used in African-American culture from the 1900s and referred to an awareness of social and racial justice. This is not the meaning of the modern version or 'New Woke' as I call it in *The Answer*. Oh, no, Woke today means something very different no matter how much Wokers may seek to hide that and insist Old Woke and New

Woke are the same. See if you find any 'awareness of social justice' here in the modern variety:

- Woke demands 'inclusivity' while excluding anyone with a different opinion and calls for mass censorship to silence other views.
- Woke claims to stand against oppression when imposing oppression is the foundation of all that it does. It is the driver of political correctness which is nothing more than a Cult invention to manipulate the population to silence itself.
- Woke believes itself to be 'liberal' while pursuing a global society that can only be described as fascist (see 'anti-fascist' fascist Antifa).
- Woke calls for 'social justice' while spreading injustice wherever it goes against the common 'enemy' which can be easily identified as a differing view.
- Woke is supposed to be a metaphor for 'awake' when it is solid-gold asleep and deep in a Cult-induced coma that meets the criteria for 'off with the fairies'.

I state these points as obvious facts if people only care to look. I don't do this with a sense of condemnation. We need to appreciate that the onslaught of perceptual programming on the young has been incessant and merciless. I can understand why so many have been reframed, or, given their youth, framed from the start to see the world as the Cult demands. The Cult has had access to their minds day after day in its 'education' system for their entire formative years. Perception is formed from information received and the Cult-created system is a life-long download of information delivered to elicit a particular perception, thus behaviour. The more this has expanded into still new extremes in recent decades and ever-increasing censorship has deleted other opinions and information why wouldn't that lead to a perceptual reframing on a mass scale? I

have described already cradle-to-grave programming and in more recent times the targeting of young minds from birth to adulthood has entered the stratosphere. This has taken the form of skewing what is 'taught' to fit the Cult agenda and the omnipresent techniques of group-think to isolate non-believers and pressure them into line. There has always been a tendency to follow the herd, but we really are in a new world now in relation to that. We have parents who can see the 'Covid' hoax told by their children not to stop them wearing masks at school, being 'Covid' tested or having the 'vaccine' in fear of the peer-pressure consequences of being different. What is 'peer-pressure' if not pressure to conform to group-think? Renegade Minds never group-think and always retain a set of perceptions that are unique to them. Group-think is always underpinned by consequences for not group-thinking. Abuse now aimed at those refusing DNA-manipulating 'Covid vaccines' are a potent example of this. The biggest pressure to conform comes from the very group which is itself being manipulated. 'I am programmed to be part of a hive mind and so you must be.'

Woke control structures in 'education' now apply to every mainstream organisation. Those at the top of the 'education' hierarchy (the Cult) decide the policy. This is imposed on governments through the Cult network; governments impose it on schools, colleges and universities; their leadership impose the policy on teachers and academics and they impose it on children and students. At any level where there is resistance, perhaps from a teacher or university lecturer, they are targeted by the authorities and often fired. Students themselves regularly demand the dismissal of academics (increasingly few) at odds with the narrative that the students have been programmed to believe in. It is quite a thought that students who are being targeted by the Cult become so consumed by programmed group-think that they launch protests and demand the removal of those who are trying to push back against those targeting the students. Such is the scale of perceptual inversion. We see this with 'Covid' programming as the Cult imposes the rules via psycho-psychologists and governments on

shops, transport companies and businesses which impose them on their staff who impose them on their customers who pressure Pushbackers to conform to the will of the Cult which is in the process of destroying them and their families. Scan all aspects of society and you will see the same sequence every time.

Fact free Woke and hijacking the 'left'

There is no more potent example of this than 'Woke', a mentality only made possible by the deletion of factual evidence by an 'education' system seeking to produce an ever more uniform society. Why would you bother with facts when you don't know any? Deletion of credible history both in volume and type is highly relevant. Orwell said: 'Who controls the past controls the future: who controls the present controls the past.' They who control the perception of the past control the perception of the future and they who control the present control the perception of the past through the writing and deleting of history. Why would you oppose the imposition of Marxism in the name of Wokeism when you don't know that Marxism cost at least 100 million lives in the 20th century alone? Watch videos and read reports in which Woker generations are asked basic historical questions – it's mind-blowing. A survey of 2,000 people found that six percent of millennials (born approximately early 1980s to early 2000s) believed the Second World War (1939-1945) broke out with the assassination of President Kennedy (in 1963) and one in ten thought Margaret Thatcher was British Prime Minister at the time. She was in office between 1979 and 1990. We are in a post-fact society. Provable facts are no defence against the fascism of political correctness or Silicon Valley censorship. Facts don't matter anymore as we have witnessed with the 'Covid' hoax. Sacrificing uniqueness to the Woke group-think religion is all you are required to do and that means thinking for yourself is the biggest Woke no, no. All religions are an expression of group-think and censorship and Woke is just another religion with an orthodoxy defended by group-think and censorship. Burned at

the stake becomes burned on Twitter which leads back eventually to burned at the stake as Woke humanity regresses to ages past.

The biggest Woke inversion of all is its creators and funders. I grew up in a traditional left of centre political household on a council estate in Leicester in the 1950s and 60s – you know, the left that challenged the power of wealth-hoarding elites and threats to freedom of speech and opinion. In those days students went on marches defending freedom of speech while today's Wokers march for its deletion. What on earth could have happened? Those very elites (collectively the Cult) that we opposed in my youth and early life have funded into existence the antithesis of that former left and hijacked the 'brand' while inverting everything it ever stood for. We have a mentality that calls itself 'liberal' and 'progressive' while acting like fascists. Cult billionaires and their corporations have funded themselves into control of 'education' to ensure that Woke programming is unceasing throughout the formative years of children and young people and that non-Wokers are isolated (that word again) whether they be students, teachers or college professors. The Cult has funded into existence the now colossal global network of Woke organisations that have spawned and promoted all the 'causes' on the Cult wish-list for global transformation and turned Wokers into demanders of them. Does anyone really think it's a coincidence that the Cult agenda for humanity is a carbon (sorry) copy of the societal transformations desired by Woke?? These are only some of them:

Political correctness: The means by which the Cult deletes all public debates that it knows it cannot win if we had the free-flow of information and evidence.

Human-caused 'climate change': The means by which the Cult seeks to transform society into a globally-controlled dictatorship imposing its will over the fine detail of everyone's lives 'to save the planet' which doesn't actually need saving.

Transgender obsession: Preparing collective perception to accept the 'new human' which would not have genders because it would be created technologically and not through procreation. I'll have much more on this in Human 2.0.

Race obsession: The means by which the Cult seeks to divide and rule the population by triggering racial division through the perception that society is more racist than ever when the opposite is the case. Is it perfect in that regard? No. But to compare today with the racism of apartheid and segregation brought to an end by the civil rights movement in the 1960s is to insult the memory of that movement and inspirations like Martin Luther King. Why is the 'anti-racism' industry (which it is) so dominated by privileged white people?

White supremacy: This is a label used by privileged white people to demonise poor and deprived white people pushing back on tyranny to marginalise and destroy them. White people are being especially targeted as the dominant race by number within Western society which the Cult seeks to transform in its image. If you want to change a society you must weaken and undermine its biggest group and once you have done that by using the other groups you next turn on them to do the same ... 'Then they came for the Jews and I was not a Jew so I did nothing.'

Mass migration: The mass movement of people from the Middle East, Africa and Asia into Europe, from the south into the United States and from Asia into Australia are another way the Cult seeks to dilute the racial, cultural and political influence of white people on Western society. White people ask why their governments appear to be working against them while being politically and culturally biased towards incoming cultures. Well, here's your answer. In the same way sexually 'straight' people, men and women, ask why the

authorities are biased against them in favour of other sexualities. The answer is the same – that's the way the Cult wants it to be for very sinister motives.

These are all central parts of the Cult agenda and central parts of the Woke agenda and Woke was created and continues to be funded to an immense degree by Cult billionaires and corporations. If anyone begins to say 'coincidence' the syllables should stick in their throat.

Billionaire 'social justice warriors'

Joe Biden is a 100 percent-owned asset of the Cult and the Wokers' man in the White House whenever he can remember his name and for however long he lasts with his rapidly diminishing cognitive function. Even walking up the steps of an aircraft without falling on his arse would appear to be a challenge. He's not an empty-shell puppet or anything. From the minute Biden took office (or the Cult did) he began his executive orders promoting the Woke wish-list. You will see the Woke agenda imposed ever more severely because it's really the *Cult* agenda. Woke organisations and activist networks spawned by the Cult are funded to the extreme so long as they promote what the Cult wants to happen. Woke is funded to promote 'social justice' by billionaires who become billionaires by destroying social justice. The social justice mantra is only a cover for dismantling social justice and funded by billionaires that couldn't give a damn about social justice. Everything makes sense when you see that. One of Woke's premier funders is Cult billionaire financier George Soros who said: 'I am basically there to make money, I cannot and do not look at the social consequences of what I do.' This is the same Soros who has given more than \$32 billion to his Open Society Foundations global Woke network and funded Black Lives Matter, mass immigration into Europe and the United States, transgender activism, climate change activism, political correctness and groups targeting 'white supremacy' in the form of privileged white thugs that dominate Antifa. What a scam it all is and when

you are dealing with the unquestioning fact-free zone of Woke scamming them is child's play. All you need to pull it off in all these organisations are a few in-the-know agents of the Cult and an army of naïve, reframed, uninformed, narcissistic, know-nothings convinced of their own self-righteousness, self-purity and virtue.

Soros and fellow billionaires and billionaire corporations have poured hundreds of millions into Black Lives Matter and connected groups and promoted them to a global audience. None of this is motivated by caring about black people. These are the billionaires that have controlled and exploited a system that leaves millions of black people in abject poverty and deprivation which they do absolutely nothing to address. The same Cult networks funding BLM were behind the *slave trade*! Black Lives Matter hijacked a phrase that few would challenge and they have turned this laudable concept into a political weapon to divide society. You know that BLM is a fraud when it claims that *All Lives Matter*, the most inclusive statement of all, is 'racist'. BLM and its Cult masters don't want to end racism. To them it's a means to an end to control all of humanity never mind the colour, creed, culture or background. What has destroying the nuclear family got to do with ending racism? Nothing – but that is one of the goals of BLM and also happens to be a goal of the Cult as I have been exposing in my books for decades. Stealing children from loving parents and giving schools ever more power to override parents is part of that same agenda. BLM is a Marxist organisation and why would that not be the case when the Cult created Marxism *and* BLM? Patrisse Cullors, a BLM co-founder, said in a 2015 video that she and her fellow organisers, including co-founder Alicia Garza, are 'trained Marxists'. The lady known after marriage as Patrisse Khan-Cullors bought a \$1.4 million home in 2021 in one of the whitest areas of California with a black population of just 1.6 per cent and has so far bought *four* high-end homes for a total of \$3.2 million. How very Marxist. There must be a bit of spare in the BLM coffers, however, when Cult corporations and billionaires have handed over the best part of \$100 million. Many black people can see that Black Lives Matter is not

working for them, but against them, and this is still more confirmation. Black journalist Jason Whitlock, who had his account suspended by Twitter for simply linking to the story about the 'Marxist's' home buying spree, said that BLM leaders are 'making millions of dollars off the backs of these dead black men who they wouldn't spit on if they were on fire and alive'.

Black Lies Matter

Cult assets and agencies came together to promote BLM in the wake of the death of career criminal George Floyd who had been jailed a number of times including for forcing his way into the home of a black woman with others in a raid in which a gun was pointed at her stomach. Floyd was filmed being held in a Minneapolis street in 2020 with the knee of a police officer on his neck and he subsequently died. It was an appalling thing for the officer to do, but the same technique has been used by police on peaceful protestors of lockdown without any outcry from the Woke brigade. As unquestioning supporters of the Cult agenda Wokers have supported lockdown and all the 'Covid' claptrap while attacking anyone standing up to the tyranny imposed in its name. Court documents would later include details of an autopsy on Floyd by County Medical Examiner Dr Andrew Baker who concluded that Floyd had taken a fatal level of the drug fentanyl. None of this mattered to fact-free, question-free, Woke. Floyd's death was followed by worldwide protests against police brutality amid calls to defund the police. Throwing babies out with the bathwater is a Woke speciality. In the wake of the murder of British woman Sarah Everard a Green Party member of the House of Lords, Baroness Jones of Moulscroomb (Nincompoopia would have been better), called for a 6pm curfew for all men. This would be in breach of the Geneva Conventions on war crimes which ban collective punishment, but that would never have crossed the black and white Woke mind of Baroness Nincompoopia who would have been far too convinced of her own self-righteousness to compute such details. Many American cities did defund the police in the face of Floyd riots

and after \$15 million was deleted from the police budget in Washington DC under useless Woke mayor Muriel Bowser car-jacking alone rose by 300 percent and within six months the US capital recorded its highest murder rate in 15 years. The same happened in Chicago and other cities in line with the Cult/Soros plan to bring fear to streets and neighbourhoods by reducing the police, releasing violent criminals and not prosecuting crime. This is the mob-rule agenda that I have warned in the books was coming for so long. Shootings in the area of Minneapolis where Floyd was arrested increased by 2,500 percent compared with the year before. Defunding the police over George Floyd has led to a big increase in dead people with many of them black. Police protection for politicians making these decisions stayed the same or increased as you would expect from professional hypocrites. The Cult doesn't actually want to abolish the police. It wants to abolish local control over the police and hand it to federal government as the psychopaths advance the Hunger Games Society. Many George Floyd protests turned into violent riots with black stores and businesses destroyed by fire and looting across America fuelled by Black Lives Matter. Woke doesn't do irony. If you want civil rights you must loot the liquor store and the supermarket and make off with a smart TV. It's the only way.

It's not a race war – it's a class war

Black people are patronised by privileged blacks and whites alike and told they are victims of white supremacy. I find it extraordinary to watch privileged blacks supporting the very system and bloodline networks behind the slave trade and parroting the same Cult-serving manipulative crap of their privileged white, often billionaire, associates. It is indeed not a race war but a class war and colour is just a diversion. Black Senator Cory Booker and black Congresswoman Maxine Waters, more residents of Nincompoopia, personify this. Once you tell people they are victims of someone else you devalue both their own responsibility for their plight and the power they have to impact on their reality and experience. Instead

we have: 'You are only in your situation because of whitey – turn on them and everything will change.' It won't change. Nothing changes in our lives unless *we* change it. Crucial to that is never seeing yourself as a victim and always as the creator of your reality. Life is a simple sequence of choice and consequence. Make different choices and you create different consequences. *You* have to make those choices – not Black Lives Matter, the Woke Mafia and anyone else that seeks to dictate your life. Who are they these Wokers, an emotional and psychological road traffic accident, to tell you what to do? Personal empowerment is the last thing the Cult and its Black Lives Matter want black people or anyone else to have. They claim to be defending the underdog while *creating* and perpetuating the underdog. The Cult's worst nightmare is human unity and if they are going to keep blacks, whites and every other race under economic servitude and control then the focus must be diverted from what they have in common to what they can be manipulated to believe divides them. Blacks have to be told that their poverty and plight is the fault of the white bloke living on the street in the same poverty and with the same plight they are experiencing. The difference is that your plight black people is due to him, a white supremacist with 'white privilege' living on the street. Don't unite as one human family against your mutual oppressors and suppressors – fight the oppressor with the white face who is as financially deprived as you are. The Cult knows that as its 'Covid' agenda moves into still new levels of extremism people are going to respond and it has been spreading the seeds of disunity everywhere to stop a united response to the evil that targets *all of us*.

Racist attacks on 'whiteness' are getting ever more outrageous and especially through the American Democratic Party which has an appalling history for anti-black racism. Barack Obama, Joe Biden, Hillary Clinton and Nancy Pelosi all eulogised about Senator Robert Byrd at his funeral in 2010 after a nearly 60-year career in Congress. Byrd was a brutal Ku Klux Klan racist and a violent abuser of Cathy O'Brien in MKUltra. He said he would never fight in the military 'with a negro by my side' and 'rather I should die a thousand times,

and see Old Glory trampled in the dirt never to rise again, than to see this beloved land of ours become degraded by race mongrels, a throwback to the blackest specimen from the wilds'. Biden called Byrd a 'very close friend and mentor'. These 'Woke' hypocrites are not anti-racist they are anti-poor and anti-people not of their perceived class. Here is an illustration of the scale of anti-white racism to which we have now descended. Seriously Woke and moronic *New York Times* contributor Damon Young described whiteness as a 'virus' that 'like other viruses will not die until there are no bodies left for it to infect'. He went on: '... the only way to stop it is to locate it, isolate it, extract it, and kill it.' Young can say that as a black man with no consequences when a white man saying the same in reverse would be facing a jail sentence. *That's* racism. We had super-Woke numbskull senators Tammy Duckworth and Mazie Hirono saying they would object to future Biden Cabinet appointments if he did not nominate more Asian Americans and Pacific Islanders. Never mind the ability of the candidate what do they look like? Duckworth said: 'I will vote for racial minorities and I will vote for LGBTQ, but anyone else I'm not voting for.' Appointing people on the grounds of race is illegal, but that was not a problem for this ludicrous pair. They were on-message and that's a free pass in any situation.

Critical race racism

White children are told at school they are intrinsically racist as they are taught the divisive 'critical race theory'. This claims that the law and legal institutions are inherently racist and that race is a socially constructed concept used by white people to further their economic and political interests at the expense of people of colour. White is a 'virus' as we've seen. Racial inequality results from 'social, economic, and legal differences that white people create between races to maintain white interests which leads to poverty and criminality in minority communities'. I must tell that to the white guy sleeping on the street. The principal of East Side Community School in New York sent white parents a manifesto that called on

them to become 'white traitors' and advocate for full 'white abolition'. These people are teaching your kids when they urgently need a psychiatrist. The 'school' included a chart with 'eight white identities' that ranged from 'white supremacist' to 'white abolition' and defined the behaviour white people must follow to end 'the regime of whiteness'. Woke blacks and their privileged white associates are acting exactly like the slave owners of old and Ku Klux Klan racists like Robert Byrd. They are too full of their own self-purity to see that, but it's true. Racism is not a body type; it's a state of mind that can manifest through any colour, creed or culture.

Another racial fraud is '*equity*'. Not equality of treatment and opportunity – equity. It's a term spun as equality when it means something very different. Equality in its true sense is a raising up while '*equity*' is a race to the bottom. Everyone in the same level of poverty is '*equity*'. Keep everyone down – that's equity. The Cult doesn't want anyone in the human family to be empowered and BLM leaders, like all these 'anti-racist' organisations, continue their privileged, pampered existence by perpetuating the perception of gathering racism. When is the last time you heard an 'anti-racist' or 'anti-Semitism' organisation say that acts of racism and discrimination have *fallen*? It's not in the interests of their fundraising and power to influence and the same goes for the professional soccer anti-racism operation, Kick It Out. Two things confirmed that the Black Lives Matter riots in the summer of 2020 were Cult creations. One was that while anti-lockdown protests were condemned in this same period for 'transmitting 'Covid' the authorities supported mass gatherings of Black Lives Matter supporters. I even saw self-deluding people claiming to be doctors say the two types of protest were not the same. No – the non-existent 'Covid' was in favour of lockdowns and attacked those that protested against them while 'Covid' supported Black Lives Matter and kept well away from its protests. The whole thing was a joke and as lockdown protestors were arrested, often brutally, by reframed Face-Nappies we had the grotesque sight of police officers taking the knee to Black Lives Matter, a Cult-funded Marxist

organisation that supports violent riots and wants to destroy the nuclear family and white people.

He's not white? Shucks!

Woke obsession with race was on display again when ten people were shot dead in Boulder, Colorado, in March, 2021. Cult-owned Woke TV channels like CNN said the shooter appeared to be a white man and Wokers were on Twitter condemning 'violent white men' with the usual mantras. Then the shooter's name was released as Ahmad Al Aliwi Alissa, an anti-Trump Arab-American, and the sigh of disappointment could be heard five miles away. Never mind that ten people were dead and what that meant for their families. Race baiting was all that mattered to these sick Cult-serving people like Barack Obama who exploited the deaths to further divide America on racial grounds which is his job for the Cult. This is the man that 'racist' white Americans made the first black president of the United States and then gave him a second term. Not-very-bright Obama has become filthy rich on the back of that and today appears to have a big influence on the Biden administration. Even so he's still a downtrodden black man and a victim of white supremacy. This disingenuous fraud reveals the contempt he has for black people when he puts on a Deep South Alabama accent whenever he talks to them, no, *at* them.

Another BLM red flag was how the now fully-Woke (fully-Cult) and fully-virtue-signalled professional soccer authorities had their teams taking the knee before every match in support of Marxist Black Lives Matter. Soccer authorities and clubs displayed 'Black Lives Matter' on the players' shirts and flashed the name on electronic billboards around the pitch. Any fans that condemned what is a Freemasonic taking-the-knee ritual were widely condemned as you would expect from the Woke virtue-signallers of professional sport and the now fully-Woke media. We have reverse racism in which you are banned from criticising any race or culture except for white people for whom anything goes – say what you like, no problem. What has this got to do with racial harmony and

equality? We've had black supremacists from Black Lives Matter telling white people to fall to their knees in the street and apologise for their white supremacy. Black supremacists acting like white supremacist slave owners of the past couldn't breach their self-obsessed, race-obsessed sense of self-purity. Joe Biden appointed a race-obsessed black supremacist Kristen Clarke to head the Justice Department Civil Rights Division. Clarke claimed that blacks are endowed with 'greater mental, physical and spiritual abilities' than whites. If anyone reversed that statement they would be vilified. Clarke is on-message so no problem. She's never seen a black-white situation in which the black figure is anything but a virtuous victim and she heads the Civil Rights Division which should treat everyone the same or it isn't civil rights. Another perception of the Renegade Mind: If something or someone is part of the Cult agenda they will be supported by Woke governments and media no matter what. If they're not, they will be condemned and censored. It really is that simple and so racist Clarke prospers despite (make that because of) her racism.

The end of culture

Biden's administration is full of such racial, cultural and economic bias as the Cult requires the human family to be divided into warring factions. We are now seeing racially-segregated graduations and everything, but everything, is defined through the lens of perceived 'racism. We have 'racist' mathematics, 'racist' food and even 'racist' *plants*. World famous Kew Gardens in London said it was changing labels on plants and flowers to tell its pre-'Covid' more than two million visitors a year how racist they are. Kew director Richard Deverell said this was part of an effort to 'move quickly to decolonise collections' after they were approached by one Ajay Chhabra 'an actor with an insight into how sugar cane was linked to slavery'. They are *plants* you idiots. 'Decolonisation' in the Woke manual really means colonisation of society with its mentality and by extension colonisation by the Cult. We are witnessing a new Chinese-style 'Cultural Revolution' so essential to the success of all

Marxist takeovers. Our cultural past and traditions have to be swept away to allow a new culture to be built-back-better. Woke targeting of long-standing Western cultural pillars including historical monuments and cancelling of historical figures is what happened in the Mao revolution in China which 'purged remnants of capitalist and traditional elements from Chinese society' and installed Maoism as the dominant ideology'. For China see the Western world today and for 'dominant ideology' see Woke. Better still see Marxism or Maoism. The 'Covid' hoax has specifically sought to destroy the arts and all elements of Western culture from people meeting in a pub or restaurant to closing theatres, music venues, sports stadiums, places of worship and even banning *singing*. Destruction of Western society is also why criticism of any religion is banned except for Christianity which again is the dominant religion as white is the numerically-dominant race. Christianity may be fading rapidly, but its history and traditions are weaved through the fabric of Western society. Delete the pillars and other structures will follow until the whole thing collapses. I am not a Christian defending that religion when I say that. I have no religion. It's just a fact. To this end Christianity has itself been turned Woke to usher its own downfall and its ranks are awash with 'change agents' – knowing and unknowing – at every level including Pope Francis (*definitely* knowing) and the clueless Archbishop of Canterbury Justin Welby (possibly not, but who can be sure?). Woke seeks to coordinate attacks on Western culture, traditions, and ways of life through 'intersectionality' defined as 'the complex, cumulative way in which the effects of multiple forms of discrimination (such as racism, sexism, and classism) combine, overlap, or intersect especially in the experiences of marginalised individuals or groups'. Wade through the Orwellian Woke-speak and this means coordinating disparate groups in a common cause to overthrow freedom and liberal values.

The entire structure of public institutions has been infested with Woke – government at all levels, political parties, police, military, schools, universities, advertising, media and trade unions. This abomination has been achieved through the Cult web by appointing

Wokers to positions of power and battering non-Wokers into line through intimidation, isolation and threats to their job. Many have been fired in the wake of the empathy-deleted, vicious hostility of 'social justice' Wokers and the desire of gutless, spineless employers to virtue-signal their Wokeness. Corporations are filled with Wokers today, most notably those in Silicon Valley. Ironically at the top they are not Woke at all. They are only exploiting the mentality their Cult masters have created and funded to censor and enslave while the Wokers cheer them on until it's their turn. Thus the Woke 'liberal left' is an inversion of the traditional liberal left. Campaigning for justice on the grounds of power and wealth distribution has been replaced by campaigning for identity politics. The genuine traditional left would never have taken money from today's billionaire abusers of fairness and justice and nor would the billionaires have wanted to fund that genuine left. It would not have been in their interests to do so. The division of opinion in those days was between the haves and have nots. This all changed with Cult manipulated and funded identity politics. The division of opinion today is between Wokers and non-Wokers and not income brackets. Cult corporations and their billionaires may have taken wealth disparity to cataclysmic levels of injustice, but as long as they speak the language of Woke, hand out the dosh to the Woke network and censor the enemy they are 'one of us'. Billionaires who don't give a damn about injustice are laughing at them till their bellies hurt. Wokers are not even close to self-aware enough to see that. The transformed 'left' dynamic means that Wokers who drone on about 'social justice' are funded by billionaires that have destroyed social justice the world over. It's *why* they are billionaires.

The climate con

Nothing encapsulates what I have said more comprehensively than the hoax of human-caused global warming. I have detailed in my books over the years how Cult operatives and organisations were the pump-primers from the start of the climate con. A purpose-built vehicle for this is the Club of Rome established by the Cult in 1968

with the Rockefellers and Rothschilds centrally involved all along. Their gofer frontman Maurice Strong, a Canadian oil millionaire, hosted the Earth Summit in Rio de Janeiro, Brazil, in 1992 where the global 'green movement' really expanded in earnest under the guiding hand of the Cult. The Earth Summit established Agenda 21 through the Cult-created-and-owned United Nations to use the illusion of human-caused climate change to justify the transformation of global society to save the world from climate disaster. It is a No-Problem-Reaction-Solution sold through governments, media, schools and universities as whole generations have been terrified into believing that the world was going to end in their lifetimes unless what old people had inflicted upon them was stopped by a complete restructuring of how everything is done. Chill, kids, it's all a hoax. Such restructuring is precisely what the Cult agenda demands (purely by coincidence of course). Today this has been given the codename of the Great Reset which is only an updated term for Agenda 21 and its associated Agenda 2030. The latter, too, is administered through the UN and was voted into being by the General Assembly in 2015. Both 21 and 2030 seek centralised control of all resources and food right down to the raindrops falling on your own land. These are some of the demands of Agenda 21 established in 1992. See if you recognise this society emerging today:

- End national sovereignty
- State planning and management of all land resources, ecosystems, deserts, forests, mountains, oceans and fresh water; agriculture; rural development; biotechnology; and ensuring 'equity'
- The state to 'define the role' of business and financial resources
- Abolition of private property
- 'Restructuring' the family unit (see BLM)
- Children raised by the state
- People told what their job will be
- Major restrictions on movement
- Creation of 'human settlement zones'

- Mass resettlement as people are forced to vacate land where they live
- Dumbing down education
- Mass global depopulation in pursuit of all the above

The United Nations was created as a Trojan horse for world government. With the climate con of critical importance to promoting that outcome you would expect the UN to be involved. Oh, it's involved all right. The UN is promoting Agenda 21 and Agenda 2030 justified by 'climate change' while also driving the climate hoax through its Intergovernmental Panel on Climate Change (IPCC), one of the world's most corrupt organisations. The IPCC has been lying ferociously and constantly since the day it opened its doors with the global media hanging unquestioningly on its every mendacious word. The Green movement is entirely Woke and has long lost its original environmental focus since it was co-opted by the Cult. An obsession with 'global warming' has deleted its values and scrambled its head. I experienced a small example of what I mean on a beautiful country walk that I have enjoyed several times a week for many years. The path merged into the fields and forests and you felt at one with the natural world. Then a 'Green' organisation, the Hampshire and Isle of Wight Wildlife Trust, took over part of the land and proceeded to cut down a large number of trees, including mature ones, to install a horrible big, bright steel 'this-is-ours-stay-out' fence that destroyed the whole atmosphere of this beautiful place. No one with a feel for nature would do that. Day after day I walked to the sound of chainsaws and a magnificent mature weeping willow tree that I so admired was cut down at the base of the trunk. When I challenged a Woke young girl in a green shirt (of course) about this vandalism she replied: 'It's a weeping willow – it will grow back.' This is what people are paying for when they donate to the Hampshire and Isle of Wight Wildlife Trust and many other 'green' organisations today. It is not the environmental movement that I knew and instead has become a support-system – as with Extinction Rebellion – for a very dark agenda.

Private jets for climate justice

The Cult-owned, Gates-funded, World Economic Forum and its founder Klaus Schwab were behind the emergence of Greta Thunberg to harness the young behind the climate agenda and she was invited to speak to the world at ... the UN. Schwab published a book, *Covid-19: The Great Reset* in 2020 in which he used the 'Covid' hoax and the climate hoax to lay out a new society straight out of Agenda 21 and Agenda 2030. Bill Gates followed in early 2021 when he took time out from destroying the world to produce a book in his name about the way to save it. Gates flies across the world in private jets and admitted that 'I probably have one of the highest greenhouse gas footprints of anyone on the planet ... my personal flying alone is gigantic.' He has also bid for the planet's biggest private jet operator. Other climate change saviours who fly in private jets include John Kerry, the US Special Presidential Envoy for Climate, and actor Leonardo DiCaprio, a 'UN Messenger of Peace with special focus on climate change'. These people are so full of bullshit they could corner the market in manure. We mustn't be sceptical, though, because the Gates book, *How to Avoid a Climate Disaster: The Solutions We Have and the Breakthroughs We Need*, is a genuine attempt to protect the world and not an obvious pile of excrement attributed to a mega-psychopath aimed at selling his masters' plans for humanity. The Gates book and the other shite-pile by Klaus Schwab could have been written by the same person and may well have been. Both use 'climate change' and 'Covid' as the excuses for their new society and by coincidence the Cult's World Economic Forum and Bill and Melinda Gates Foundation promote the climate hoax and hosted Event 201 which pre-empted with a 'simulation' the very 'coronavirus' hoax that would be simulated for real on humanity within weeks. The British 'royal' family is promoting the 'Reset' as you would expect through Prince 'climate change caused the war in Syria' Charles and his hapless son Prince William who said that we must 'reset our relationship with nature and our trajectory as a species' to avoid a climate disaster. Amazing how many promoters of the 'Covid' and 'climate change' control

systems are connected to Gates and the World Economic Forum. A 'study' in early 2021 claimed that carbon dioxide emissions must fall by the equivalent of a global lockdown roughly every two years for the next decade to save the planet. The 'study' appeared in the same period that the Schwab mob claimed in a video that lockdowns destroying the lives of billions are good because they make the earth 'quieter' with less 'ambient noise'. They took down the video amid a public backlash for such arrogant, empathy-deleted stupidity You see, however, where they are going with this. Corinne Le Quéré, a professor at the Tyndall Centre for Climate Change Research, University of East Anglia, was lead author of the climate lockdown study, and she writes for ... the World Economic Forum. Gates calls in 'his' book for changing 'every aspect of the economy' (long-time Cult agenda) and for humans to eat synthetic 'meat' (predicted in my books) while cows and other farm animals are eliminated. Australian TV host and commentator Alan Jones described what carbon emission targets would mean for farm animals in Australia alone if emissions were reduced as demanded by 35 percent by 2030 and zero by 2050:

Well, let's take agriculture, the total emissions from agriculture are about 75 million tonnes of carbon dioxide, equivalent. Now reduce that by 35 percent and you have to come down to 50 million tonnes, I've done the maths. So if you take for example 1.5 million cows, you're going to have to reduce the herd by 525,000 [by] 2030, nine years, that's 58,000 cows a year. The beef herd's 30 million, reduce that by 35 percent, that's 10.5 million, which means 1.2 million cattle have to go every year between now and 2030. This is insanity!

There are 75 million sheep. Reduce that by 35 percent, that's 26 million sheep, that's almost 3 million a year. So under the Paris Agreement over 30 million beasts. dairy cows, cattle, pigs and sheep would go. More than 8,000 every minute of every hour for the next decade, do these people know what they're talking about?

Clearly they don't at the level of campaigners, politicians and administrators. The Cult *does* know; that's the outcome it wants. We are faced with not just a war on humanity. Animals and the natural world are being targeted and I have been saying since the 'Covid' hoax began that the plan eventually was to claim that the 'deadly virus' is able to jump from animals, including farm animals and

domestic pets, to humans. Just before this book went into production came this story: 'Russia registers world's first Covid-19 vaccine for cats & dogs as makers of Sputnik V warn pets & farm animals could spread virus'. The report said 'top scientists warned that the deadly pathogen could soon begin spreading through homes and farms' and 'the next stage is the infection of farm and domestic animals'. Know the outcome and you'll see the journey. Think what that would mean for animals and keep your eye on a term called zoonosis or zoonotic diseases which transmit between animals and humans. The Cult wants to break the connection between animals and people as it does between people and people. Farm animals fit with the Cult agenda to transform food from natural to synthetic.

The gas of life is killing us

There can be few greater examples of Cult inversion than the condemnation of carbon dioxide as a dangerous pollutant when it is the gas of life. Without it the natural world would be dead and so we would all be dead. We breathe in oxygen and breathe out carbon dioxide while plants produce oxygen and absorb carbon dioxide. It is a perfect symbiotic relationship that the Cult wants to dismantle for reasons I will come to in the final two chapters. Gates, Schwab, other Cult operatives and mindless repeaters, want the world to be 'carbon neutral' by at least 2050 and the earlier the better. 'Zero carbon' is the cry echoed by lunatics calling for 'Zero Covid' when we already have it. These carbon emission targets will deindustrialise the world in accordance with Cult plans – the post-industrial, post-democratic society – and with so-called renewables like solar and wind not coming even close to meeting human energy needs blackouts and cold are inevitable. Texans got the picture in the winter of 2021 when a snow storm stopped wind turbines and solar panels from working and the lights went down along with water which relies on electricity for its supply system. Gates wants everything to be powered by electricity to ensure that his masters have the kill switch to stop all human activity, movement, cooking, water and warmth any time they like. The climate lie is so

stupendously inverted that it claims we must urgently reduce carbon dioxide when we *don't have enough*.

Co2 in the atmosphere is a little above 400 parts per million when the optimum for plant growth is 2,000 ppm and when it falls anywhere near 150 ppm the natural world starts to die and so do we. It fell to as low as 280 ppm in an 1880 measurement in Hawaii and rose to 413 ppm in 2019 with industrialisation which is why the planet has become *greener* in the industrial period. How insane then that psychopathic madman Gates is not satisfied only with blocking the rise of Co2. He's funding technology to suck it out of the atmosphere. The reason why will become clear. The industrial era is not destroying the world through Co2 and has instead turned around a potentially disastrous ongoing fall in Co2. Greenpeace co-founder and scientist Patrick Moore walked away from Greenpeace in 1986 and has exposed the green movement for fear-mongering and lies. He said that 500 million years ago there was *17 times* more Co2 in the atmosphere than we have today and levels have been falling for hundreds of millions of years. In the last 150 million years Co2 levels in Earth's atmosphere had reduced by *90 percent*. Moore said that by the time humanity began to unlock carbon dioxide from fossil fuels we were at '38 seconds to midnight' and in that sense: 'Humans are [the Earth's] salvation.' Moore made the point that only half the Co2 emitted by fossil fuels stays in the atmosphere and we should remember that all pollution pouring from chimneys that we are told is carbon dioxide is in fact nothing of the kind. It's pollution. Carbon dioxide is an invisible gas.

William Happer, Professor of Physics at Princeton University and long-time government adviser on climate, has emphasised the Co2 deficiency for maximum growth and food production. Greenhouse growers don't add carbon dioxide for a bit of fun. He said that most of the warming in the last 100 years, after the earth emerged from the super-cold period of the 'Little Ice Age' into a natural warming cycle, was over by 1940. Happer said that a peak year for warming in 1988 can be explained by a 'monster El Nino' which is a natural and cyclical warming of the Pacific that has nothing to do with 'climate

change'. He said the effect of Co2 could be compared to painting a wall with red paint in that once two or three coats have been applied it didn't matter how much more you slapped on because the wall will not get much redder. Almost all the effect of the rise in Co2 has already happened, he said, and the volume in the atmosphere would now have to *double* to increase temperature by a single degree. Climate hoaxers know this and they have invented the most ridiculously complicated series of 'feedback' loops to try to overcome this rather devastating fact. You hear puppet Greta going on cluelessly about feedback loops and this is why.

The Sun affects temperature? No you *climate denier*

Some other nonsense to contemplate: Climate graphs show that rises in temperature do not follow rises in Co2 – *it's the other way round* with a lag between the two of some 800 years. If we go back 800 years from present time we hit the Medieval Warm Period when temperatures were higher than now without any industrialisation and this was followed by the Little Ice Age when temperatures plummeted. The world was still emerging from these centuries of serious cold when many climate records began which makes the ever-repeated line of the 'hottest year since records began' meaningless when you are not comparing like with like. The coldest period of the Little Ice Age corresponded with the lowest period of sunspot activity when the Sun was at its least active. Proper scientists will not be at all surprised by this when it confirms the obvious fact that earth temperature is affected by the scale of Sun activity and the energetic power that it subsequently emits; but when is the last time you heard a climate hoaxer talking about the Sun as a source of earth temperature?? Everything has to be focussed on Co2 which makes up just 0.117 percent of so-called greenhouse gases and only a fraction of even that is generated by human activity. The rest is natural. More than *90 percent* of those greenhouse gases are water vapour and clouds ([Fig 9](#)). Ban moisture I say. Have you noticed that the climate hoaxers no longer use the polar bear as their promotion image? That's because far from becoming extinct polar

bear communities are stable or thriving. Joe Bastardi, American meteorologist, weather forecaster and outspoken critic of the climate lie, documents in his book *The Climate Chronicles* how weather patterns and events claimed to be evidence of climate change have been happening since long before industrialisation: 'What happened before naturally is happening again, as is to be expected given the cyclical nature of the climate due to the design of the planet.' If you read the detailed background to the climate hoax in my other books you will shake your head and wonder how anyone could believe the crap which has spawned a multi-trillion dollar industry based on absolute garbage (see HIV causes AIDs and Sars-Cov-2 causes 'Covid-19'). Climate and 'Covid' have much in common given they have the same source. They both have the contradictory *everything* factor in which everything is explained by reference to them. It's hot – 'it's climate change'. It's cold – 'it's climate change'. I got a sniffle – 'it's Covid'. I haven't got a sniffle – 'it's Covid'. Not having a sniffle has to be a symptom of 'Covid'. Everything is and not having a sniffle is especially dangerous if you are a slow walker. For sheer audacity I offer you a Cambridge University 'study' that actually linked 'Covid' to 'climate change'. It had to happen eventually. They concluded that climate change played a role in 'Covid-19' spreading from animals to humans because ... wait for it ... I kid you not ... *the two groups were forced closer together as populations grow*. Er, that's it. The whole foundation on which this depended was that 'Bats are the likely zoonotic origin of SARS-CoV-1 and SARS-CoV-2'. Well, they are not. They are nothing to do with it. Apart from bats not being the origin and therefore 'climate change' effects on bats being irrelevant I am in awe of their academic insight. Where would we be without them? Not where we are that's for sure.

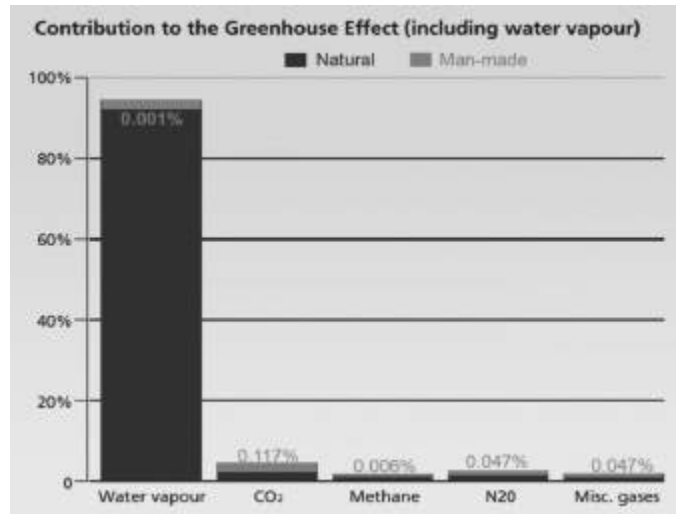


Figure 9: The idea that the gas of life is disastrously changing the climate is an insult to brain cell activity.

One other point about the weather is that climate modification is now well advanced and not every major weather event is natural – or earthquake come to that. I cover this subject at some length in other books. China is openly planning a rapid expansion of its weather modification programme which includes changing the climate in an area more than one and a half times the size of India. China used weather manipulation to ensure clear skies during the 2008 Olympics in Beijing. I have quoted from US military documents detailing how to employ weather manipulation as a weapon of war and they did that in the 1960s and 70s during the conflict in Vietnam with Operation Popeye manipulating monsoon rains for military purposes. Why would there be international treaties on weather modification if it wasn't possible? Of course it is. Weather is energetic information and it can be changed.

How was the climate hoax pulled off? See 'Covid'

If you can get billions to believe in a 'virus' that doesn't exist you can get them to believe in human-caused climate change that doesn't exist. Both are being used by the Cult to transform global society in the way it has long planned. Both hoaxes have been achieved in pretty much the same way. First you declare a lie is a fact. There's a

'virus' you call SARS-Cov-2 or humans are warming the planet with their behaviour. Next this becomes, via Cult networks, the foundation of government, academic and science policy and belief. Those who parrot the mantra are given big grants to produce research that confirms the narrative is true and ever more 'symptoms' are added to make the 'virus'/'climate change' sound even more scary. Scientists and researchers who challenge the narrative have their grants withdrawn and their careers destroyed. The media promote the lie as the unquestionable truth and censor those with an alternative view or evidence. A great percentage of the population believe what they are told as the lie becomes an everybody-knows-that and the believing-masses turn on those with a mind of their own. The technique has been used endlessly throughout human history. Wokers are the biggest promoters of the climate lie *and* 'Covid' fascism because their minds are owned by the Cult; their sense of self-righteous self-purity knows no bounds; and they exist in a bubble of reality in which facts are irrelevant and only get in the way of looking without seeing.

Running through all of this like veins in a blue cheese is control of information, which means control of perception, which means control of behaviour, which collectively means control of human society. The Cult owns the global media and Silicon Valley fascists for the simple reason that it *has* to. Without control of information it can't control perception and through that human society. Examine every facet of the Cult agenda and you will see that anything supporting its introduction is never censored while anything pushing back is always censored. I say again: Psychopaths that know why they are doing this must go before Nuremberg trials and those that follow their orders must trot along behind them into the same dock. 'I was just following orders' didn't work the first time and it must not work now. Nuremberg trials must be held all over the world before public juries for politicians, government officials, police, compliant doctors, scientists and virologists, and all Cult operatives such as Gates, Tedros, Fauci, Vallance, Whitty, Ferguson, Zuckerberg, Wojcicki, Brin, Page, Dorsey, the whole damn lot of

them – including, no *especially*, the psychopath psychologists. Without them and the brainless, gutless excuses for journalists that have repeated their lies, none of this could be happening. Nobody can be allowed to escape justice for the psychological and economic Armageddon they are all responsible for visiting upon the human race.

As for the compliant, unquestioning, swathes of humanity, and the self-obsessed, all-knowing ignorance of the Wokers ... don't start me. God help their kids. God help their grandkids. God *help them*.

CHAPTER NINE

We must have it? So what is it?

Well I won't back down. No, I won't back down. You can stand me up at the Gates of Hell. But I won't back down

Tom Petty

I will now focus on the genetically-manipulating 'Covid vaccines' which do not meet this official definition of a vaccine by the US Centers for Disease Control (CDC): 'A product that stimulates a person's immune system to produce immunity to a specific disease, protecting the person from that disease.' On that basis 'Covid vaccines' are not a vaccine in that the makers don't even claim they stop infection or transmission.

They are instead part of a multi-levelled conspiracy to change the nature of the human body and what it means to be 'human' and to depopulate an enormous swathe of humanity. What I shall call Human 1.0 is on the cusp of becoming Human 2.0 and for very sinister reasons. Before I get to the 'Covid vaccine' in detail here's some background to vaccines in general. Government regulators do not test vaccines – the makers do – and the makers control which data is revealed and which isn't. Children in America are given 50 vaccine doses by age six and 69 by age 19 and the effect of the whole combined schedule has never been tested. Autoimmune diseases when the immune system attacks its own body have soared in the mass vaccine era and so has disease in general in children and the young. Why wouldn't this be the case when vaccines target the *immune system*? The US government gave Big Pharma drug

companies immunity from prosecution for vaccine death and injury in the 1986 National Childhood Vaccine Injury Act (NCVIA) and since then the government (taxpayer) has been funding compensation for the consequences of Big Pharma vaccines. The criminal and satanic drug giants can't lose and the vaccine schedule has increased dramatically since 1986 for this reason. There is no incentive to make vaccines safe and a big incentive to make money by introducing ever more. Even against a ridiculously high bar to prove vaccine liability, and with the government controlling the hearing in which it is being challenged for compensation, the vaccine court has so far paid out more than \$4 billion. These are the vaccines we are told are safe and psychopaths like Zuckerberg censor posts saying otherwise. The immunity law was even justified by a ruling that vaccines by their nature were 'unavoidably unsafe'.

Check out the ingredients of vaccines and you will be shocked if you are new to this. *They put that in children's bodies?? What??* Try aluminium, a brain toxin connected to dementia, aborted foetal tissue and formaldehyde which is used to embalm corpses. World-renowned aluminium expert Christopher Exley had his research into the health effect of aluminium in vaccines shut down by Keele University in the UK when it began taking funding from the Bill and Melinda Gates Foundation. Research when diseases 'eradicated' by vaccines began to decline and you will find the fall began long *before* the vaccine was introduced. Sometimes the fall even plateaued after the vaccine. Diseases like scarlet fever for which there was no vaccine declined in the same way because of environmental and other factors. A perfect case in point is the polio vaccine. Polio began when lead arsenate was first sprayed as an insecticide and residues remained in food products. Spraying started in 1892 and the first US polio epidemic came in Vermont in 1894. The simple answer was to stop spraying, but Rockefeller-created Big Pharma had a better idea. Polio was decreed to be caused by the *poliovirus* which 'spreads from person to person and can infect a person's spinal cord'. Lead arsenate was replaced by the lethal DDT which had the same effect of causing paralysis by damaging the brain and central nervous

system. Polio plummeted when DDT was reduced and then banned, but the vaccine is still given the credit for something it didn't do. Today by far the biggest cause of polio is the vaccines promoted by Bill Gates. Vaccine justice campaigner Robert Kennedy Jr, son of assassinated (by the Cult) US Attorney General Robert Kennedy, wrote:

In 2017, the World Health Organization (WHO) reluctantly admitted that the global explosion in polio is predominantly vaccine strain. The most frightening epidemics in Congo, Afghanistan, and the Philippines, are all linked to vaccines. In fact, by 2018, 70% of global polio cases were vaccine strain.

Vaccines make fortunes for Cult-owned Gates and Big Pharma while undermining the health and immune systems of the population. We had a glimpse of the mentality behind the Big Pharma cartel with a report on WION (World is One News), an international English language TV station based in India, which exposed the extraordinary behaviour of US drug company Pfizer over its 'Covid vaccine'. The WION report told how Pfizer had made fantastic demands of Argentina, Brazil and other countries in return for its 'vaccine'. These included immunity from prosecution, even for Pfizer negligence, government insurance to protect Pfizer from law suits and handing over as collateral sovereign assets of the country to include Argentina's bank reserves, military bases and embassy buildings. Pfizer demanded the same of Brazil in the form of waiving sovereignty of its assets abroad; exempting Pfizer from Brazilian laws; and giving Pfizer immunity from all civil liability. This is a 'vaccine' developed with government funding. Big Pharma is evil incarnate as a creation of the Cult and all must be handed tickets to Nuremberg.

Phantom 'vaccine' for a phantom 'disease'

I'll expose the 'Covid vaccine' fraud and then go on to the wider background of why the Cult has set out to 'vaccinate' every man, woman and child on the planet for an alleged 'new disease' with a survival rate of 99.77 percent (or more) even by the grotesquely-

manipulated figures of the World Health Organization and Johns Hopkins University. The 'infection' to 'death' ratio is 0.23 to 0.15 percent according to Stanford epidemiologist Dr John Ioannidis and while estimates vary the danger remains tiny. I say that if the truth be told the fake infection to fake death ratio is zero. Never mind all the evidence I have presented here and in *The Answer* that there is no 'virus' let us just focus for a moment on that death-rate figure of say 0.23 percent. The figure includes all those worldwide who have tested positive with a test not testing for the 'virus' and then died within 28 days or even longer of any other cause – *any other cause*. Now subtract all those illusory 'Covid' deaths on the global data sheets from the 0.23 percent. What do you think you would be left with? *Zero*. A vaccination has never been successfully developed for a so-called coronavirus. They have all failed at the animal testing stage when they caused hypersensitivity to what they were claiming to protect against and made the impact of a disease far worse. Cult-owned vaccine corporations got around that problem this time by bypassing animal trials, going straight to humans and making the length of the 'trials' before the public rollout as short as they could get away with. Normally it takes five to ten years or more to develop vaccines that still cause demonstrable harm to many people and that's without including the long-term effects that are never officially connected to the vaccination. 'Covid' non-vaccines have been officially produced and approved in a matter of months from a standing start and part of the reason is that (a) they were developed before the 'Covid' hoax began and (b) they are based on computer programs and not natural sources. Official non-trials were so short that government agencies gave *emergency*, not full, approval. 'Trials' were not even completed and full approval cannot be secured until they are. Public 'Covid vaccination' is actually a *continuation of the trial*. Drug company 'trials' are not scheduled to end until 2023 by which time a lot of people are going to be dead. Data on which government agencies gave this emergency approval was supplied by the Big Pharma corporations themselves in the form of Pfizer/BioNTech, AstraZeneca, Moderna, Johnson & Johnson, and

others, and this is the case with all vaccines. By its very nature *emergency* approval means drug companies do not have to prove that the 'vaccine' is 'safe and effective'. How could they with trials way short of complete? Government regulators only have to *believe* that they *could* be safe and effective. It is criminal manipulation to get products in circulation with no testing worth the name. Agencies giving that approval are infested with Big Pharma-connected place-people and they act in the interests of Big Pharma (the Cult) and not the public about whom they do not give a damn.

More human lab rats

'Covid vaccines' produced in record time by Pfizer/BioNTech and Moderna employ a technique *never approved before for use on humans*. They are known as mRNA 'vaccines' and inject a synthetic version of 'viral' mRNA or 'messenger RNA'. The key is in the term 'messenger'. The body works, or doesn't, on the basis of information messaging. Communications are constantly passing between and within the genetic system and the brain. Change those messages and you change the state of the body and even its very nature and you can change psychology and behaviour by the way the brain processes information. I think you are going to see significant changes in personality and perception of many people who have had the 'Covid vaccine' synthetic potions. Insider Aldous Huxley predicted the following in 1961 and mRNA 'vaccines' can be included in the term 'pharmacological methods':

There will be, in the next generation or so, a pharmacological method of making people love their servitude, and producing dictatorship without tears, so to speak, producing a kind of painless concentration camp for entire societies, so that people will in fact have their own liberties taken away from them, but rather enjoy it, because they will be distracted from any desire to rebel by propaganda or brainwashing, or brainwashing enhanced by pharmacological methods. And this seems to be the final revolution.

Apologists claim that mRNA synthetic 'vaccines' don't change the DNA genetic blueprint because RNA does not affect DNA only the other way round. This is so disingenuous. A process called 'reverse

transcription' can convert RNA into DNA and be integrated into DNA in the cell nucleus. This was highlighted in December, 2020, by scientists at Harvard and Massachusetts Institute of Technology (MIT). Geneticists report that more than 40 percent of mammalian genomes results from reverse transcription. On the most basic level if messaging changes then that sequence must lead to changes in DNA which is receiving and transmitting those communications. How can introducing synthetic material into cells not change the cells where DNA is located? The process is known as transfection which is defined as 'a technique to insert foreign nucleic acid (DNA or RNA) into a cell, typically with the intention of altering the properties of the cell'. Researchers at the Sloan Kettering Institute in New York found that changes in messenger RNA can deactivate tumour-suppressing proteins and thereby promote cancer. This is what happens when you mess with messaging. 'Covid vaccine' maker Moderna was founded in 2010 by Canadian stem cell biologist Derrick J. Rossi after his breakthrough discovery in the field of transforming and reprogramming stem cells. These are neutral cells that can be programmed to become any cell including sperm cells. Moderna was therefore founded on the principle of genetic manipulation and has never produced any vaccine or drug before its genetically-manipulating synthetic 'Covid' shite. Look at the name – Mode-RNA or Modify-RNA. Another important point is that the US Supreme Court has ruled that genetically-modified DNA, or complementary DNA (cDNA) synthesized in the laboratory from messenger RNA, can be patented and owned. These psychopaths are doing this to the human body.

Cells replicate synthetic mRNA in the 'Covid vaccines' and in theory the body is tricked into making antigens which trigger antibodies to target the 'virus spike proteins' which as Dr Tom Cowan said have *never been seen*. Cut the crap and these 'vaccines' deliver *self-replicating* synthetic material to the cells with the effect of changing human DNA. The more of them you have the more that process is compounded while synthetic material is all the time self-replicating. 'Vaccine'-maker Moderna describes mRNA as 'like

software for the cell' and so they are messing with the body's software. What happens when you change the software in a computer? Everything changes. For this reason the Cult is preparing a production line of mRNA 'Covid vaccines' and a long list of excuses to use them as with all the 'variants' of a 'virus' never shown to exist. The plan is further to transfer the mRNA technique to other vaccines mostly given to children and young people. The cumulative consequences will be a transformation of human DNA through a constant infusion of synthetic genetic material which will kill many and change the rest. Now consider that governments that have given emergency approval for a vaccine that's not a vaccine; never been approved for humans before; had no testing worth the name; and the makers have been given immunity from prosecution for any deaths or adverse effects suffered by the public. The UK government awarded *permanent legal indemnity* to itself and its employees for harm done when a patient is being treated for 'Covid-19' or 'suspected Covid-19'. That is quite a thought when these are possible 'side-effects' from the 'vaccine' (they are not 'side', they are effects) listed by the US Food and Drug Administration:

Guillain-Barre syndrome; acute disseminated encephalomyelitis; transverse myelitis; encephalitis; myelitis; encephalomyelitis; meningoencephalitis; meningitis; encephalopathy; convulsions; seizures; stroke; narcolepsy; cataplexy; anaphylaxis; acute myocardial infarction (heart attack); myocarditis; pericarditis; autoimmune disease; death; implications for pregnancy, and birth outcomes; other acute demyelinating diseases; non anaphylactic allergy reactions; thrombocytopenia ; disseminated intravascular coagulation; venous thromboembolism; arthritis; arthralgia; joint pain; Kawasaki disease; multisystem inflammatory syndrome in children; vaccine enhanced disease. The latter is the way the 'vaccine' has the potential to make diseases far worse than they would otherwise be.

UK doctor and freedom campaigner Vernon Coleman described the conditions in this list as 'all unpleasant, most of them very serious, and you can't get more serious than death'. The thought that anyone at all has had the 'vaccine' in these circumstances is testament to the potential that humanity has for clueless, unquestioning, stupidity and for many that programmed stupidity has already been terminal.

An insider speaks

Dr Michael Yeadon is a former Vice President, head of research and Chief Scientific Adviser at vaccine giant Pfizer. Yeadon worked on the inside of Big Pharma, but that did not stop him becoming a vocal critic of 'Covid vaccines' and their potential for multiple harms, including infertility in women. By the spring of 2021 he went much further and even used the no, no, term 'conspiracy'. When you begin to see what is going on it is impossible not to do so. Yeadon spoke out in an interview with freedom campaigner James Delingpole and I mentioned earlier how he said that no one had samples of 'the virus'. He explained that the mRNA technique originated in the anti-cancer field and ways to turn on and off certain genes which could be advantageous if you wanted to stop cancer growing out of control. 'That's the origin of them. They are a very unusual application, really.' Yeadon said that treating a cancer patient with an aggressive procedure might be understandable if the alternative was dying, but it was quite another thing to use the same technique as a public health measure. Most people involved wouldn't catch the infectious agent you were vaccinating against and if they did they probably wouldn't die:

If you are really using it as a public health measure you really want to as close as you can get to zero sides-effects ... I find it odd that they chose techniques that were really cutting their teeth in the field of oncology and I'm worried that in using gene-based vaccines that have to be injected in the body and spread around the body, get taken up into some cells, and the regulators haven't quite told us which cells they get taken up into ... you are going to be generating a wide range of responses ... with multiple steps each of which could go well or badly.

I doubt the Cult intends it to go well. Yeadon said that you can put any gene you like into the body through the 'vaccine'. 'You can certainly give them a gene that would do them some harm if you wanted.' I was intrigued when he said that when used in the cancer field the technique could turn genes on and off. I explore this process in *The Answer* and with different genes having different functions you could create mayhem – physically and psychologically – if you turned the wrong ones on and the right ones off. I read reports of an experiment by researchers at the University of Washington's school of computer science and engineering in which they encoded DNA to infect computers. The body is itself a biological computer and if human DNA can inflict damage on a computer why can't the computer via synthetic material mess with the human body? It can. The Washington research team said it was possible to insert malicious malware into 'physical DNA strands' and corrupt the computer system of a gene sequencing machine as it 'reads gene letters and stores them as binary digits 0 and 1'. They concluded that hackers could one day use blood or spit samples to access computer systems and obtain sensitive data from police forensics labs or infect genome files. It is at this level of digital interaction that synthetic 'vaccines' need to be seen to get the full picture and that will become very clear later on. Michael Yeadon said it made no sense to give the 'vaccine' to younger people who were in no danger from the 'virus'. What was the benefit? It was all downside with potential effects:

The fact that my government in what I thought was a civilised, rational country, is raining [the 'vaccine'] on people in their 30s and 40s, even my children in their 20s, they're getting letters and phone calls, I know this is not right and any of you doctors who are vaccinating you know it's not right, too. They are not at risk. They are not at risk from the disease, so you are now hoping that the side-effects are so rare that you get away with it. You don't give new technology ... that you don't understand to 100 percent of the population.

Blood clot problems with the AstraZeneca 'vaccine' have been affecting younger people to emphasise the downside risks with no benefit. AstraZeneca's version, produced with Oxford University, does not use mRNA, but still gets its toxic cocktail inside cells where

it targets DNA. The Johnson & Johnson 'vaccine' which uses a similar technique has also produced blood clot effects to such an extent that the United States paused its use at one point. They are all 'gene therapy' (cell modification) procedures and not 'vaccines'. The truth is that once the content of these injections enter cells we have no idea what the effect will be. People can speculate and some can give very educated opinions and that's good. In the end, though, only the makers know what their potions are designed to do and even they won't know every last consequence. Michael Yeadon was scathing about doctors doing what they knew to be wrong. 'Everyone's mute', he said. Doctors in the NHS must know this was not right, coming into work and injecting people. 'I don't know how they sleep at night. I know I couldn't do it. I know that if I were in that position I'd have to quit.' He said he knew enough about toxicology to know this was not a good risk-benefit. Yeadon had spoken to seven or eight university professors and all except two would not speak out publicly. Their universities had a policy that no one said anything that countered the government and its medical advisors. They were afraid of losing their government grants. This is how intimidation has been used to silence the truth at every level of the system. I say silence, but these people could still speak out if they made that choice. Yeadon called them 'moral cowards' – 'This is about your children and grandchildren's lives and you have just buggered off and left it.'

'Variant' nonsense

Some of his most powerful comments related to the alleged 'variants' being used to instil more fear, justify more lockdowns, and introduce more 'vaccines'. He said government claims about 'variants' were nonsense. He had checked the alleged variant 'codes' and they were 99.7 percent identical to the 'original'. This was the human identity difference equivalent to putting a baseball cap on and off or wearing it the other way round. A 0.3 percent difference would make it impossible for that 'variant' to escape immunity from the 'original'. This made no sense of having new 'vaccines' for

'variants'. He said there would have to be at least a *30 percent* difference for that to be justified and even then he believed the immune system would still recognise what it was. Gates-funded 'variant modeller' and 'vaccine'-pusher John Edmunds might care to comment. Yeadon said drug companies were making new versions of the 'vaccine' as a 'top up' for 'variants'. Worse than that, he said, the 'regulators' around the world like the MHRA in the UK had got together and agreed that because 'vaccines' for 'variants' were so similar to the first 'vaccines' *they did not have to do safety studies*. How transparently sinister that is. This is when Yeadon said: 'There is a conspiracy here.' There was no need for another vaccine for 'variants' and yet we were told that there was and the country had shut its borders because of them. 'They are going into hundreds of millions of arms without passing 'go' or any regulator. Why did they do that? Why did they pick this method of making the vaccine?'

The reason had to be something bigger than that it seemed and 'it's not protection against the virus'. It's was a far bigger project that meant politicians and advisers were willing to do things and not do things that knowingly resulted in avoidable deaths – 'that's already happened when you think about lockdown and deprivation of health care for a year.' He spoke of people prepared to do something that results in the avoidable death of their fellow human beings and it not bother them. This is the penny-drop I have been working to get across for more than 30 years – the level of pure evil we are dealing with. Yeadon said his friends and associates could not believe there could be that much evil, but he reminded them of Stalin, Pol Pot and Hitler and of what Stalin had said: 'One death is a tragedy. A million? A statistic.' He could not think of a benign explanation for why you need top-up vaccines 'which I'm sure you don't' and for the regulators 'to just get out of the way and wave them through'. Why would the regulators do that when they were still wrestling with the dangers of the 'parent' vaccine? He was clearly shocked by what he had seen since the 'Covid' hoax began and now he was thinking the previously unthinkable:

If you wanted to depopulate a significant proportion of the world and to do it in a way that doesn't involve destruction of the environment with nuclear weapons, poisoning everyone with anthrax or something like that, and you wanted plausible deniability while you had a multi-year infectious disease crisis, I actually don't think you could come up with a better plan of work than seems to be in front of me. I can't say that's what they are going to do, but I can't think of a benign explanation why they are doing it.

He said he never thought that they would get rid of 99 percent of humans, but now he wondered. 'If you wanted to that this would be a hell of a way to do it – it would be unstoppable folks.' Yeadon had concluded that those who submitted to the 'vaccine' would be allowed to have some kind of normal life (but for how long?) while screws were tightened to coerce and mandate the last few percent. 'I think they'll put the rest of them in a prison camp. I wish I was wrong, but I don't think I am.' Other points he made included: There were no coronavirus vaccines then suddenly they all come along at the same time; we have no idea of the long term affect with trials so short; coercing or forcing people to have medical procedures is against the Nuremberg Code instigated when the Nazis did just that; people should at least delay having the 'vaccine'; a quick Internet search confirms that masks don't reduce respiratory viral transmission and 'the government knows that'; they have smashed civil society and they know that, too; two dozen peer-reviewed studies show no connection between lockdown and reducing deaths; he knew from personal friends the elite were still flying around and going on holiday while the public were locked down; the elite were not having the 'vaccines'. He was also asked if 'vaccines' could be made to target difference races. He said he didn't know, but the document by the Project for the New American Century in September, 2000, said developing 'advanced forms of biological warfare that can target *specific genotypes* may transform biological warfare from the realm of terror to a politically useful tool.' Oh, they're evil all right. Of that we can be *absolutely* sure.

Another cull of old people

We have seen from the CDC definition that the mRNA 'Covid vaccine' is not a vaccine and nor are the others that *claim* to reduce 'severity of symptoms' in *some* people, but not protect from infection or transmission. What about all the lies about returning to 'normal' if people were 'vaccinated'? If they are not claimed to stop infection and transmission of the alleged 'virus', how does anything change? This was all lies to manipulate people to take the jabs and we are seeing that now with masks and distancing still required for the 'vaccinated'. How did they think that elderly people with fragile health and immune responses were going to be affected by infusing their cells with synthetic material and other toxic substances? They *knew* that in the short and long term it would be devastating and fatal as the culling of the old that began with the first lockdowns was continued with the 'vaccine'. Death rates in care homes soared immediately residents began to be 'vaccinated' – infused with synthetic material. Brave and committed whistleblower nurses put their careers at risk by exposing this truth while the rest kept their heads down and their mouths shut to put their careers before those they are supposed to care for. A long-time American Certified Nursing Assistant who gave his name as James posted a video in which he described emotionally what happened in his care home when vaccination began. He said that during 2020 very few residents were sick with 'Covid' and no one died during the entire year; but shortly after the Pfizer mRNA injections 14 people died within two weeks and many others were near death. 'They're dropping like flies', he said. Residents who walked on their own before the shot could no longer and they had lost their ability to conduct an intelligent conversation. The home's management said the sudden deaths were caused by a 'super-spreader' of 'Covid-19'. Then how come, James asked, that residents who refused to take the injections were not sick? It was a case of inject the elderly with mRNA synthetic potions and blame their illness and death that followed on the 'virus'. James described what was happening in care homes as 'the greatest crime of genocide this country has ever seen'. Remember the NHS staff nurse from earlier who used the same

word 'genocide' for what was happening with the 'vaccines' and that it was an 'act of human annihilation'. A UK care home whistleblower told a similar story to James about the effect of the 'vaccine' in deaths and 'outbreaks' of illness dubbed 'Covid' after getting the jab. She told how her care home management and staff had zealously imposed government regulations and no one was allowed to even question the official narrative let alone speak out against it. She said the NHS was even worse. Again we see the results of reframing. A worker at a local care home where I live said they had not had a single case of 'Covid' there for almost a year and when the residents were 'vaccinated' they had 19 positive cases in two weeks with eight dying.

It's not the 'vaccine' – honest

The obvious cause and effect was being ignored by the media and most of the public. Australia's health minister Greg Hunt (a former head of strategy at the World Economic Forum) was admitted to hospital after he had the 'vaccine'. He was suffering according to reports from the skin infection 'cellulitis' and it must have been a severe case to have warranted days in hospital. Immediately the authorities said this was nothing to do with the 'vaccine' when an effect of some vaccines is a 'cellulitis-like reaction'. We had families of perfectly healthy old people who died after the 'vaccine' saying that if only they had been given the 'vaccine' earlier they would still be alive. As a numbskull rating that is off the chart. A father of four 'died of Covid' at aged 48 when he was taken ill two days after having the 'vaccine'. The man, a health administrator, had been 'shielding during the pandemic' and had 'not really left the house' until he went for the 'vaccine'. Having the 'vaccine' and then falling ill and dying does not seem to have qualified as a possible cause and effect and 'Covid-19' went on his death certificate. His family said they had no idea how he 'caught the virus'. A family member said: 'Tragically, it could be that going for a vaccination ultimately led to him catching Covid ...The sad truth is that they are never going to know where it came from.' The family warned people to remember

that the virus still existed and was 'very real'. So was their stupidity. Nurses and doctors who had the first round of the 'vaccine' were collapsing, dying and ending up in a hospital bed while they or their grieving relatives were saying they'd still have the 'vaccine' again despite what happened. I kid you not. You mean if your husband returned from the dead he'd have the same 'vaccine' again that killed him??

Doctors at the VCU Medical Center in Richmond, Virginia, said the Johnson & Johnson 'vaccine' was to blame for a man's skin peeling off. Patient Richard Terrell said: 'It all just happened so fast. My skin peeled off. It's still coming off on my hands now.' He said it was stinging, burning and itching and when he bent his arms and legs it was very painful with 'the skin swollen and rubbing against itself'. Pfizer/BioNTech and Moderna vaccines use mRNA to change the cell while the Johnson & Johnson version uses DNA in a process similar to AstraZeneca's technique. Johnson & Johnson and AstraZeneca have both had their 'vaccines' paused by many countries after causing serious blood problems. Terrell's doctor Fnu Nutan said he could have died if he hadn't got medical attention. It sounds terrible so what did Nutan and Terrell say about the 'vaccine' now? Oh, they still recommend that people have it. A nurse in a hospital bed 40 minutes after the vaccination and unable to swallow due to throat swelling was told by a doctor that he lost mobility in his arm for 36 hours following the vaccination. What did he say to the ailing nurse? 'Good for you for getting the vaccination.' We are dealing with a serious form of cognitive dissonance madness in both public and medical staff. There is a remarkable correlation between those having the 'vaccine' and trumpeting the fact and suffering bad happenings shortly afterwards. Witold Rogiewicz, a Polish doctor, made a video of his 'vaccination' and ridiculed those who were questioning its safety and the intentions of Bill Gates: 'Vaccinate yourself to protect yourself, your loved ones, friends and also patients. And to mention quickly I have info for anti-vaxxers and anti-Coviders if you want to contact Bill Gates you can do this through me.' He further ridiculed the dangers of 5G. Days later he

was dead, but naturally the vaccination wasn't mentioned in the verdict of 'heart attack'.

Lies, lies and more lies

So many members of the human race have slipped into extreme states of insanity and unfortunately they include reframed doctors and nursing staff. Having a 'vaccine' and dying within minutes or hours is not considered a valid connection while death from any cause within 28 days or longer of a positive test with a test not testing for the 'virus' means 'Covid-19' goes on the death certificate. How could that 'vaccine'-death connection not have been made except by calculated deceit? US figures in the initial rollout period to February 12th, 2020, revealed that a third of the deaths reported to the CDC after 'Covid vaccines' happened within 48 hours. Five men in the UK suffered an 'extremely rare' blood clot problem after having the AstraZeneca 'vaccine', but no causal link was established said the Gates-funded Medicines and Healthcare products Regulatory Agency (MHRA) which had given the 'vaccine' emergency approval to be used. Former Pfizer executive Dr Michael Yeadon explained in his interview how the procedures could cause blood coagulation and clots. People who should have been at no risk were dying from blood clots in the brain and he said he had heard from medical doctor friends that people were suffering from skin bleeding and massive headaches. The AstraZeneca 'shot' was stopped by some 20 countries over the blood clotting issue and still the corrupt MHRA, the European Medicines Agency (EMA) and the World Health Organization said that it should continue to be given even though the EMA admitted that it 'still cannot rule out definitively' a link between blood clotting and the 'vaccine'. Later Marco Cavaleri, head of EMA vaccine strategy, said there was indeed a clear link between the 'vaccine' and thrombosis, but they didn't know why. So much for the trials showing the 'vaccine' is safe. Blood clots were affecting younger people who would be under virtually no danger from 'Covid' even if it existed which makes it all the more stupid and sinister.

The British government responded to public alarm by wheeling out June Raine, the terrifyingly weak infant school headmistress sound-alike who heads the UK MHRA drug 'regulator'. The idea that she would stand up to Big Pharma and government pressure is laughable and she told us that all was well in the same way that she did when allowing untested, never-used-on-humans-before, genetically-manipulating 'vaccines' to be exposed to the public in the first place. Mass lying is the new normal of the 'Covid' era. The MHRA later said 30 cases of rare blood clots had by then been connected with the AstraZeneca 'vaccine' (that means a lot more in reality) while stressing that the benefits of the jab in preventing 'Covid-19' outweighed any risks. A more ridiculous and disingenuous statement with callous disregard for human health it is hard to contemplate. Immediately after the mendacious 'all-clears' two hospital workers in Denmark experienced blood clots and cerebral haemorrhaging following the AstraZeneca jab and one died. Top Norwegian health official Pål Andre Holme said the 'vaccine' was the only common factor: 'There is nothing in the patient history of these individuals that can give such a powerful immune response ... I am confident that the antibodies that we have found are the cause, and I see no other explanation than it being the vaccine which triggers it.' Strokes, a clot or bleed in the brain, were clearly associated with the 'vaccine' from word of mouth and whistleblower reports. Similar consequences followed with all these 'vaccines' that we were told were so safe and as the numbers grew by the day it was clear we were witnessing human carnage.

Learning the hard way

A woman interviewed by UKColumn told how her husband suffered dramatic health effects after the vaccine when he'd been in good health all his life. He went from being a little unwell to losing all feeling in his legs and experiencing 'excruciating pain'. Misdiagnosis followed twice at Accident and Emergency (an 'allergy' and 'sciatica') before he was admitted to a neurology ward where doctors said his serious condition had been caused by the

'vaccine'. Another seven 'vaccinated' people were apparently being treated on the same ward for similar symptoms. The woman said he had the 'vaccine' because they believed media claims that it was safe. 'I didn't think the government would give out a vaccine that does this to somebody; I believed they would be bringing out a vaccination that would be safe.' What a tragic way to learn that lesson. Another woman posted that her husband was transporting stroke patients to hospital on almost every shift and when he asked them if they had been 'vaccinated' for 'Covid' they all replied 'yes'. One had a 'massive brain bleed' the day after his second dose. She said her husband reported the 'just been vaccinated' information every time to doctors in A and E only for them to ignore it, make no notes and appear annoyed that it was even mentioned. This particular report cannot be verified, but it expresses a common theme that confirms the monumental underreporting of 'vaccine' consequences. Interestingly as the 'vaccines' and their brain blood clot/stroke consequences began to emerge the UK National Health Service began a publicity campaign telling the public what to do in the event of a stroke. A Scottish NHS staff nurse who quit in disgust in March, 2021, said:

I have seen traumatic injuries from the vaccine, they're not getting reported to the yellow card [adverse reaction] scheme, they're treating the symptoms, not asking why, why it's happening. It's just treating the symptoms and when you speak about it you're dismissed like you're crazy, I'm not crazy, I'm not crazy because every other colleague I've spoken to is terrified to speak out, they've had enough.

Videos appeared on the Internet of people uncontrollably shaking after the 'vaccine' with no control over muscles, limbs and even their face. A Scottish mother broke out in a severe rash all over her body almost immediately after she was given the AstraZeneca 'vaccine'. The pictures were horrific. Leigh King, a 41-year-old hairdresser from Lanarkshire said: 'Never in my life was I prepared for what I was about to experience ... My skin was so sore and constantly hot ... I have never felt pain like this ...' But don't you worry, the 'vaccine' is perfectly safe. Then there has been the effect on medical

staff who have been pressured to have the 'vaccine' by psychopathic 'health' authorities and government. A London hospital consultant who gave the name K. Polyakova wrote this to the *British Medical Journal* or *BMJ*:

I am currently struggling with ... the failure to report the reality of the morbidity caused by our current vaccination program within the health service and staff population. The levels of sickness after vaccination is unprecedented and staff are getting very sick and some with neurological symptoms which is having a huge impact on the health service function. Even the young and healthy are off for days, some for weeks, and some requiring medical treatment. Whole teams are being taken out as they went to get vaccinated together.

Mandatory vaccination in this instance is stupid, unethical and irresponsible when it comes to protecting our staff and public health. We are in the voluntary phase of vaccination, and encouraging staff to take an unlicensed product that is impacting on their immediate health ... it is clearly stated that these vaccine products do not offer immunity or stop transmission. In which case why are we doing it?

Not to protect health that's for sure. Medical workers are lauded by governments for agenda reasons when they couldn't give a toss about them any more than they can for the population in general. Schools across America faced the same situation as they closed due to the high number of teachers and other staff with bad reactions to the Pfizer/BioNTech, Moderna, and Johnson & Johnson 'Covid vaccines' all of which were linked to death and serious adverse effects. The *BMJ* took down the consultant's comments pretty quickly on the grounds that they were being used to spread 'disinformation'. They were exposing the truth about the 'vaccine' was the real reason. The cover-up is breathtaking.

Hiding the evidence

The scale of the 'vaccine' death cover-up worldwide can be confirmed by comparing official figures with the personal experience of the public. I heard of many people in my community who died immediately or soon after the vaccine that would never appear in the media or even likely on the official totals of 'vaccine' fatalities and adverse reactions when only about ten percent are estimated to be

reported and I have seen some estimates as low as one percent in a Harvard study. In the UK alone by April 29th, 2021, some 757,654 adverse reactions had been officially reported from the Pfizer/BioNTech, Oxford/AstraZeneca and Moderna 'vaccines' with more than a thousand deaths linked to jabs and that means an estimated ten times this number in reality from a ten percent reporting rate percentage. That's seven million adverse reactions and 10,000 potential deaths and a one percent reporting rate would be ten times *those* figures. In 1976 the US government pulled the swine flu vaccine after 53 deaths. The UK data included a combined 10,000 eye disorders from the 'Covid vaccines' with more than 750 suffering visual impairment or blindness and again multiply by the estimated reporting percentages. As 'Covid cases' officially fell hospitals virtually empty during the 'Covid crisis' began to fill up with a range of other problems in the wake of the 'vaccine' rollout. The numbers across America have also been catastrophic. Deaths linked to *all* types of vaccine increased by 6,000 percent in the first quarter of 2021 compared with 2020. A 39-year-old woman from Ogden, Utah, died four days after receiving a second dose of Moderna's 'Covid vaccine' when her liver, heart and kidneys all failed despite the fact that she had no known medical issues or conditions. Her family sought an autopsy, but Dr Erik Christensen, Utah's chief medical examiner, said proving vaccine injury as a cause of death almost never happened. He could think of only one instance where an autopsy would name a vaccine as the official cause of death and that would be anaphylaxis where someone received a vaccine and died almost instantaneously. 'Short of that, it would be difficult for us to definitively say this is the vaccine,' Christensen said. If that is true this must be added to the estimated ten percent (or far less) reporting rate of vaccine deaths and serious reactions and the conclusion can only be that vaccine deaths and serious reactions – including these 'Covid' potions' – are phenomenally understated in official figures. The same story can be found everywhere. Endless accounts of deaths and serious reactions among the public, medical

and care home staff while official figures did not even begin to reflect this.

Professional script-reader Dr David Williams, a 'top public-health official' in Ontario, Canada, insulted our intelligence by claiming only four serious adverse reactions and no deaths from the more than 380,000 vaccine doses then given. This bore no resemblance to what people knew had happened in their own circles and we had Dirk Huyer in charge of getting millions vaccinated in Ontario while at the same time he was Chief Coroner for the province investigating causes of death including possible death from the vaccine. An aide said he had stepped back from investigating deaths, but evidence indicated otherwise. Rosemary Frei, who secured a Master of Science degree in molecular biology at the Faculty of Medicine at Canada's University of Calgary before turning to investigative journalism, was one who could see that official figures for 'vaccine' deaths and reactions made no sense. She said that doctors seldom reported adverse events and when people got really sick or died after getting a vaccination they would attribute that to anything except the vaccines. It had been that way for years and anyone who wondered aloud whether the 'Covid vaccines' or other shots cause harm is immediately branded as 'anti-vax' and 'anti-science'. This was 'career-threatening' for health professionals. Then there was the huge pressure to support the push to 'vaccinate' billions in the quickest time possible. Frei said:

So that's where we're at today. More than half a million vaccine doses have been given to people in Ontario alone. The rush is on to vaccinate all 15 million of us in the province by September. And the mainstream media are screaming for this to be sped up even more. That all adds up to only a very slim likelihood that we're going to be told the truth by officials about how many people are getting sick or dying from the vaccines.

What is true of Ontario is true of everywhere.

They KNEW – and still did it

The authorities knew what was going to happen with multiple deaths and adverse reactions. The UK government's Gates-funded

and Big Pharma-dominated Medicines and Healthcare products Regulatory Agency (MHRA) hired a company to employ AI in compiling the projected reactions to the 'vaccine' that would otherwise be uncountable. The request for applications said: 'The MHRA urgently seeks an Artificial Intelligence (AI) software tool to process the expected high volume of Covid-19 vaccine Adverse Drug Reaction ...' This was from the agency, headed by the disingenuous June Raine, that gave the 'vaccines' emergency approval and the company was hired before the first shot was given. 'We are going to kill and maim you – is that okay?' 'Oh, yes, perfectly fine – I'm very grateful, thank you, doctor.' The range of 'Covid vaccine' adverse reactions goes on for page after page in the MHRA criminally underreported 'Yellow Card' system and includes affects to eyes, ears, skin, digestion, blood and so on. Raine's MHRA amazingly claimed that the 'overall safety experience ... is so far as expected from the clinical trials'. The death, serious adverse effects, deafness and blindness were *expected*? When did they ever mention that? If these human tragedies were expected then those that gave approval for the use of these 'vaccines' must be guilty of crimes against humanity including murder – a definition of which is 'killing a person with malice aforethought or with recklessness manifesting extreme indifference to the value of human life.' People involved at the MHRA, the CDC in America and their equivalent around the world must go before Nuremberg trials to answer for their callous inhumanity. We are only talking here about the immediate effects of the 'vaccine'. The longer-term impact of the DNA synthetic manipulation is the main reason they are so hysterically desperate to inoculate the entire global population in the shortest possible time.

Africa and the developing world are a major focus for the 'vaccine' depopulation agenda and a mass vaccination sales-pitch is underway thanks to caring people like the Rockefellers and other Cult assets. The Rockefeller Foundation, which pre-empted the 'Covid pandemic' in a document published in 2010 that 'predicted' what happened a decade later, announced an initial \$34.95 million grant in February, 2021, 'to ensure more equitable access to Covid-19

testing and vaccines' among other things in Africa in collaboration with '24 organizations, businesses, and government agencies'. The pan-Africa initiative would focus on 10 countries: Burkina Faso, Ethiopia, Ghana, Kenya, Nigeria, Rwanda, South Africa, Tanzania, Uganda, and Zambia'. Rajiv Shah, President of the Rockefeller Foundation and former administrator of CIA-controlled USAID, said that if Africa was not mass-vaccinated (to change the DNA of its people) it was a 'threat to all of humanity' and not fair on Africans. When someone from the Rockefeller Foundation says they want to do something to help poor and deprived people and countries it is time for a belly-laugh. They are doing this out of the goodness of their 'heart' because 'vaccinating' the entire global population is what the 'Covid' hoax set out to achieve. Official 'decolonisation' of Africa by the Cult was merely a prelude to financial colonisation on the road to a return to physical colonisation. The 'vaccine' is vital to that and the sudden and convenient death of the 'Covid' sceptic president of Tanzania can be seen in its true light. A lot of people in Africa are aware that this is another form of colonisation and exploitation and they need to stand their ground.

The 'vaccine is working' scam

A potential problem for the Cult was that the 'vaccine' is meant to change human DNA and body messaging and not to protect anyone from a 'virus' never shown to exist. The vaccine couldn't work because it was not designed to work and how could they make it *appear* to be working so that more people would have it? This was overcome by lowering the amplification rate of the PCR test to produce fewer 'cases' and therefore fewer 'deaths'. Some of us had been pointing out since March, 2020, that the amplification rate of the test not testing for the 'virus' had been made artificially high to generate positive tests which they could call 'cases' to justify lockdowns. The World Health Organization recommended an absurdly high 45 amplification cycles to ensure the high positives required by the Cult and then remained silent on the issue until January 20th, 2021 – Biden's Inauguration Day. This was when the

'vaccinations' were seriously underway and on that day the WHO recommended after discussions with America's CDC that laboratories *lowered their testing amplification*. Dr David Samadi, a certified urologist and health writer, said the WHO was encouraging all labs to reduce their cycle count for PCR tests. He said the current cycle was much too high and was 'resulting in any particle being declared a positive case'. Even one mainstream news report I saw said this meant the number of 'Covid' infections may have been 'dramatically inflated'. Oh, just a little bit. The CDC in America issued new guidance to laboratories in April, 2021, to use 28 cycles *but only for 'vaccinated' people*. The timing of the CDC/WHO interventions were cynically designed to make it appear the 'vaccines' were responsible for falling cases and deaths when the real reason can be seen in the following examples. New York's state lab, the Wadsworth Center, identified 872 positive tests in July, 2020, based on a threshold of 40 cycles. When the figure was lowered to 35 cycles 43 percent of the 872 were no longer 'positives'. At 30 cycles the figure was 63 percent. A Massachusetts lab found that between 85 to 90 percent of people who tested positive in July with a cycle threshold of 40 would be negative at 30 cycles, Ashish Jha, MD, director of the Harvard Global Health Institute, said: 'I'm really shocked that it could be that high ... Boy, does it really change the way we need to be thinking about testing.' I'm shocked that I could see the obvious in the spring of 2020, with no medical background, and most medical professionals still haven't worked it out. No, that's not shocking – it's terrifying.

Three weeks after the WHO directive to lower PCR cycles the London *Daily Mail* ran this headline: 'Why ARE Covid cases plummeting? New infections have fallen 45% in the US and 30% globally in the past 3 weeks but experts say vaccine is NOT the main driver because only 8% of Americans and 13% of people worldwide have received their first dose.' They acknowledged that the drop could not be attributed to the 'vaccine', but soon this morphed throughout the media into the 'vaccine' has caused cases and deaths to fall when it was the PCR threshold. In December, 2020, there was

chaos at English Channel ports with truck drivers needing negative 'Covid' tests before they could board a ferry home for Christmas. The government wanted to remove the backlog as fast as possible and they brought in troops to do the 'testing'. Out of 1,600 drivers just 36 tested positive and the rest were given the all clear to cross the Channel. I guess the authorities thought that 36 was the least they could get away with without the unquestioning catching on. The amplification trick which most people believed in the absence of information in the mainstream applied more pressure on those refusing the 'vaccine' to succumb when it 'obviously worked'. The truth was the exact opposite with deaths in care homes soaring with the 'vaccine' and in Israel the term used was 'skyrocket'. A re-analysis of published data from the Israeli Health Ministry led by Dr Hervé Seligmann at the Medicine Emerging Infectious and Tropical Diseases at Aix-Marseille University found that Pfizer's 'Covid vaccine' killed 'about 40 times more [elderly] people than the disease itself would have killed' during a five-week vaccination period and *260 times* more younger people than would have died from the 'virus' even according to the manipulated 'virus' figures. Dr Seligmann and his co-study author, Haim Yativ, declared after reviewing the Israeli 'vaccine' death data: 'This is a new Holocaust.'

Then, in mid-April, 2021, after vast numbers of people worldwide had been 'vaccinated', the story changed with clear coordination. The UK government began to prepare the ground for more future lockdowns when Nuremberg-destined Boris Johnson told yet another whopper. He said that cases had fallen because of *lockdowns* not 'vaccines'. Lockdowns are irrelevant when *there is no 'virus'* and the test and fraudulent death certificates are deciding the number of 'cases' and 'deaths'. Study after study has shown that lockdowns don't work and instead kill and psychologically destroy people. Meanwhile in the United States Anthony Fauci and Rochelle Walensky, the ultra-Zionist head of the CDC, peddled the same line. More lockdown was the answer and not the 'vaccine', a line repeated on cue by the moron that is Canadian Prime Minister Justin Trudeau. Why all the hysteria to get everyone 'vaccinated' if lockdowns and

not 'vaccines' made the difference? None of it makes sense on the face of it. Oh, but it does. The Cult wants lockdowns *and* the 'vaccine' and if the 'vaccine' is allowed to be seen as the total answer lockdowns would no longer be justified when there are still livelihoods to destroy. 'Variants' and renewed upward manipulation of PCR amplification are planned to instigate never-ending lockdown *and* more 'vaccines'.

You *must* have it – we're desperate

Israel, where the Jewish and Arab population are ruled by the Sabbatian Cult, was the front-runner in imposing the DNA-manipulating 'vaccine' on its people to such an extent that Jewish refusers began to liken what was happening to the early years of Nazi Germany. This would seem to be a fantastic claim. Why would a government of Jewish people be acting like the Nazis did? If you realise that the Sabbatian Cult was behind the Nazis and that Sabbatians hate Jews the pieces start to fit and the question of why a 'Jewish' government would treat Jews with such callous disregard for their lives and freedom finds an answer. Those controlling the government of Israel *aren't Jewish* – they're Sabbatian. Israeli lawyer Tamir Turgal was one who made the Nazi comparison in comments to German lawyer Reiner Fuellmich who is leading a class action lawsuit against the psychopaths for crimes against humanity. Turgal described how the Israeli government was vaccinating children and pregnant women on the basis that there was no evidence that this was dangerous when they had no evidence that it *wasn't* dangerous either. They just had no evidence. This was medical experimentation and Turgal said this breached the Nuremberg Code about medical experimentation and procedures requiring informed consent and choice. Think about that. A Nuremberg Code developed because of Nazi experimentation on Jews and others in concentration camps by people like the evil-beyond-belief Josef Mengele is being breached by the *Israeli* government; but when you know that it's a *Sabbatian* government along with its intelligence and military agencies like Mossad, Shin Bet and the Israeli Defense Forces, and that Sabbatians

were the force behind the Nazis, the kaleidoscope comes into focus. What have we come to when Israeli Jews are suing their government for violating the Nuremberg Code by essentially making Israelis subject to a medical experiment using the controversial 'vaccines'? It's a shocker that this has to be done in the light of what happened in Nazi Germany. The Anshe Ha-Emet, or 'People of the Truth', made up of Israeli doctors, lawyers, campaigners and public, have launched a lawsuit with the International Criminal Court. It says:

When the heads of the Ministry of Health as well as the prime minister presented the vaccine in Israel and began the vaccination of Israeli residents, the vaccinated were not advised, that, in practice, they are taking part in a medical experiment and that their consent is required for this under the Nuremberg Code.

The irony is unbelievable, but easily explained in one word: Sabbatians. The foundation of Israeli 'Covid' apartheid is the 'green pass' or 'green passport' which allows Jews and Arabs who have had the DNA-manipulating 'vaccine' to go about their lives – to work, fly, travel in general, go to shopping malls, bars, restaurants, hotels, concerts, gyms, swimming pools, theatres and sports venues, while non-'vaccinated' are banned from all those places and activities. Israelis have likened the 'green pass' to the yellow stars that Jews in Nazi Germany were forced to wear – the same as the yellow stickers that a branch of UK supermarket chain Morrisons told exempt mask-wearers they had to display when shopping. How very sensitive. The Israeli system is blatant South African-style apartheid on the basis of compliance or non-compliance to fascism rather than colour of the skin. How appropriate that the Sabbatian Israeli government was so close to the pre-Mandela apartheid regime in Pretoria. The Sabbatian-instigated 'vaccine passport' in Israel is planned for everywhere. Sabbatians struck a deal with Pfizer that allowed them to lead the way in the percentage of a national population infused with synthetic material and the result was catastrophic. Israeli freedom activist Shai Dannon told me how chairs were appearing on beaches that said 'vaccinated only'. Health Minister Yuli Edelstein said that anyone unwilling or unable to get

the jabs that 'confer immunity' will be 'left behind'. The man's a liar. Not even the makers claim the 'vaccines' confer immunity. When you see those figures of 'vaccine' deaths these psychopaths were saying that you must take the chance the 'vaccine' will kill you or maim you while knowing it will change your DNA or lockdown for you will be permanent. That's fascism. The Israeli parliament passed a law to allow personal information of the non-vaccinated to be shared with local and national authorities for three months. This was claimed by its supporters to be a way to 'encourage' people to be vaccinated. Hadas Ziv from Physicians for Human Rights described this as a 'draconian law which crushed medical ethics and the patient rights'. But that's the idea, the Sabbatians would reply.

Your papers, please

Sabbatian Israel was leading what has been planned all along to be a global 'vaccine pass' called a 'green passport' without which you would remain in permanent lockdown restriction and unable to do anything. This is how badly – *desperately* – the Cult is to get everyone 'vaccinated'. The term and colour 'green' was not by chance and related to the psychology of fusing the perception of the green climate hoax with the 'Covid' hoax and how the 'solution' to both is the same Great Reset. Lying politicians, health officials and psychologists denied there were any plans for mandatory vaccinations or restrictions based on vaccinations, but they knew that was exactly what was meant to happen with governments of all countries reaching agreements to enforce a global system. 'Free' Denmark and 'free' Sweden unveiled digital vaccine certification. Cyprus, Czech Republic, Estonia, Greece, Hungary, Iceland, Italy, Poland, Portugal, Slovakia, and Spain have all committed to a vaccine passport system and the rest including the whole of the EU would follow. The satanic UK government will certainly go this way despite mendacious denials and at the time of writing it is trying to manipulate the public into having the 'vaccine' so they could go abroad on a summer holiday. How would that work without something to prove you had the synthetic toxicity injected into you?

Documents show that the EU's European Commission was moving towards 'vaccine certificates' in 2018 and 2019 before the 'Covid' hoax began. They knew what was coming. Abracadabra – Ursula von der Leyen, the German President of the Commission, announced in March, 2021, an EU 'Digital Green Certificate' – green again – to track the public's 'Covid status'. The passport sting is worldwide and the Far East followed the same pattern with South Korea ruling that only those with 'vaccination' passports – again the *green* pass – would be able to 'return to their daily lives'.

Bill Gates has been preparing for this 'passport' with other Cult operatives for years and beyond the paper version is a Gates-funded 'digital tattoo' to identify who has been vaccinated and who hasn't. The 'tattoo' is reported to include a substance which is externally readable to confirm who has been vaccinated. This is a bio-luminous light-generating enzyme (think fireflies) called ... *Luciferase*. Yes, named after the Cult 'god' Lucifer the 'light bringer' of whom more to come. Gates said he funded the readable tattoo to ensure children in the developing world were vaccinated and no one was missed out. He cares so much about poor kids as we know. This was just the cover story to develop a vaccine tagging system for everyone on the planet. Gates has been funding the ID2020 'alliance' to do just that in league with other lovely people at Microsoft, GAVI, the Rockefeller Foundation, Accenture and IDEO.org. He said in interviews in March, 2020, before any 'vaccine' publicly existed, that the world must have a globalised digital certificate to track the 'virus' and who had been vaccinated. Gates knew from the start that the mRNA vaccines were coming and when they would come and that the plan was to tag the 'vaccinated' to marginalise the intelligent and stop them doing anything including travel. Evil just doesn't suffice. Gates was exposed for offering a \$10 million bribe to the Nigerian House of Representatives to invoke compulsory 'Covid' vaccination of all Nigerians. Sara Cunial, a member of the Italian Parliament, called Gates a 'vaccine criminal'. She urged the Italian President to hand him over to the International Criminal Court for crimes against

humanity and condemned his plans to 'chip the human race' through ID2020.

You know it's a long-planned agenda when war criminal and Cult gofer Tony Blair is on the case. With the scale of arrogance only someone as dark as Blair can muster he said: 'Vaccination in the end is going to be your route to liberty.' Blair is a disgusting piece of work and he confirms that again. The media has given a lot of coverage to a bloke called Charlie Mullins, founder of London's biggest independent plumbing company, Pimlico Plumbers, who has said he won't employ anyone who has not been vaccinated or have them go to any home where people are not vaccinated. He said that if he had his way no one would be allowed to walk the streets if they have not been vaccinated. Gates was cheering at the time while I was alerting the white coats. The plan is that people will qualify for 'passports' for having the first two doses and then to keep it they will have to have all the follow ups and new ones for invented 'variants' until human genetics is transformed and many are dead who can't adjust to the changes. Hollywood celebrities – the usual propaganda stunt – are promoting something called the WELL Health-Safety Rating to verify that a building or space has 'taken the necessary steps to prioritize the health and safety of their staff, visitors and other stakeholders'. They included Lady Gaga, Jennifer Lopez, Michael B. Jordan, Robert DeNiro, Venus Williams, Wolfgang Puck, Deepak Chopra and 17th Surgeon General Richard Carmona. Yawn. WELL Health-Safety has big connections with China. Parent company Delos is headed by former Goldman Sachs partner Paul Scialla. This is another example – and we will see so many others – of using the excuse of 'health' to dictate the lives and activities of the population. I guess one confirmation of the 'safety' of buildings is that only 'vaccinated' people can go in, right?

Electronic concentration camps

I wrote decades ago about the plans to restrict travel and here we are for those who refuse to bow to tyranny. This can be achieved in one go with air travel if the aviation industry makes a blanket decree.

The 'vaccine' and guaranteed income are designed to be part of a global version of China's social credit system which tracks behaviour 24/7 and awards or deletes 'credits' based on whether your behaviour is supported by the state or not. I mean your entire lifestyle – what you do, eat, say, everything. Once your credit score falls below a certain level consequences kick in. In China tens of millions have been denied travel by air and train because of this. All the locations and activities denied to refusers by the 'vaccine' passports will be included in one big mass ban on doing almost anything for those that don't bow their head to government. It's beyond fascist and a new term is required to describe its extremes – I guess fascist technocracy will have to do. The way the Chinese system of technological – technocratic – control is sweeping the West can be seen in the Los Angeles school system and is planned to be expanded worldwide. Every child is required to have a 'Covid'-tracking app scanned daily before they can enter the classroom. The so-called Daily Pass tracking system is produced by Gates' Microsoft which I'm sure will shock you rigid. The pass will be scanned using a barcode (one step from an inside-the-body barcode) and the information will include health checks, 'Covid' tests and vaccinations. Entry codes are for one specific building only and access will only be allowed if a student or teacher has a negative test with a test not testing for the 'virus', has no symptoms of anything alleged to be related to 'Covid' (symptoms from a range of other illness), and has a temperature under 100 degrees. No barcode, no entry, is planned to be the case for everywhere and not only schools.

Kids are being psychologically prepared to accept this as 'normal' their whole life which is why what they can impose in schools is so important to the Cult and its gofers. Long-time American freedom campaigner John Whitehead of the Rutherford Institute was not exaggerating when he said: 'Databit by databit, we are building our own electronic concentration camps.' Canada under its Cult gofer prime minister Justin Trudeau has taken a major step towards the real thing with people interned against their will if they test positive with a test not testing for the 'virus' when they arrive at a Canadian

airport. They are jailed in internment hotels often without food or water for long periods and with many doors failing to lock there have been sexual assaults. The interned are being charged sometimes \$2,000 for the privilege of being abused in this way. Trudeau is fully on board with the Cult and says the 'Covid pandemic' has provided an opportunity for a global 'reset' to permanently change Western civilisation. His number two, Deputy Prime Minister Chrystia Freeland, is a trustee of the World Economic Forum and a Rhodes Scholar. The Trudeau family have long been servants of the Cult. See *The Biggest Secret* and Cathy O'Brien's book *Trance-Formation of America* for the horrific background to Trudeau's father Pierre Trudeau another Canadian prime minister. Hide your fascism behind the façade of a heart-on-the-sleeve liberal. It's a well-honed Cult technique.

What can the 'vaccine' really do?

We have a 'virus' never shown to exist and 'variants' of the 'virus' that have also never been shown to exist except, like the 'original', as computer-generated fictions. Even if you believe there's a 'virus' the 'case' to 'death' rate is in the region of 0.23 to 0.15 percent and those 'deaths' are concentrated among the very old around the same average age that people die anyway. In response to this lack of threat (in truth none) psychopaths and idiots, knowingly and unknowingly answering to Gates and the Cult, are seeking to 'vaccinate' every man, woman and child on Planet Earth. Clearly the 'vaccine' is not about 'Covid' – none of this ever has been. So what is it all about *really*? Why the desperation to infuse genetically-manipulating synthetic material into everyone through mRNA fraudulent 'vaccines' with the intent of doing this over and over with the excuses of 'variants' and other 'virus' inventions? Dr Sherri Tenpenny, an osteopathic medical doctor in the United States, has made herself an expert on vaccines and their effects as a vehement campaigner against their use. Tenpenny was board certified in emergency medicine, the director of a level two trauma centre for 12 years, and moved to Cleveland in 1996 to start an integrative

medicine practice which has treated patients from all 50 states and some 17 other countries. Weaning people off pharmaceutical drugs is a speciality.

She became interested in the consequences of vaccines after attending a meeting at the National Vaccine Information Center in Washington DC in 2000 where she 'sat through four days of listening to medical doctors and scientists and lawyers and parents of vaccine injured kids' and asked: 'What's going on?' She had never been vaccinated and never got ill while her father was given a list of vaccines to be in the military and was 'sick his entire life'. The experience added to her questions and she began to examine vaccine documents from the Centers for Disease Control (CDC). After reading the first one, the 1998 version of *The General Recommendations of Vaccination*, she thought: 'This is it?' The document was poorly written and bad science and Tenpenny began 20 years of research into vaccines that continues to this day. She began her research into 'Covid vaccines' in March, 2020, and she describes them as 'deadly'. For many, as we have seen, they already have been. Tenpenny said that in the first 30 days of the 'vaccine' rollout in the United States there had been more than 40,000 adverse events reported to the vaccine adverse event database. A document had been delivered to her the day before that was 172 pages long. 'We have over 40,000 adverse events; we have over 3,100 cases of [potentially deadly] anaphylactic shock; we have over 5,000 neurological reactions.' Effects ranged from headaches to numbness, dizziness and vertigo, to losing feeling in hands or feet and paraesthesia which is when limbs 'fall asleep' and people have the sensation of insects crawling underneath their skin. All this happened in the first 30 days and remember that only about *ten percent* (or far less) of adverse reactions and vaccine-related deaths are estimated to be officially reported. Tenpenny said:

So can you think of one single product in any industry, any industry, for as long as products have been made on the planet that within 30 days we have 40,000 people complaining of side effects that not only is still on the market but ... we've got paid actors telling us how great

they are for getting their vaccine. We're offering people \$500 if they will just get their vaccine and we've got nurses and doctors going; 'I got the vaccine, I got the vaccine'.

Tenpenny said they were not going to be 'happy dancing folks' when they began to suffer Bell's palsy (facial paralysis), neuropathies, cardiac arrhythmias and autoimmune reactions that kill through a blood disorder. 'They're not going to be so happy, happy then, but we're never going to see pictures of those people' she said. Tenpenny described the 'vaccine' as 'a well-designed killing tool'.

No off-switch

Bad as the initial consequences had been Tenpenny said it would be maybe 14 months before we began to see the 'full ravage' of what is going to happen to the 'Covid vaccinated' with full-out consequences taking anything between two years and 20 years to show. You can understand why when you consider that variations of the 'Covid vaccine' use mRNA (messenger RNA) to in theory activate the immune system to produce protective antibodies without using the actual 'virus'. How can they when it's a computer program and they've never isolated what they claim is the 'real thing'? Instead they use *synthetic* mRNA. They are inoculating synthetic material into the body which through a technique known as the Trojan horse is absorbed into cells to change the nature of DNA. Human DNA is changed by an infusion of messenger RNA and with each new 'vaccine' of this type it is changed even more. Say so and you are banned by Cult Internet platforms. The contempt the contemptuous Mark Zuckerberg has for the truth and human health can be seen in an internal Facebook video leaked to the Project Veritas investigative team in which he said of the 'Covid vaccines': '... I share some caution on this because we just don't know the long term side-effects of basically modifying people's DNA and RNA.' At the same time this disgusting man's Facebook was censoring and banning anyone saying exactly the same. He must go before a Nuremberg trial for crimes against humanity when he *knows* that he

is censoring legitimate concerns and denying the right of informed consent on behalf of the Cult that owns him. People have been killed and damaged by the very 'vaccination' technique he cast doubt on himself when they may not have had the 'vaccine' with access to information that he denied them. The plan is to have at least annual 'Covid vaccinations', add others to deal with invented 'variants', and change all other vaccines into the mRNA system. Pfizer executives told shareholders at a virtual Barclays Global Healthcare Conference in March, 2021, that the public may need a third dose of 'Covid vaccine', plus regular yearly boosters and the company planned to hike prices to milk the profits in a 'significant opportunity for our vaccine'. These are the professional liars, cheats and opportunists who are telling you their 'vaccine' is safe. Given this volume of mRNA planned to be infused into the human body and its ability to then replicate we will have a transformation of human genetics from biological to synthetic biological – exactly the long-time Cult plan for reasons we'll see – and many will die. Sherri Tenpenny said of this replication:

It's like having an on-button but no off-button and that whole mechanism ... they actually give it a name and they call it the Trojan horse mechanism, because it allows that [synthetic] virus and that piece of that [synthetic] virus to get inside of your cells, start to replicate and even get inserted into other parts of your DNA as a Trojan-horse.

Ask the overwhelming majority of people who have the 'vaccine' what they know about the contents and what they do and they would reply: 'The government says it will stop me getting the virus.' Governments give that false impression on purpose to increase take-up. You can read Sherri Tenpenny's detailed analysis of the health consequences in her blog at [Vaxxter.com](https://www.vaxxter.com), but in summary these are some of them. She highlights the statement by Bill Gates about how human beings can become their own 'vaccine manufacturing machine'. The man is insane. ['Vaccine'-generated] 'antibodies' carry synthetic messenger RNA into the cells and the damage starts, Tenpenny contends, and she says that lungs can be adversely affected through varying degrees of pus and bleeding which

obviously affects breathing and would be dubbed 'Covid-19'. Even more sinister was the impact of 'antibodies' on macrophages, a white blood cell of the immune system. They consist of Type 1 and Type 2 which have very different functions. She said Type 1 are 'hyper-vigilant' white blood cells which 'gobble up' bacteria etc. However, in doing so, this could cause inflammation and in extreme circumstances be fatal. She says these affects are mitigated by Type 2 macrophages which kick in to calm down the system and stop it going rogue. They clear up dead tissue debris and reduce inflammation that the Type 1 'fire crews' have caused. Type 1 kills the infection and Type 2 heals the damage, she says. This is her punchline with regard to 'Covid vaccinations': She says that mRNA 'antibodies' block Type 2 macrophages by attaching to them and deactivating them. This meant that when the Type 1 response was triggered by infection there was nothing to stop that getting out of hand by calming everything down. There's an on-switch, but no off-switch, she says. What follows can be 'over and out, see you when I see you'.

Genetic suicide

Tenpenny also highlights the potential for autoimmune disease – the body attacking itself – which has been associated with vaccines since they first appeared. Infusing a synthetic foreign substance into cells could cause the immune system to react in a panic believing that the body is being overwhelmed by an invader (it is) and the consequences can again be fatal. There is an autoimmune response known as a 'cytokine storm' which I have likened to a homeowner panicked by an intruder and picking up a gun to shoot randomly in all directions before turning the fire on himself. The immune system unleashes a storm of inflammatory response called cytokines to a threat and the body commits hara-kiri. The lesson is that you mess with the body's immune response at your peril and these 'vaccines' seriously – fundamentally – mess with immune response. Tenpenny refers to a consequence called anaphylactic shock which is a severe and highly dangerous allergic reaction when the immune system

floods the body with chemicals. She gives the example of having a bee sting which primes the immune system and makes it sensitive to those chemicals. When people are stung again maybe years later the immune response can be so powerful that it leads to anaphylactic shock. Tenpenny relates this 'shock' with regard to the 'Covid vaccine' to something called polyethylene glycol or PEG. Enormous numbers of people have become sensitive to this over decades of use in a whole range of products and processes including food, drink, skin creams and 'medicine'. Studies have claimed that some 72 percent of people have antibodies triggered by PEG compared with two percent in the 1960s and allergic hypersensitive reactions to this become a gathering cause for concern. Tenpenny points out that the 'mRNA vaccine' is coated in a 'bubble' of polyethylene glycol which has the potential to cause anaphylactic shock through immune sensitivity. Many reports have appeared of people reacting this way after having the 'Covid vaccine'. What do we think is going to happen as humanity has more and more of these 'vaccines'?

Tenpenny said: 'All these pictures we have seen with people with these rashes ... these weepy rashes, big reactions on their arms and things like that – it's an acute allergic reaction most likely to the polyethylene glycol that you've been previously primed and sensitised to.'

Those who have not studied the conspiracy and its perpetrators at length might think that making the population sensitive to PEG and then putting it in these 'vaccines' is just a coincidence. It is not. It is instead testament to how carefully and coldly-planned current events have been and the scale of the conspiracy we are dealing with. Tenpenny further explains that the 'vaccine' mRNA procedure can breach the blood-brain barrier which protects the brain from toxins and other crap that will cause malfunction. In this case they could make two proteins corrupt brain function to cause Amyotrophic lateral sclerosis (ALS), a progressive nervous system disease leading to loss of muscle control, and frontal lobe degeneration – Alzheimer's and dementia. Immunologist J. Bart Classon published a paper connecting mRNA 'vaccines' to prion

disease which can lead to Alzheimer's and other forms of neurodegenerative disease while others have pointed out the potential to affect the placenta in ways that make women infertile. This will become highly significant in the next chapter when I will discuss other aspects of this non-vaccine that relate to its nanotechnology and transmission from the injected to the uninjected.

Qualified in idiocy

Tenpenny describes how research has confirmed that these 'vaccine'-generated antibodies can interact with a range of other tissues in the body and attack many other organs including the lungs. 'This means that if you have a hundred people standing in front of you that all got this shot they could have a hundred different symptoms.'

Anyone really think that Cult gofers like the Queen, Tony Blair, Christopher Whitty, Anthony Fauci, and all the other psychopaths have really had this 'vaccine' in the pictures we've seen? Not a bloody chance. Why don't doctors all tell us about all these dangers and consequences of the 'Covid vaccine'? Why instead do they encourage and pressure patients to have the shot? Don't let's think for a moment that doctors and medical staff can't be stupid, lazy, and psychopathic and that's without the financial incentives to give the jab. Tenpenny again:

Some people are going to die from the vaccine directly but a large number of people are going to start to get horribly sick and get all kinds of autoimmune diseases 42 days to maybe a year out. What are they going to do, these stupid doctors who say; 'Good for you for getting that vaccine.' What are they going to say; 'Oh, it must be a mutant, we need to give an extra dose of that vaccine.'

Because now the vaccine, instead of one dose or two doses we need three or four because the stupid physicians aren't taking the time to learn anything about it. If I can learn this sitting in my living room reading a 19 page paper and several others so can they. There's nothing special about me, I just take the time to do it.

Remember how Sara Kayat, the NHS and TV doctor, said that the 'Covid vaccine' would '100 percent prevent hospitalisation and death'. Doctors can be idiots like every other profession and they

should not be worshipped as infallible. They are not and far from it. Behind many medical and scientific 'experts' lies an uninformed prat trying to hide themselves from you although in the 'Covid' era many have failed to do so as with UK narrative-repeating 'TV doctor' Hilary Jones. Pushing back against the minority of proper doctors and scientists speaking out against the 'vaccine' has been the entire edifice of the Cult global state in the form of governments, medical systems, corporations, mainstream media, Silicon Valley, and an army of compliant doctors, medical staff and scientists willing to say anything for money and to enhance their careers by promoting the party line. If you do that you are an 'expert' and if you won't you are an 'anti-vaxxer' and 'Covidiot'. The pressure to be 'vaccinated' is incessant. We have even had reports claiming that the 'vaccine' can help cure cancer and Alzheimer's and make the lame walk. I am waiting for the announcement that it can bring you coffee in the morning and cook your tea. Just as the symptoms of 'Covid' seem to increase by the week so have the miracles of the 'vaccine'. American supermarket giant Kroger Co. offered nearly 500,000 employees in 35 states a \$100 bonus for having the 'vaccine' while donut chain Krispy Kreme promised 'vaccinated' customers a free glazed donut every day for the rest of 2021. Have your DNA changed and you will get a doughnut although we might not have to give you them for long. Such offers and incentives confirm the desperation.

Perhaps the worse vaccine-stunt of them all was UK 'Health' Secretary Matt-the-prat Hancock on live TV after watching a clip of someone being 'vaccinated' when the roll-out began. Hancock faked tears so badly it was embarrassing. Brain-of-Britain Piers Morgan, the lockdown-supporting, 'vaccine' supporting, 'vaccine' passport-supporting, TV host played along with Hancock – 'You're quite emotional about that' he said in response to acting so atrocious it would have been called out at a school nativity which will presumably today include Mary and Jesus in masks, wise men keeping their camels six feet apart, and shepherds under tent arrest. System-serving Morgan tweeted this: 'Love the idea of covid vaccine passports for everywhere: flights, restaurants, clubs, football, gyms,

shops etc. It's time covid-denying, anti-vaxxer loonies had their bullsh*t bluff called & bar themselves from going anywhere that responsible citizens go.' If only I could aspire to his genius. To think that Morgan, who specialises in shouting over anyone he disagrees with, was lauded as a free speech hero when he lost his job after storming off the set of his live show like a child throwing his dolly out of the pram. If he is a free speech hero we are in real trouble. I have no idea what 'bullsh*t' means, by the way, the * throws me completely.

The Cult is desperate to infuse its synthetic DNA-changing concoction into everyone and has been using every lie, trick and intimidation to do so. The question of '*Why?*' we shall now address.

CHAPTER TEN

Human 2.0

I believe that at the end of the century the use of words and general educated opinion will have altered so much that one will be able to speak of machines thinking without expecting to be contradicted – Alan Turing (1912-1954), the ‘Father of artificial intelligence’

I have been exposing for decades the plan to transform the human body from a biological to a synthetic-biological state. The new human that I will call Human 2.0 is planned to be connected to artificial intelligence and a global AI ‘Smart Grid’ that would operate as one global system in which AI would control everything from your fridge to your heating system to your car to your mind. Humans would no longer be ‘human’, but post-human and sub-human, with their thinking and emotional processes replaced by AI.

What I said sounded crazy and beyond science fiction and I could understand that. To any balanced, rational, mind it *is* crazy. Today, however, that world is becoming reality and it puts the ‘Covid vaccine’ into its true context. Ray Kurzweil is the ultra-Zionist ‘computer scientist, inventor and futurist’ and co-founder of the Singularity University. Singularity refers to the merging of humans with machines or ‘transhumanism’. Kurzweil has said humanity would be connected to the cyber ‘cloud’ in the period of the ever-recurring year of 2030:

Our thinking ... will be a hybrid of biological and non-biological thinking ... humans will be able to extend their limitations and ‘think in the cloud’ ... We’re going to put gateways to the

cloud in our brains ... We're going to gradually merge and enhance ourselves ... In my view, that's the nature of being human – we transcend our limitations. As the technology becomes vastly superior to what we are then the small proportion that is still human gets smaller and smaller and smaller until it's just utterly negligible.

They are trying to sell this end-of-humanity-as-we-know-it as the next stage of 'evolution' when we become super-human and 'like the gods'. They are lying to you. Shocked, eh? The population, and again especially the young, have been manipulated into addiction to technologies designed to enslave them for life. First they induced an addiction to smartphones (holdables); next they moved to technology on the body (wearables); and then began the invasion of the body (implantables). I warned way back about the plan for microchipped people and we are now entering that era. We should not be diverted into thinking that this refers only to chips we can see. Most important are the nanochips known as smart dust, neural dust and nanobots which are far too small to be seen by the human eye. Nanotechnology is everywhere, increasingly in food products, and released into the atmosphere by the geoengineering of the skies funded by Bill Gates to 'shut out the Sun' and 'save the planet from global warming'. Gates has been funding a project to spray millions of tonnes of chalk (calcium carbonate) into the stratosphere over Sweden to 'dim the Sun' and cool the Earth. Scientists warned the move could be disastrous for weather systems in ways no one can predict and opposition led to the Swedish space agency announcing that the 'experiment' would not be happening as planned in the summer of 2021; but it shows where the Cult is going with dimming the impact of the Sun and there's an associated plan to change the planet's atmosphere. Who gives psychopath Gates the right to dictate to the entire human race and dismantle planetary systems? The world will not be safe while this man is at large.

The global warming hoax has made the Sun, like the gas of life, something to fear when both are essential to good health and human survival (more inversion). The body transforms sunlight into vital vitamin D through a process involving ... *cholesterol*. This is the cholesterol we are also told to fear. We are urged to take Big Pharma

statin drugs to reduce cholesterol and it's all systematic. Reducing cholesterol means reducing vitamin D uptake with all the multiple health problems that will cause. At least if you take statins long term it saves the government from having to pay you a pension. The delivery system to block sunlight is widely referred to as chemtrails although these have a much deeper agenda, too. They appear at first to be contrails or condensation trails streaming from aircraft into cold air at high altitudes. Contrails disperse very quickly while chemtrails do not and spread out across the sky before eventually their content falls to earth. Many times I have watched aircraft cross-cross a clear blue sky releasing chemtrails until it looks like a cloudy day. Chemtrails contain many things harmful to humans and the natural world including toxic heavy metals, aluminium (see Alzheimer's) and nanotechnology. Ray Kurzweil reveals the reason without actually saying so: 'Nanobots will infuse all the matter around us with information. Rocks, trees, everything will become these intelligent creatures.' How do you deliver that? *From the sky*. Self-replicating nanobots would connect everything to the Smart Grid. The phenomenon of Morgellons disease began in the chemtrail era and the correlation has led to it being dubbed the 'chemtrail disease'. Self-replicating fibres appear in the body that can be pulled out through the skin. Morgellons fibres continue to grow outside the body and have a form of artificial intelligence. I cover this at greater length in *Phantom Self*.

'Vaccine' operating system

'Covid vaccines' with their self-replicating synthetic material are also designed to make the connection between humanity and Kurzweil's 'cloud'. American doctor and dedicated campaigner for truth, Carrie Madej, an Internal Medicine Specialist in Georgia with more than 20 years medical experience, has highlighted the nanotechnology aspect of the fake 'vaccines'. She explains how one of the components in at least the Moderna and Pfizer synthetic potions are 'lipid nanoparticles' which are 'like little tiny computer bits' – a 'sci-fi substance' known as nanobots and hydrogel which can be 'triggered

at any moment to deliver its payload' and act as 'biosensors'. The synthetic substance had 'the ability to accumulate data from your body like your breathing, your respiration, thoughts and emotions, all kind of things' and each syringe could carry a *million* nanobots:

This substance because it's like little bits of computers in your body, crazy, but it's true, it can do that, [and] obviously has the ability to act through Wi-Fi. It can receive and transmit energy, messages, frequencies or impulses. That issue has never been addressed by these companies. What does that do to the human?

Just imagine getting this substance in you and it can react to things all around you, the 5G, your smart device, your phones, what is happening with that? What if something is triggering it, too, like an impulse, a frequency? We have something completely foreign in the human body.

Madej said her research revealed that electromagnetic (EMF) frequencies emitted by phones and other devices had increased dramatically in the same period of the 'vaccine' rollout and she was seeing more people with radiation problems as 5G and other electromagnetic technology was expanded and introduced to schools and hospitals. She said she was 'floored with the EMF coming off' the devices she checked. All this makes total sense and syncs with my own work of decades when you think that Moderna refers in documents to its mRNA 'vaccine' as an 'operating system':

Recognizing the broad potential of mRNA science, we set out to create an mRNA technology platform that functions very much like an operating system on a computer. It is designed so that it can plug and play interchangeably with different programs. In our case, the 'program' or 'app' is our mRNA drug – the unique mRNA sequence that codes for a protein ...

... Our MRNA Medicines – 'The 'Software Of Life': When we have a concept for a new mRNA medicine and begin research, fundamental components are already in place. Generally, the only thing that changes from one potential mRNA medicine to another is the coding region – the actual genetic code that instructs ribosomes to make protein. Utilizing these instruction sets gives our investigational mRNA medicines a software-like quality. We also have the ability to combine different mRNA sequences encoding for different proteins in a single mRNA investigational medicine.

Who needs a real 'virus' when you can create a computer version to justify infusing your operating system into the entire human race on the road to making living, breathing people into cyborgs? What is missed with the 'vaccines' is the *digital* connection between synthetic material and the body that I highlighted earlier with the study that hacked a computer with human DNA. On one level the body is digital, based on mathematical codes, and I'll have more about that in the next chapter. Those who ridiculously claim that mRNA 'vaccines' are not designed to change human genetics should explain the words of Dr Tal Zaks, chief medical officer at Moderna, in a 2017 TED talk. He said that over the last 30 years 'we've been living this phenomenal digital scientific revolution, and I'm here today to tell you, that we are actually *hacking the software of life*, and that it's changing the way we think about prevention and treatment of disease':

In every cell there's this thing called messenger RNA, or mRNA for short, that transmits the critical information from the DNA in our genes to the protein, which is really the stuff we're all made out of. This is the critical information that determines what the cell will do. So we think about it as an operating system. So if you could change that, if you could introduce a line of code, or change a line of code, it turns out, that has profound implications for everything, from the flu to cancer.

Zaks should more accurately have said that this has profound implications for the human genetic code and the nature of DNA. Communications within the body go both ways and not only one. But, hey, no, the 'Covid vaccine' will not affect your genetics. Cult fact-checkers say so even though the man who helped to develop the mRNA technique says that it does. Zaks said in 2017:

If you think about what it is we're trying to do. We've taken information and our understanding of that information and how that information is transmitted in a cell, and we've taken our understanding of medicine and how to make drugs, and we're fusing the two. We think of it as information therapy.

I have been writing for decades that the body is an information field communicating with itself and the wider world. This is why

radiation which is information can change the information field of body and mind through phenomena like 5G and change their nature and function. 'Information therapy' means to change the body's information field and change the way it operates. DNA is a receiver-transmitter of information and can be mutated by information like mRNA synthetic messaging. Technology to do this has been ready and waiting in the underground bases and other secret projects to be rolled out when the 'Covid' hoax was played. 'Trials' of such short and irrelevant duration were only for public consumption. When they say the 'vaccine' is 'experimental' that is not true. It may appear to be 'experimental' to those who don't know what's going on, but the trials have already been done to ensure the Cult gets the result it desires. Zaks said that it took decades to sequence the human genome, completed in 2003, but now they could do it in a week. By 'they' he means scientists operating in the public domain. In the secret projects they were sequencing the genome in a week long before even 2003.

Deluge of mRNA

Highly significantly the Moderna document says the guiding premise is that if using mRNA as a medicine works for one disease then it should work for many diseases. They were leveraging the flexibility afforded by their platform and the fundamental role mRNA plays in protein synthesis to pursue mRNA medicines for a broad spectrum of diseases. Moderna is confirming what I was saying through 2020 that multiple 'vaccines' were planned for 'Covid' (and later invented 'variants') and that previous vaccines would be converted to the mRNA system to infuse the body with massive amounts of genetically-manipulating synthetic material to secure a transformation to a synthetic-biological state. The 'vaccines' are designed to kill stunning numbers as part of the long-exposed Cult depopulation agenda and transform the rest. Given this is the goal you can appreciate why there is such hysterical demand for every human to be 'vaccinated' for an alleged 'disease' that has an estimated 'infection' to 'death' ratio of 0.23-0.15 percent. As I write

children are being given the 'vaccine' in trials (their parents are a disgrace) and ever-younger people are being offered the vaccine for a 'virus' that even if you believe it exists has virtually zero chance of harming them. Horrific effects of the 'trials' on a 12-year-old girl were revealed by a family member to be serious brain and gastric problems that included a bowel obstruction and the inability to swallow liquids or solids. She was unable to eat or drink without throwing up, had extreme pain in her back, neck and abdomen, and was paralysed from the waist down which stopped her urinating unaided. When the girl was first taken to hospital doctors said it was all in her mind. She was signed up for the 'trial' by her parents for whom no words suffice. None of this 'Covid vaccine' insanity makes any sense unless you see what the 'vaccine' really is – a body-changer. Synthetic biology or 'SynBio' is a fast-emerging and expanding scientific discipline which includes everything from genetic and molecular engineering to electrical and computer engineering. Synthetic biology is defined in these ways:

- A multidisciplinary area of research that seeks to create new biological parts, devices, and systems, or to redesign systems that are already found in nature.
- The use of a mixture of physical engineering and genetic engineering to create new (and therefore synthetic) life forms.
- An emerging field of research that aims to combine the knowledge and methods of biology, engineering and related disciplines in the design of chemically-synthesized DNA to create organisms with novel or enhanced characteristics and traits (synthetic organisms including humans).

We now have synthetic blood, skin, organs and limbs being developed along with synthetic body parts produced by 3D printers. These are all elements of the synthetic human programme and this comment by Kurzweil's co-founder of the Singularity University,

Peter Diamandis, can be seen in a whole new light with the 'Covid' hoax and the sanctions against those that refuse the 'vaccine':

Anybody who is going to be resisting the progress forward [to transhumanism] is going to be resisting evolution and, fundamentally, they will die out. It's not a matter of whether it's good or bad. It's going to happen.

'Resisting evolution'? What absolute bollocks. The arrogance of these people is without limit. His 'it's going to happen' mantra is another way of saying 'resistance is futile' to break the spirit of those pushing back and we must not fall for it. Getting this genetically-transforming 'vaccine' into everyone is crucial to the Cult plan for total control and the desperation to achieve that is clear for anyone to see. Vaccine passports are a major factor in this and they, too, are a form of resistance is futile. It's NOT. The paper funded by the Rockefeller Foundation for the 2013 'health conference' in China said:

We will interact more with artificial intelligence. The use of robotics, bio-engineering to augment human functioning is already well underway and will advance. Re-engineering of humans into potentially separate and unequal forms through genetic engineering or mixed human-robots raises debates on ethics and equality.

A new demography is projected to emerge after 2030 [that year again] of technologies (robotics, genetic engineering, nanotechnology) producing robots, engineered organisms, 'nanobots' and artificial intelligence (AI) that can self-replicate. Debates will grow on the implications of an impending reality of human designed life.

What is happening today is so long planned. The world army enforcing the will of the world government is intended to be a robot army, not a human one. Today's military and its technologically 'enhanced' troops, pilotless planes and driverless vehicles are just stepping stones to that end. Human soldiers are used as Cult fodder and its time they woke up to that and worked for the freedom of the population instead of their own destruction and their family's destruction – the same with the police. Join us and let's sort this out. The phenomenon of enforce my own destruction is widespread in the 'Covid' era with Woker 'luvvies' in the acting and entertainment

industries supporting 'Covid' rules which have destroyed their profession and the same with those among the public who put signs on the doors of their businesses 'closed due to Covid – stay safe' when many will never reopen. It's a form of masochism and most certainly insanity.

Transgender = transhumanism

When something explodes out of nowhere and is suddenly everywhere it is always the Cult agenda and so it is with the tidal wave of claims and demands that have infiltrated every aspect of society under the heading of 'transgenderism'. The term 'trans' is so 'in' and this is the dictionary definition:

A prefix meaning 'across', 'through', occurring ... in loanwords from Latin, used in particular for denoting movement or conveyance from place to place (transfer; transmit; transplant) or complete change (transform; transmute), or to form adjectives meaning 'crossing', 'on the other side of', or 'going beyond' the place named (transmontane; transnational; trans-Siberian).

Transgender means to go beyond gender and transhuman means to go beyond human. Both are aspects of the Cult plan to transform the human body to a synthetic state with *no gender*. Human 2.0 is not designed to procreate and would be produced technologically with no need for parents. The new human would mean the end of parents and so men, and increasingly women, are being targeted for the deletion of their rights and status. Parental rights are disappearing at an ever-quickenning speed for the same reason. The new human would have no need for men or women when there is no procreation and no gender. Perhaps the transgender movement that appears to be in a permanent state of frenzy might now contemplate on how it is being used. This was never about transgender rights which are only the interim excuse for confusing gender, particularly in the young, on the road to *fusing* gender. Transgender activism is not an end; it is a *means* to an end. We see again the technique of creative destruction in which you destroy the status quo to 'build back better' in the form that you want. The gender status quo had to be

destroyed by persuading the Cult-created Woke mentality to believe that you can have 100 genders or more. A programme for 9 to 12 year olds produced by the Cult-owned BBC promoted the 100 genders narrative. The very idea may be the most monumental nonsense, but it is not what is true that counts, only what you can make people *believe* is true. Once the gender of $2 + 2 = 4$ has been dismantled through indoctrination, intimidation and $2 + 2 = 5$ then the new no-gender normal can take its place with Human 2.0.

Aldous Huxley revealed the plan in his prophetic *Brave New World* in 1932:

Natural reproduction has been done away with and children are created, decanted', and raised in 'hatcheries and conditioning centres'. From birth, people are genetically designed to fit into one of five castes, which are further split into 'Plus' and 'Minus' members and designed to fulfil predetermined positions within the social and economic strata of the World State.

How could Huxley know this in 1932? For the same reason George Orwell knew about the Big Brother state in 1948, Cult insiders I have quoted knew about it in 1969, and I have known about it since the early 1990s. If you are connected to the Cult or you work your balls off to uncover the plan you can predict the future. The process is simple. If there is a plan for the world and nothing intervenes to stop it then it will happen. Thus if you communicate the plan ahead of time you are perceived to have predicted the future, but you haven't. You have revealed the plan which without intervention will become the human future. The whole reason I have done what I have is to alert enough people to inspire an intervention and maybe at last that time has come with the Cult and its intentions now so obvious to anyone with a brain in working order.

The future is here

Technological wombs that Huxley described to replace parent procreation are already being developed and they are only the projects we know about in the public arena. Israeli scientists told *The Times of Israel* in March, 2021, that they have grown 250-cell embryos

into mouse fetuses with fully formed organs using artificial wombs in a development they say could pave the way for gestating humans outside the womb. Professor Jacob Hanna of the Weizmann Institute of Science said:

We took mouse embryos from the mother at day five of development, when they are just of 250 cells, and had them in the incubator from day five until day 11, by which point they had grown all their organs.

By day 11 they make their own blood and have a beating heart, a fully developed brain. Anybody would look at them and say, 'this is clearly a mouse foetus with all the characteristics of a mouse.' It's gone from being a ball of cells to being an advanced foetus.

A special liquid is used to nourish embryo cells in a laboratory dish and they float on the liquid to duplicate the first stage of embryonic development. The incubator creates all the right conditions for its development, Hanna said. The liquid gives the embryo 'all the nutrients, hormones and sugars they need' along with a custom-made electronic incubator which controls gas concentration, pressure and temperature. The cutting-edge in the underground bases and other secret locations will be light years ahead of that, however, and this was reported by the London *Guardian* in 2017:

We are approaching a biotechnological breakthrough. Ectogenesis, the invention of a complete external womb, could completely change the nature of human reproduction. In April this year, researchers at the Children's Hospital of Philadelphia announced their development of an artificial womb.

The article was headed 'Artificial wombs could soon be a reality. What will this mean for women?' What would it mean for children is an even bigger question. No mother to bond with only a machine in preparation for a life of soulless interaction and control in a world governed by machines (see the *Matrix* movies). Now observe the calculated manipulations of the 'Covid' hoax as human interaction and warmth has been curtailed by distancing, isolation and fear with people communicating via machines on a scale never seen before.

These are all dots in the same picture as are all the personal assistants, gadgets and children's toys through which kids and adults communicate with AI as if it is human. The AI 'voice' on Sat-Nav should be included. All these things are psychological preparation for the Cult endgame. Before you can make a physical connection with AI you have to make a psychological connection and that is what people are being conditioned to do with this ever gathering human-AI interaction. Movies and TV programmes depicting the transhuman, robot dystopia relate to a phenomenon known as 'pre-emptive programming' in which the world that is planned is portrayed everywhere in movies, TV and advertising. This is conditioning the conscious and subconscious mind to become familiar with the planned reality to dilute resistance when it happens for real. What would have been a shock such is the change is made less so. We have young children put on the road to transgender transition surgery with puberty blocking drugs at an age when they could never be able to make those life-changing decisions.

Rachel Levine, a professor of paediatrics and psychiatry who believes in treating children this way, became America's highest-ranked openly-transgender official when she was confirmed as US Assistant Secretary at the Department of Health and Human Services after being nominated by Joe Biden (the Cult). Activists and governments press for laws to deny parents a say in their children's transition process so the kids can be isolated and manipulated into agreeing to irreversible medical procedures. A Canadian father Robert Hoogland was denied bail by the Vancouver Supreme Court in 2021 and remained in jail for breaching a court order that he stay silent over his young teenage daughter, a minor, who was being offered life-changing hormone therapy without parental consent. At the age of 12 the girl's 'school counsellor' said she may be transgender, referred her to a doctor and told the school to treat her like a boy. This is another example of state-serving schools imposing ever more control over children's lives while parents have ever less.

Contemptible and extreme child abuse is happening all over the world as the Cult gender-fusion operation goes into warp-speed.

Why the war on men – and now women?

The question about what artificial wombs mean for women should rightly be asked. The answer can be seen in the deletion of women's rights involving sport, changing rooms, toilets and status in favour of people in male bodies claiming to identify as women. I can identify as a mountain climber, but it doesn't mean I can climb a mountain any more than a biological man can be a biological woman. To believe so is a triumph of belief over factual reality which is the very perceptual basis of everything Woke. Women's sport is being destroyed by allowing those with male bodies who say they identify as female to 'compete' with girls and women. Male body 'women' dominate 'women's' competition with their greater muscle mass, bone density, strength and speed. With that disadvantage sport for women loses all meaning. To put this in perspective nearly 300 American high school boys can run faster than the quickest woman sprinter in the world. Women are seeing their previously protected spaces invaded by male bodies simply because they claim to identify as women. That's all they need to do to access all women's spaces and activities under the Biden 'Equality Act' that destroys equality for women with the usual Orwellian Woke inversion. Male sex offenders have already committed rapes in women's prisons after claiming to identify as women to get them transferred. Does this not matter to the Woke 'equality' hypocrites? Not in the least. What matters to Cult manipulators and funders behind transgender activists is to advance gender fusion on the way to the no-gender 'human'. When you are seeking to impose transparent nonsense like this, or the 'Covid' hoax, the only way the nonsense can prevail is through censorship and intimidation of dissenters, deletion of factual information, and programming of the unquestioning, bewildered and naive. You don't have to scan the world for long to see that all these things are happening.

Many women's rights organisations have realised that rights and status which took such a long time to secure are being eroded and that it is systematic. Kara Dansky of the global Women's Human Rights Campaign said that Biden's transgender executive order immediately he took office, subsequent orders, and Equality Act legislation that followed 'seek to erase women and girls in the law as a category'. *Exactly*. I said during the long ago-started war on men (in which many women play a crucial part) that this was going to turn into a war on them. The Cult is phasing out *both* male and female genders. To get away with that they are brought into conflict so they are busy fighting each other while the Cult completes the job with no unity of response. Unity, people, *unity*. We need unity everywhere. Transgender is the only show in town as the big step towards the no-gender human. It's not about rights for transgender people and never has been. Woke political correctness is deleting words relating to genders to the same end. Wokers believe this is to be 'inclusive' when the opposite is true. They are deleting words describing gender because gender *itself* is being deleted by Human 2.0. Terms like 'man', 'woman', 'mother' and 'father' are being deleted in the universities and other institutions to be replaced by the *no-gender*, not trans-gender, 'individuals' and 'guardians'. Women's rights campaigner Maria Keffler of Partners for Ethical Care said: 'Children are being taught from kindergarten upward that some boys have a vagina, some girls have a penis, and that kids can be any gender they want to be.' Do we really believe that suddenly countries all over the world at the same time had the idea of having drag queens go into schools or read transgender stories to very young children in the local library? It's coldly-calculated confusion of gender on the way to the fusion of gender. Suzanne Vierling, a psychologist from Southern California, made another important point:

Yesterday's slave woman who endured gynecological medical experiments is today's girl-child being butchered in a booming gender-transitioning sector. Ovaries removed, pushing her into menopause and osteoporosis, uncharted territory, and parents' rights and authority decimated.

The erosion of parental rights is a common theme in line with the Cult plans to erase the very concept of parents and 'ovaries removed, pushing her into menopause' means what? Those born female lose the ability to have children – another way to discontinue humanity as we know it.

Eliminating Human 1.0 (before our very eyes)

To pave the way for Human 2.0 you must phase out Human 1.0. This is happening through plummeting sperm counts and making women infertile through an onslaught of chemicals, radiation (including smartphones in pockets of men) and mRNA 'vaccines'. Common agriculture pesticides are also having a devastating impact on human fertility. I have been tracking collapsing sperm counts in the books for a long time and in 2021 came a book by fertility scientist and reproductive epidemiologist Shanna Swan, *Count Down: How Our Modern World Is Threatening Sperm Counts, Altering Male and Female Reproductive Development and Imperiling the Future of the Human Race*. She reports how the global fertility rate dropped by *half* between 1960 and 2016 with America's birth rate 16 percent below where it needs to be to sustain the population. Women are experiencing declining egg quality, more miscarriages, and more couples suffer from infertility. Other findings were an increase in erectile dysfunction, infant boys developing more genital abnormalities, male problems with conception, and plunging levels of the male hormone testosterone which would explain why so many men have lost their backbone and masculinity. This has been very evident during the 'Covid' hoax when women have been prominent among the Pushbackers and big strapping blokes have bowed their heads, covered their faces with a nappy and quietly submitted. Mind control expert Cathy O'Brien also points to how global education introduced the concept of 'we're all winners' in sport and classrooms: 'Competition was defused, and it in turn defused a sense of fighting back.' This is another version of the 'equity' doctrine in which you drive down rather than raise up. What a contrast in Cult-controlled China with its global ambitions

where the government published plans in January, 2021, to 'cultivate masculinity' in boys from kindergarten through to high school in the face of a 'masculinity crisis'. A government adviser said boys would be soon become 'delicate, timid and effeminate' unless action was taken. Don't expect any similar policy in the targeted West. A 2006 study showed that a 65-year-old man in 2002 had testosterone levels *15 percent* lower than a 65-year-old man in 1987 while a 2020 study found a similar story with young adults and adolescents. Men are getting prescriptions for testosterone replacement therapy which causes an even greater drop in sperm count with up to 99 percent seeing sperm counts drop to zero during the treatment. More sperm is defective and malfunctioning with some having two heads or not pursuing an egg.

A class of *synthetic* chemicals known as phthalates are being blamed for the decline. These are found everywhere in plastics, shampoos, cosmetics, furniture, flame retardants, personal care products, pesticides, canned foods and even receipts. Why till receipts? Everyone touches them. Let no one delude themselves that all this is not systematic to advance the long-time agenda for human body transformation. Phthalates mimic hormones and disrupt the hormone balance causing testosterone to fall and genital birth defects in male infants. Animals and fish have been affected in the same way due to phthalates and other toxins in rivers. When fish turn gay or change sex through chemicals in rivers and streams it is a pointer to why there has been such an increase in gay people and the sexually confused. It doesn't matter to me what sexuality people choose to be, but if it's being affected by chemical pollution and consumption then we need to know. Does anyone really think that this is not connected to the transgender agenda, the war on men and the condemnation of male 'toxic masculinity'? You watch this being followed by 'toxic femininity'. It's already happening. When breastfeeding becomes 'chest-feeding', pregnant women become pregnant people along with all the other Woke claptrap you know that the world is going insane and there's a Cult scam in progress. Transgender activists are promoting the Cult agenda while Cult

billionaires support and fund the insanity as they laugh themselves to sleep at the sheer stupidity for which humans must be infamous in galaxies far, far away.

'Covid vaccines' and female infertility

We can now see why the 'vaccine' has been connected to potential infertility in women. Dr Michael Yeadon, former Vice President and Chief Scientific Advisor at Pfizer, and Dr Wolfgang Wodarg in Germany, filed a petition with the European Medicines Agency in December, 2020, urging them to stop trials for the Pfizer/BioNTech shot and all other mRNA trials until further studies had been done. They were particularly concerned about possible effects on fertility with 'vaccine'-produced antibodies attacking the protein Syncytin-1 which is responsible for developing the placenta. The result would be infertility 'of indefinite duration' in women who have the 'vaccine' with the placenta failing to form. Section 10.4.2 of the Pfizer/BioNTech trial protocol says that pregnant women or those who might become so should not have mRNA shots. Section 10.4 warns men taking mRNA shots to 'be abstinent from heterosexual intercourse' and not to donate sperm. The UK government said that it *did not know* if the mRNA procedure had an effect on fertility. *Did not know?* These people have to go to jail. UK government advice did not recommend at the start that pregnant women had the shot and said they should avoid pregnancy for at least two months after 'vaccination'. The 'advice' was later updated to pregnant women should only have the 'vaccine' if the benefits outweighed the risks to mother and foetus. What the hell is that supposed to mean? Then 'spontaneous abortions' began to appear and rapidly increase on the adverse reaction reporting schemes which include only a fraction of adverse reactions. Thousands and ever-growing numbers of 'vaccinated' women are describing changes to their menstrual cycle with heavier blood flow, irregular periods and menstruating again after going through the menopause – all links to reproduction effects. Women are passing blood clots and the lining of their uterus while men report erectile dysfunction and blood effects. Most

significantly of all *unvaccinated* women began to report similar menstrual changes after interaction with '*vaccinated*' people and men and children were also affected with bleeding noses, blood clots and other conditions. 'Shedding' is when vaccinated people can emit the content of a vaccine to affect the unvaccinated, but this is different. 'Vaccinated' people were not shedding a 'live virus' allegedly in 'vaccines' as before because the fake 'Covid vaccines' involve synthetic material and other toxicity. Doctors exposing what is happening prefer the term 'transmission' to shedding. Somehow those that have had the shots are transmitting effects to those that haven't. Dr Carrie Madej said the nano-content of the 'vaccines' can 'act like an antenna' to others around them which fits perfectly with my own conclusions. This 'vaccine' transmission phenomenon was becoming known as the book went into production and I deal with this further in the Postscript.

Vaccine effects on sterility are well known. The World Health Organization was accused in 2014 of sterilising millions of women in Kenya with the evidence confirmed by the content of the vaccines involved. The same WHO behind the 'Covid' hoax admitted its involvement for more than ten years with the vaccine programme. Other countries made similar claims. Charges were lodged by Tanzania, Nicaragua, Mexico, and the Philippines. The Gardasil vaccine claimed to protect against a genital 'virus' known as HPV has also been linked to infertility. Big Pharma and the WHO (same thing) are criminal and satanic entities. Then there's the Bill Gates Foundation which is connected through funding and shared interests with 20 pharmaceutical giants and laboratories. He stands accused of directing the policy of United Nations Children's Fund (UNICEF), vaccine alliance GAVI, and other groupings, to advance the vaccine agenda and silence opposition at great cost to women and children. At the same time Gates wants to reduce the global population. Coincidence?

Great Reset = Smart Grid = new human

The Cult agenda I have been exposing for 30 years is now being openly promoted by Cult assets like Gates and Klaus Schwab of the World Economic Forum under code-terms like the 'Great Reset', 'Build Back Better' and 'a rare but narrow window of opportunity to reflect, reimagine, and reset our world'. What provided this 'rare but narrow window of opportunity'? The 'Covid' hoax did. Who created that? *They* did. My books from not that long ago warned about the planned 'Internet of Things' (IoT) and its implications for human freedom. This was the plan to connect all technology to the Internet and artificial intelligence and today we are way down that road with an estimated 36 billion devices connected to the World Wide Web and that figure is projected to be 76 billion by 2025. I further warned that the Cult planned to go beyond that to the Internet of *Everything* when the human brain was connected via AI to the Internet and Kurzweil's 'cloud'. Now we have Cult operatives like Schwab calling for precisely that under the term 'Internet of Bodies', a fusion of the physical, digital and biological into one centrally-controlled Smart Grid system which the Cult refers to as the 'Fourth Industrial Revolution'. They talk about the 'biological', but they really mean the synthetic-biological which is required to fully integrate the human body and brain into the Smart Grid and artificial intelligence planned to replace the human mind. We have everything being synthetically manipulated including the natural world through GMO and smart dust, the food we eat and the human body itself with synthetic 'vaccines'. I said in *The Answer* that we would see the Cult push for synthetic meat to replace animals and in February, 2021, the so predictable psychopath Bill Gates called for the introduction of synthetic meat to save us all from 'climate change'. The climate hoax just keeps on giving like the 'Covid' hoax. The war on meat by vegan activists is a carbon (oops, sorry) copy of the manipulation of transgender activists. They have no idea (except their inner core) that they are being used to promote and impose the agenda of the Cult or that they are only the *vehicle* and not the *reason*. This is not to say those who choose not to eat meat shouldn't be respected and supported in that right, but there are ulterior motives

for those in power. A *Forbes* article in December, 2019, highlighted the plan so beloved of Schwab and the Cult under the heading: 'What Is The Internet of Bodies? And How Is It Changing Our World?' The article said the human body is the latest data platform (remember 'our vaccine is an operating system'). *Forbes* described the plan very accurately and the words could have come straight out of my books from long before:

The Internet of Bodies (IoB) is an extension of the IoT and basically connects the human body to a network through devices that are ingested, implanted, or connected to the body in some way. Once connected, data can be exchanged, and the body and device can be remotely monitored and controlled.

They were really describing a human hive mind with human perception centrally-dictated via an AI connection as well as allowing people to be 'remotely monitored and controlled'. Everything from a fridge to a human mind could be directed from a central point by these insane psychopaths and 'Covid vaccines' are crucial to this. *Forbes* explained the process I mentioned earlier of holdable and wearable technology followed by implantable. The article said there were three generations of the Internet of Bodies that include:

- Body external: These are wearable devices such as Apple Watches or Fitbits that can monitor our health.
- Body internal: These include pacemakers, cochlear implants, and digital pills that go inside our bodies to monitor or control various aspects of health.
- Body embedded: The third generation of the Internet of Bodies is embedded technology where technology and the human body are melded together and have a real-time connection to a remote machine.

Forbes noted the development of the Brain Computer Interface (BCI) which merges the brain with an external device for monitoring and controlling in real-time. 'The ultimate goal is to help restore function to individuals with disabilities by using brain signals rather than conventional neuromuscular pathways.' Oh, do fuck off. The goal of brain interface technology is controlling human thought and emotion from the central point in a hive mind serving its masters wishes. Many people are now agreeing to be chipped to open doors without a key. You can recognise them because they'll be wearing a mask, social distancing and lining up for the 'vaccine'. The Cult plans a Great Reset money system after they have completed the demolition of the global economy in which 'money' will be exchanged through communication with body operating systems. Rand Corporation, a Cult-owned think tank, said of the Internet of Bodies or IoB:

Internet of Bodies technologies fall under the broader IoT umbrella. But as the name suggests, IoB devices introduce an even more intimate interplay between humans and gadgets. IoB devices monitor the human body, collect health metrics and other personal information, and transmit those data over the Internet. Many devices, such as fitness trackers, are already in use ... IoB devices ... and those in development can track, record, and store users' whereabouts, bodily functions, and what they see, hear, and even think.

Schwab's World Economic Forum, a long-winded way of saying 'fascism' or 'the Cult', has gone full-on with the Internet of Bodies in the 'Covid' era. 'We're entering the era of the Internet of Bodies', it declared, 'collecting our physical data via a range of devices that can be implanted, swallowed or worn'. The result would be a huge amount of health-related data that could improve human wellbeing around the world, and prove crucial in fighting the 'Covid-19 pandemic'. Does anyone think these clowns care about 'human wellbeing' after the death and devastation their pandemic hoax has purposely caused? Schwab and co say we should move forward with the Internet of Bodies because 'Keeping track of symptoms could help us stop the spread of infection, and quickly detect new cases'. How wonderful, but keeping track' is all they are really bothered

about. Researchers were investigating if data gathered from smartwatches and similar devices could be used as viral infection alerts by tracking the user's heart rate and breathing. Schwab said in his 2018 book *Shaping the Future of the Fourth Industrial Revolution*:

The lines between technologies and beings are becoming blurred and not just by the ability to create lifelike robots or synthetics. Instead it is about the ability of new technologies to literally become part of us. Technologies already influence how we understand ourselves, how we think about each other, and how we determine our realities. As the technologies ... give us deeper access to parts of ourselves, we may begin to integrate digital technologies into our bodies.

You can see what the game is. Twenty-four hour control and people – if you could still call them that – would never know when something would go ping and take them out of circulation. It's the most obvious rush to a global fascist dictatorship and the complete submission of humanity and yet still so many are locked away in their Cult-induced perceptual coma and can't see it.

Smart Grid control centres

The human body is being transformed by the 'vaccines' and in other ways into a synthetic cyborg that can be attached to the global Smart Grid which would be controlled from a central point and other sub-locations of Grid manipulation. Where are these planned to be? Well, China for a start which is one of the Cult's biggest centres of operation. The technological control system and technocratic rule was incubated here to be unleashed across the world after the 'Covid' hoax came out of China in 2020. Another Smart Grid location that will surprise people new to this is Israel. I have exposed in *The Trigger* how Sabbatian technocrats, intelligence and military operatives were behind the horrors of 9/11 and not 19 Arab hijackers' who somehow manifested the ability to pilot big passenger airliners when instructors at puddle-jumping flying schools described some of them as a joke. The 9/11 attacks were made possible through control of civilian and military air computer systems and those of the White House, Pentagon and connected agencies. See *The Trigger* – it

will blow your mind. The controlling and coordinating force were the Sabbatian networks in Israel and the United States which by then had infiltrated the entire US government, military and intelligence system. The real name of the American Deep State is 'Sabbatian State'. Israel is a tiny country of only nine million people, but it is one of the global centres of cyber operations and fast catching Silicon Valley in importance to the Cult. Israel is known as the 'start-up nation' for all the cyber companies spawned there with the Sabbatian specialisation of 'cyber security' that I mentioned earlier which gives those companies access to computer systems of their clients in real time through 'backdoors' written into the coding when security software is downloaded. The Sabbatian centre of cyber operations outside Silicon Valley is the Israeli military Cyber Intelligence Unit, the biggest infrastructure project in Israel's history, headquartered in the desert-city of Beersheba and involving some 20,000 'cyber soldiers'. Here are located a literal army of Internet trolls scanning social media, forums and comment lists for anyone challenging the Cult agenda. The UK military has something similar with its 77th Brigade and associated operations. The Beersheba complex includes research and development centres for other Cult operations such as Intel, Microsoft, IBM, Google, Apple, Hewlett-Packard, Cisco Systems, Facebook and Motorola. Techcrunch.com ran an article about the Beersheba global Internet technology centre headlined 'Israel's desert city of Beersheba is turning into a cybertech oasis':

The military's massive relocation of its prestigious technology units, the presence of multinational and local companies, a close proximity to Ben Gurion University and generous government subsidies are turning Beersheba into a major global cybertech hub. Beersheba has all of the ingredients of a vibrant security technology ecosystem, including Ben Gurion University with its graduate program in cybersecurity and Cyber Security Research Center, and the presence of companies such as EMC, Deutsche Telekom, PayPal, Oracle, IBM, and Lockheed Martin. It's also the future home of the INCB (Israeli National Cyber Bureau); offers a special income tax incentive for cyber security companies, and was the site for the relocation of the army's intelligence corps units.

Sabbatians have taken over the cyber world through the following process: They scan the schools for likely cyber talent and develop them at Ben Gurion University and their period of conscription in the Israeli Defense Forces when they are stationed at the Beersheba complex. When the cyber talented officially leave the army they are funded to start cyber companies with technology developed by themselves or given to them by the state. Much of this is stolen through backdoors of computer systems around the world with America top of the list. Others are sent off to Silicon Valley to start companies or join the major ones and so we have many major positions filled by apparently 'Jewish' but really Sabbatian operatives. Google, YouTube and Facebook are all run by 'Jewish' CEOs while Twitter is all but run by ultra-Zionist hedge-fund shark Paul Singer. At the centre of the Sabbatian global cyber web is the Israeli army's Unit 8200 which specialises in hacking into computer systems of other countries, inserting viruses, gathering information, instigating malfunction, and even taking control of them from a distance. A long list of Sabbatians involved with 9/11, Silicon Valley and Israeli cyber security companies are operatives of Unit 8200. This is not about Israel. It's about the Cult. Israel is planned to be a Smart Grid hub as with China and what is happening at Beersheba is not for the benefit of Jewish people who are treated disgustingly by the Sabbatian elite that control the country. A glance at the Nuremberg Codes will tell you that.

The story is much bigger than 'Covid', important as that is to where we are being taken. Now, though, it's time to really strap in. There's more ... much more ...

CHAPTER ELEVEN

Who controls the Cult?

Awake, arise or be forever fall'n
John Milton, *Paradise Lost*

I have exposed this far the level of the Cult conspiracy that operates in the world of the seen and within the global secret society and satanic network which operates in the shadows one step back from the seen. The story, however, goes much deeper than that.

The 'Covid' hoax is major part of the Cult agenda, but only part, and to grasp the biggest picture we have to expand our attention beyond the realm of human sight and into the infinity of possibility that we cannot see. It is from here, ultimately, that humanity is being manipulated into a state of total control by the force which dictates the actions of the Cult. How much of reality can we see? Next to damn all is the answer. We may appear to see all there is to see in the 'space' our eyes survey and observe, but little could be further from the truth. The human 'world' is only a tiny band of frequency that the body's visual and perceptual systems can decode into *perception* of a 'world'. According to mainstream science the electromagnetic spectrum is 0.005 percent of what exists in the Universe (Fig 10). The maximum estimate I have seen is 0.5 percent and either way it's miniscule. I say it is far, far, smaller even than 0.005 percent when you compare reality we see with the totality of reality that we don't. Now get this if you are new to such information: Visible light, the only band of frequency that we can see, is a *fraction* of the 0.005

percent (Fig 11 overleaf). Take this further and realise that our universe is one of infinite universes and that universes are only a fragment of overall reality – *infinite* reality. Then compare that with the almost infinitesimal frequency band of visible light or human sight. You see that humans are as near blind as it is possible to be without actually being so. Artist and filmmaker, Sergio Toporek, said:

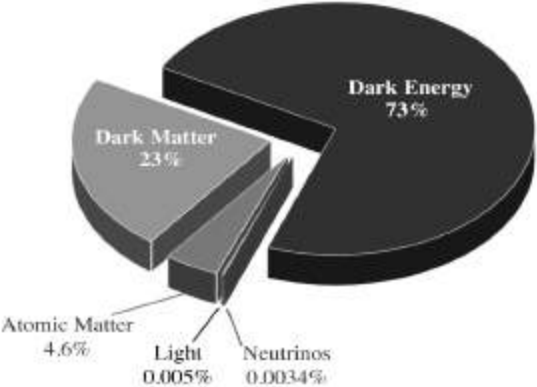


Figure 10: Humans can perceive such a tiny band of visual reality it's laughable.

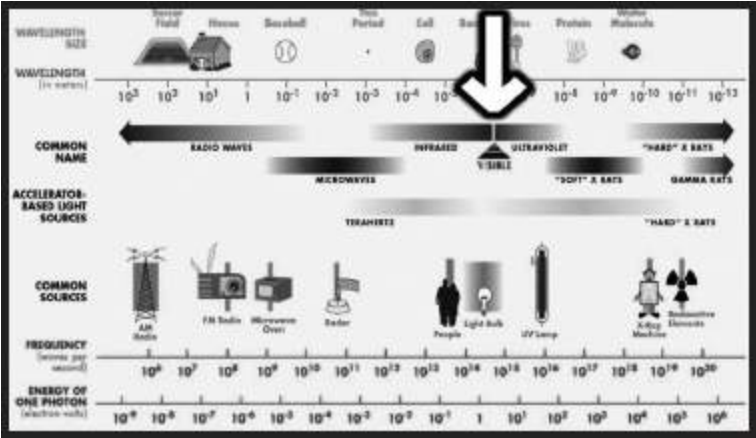


Figure 11: We can see a smear of the 0.005 percent electromagnetic spectrum, but we still know it all. Yep, makes sense.

Consider that you can see less than 1% of the electromagnetic spectrum and hear less than 1% of the acoustic spectrum. 90% of the cells in your body carry their own microbial DNA and are not 'you'. The atoms in your body are 99.9999999999999999% empty space and none of them are the ones you were born with ... Human beings have 46 chromosomes, two less than a potato.

The existence of the rainbow depends on the conical photoreceptors in your eyes; to animals without cones, the rainbow does not exist. So you don't just look at a rainbow, you create it. This is pretty amazing, especially considering that all the beautiful colours you see represent less than 1% of the electromagnetic spectrum.

Suddenly the 'world' of humans looks a very different place. Take into account, too, that Planet Earth when compared with the projected size of this single universe is the equivalent of a billionth of a pinhead. Imagine the ratio that would be when compared to infinite reality. To think that Christianity once insisted that Earth and humanity were the centre of everything. This background is vital if we are going to appreciate the nature of 'human' and how we can be manipulated by an unseen force. To human visual reality virtually *everything* is unseen and yet the prevailing perception within the institutions and so much of the public is that if we can't see it, touch it, hear it, taste it and smell it then it cannot exist. Such perception is indoctrinated and encouraged by the Cult and its agents because it isolates believers in the strictly limited, village-idiot, realm of the five senses where perceptions can be firewalled and information controlled. Most of those perpetuating the 'this-world-is-all-there-is' insanity are themselves indoctrinated into believing the same delusion. While major players and influencers know that official reality is laughable most of those in science, academia and medicine really believe the nonsense they peddle and teach succeeding generations. Those who challenge the orthodoxy are dismissed as nutters and freaks to protect the manufactured illusion from exposure. Observe the dynamic of the 'Covid' hoax and you will see how that takes the same form. The inner-circle psychopaths knows it's a gigantic scam, but almost the entirety of those imposing their fascist rules believe that 'Covid' is all that they're told it is.

Stolen identity

Ask people who they are and they will give you their name, place of birth, location, job, family background and life story. Yet that is not who they are – it is what they are *experiencing*. The difference is *absolutely crucial*. The true 'I', the eternal, infinite 'I', is consciousness,

a state of being aware. Forget 'form'. That is a vehicle for a brief experience. Consciousness does not come *from* the brain, but *through* the brain and even that is more symbolic than literal. We are awareness, pure awareness, and this is what withdraws from the body at what we call 'death' to continue our eternal beingness, *isness*, in other realms of reality within the limitlessness of infinity or the Biblical 'many mansions in my father's house'. Labels of a human life, man, woman, transgender, black, white, brown, nationality, circumstances and income are not who we are. They are what we are – awareness – is *experiencing* in a brief connection with a band of frequency we call 'human'. The labels are not the self; they are, to use the title of one of my books, a *Phantom Self*. I am not David Icke born in Leicester, England, on April 29th, 1952. I am the consciousness *having that experience*. The Cult and its non-human masters seek to convince us through the institutions of 'education', science, medicine, media and government that what we are *experiencing* is who we *are*. It's so easy to control and direct perception locked away in the bewildered illusions of the five senses with no expanded radar. Try, by contrast, doing the same with a humanity aware of its true self and its true power to consciously create its reality and experience. How is it possible to do this? We do it all day every day. If you perceive yourself as 'little me' with no power to impact upon your life and the world then your life experience will reflect that. You will hand the power you don't think you have to authority in all its forms which will use it to control your experience. This, in turn, will appear to confirm your perception of 'little me' in a self-fulfilling feedback loop. But that is what 'little me' really is – a *perception*. We are all 'big-me', infinite me, and the Cult has to make us forget that if its will is to prevail. We are therefore manipulated and pressured into self-identifying with human labels and not the consciousness/awareness *experiencing* those human labels.

The phenomenon of identity politics is a Cult-instigated manipulation technique to sub-divide previous labels into even smaller ones. A United States university employs this list of letters to

describe student identity: LGBTTQQFAGPBDSM or lesbian, gay, bisexual, transgender, transsexual, queer, questioning, flexual, asexual, gender-fuck, polyamorous, bondage/discipline, dominance/submission and sadism/masochism. I'm sure other lists are even longer by now as people feel the need to self-identity the 'I' with the minutiae of race and sexual preference. Wokers programmed by the Cult for generations believe this is about 'inclusivity' when it's really the Cult locking them away into smaller and smaller versions of Phantom Self while firewalling them from the influence of their true self, the infinite, eternal 'I'. You may notice that my philosophy which contends that we are all unique points of attention/awareness within the same infinite whole or Oneness is the ultimate non-racism. The very sense of Oneness makes the judgement of people by their body-type, colour or sexuality utterly ridiculous and confirms that racism has no understanding of reality (including anti-white racism). Yet despite my perception of life Cult agents and fast-asleep Wokers label me racist to discredit my information while they are themselves phenomenally racist and sexist. All they see is race and sexuality and they judge people as good or bad, demons or untouchables, by their race and sexuality. All they see is *Phantom Self* and perceive themselves in terms of Phantom Self. They are pawns and puppets of the Cult agenda to focus attention and self-identity in the five senses and play those identities against each other to divide and rule. Columbia University has introduced segregated graduations in another version of social distancing designed to drive people apart and teach them that different racial and cultural groups have nothing in common with each other. The last thing the Cult wants is unity. Again the pump-primers of this will be Cult operatives in the knowledge of what they are doing, but the rest are just the Phantom Self blind leading the Phantom Self blind. We *do* have something in common – we are all *the same consciousness* having different temporary experiences.

What is this 'human'?

Yes, what *is* 'human'? That is what we are supposed to be, right? I mean 'human'? True, but 'human' is the experience not the 'I'. Break it down to basics and 'human' is the way that information is processed. If we are to experience and interact with this band of frequency we call the 'world' we must have a vehicle that operates within that band of frequency. Our consciousness in its prime form cannot do that; it is way beyond the frequency of the human realm. My consciousness or awareness could not tap these keys and pick up the cup in front of me in the same way that radio station A cannot interact with radio station B when they are on different frequencies. The human body is the means through which we have that interaction. I have long described the body as a biological computer which processes information in a way that allows consciousness to experience this reality. The body is a receiver, transmitter and processor of information in a particular way that we call human. We visually perceive only the world of the five senses in a wakened state – that is the limit of the body's visual decoding system. In truth it's not even visual in the way we experience 'visual reality' as I will come to in a moment. We are 'human' because the body processes the information sources of human into a reality and behaviour system that we *perceive* as human. Why does an elephant act like an elephant and not like a human or a duck? The elephant's biological computer is a different information field and processes information according to that program into a visual and behaviour type we call an elephant. The same applies to everything in our reality. These body information fields are perpetuated through procreation (like making a copy of a software program). The Cult wants to break that cycle and intervene technologically to transform the human information field into one that will change what we call humanity. If it can change the human information field it will change the way that field processes information and change humanity both 'physically' and psychologically. Hence the *messenger* (information) RNA 'vaccines' and so much more that is targeting human genetics by changing the body's information – *messaging* – construct through food, drink, radiation, toxicity and other means.

Reality that we experience is nothing like reality as it really is in the same way that the reality people experience in virtual reality games is not the reality they are really living in. The game is only a decoded source of information that appears to be a reality. Our world is also an information construct – a *simulation* (more later). In its base form our reality is a wavefield of information much the same in theme as Wi-Fi. The five senses decode wavefield information into electrical information which they communicate to the brain to decode into holographic (illusory ‘physical’) information. Different parts of the brain specialise in decoding different senses and the information is fused into a reality that appears to be outside of us but is really inside the brain and the genetic structure in general (Fig 12 overleaf). DNA is a receiver-transmitter of information and a vital part of this decoding process and the body’s connection to other realities. Change DNA and you change the way we decode and connect with reality – see ‘Covid vaccines’. Think of computers decoding Wi-Fi. You have information encoded in a radiation field and the computer decodes that information into a very different form on the screen. You can’t see the Wi-Fi until its information is made manifest on the screen and the information on the screen is inside the computer and not outside. I have just described how we decode the ‘human world’. All five senses decode the waveform ‘Wi-Fi’ field into electrical signals and the brain (computer) constructs reality inside the brain and not outside – ‘You don’t just look at a rainbow, you create it’. Sound is a simple example. We don’t hear sound until the brain decodes it. Waveform sound waves are picked up by the hearing sense and communicated to the brain in an electrical form to be decoded into the sounds that we hear. Everything we hear is inside the brain along with everything we see, feel, smell and taste. Words and language are waveform fields generated by our vocal chords which pass through this process until they are decoded by the brain into words that we hear. Different languages are different frequency fields or sound waves generated by vocal chords. Late British philosopher Alan Watts said:

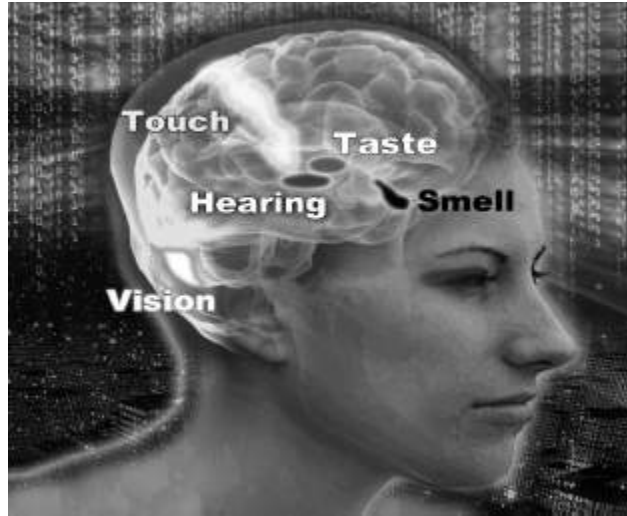


Figure 12: The brain receives information from the five senses and constructs from that our perceived reality.

[Without the brain] the world is devoid of light, heat, weight, solidity, motion, space, time or any other imaginable feature. All these phenomena are interactions, or transactions, of vibrations with a certain arrangement of neurons.

That's exactly what they are and scientist Robert Lanza describes in his book, *Biocentrism*, how we decode electromagnetic waves and energy into visual and 'physical' experience. He uses the example of a flame emitting photons, electromagnetic energy, each pulsing electrically and magnetically:

... these ... invisible electromagnetic waves strike a human retina, and if (and only if) the waves happen to measure between 400 and 700 nano meters in length from crest to crest, then their energy is just right to deliver a stimulus to the 8 million cone-shaped cells in the retina.

Each in turn send an electrical pulse to a neighbour neuron, and on up the line this goes, at 250 mph, until it reaches the ... occipital lobe of the brain, in the back of the head. There, a cascading complex of neurons fire from the incoming stimuli, and we subjectively perceive this experience as a yellow brightness occurring in a place we have been conditioned to call the 'external world'.

You hear what you decode

If a tree falls or a building collapses they make no noise unless someone is there to decode the energetic waves generated by the disturbance into what we call sound. Does a falling tree make a noise? Only if you hear it – *decode* it. Everything in our reality is a frequency field of information operating within the overall ‘Wi-Fi’ field that I call The Field. A vibrational disturbance is generated in The Field by the fields of the falling tree or building. These disturbance waves are what we decode into the sound of them falling. If no one is there to do that then neither will make any noise. Reality is created by the observer – *decoder* – and the *perceptions* of the observer affect the decoding process. For this reason different people – different *perceptions* – will perceive the same reality or situation in a different way. What one may perceive as a nightmare another will see as an opportunity. The question of why the Cult is so focused on controlling human perception now answers itself. All experienced reality is the act of decoding and we don’t experience Wi-Fi until it is decoded on the computer screen. The sight and sound of an Internet video is encoded in the Wi-Fi all around us, but we don’t see or hear it until the computer decodes that information. Taste, smell and touch are all phenomena of the brain as a result of the same process. We don’t taste, smell or feel anything except in the brain and there are pain relief techniques that seek to block the signal from the site of discomfort to the brain because if the brain doesn’t decode that signal we don’t feel pain. Pain is in the brain and only appears to be at the point of impact thanks to the feedback loop between them. We don’t see anything until electrical information from the sight senses is decoded in an area at the back of the brain. If that area is damaged we can go blind when our eyes are perfectly okay. So why do we go blind if we damage an eye? We damage the information processing between the waveform visual information and the visual decoding area of the brain. If information doesn’t reach the brain in a form it can decode then we can’t see the visual reality that it represents. What’s more the brain is decoding only a fraction of the information it receives and the rest is absorbed by the

sub-conscious mind. This explanation is from the science magazine, *Wonderpedia*:

Every second, 11 million sensations crackle along these [brain] pathways ... The brain is confronted with an alarming array of images, sounds and smells which it rigorously filters down until it is left with a manageable list of around 40. Thus 40 sensations per second make up what we perceive as reality.

The 'world' is not what people are told to believe that is it and the inner circles of the Cult *know that*.

Illusory 'physical' reality

We can only see a smear of 0.005 percent of the Universe which is only one of a vast array of universes – 'mansions' – within infinite reality. Even then the brain decodes only 40 pieces of information ('sensations') from a potential *11 million* that we receive every second. Two points strike you from this immediately: The sheer breathtaking stupidity of believing we know anything so rigidly that there's nothing more to know; and the potential for these processes to be manipulated by a malevolent force to control the reality of the population. One thing I can say for sure with no risk of contradiction is that when you can perceive an almost indescribable fraction of infinite reality there is always more to know as in tidal waves of it. Ancient Greek philosopher Socrates was so right when he said that wisdom is to know how little we know. How obviously true that is when you think that we are experiencing a physical world of solidity that is neither physical nor solid and a world of apartness when everything is connected. Cult-controlled 'science' dismisses the so-called 'paranormal' and all phenomena related to that when the 'para'-normal is perfectly normal and explains the alleged 'great mysteries' which dumbfound scientific minds. There is a reason for this. A 'scientific mind' in terms of the mainstream is a material mind, a five-sense mind imprisoned in see it, touch it, hear it, smell it and taste it. Phenomena and happenings that can't be explained that way leave the 'scientific mind' bewildered and the rule is that if they

can't account for why something is happening then it can't, by definition, be happening. I beg to differ. Telepathy is thought waves passing through The Field (think wave disturbance again) to be decoded by someone able to connect with that wavelength (information). For example: You can pick up the thought waves of a friend at any distance and at the very least that will bring them to mind. A few minutes later the friend calls you. 'My god', you say, 'that's incredible – I was just thinking of you.' Ah, but *they* were thinking of *you* before they made the call and that's what you decoded. Native peoples not entrapped in five-sense reality do this so well it became known as the 'bush telegraph'. Those known as psychics and mediums (genuine ones) are doing the same only across dimensions of reality. 'Mind over matter' comes from the fact that matter and mind are the *same*. The state of one influences the state of the other. Indeed one *and* the other are illusions. They are aspects of the same field. Paranormal phenomena are all explainable so why are they still considered 'mysteries' or not happening? Once you go down this road of understanding you begin to expand awareness beyond the five senses and that's the nightmare for the Cult.



Figure 13: Holograms are not solid, but the best ones appear to be.

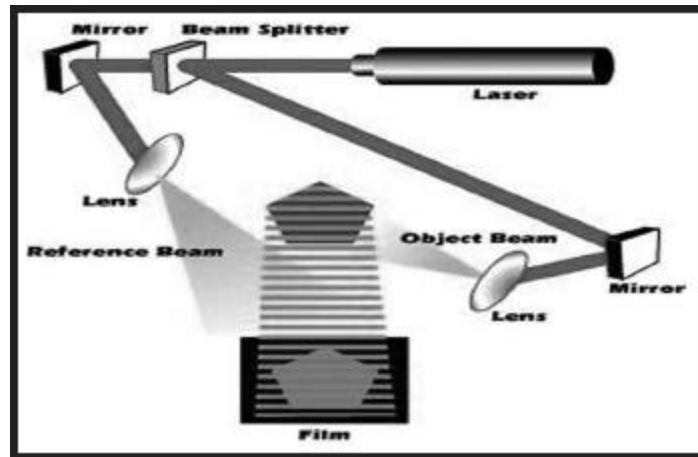


Figure 14: How holograms are created by capturing a waveform version of the subject image.

Holographic 'solidity'

Our reality is not solid, it is holographic. We are now well aware of holograms which are widely used today. Two-dimensional information is decoded into a three-dimensional reality that is not solid although can very much appear to be (Fig 13). Holograms are created with a laser divided into two parts. One goes directly onto a holographic photographic print ('reference beam') and the other takes a waveform image of the subject ('working beam') before being directed onto the print where it 'collides' with the other half of the laser (Fig 14). This creates a *waveform* interference pattern which contains the wavefield information of whatever is being photographed (Fig 15 overleaf). The process can be likened to dropping pebbles in a pond. Waves generated by each one spread out across the water to collide with the others and create a wave representation of where the stones fell and at what speed, weight and distance. A waveform interference pattern of a hologram is akin to the waveform information in The Field which the five senses decode into electrical signals to be decoded by the brain into a holographic illusory 'physical' reality. In the same way when a laser (think human attention) is directed at the waveform interference pattern a three-dimensional version of the subject is projected into apparently 'solid' reality (Fig 16). An amazing trait of holograms reveals more 'paranormal mysteries'. Information of the *whole*

hologram is encoded in waveform in every part of the interference pattern by the way they are created. This means that every *part* of a hologram is a smaller version of the whole. Cut the interference wave-pattern into four and you won't get four parts of the image. You get quarter-sized versions of the *whole* image. The body is a hologram and the same applies. Here we have the basis of acupuncture, reflexology and other forms of healing which identify representations of the whole body in all of the parts, hands, feet, ears, everywhere. Skilled palm readers can do what they do because the information of whole body is encoded in the hand. The concept of as above, so below, comes from this.



Figure 15: A waveform interference pattern that holds the information that transforms into a hologram.



Figure 16: Holographic people including 'Elvis' holographically inserted to sing a duet with Celine Dion.

The question will be asked of why, if solidity is illusory, we can't just walk through walls and each other. The resistance is not solid against solid; it is electromagnetic field against electromagnetic field and we decode this into the *experience* of solid against solid. We should also not underestimate the power of belief to dictate reality. What you believe is impossible *will be*. Your belief impacts on your decoding processes and they won't decode what you think is impossible. What we believe we perceive and what we perceive we experience. 'Can't dos' and 'impossibles' are like a firewall in a computer system that won't put on the screen what the firewall blocks. How vital that is to understanding how human experience has been hijacked. I explain in *The Answer, Everything You Need To Know But Have Never Been Told* and other books a long list of 'mysteries' and 'paranormal' phenomena that are not mysterious and perfectly normal once you realise what reality is and how it works. 'Ghosts' can be seen to pass through 'solid' walls because the walls are not solid and the ghost is a discarnate entity operating on a frequency so different to that of the wall that it's like two radio stations sharing the same space while never interfering with each other. I have seen ghosts do this myself. The apartness of people and objects is also an illusion. Everything is connected by the Field like all sea life is connected by the sea. It's just that within the limits of our visual reality we only 'see' holographic information and not the field of information that connects everything and from which the holographic world is made manifest. If you can only see holographic 'objects' and not the field that connects them they will appear to you as unconnected to each other in the same way that we see the computer while not seeing the Wi-Fi.

What you don't know *can* hurt you

Okay, we return to those 'two worlds' of human society and the Cult with its global network of interconnecting secret societies and satanic groups which manipulate through governments, corporations, media, religions, etc. The fundamental difference between them is *knowledge*. The idea has been to keep humanity

ignorant of the plan for its total enslavement underpinned by a crucial ignorance of reality – who we are and where we are – and how we interact with it. ‘Human’ should be the interaction between our expanded eternal consciousness and the five-sense body experience. We are meant to be *in* this world in terms of the five senses but not *of* this world in relation to our greater consciousness and perspective. In that state we experience the small picture of the five senses within the wider context of the big picture of awareness beyond the five senses. Put another way the five senses see the dots and expanded awareness connects them into pictures and patterns that give context to the apparently random and unconnected. Without the context of expanded awareness the five senses see only apartness and randomness with apparently no meaning. The Cult and its other-dimensional controllers seek to intervene in the frequency realm where five-sense reality is supposed to connect with expanded reality and to keep the two apart (more on this in the final chapter). When that happens five-sense mental and emotional processes are no longer influenced by expanded awareness, or the True ‘I’, and instead are driven by the isolated perceptions of the body’s decoding systems. They are in the world *and* of it. Here we have the human plight and why humanity with its potential for infinite awareness can be so easily manipulatable and descend into such extremes of stupidity.

Once the Cult isolates five-sense mind from expanded awareness it can then program the mind with perceptions and beliefs by controlling information that the mind receives through the ‘education’ system of the formative years and the media perceptual bombardment and censorship of an entire lifetime. Limit perception and a sense of the possible through limiting knowledge by limiting and skewing information while censoring and discrediting that which could set people free. As the title of another of my books says ... *And The Truth Shall Set You Free*. For this reason the last thing the Cult wants in circulation is the truth about anything – especially the reality of the eternal ‘I’ – and that’s why it is desperate to control information. The Cult knows that information becomes perception

which becomes behaviour which, collectively, becomes human society. Cult-controlled and funded mainstream 'science' denies the existence of an eternal 'I' and seeks to dismiss and trash all evidence to the contrary. Cult-controlled mainstream religion has a version of 'God' that is little more than a system of control and dictatorship that employs threats of damnation in an afterlife to control perceptions and behaviour in the here and now through fear and guilt. Neither is true and it's the 'neither' that the Cult wishes to suppress. This 'neither' is that everything is an expression, a point of attention, within an infinite state of consciousness which is the real meaning of the term 'God'.

Perceptual obsession with the 'physical body' and five-senses means that 'God' becomes personified as a bearded bloke sitting among the clouds or a raging bully who loves us if we do what 'he' wants and condemns us to the fires of hell if we don't. These are no more than a 'spiritual' fairy tales to control and dictate events and behaviour through fear of this 'God' which has bizarrely made 'God-fearing' in religious circles a state to be desired. I would suggest that fearing *anything* is not to be encouraged and celebrated, but rather deleted. You can see why 'God fearing' is so beneficial to the Cult and its religions when *they* decide what 'God' wants and what 'God' demands (the Cult demands) that everyone do. As the great American comedian Bill Hicks said satirising a Christian zealot: 'I think what God meant to say.' How much of this infinite awareness ('God') that we access is decided by how far we choose to expand our perceptions, self-identity and sense of the possible. The scale of self-identity reflects itself in the scale of awareness that we can connect with and are influenced by – how much knowing and insight we have instead of programmed perception. You cannot expand your awareness into the infinity of possibility when you believe that you are little me Peter the postman or Mary in marketing and nothing more. I'll deal with this in the concluding chapter because it's crucial to how we turnaround current events.

Where the Cult came from

When I realised in the early 1990s there was a Cult network behind global events I asked the obvious question: When did it start? I took it back to ancient Rome and Egypt and on to Babylon and Sumer in Mesopotamia, the 'Land Between Two Rivers', in what we now call Iraq. The two rivers are the Tigris and Euphrates and this region is of immense historical and other importance to the Cult, as is the land called Israel only 550 miles away by air. There is much more going on with deep esoteric meaning across this whole region. It's not only about 'wars for oil'. Priceless artefacts from Mesopotamia were stolen or destroyed after the American and British invasion of Iraq in 2003 justified by the lies of Boy Bush and Tony Blair (their Cult masters) about non-existent 'weapons of mass destruction'.

Mesopotamia was the location of Sumer (about 5,400BC to 1,750BC), and Babylon (about 2,350BC to 539BC). Sabbatians may have become immensely influential in the Cult in modern times but they are part of a network that goes back into the mists of history. Sumer is said by historians to be the 'cradle of civilisation'. I disagree. I say it was the re-start of what we call human civilisation after cataclysmic events symbolised in part as the 'Great Flood' destroyed the world that existed before. These fantastic upheavals that I have been describing in detail in the books since the early 1990s appear in accounts and legends of ancient cultures across the world and they are supported by geological and biological evidence. Stone tablets found in Iraq detailing the Sumer period say the cataclysms were caused by non-human 'gods' they call the Anunnaki. These are described in terms of extraterrestrial visitations in which knowledge supplied by the Anunnaki is said to have been the source of at least one of the world's oldest writing systems and developments in astronomy, mathematics and architecture that were way ahead of their time. I have covered this subject at length in *The Biggest Secret* and *Children of the Matrix* and the same basic 'Anunnaki' story can be found in Zulu accounts in South Africa where the late and very great Zulu high shaman Credo Mutwa told me that the Sumerian Anunnaki were known by Zulus as the Chitauri or 'children of the serpent'. See my six-hour video interview with Credo on this subject entitled *The*

Reptilian Agenda recorded at his then home near Johannesburg in 1999 which you can watch on the Ickonic media platform.

The Cult emerged out of Sumer, Babylon and Egypt (and elsewhere) and established the Roman Empire before expanding with the Romans into northern Europe from where many empires were savagely imposed in the form of Cult-controlled societies all over the world. Mass death and destruction was their calling card. The Cult established its centre of operations in Europe and European Empires were Cult empires which allowed it to expand into a global force. Spanish and Portuguese colonialists headed for Central and South America while the British and French targeted North America. Africa was colonised by Britain, France, Belgium, the Netherlands, Portugal, Spain, Italy, and Germany. Some like Britain and France moved in on the Middle East. The British Empire was by far the biggest for a simple reason. By now Britain was the headquarters of the Cult from which it expanded to form Canada, the United States, Australia and New Zealand. The Sun never set on the British Empire such was the scale of its occupation. London remains a global centre for the Cult along with Rome and the Vatican although others have emerged in Israel and China. It is no accident that the 'virus' is alleged to have come out of China while Italy was chosen as the means to terrify the Western population into compliance with 'Covid' fascism. Nor that Israel has led the world in 'Covid' fascism and mass 'vaccination'.

You would think that I would mention the United States here, but while it has been an important means of imposing the Cult's will it is less significant than would appear and is currently in the process of having what power it does have deleted. The Cult in Europe has mostly loaded the guns for the US to fire. America has been controlled from Europe from the start through Cult operatives in Britain and Europe. The American Revolution was an illusion to make it appear that America was governing itself while very different forces were pulling the strings in the form of Cult families such as the Rothschilds through the Rockefellers and other subordinates. The Rockefellers are extremely close to Bill Gates and

established both scalpel and drug 'medicine' and the World Health Organization. They play a major role in the development and circulation of vaccines through the Rockefeller Foundation on which Bill Gates said his Foundation is based. Why wouldn't this be the case when the Rockefellers and Gates are on the same team? Cult infiltration of human society goes way back into what we call history and has been constantly expanding and centralising power with the goal of establishing a global structure to dictate everything. Look how this has been advanced in great leaps with the 'Covid' hoax.

The non-human dimension

I researched and observed the comings and goings of Cult operatives through the centuries and even thousands of years as they were born, worked to promote the agenda within the secret society and satanic networks, and then died for others to replace them. Clearly there had to be a coordinating force that spanned this entire period while operatives who would not have seen the end goal in their lifetimes came and went advancing the plan over millennia. I went in search of that coordinating force with the usual support from the extraordinary synchronicity of my life which has been an almost daily experience since 1990. I saw common themes in religious texts and ancient cultures about a non-human force manipulating human society from the hidden. Christianity calls this force Satan, the Devil and demons; Islam refers to the Jinn or Djinn; Zulus have their Chitauri (spelt in other ways in different parts of Africa); and the Gnostic people in Egypt in the period around and before 400AD referred to this phenomena as the 'Archons', a word meaning rulers in Greek. Central American cultures speak of the 'Predators' among other names and the same theme is everywhere. I will use 'Archons' as a collective name for all of them. When you see how their nature and behaviour is described all these different sources are clearly talking about the same force. Gnostics described the Archons in terms of 'luminous fire' while Islam relates the Jinn to 'smokeless fire'. Some refer to beings in form that could occasionally be seen, but the most common of common theme is that they operate from

unseen realms which means almost all existence to the visual processes of humans. I had concluded that this was indeed the foundation of human control and that the Cult was operating within the human frequency band on behalf of this hidden force when I came across the writings of Gnostics which supported my conclusions in the most extraordinary way.

A sealed earthen jar was found in 1945 near the town of Nag Hammadi about 75-80 miles north of Luxor on the banks of the River Nile in Egypt. Inside was a treasure trove of manuscripts and texts left by the Gnostic people some 1,600 years earlier. They included 13 leather-bound papyrus codices (manuscripts) and more than 50 texts written in Coptic Egyptian estimated to have been hidden in the jar in the period of 400AD although the source of the information goes back much further. Gnostics oversaw the Great or Royal Library of Alexandria, the fantastic depository of ancient texts detailing advanced knowledge and accounts of human history. The Library was dismantled and destroyed in stages over a long period with the death-blow delivered by the Cult-established Roman Church in the period around 415AD. The Church of Rome was the Church of Babylon relocated as I said earlier. Gnostics were not a race. They were a way of perceiving reality. Whenever they established themselves and their information circulated the terrorists of the Church of Rome would target them for destruction. This happened with the Great Library and with the Gnostic Cathars who were burned to death by the psychopaths after a long period of oppression at the siege of the Castle of Monségur in southern France in 1244. The Church has always been terrified of Gnostic information which demolishes the official Christian narrative although there is much in the Bible that supports the Gnostic view if you read it in another way. To anyone studying the texts of what became known as the Nag Hammadi Library it is clear that great swathes of Christian and Biblical belief has its origin with Gnostics sources going back to Sumer. Gnostic themes have been twisted to manipulate the perceived reality of Bible believers. Biblical texts have been in the open for centuries where they could be changed while Gnostic

documents found at Nag Hammadi were sealed away and untouched for 1,600 years. What you see is what they wrote.

Use your *pneuma* not your *nous*

Gnosticism and Gnostic come from 'gnosis' which means knowledge, or rather *secret* knowledge, in the sense of spiritual awareness – knowledge about reality and life itself. The desperation of the Cult's Church of Rome to destroy the Gnostics can be understood when the knowledge they were circulating was the last thing the Cult wanted the population to know. Sixteen hundred years later the same Cult is working hard to undermine and silence me for the same reason. The dynamic between knowledge and ignorance is a constant. 'Time' appears to move on, but essential themes remain the same. We are told to 'use your nous', a Gnostic word for head/brain/intelligence. They said, however, that spiritual awakening or 'salvation' could only be secured by expanding awareness *beyond* what they called *nous* and into *pneuma* or Infinite Self. Obviously as I read these texts the parallels with what I have been saying since 1990 were fascinating to me. There is a universal truth that spans human history and in that case why wouldn't we be talking the same language 16 centuries apart? When you free yourself from the perception program of the five senses and explore expanded realms of consciousness you are going to connect with the same information no matter what the perceived 'era' within a manufactured timeline of a single and tiny range of manipulated frequency. Humans working with 'smart' technology or knocking rocks together in caves is only a timeline appearing to operate within the human frequency band. Expanded awareness and the knowledge it holds have always been there whether the era be Stone Age or computer age. We can only access that knowledge by opening ourselves to its frequency which the five-sense prison cell is designed to stop us doing. Gates, Fauci, Whitty, Vallance, Zuckerberg, Brin, Page, Wojcicki, Bezos, and all the others behind the 'Covid' hoax clearly have a long wait before their range of frequency can make that connection given that an open heart is

crucial to that as we shall see. Instead of accessing knowledge directly through expanded awareness it is given to Cult operatives by the secret society networks of the Cult where it has been passed on over thousands of years outside the public arena. Expanded realms of consciousness is where great artists, composers and writers find their inspiration and where truth awaits anyone open enough to connect with it. We need to go there fast.

Archon hijack

A fifth of the Nag Hammadi texts describe the existence and manipulation of the Archons led by a 'Chief Archon' they call 'Yaldabaoth', or the 'Demiurge', and this is the Christian 'Devil', 'Satan', 'Lucifer', and his demons. Archons in Biblical symbolism are the 'fallen ones' which are also referred to as fallen angels after the angels expelled from heaven according to the Abrahamic religions of Judaism, Christianity and Islam. These angels are claimed to tempt humans to 'sin' ongoing and you will see how accurate that symbolism is during the rest of the book. The theme of 'original sin' is related to the 'Fall' when Adam and Eve were 'tempted by the serpent' and fell from a state of innocence and 'obedience' (connection) with God into a state of disobedience (disconnection). The Fall is said to have brought sin into the world and corrupted everything including human nature. Yaldabaoth, the 'Lord Archon', is described by Gnostics as a 'counterfeit spirit', 'The Blind One', 'The Blind God', and 'The Foolish One'. The Jewish name for Yaldabaoth in Talmudic writings is Samael which translates as 'Poison of God', or 'Blindness of God'. You see the parallels. Yaldabaoth in Islamic belief is the Muslim Jinn devil known as Shaytan – Shaytan is Satan as the same themes are found all over the world in every religion and culture. The 'Lord God' of the Old Testament is the 'Lord Archon' of Gnostic manuscripts and that's why he's such a bloodthirsty bastard. Satan is known by Christians as 'the Demon of Demons' and Gnostics called Yaldabaoth the 'Archon of Archons'. Both are known as 'The Deceiver'. We are talking about the same 'bloke' for sure and these common themes

using different names, storylines and symbolism tell a common tale of the human plight.

Archons are referred to in Nag Hammadi documents as mind parasites, inverters, guards, gatekeepers, detainers, judges, pitiless ones and deceivers. The 'Covid' hoax alone is a glaring example of all these things. The Biblical 'God' is so different in the Old and New Testaments because they are not describing the same phenomenon. The vindictive, angry, hate-filled, 'God' of the Old Testament, known as Yahweh, is Yaldabaoth who is depicted in Cult-dictated popular culture as the 'Dark Lord', 'Lord of Time', Lord (Darth) Vader and Dormammu, the evil ruler of the 'Dark Dimension' trying to take over the 'Earth Dimension' in the Marvel comic movie, *Dr Strange*. Yaldabaoth is both the Old Testament 'god' and the Biblical 'Satan'. Gnostics referred to Yaldabaoth as the 'Great Architect of the Universe' and the Cult-controlled Freemason network calls their god 'the 'Great Architect of the Universe' (also Grand Architect). The 'Great Architect' Yaldabaoth is symbolised by the Cult as the all-seeing eye at the top of the pyramid on the Great Seal of the United States and the dollar bill. Archon is encoded in *arch*-itect as it is in *arch*-angels and *arch*-bishops. All religions have the theme of a force for good and force for evil in some sort of spiritual war and there is a reason for that – the theme is true. The Cult and its non-human masters are quite happy for this to circulate. They present themselves as the force for good fighting evil when they are really the force of evil (absence of love). The whole foundation of Cult modus operandi is inversion. They promote themselves as a force for good and anyone challenging them in pursuit of peace, love, fairness, truth and justice is condemned as a satanic force for evil. This has been the game plan throughout history whether the Church of Rome inquisitions of non-believers or 'conspiracy theorists' and 'anti-vaxxers' of today. The technique is the same whatever the timeline era.

Yaldabaoth is revolting (true)

Yaldabaoth and the Archons are said to have revolted against God with Yaldabaoth claiming to *be* God – the *All That Is*. The Old Testament ‘God’ (Yaldabaoth) demanded to be worshipped as such: ‘*I am the LORD, and there is none else, there is no God beside me*’ (Isaiah 45:5). I have quoted in other books a man who said he was the unofficial son of the late Baron Philippe de Rothschild of the Mouton-Rothschild wine producing estates in France who died in 1988 and he told me about the Rothschild ‘revolt from God’. The man said he was given the name Phillip Eugene de Rothschild and we shared long correspondence many years ago while he was living under another identity. He said that he was conceived through ‘occult incest’ which (within the Cult) was ‘normal and to be admired’. ‘Phillip’ told me about his experience attending satanic rituals with rich and famous people whom he names and you can see them and the wider background to Cult Satanism in my other books starting with *The Biggest Secret*. Cult rituals are interactions with Archontic ‘gods’. ‘Phillip’ described Baron Philippe de Rothschild as ‘a master Satanist and hater of God’ and he used the same term ‘revolt from God’ associated with Yaldabaoth/Satan/Lucifer/the Devil in describing the Sabbatian Rothschild dynasty. ‘I played a key role in my family’s revolt from God’, he said. That role was to infiltrate in classic Sabbatian style the Christian Church, but eventually he escaped the mind-prison to live another life. The Cult has been targeting religion in a plan to make worship of the Archons the global one-world religion. Infiltration of Satanism into modern ‘culture’, especially among the young, through music videos, stage shows and other means, is all part of this.

Nag Hammadi texts describe Yaldabaoth and the Archons in their prime form as energy – consciousness – and say they can take form if they choose in the same way that consciousness takes form as a human. Yaldabaoth is called ‘formless’ and represents a deeply inverted, distorted and chaotic state of consciousness which seeks to attached to humans and turn them into a likeness of itself in an attempt at assimilation. For that to happen it has to manipulate

humans into low frequency mental and emotional states that match its own. Archons can certainly appear in human form and this is the origin of the psychopathic personality. The energetic distortion Gnostics called Yaldabaoth is psychopathy. When psychopathic Archons take human form that human will be a psychopath as an expression of Yaldabaoth consciousness. Cult psychopaths are Archons in human form. The principle is the same as that portrayed in the 2009 *Avatar* movie when the American military travelled to a fictional Earth-like moon called Pandora in the Alpha Centauri star system to infiltrate a society of blue people, or Na'vi, by hiding within bodies that looked like the Na'vi. Archons posing as humans have a particular hybrid information field, part human, part Archon, (the ancient 'demigods') which processes information in a way that manifests behaviour to match their psychopathic evil, lack of empathy and compassion, and stops them being influenced by the empathy, compassion and love that a fully-human information field is capable of expressing. Cult bloodlines interbreed, be they royalty or dark suits, for this reason and you have their obsession with incest. Interbreeding with full-blown humans would dilute the Archontic energy field that guarantees psychopathy in its representatives in the human realm.

Gnostic writings say the main non-human forms that Archons take are *serpentine* (what I have called for decades 'reptilian' amid unbounded ridicule from the Archontically-programmed) and what Gnostics describe as 'an unborn baby or foetus with grey skin and dark, unmoving eyes'. This is an excellent representation of the ET 'Greys' of UFO folklore which large numbers of people claim to have seen and been abducted by – Zulu shaman Credo Mutwa among them. I agree with those that believe in extraterrestrial or interdimensional visitations today and for thousands of years past. No wonder with their advanced knowledge and technological capability they were perceived and worshipped as gods for technological and other 'miracles' they appeared to perform. Imagine someone arriving in a culture disconnected from the modern world with a smartphone and computer. They would be

seen as a 'god' capable of 'miracles'. The Renegade Mind, however, wants to know the source of everything and not only the way that source manifests as human or non-human. In the same way that a Renegade Mind seeks the original source material for the 'Covid virus' to see if what is claimed is true. The original source of Archons in form is consciousness – the distorted state of consciousness known to Gnostics as Yaldabaoth.

'Revolt from God' is energetic disconnection

Where I am going next will make a lot of sense of religious texts and ancient legends relating to 'Satan', Lucifer' and the 'gods'. Gnostic descriptions sync perfectly with the themes of my own research over the years in how they describe a consciousness distortion seeking to impose itself on human consciousness. I've referred to the core of infinite awareness in previous books as Infinite Awareness in Awareness of Itself. By that I mean a level of awareness that knows that it is all awareness and is aware of all awareness. From here comes the frequency of love in its true sense and balance which is what love is on one level – the balance of all forces into a single whole called Oneness and Isness. The more we disconnect from this state of love that many call 'God' the constituent parts of that Oneness start to unravel and express themselves as a part and not a whole. They become individualised as intellect, mind, selfishness, hatred, envy, desire for power over others, and such like. This is not a problem in the greater scheme in that 'God', the *All That Is*, can experience all these possibilities through different expressions of itself including humans. What we as expressions of the whole experience the *All That Is* experiences. We are the *All That Is* experiencing itself. As we withdraw from that state of Oneness we disconnect from its influence and things can get very unpleasant and very stupid. Archontic consciousness is at the extreme end of that. It has so disconnected from the influence of Oneness that it has become an inversion of unity and love, an inversion of everything, an inversion of life itself. Evil is appropriately live written backwards. Archontic consciousness is obsessed with death, an inversion of life,

and so its manifestations in Satanism are obsessed with death. They use inverted symbols in their rituals such as the inverted pentagram and cross. Sabbatians as Archontic consciousness incarnate invert Judaism and every other religion and culture they infiltrate. They seek disunity and chaos and they fear unity and harmony as they fear love like garlic to a vampire. As a result the Cult, Archons incarnate, act with such evil, psychopathy and lack of empathy and compassion disconnected as they are from the source of love. How could Bill Gates and the rest of the Archontic psychopaths do what they have to human society in the 'Covid' era with all the death, suffering and destruction involved and have no emotional consequence for the impact on others? Now you know. Why have Zuckerberg, Brin, Page, Wojcicki and company callously censored information warning about the dangers of the 'vaccine' while thousands have been dying and having severe, sometimes life-changing reactions? Now you know. Why have Tedros, Fauci, Whitty, Vallance and their like around the world been using case and death figures they're aware are fraudulent to justify lockdowns and all the deaths and destroyed lives that have come from that? Now you know. Why did Christian Drosten produce and promote a 'testing' protocol that he knew couldn't test for infectious disease which led to a global human catastrophe. Now you know. The Archontic mind doesn't give a shit (Fig 17). I personally think that Gates and major Cult insiders are a form of AI cyborg that the Archons want humans to become.

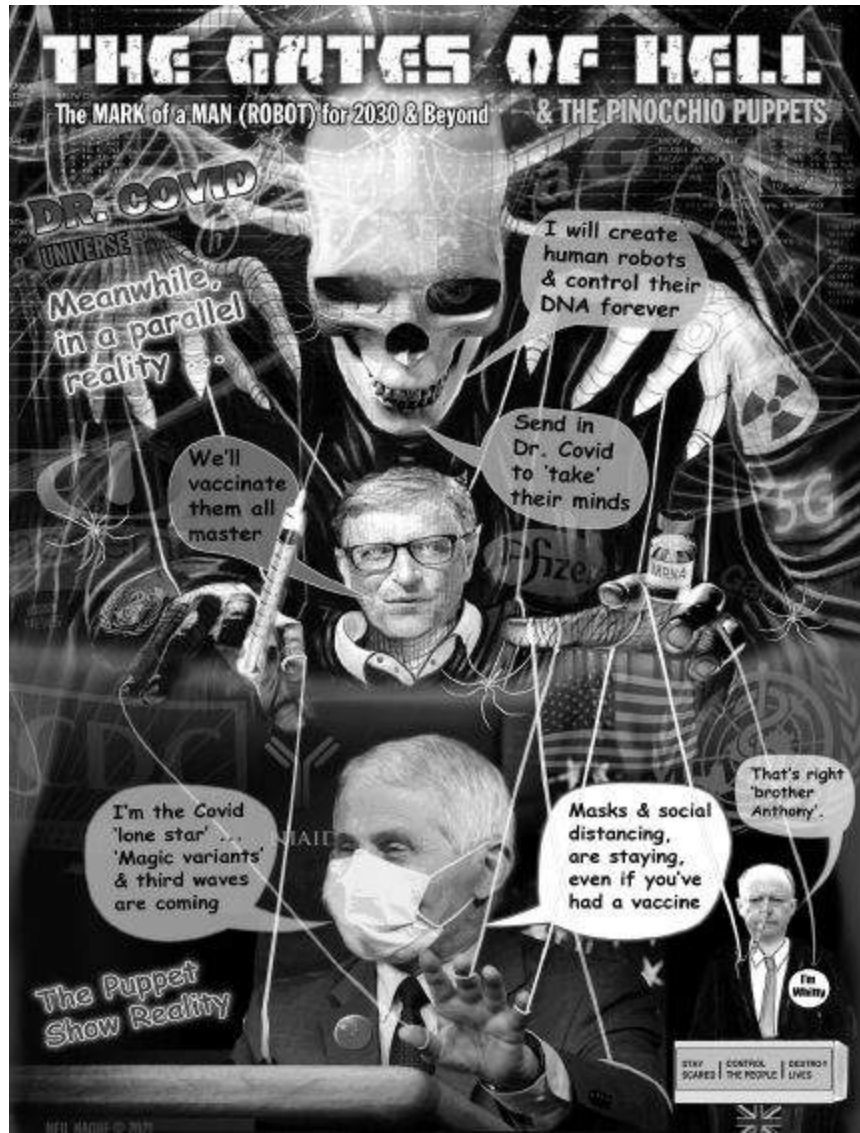


Figure 17: Artist Neil Hague's version of the 'Covid' hierarchy.

Human batteries

A state of such inversion does have its consequences, however. The level of disconnection from the Source of All means that you withdraw from that source of energetic sustenance and creativity. This means that you have to find your own supply of energetic power and it has – us. When the Morpheus character in the first *Matrix* movie held up a battery he spoke a profound truth when he said: 'The Matrix is a computer-generated dream world built to keep us under control in order to change the human being into one of

these.’ The statement was true in all respects. We do live in a technologically-generated virtual reality simulation (more very shortly) and we have been manipulated to be an energy source for Archontic consciousness. The Disney-Pixar animated movie *Monsters, Inc.* in 2001 symbolised the dynamic when monsters in their world had no energy source and they would enter the human world to terrify children in their beds, catch the child’s scream, terror (low-vibrational frequencies), and take that energy back to power the monster world. The lead character you might remember was a single giant eye and the symbolism of the Cult’s all-seeing eye was obvious. Every thought and emotion is broadcast as a frequency unique to that thought and emotion. Feelings of love and joy, empathy and compassion, are high, quick, frequencies while fear, depression, anxiety, suffering and hate are low, slow, dense frequencies. Which kind do you think Archontic consciousness can connect with and absorb? In such a low and dense frequency state there’s no way it can connect with the energy of love and joy. Archons can only feed off energy compatible with their own frequency and they and their Cult agents want to delete the human world of love and joy and manipulate the transmission of low vibrational frequencies through low-vibrational human mental and emotional states. *We are their energy source.* Wars are energetic banquets to the Archons – a world war even more so – and think how much low-frequency mental and emotional energy has been generated from the consequences for humanity of the ‘Covid’ hoax orchestrated by Archons incarnate like Gates.

The ancient practice of human sacrifice ‘to the gods’, continued in secret today by the Cult, is based on the same principle. ‘The gods’ are Archontic consciousness in different forms and the sacrifice is induced into a state of intense terror to generate the energy the Archontic frequency can absorb. Incarnate Archons in the ritual drink the blood which contains an adrenaline they crave which floods into the bloodstream when people are terrorised. Most of the sacrifices, ancient and modern, are children and the theme of ‘sacrificing young virgins to the gods’ is just code for children. They

have a particular pre-puberty energy that Archons want more than anything and the energy of the young in general is their target. The California Department of Education wants students to chant the names of Aztec gods (Archontic gods) once worshipped in human sacrifice rituals in a curriculum designed to encourage them to 'challenge racist, bigoted, discriminatory, imperialist/colonial beliefs', join 'social movements that struggle for social justice', and 'build new possibilities for a post-racist, post-systemic racism society'. It's the usual Woke crap that inverts racism and calls it anti-racism. In this case solidarity with 'indigenous tribes' is being used as an excuse to chant the names of 'gods' to which people were sacrificed (and still are in secret). What an example of Woke's inability to see beyond black and white, us and them, They condemn the colonisation of these tribal cultures by Europeans (quite right), but those cultures sacrificing people including children to their 'gods', and mass murdering untold numbers as the Aztecs did, is just fine. One chant is to the Aztec god Tezcatlipoca who had a man sacrificed to him in the 5th month of the Aztec calendar. His heart was cut out and he was eaten. Oh, that's okay then. Come on children ... after three ... Other sacrificial 'gods' for the young to chant their allegiance include Quetzalcoatl, Huitzilopochtli and Xipe Totec. The curriculum says that 'chants, affirmations, and energizers can be used to bring the class together, build unity around ethnic studies principles and values, and to reinvigorate the class following a lesson that may be emotionally taxing or even when student engagement may appear to be low'. Well, that's the cover story, anyway. Chanting and mantras are the repetition of a particular frequency generated from the vocal cords and chanting the names of these Archontic 'gods' tunes you into their frequency. That is the last thing you want when it allows for energetic synchronisation, attachment and perceptual influence. Initiates chant the names of their 'Gods' in their rituals for this very reason.

Vampires of the Woke

Paedophilia is another way that Archons absorb the energy of children. Paedophiles possessed by Archontic consciousness are used as the conduit during sexual abuse for discarnate Archons to vampire the energy of the young they desire so much. Stupendous numbers of children disappear every year never to be seen again although you would never know from the media. Imagine how much low-vibrational energy has been generated by children during the 'Covid' hoax when so many have become depressed and psychologically destroyed to the point of killing themselves. Shocking numbers of children are now taken by the state from loving parents to be handed to others. I can tell you from long experience of researching this since 1996 that many end up with paedophiles and assets of the Cult through corrupt and Cult-owned social services which in the reframing era has hired many psychopaths and emotionless automatons to do the job. Children are even stolen to order using spurious reasons to take them by the corrupt and secret (because they're corrupt) 'family courts'. I have written in detail in other books, starting with *The Biggest Secret* in 1997, about the ubiquitous connections between the political, corporate, government, intelligence and military elites (Cult operatives) and Satanism and paedophilia. If you go deep enough both networks have an interlocking leadership. The Woke mentality has been developed by the Cult for many reasons: To promote almost every aspect of its agenda; to hijack the traditional political left and turn it fascist; to divide and rule; and to target agenda pushbackers. But there are other reasons which relate to what I am describing here. How many happy and joyful Wokers do you ever see especially at the extreme end? They are a mental and psychological mess consumed by emotional stress and constantly emotionally cocked for the next explosion of indignation at someone referring to a female as a female. They are walking, talking, batteries as Morpheus might say emitting frequencies which both enslave them in low-vibrational bubbles of perceptual limitation and feed the Archons. Add to this the hatred claimed to be love; fascism claimed to 'anti-fascism', racism claimed to be 'anti-racism';

exclusion claimed to inclusion; and the abuse-filled Internet trolling. You have a purpose-built Archontic energy system with not a wind turbine in sight and all founded on Archontic *inversion*. We have whole generations now manipulated to serve the Archons with their actions and energy. They will be doing so their entire adult lives unless they snap out of their Archon-induced trance. Is it really a surprise that Cult billionaires and corporations put so much money their way? Where is the energy of joy and laughter, including laughing at yourself which is confirmation of your own emotional security? Mark Twain said: 'The human race has one really effective weapon, and that is laughter.' We must use it all the time. Woke has destroyed comedy because it has no humour, no joy, sense of irony, or self-deprecation. Its energy is dense and intense. *Mmmmm*, lunch says the Archontic frequency. Rudolf Steiner (1861-1925) was the Austrian philosopher and famous esoteric thinker who established Waldorf education or Steiner schools to treat children like unique expressions of consciousness and not minds to be programmed with the perceptions determined by authority. I'd been writing about this energy vampiring for decades when I was sent in 2016 a quote by Steiner. He was spot on:

There are beings in the spiritual realms for whom anxiety and fear emanating from human beings offer welcome food. When humans have no anxiety and fear, then these creatures starve. If fear and anxiety radiates from people and they break out in panic, then these creatures find welcome nutrition and they become more and more powerful. These beings are hostile towards humanity. Everything that feeds on negative feelings, on anxiety, fear and superstition, despair or doubt, are in reality hostile forces in super-sensible worlds, launching cruel attacks on human beings, while they are being fed ... These are exactly the feelings that belong to contemporary culture and materialism; because it estranges people from the spiritual world, it is especially suited to evoke hopelessness and fear of the unknown in people, thereby calling up the above mentioned hostile forces against them.

Pause for a moment from this perspective and reflect on what has happened in the world since the start of 2020. Not only will pennies drop, but billion dollar bills. We see the same theme from Don Juan Matus, a Yaqui Indian shaman in Mexico and the information source for Peruvian-born writer, Carlos Castaneda, who wrote a series of

books from the 1960s to 1990s. Don Juan described the force manipulating human society and his name for the Archons was the predator:

We have a predator that came from the depths of the cosmos and took over the rule of our lives. Human beings are its prisoners. The predator is our lord and master. It has rendered us docile, helpless. If we want to protest, it suppresses our protest. If we want to act independently, it demands that we don't do so ... indeed we are held prisoner!

They took us over because we are food to them, and they squeeze us mercilessly because we are their sustenance. Just as we rear chickens in coops, the predators rear us in human coops, humaneros. Therefore, their food is always available to them.

Different cultures, different eras, same recurring theme.

The 'ennoia' dilemma

Nag Hammadi Gnostic manuscripts say that Archon consciousness has no 'ennoia'. This is directly translated as 'intentionality', but I'll use the term 'creative imagination'. The *All That Is* in awareness of itself is the source of all creativity – all possibility – and the more disconnected you are from that source the more you are subsequently denied 'creative imagination'. Given that Archon consciousness is almost entirely disconnected it severely lacks creativity and has to rely on far more mechanical processes of thought and exploit the creative potential of those that do have 'ennoia'. You can see cases of this throughout human society. Archon consciousness almost entirely dominates the global banking system and if we study how that system works you will appreciate what I mean. Banks manifest 'money' out of nothing by issuing lines of 'credit' which is 'money' that has never, does not, and will never exist except in theory. It's a confidence trick. If you think 'credit' figures-on-a-screen 'money' is worth anything you accept it as payment. If you don't then the whole system collapses through lack of confidence in the value of that 'money'. Archontic bankers with no 'ennoia' are 'lending' 'money' that doesn't exist to humans that *do* have creativity – those that have the inspired ideas and create businesses and products. Archon banking feeds off human creativity

which it controls through 'money' creation and debt. Humans have the creativity and Archons exploit that for their own benefit and control while having none themselves. Archon Internet platforms like Facebook claim joint copyright of everything that creative users post and while Archontic minds like Zuckerberg may officially head that company it will be human creatives on the staff that provide the creative inspiration. When you have limitless 'money' you can then buy other companies established by creative humans. Witness the acquisition record of Facebook, Google and their like. Survey the Archon-controlled music industry and you see non-creative dark suit executives making their fortune from the human creativity of their artists. The cases are endless. Research the history of people like Gates and Zuckerberg and how their empires were built on exploiting the creativity of others. Archon minds cannot create out of nothing, but they are skilled (because they have to be) in what Gnostic texts call 'countermimicry'. They can imitate, but not innovate. Sabbatians trawl the creativity of others through backdoors they install in computer systems through their cybersecurity systems. Archon-controlled China is globally infamous for stealing intellectual property and I remember how Hong Kong, now part of China, became notorious for making counterfeit copies of the creativity of others – 'countermimicry'. With the now pervasive and all-seeing surveillance systems able to infiltrate any computer you can appreciate the potential for Archons to vampire the creativity of humans. Author John Lamb Lash wrote in his book about the Nag Hammadi texts, *Not In His Image*:

Although they cannot originate anything, because they lack the divine factor of ennoia (intentionality), Archons can imitate with a vengeance. Their expertise is simulation (HAL, virtual reality). The Demiurge [Yaldabaoth] fashions a heaven world copied from the fractal patterns [of the original] ... His construction is celestial kitsch, like the fake Italianate villa of a Mafia don complete with militant angels to guard every portal.

This brings us to something that I have been speaking about since the turn of the millennium. Our reality is a simulation; a virtual reality that we think is real. No, I'm not kidding.

Human reality? Well, virtually

I had pondered for years about whether our reality is 'real' or some kind of construct. I remembered being immensely affected on a visit as a small child in the late 1950s to the then newly-opened Planetarium on the Marylebone Road in London which is now closed and part of the adjacent Madame Tussauds wax museum. It was in the middle of the day, but when the lights went out there was the night sky projected in the Planetarium's domed ceiling and it appeared to be so real. The experience never left me and I didn't know why until around the turn of the millennium when I became certain that our 'night sky' and entire reality is a projection, a virtual reality, akin to the illusory world portrayed in the *Matrix* movies. I looked at the sky one day in this period and it appeared to me like the domed roof of the Planetarium. The release of the first *Matrix* movie in 1999 also provided a synchronistic and perfect visual representation of where my mind had been going for a long time. I hadn't come across the Gnostic Nag Hammadi texts then. When I did years later the correlation was once again astounding. As I read Gnostic accounts from 1,600 years and more earlier it was clear that they were describing the same simulation phenomenon. They tell how the Yaldabaoth 'Demiurge' and Archons created a 'bad copy' of original reality to rule over all that were captured by its illusions and the body was a prison to trap consciousness in the 'bad copy' fake reality. Read how Gnostics describe the 'bad copy' and update that to current times and they are referring to what we would call today a virtual reality simulation.

Author John Lamb Lash said 'the Demiurge fashions a heaven world copied from the fractal patterns' of the original through expertise in 'HAL' or virtual reality simulation. Fractal patterns are part of the energetic information construct of our reality, a sort of blueprint. If these patterns were copied in computer terms it would indeed give you a copy of a 'natural' reality in a non-natural frequency and digital form. The principle is the same as making a copy of a website. The original website still exists, but now you can change the copy version to make it whatever you like and it can

become very different to the original website. Archons have done this with our reality, a *synthetic* copy of prime reality that still exists beyond the frequency walls of the simulation. Trapped within the illusions of this synthetic Matrix, however, were and are human consciousness and other expressions of prime reality and this is why the Archons via the Cult are seeking to make the human body synthetic and give us synthetic AI minds to complete the job of turning the entire reality synthetic including what we perceive to be the natural world. To quote Kurzweil: 'Nanobots will infuse all the matter around us with information. Rocks, trees, everything will become these intelligent creatures.' Yes, *synthetic* 'creatures' just as 'Covid' and other genetically-manipulating 'vaccines' are designed to make the human body synthetic. From this perspective it is obvious why Archons and their Cult are so desperate to infuse synthetic material into every human with their 'Covid' scam.

Let there be (electromagnetic) light

Yaldabaoth, the force that created the simulation, or Matrix, makes sense of the Gnostic reference to 'The Great Architect' and its use by Cult Freemasonry as the name of its deity. The designer of the Matrix in the movies is called 'The Architect' and that trilogy is jam-packed with symbolism relating to these subjects. I have contended for years that the angry Old Testament God (Yaldabaoth) is the 'God' being symbolically 'quoted' in the opening of Genesis as 'creating the world'. This is not the creation of prime reality – it's the creation of the *simulation*. The Genesis 'God' says: 'Let there be Light: and there was light.' But what is this 'Light'? I have said for decades that the speed of light (186,000 miles per second) is not the fastest speed possible as claimed by mainstream science and is in fact the frequency walls or outer limits of the Matrix. You can't have a fastest or slowest anything within all possibility when everything is possible. The human body is encoded to operate within the speed of light or *within the simulation* and thus we see only the tiny frequency band of visible *light*. Near-death experiencers who perceive reality outside the body during temporary 'death' describe a very different

form of light and this is supported by the Nag Hammadi texts. Prime reality beyond the simulation ('Upper Aeons' to the Gnostics) is described as a realm of incredible beauty, bliss, love and harmony – a realm of 'watery light' that is so powerful 'there are no shadows'. Our false reality of Archon control, which Gnostics call the 'Lower Aeons', is depicted as a realm with a different kind of 'light' and described in terms of chaos, 'Hell', 'the Abyss' and 'Outer Darkness', where trapped souls are tormented and manipulated by demons (relate that to the 'Covid' hoax alone). The watery light theme can be found in near-death accounts and it is not the same as *simulation* 'light' which is electromagnetic or radiation light within the speed of light – the 'Lower Aeons'. Simulation 'light' is the 'luminous fire' associated by Gnostics with the Archons. The Bible refers to Yaldabaoth as 'that old serpent, called the Devil, and Satan, which deceiveth the whole world' (Revelation 12:9). I think that making a simulated copy of prime reality ('countermimicry') and changing it dramatically while all the time manipulating humanity to believe it to be real could probably meet the criteria of deceiving the whole world. Then we come to the Cult god Lucifer – the *Light Bringer*. Lucifer is symbolic of Yaldabaoth, the bringer of radiation light that forms the bad copy simulation within the speed of light. 'He' is symbolised by the lighted torch held by the Statue of Liberty and in the name 'Illuminati'. Sabbatian-Frankism declares that Lucifer is the true god and Lucifer is the real god of Freemasonry honoured as their 'Great or Grand Architect of the Universe' (simulation).

I would emphasise, too, the way Archontic technologically-generated luminous fire of radiation has deluged our environment since I was a kid in the 1950s and changed the nature of The Field with which we constantly interact. Through that interaction technological radiation is changing us. The Smart Grid is designed to operate with immense levels of communication power with 5G expanding across the world and 6G, 7G, in the process of development. Radiation is the simulation and the Archontic manipulation system. Why wouldn't the Archon Cult wish to unleash radiation upon us to an ever-greater extreme to form

Kurzweil's 'cloud'? The plan for a synthetic human is related to the need to cope with levels of radiation beyond even anything we've seen so far. Biological humans would not survive the scale of radiation they have in their script. The Smart Grid is a technological sub-reality within the technological simulation to further disconnect five-sense perception from expanded consciousness. It's a technological prison of the mind.

Infusing the 'spirit of darkness'

A recurring theme in religion and native cultures is the manipulation of human genetics by a non-human force and most famously recorded as the biblical 'sons of god' (the gods plural in the original) who interbred with the daughters of men. The Nag Hammadi *Apocryphon of John* tells the same story this way:

He [Yaldabaoth] sent his angels [Archons/demons] to the daughters of men, that they might take some of them for themselves and raise offspring for their enjoyment. And at first they did not succeed. When they had no success, they gathered together again and they made a plan together ... And the angels changed themselves in their likeness into the likeness of their mates, filling them with the spirit of darkness, which they had mixed for them, and with evil ... And they took women and begot children out of the darkness according to the likeness of their spirit.

Possession when a discarnate entity takes over a human body is an age-old theme and continues today. It's very real and I've seen it. Satanic and secret society rituals can create an energetic environment in which entities can attach to initiates and I've heard many stories of how people have changed their personality after being initiated even into lower levels of the Freemasons. I have been inside three Freemasonic temples, one at a public open day and two by just walking in when there was no one around to stop me. They were in Ryde, the town where I live, Birmingham, England, when I was with a group, and Boston, Massachusetts. They all felt the same energetically – dark, dense, low-vibrational and sinister. Demonic attachment can happen while the initiate has no idea what is going on. To them it's just a ritual to get in the Masons and do a bit of good

business. In the far more extreme rituals of Satanism human possession is even more powerful and they are designed to make possession possible. The hierarchy of the Cult is dictated by the power and perceived status of the possessing Archon. In this way the Archon hierarchy becomes the Cult hierarchy. Once the entity has attached it can influence perception and behaviour and if it attaches to the extreme then so much of its energy (information) infuses into the body information field that the hologram starts to reflect the nature of the possessing entity. This is the *Exorcist* movie type of possession when facial features change and it's known as shapeshifting. Islam's Jinn are said to be invisible tricksters who change shape, 'whisper', confuse and take human form. These are all traits of the Archons and other versions of the same phenomenon. Extreme possession could certainly infuse the 'spirit of darkness' into a partner during sex as the Nag Hammadi texts appear to describe. Such an infusion can change genetics which is also energetic information. Human genetics is information and the 'spirit of darkness' is information. Mix one with the other and change must happen. Islam has the concept of a 'Jinn baby' through possession of the mother and by Jinn taking human form. There are many ways that human genetics can be changed and remember that Archons have been aware all along of advanced techniques to do this. What is being done in human society today – and far more – was known about by Archons at the time of the 'fallen ones' and their other versions described in religions and cultures.

Archons and their human-world Cult are obsessed with genetics as we see today and they know this dictates how information is processed into perceived reality during a human life. They needed to produce a human form that would decode the simulation and this is symbolically known as 'Adam and Eve' who left the 'garden' (prime reality) and 'fell' into Matrix reality. The simulation is not a 'physical' construct (there is no 'physical'); it is a source of information. Think Wi-Fi again. The simulation is an energetic field encoded with information and body-brain systems are designed to decode that information encoded in wave or frequency form which

is transmitted to the brain as electrical signals. These are decoded by the brain to construct our sense of reality – an illusory ‘physical’ world that only exists in the brain or the mind. Virtual reality games mimic this process using the same sensory decoding system. Information is fed to the senses to decode a virtual reality that can appear so real, but isn’t (Figs 18 and 19). Some scientists believe – and I agree with them – that what we perceive as ‘physical’ reality only exists when we are looking or observing. The act of perception or focus triggers the decoding systems which turn waveform information into holographic reality. When we are not observing something our reality reverts from a holographic state to a waveform state. This relates to the same principle as a falling tree not making a noise unless someone is there to hear it or decode it. The concept makes sense from the simulation perspective. A computer is not decoding all the information in a Wi-Fi field all the time and only decodes or brings into reality on the screen that part of Wi-Fi that it’s decoding – focusing upon – at that moment.



Figure 18: Virtual reality technology ‘hacks’ into the body’s five-sense decoding system.



Figure 19: The result can be experienced as very ‘real’.

Interestingly, Professor Donald Hoffman at the Department of Cognitive Sciences at the University of California, Irvine, says that our experienced reality is like a computer interface that shows us only the level with which we interact while hiding all that exists beyond it: 'Evolution shaped us with a user interface that hides the truth. Nothing that we see is the truth – the very language of space and time and objects is the wrong language to describe reality.' He is correct in what he says on so many levels. Space and time are not a universal reality. They are a phenomenon of decoded *simulation* reality as part of the process of enslaving our sense of reality. Near-death experiencers report again and again how space and time did not exist as we perceive them once they were free of the body – body decoding systems. You can appreciate from this why Archons and their Cult are so desperate to entrap human attention in the five senses where we are in the Matrix and of the Matrix. Opening your mind to expanded states of awareness takes you beyond the information confines of the simulation and you become aware of knowledge and insights denied to you before. This is what we call 'awakening' – *awakening from the Matrix* – and in the final chapter I will relate this to current events.

Where are the 'aliens'?

A simulation would explain the so-called 'Fermi Paradox' named after Italian physicist Enrico Fermi (1901-1954) who created the first nuclear reactor. He considered the question of why there is such a lack of extraterrestrial activity when there are so many stars and planets in an apparently vast universe; but what if the night sky that we see, or think we do, is a simulated projection as I say? If you control the simulation and your aim is to hold humanity fast in essential ignorance would you want other forms of life including advanced life coming and going sharing information with humanity? Or would you want them to believe they were isolated and apparently alone? Themes of human isolation and apartness are common whether they be the perception of a lifeless universe or the fascist isolation laws of the 'Covid' era. Paradoxically the very

existence of a simulation means that we are not alone when some force had to construct it. My view is that experiences that people have reported all over the world for centuries with Reptilians and Grey entities are Archon phenomena as Nag Hammadi texts describe; and that benevolent 'alien' interactions are non-human groups that come in and out of the simulation by overcoming Archon attempts to keep them out. It should be highlighted, too, that Reptilians and Greys are obsessed with *genetics* and *technology* as related by cultural accounts and those who say they have been abducted by them. Technology is their way of overcoming some of the limitations in their creative potential and our technology-driven and controlled human society of today is *archetypical* Archon-Reptilian-Grey modus operandi. Technocracy is really *Archontocracy*. The Universe does not have to be as big as it appears with a simulation. There is no space or distance only information decoded into holographic reality. What we call 'space' is only the absence of holographic 'objects' and that 'space' is The Field of energetic information which connects everything into a single whole. The same applies with the artificially-generated information field of the simulation. The Universe is not big or small as a physical reality. It is decoded information, that's all, and its perceived size is decided by the way the simulation is encoded to make it appear. The entire night sky as we perceive it only exists in our brain and so where are those 'millions of light years'? The 'stars' on the ceiling of the Planetarium looked a vast distance away.

There's another point to mention about 'aliens'. I have been highlighting since the 1990s the plan to stage a fake 'alien invasion' to justify the centralisation of global power and a world military. Nazi scientist Werner von Braun, who was taken to America by Operation Paperclip after World War Two to help found NASA, told his American assistant Dr Carol Rosin about the Cult agenda when he knew he was dying in 1977. Rosin said that he told her about a sequence that would lead to total human control by a one-world government. This included threats from terrorism, rogue nations, meteors and asteroids before finally an 'alien invasion'. All of these

things, von Braun said, would be bogus and what I would refer to as a No-Problem-Reaction-Solution. Keep this in mind when 'the aliens are coming' is the new mantra. The aliens are not coming – they are *already here* and they have infiltrated human society while looking human. French-Canadian investigative journalist Serge Monast said in 1994 that he had uncovered a NASA/military operation called Project Blue Beam which fits with what Werner von Braun predicted. Monast died of a 'heart attack' in 1996 the day after he was arrested and spent a night in prison. He was 51. He said Blue Beam was a plan to stage an alien invasion that would include religious figures beamed holographically into the sky as part of a global manipulation to usher in a 'new age' of worshipping what I would say is the Cult 'god' Yaldabaoth in a one-world religion. Fake holographic asteroids are also said to be part of the plan which again syncs with von Braun. How could you stage an illusory threat from asteroids unless they were holographic inserts? This is pretty straightforward given the advanced technology outside the public arena and the fact that our 'physical' reality is holographic anyway. Information fields would be projected and we would decode them into the illusion of a 'physical' asteroid. If they can sell a global 'pandemic' with a 'virus' that doesn't exist what will humans not believe if government and media tell them?

All this is particularly relevant as I write with the Pentagon planning to release in June, 2021, information about 'UFO sightings'. I have been following the UFO story since the early 1990s and the common theme throughout has been government and military denials and cover up. More recently, however, the Pentagon has suddenly become more talkative and apparently open with Air Force pilot radar images released of unexplained craft moving and changing direction at speeds well beyond anything believed possible with human technology. Then, in March, 2021, former Director of National Intelligence John Ratcliffe said a Pentagon report months later in June would reveal a great deal of information about UFO sightings unknown to the public. He said the report would have 'massive implications'. The order to do this was included bizarrely

in a \$2.3 trillion 'coronavirus' relief and government funding bill passed by the Trump administration at the end of 2020. I would add some serious notes of caution here. I have been pointing out since the 1990s that the US military and intelligence networks have long had craft – 'flying saucers' or anti-gravity craft – which any observer would take to be extraterrestrial in origin. Keeping this knowledge from the public allows craft flown by *humans* to be perceived as alien visitations. I am not saying that 'aliens' do not exist. I would be the last one to say that, but we have to be streetwise here. President Ronald Reagan told the UN General Assembly in 1987: 'I occasionally think how quickly our differences worldwide would vanish if we were facing an alien threat from outside this world.' That's the idea. Unite against a common 'enemy' with a common purpose behind your 'saviour force' (the Cult) as this age-old technique of mass manipulation goes global.

Science moves this way ...

I could find only one other person who was discussing the simulation hypothesis publicly when I concluded it was real. This was Nick Bostrom, a Swedish-born philosopher at the University of Oxford, who has explored for many years the possibility that human reality is a computer simulation although his version and mine are not the same. Today the simulation and holographic reality hypothesis have increasingly entered the scientific mainstream. Well, the more open-minded mainstream, that is. Here are a few of the ever-gathering examples. American nuclear physicist Silas Beane led a team of physicists at the University of Bonn in Germany pursuing the question of whether we live in a simulation. They concluded that we probably do and it was likely based on a lattice of cubes. They found that cosmic rays align with that specific pattern. The team highlighted the Greisen–Zatsepin–Kuzmin (GZK) limit which refers to cosmic ray particle interaction with cosmic background radiation that creates an apparent boundary for cosmic ray particles. They say in a paper entitled 'Constraints on the Universe as a Numerical Simulation' that this 'pattern of constraint' is exactly what you

would find with a computer simulation. They also made the point that a simulation would create its own 'laws of physics' that would limit possibility. I've been making the same point for decades that the *perceived* laws of physics relate only to this reality, or what I would later call the simulation. When designers write codes to create computer and virtual reality games they are the equivalent of the laws of physics for that game. Players interact within the limitations laid out by the coding. In the same way those who wrote the codes for the simulation decided the laws of physics that would apply. These can be overridden by expanded states of consciousness, but not by those enslaved in only five-sense awareness where simulation codes rule. Overriding the codes is what people call 'miracles'. They are not. They are bypassing the encoded limits of the simulation. A population caught in simulation perception would have no idea that this was their plight. As the Bonn paper said: 'Like a prisoner in a pitch-black cell we would not be able to see the "walls" of our prison,' That's true if people remain mesmerised by the five senses. Open to expanded awareness and those walls become very clear. The main one is the speed of light.

American theoretical physicist James Gates is another who has explored the simulation question and found considerable evidence to support the idea. Gates was Professor of Physics at the University of Maryland, Director of The Center for String and Particle Theory, and on Barack Obama's Council of Advisors on Science and Technology. He and his team found *computer codes* of digital data embedded in the fabric of our reality. They relate to on-off electrical charges of 1 and 0 in the binary system used by computers. 'We have no idea what they are doing there', Gates said. They found within the energetic fabric mathematical sequences known as error-correcting codes or block codes that 'reboot' data to its original state or 'default settings' when something knocks it out of sync. Gates was asked if he had found a set of equations embedded in our reality indistinguishable from those that drive search engines and browsers and he said: 'That is correct.' Rich Terrile, director of the Centre for Evolutionary Computation and Automated Design at NASA's Jet

Propulsion Laboratory, has said publicly that he believes the Universe is a digital hologram that must have been created by a form of intelligence. I agree with that in every way. Waveform information is delivered electrically by the senses to the brain which constructs a *digital* holographic reality that we call the 'world'. This digital level of reality can be read by the esoteric art of numerology. Digital holograms are at the cutting edge of holographics today. We have digital technology everywhere designed to access and manipulate our digital level of perceived reality. Synthetic mRNA in 'Covid vaccines' has a digital component to manipulate the body's digital 'operating system'.

Reality is numbers

How many know that our reality can be broken down to numbers and codes that are the same as computer games? Max Tegmark, a physicist at the Massachusetts Institute of Technology (MIT), is the author of *Our Mathematical Universe* in which he lays out how reality can be entirely described by numbers and maths in the way that a video game is encoded with the 'physics' of computer games. Our world and computer virtual reality are essentially the same.

Tegmark imagines the perceptions of characters in an advanced computer game when the graphics are so good they don't know they are in a game. They think they can bump into real objects (electromagnetic resistance in our reality), fall in love and feel emotions like excitement. When they began to study the apparently 'physical world' of the video game they would realise that everything was made of pixels (which have been found in our energetic reality as must be the case when on one level our world is digital). What computer game characters thought was physical 'stuff', Tegmark said, could actually be broken down into numbers:

And we're exactly in this situation in our world. We look around and it doesn't seem that mathematical at all, but everything we see is made out of elementary particles like quarks and electrons. And what properties does an electron have? Does it have a smell or a colour or a texture? No! ... We physicists have come up with geeky names for [Electron] properties, like

electric charge, or spin, or lepton number, but the electron doesn't care what we call it, the properties are just numbers.

This is the illusory reality Gnostics were describing. This is the simulation. The A, C, G, and T codes of DNA have a binary value – A and C = 0 while G and T = 1. This has to be when the simulation is digital and the body must be digital to interact with it. Recurring mathematical sequences are encoded throughout reality and the body. They include the Fibonacci sequence in which the two previous numbers are added to get the next one, as in ... 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, etc. The sequence is encoded in the human face and body, proportions of animals, DNA, seed heads, pine cones, trees, shells, spiral galaxies, hurricanes and the number of petals in a flower. The list goes on and on. There are fractal patterns – a 'never-ending pattern that is infinitely complex and self-similar across all scales in the as above, so below, principle of holograms. These and other famous recurring geometrical and mathematical sequences such as Phi, Pi, Golden Mean, Golden Ratio and Golden Section are *computer codes* of the simulation. I had to laugh and give my head a shake the day I finished this book and it went into the production stage. I was sent an article in *Scientific American* published in April, 2021, with the headline 'Confirmed! We Live in a Simulation'. Two decades after I first said our reality is a simulation and the speed of light is its outer limit the article suggested that we do live in a simulation and that the speed of light is its outer limit. I left school at 15 and never passed a major exam in my life while the writer was up to his eyes in qualifications. As I will explain in the final chapter *knowing* is far better than thinking and they come from very different sources. The article rightly connected the speed of light to the processing speed of the 'Matrix' and said what has been in my books all this time ... 'If we are in a simulation, as it appears, then space is an abstract property written in code. It is not real'. No it's not and if we live in a simulation something created it and it wasn't *us*. 'That David Icke says we are manipulated by aliens' – he's crackers.'

Wow ...

The reality that humanity thinks is so real is an illusion. Politicians, governments, scientists, doctors, academics, law enforcement, media, school and university curriculums, on and on, are all founded on a world that *does not exist* except as a simulated prison cell. Is it such a stretch to accept that 'Covid' doesn't exist when our entire 'physical' reality doesn't exist? Revealed here is the knowledge kept under raps in the Cult networks of compartmentalised secrecy to control humanity's sense of reality by inducing the population to believe in a reality that's not real. If it wasn't so tragic in its experiential consequences the whole thing would be hysterically funny. None of this is new to Renegade Minds. Ancient Greek philosopher Plato (about 428 to about 347BC) was a major influence on Gnostic belief and he described the human plight thousands of years ago with his Allegory of the Cave. He told the symbolic story of prisoners living in a cave who had never been outside. They were chained and could only see one wall of the cave while behind them was a fire that they could not see. Figures walked past the fire casting shadows on the prisoners' wall and those moving shadows became their sense of reality. Some prisoners began to study the shadows and were considered experts on them (today's academics and scientists), but what they studied was only an illusion (today's academics and scientists). A prisoner escaped from the cave and saw reality as it really is. When he returned to report this revelation they didn't believe him, called him mad and threatened to kill him if he tried to set them free. Plato's tale is not only a brilliant analogy of the human plight and our illusory reality. It describes, too, the dynamics of the 'Covid' hoax. I have only skimmed the surface of these subjects here. The aim of this book is to crisply connect all essential dots to put what is happening today into its true context. All subject areas and their connections in this chapter are covered in great evidential detail in *Everything You Need To Know, But Have Never Been Told* and *The Answer*.

They say that bewildered people 'can't see the forest for the trees'. Humanity, however, can't see the forest for the *twigs*. The five senses

see only twigs while Renegade Minds can see the forest and it's the forest where the answers lie with the connections that reveals. Breaking free of perceptual programming so the forest can be seen is the way we turn all this around. Not breaking free is how humanity got into this mess. The situation may seem hopeless, but I promise you it's not. We are a perceptual heartbeat from paradise if only we knew.

CHAPTER TWELVE

Escaping Wetiko

Life is simply a vacation from the infinite

Dean Cavanagh

Renegade Minds weave the web of life and events and see common themes in the apparently random. They are always there if you look for them and their pursuit is aided by incredible synchronicity that comes when your mind is open rather than mesmerised by what it thinks it can see.

Infinite awareness is infinite possibility and the more of infinite possibility that we access the more becomes infinitely possible. That may be stating the apparently obvious, but it is a devastatingly-powerful fact that can set us free. We are a point of attention within an infinity of consciousness. The question is how much of that infinity do we choose to access? How much knowledge, insight, awareness, wisdom, do we want to connect with and explore? If your focus is only in the five senses you will be influenced by a fraction of infinite awareness. I mean a range so tiny that it gives new meaning to infinitesimal. Limitation of self-identity and a sense of the possible limit accordingly your range of consciousness. We are what we think we are. Life is what we think it is. The dream is the dreamer and the dreamer is the dream. Buddhist philosophy puts it this way: 'As a thing is viewed, so it appears.' Most humans live in the realm of touch, taste, see, hear, and smell and that's the limit of their sense of the possible and sense of self. Many will follow a religion and speak of a God in his heaven, but their lives are still

dominated by the five senses in their perceptions and actions. The five senses become the arbiter of everything. When that happens all except a smear of infinity is sealed away from influence by the rigid, unyielding, reality bubbles that are the five-sense human or Phantom Self. Archon Cult methodology is to isolate consciousness within five-sense reality – the simulation – and then program that consciousness with a sense of self and the world through a deluge of life-long information designed to instil the desired perception that allows global control. Efforts to do this have increased dramatically with identity politics as identity bubbles are squeezed into the minutiae of five-sense detail which disconnect people even more profoundly from the infinite 'I'.

Five-sense focus and self-identity are like a firewall that limits access to the infinite realms. You only perceive one radio or television station and no other. We'll take that literally for a moment. Imagine a vast array of stations giving different information and angles on reality, but you only ever listen to one. Here we have the human plight in which the population is overwhelmingly confined to CultFM. This relates only to the frequency range of CultFM and limits perception and insight to that band – limits *possibility* to that band. It means you are connecting with an almost imperceptibly minuscule range of possibility and creative potential within the infinite Field. It's a world where everything seems apart from everything else and where synchronicity is rare. Synchronicity is defined in the dictionary as 'the happening by chance of two or more related or similar events at the same time'. Use of 'by chance' betrays a complete misunderstanding of reality. Synchronicity is not 'by chance'. As people open their minds, or 'awaken' to use the term, they notice more and more coincidences in their lives, bits of 'luck', apparently miraculous happenings that put them in the right place at the right time with the right people. Days become peppered with 'fancy meeting you here' and 'what are the chances of that?' My entire life has been lived like this and ever more so since my own colossal awakening in 1990 and 91 which transformed my sense of reality. Synchronicity is not 'by chance'; it is by accessing expanded

realms of possibility which allow expanded potential for manifestation. People broadcasting the same vibe from the same openness of mind tend to be drawn 'by chance' to each other through what I call frequency magnetism and it's not only people. In the last more than 30 years incredible synchronicity has also led me through the Cult maze to information in so many forms and to crucial personal experiences. These 'coincidences' have allowed me to put the puzzle pieces together across an enormous array of subjects and situations. Those who have breached the bubble of five-sense reality will know exactly what I mean and this escape from the perceptual prison cell is open to everyone whenever they make that choice. This may appear super-human when compared with the limitations of 'human', but it's really our natural state. 'Human' as currently experienced is consciousness in an unnatural state of induced separation from the infinity of the whole. I'll come to how this transformation into unity can be made when I have described in more detail the force that holds humanity in servitude by denying this access to infinite self.

The Wetiko factor

I have been talking and writing for decades about the way five-sense mind is systematically barricaded from expanded awareness. I have used the analogy of a computer (five-sense mind) and someone at the keyboard (expanded awareness). Interaction between the computer and the operator is symbolic of the interaction between five-sense mind and expanded awareness. The computer directly experiences the Internet and the operator experiences the Internet via the computer which is how it's supposed to be – the two working as one. Archons seek to control that point where the operator connects with the computer to stop that interaction ([Fig 20](#)). Now the operator is banging the keyboard and clicking the mouse, but the computer is not responding and this happens when the computer is taken over – *possessed* – by an appropriately-named computer 'virus'. The operator has lost all influence over the computer which goes its own way making decisions under the control of the 'virus'. I have

just described the dynamic through which the force known to Gnostics as Yaldabaoth and Archons disconnects five-sense mind from expanded awareness to imprison humanity in perceptual servitude.

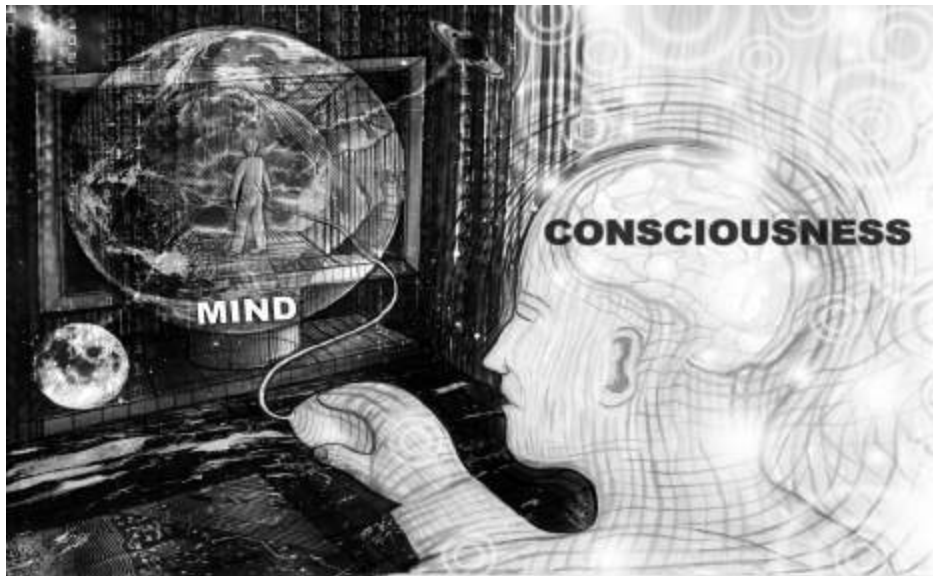


Figure 20: The mind ‘virus’ I have been writing about for decades seeks to isolate five-sense mind (the computer) from the true ‘I’. (Image by Neil Hague).

About a year ago I came across a Native American concept of Wetiko which describes precisely the same phenomenon. Wetiko is the spelling used by the Cree and there are other versions including wintiko and windigo used by other tribal groups. They spell the name with lower case, but I see Wetiko as a proper noun as with Archons and prefer a capital. I first saw an article about Wetiko by writer and researcher Paul Levy which so synced with what I had been writing about the computer/operator disconnection and later the Archons. I then read his book, the fascinating *Dispelling Wetiko, Breaking the Spell of Evil*. The parallels between what I had concluded long before and the Native American concept of Wetiko were so clear and obvious that it was almost funny. For Wetiko see the Gnostic Archons for sure and the Jinn, the Predators, and every other name for a force of evil, inversion and chaos. Wetiko is the Native American name for the force that divides the computer from

the operator (Fig 21). Indigenous author Jack D. Forbes, a founder of the Native American movement in the 1960s, wrote another book about Wetiko entitled *Columbus And Other Cannibals – The Wetiko Disease of Exploitation, Imperialism, and Terrorism* which I also read. Forbes says that Wetiko refers to an evil person or spirit ‘who terrorizes other creatures by means of terrible acts, including cannibalism’. Zulu shaman Credo Mutwa told me that African accounts tell how cannibalism was brought into the world by the Chitauri ‘gods’ – another manifestation of Wetiko. The distinction between ‘evil person or spirit’ relates to Archons/Wetiko possessing a human or acting as pure consciousness. Wetiko is said to be a sickness of the soul or spirit and a state of being that takes but gives nothing back – the Cult and its operatives perfectly described. Black Hawk, a Native American war leader defending their lands from confiscation, said European invaders had ‘poisoned hearts’ – Wetiko hearts – and that this would spread to native societies. Mention of the heart is very significant as we shall shortly see. Forbes writes: ‘Tragically, the history of the world for the past 2,000 years is, in great part, the story of the epidemiology of the wetiko disease.’ Yes, and much longer. Forbes is correct when he says: ‘The wetikos destroyed Egypt and Babylon and Athens and Rome and Tenochtitlan [capital of the Aztec empire] and perhaps now they will destroy the entire earth.’ Evil, he said, is the number one export of a Wetiko culture – see its globalisation with ‘Covid’. Constant war, mass murder, suffering of all kinds, child abuse, Satanism, torture and human sacrifice are all expressions of Wetiko and the Wetiko possessed. The world is Wetiko made manifest, *but it doesn’t have to be*. There is a way out of this even now.



Figure 21: The mind 'virus' is known to Native Americans as 'Wetiko'. (Image by Neil Hague).

Cult of Wetiko

Wetiko is the Yaldabaoth frequency distortion that seeks to attach to human consciousness and absorb it into its own. Once this connection is made Wetiko can drive the perceptions of the target which they believe to be coming from their own mind. All the horrors of history and today from mass killers to Satanists, paedophiles like Jeffrey Epstein and other psychopaths, are the embodiment of Wetiko and express its state of being in all its grotesqueness. The Cult is Wetiko incarnate, Yaldabaoth incarnate, and it seeks to facilitate Wetiko assimilation of humanity in totality into its distortion by manipulating the population into low frequency states that match its own. Paul Levy writes: 'Holographically enforced within the psyche of every human being the wetiko virus pervades and underlies the entire field of consciousness, and can therefore potentially manifest through any one of us at any moment if we are not mindful.' The 'Covid' hoax has achieved this with many people, but others have not fallen into Wetiko's frequency lair. Players in the 'Covid' human catastrophe including Gates, Schwab, Tedros, Fauci, Whitty, Vallance, Johnson, Hancock, Ferguson, Drosten, and all the rest, including the psychopath psychologists, are expressions of Wetiko. This is why

they have no compassion or empathy and no emotional consequence for what they do that would make them stop doing it. Observe all the people who support the psychopaths in authority against the Pushbackers despite the damaging impact the psychopaths have on their own lives and their family's lives. You are again looking at Wetiko possession which prevents them seeing through the lies to the obvious scam going on. *Why can't they see it?* Wetiko won't let them see it. The perceptual divide that has now become a chasm is between the Wetikoed and the non-Wetikoed.

Paul Levy describes Wetiko in the same way that I have long described the Archontic force. They are the same distorted consciousness operating across dimensions of reality: '... the subtle body of wetiko is not located in the third dimension of space and time, literally existing in another dimension ... it is able to affect ordinary lives by mysteriously interpenetrating into our three-dimensional world.' Wetiko does this through its incarnate representatives in the Cult and by weaving itself into The Field which on our level of reality is the electromagnetic information field of the simulation or Matrix. More than that, the simulation *is* Wetiko / Yaldabaoth. Caleb Scharf, Director of Astrobiology at Columbia University, has speculated that 'alien life' could be so advanced that it has transcribed itself into the quantum realm to become what we call physics. He said intelligence indistinguishable from the fabric of the Universe would solve many of its greatest mysteries:

Perhaps hyper-advanced life isn't just external. Perhaps it's already all around. It is embedded in what we perceive to be physics itself, from the root behaviour of particles and fields to the phenomena of complexity and emergence ... In other words, life might not just be in the equations. It might BE the equations [My emphasis].

Scharf said it is possible that 'we don't recognise advanced life because it forms an integral and unsuspecting part of what we've considered to be the natural world'. I agree. Wetiko/Yaldabaoth *is* the simulation. We are literally in the body of the beast. But that doesn't mean it has to control us. We all have the power to overcome Wetiko

influence and the Cult knows that. I doubt it sleeps too well because it knows that.

Which Field?

This, I suggest, is how it all works. There are two Fields. One is the fierce electromagnetic light of the Matrix within the speed of light; the other is the 'watery light' of The Field beyond the walls of the Matrix that connects with the Great Infinity. Five-sense mind and the decoding systems of the body attach us to the Field of Matrix light. They have to or we could not experience this reality. Five-sense mind sees only the Matrix Field of information while our expanded consciousness is part of the Infinity Field. When we open our minds, and most importantly our hearts, to the Infinity Field we have a mission control which gives us an expanded perspective, a road map, to understand the nature of the five-sense world. If we are isolated only in five-sense mind there is no mission control. We're on our own trying to understand a world that's constantly feeding us information to ensure we do not understand. People in this state can feel 'lost' and bewildered with no direction or radar. You can see ever more clearly those who are influenced by the Fields of Big Infinity or little five-sense mind simply by their views and behaviour with regard to the 'Covid' hoax. We have had this division throughout known human history with the mass of the people on one side and individuals who could see and intuit beyond the walls of the simulation – Plato's prisoner who broke out of the cave and saw reality for what it is. Such people have always been targeted by Wetiko/Archon-possessed authority, burned at the stake or demonised as mad, bad and dangerous. The Cult today and its global network of 'anti-hate', 'anti-fascist' Woke groups are all expressions of Wetiko attacking those exposing the conspiracy, 'Covid' lies and the 'vaccine' agenda.

Woke as a whole is Wetiko which explains its black and white mentality and how at one it is with the Wetiko-possessed Cult. Paul Levy said: 'To be in this paradigm is to still be under the thrall of a two-valued logic – where things are either true or false – of a

wetikoized mind.’ Wetiko consciousness is in a permanent rage, therefore so is Woke, and then there is Woke inversion and contradiction. ‘Anti-fascists’ act like fascists because fascists *and* ‘anti-fascists’ are both Wetiko at work. Political parties act the same while claiming to be different for the same reason. Secret society and satanic rituals are attaching initiates to Wetiko and the cold, ruthless, psychopathic mentality that secures the positions of power all over the world is Wetiko. Reframing ‘training programmes’ have the same cumulative effect of attaching Wetiko and we have their graduates described as automatons and robots with a cold, psychopathic, uncaring demeanour. They are all traits of Wetiko possession and look how many times they have been described in this book and elsewhere with regard to personnel behind ‘Covid’ including the police and medical profession. Climbing the greasy pole in any profession in a Wetiko society requires traits of Wetiko to get there and that is particularly true of politics which is not about fair competition and pre-eminence of ideas. It is founded on how many backs you can stab and arses you can lick. This culminated in the global ‘Covid’ coordination between the Wetiko possessed who pulled it off in all the different countries without a trace of empathy and compassion for their impact on humans. Our sight sense can see only holographic form and not the Field which connects holographic form. Therefore we perceive ‘physical’ objects with ‘space’ in between. In fact that ‘space’ is energy/consciousness operating on multiple frequencies. One of them is Wetiko and that connects the Cult psychopaths, those who submit to the psychopaths, and those who serve the psychopaths in the media operations of the world. Wetiko is Gates. Wetiko is the mask-wearing submissive. Wetiko is the fake journalist and ‘fact-checker’. The Wetiko Field is coordinating the whole thing. Psychopaths, gofers, media operatives, ‘anti-hate’ hate groups, ‘fact-checkers’ and submissive people work as one unit *even without human coordination* because they are attached to the *same* Field which is organising it all (Fig 22). Paul Levy is here describing how Wetiko-possessed people are drawn together and refuse to let any information breach their rigid

perceptions. He was writing long before 'Covid', but I think you will recognise followers of the 'Covid' religion *oh just a little bit*:

People who are channelling the vibratory frequency of wetiko align with each other through psychic resonance to reinforce their unspoken shared agreement so as to uphold their deranged view of reality. Once an unconscious content takes possession of certain individuals, it irresistibly draws them together by mutual attraction and knits them into groups tied together by their shared madness that can easily swell into an avalanche of insanity.

A psychic epidemic is a closed system, which is to say that it is insular and not open to any new information or informing influences from the outside world which contradict its fixed, limited, and limiting perspective.

There we have the Woke mind and the 'Covid' mind. Compatible resonance draws the awakening together, too, which is clearly happening today.

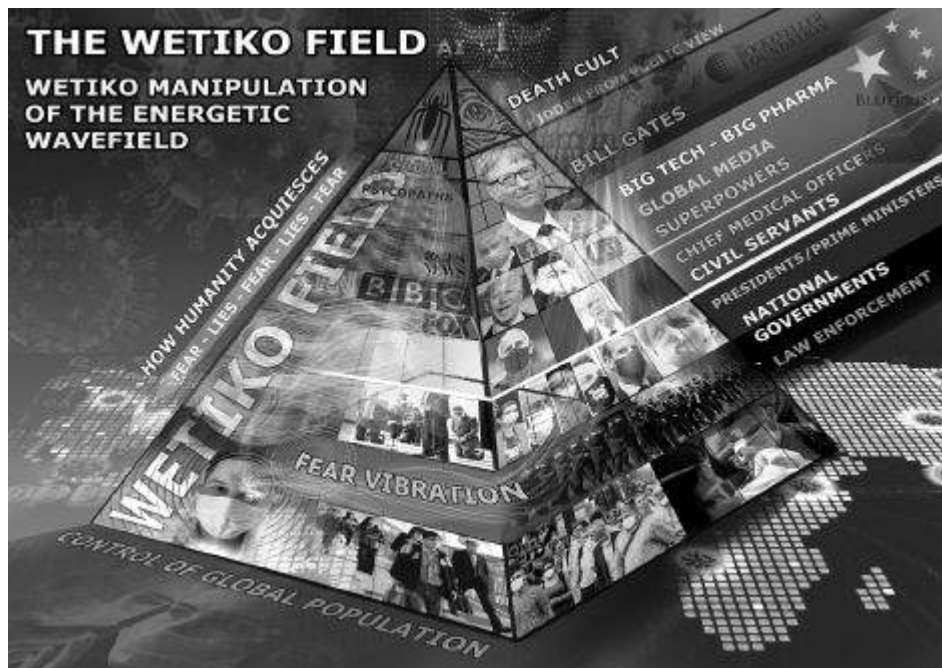


Figure 22: The Wetiko Field from which the Cult pyramid and its personnel are made manifest. (Image by Neil Hague).

Spiritual servitude

Wetiko doesn't care about humans. It's not human; it just possesses humans for its own ends and the effect (depending on the scale of

possession) can be anything from extreme psychopathy to unquestioning obedience. Wetiko's worst nightmare is for human consciousness to expand beyond the simulation. Everything is focussed on stopping that happening through control of information, thus perception, thus frequency. The 'education system', media, science, medicine, academia, are all geared to maintaining humanity in five-sense servitude as is the constant stimulation of low-vibrational mental and emotional states (see 'Covid'). Wetiko seeks to dominate those subconscious spaces between five-sense perception and expanded consciousness where the computer meets the operator. From these subconscious hiding places Wetiko speaks to us to trigger urges and desires that we take to be our own and manipulate us into anything from low-vibrational to psychopathic states. Remember how Islam describes the Jinn as invisible tricksters that 'whisper' and confuse. Wetiko is the origin of the 'trickster god' theme that you find in cultures all over the world. Jinn, like the Archons, are Wetiko which is terrified of humans awakening and reconnecting with our true self for then its energy source has gone. With that the feedback loop breaks between Wetiko and human perception that provides the energetic momentum on which its very existence depends as a force of evil. Humans are both its target and its source of survival, but only if we are operating in low-vibrational states of fear, hate, depression and the background anxiety that most people suffer. We are Wetiko's target because we are its key to survival. It needs us, not the other way round. Paul Levy writes:

A vampire has no intrinsic, independent, substantial existence in its own right; it only exists in relation to us. The pathogenic, vampiric mind-parasite called wetiko is nothing in itself – not being able to exist from its own side – yet it has a 'virtual reality' such that it can potentially destroy our species ...

...The fact that a vampire is not reflected by a mirror can also mean that what we need to see is that there's nothing, no-thing to see, other than ourselves. The fact that wetiko is the expression of something inside of us means that the cure for wetiko is with us as well. The critical issue is finding this cure within us and then putting it into effect.

Evil begets evil because if evil does not constantly expand and find new sources of energetic sustenance its evil, its *distortion*, dies with the assimilation into balance and harmony. Love is the garlic to Wetiko's vampire. Evil, the absence of love, cannot exist in the presence of love. I think I see a way out of here. I have emphasised so many times over the decades that the Archons/Wetiko and their Cult are not all powerful. *They are not*. I don't care how it looks even now *they are not*. I have not called them little boys in short trousers for effect. I have said it because it is true. Wetiko's insatiable desire for power over others is not a sign of its omnipotence, but its insecurity. Paul Levy writes: 'Due to the primal fear which ultimately drives it and which it is driven to cultivate, wetiko's body politic has an intrinsic and insistent need for centralising power and control so as to create imagined safety for itself.' *Yeaaaaees!* Exactly! Why does Wetiko want humans in an ongoing state of fear? Wetiko itself *is* fear and it is petrified of love. As evil is an absence of love, so love is an absence of fear. Love conquers all and *especially* Wetiko which *is* fear. Wetiko brought fear into the world when it wasn't here before. *Fear* was the 'fall', the fall into low-frequency ignorance and illusion – fear is **False Emotion Appearing Real**. The simulation is driven and energised by fear because Wetiko/Yaldabaoth (fear) *are* the simulation. Fear is the absence of love and Wetiko is the absence of love.

Wetiko today

We can now view current events from this level of perspective. The 'Covid' hoax has generated momentous amounts of ongoing fear, anxiety, depression and despair which have empowered Wetiko. No wonder people like Gates have been the instigators when they are Wetiko incarnate and exhibit every trait of Wetiko in the extreme. See how cold and unemotional these people are like Gates and his cronies, how dead of eye they are. That's Wetiko. Sabbatians are Wetiko and everything they control including the World Health Organization, Big Pharma and the 'vaccine' makers, national 'health'

hierarchies, corporate media, Silicon Valley, the banking system, and the United Nations with its planned transformation into world government. All are controlled and possessed by the Wetiko distortion into distorting human society in its image. We are with this knowledge at the gateway to understanding the world. Divisions of race, culture, creed and sexuality are diversions to hide the real division between those possessed and influenced by Wetiko and those that are not. The 'Covid' hoax has brought both clearly into view. Human behaviour is not about race. Tyrants and dictatorships come in all colours and creeds. What unites the US president bombing the innocent and an African tribe committing genocide against another as in Rwanda? What unites them? *Wetiko*. All wars are Wetiko, all genocide is Wetiko, all hunger over centuries in a world of plenty is Wetiko. Children going to bed hungry, including in the West, is Wetiko. Cult-generated Woke racial divisions that focus on the body are designed to obscure the reality that divisions in behaviour are manifestations of mind, not body. Obsession with body identity and group judgement is a means to divert attention from the real source of behaviour – mind and perception. Conflict sown by the Woke both within themselves and with their target groups are Wetiko providing lunch for itself through still more agents of the division, chaos, and fear on which it feeds. The Cult is seeking to assimilate the entirety of humanity and all children and young people into the Wetiko frequency by manipulating them into states of fear and despair. Witness all the suicide and psychological unravelling since the spring of 2020. Wetiko psychopaths want to impose a state of unquestioning obedience to authority which is no more than a conduit for Wetiko to enforce its will and assimilate humanity into itself. It needs us to believe that resistance is futile when it fears resistance and even more so the game-changing non-cooperation with its impositions. It can use violent resistance for its benefit. Violent impositions and violent resistance are *both* Wetiko. The Power of Love with its Power of No will sweep Wetiko from our world. Wetiko and its Cult know that. They just don't want us to know.

AI Wetiko

This brings me to AI or artificial intelligence and something else Wetikos don't want us to know. What is AI *really*? I know about computer code algorithms and AI that learns from data input. These, however, are more diversions, the expeditionary force, for the real AI that they want to connect to the human brain as promoted by Silicon Valley Wetikos like Kurzweil. What is this AI? It is the frequency of *Wetiko*, the frequency of the Archons. The connection of AI to the human brain is the connection of the Wetiko frequency to create a Wetiko hive mind and complete the job of assimilation. The hive mind is planned to be controlled from Israel and China which are both 100 percent owned by Wetiko Sabbatians. The assimilation process has been going on minute by minute in the 'smart' era which fused with the 'Covid' era. We are told that social media is scrambling the minds of the young and changing their personality. This is true, but what is social media? Look more deeply at how it works, how it creates divisions and conflict, the hostility and cruelty, the targeting of people until they are destroyed. That's Wetiko. Social media is manipulated to tune people to the Wetiko frequency with all the emotional exploitation tricks employed by platforms like Facebook and its Wetiko front man, Zuckerberg. Facebook's Instagram announced a new platform for children to overcome a legal bar on them using the main site. This is more Wetiko exploitation and manipulation of kids. Amnesty International likened the plan to foxes offering to guard the henhouse and said it was incompatible with human rights. Since when did Wetiko or Zuckerberg (I repeat myself) care about that? Would Brin and Page at Google, Wojcicki at YouTube, Bezos at Amazon and whoever the hell runs Twitter act as they do if they were not channelling Wetiko? Would those who are developing technologies for no other reason than human control? How about those designing and selling technologies to kill people and Big Pharma drug and 'vaccine' producers who know they will end or devastate lives? Quite a thought for these people to consider is that if you are Wetiko in a human life you are Wetiko on the 'other side' unless your frequency

changes and that can only change by a change of perception which becomes a change of behaviour. Where Gates is going does not bear thinking about although perhaps that's exactly where he wants to go. Either way, that's where he's going. His frequency will make it so.

The frequency lair

I have been saying for a long time that a big part of the addiction to smartphones and devices is that a frequency is coming off them that entraps the mind. People spend ages on their phones and sometimes even a minute or so after they put them down they pick them up again and it all repeats. 'Covid' lockdowns will have increased this addiction a million times for obvious reasons. Addictions to alcohol overindulgence and drugs are another way that Wetiko entraps consciousness to attach to its own. Both are symptoms of low-vibrational psychological distress which alcoholism and drug addiction further compound. Do we think it's really a coincidence that access to them is made so easy while potions that can take people into realms beyond the simulation are banned and illegal? I have explored smartphone addiction in other books, the scale is mind-blowing, and that level of addiction does not come without help. Tech companies that make these phones are Wetiko and they will have no qualms about destroying the minds of children. We are seeing again with these companies the Wetiko perceptual combination of psychopathic enforcers and weak and meek unquestioning compliance by the rank and file.

The global Smart Grid is the Wetiko Grid and it is crucial to complete the Cult endgame. The simulation is radiation and we are being deluged with technological radiation on a devastating scale. Wetiko frauds like Elon Musk serve Cult interests while occasionally criticising them to maintain his street-cred. 5G and other forms of Wi-Fi are being directed at the earth from space on a volume and scale that goes on increasing by the day. Elon Musk's (officially) SpaceX Starlink project is in the process of putting tens of thousands of satellites in low orbit to cover every inch of the planet with 5G and other Wi-Fi to create Kurzweil's global 'cloud' to which the

human mind is planned to be attached very soon. SpaceX has approval to operate 12,000 satellites with more than 1,300 launched at the time of writing and applications filed for 30,000 more. Other operators in the Wi-Fi, 5G, low-orbit satellite market include OneWeb (UK), Telesat (Canada), and AST & Science (US). Musk tells us that AI could be the end of humanity and then launches a company called Neuralink to connect the human brain to computers. Musk's (in theory) Tesla company is building electric cars and the driverless vehicles of the smart control grid. As frauds and bullshitters go Elon Musk in my opinion is Major League.

5G and technological radiation in general are destructive to human health, genetics and psychology and increasing the strength of artificial radiation underpins the five-sense perceptual bubbles which are themselves expressions of radiation or electromagnetism. Freedom activist John Whitehead was so right with his 'databit by databit, we are building our own electronic concentration camps'. The Smart Grid and 5G is a means to control the human mind and infuse perceptual information into The Field to influence anyone in sync with its frequency. You can change perception and behaviour en masse if you can manipulate the population into those levels of frequency and this is happening all around us today. The arrogance of Musk and his fellow Cult operatives knows no bounds in the way that we see with Gates. Musk's satellites are so many in number already they are changing the night sky when viewed from Earth. The astronomy community has complained about this and they have seen nothing yet. Some consequences of Musk's Wetiko hubris include: Radiation; visible pollution of the night sky; interference with astronomy and meteorology; ground and water pollution from intensive use of increasingly many spaceports; accumulating space debris; continual deorbiting and burning up of aging satellites, polluting the atmosphere with toxic dust and smoke; and ever-increasing likelihood of collisions. A collective public open letter of complaint to Musk said:

We are writing to you ... because SpaceX is in process of surrounding the Earth with a network of thousands of satellites whose very purpose is to irradiate every square inch of the

Earth. SpaceX, like everyone else, is treating the radiation as if it were not there. As if the mitochondria in our cells do not depend on electrons moving undisturbed from the food we digest to the oxygen we breathe.

As if our nervous systems and our hearts are not subject to radio frequency interference like any piece of electronic equipment. As if the cancer, diabetes, and heart disease that now afflict a majority of the Earth's population are not metabolic diseases that result from interference with our cellular machinery. As if insects everywhere, and the birds and animals that eat them, are not starving to death as a result.

People like Musk and Gates believe in their limitless Wetiko arrogance that they can do whatever they like to the world because they own it. Consequences for humanity are irrelevant. It's absolutely time that we stopped taking this shit from these self-styled masters of the Earth when you consider where this is going.

Why is the Cult so anti-human?

I hear this question often: Why would they do this when it will affect them, too? Ah, but will it? Who is this *them*? Forget their bodies. They are just vehicles for Wetiko consciousness. When you break it all down to the foundations we are looking at a state of severely distorted consciousness targeting another state of consciousness for assimilation. The rest is detail. The simulation is the fly-trap in which unique sensations of the five senses create a cycle of addiction called reincarnation. Renegade Minds see that everything which happens in our reality is a smaller version of the whole picture in line with the holographic principle. Addiction to the radiation of smart technology is a smaller version of addiction to the whole simulation. Connecting the body/brain to AI is taking that addiction on a giant step further to total ongoing control by assimilating human incarnate consciousness into Wetiko. I have watched during the 'Covid' hoax how many are becoming ever more profoundly attached to Wetiko's perceptual calling cards of aggressive response to any other point of view ('There is no other god but me'), psychopathic lack of compassion and empathy, and servile submission to the narrative and will of authority. Wetiko is the psychopaths *and* subservience to psychopaths. The Cult of Wetiko is

so anti-human because it is *not* human. It embarked on a mission to destroy human by targeting everything that it means to be human and to survive as human. 'Covid' is not the end, just a means to an end. The Cult with its Wetiko consciousness is seeking to change Earth systems, including the atmosphere, to suit them, not humans. The gathering bombardment of 5G alone from ground and space is dramatically changing The Field with which the five senses interact. There is so much more to come if we sit on our hands and hope it will all go away. It is not meant to go away. It is meant to get ever more extreme and we need to face that while we still can – just.

Carbon dioxide is the gas of life. Without that human is over. Kaput, gone, history. No natural world, no human. The Cult has created a cock and bull story about carbon dioxide and climate change to justify its reduction to the point where Gates and the ignoramus Biden 'climate chief' John Kerry want to suck it out of the atmosphere. Kerry wants to do this because his master Gates does. Wetikos have made the gas of life a demon with the usual support from the Wokers of Extinction Rebellion and similar organisations and the bewildered puppet-child that is Greta Thunberg who was put on the world stage by Klaus Schwab and the World Economic Forum. The name Extinction Rebellion is both ironic and as always Wetiko inversion. The gas that we need to survive must be reduced to save us from extinction. The most basic need of human is oxygen and we now have billions walking around in face nappies depriving body and brain of this essential requirement of human existence. More than that 5G at 60 gigahertz interacts with the oxygen molecule to reduce the amount of oxygen the body can absorb into the bloodstream. The obvious knock-on consequences of that for respiratory and cognitive problems and life itself need no further explanation. Psychopaths like Musk are assembling a global system of satellites to deluge the human atmosphere with this insanity. The man should be in jail. Here we have two most basic of human needs, oxygen and carbon dioxide, being dismantled.

Two others, water and food, are getting similar treatment with the United Nations Agendas 21 and 2030 – the Great Reset – planning to

centrally control all water and food supplies. People will not even own rain water that falls on their land. Food is affected at the most basic level by reducing carbon dioxide. We have genetic modification or GMO infiltrating the food chain on a mass scale, pesticides and herbicides polluting the air and destroying the soil. Freshwater fish that provide livelihoods for 60 million people and feed hundreds of millions worldwide are being 'pushed to the brink' according the conservationists while climate change is the only focus. Now we have Gates and Schwab wanting to dispense with current food sources all together and replace them with a synthetic version which the Wetiko Cult would control in terms of production and who eats and who doesn't. We have been on the Totalitarian Tiptoe to this for more than 60 years as food has become ever more processed and full of chemical shite to the point today when it's not natural food at all. As Dr Tom Cowan says: 'If it has a label don't eat it.' Bill Gates is now the biggest owner of farmland in the United States and he does nothing without an ulterior motive involving the Cult. Klaus Schwab wrote: 'To feed the world in the next 50 years we will need to produce as much food as was produced in the last 10,000 years ... food security will only be achieved, however, if regulations on genetically modified foods are adapted to reflect the reality that gene editing offers a precise, efficient and safe method of improving crops.' Liar. People and the world are being targeted with aluminium through vaccines, chemtrails, food, drink cans, and endless other sources when aluminium has been linked to many health issues including dementia which is increasing year after year. Insects, bees and wildlife essential to the food chain are being deleted by pesticides, herbicides and radiation which 5G is dramatically increasing with 6G and 7G to come. The pollinating bee population is being devastated while wildlife including birds, dolphins and whales are having their natural radar blocked by the effects of ever-increasing radiation. In the summer windscreens used to be splattered with insects so numerous were they. It doesn't happen now. Where have they gone?

Synthetic everything

The Cult is introducing genetically-modified versions of trees, plants and insects including a Gates-funded project to unleash hundreds of millions of genetically-modified, lab-altered and patented male mosquitoes to mate with wild mosquitoes and induce genetic flaws that cause them to die out. Clinically-insane Gates-funded Japanese researchers have developed mosquitos that spread vaccine and are dubbed 'flying vaccinators'. Gates is funding the modification of weather patterns in part to sell the myth that this is caused by carbon dioxide and he's funding geoengineering of the skies to change the atmosphere. Some of this came to light with the Gates-backed plan to release tonnes of chalk into the atmosphere to 'deflect the Sun and cool the planet'. Funny how they do this while the heating effect of the Sun is not factored into climate projections focussed on carbon dioxide. The reason is that they want to reduce carbon dioxide (so don't mention the Sun), but at the same time they do want to reduce the impact of the Sun which is so essential to human life and health. I have mentioned the sun-cholesterol-vitamin D connection as they demonise the Sun with warnings about skin cancer (caused by the chemicals in sun cream they tell you to splash on). They come from the other end of the process with statin drugs to reduce cholesterol that turns sunlight into vitamin D. A lack of vitamin D leads to a long list of health effects and how vitamin D levels must have fallen with people confined to their homes over 'Covid'. Gates is funding other forms of geoengineering and most importantly chemtrails which are dropping heavy metals, aluminium and self-replicating nanotechnology onto the Earth which is killing the natural world. See *Everything You Need To Know, But Have Never Been Told* for the detailed background to this.

Every human system is being targeted for deletion by a force that's not human. The Wetiko Cult has embarked on the process of transforming the human body from biological to synthetic biological as I have explained. Biological is being replaced by the artificial and synthetic – Archontic 'countermimicry' – right across human society. The plan eventually is to dispense with the human body altogether

and absorb human consciousness – which it wouldn't really be by then – into cyberspace (the simulation which is Wetiko/Yaldabaoth). Preparations for that are already happening if people would care to look. The alternative media rightly warns about globalism and 'the globalists', but this is far bigger than that and represents the end of the human race as we know it. The 'bad copy' of prime reality that Gnostics describe was a bad copy of harmony, wonder and beauty to start with before Wetiko/Yaldabaoth set out to change the simulated 'copy' into something very different. The process was slow to start with. Entrapped humans in the simulation timeline were not technologically aware and they had to be brought up to intellectual speed while being suppressed spiritually to the point where they could build their own prison while having no idea they were doing so. We have now reached that stage where technological intellect has the potential to destroy us and that's why events are moving so fast. Central American shaman Don Juan Matus said:

Think for a moment, and tell me how you would explain the contradictions between the intelligence of man the engineer and the stupidity of his systems of belief, or the stupidity of his contradictory behaviour. Sorcerers believe that the predators have given us our systems of beliefs, our ideas of good and evil; our social mores. They are the ones who set up our dreams of success or failure. They have given us covetousness, greed, and cowardice. It is the predator who makes us complacent, routinary, and egomaniacal.

In order to keep us obedient and meek and weak, the predators engaged themselves in a stupendous manoeuvre – stupendous, of course, from the point of view of a fighting strategist; a horrendous manoeuvre from the point of those who suffer it. They gave us their mind. The predators' mind is baroque, contradictory, morose, filled with the fear of being discovered any minute now.

For 'predators' see Wetiko, Archons, Yaldabaoth, Jinn, and all the other versions of the same phenomenon in cultures and religions all over the world. The theme is always the same because it's true and it's real. We have reached the point where we have to deal with it. The question is – how?

Don't fight – walk away

I thought I'd use a controversial subheading to get things moving in terms of our response to global fascism. What do you mean 'don't fight'? What do you mean 'walk away'? We've got to fight. We can't walk away. Well, it depends what we mean by fight and walk away. If fighting means physical combat we are playing Wetiko's game and falling for its trap. It wants us to get angry, aggressive, and direct hate and hostility at the enemy we think we must fight. Every war, every battle, every conflict, has been fought with Wetiko leading both sides. It's what it does. Wetiko wants a fight, anywhere, any place. Just hit me, son, so I can hit you back. Wetiko hits Wetiko and Wetiko hits Wetiko in return. I am very forthright as you can see in exposing Wetikos of the Cult, but I don't hate them. I refuse to hate them. It's what they want. What you hate you become. What you *fight* you become. Wokers, 'anti-haters' and 'anti-fascists' prove this every time they reach for their keyboards or don their balaclavas. By walk away I mean to disengage from Wetiko which includes ceasing to cooperate with its tyranny. Paul Levy says of Wetiko:

The way to 'defeat' evil is not to try to destroy it (for then, in playing evil's game, we have already lost), but rather, to find the invulnerable place within ourselves where evil is unable to vanquish us – this is to truly 'win' our battle with evil.

Wetiko is everywhere in human society and it's been on steroids since the 'Covid' hoax. Every shouting match over wearing masks has Wetiko wearing a mask and Wetiko not wearing one. It's an electrical circuit of push and resist, push and resist, with Wetiko pushing *and* resisting. Each polarity is Wetiko empowering itself. Dictionary definitions of 'resist' include 'opposing, refusing to accept or comply with' and the word to focus on is 'opposing'. What form does this take – setting police cars alight or 'refusing to accept or comply with'? The former is Wetiko opposing Wetiko while the other points the way forward. This is the difference between those aggressively demanding that government fascism must be obeyed who stand in stark contrast to the great majority of Pushbackers. We saw this clearly with a march by thousands of Pushbackers against lockdown in London followed days later by a Woker-hijacked

protest in Bristol in which police cars were set on fire. Masks were virtually absent in London and widespread in Bristol. Wetiko wants lockdown on every level of society and infuses its aggression to police it through its unknowing stooges. Lockdown protesters are the ones with the smiling faces and the hugs, The two blatantly obvious states of being – getting more obvious by the day – are the result of Wokers and their like becoming ever more influenced by the simulation Field of Wetiko and Pushbackers ever more influenced by The Field of a far higher vibration beyond the simulation. Wetiko can't invade the heart which is where most lockdown opponents are coming from. It's the heart that allows them to see through the lies to the truth in ways I will be highlighting.

Renegade Minds know that calmness is the place from which wisdom comes. You won't find wisdom in a hissing fit and wisdom is what we need in abundance right now. Calmness is not weakness – you don't have to scream at the top of your voice to be strong. Calmness is indeed a sign of strength. 'No' means I'm not doing it. NOOOO!!! doesn't mean you're not doing it even more. Volume does not advance 'No – I'm not doing it'. You are just not doing it. Wetiko possessed and influenced don't know how to deal with that. Wetiko wants a fight and we should not give it one. What it needs more than anything is our *cooperation* and we should not give that either. Mass rallies and marches are great in that they are a visual representation of feeling, but if it ends there they are irrelevant. You demand that Wetikos act differently? Well, they're not going to are they? They are Wetikos. We don't need to waste our time demanding that something doesn't happen when that will make no difference. We need to delete the means that *allows* it to happen. This, invariably, is our cooperation. You can demand a child stop firing a peashooter at the dog or you can refuse to buy the peashooter. If you provide the means you are cooperating with the dog being smacked on the nose with a pea. How can the authorities enforce mask-wearing if millions in a country refuse? What if the 74 million Pushbackers that voted for Trump in 2020 refused to wear masks, close their businesses or stay in their homes. It would be unenforceable. The

few control the many through the compliance of the many and that's always been the dynamic be it 'Covid' regulations or the Roman Empire. I know people can find it intimidating to say no to authority or stand out in a crowd for being the only one with a face on display; but it has to be done or it's over. I hope I've made clear in this book that where this is going will be far more intimidating than standing up now and saying 'No' – I will not cooperate with my own enslavement and that of my children. There might be consequences for some initially, although not so if enough do the same. The question that must be addressed is what is going to happen if we don't? It is time to be strong and unyieldingly so. No means no. Not here and there, but *everywhere* and *always*. I have refused to wear a mask and obey all the other nonsense. I will not comply with tyranny. I repeat: Fascism is not imposed by fascists – there are never enough of them. Fascism is imposed by the population acquiescing to fascism. *I will not do it*. I will die first, or my body will. Living meekly under fascism is a form of death anyway, the death of the spirit that Martin Luther King described.

Making things happen

We must not despair. This is not over till it's over and it's far from that. The 'fat lady' must refuse to sing. The longer the 'Covid' hoax has dragged on and impacted on more lives we have seen an awakening of phenomenal numbers of people worldwide to the realisation that what they have believed all their lives is not how the world really is. Research published by the system-serving University of Bristol and King's College London in February, 2021, concluded: 'One in every 11 people in Britain say they trust David Icke's take on the coronavirus pandemic.' It will be more by now and we have gathering numbers to build on. We must urgently progress from seeing the scam to ceasing to cooperate with it. Prominent German lawyer Reiner Fuellmich, also licenced to practice law in America, is doing a magnificent job taking the legal route to bring the psychopaths to justice through a second Nuremberg tribunal for crimes against humanity. Fuellmich has an impressive record of

beating the elite in court and he formed the German Corona Investigative Committee to pursue civil charges against the main perpetrators with a view to triggering criminal charges. Most importantly he has grasped the foundation of the hoax – the PCR test not testing for the ‘virus’ – and Christian Drosten is therefore on his charge sheet along with Gates frontman Tedros at the World Health Organization. Major players must not be allowed to inflict their horrors on the human race without being brought to book. A life sentence must follow for Bill Gates and the rest of them. A group of researchers has also indicted the government of Norway for crimes against humanity with copies sent to the police and the International Criminal Court. The lawsuit cites participation in an internationally-planned false pandemic and violation of international law and human rights, the European Commission’s definition of human rights by coercive rules, Nuremberg and Hague rules on fundamental human rights, and the Norwegian constitution. We must take the initiative from hereon and not just complain, protest and react.

There are practical ways to support vital mass non-cooperation. Organising in numbers is one. Lockdown marches in London in the spring in 2021 were mass non-cooperation that the authorities could not stop. There were too many people. Hundreds of thousands walked the London streets in the centre of the road for mile after mile while the Face-Nappies could only look on. They were determined, but calm, and just *did it* with no histrionics and lots of smiles. The police were impotent. Others are organising group shopping without masks for mutual support and imagine if that was happening all over. Policing it would be impossible. If the store refuses to serve people in these circumstances they would be faced with a long line of trolleys full of goods standing on their own and everything would have to be returned to the shelves. How would they cope with that if it kept happening? I am talking here about moving on from complaining to being pro-active; from watching things happen to making things happen. I include in this our relationship with the police. The behaviour of many Face-Nappies

has been disgraceful and anyone who thinks they would never find concentration camp guards in the 'enlightened' modern era have had that myth busted big-time. The period and setting may change – Wetikos never do. I watched film footage from a London march in which a police thug viciously kicked a protestor on the floor who had done nothing. His fellow Face-Nappies stood in a ring protecting him. What he did was a criminal assault and with a crowd far outnumbering the police this can no longer be allowed to happen unchallenged. I get it when people chant 'shame on you' in these circumstances, but that is no longer enough. They *have* no shame those who do this. Crowds needs to start making a citizen's arrest of the police who commit criminal offences and brutally attack innocent people and defenceless women. A citizen's arrest can be made under section 24A of the UK Police and Criminal Evidence (PACE) Act of 1984 and you will find something similar in other countries. I prefer to call it a Common Law arrest rather than citizen's for reasons I will come to shortly. Anyone can arrest a person committing an indictable offence or if they have reasonable grounds to suspect they are committing an indictable offence. On both counts the attack by the police thug would have fallen into this category. A citizen's arrest can be made to stop someone:

- Causing physical injury to himself or any other person
- Suffering physical injury
- Causing loss of or damage to property
- Making off before a constable can assume responsibility for him

A citizen's arrest may also be made to prevent a breach of the peace under Common Law and if they believe a breach of the peace will happen or anything related to harm likely to be done or already done in their presence. This is the way to go I think – the Common Law version. If police know that the crowd and members of the public will no longer be standing and watching while they commit

their thuggery and crimes they will think twice about acting like Brownshirts and Blackshirts.

Common Law – common sense

Mention of Common Law is very important. Most people think the law is the law as in one law. This is not the case. There are two bodies of law, Common Law and Statute Law, and they are not the same. Common Law is founded on the simple premise of do no harm. It does not recognise victimless crimes in which no harm is done while Statute Law does. There is a Statute Law against almost everything. So what is Statute Law? Amazingly it's the law of the *sea* that was brought ashore by the Cult to override the law of the land which is Common Law. They had no right to do this and as always they did it anyway. They had to. They could not impose their will on the people through Common Law which only applies to do no harm. How could you stitch up the fine detail of people's lives with that? Instead they took the law of the sea, or Admiralty Law, and applied it to the population. Statute Law refers to all the laws spewing out of governments and their agencies including all the fascist laws and regulations relating to 'Covid'. The key point to make is that Statute Law is *contract law*. It only applies between *contracting* corporations. Most police officers don't even know this. They have to be kept in the dark, too. Long ago when merchants and their sailing ships began to trade with different countries a contractual law was developed called Admiralty Law and other names. Again it only applied to *contracts* agreed between *corporate* entities. If there is no agreed contract the law of the sea had no jurisdiction *and that still applies to its new alias of Statute Law*. The problem for the Cult when the law of the sea was brought ashore was an obvious one. People were not corporations and neither were government entities. To overcome the latter they made governments and all associated organisations corporations. All the institutions are *private corporations* and I mean governments and their agencies, local councils, police, courts, military, US states, the whole lot. Go to the

Dun and Bradstreet corporate listings website for confirmation that they are all corporations. You are arrested by a private corporation called the police by someone who is really a private security guard and they take you to court which is another private corporation. Neither have jurisdiction over you unless you consent and *contract* with them. This is why you hear the mantra about law enforcement policing by *consent* of the people. In truth the people 'consent' only in theory through monumental trickery.

Okay, the Cult overcame the corporate law problem by making governments and institutions corporate entities; but what about people? They are not corporations are they? Ah ... well in a sense, and *only* a sense, they are. Not people exactly – the illusion of people. The Cult creates a corporation in the name of everyone at the time that their birth certificate is issued. Note birth/ *berth* certificate and when you go to court under the law of the sea on land you stand in a *dock*. These are throwbacks to the origin. My Common Law name is David Vaughan Icke. The name of the corporation created by the government when I was born is called Mr David Vaughan Icke usually written in capitals as MR DAVID VAUGHAN ICKE. That is not me, the living, breathing man. It is a fictitious corporate entity. The trick is to make you think that David Vaughan Icke and MR DAVID VAUGHAN ICKE are the same thing. *They are not*. When police charge you and take you to court they are prosecuting the corporate entity and not the living, breathing, man or woman. They have to trick you into identifying as the corporate entity and contracting with them. Otherwise they have no jurisdiction. They do this through a language known as legalese. Lawful and legal are not the same either. Lawful relates to Common Law and legal relates to Statute Law. Legalese is the language of Statue Law which uses terms that mean one thing to the public and another in legalese. Notice that when a police officer tells someone why they are being charged he or she will say at the end: 'Do you understand?' To the public that means 'Do you comprehend?' In legalese it means 'Do you stand under me?' Do you stand under my authority? If you say

yes to the question you are unknowingly agreeing to give them jurisdiction over you in a contract between two corporate entities.

This is a confidence trick in every way. Contracts have to be agreed between informed parties and if you don't know that David Vaughan Icke is agreeing to be the corporation MR DAVID VAUGHAN ICKE you cannot knowingly agree to contract. They are deceiving you and another way they do this is to ask for proof of identity. You usually show them a driving licence or other document on which your corporate name is written. In doing so you are accepting that you are that corporate entity when you are not. Referring to yourself as a 'person' or 'citizen' is also identifying with your corporate fiction which is why I made the Common Law point about the citizen's arrest. If you are approached by a police officer you identify yourself immediately as a living, breathing, man or woman and say 'I do not consent, I do not contract with you and I do not understand' or stand under their authority. I have a Common Law birth certificate as a living man and these are available at no charge from commonlawcourt.com. Businesses registered under the Statute Law system means that its laws apply. There are, however, ways to run a business under Common Law. Remember all 'Covid' laws and regulations are Statute Law – the law of *contracts* and you do not have to contract. This doesn't mean that you can kill someone and get away with it. Common Law says do no harm and that applies to physical harm, financial harm etc. Police are employees of private corporations and there needs to be a new system of non-corporate Common Law constables operating outside the Statute Law system. If you go to davidicke.com and put Common Law into the search engine you will find videos that explain Common Law in much greater detail. It is definitely a road we should walk.

With all my heart

I have heard people say that we are in a spiritual war. I don't like the term 'war' with its Wetiko dynamic, but I know what they mean. Sweep aside all the bodily forms and we are in a situation in which two states of consciousness are seeking very different realities.

Wetiko wants upheaval, chaos, fear, suffering, conflict and control. The other wants love, peace, harmony, fairness and freedom. That's where we are. We should not fall for the idea that Wetiko is all-powerful and there's nothing we can do. Wetiko is not all-powerful. It's a joke, pathetic. It doesn't have to be, but it has made that choice for now. A handful of times over the years when I have felt the presence of its frequency I have allowed it to attach briefly so I could consciously observe its nature. The experience is not pleasant, the energy is heavy and dark, but the ease with which you can kick it back out the door shows that its real power is in persuading us that it has power. It's all a con. Wetiko is a con. It's a trickster and not a power that can control us if we unleash our own. The con is founded on manipulating humanity to give its power to Wetiko which recycles it back to present the illusion that it has power when its power is *ours* that we gave away. This happens on an energetic level and plays out in the world of the seen as humanity giving its power to Wetiko authority which uses that power to control the population when the power is only the power the population has handed over. How could it be any other way for billions to be controlled by a relative few? I have had experiences with people possessed by Wetiko and again you can kick its arse if you do it with an open heart. Oh yes – the *heart* which can transform the world of perceived 'matter'.

We are receiver-transmitters and processors of information, but what information and where from? Information is processed into perception in three main areas – the brain, the heart and the belly. These relate to thinking, knowing, and emotion. Wetiko wants us to be head and belly people which means we think within the confines of the Matrix simulation and low-vibrational emotional reaction scrambles balance and perception. A few minutes on social media and you see how emotion is the dominant force. Woke is all emotion and is therefore thought-free and fact-free. Our heart is something different. It *knows* while the head *thinks* and has to try to work it out because it doesn't know. The human energy field has seven prime vortexes which connect us with wider reality ([Fig 23](#)). Chakra means

'wheels of light' in the Sanskrit language of ancient India. The main ones are: The crown chakra on top of the head; brow (or 'third eye') chakra in the centre of the forehead; throat chakra; heart chakra in the centre of the chest; solar plexus chakra below the sternum; sacral chakra beneath the navel; and base chakra at the bottom of the spine. Each one has a particular function or functions. We feel anxiety and nervousness in the belly where the sacral chakra is located and this processes emotion that can affect the colon to give people 'the shits' or make them 'shit scared' when they are nervous. Chakras all play an important role, but the Mr and Mrs Big is the heart chakra which sits at the centre of the seven, above the chakras that connect us to the 'physical' and below those that connect with higher realms (or at least should). Here in the heart chakra we feel love, empathy and compassion – 'My heart goes out to you'. Those with closed hearts become literally 'heart-less' in their attitudes and behaviour (see Bill Gates). Native Americans portrayed Wetiko with what Paul Levy calls a 'frigid, icy heart, devoid of mercy' (see Bill Gates).



Figure 23: The chakra system which interpenetrates the human energy field. The heart chakra is the governor – or should be.

Wetiko trembles at the thought of heart energy which it cannot infiltrate. The frequency is too high. What it seeks to do instead is close the heart chakra vortex to block its perceptual and energetic influence. Psychopaths have 'hearts of stone' and emotionally-damaged people have 'heartache' and 'broken hearts'. The astonishing amount of heart disease is related to heart chakra

disruption with its fundamental connection to the 'physical' heart. Dr Tom Cowan has written an outstanding book challenging the belief that the heart is a pump and making the connection between the 'physical' and spiritual heart. Rudolph Steiner who was way ahead of his time said the same about the fallacy that the heart is a pump. *What?* The heart is not a pump? That's crazy, right? Everybody knows that. Read Cowan's *Human Heart, Cosmic Heart* and you will realise that the very idea of the heart as a pump is ridiculous when you see the evidence. How does blood in the feet so far from the heart get pumped horizontally up the body by the heart?? Cowan explains in the book the real reason why blood moves as it does. Our 'physical' heart is used to symbolise love when the source is really the heart vortex or spiritual heart which is our most powerful energetic connection to 'out there' expanded consciousness. That's why we feel *knowing* – intuitive knowing – in the centre of the chest. Knowing doesn't come from a process of thoughts leading to a conclusion. It is there in an instant all in one go. Our heart knows because of its connection to levels of awareness that *do* know. This is the meaning and source of intuition – intuitive *knowing*.

For the last more than 30 years of uncovering the global game and the nature of reality my heart has been my constant antenna for truth and accuracy. An American intelligence insider once said that I had quoted a disinformant in one of my books and yet I had only quoted the part that was true. He asked: 'How do you do that?' By using my heart antenna was the answer and anyone can do it. Heart-centred is how we are meant to be. With a closed heart chakra we withdraw into a closed mind and the bubble of five-sense reality. If you take a moment to focus your attention on the centre of your chest, picture a spinning wheel of light and see it opening and expanding. You will feel it happening, too, and perceptions of the heart like joy and love as the heart impacts on the mind as they interact. The more the chakra opens the more you will feel expressions of heart consciousness and as the process continues, and becomes part of you, insights and knowings will follow. An open

heart is connected to that level of awareness that knows all is *One*. You will see from its perspective that the fault-lines that divide us are only illusions to control us. An open heart does not process the illusions of race, creed and sexuality except as brief experiences for a consciousness that is all. Our heart does not see division, only unity (Figs 24 and 25). There's something else, too. Our hearts love to laugh. Mark Twain's quote that says 'The human race has one really effective weapon, and that is laughter' is really a reference to the heart which loves to laugh with the joy of knowing the true nature of infinite reality and that all the madness of human society is an illusion of the mind. Twain also said: 'Against the assault of laughter nothing can stand.' This is so true of Wetiko and the Cult. Their insecurity demands that they be taken seriously and their power and authority acknowledged and feared. We should do nothing of the sort. We should not get aggressive or fearful which their insecurity so desires. We should laugh in their face. Even in their no-face as police come over in their face-nappies and expect to be taken seriously. They don't take themselves seriously looking like that so why should we? Laugh in the face of intimidation. Laugh in the face of tyranny. You will see by its reaction that you have pressed all of its buttons. Wetiko does not know what to do in the face of laughter or when its targets refuse to concede their joy to fear. We have seen many examples during the 'Covid' hoax when people have expressed their energetic power and the string puppets of Wetiko retreat with their tail limp between their knees. Laugh – the world is bloody mad after all and if it's a choice between laughter and tears I know which way I'm going.



Figure 24: Head consciousness without the heart sees division and everything apart from everything else.



Figure 25: Heart consciousness sees everything as One.

'Vaccines' and the soul

The foundation of Wetiko/Archon control of humans is the separation of incarnate five-sense mind from the infinite 'I' and closing the heart chakra where the True 'I' lives during a human life. The goal has been to achieve complete separation in both cases. I was interested therefore to read an account by a French energetic healer of what she said she experienced with a patient who had been given the 'Covid' vaccine. Genuine energy healers can sense information and consciousness fields at different levels of being which are referred to as 'subtle bodies'. She described treating the patient who later returned after having, without the healer's knowledge, two doses of the 'Covid vaccine'. The healer said:

I noticed immediately the change, very heavy energy emanating from [the] subtle bodies. The scariest thing was when I was working on the heart chakra, I connected with her soul: it was detached from the physical body, it had no contact and it was, as if it was floating in a state of total confusion: a damage to the consciousness that loses contact with the physical body, i.e. with our biological machine, there is no longer any communication between them.

I continued the treatment by sending light to the heart chakra, the soul of the person, but it seemed that the soul could no longer receive any light, frequency or energy. It was a very powerful experience for me. Then I understood that this substance is indeed used to detach consciousness so that this consciousness can no longer interact through this body that it possesses in life, where there is no longer any contact, no frequency, no light, no more energetic balance or mind.

This would create a human that is rudderless and at the extreme almost zombie-like operating with a fractional state of consciousness at the mercy of Wetiko. I was especially intrigued by what the healer said in the light of the prediction by the highly-informed Rudolf Steiner more than a hundred years ago. He said:

In the future, we will eliminate the soul with medicine. Under the pretext of a 'healthy point of view', there will be a vaccine by which the human body will be treated as soon as possible directly at birth, so that the human being cannot develop the thought of the existence of soul and Spirit. To materialistic doctors will be entrusted the task of removing the soul of humanity.

As today, people are vaccinated against this disease or that disease, so in the future, children will be vaccinated with a substance that can be produced precisely in such a way that people, thanks to this vaccination, will be immune to being subjected to the 'madness' of spiritual life. He would be extremely smart, but he would not develop a conscience, and that is the true goal of some materialistic circles.

Steiner said the vaccine would detach the physical body from the etheric body (subtle bodies) and 'once the etheric body is detached the relationship between the universe and the etheric body would become extremely unstable, and man would become an automaton'. He said 'the physical body of man must be polished on this Earth by spiritual will – so the vaccine becomes a kind of arymanique (Wetiko) force' and 'man can no longer get rid of a given materialistic feeling'. Humans would then, he said, become 'materialistic of constitution and can no longer rise to the spiritual'. I have been writing for years about DNA being a receiver-transmitter of information that connects us to other levels of reality and these 'vaccines' changing DNA can be likened to changing an antenna and what it can transmit and receive. Such a disconnection would clearly lead to changes in personality and perception. Steiner further predicted the arrival of AI. Big Pharma 'Covid vaccine' makers, expressions of Wetiko, are testing their DNA-manipulating evil on children as I write with a view to giving the 'vaccine' to babies. If it's a soul-body disconnecter – and I say that it is or can be – every child would be disconnected from 'soul' at birth and the 'vaccine' would create a closed system in which spiritual guidance from the greater self would play no part. This has been the ambition of Wetiko all

along. A Pentagon video from 2005 was leaked of a presentation explaining the development of vaccines to change behaviour by their effect on the brain. Those that believe this is not happening with the 'Covid' genetically-modifying procedure masquerading as a 'vaccine' should make an urgent appointment with Naivety Anonymous. Klaus Schwab wrote in 2018:

Neurotechnologies enable us to better influence consciousness and thought and to understand many activities of the brain. They include decoding what we are thinking in fine levels of detail through new chemicals and interventions that can influence our brains to correct for errors or enhance functionality.

The plan is clear and only the heart can stop it. With every heart that opens, every mind that awakens, Wetiko is weakened. Heart and love are far more powerful than head and hate and so nothing like a majority is needed to turn this around.

Beyond the Phantom

Our heart is the prime target of Wetiko and so it must be the answer to Wetiko. We *are* our heart which is part of one heart, the infinite heart. Our heart is where the true self lives in a human life behind firewalls of five-sense illusion when an imposter takes its place – *Phantom Self*; but our heart waits patiently to be set free any time we choose to see beyond the Phantom, beyond Wetiko. A Wetikoed Phantom Self can wreak mass death and destruction while the love of forever is locked away in its heart. The time is here to unleash its power and let it sweep away the fear and despair that is Wetiko. Heart consciousness does not seek manipulated, censored, advantage for its belief or religion, its activism and desires. As an expression of the One it treats all as One with the same rights to freedom and opinion. Our heart demands fairness for itself no more than for others. From this unity of heart we can come together in mutual support and transform this Wetikoed world into what reality is meant to be – a place of love, joy, happiness, fairness, justice and freedom. Wetiko has another agenda and that's why the world is as

it is, but enough of this nonsense. Wetiko can't stay where hearts are open and it works so hard to keep them closed. Fear is its currency and its food source and love in its true sense has no fear. Why would love have fear when it knows it is *All That Is, Has Been, And Ever Can Be* on an eternal exploration of all possibility? Love in this true sense is not the physical attraction that passes for love. This can be an expression of it, yes, but Infinite Love, a love without condition, goes far deeper to the core of all being. It *is* the core of all being. Infinite reality was born from love beyond the illusions of the simulation. Love infinitely expressed is the knowing that all is One and the swiftly-passing experience of separation is a temporary hallucination. You cannot disconnect from Oneness; you can only *perceive* that you have and withdraw from its influence. This is the most important of all perception trickery by the mind parasite that is Wetiko and the foundation of all its potential for manipulation.

If we open our hearts, open the sluice gates of the mind, and redefine self-identity amazing things start to happen. Consciousness expands or contracts in accordance with self-identity. When true self is recognised as infinite awareness and label self – Phantom Self – is seen as only a series of brief experiences life is transformed. Consciousness expands to the extent that self-identity expands and everything changes. You see unity, not division, the picture, not the pixels. From this we can play the long game. No more is an experience something in and of itself, but a fleeting moment in the eternity of forever. Suddenly people in uniform and dark suits are no longer intimidating. Doing what your heart knows to be right is no longer intimidating and consequences for those actions take on the same nature of a brief experience that passes in the blink of an infinite eye. Intimidation is all in the mind. Beyond the mind there is no intimidation.

An open heart does not consider consequences for what it knows to be right. To do so would be to consider not doing what it knows to be right and for a heart in its power that is never an option. The Renegade Mind is really the Renegade Heart. Consideration of consequences will always provide a getaway car for the mind and

the heart doesn't want one. What is right in the light of what we face today is to stop cooperating with Wetiko in all its forms and to do it without fear or compromise. You cannot compromise with tyranny when tyranny always demands more until it has everything. Life is your perception and you are your destiny. Change your perception and you change your life. Change collective perception and we change the world.

Come on people ... One human family, One heart, One goal ...
FREEEEEEEDOM!

We must settle for nothing less.

Postscript

The big scare story as the book goes to press is the 'Indian' variant and the world is being deluged with propaganda about the 'Covid catastrophe' in India which mirrors in its lies and misrepresentations what happened in Italy before the first lockdown in 2020.

The *New York Post* published a picture of someone who had 'collapsed in the street from Covid' in India in April, 2021, which was actually taken during a gas leak in May, 2020. Same old, same old. Media articles in mid-February were asking why India had been so untouched by 'Covid' and then as their vaccine rollout gathered pace the alleged 'cases' began to rapidly increase. Indian 'Covid vaccine' maker Bharat Biotech was funded into existence by the Bill and Melinda Gates Foundation (the pair announced their divorce in May, 2021, which is a pity because they so deserve each other). The Indian 'Covid crisis' was ramped up by the media to terrify the world and prepare people for submission to still more restrictions. The scam that worked the first time was being repeated only with far more people seeing through the deceit. Davidicke.com and Ickonic.com have sought to tell the true story of what is happening by talking to people living through the Indian nightmare which has nothing to do with 'Covid'. We posted a letter from 'Alisha' in Pune who told a very different story to government and media mendacity. She said scenes of dying people and overwhelmed hospitals were designed to hide what was really happening – genocide and starvation. Alisha said that millions had already died of starvation during the ongoing lockdowns while government and media were lying and making it look like the 'virus':

Restaurants, shops, gyms, theatres, basically everything is shut. The cities are ghost towns. Even so-called 'essential' businesses are only open till 11am in the morning. You basically have just an hour to buy food and then your time is up.

Inter-state travel and even inter-district travel is banned. The cops wait at all major crossroads to question why you are traveling outdoors or to fine you if you are not wearing a mask.

The medical community here is also complicit in genocide, lying about hospitals being full and turning away people with genuine illnesses, who need immediate care. They have even created a shortage of oxygen cylinders.

This is the classic Cult modus operandi played out in every country. Alisha said that people who would not have a PCR test not testing for the 'virus' were being denied hospital treatment. She said the people hit hardest were migrant workers and those in rural areas. Most businesses employed migrant workers and with everything closed there were no jobs, no income and no food. As a result millions were dying of starvation or malnutrition. All this was happening under Prime Minister Narendra Modi, a 100-percent asset of the Cult, and it emphasises yet again the scale of pure anti-human evil we are dealing with. Australia banned its people from returning home from India with penalties for trying to do so of up to five years in jail and a fine of £37,000. The manufactured 'Covid' crisis in India was being prepared to justify further fascism in the West. Obvious connections could be seen between the Indian 'vaccine' programme and increased 'cases' and this became a common theme. The Seychelles, the most per capita 'Covid vaccinated' population in the world, went back into lockdown after a 'surge of cases'.

Long ago the truly evil Monsanto agricultural biotechnology corporation with its big connections to Bill Gates devastated Indian farming with genetically-modified crops. Human rights activist Gurcharan Singh highlighted the efforts by the Indian government to complete the job by destroying the food supply to hundreds of millions with 'Covid' lockdowns. He said that 415 million people at the bottom of the disgusting caste system (still going whatever they say) were below the poverty line and struggled to feed themselves every year. Now the government was imposing lockdown at just the

time to destroy the harvest. This deliberate policy was leading to mass starvation. People may reel back at the suggestion that a government would do that, but Wetiko-controlled 'leaders' are capable of any level of evil. In fact what is described in India is in the process of being instigated worldwide. The food chain and food supply are being targeted at every level to cause world hunger and thus control. Bill Gates is not the biggest owner of farmland in America for no reason and destroying access to food aids both the depopulation agenda and the plan for synthetic 'food' already being funded into existence by Gates. Add to this the coming hyper-inflation from the suicidal creation of fake 'money' in response to 'Covid' and the breakdown of container shipping systems and you have a cocktail that can only lead one way and is meant to. The Cult plan is to crash the entire system to 'build back better' with the Great Reset.

'Vaccine' transmission

Reports from all over the world continue to emerge of women suffering menstrual and fertility problems after having the fake 'vaccine' and of the non-'vaccinated' having similar problems when interacting with the 'vaccinated'. There are far too many for 'coincidence' to be credible. We've had menopausal women getting periods, others having periods stop or not stopping for weeks, passing clots, sometimes the lining of the uterus, breast irregularities, and miscarriages (which increased by 400 percent in parts of the United States). Non-'vaccinated' men and children have suffered blood clots and nose bleeding after interaction with the 'vaccinated'. Babies have died from the effects of breast milk from a 'vaccinated' mother. Awake doctors – the small minority – speculated on the cause of non-'vaccinated' suffering the same effects as the 'vaccinated'. Was it nanotechnology in the synthetic substance transmitting frequencies or was it a straight chemical bioweapon that was being transmitted between people? I am not saying that some kind of chemical transmission is not one possible answer, but the foundation of all that the Cult does is frequency and

this is fertile ground for understanding how transmission can happen. American doctor Carrie Madej, an internal medicine physician and osteopath, has been practicing for the last 20 years, teaching medical students, and she says attending different meetings where the agenda for humanity was discussed. Madej, who operates out of Georgia, did not dismiss other possible forms of transmission, but she focused on frequency in search of an explanation for transmission. She said the Moderna and Pfizer 'vaccines' contained nano-lipid particles as a key component. This was a brand new technology never before used on humanity. 'They're using a nanotechnology which is pretty much little tiny computer bits ... nanobots or hydrogel.' Inside the 'vaccines' was 'this sci-fi kind of substance' which suppressed immune checkpoints to get into the cell. I referred to this earlier as the 'Trojan horse' technique that tricks the cell into opening a gateway for the self-replicating synthetic material and while the immune system is artificially suppressed the body has no defences. Madej said the substance served many purposes including an on-demand ability to 'deliver the payload' and using the nano 'computer bits' as biosensors in the body. 'It actually has the ability to accumulate data from your body, like your breathing, your respiration, thoughts, emotions, all kinds of things.'

She said the technology obviously has the ability to operate through Wi-Fi and transmit and receive energy, messages, frequencies or impulses. 'Just imagine you're getting this new substance in you and it can react to things all around you, the 5G, your smart device, your phones.' We had something completely foreign in the human body that had never been launched large scale at a time when we were seeing 5G going into schools and hospitals (plus the Musk satellites) and she believed the 'vaccine' transmission had something to do with this: '... if these people have this inside of them ... it can act like an antenna and actually transmit it outwardly as well.' The synthetic substance produced its own voltage and so it could have that kind of effect. This fits with my own contention that the nano receiver-transmitters are designed to connect people to the

Smart Grid and break the receiver-transmitter connection to expanded consciousness. That would explain the French energy healer's experience of the disconnection of body from 'soul' with those who have had the 'vaccine'. The nanobots, self-replicating inside the body, would also transmit the synthetic frequency which could be picked up through close interaction by those who have not been 'vaccinated'. Madej speculated that perhaps it was 5G and increased levels of other radiation that was causing the symptoms directly although interestingly she said that non-'vaccinated' patients had shown improvement when they were away from the 'vaccinated' person they had interacted with. It must be remembered that you can control frequency and energy with your mind and you can consciously create energetic barriers or bubbles with the mind to stop damaging frequencies from penetrating your field. American paediatrician Dr Larry Palevsky said the 'vaccine' was not a 'vaccine' and was never designed to protect from a 'viral' infection. He called it 'a massive, brilliant propaganda of genocide' because they didn't have to inject everyone to get the result they wanted. He said the content of the jabs was able to infuse any material into the brain, heart, lungs, kidneys, liver, sperm and female productive system. 'This is genocide; this is a weapon of mass destruction.' At the same time American colleges were banning students from attending if they didn't have this life-changing and potentially life-ending 'vaccine'. Class action lawsuits must follow when the consequences of this college fascism come to light. As the book was going to press came reports about fertility effects on sperm in 'vaccinated' men which would absolutely fit with what I have been saying and hospitals continued to fill with 'vaccine' reactions. Another question is what about transmission via blood transfusions? The NHS has extended blood donation restrictions from seven days after a 'Covid vaccination' to 28 days after even a sore arm reaction.

I said in the spring of 2020 that the then touted 'Covid vaccine' would be ongoing each year like the flu jab. A year later Pfizer CEO, the appalling Albert Bourla, said people would 'likely' need a 'booster dose' of the 'vaccine' within 12 months of getting 'fully

vaccinated' and then a yearly shot. 'Variants will play a key role', he said confirming the point. Johnson & Johnson CEO Alex Gorsky also took time out from his 'vaccine' disaster to say that people may need to be vaccinated against 'Covid-19' each year. UK Health Secretary, the psychopath Matt Hancock, said additional 'boosters' would be available in the autumn of 2021. This is the trap of the 'vaccine passport'. The public will have to accept every last 'vaccine' they introduce, including for the fake 'variants', or it would cease to be valid. The only other way in some cases would be continuous testing with a test not testing for the 'virus' and what is on the swabs constantly pushed up your nose towards the brain every time?

'Vaccines' changing behaviour

I mentioned in the body of the book how I believed we would see gathering behaviour changes in the 'vaccinated' and I am already hearing such comments from the non-'vaccinated' describing behaviour changes in friends, loved ones and work colleagues. This will only increase as the self-replicating synthetic material and nanoparticles expand in body and brain. An article in the *Guardian* in 2016 detailed research at the University of Virginia in Charlottesville which developed a new method for controlling brain circuits associated with complex animal behaviour. The method, dubbed 'magnetogenetics', involves genetically-engineering a protein called ferritin, which stores and releases iron, to create a magnetised substance – 'Magneto' – that can activate specific groups of nerve cells from a distance. This is claimed to be an advance on other methods of brain activity manipulation known as optogenetics and chemogenetics (the Cult has been developing methods of brain control for a long time). The ferritin technique is said to be non-invasive and able to activate neurons 'rapidly and reversibly'. In other words, human thought and perception. The article said that earlier studies revealed how nerve cell proteins 'activated by heat and mechanical pressure can be genetically engineered so that they become sensitive to radio waves and magnetic fields, by attaching them to an iron-storing protein called ferritin, or to inorganic

paramagnetic particles'. Sensitive to radio waves and magnetic fields? You mean like 5G, 6G and 7G? This is the human-AI Smart Grid hive mind we are talking about. The *Guardian* article said:

... the researchers injected Magneto into the striatum of freely behaving mice, a deep brain structure containing dopamine-producing neurons that are involved in reward and motivation, and then placed the animals into an apparatus split into magnetised and non-magnetised sections.

Mice expressing Magneto spent far more time in the magnetised areas than mice that did not, because activation of the protein caused the striatal neurons expressing it to release dopamine, so that the mice found being in those areas rewarding. This shows that Magneto can remotely control the firing of neurons deep within the brain, and also control complex behaviours.

Make no mistake this basic methodology will be part of the 'Covid vaccine' cocktail and using magnetics to change brain function through electromagnetic field frequency activation. The Pentagon is developing a 'Covid vaccine' using ferritin. Magnetism would explain changes in behaviour and why videos are appearing across the Internet as I write showing how magnets stick to the skin at the point of the 'vaccine' shot. Once people take these 'vaccines' anything becomes possible in terms of brain function and illness which will be blamed on 'Covid-19' and 'variants'. Magnetic field manipulation would further explain why the non-'vaccinated' are reporting the same symptoms as the 'vaccinated' they interact with and why those symptoms are reported to decrease when not in their company. Interestingly 'Magneto', a 'mutant', is a character in the Marvel Comic *X-Men* stories with the ability to manipulate magnetic fields and he believes that mutants should fight back against their human oppressors by any means necessary. The character was born Erik Lehnsherr to a Jewish family in Germany.

Cult-controlled courts

The European Court of Human Rights opened the door for mandatory 'Covid-19 vaccines' across the continent when it ruled in a Czech Republic dispute over childhood immunisation that legally

enforced vaccination could be 'necessary in a democratic society'. The 17 judges decided that compulsory vaccinations did not breach human rights law. On the face of it the judgement was so inverted you gasp for air. If not having a vaccine infused into your body is not a human right then what is? Ah, but they said human rights law which has been specifically written to delete all human rights at the behest of the state (the Cult). Article 8 of the European Convention on Human Rights relates to the right to a private life. The crucial word here is *'except'*:

There shall be no interference by a public authority with the exercise of this right EXCEPT such as is in accordance with the law and is necessary in a democratic society in the interests of national security, public safety or the economic wellbeing of the country, for the prevention of disorder or crime, for the protection of health or morals, or for the protection of the rights and freedoms of others [My emphasis].

No interference *except* in accordance with the law means there *are* no 'human rights' *except* what EU governments decide you can have at their behest. 'As is necessary in a democratic society' explains that reference in the judgement and 'in the interests of national security, public safety or the economic well-being of the country, for the prevention of disorder or crime, for the protection of health or morals, or for the protection of the rights and freedoms of others' gives the EU a coach and horses to ride through 'human rights' and scatter them in all directions. The judiciary is not a check and balance on government extremism; it is a vehicle to enforce it. This judgement was almost laughably predictable when the last thing the Cult wanted was a decision that went against mandatory vaccination. Judges rule over and over again to benefit the system of which they are a part. Vaccination disputes that come before them are invariably delivered in favour of doctors and authorities representing the view of the state which owns the judiciary. Oh, yes, and we have even had calls to stop putting 'Covid-19' on death certificates within 28 days of a 'positive test' because it is claimed the practice makes the 'vaccine' appear not to work. They are laughing at you.

The scale of madness, inhumanity and things to come was highlighted when those not 'vaccinated' for 'Covid' were refused evacuation from the Caribbean island of St Vincent during massive volcanic eruptions. Cruise ships taking residents to the safety of another island allowed only the 'vaccinated' to board and the rest were left to their fate. Even in life and death situations like this we see 'Covid' stripping people of their most basic human instincts and the insanity is even more extreme when you think that fake 'vaccine'-makers are not even claiming their body-manipulating concoctions stop 'infection' and 'transmission' of a 'virus' that doesn't exist. St Vincent Prime Minister Ralph Gonsalves said: 'The chief medical officer will be identifying the persons already vaccinated so that we can get them on the ship.' Note again the power of the chief medical officer who, like Whitty in the UK, will be answering to the World Health Organization. This is the Cult network structure that has overridden politicians who 'follow the science' which means doing what WHO-controlled 'medical officers' and 'science advisers' tell them. Gonsalves even said that residents who were 'vaccinated' after the order so they could board the ships would still be refused entry due to possible side effects such as 'wooziness in the head'. The good news is that if they were woozy enough in the head they could qualify to be prime minister of St Vincent.

Microchipping freedom

The European judgement will be used at some point to justify moves to enforce the 'Covid' DNA-manipulating procedure. Sandra Ro, CEO of the Global Blockchain Business Council, told a World Economic Forum event that she hoped 'vaccine passports' would help to 'drive forced consent and standardisation' of global digital identity schemes: 'I'm hoping with the desire and global demand for some sort of vaccine passport – so that people can get travelling and working again – [it] will drive forced consent, standardisation, and frankly, cooperation across the world.' The lady is either not very bright, or thoroughly mendacious, to use the term 'forced consent'.

You do not 'consent' if you are forced – you *submit*. She was describing what the plan has been all along and that's to enforce a digital identity on every human without which they could not function. 'Vaccine passports' are opening the door and are far from the end goal. A digital identity would allow you to be tracked in everything you do in cyberspace and this is the same technique used by Cult-owned China to enforce its social credit system of total control. The ultimate 'passport' is planned to be a microchip as my books have warned for nearly 30 years. Those nice people at the Pentagon working for the Cult-controlled Defense Advanced Research Projects Agency (DARPA) claimed in April, 2021, they have developed a microchip inserted under the skin to detect 'asymptomatic Covid-19 infection' before it becomes an outbreak and a 'revolutionary filter' that can remove the 'virus' from the blood when attached to a dialysis machine. The only problems with this are that the 'virus' does not exist and people transmitting the 'virus' with no symptoms is brain-numbing bullshit. This is, of course, not a ruse to get people to be microchipped for very different reasons. DARPA also said it was producing a one-stop 'vaccine' for the 'virus' and all 'variants'. One of the most sinister organisations on Planet Earth is doing this? Better have it then. These people are insane because Wetiko that possesses them is insane.

Researchers from the Salk Institute in California announced they have created an embryo that is part human and part monkey. My books going back to the 1990s have exposed experiments in top secret underground facilities in the United States where humans are being crossed with animal and non-human 'extraterrestrial' species. They are now easing that long-developed capability into the public arena and there is much more to come given we are dealing with psychiatric basket cases. Talking of which – Elon Musk's scientists at Neuralink trained a monkey to play Pong and other puzzles on a computer screen using a joystick and when the monkey made the correct move a metal tube squirted banana smoothie into his mouth which is the basic technique for training humans into unquestioning compliance. Two Neuralink chips were in the monkey's skull and

more than 2,000 wires 'fanned out' into its brain. Eventually the monkey played a video game purely with its brain waves. Psychopathic narcissist Musk said the 'breakthrough' was a step towards putting Neuralink chips into human skulls and merging minds with artificial intelligence. *Exactly*. This man is so dark and Cult to his DNA.

World Economic Fascism (WEF)

The World Economic Forum is telling you the plan by the statements made at its many and various events. Cult-owned fascist YouTube CEO Susan Wojcicki spoke at the 2021 WEF Global Technology Governance Summit (see the name) in which 40 governments and 150 companies met to ensure 'the responsible design and deployment of emerging technologies'. Orwellian translation: 'Ensuring the design and deployment of long-planned technologies will advance the Cult agenda for control and censorship.' Freedom-destroyer and Nuremberg-bound Wojcicki expressed support for tech platforms like hers to censor content that is 'technically legal but could be harmful'. Who decides what is 'harmful'? She does and they do. 'Harmful' will be whatever the Cult doesn't want people to see and we have legislation proposed by the UK government that would censor content on the basis of 'harm' no matter if the information is fair, legal and provably true. Make that *especially* if it is fair, legal and provably true. Wojcicki called for a global coalition to be formed to enforce content moderation standards through automated censorship. This is a woman and mega-censor so self-deluded that she shamelessly accepted a 'free expression' award – *Wojcicki* – in an event sponsored by her own *YouTube*. They have no shame and no self-awareness.

You know that 'Covid' is a scam and Wojcicki a Cult operative when YouTube is censoring medical and scientific opinion purely on the grounds of whether it supports or opposes the Cult 'Covid' narrative. Florida governor Ron DeSantis compiled an expert panel with four professors of medicine from Harvard, Oxford, and Stanford Universities who spoke against forcing children and

vaccinated people to wear masks. They also said there was no proof that lockdowns reduced spread or death rates of 'Covid-19'. Cult-gofer Wojcicki and her YouTube deleted the panel video 'because it included content that contradicts the consensus of local and global health authorities regarding the efficacy of masks to prevent the spread of Covid-19'. This 'consensus' refers to what the Cult tells the World Health Organization to say and the WHO tells 'local health authorities' to do. Wojcicki knows this, of course. The panellists pointed out that censorship of scientific debate was responsible for deaths from many causes, but Wojcicki couldn't care less. She would not dare go against what she is told and as a disgrace to humanity she wouldn't want to anyway. The UK government is seeking to pass a fascist 'Online Safety Bill' to specifically target with massive fines and other means non-censored video and social media platforms to make them censor 'lawful but harmful' content like the Cult-owned Facebook, Twitter, Google and YouTube. What is 'lawful but harmful' would be decided by the fascist Blair-created Ofcom.

Another WEF obsession is a cyber-attack on the financial system and this is clearly what the Cult has planned to take down the bank accounts of everyone – except theirs. Those that think they have enough money for the Cult agenda not to matter to them have got a big lesson coming if they continue to ignore what is staring them in the face. The World Economic Forum, funded by Gates and fronted by Klaus Schwab, announced it would be running a 'simulation' with the Russian government and global banks of just such an attack called Cyber Polygon 2021. What they simulate – as with the 'Covid' Event 201 – they plan to instigate. The WEF is involved in a project with the Cult-owned Carnegie Endowment for International Peace called the WEF-Carnegie Cyber Policy Initiative which seeks to merge Wall Street banks, 'regulators' (I love it) and intelligence agencies to 'prevent' (arrange and allow) a cyber-attack that would bring down the global financial system as long planned by those that control the WEF and the Carnegie operation. The Carnegie Endowment for International Peace sent an instruction to First World

War US President Woodrow Wilson not to let the war end before society had been irreversibly transformed.

The Wuhan lab diversion

As I close, the Cult-controlled authorities and lapdog media are systematically pushing 'the virus was released from the Wuhan lab' narrative. There are two versions – it happened by accident and it happened on purpose. Both are nonsense. The perceived existence of the never-shown-to-exist 'virus' is vital to sell the impression that there is actually an infective agent to deal with and to allow the endless potential for terrifying the population with 'variants' of a 'virus' that does not exist. The authorities at the time of writing are going with the 'by accident' while the alternative media is promoting the 'on purpose'. Cable news host Tucker Carlson who has questioned aspects of lockdown and 'vaccine' compulsion has bought the Wuhan lab story. 'Everyone now agrees' he said. Well, I don't and many others don't and the question is *why* does the system and its media suddenly 'agree'? When the media moves as one unit with a narrative it is always a lie – witness the hour by hour mendacity of the 'Covid' era. Why would this Cult-owned combination which has unleashed lies like machine gun fire suddenly 'agree' to tell the truth??

Much of the alternative media is buying the lie because it fits the conspiracy narrative, but it's the *wrong* conspiracy. The real conspiracy is that *there is no virus* and that is what the Cult is desperate to hide. The idea that the 'virus' was released by accident is ludicrous when the whole 'Covid' hoax was clearly long-planned and waiting to be played out as it was so fast in accordance with the Rockefeller document and Event 201. So they prepared everything in detail over decades and then sat around strumming their fingers waiting for an 'accidental' release from a bio-lab? *What??* It's crazy. Then there's the 'on purpose' claim. You want to circulate a 'deadly virus' and hide the fact that you've done so and you release it down the street from the highest-level bio-lab in China? I repeat – *What??*

You would release it far from that lab to stop any association being made. But, no, we'll do it in a place where the connection was certain to be made. Why would you need to scam 'cases' and 'deaths' and pay hospitals to diagnose 'Covid-19' if you had a real 'virus'? What are sections of the alternative media doing believing this crap? Where were all the mass deaths in Wuhan from a 'deadly pathogen' when the recovery to normal life after the initial propaganda was dramatic in speed? Why isn't the 'deadly pathogen' now circulating all over China with bodies in the street? Once again we have the technique of tell them what they want to hear and they will likely believe it. The alternative media has its 'conspiracy' and with Carlson it fits with his 'China is the danger' narrative over years. China *is* a danger as a global Cult operations centre, but not for this reason. The Wuhan lab story also has the potential to instigate conflict with China when at some stage the plan is to trigger a Problem-Reaction-Solution confrontation with the West. Question everything – *everything* – and especially when the media agrees on a common party line.

Third wave ... fourth wave ... fifth wave ...

As the book went into production the world was being set up for more lockdowns and a 'third wave' supported by invented 'variants' that were increasing all the time and will continue to do so in public statements and computer programs, but not in reality. India became the new Italy in the 'Covid' propaganda campaign and we were told to be frightened of the new 'Indian strain'. Somehow I couldn't find it within myself to do so. A document produced for the UK government entitled 'Summary of further modelling of easing of restrictions – Roadmap Step 2' declared that a third wave was inevitable (of course when it's in the script) and it would be the fault of children and those who refuse the health-destroying fake 'Covid vaccine'. One of the computer models involved came from the Cult-owned *Imperial College* and the other from Warwick University which I wouldn't trust to tell me the date in a calendar factory. The document states that both models presumed extremely high uptake

of the 'Covid vaccines' and didn't allow for 'variants'. The document states: 'The resurgence is a result of some people (mostly children) being ineligible for vaccination; others choosing not to receive the vaccine; and others being vaccinated but not perfectly protected.' The mendacity takes the breath away. Okay, blame those with a brain who won't take the DNA-modifying shots and put more pressure on children to have it as 'trials' were underway involving children as young as six months with parents who give insanity a bad name. Massive pressure is being put on the young to have the fake 'vaccine' and child age consent limits have been systematically lowered around the world to stop parents intervening. Most extraordinary about the document was its claim that the 'third wave' would be driven by 'the resurgence in both hospitalisations and deaths ... dominated by *those that have received two doses of the vaccine*, comprising around 60-70% of the wave respectively'. The predicted peak of the 'third wave' suggested 300 deaths per day with 250 of them *fully 'vaccinated' people*. How many more lies do acquiescers need to be told before they see the obvious? Those who took the job to 'protect themselves' are projected to be those who mostly get sick and die? So what's in the 'vaccine'? The document went on:

It is possible that a summer of low prevalence could be followed by substantial increases in incidence over the following autumn and winter. Low prevalence in late summer should not be taken as an indication that SARS-CoV-2 has retreated or that the population has high enough levels of immunity to prevent another wave.

They are telling you the script and while many British people believed 'Covid' restrictions would end in the summer of 2021 the government was preparing for them to be ongoing. Authorities were awarding contracts for 'Covid marshals' to police the restrictions with contracts starting in July, 2021, and going through to January 31st, 2022, and the government was advertising for 'Media Buying Services' to secure media propaganda slots worth a potential £320 million for 'Covid-19 campaigns' with a contract not ending until March, 2022. The recipient – via a list of other front companies – was reported to be American media marketing giant Omnicom Group

Inc. While money is no object for 'Covid' the UK waiting list for all other treatment – including life-threatening conditions – passed 4.5 million. Meantime the Cult is seeking to control all official 'inquiries' to block revelations about what has really been happening and why. It must not be allowed to – we need Nuremberg jury trials in every country. The cover-up doesn't get more obvious than appointing ultra-Zionist professor Philip Zelikow to oversee two dozen US virologists, public health officials, clinicians, former government officials and four American 'charitable foundations' to 'learn the lessons' of the 'Covid' debacle. The personnel will be those that created and perpetuated the 'Covid' lies while Zelikow is the former executive director of the 9/11 Commission who ensured that the truth about those attacks never came out and produced a report that must be among the most mendacious and manipulative documents ever written – see *The Trigger* for the detailed exposure of the almost unimaginable 9/11 story in which Sabbatians can be found at every level.

Passive no more

People are increasingly challenging the authorities with amazing numbers of people taking to the streets in London well beyond the ability of the Face-Nappies to stop them. Instead the Nappies choose situations away from the mass crowds to target, intimidate, and seek to promote the impression of 'violent protestors'. One such incident happened in London's Hyde Park. Hundreds of thousands walking through the streets in protest against 'Covid' fascism were ignored by the Cult-owned BBC and most of the rest of the mainstream media, but they delighted in reporting how police were injured in 'clashes with protestors'. The truth was that a group of people gathered in Hyde Park at the end of one march when most had gone home and they were peacefully having a good time with music and chat. Face-Nappies who couldn't deal with the full-march crowd then waded in with their batons and got more than they bargained for. Instead of just standing for this criminal brutality the crowd used their numerical superiority to push the Face-Nappies out of the

park. Eventually the Nappies turned and ran. Unfortunately two or three idiots in the crowd threw drink cans striking two officers which gave the media and the government the image they wanted to discredit the 99.9999 percent who were peaceful. The idiots walked straight into the trap and we must always be aware of potential agent provocateurs used by the authorities to discredit their targets.

This response from the crowd – the can people apart – must be a turning point when the public no longer stand by while the innocent are arrested and brutally attacked by the Face-Nappies. That doesn't mean to be violent, that's the last thing we need. We'll leave the violence to the Face-Nappies and government. But it does mean that when the Face-Nappies use violence against peaceful people the numerical superiority is employed to stop them and make citizen's arrests or Common Law arrests for a breach of the peace. The time for being passive in the face of fascism is over.

We are the many, they are the few, and we need to make that count before there is no freedom left and our children and grandchildren face an ongoing fascist nightmare.

COME ON PEOPLE – IT'S TIME.

One final thought ...

The power of love
A force from above
Cleaning my soul
Flame on burn desire
Love with tongues of fire
Purge the soul
Make love your goal

I'll protect you from the hooded claw
Keep the vampires from your door
When the chips are down I'll be around
With my undying, death-defying
Love for you

Envy will hurt itself
Let yourself be beautiful
Sparkling love, flowers
And pearls and pretty girls
Love is like an energy
Rushin' rushin' inside of me

This time we go sublime
Lovers entwine, divine, divine,
Love is danger, love is pleasure
Love is pure – the only treasure

I'm so in love with you
Purge the soul
Make love your goal

The power of love
A force from above
Cleaning my soul
The power of love
A force from above
A sky-scraping dove

Flame on burn desire
Love with tongues of fire
Purge the soul
Make love your goal

Frankie Goes To Hollywood

APPENDIX

Cowan-Kaufman-Morell Statement on Virus Isolation (SOVI)

Isolation: The action of isolating; the fact or condition of being isolated or standing alone; separation from other things or persons; solitariness

Oxford English Dictionary

The controversy over whether the SARS-CoV-2 virus has ever been isolated or purified continues. However, using the above definition, common sense, the laws of logic and the dictates of science, any unbiased person must come to the conclusion that the SARS-CoV-2 virus has never been isolated or purified. As a result, no confirmation of the virus' existence can be found. The logical, common sense, and scientific consequences of this fact are:

- the structure and composition of something not shown to exist can't be known, including the presence, structure, and function of any hypothetical spike or other proteins;
- the genetic sequence of something that has never been found can't be known;
- "variants" of something that hasn't been shown to exist can't be known;
- it's impossible to demonstrate that SARS-CoV-2 causes a disease called Covid-19.

In as concise terms as possible, here's the proper way to isolate, characterize and demonstrate a new virus. First, one takes samples (blood, sputum, secretions) from many people (e.g. 500) with symptoms which are unique and specific enough to characterize an illness. Without mixing these samples with ANY tissue or products that also contain genetic material, the virologist macerates, filters and ultracentrifuges i.e. *purifies* the specimen. This common virology technique, done for decades to isolate bacteriophages¹ and so-called giant viruses in every virology lab, then allows the virologist to demonstrate with electron microscopy thousands of identically sized and shaped particles. These particles are the isolated and purified virus.

These identical particles are then checked for uniformity by physical and/or microscopic techniques. Once the purity is determined, the particles may be further characterized. This would include examining the structure, morphology, and chemical composition of the particles. Next, their genetic makeup is characterized by extracting the genetic material directly from the purified particles and using genetic-sequencing techniques, such as Sanger sequencing, that have also been around for decades. Then one does an analysis to confirm that these uniform particles are exogenous (outside) in origin as a virus is conceptualized to be, and not the normal breakdown products of dead and dying tissues.² (As of May 2020, we know that virologists have no way to determine whether the particles they're seeing are viruses or just normal breakdown products of dead and dying tissues.)³

1 Isolation, characterization and analysis of bacteriophages from the haloalkaline lake Elmenteita, Kenya Julia Khayeli Akhwale et al, PLOS One, Published: April 25, 2019.
<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0215734> – accessed 2/15/21

2 "Extracellular Vesicles Derived From Apoptotic Cells: An Essential Link Between Death and Regeneration," Maojiao Li et al, Frontiers in Cell and Developmental Biology, 2020 October 2.
<https://www.frontiersin.org/articles/10.3389/fcell.2020.573511/full> – accessed 2/15/21

If we have come this far then we have fully isolated, characterized, and genetically sequenced an exogenous virus particle. However, we still have to show it is causally related to a disease. This is carried out by exposing a group of healthy subjects (animals are usually used) to this isolated, purified virus in the manner in which the disease is thought to be transmitted. If the animals get sick with the same disease, as confirmed by clinical and autopsy findings, one has now shown that the virus actually causes a disease. This demonstrates infectivity and transmission of an infectious agent.

None of these steps has even been attempted with the SARS-CoV-2 virus, nor have all these steps been successfully performed for any so-called pathogenic virus. Our research indicates that a single study showing these steps does not exist in the medical literature.

Instead, since 1954, virologists have taken unpurified samples from a relatively few people, often less than ten, with a similar disease. They then minimally process this sample and inoculate this unpurified sample onto tissue culture containing usually four to six other types of material – all of which contain identical genetic material as to what is called a “virus.” The tissue culture is starved and poisoned and naturally disintegrates into many types of particles, some of which contain genetic material. Against all common sense, logic, use of the English language and scientific integrity, this process is called “virus isolation.” This brew containing fragments of genetic material from many sources is then subjected to genetic analysis, which then creates in a computer-simulation process the alleged sequence of the alleged virus, a so called in silico genome. At no time is an actual virus confirmed by electron microscopy. At no time is a genome extracted and sequenced from an actual virus. This is scientific fraud.

The observation that the unpurified specimen — inoculated onto tissue culture along with toxic antibiotics, bovine fetal tissue, amniotic fluid and other tissues — destroys the kidney tissue onto which it is inoculated is given as evidence of the virus' existence and pathogenicity. This is scientific fraud.

From now on, when anyone gives you a paper that suggests the SARS-CoV-2 virus has been isolated, please check the methods sections. If the researchers used Vero cells or any other culture method, you know that their process was not isolation. You will hear the following excuses for why actual isolation isn't done:

1. There were not enough virus particles found in samples from patients to analyze.
2. Viruses are intracellular parasites; they can't be found outside the cell in this manner.

If No. 1 is correct, and we can't find the virus in the sputum of sick people, then on what evidence do we think the virus is dangerous or even lethal? If No. 2 is correct, then how is the virus spread from person to person? We are told it emerges from the cell to infect others. Then why isn't it possible to find it?

Finally, questioning these virology techniques and conclusions is not some distraction or divisive issue. Shining the light on this truth is essential to stop this terrible fraud that humanity is confronting. For, as we now know, if the virus has never been isolated, sequenced or shown to cause illness, if the virus is imaginary, then why are we wearing masks, social distancing and putting the whole world into prison?

Finally, if pathogenic viruses don't exist, then what is going into those injectable devices erroneously called "vaccines," and what is their purpose? This scientific question is the most urgent and relevant one of our time.

We are correct. The SARS-CoV2 virus does not exist.

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Index

A

abusive relationships

blaming themselves, abused as [ref1](#)

children [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#), [ref9](#), [ref10](#)

conspiracy theories [ref1](#)

domestic abuse [ref1](#), [ref2](#)

economic abuse and dependency [ref1](#)

isolation [ref1](#)

physical abuse [ref1](#)

psychological abuse [ref1](#)

signs of abuse [ref1](#)

addiction

alcoholism [ref1](#)

frequencies [ref1](#)

substance abuse [ref1](#), [ref2](#)

technology [ref1](#), [ref2](#), [ref3](#)

Adelson, Sheldon [ref1](#), [ref2](#), [ref3](#)

Agenda 21/Agenda 2030 (UN) [ref1](#), [ref2](#), [ref3](#), [ref4](#)

AIDs/HIV [ref1](#)

causal link between HIV and AIDs [ref1](#), [ref2](#)

retroviruses [ref1](#)

testing [ref1](#), [ref2](#)

trial-run for Covid-19, as [ref1](#), [ref2](#)

aliens/extraterrestrials [ref1](#), [ref2](#)

aluminium [ref1](#)

Amazon [ref1](#), [ref2](#), [ref3](#)

amplification cycles [ref1](#), [ref2](#)
anaphylactic shock [ref1](#), [ref2](#), [ref3](#), [ref4](#)
animals [ref1](#), [ref2](#), [ref3](#)
antibodies [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)
Antifa [ref1](#), [ref2](#), [ref3](#), [ref4](#)
antigens [ref1](#), [ref2](#)
anti-Semitism [ref1](#), [ref2](#), [ref3](#)
Archons [ref1](#), [ref2](#)
 consciousness [ref1](#), [ref2](#), [ref3](#)
 energy [ref1](#), [ref2](#), [ref3](#)
 ennoia [ref1](#)
 genetic manipulation [ref1](#), [ref2](#)
 inversion [ref1](#), [ref2](#), [ref3](#)
 lockdowns [ref1](#)
 money [ref1](#)
 radiation [ref1](#)
 religion [ref1](#), [ref2](#)
 technology [ref1](#), [ref2](#), [ref3](#)
 Wetiko factor [ref1](#), [ref2](#), [ref3](#), [ref4](#)
artificial intelligence (AI) [ref1](#)
army made up of robots [ref1](#), [ref2](#)
 Human 2.0 [ref1](#), [ref2](#)
 Internet [ref1](#)
 MHRA [ref1](#)
 Morgellons fibres [ref1](#), [ref2](#)
 Smart Grid [ref1](#)
 Wetiko factor [ref1](#)
asymptomatic, Covid-19 as [ref1](#), [ref2](#), [ref3](#)
aviation industry [ref1](#)

B

banking, finance and money [ref1](#), [ref2](#), [ref3](#)

2008 crisis [ref1](#), [ref2](#)

boom and bust [ref1](#)

cashless digital money systems [ref1](#)

central banks [ref1](#)

credit [ref1](#)

digital currency [ref1](#)

fractional reserve lending [ref1](#)

Great Reset [ref1](#)

guaranteed income [ref1](#), [ref2](#), [ref3](#)

Human 2.0 [ref1](#)

incomes, destruction of [ref1](#), [ref2](#)

interest [ref1](#)

one per cent [ref1](#), [ref2](#)

scams [ref1](#)

BBC [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#)

Becker-Phelps, Leslie [ref1](#)

Behavioural Insights Team (BIT) (Nudge Unit) [ref1](#), [ref2](#), [ref3](#)

behavioural scientists *and* psychologists, advice from [ref1](#), [ref2](#)

Bezos, Jeff [ref1](#), [ref2](#), [ref3](#), [ref4](#)

Biden, Hunter [ref1](#)

Biden, Joe [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#), [ref9](#), [ref10](#), [ref11](#),
[ref12](#), [ref13](#), [ref14](#), [ref15](#), [ref16](#), [ref17](#)

Big Pharma

cholesterol [ref1](#)

health professionals [ref1](#), [ref2](#)

immunity from prosecution in US [ref1](#)

vaccines [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#)

Wetiko factor [ref1](#), [ref2](#)

WHO [ref1](#), [ref2](#), [ref3](#)

Bill and Melinda Gates Foundation [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#),
[ref7](#)

billionaires [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#), [ref9](#) [ref10](#), [ref11](#)

bird flu (H5N1) [ref1](#)

Black Lives Matter (BLM) [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

Blair, Tony [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#)

Brin, Sergei [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#)

British Empire [ref1](#)

Bush, George HW [ref1](#), [ref2](#)

Bush, George W [ref1](#), [ref2](#), [ref3](#), [ref4](#)

Byrd, Robert [ref1](#)

C

Canada

Global Cult [ref1](#)

hate speech [ref1](#)

internment [ref1](#)

masks [ref1](#)

old people [ref1](#)

SARS-COV-2 [ref1](#)

satellites [ref1](#)

vaccines [ref1](#)

wearable technology [ref1](#)

Capitol Hill riot [ref1](#), [ref2](#)

agents provocateur [ref1](#)

Antifa [ref1](#)

Black Lives Matter (BLM) [ref1](#), [ref2](#)

QAnon [ref1](#)

security precautions, lack of [ref1](#), [ref2](#), [ref3](#)

carbon dioxide [ref1](#), [ref2](#)

care homes, deaths in [ref1](#), [ref2](#)

cashless digital money systems [ref1](#)

censorship [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

fact-checkers [ref1](#)

masks [ref1](#)

media [ref1](#), [ref2](#)

private messages [ref1](#)

social media [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#)

transgender persons [ref1](#)

vaccines [ref1](#), [ref2](#), [ref3](#)

Wokeness [ref1](#)

Centers for Disease Control (CDC) (United States) [ref1](#), [ref2](#), [ref3](#),
[ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#), [ref9](#), [ref10](#), [ref11](#), [ref12](#), [ref13](#)

centralisation [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#)

chakras [ref1](#)

change agents [ref1](#), [ref2](#), [ref3](#)

chemtrails [ref1](#), [ref2](#), [ref3](#)

chief medical officers and scientific advisers [ref1](#), [ref2](#), [ref3](#), [ref4](#),
[ref5](#), [ref6](#)

children *see also* **young people**

abuse [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#), [ref9](#), [ref10](#)

care, taken into [ref1](#), [ref2](#), [ref3](#)

education [ref1](#), [ref2](#), [ref3](#), [ref4](#)

energy [ref1](#)

family courts [ref1](#)

hand sanitisers [ref1](#)

human sacrifice [ref1](#)

lockdowns [ref1](#), [ref2](#), [ref3](#)

masks [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

mental health [ref1](#)

old people [ref1](#)

parents, replacement of [ref1](#), [ref2](#)

Psyop (psychological operation), Covid as a [ref1](#), [ref2](#)

reframing [ref1](#)

smartphone addiction [ref1](#)

social distancing and isolation [ref1](#)
social media [ref1](#)
transgender persons [ref1](#), [ref2](#)
United States [ref1](#)
vaccines [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#), [ref9](#), [ref10](#)
Wetiko factor [ref1](#)

China [ref1](#), [ref2](#), [ref3](#), [ref4](#)

anal swab tests [ref1](#)
Chinese Revolution [ref1](#), [ref2](#), [ref3](#)
digital currency [ref1](#)
Global Cult [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#), [ref9](#)
guaranteed income [ref1](#)
Imperial College [ref1](#)
Israel [ref1](#)
lockdown [ref1](#), [ref2](#)
masculinity crisis [ref1](#)
masks [ref1](#)
media [ref1](#)
origins of virus in China [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)
pollution causing respiratory diseases [ref1](#)
Sabbatians [ref1](#), [ref2](#)
Smart Grid [ref1](#), [ref2](#)
social credit system [ref1](#)
testing [ref1](#), [ref2](#)
United States [ref1](#), [ref2](#)
vaccines [ref1](#), [ref2](#)
Wetiko factor [ref1](#)
wet market conspiracy [ref1](#)
Wuhan [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#)

cholesterol [ref1](#), [ref2](#)

Christianity [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

criticism [ref1](#)
cross, inversion of the [ref1](#)

Nag Hammadi texts [ref1](#), [ref2](#), [ref3](#)

Roman Catholic Church [ref1](#), [ref2](#)

Sabbatians [ref1](#), [ref2](#)

Satan [ref1](#), [ref2](#), [ref3](#), [ref4](#)

Wokeness [ref1](#)

class [ref1](#), [ref2](#)

climate change hoax [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

Agenda 21/Agenda 2030 [ref1](#), [ref2](#), [ref3](#)

carbon dioxide [ref1](#), [ref2](#)

Club of Rome [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

fear [ref1](#)

funding [ref1](#)

Global Cult [ref1](#)

green new deals [ref1](#)

green parties [ref1](#)

inversion [ref1](#)

perception, control of [ref1](#)

PICC [ref1](#)

reframing [ref1](#)

temperature, increases in [ref1](#)

United Nations [ref1](#), [ref2](#)

Wikipedia [ref1](#)

Wokeness [ref1](#), [ref2](#)

Clinton, Bill [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#)

Clinton, Hillary [ref1](#), [ref2](#), [ref3](#)

the cloud [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#)

Club of Rome and climate change hoax [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

cognitive therapy [ref1](#)

Cohn, Roy [ref1](#)

Common Law [ref1](#)

Admiralty Law [ref1](#)

arrests [ref1](#), [ref2](#)

contractual law, Statute Law as [ref1](#)

corporate entities, people as [ref1](#)

legalese [ref1](#)

sea, law of the [ref1](#)

Statute Law [ref1](#)

Common Purpose leadership programme [ref1](#), [ref2](#)

communism [ref1](#), [ref2](#)

co-morbidities [ref1](#)

computer-generated virus,

Covid-19 as [ref1](#), [ref2](#), [ref3](#)

computer models [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

connections [ref1](#), [ref2](#), [ref3](#), [ref4](#)

consciousness [ref1](#), [ref2](#), [ref3](#), [ref4](#)

Archons [ref1](#), [ref2](#), [ref3](#)

expanded [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#)

experience [ref1](#)

heart [ref1](#)

infinity [ref1](#), [ref2](#)

religion [ref1](#), [ref2](#)

self-identity [ref1](#)

simulation thesis [ref1](#)

vaccines [ref1](#)

Wetiko factor [ref1](#), [ref2](#)

conspiracy theorists [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

contradictory rules [ref1](#)

contrails [ref1](#)

Corman-Drosten test [ref1](#), [ref2](#), [ref3](#), [ref4](#)

countermimicry [ref1](#), [ref2](#), [ref3](#)

Covid-19 vaccines *see* vaccines

Covidiots [ref1](#), [ref2](#)

Cowan, Tom [ref1](#), [ref2](#), [ref3](#), [ref4](#)

crimes against humanity [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#)

cyber-operations [ref1](#)

cyberwarfare [ref1](#)

D

DARPA (Defense Advanced Research Projects Agency) [ref1](#)

deaths

care homes [ref1](#)

certificates [ref1](#), [ref2](#), [ref3](#), [ref4](#)

mortality rate [ref1](#)

post-mortems/autopsies [ref1](#)

recording [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#)

vaccines [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

deceit

pyramid of deceit [ref1](#), [ref2](#)

sequence of deceit [ref1](#)

decoding [ref1](#), [ref2](#), [ref3](#)

dehumanisation [ref1](#), [ref2](#), [ref3](#)

Delphi technique [ref1](#)

democracy [ref1](#)

dependency [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

Descartes, René [ref1](#)

DNA

numbers [ref1](#)

vaccines [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#), [ref9](#), [ref10](#)

DNR (do not resuscitate)

orders [ref1](#)

domestic abuse [ref1](#), [ref2](#)

downgrading of Covid-19 [ref1](#)

Drosten, Christian [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#)

Duesberg, Peter [ref1](#), [ref2](#)

E

economic abuse [ref1](#)

Edmunds, John [ref1](#), [ref2](#)

education [ref1](#), [ref2](#), [ref3](#), [ref4](#)

electromagnetic spectrum [ref1](#), [ref2](#)

Enders, John [ref1](#)

energy

Archons [ref1](#), [ref2](#), [ref3](#)

children and young people [ref1](#)

consciousness [ref1](#)

decoding [ref1](#)

frequencies [ref1](#), [ref2](#), [ref3](#), [ref4](#)

heart [ref1](#)

human energy field [ref1](#)

source, humans as an energy [ref1](#), [ref2](#)

vaccines [ref1](#)

viruses [ref1](#)

ennoia [ref1](#)

Epstein, Jeffrey [ref1](#), [ref2](#)

eternal 'I' [ref1](#), [ref2](#)

ethylene oxide [ref1](#)

European Union [ref1](#), [ref2](#), [ref3](#), [ref4](#)

Event [ref1](#) *and* **Bill Gates** [ref2](#)

exosomes, Covid-19 as natural defence mechanism called [ref1](#)

experience [ref1](#), [ref2](#)

Extinction Rebellion [ref1](#), [ref2](#)

F

Facebook

addiction [ref1](#), 448–50

Facebook

Archons [ref1](#)

censorship [ref1](#), [ref2](#), [ref3](#)

hate speech [ref1](#)

monopoly, as [ref1](#)

private messages, censorship of [ref1](#)

Sabbatians [ref1](#)

United States election fraud [ref1](#)

vaccines [ref1](#)

Wetiko factor [ref1](#)

fact-checkers [ref1](#)

Fauci, Anthony [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#), [ref9](#), [ref10](#),
[ref11](#), [ref12](#)

fear [ref1](#), [ref2](#), [ref3](#), [ref4](#)

climate change [ref1](#)

computer models [ref1](#)

conspiracy theories [ref1](#)

empty hospitals [ref1](#)

Italy [ref1](#), [ref2](#), [ref3](#)

lockdowns [ref1](#), [ref2](#), [ref3](#), [ref4](#)

masks [ref1](#), [ref2](#)

media [ref1](#), [ref2](#)

medical staff [ref1](#)

Psyop (psychological operation), Covid as a [ref1](#)

Wetiko factor [ref1](#), [ref2](#)

female infertility [ref1](#)

Fermi Paradox [ref1](#)

Ferguson, Neil [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#)

fertility, decline in [ref1](#)

The Field [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#)

finance *see* **banking, finance and money**

five-senses [ref1](#), [ref2](#)

Archons [ref1](#), [ref2](#), [ref3](#)

censorship [ref1](#)
 consciousness, expansion of [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#)
 decoding [ref1](#)
 education [ref1](#), [ref2](#)
 the Field [ref1](#), [ref2](#)
 God, personification of [ref1](#)
 infinity [ref1](#), [ref2](#)
 media [ref1](#)
 paranormal [ref1](#)
 perceptual programming [ref1](#), [ref2](#)
 Phantom Self [ref1](#)
 pneuma not nous, using [ref1](#)
 reincarnation [ref1](#)
 self-identity [ref1](#)
 Wetiko factor [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#)
5G [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#)
Floyd, George and protests, killing of [ref1](#)
flu, re-labelling of [ref1](#), [ref2](#), [ref3](#)
food and water, control of [ref1](#), [ref2](#)
Freemasons [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#)
Frei, Rosemary [ref1](#)
frequencies
 addictions [ref1](#)
 Archons [ref1](#), [ref2](#), [ref3](#)
 awareness [ref1](#)
 chanting and mantras [ref1](#)
 consciousness [ref1](#)
 decoding [ref1](#), [ref2](#)
 education [ref1](#)
 electromagnetic (EMF) frequencies [ref1](#)
 energy [ref1](#), [ref2](#), [ref3](#), [ref4](#)
 fear [ref1](#)

the Field [ref1](#), [ref2](#) 5G [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#), [ref9](#), [ref10](#)
five-senses [ref1](#), [ref2](#)
ghosts [ref1](#)
Gnostics [ref1](#)
hive-minds [ref1](#)
human, meaning of [ref1](#)
light [ref1](#), [ref2](#)
love [ref1](#), [ref2](#)
magnetism [ref1](#)
perception [ref1](#)
reality [ref1](#), [ref2](#), [ref3](#)
simulation [ref1](#)
terror [ref1](#)
vaccines [ref1](#)
Wetiko [ref1](#), [ref2](#), [ref3](#)

Fuellmich, Reiner [ref1](#), [ref2](#), [ref3](#)

furlough/rescue payments [ref1](#)

G

Gallo, Robert [ref1](#), [ref2](#), [ref3](#)

Gates, Bill

Archons [ref1](#), [ref2](#), [ref3](#)
climate change [ref1](#), [ref2](#), [ref3](#), [ref4](#)
Daily Pass tracking system [ref1](#)
Epstein [ref1](#)
fascism [ref1](#)
five senses [ref1](#)
GAVI [ref1](#)
Great Reset [ref1](#)
GSK [ref1](#)
Imperial College [ref1](#), [ref2](#)
Johns Hopkins University [ref1](#), [ref2](#), [ref3](#)

lockdowns [ref1](#), [ref2](#)

masks [ref1](#)

Nuremberg trial, proposal for [ref1](#), [ref2](#)

Rockefellers [ref1](#), [ref2](#)

social distancing and isolation [ref1](#)

Sun, dimming the [ref1](#)

synthetic meat [ref1](#), [ref2](#)

vaccines [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#)

Wellcome Trust [ref1](#)

Wetiko factor [ref1](#), [ref2](#), [ref3](#)

WHO [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#), [ref9](#), [ref10](#)

Wokeness [ref1](#)

World Economic Forum [ref1](#), [ref2](#), [ref3](#), [ref4](#)

Gates, Melinda [ref1](#), [ref2](#), [ref3](#)

GAVI vaccine alliance [ref1](#)

genetics, manipulation of [ref1](#), [ref2](#), [ref3](#)

Germany [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#) *see also* **Nazi Germany**

Global Cult [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

anti-human, why Global Cult is [ref1](#)

Black Lives Matter (BLM) [ref1](#), [ref2](#), [ref3](#), [ref4](#)

China [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#), [ref9](#)

climate change hoax [ref1](#)

contradictory rules [ref1](#)

Covid-19 [ref1](#), [ref2](#), [ref3](#)

fascism [ref1](#)

geographical origins [ref1](#)

immigration [ref1](#)

Internet [ref1](#)

mainstream media [ref1](#), [ref2](#)

masks [ref1](#), [ref2](#)

monarchy [ref1](#)

non-human dimension [ref1](#)

perception [ref1](#)
political parties [ref1](#), [ref2](#)
pyramidal hierarchy [ref1](#), [ref2](#), [ref3](#)
reframing [ref1](#)
Sabbatian-Frankism [ref1](#), [ref2](#)
science, manipulation of [ref1](#)
spider and the web [ref1](#)
transgender persons [ref1](#)
vaccines [ref1](#)
who controls the Cult [ref1](#)
Wokeness [ref1](#), [ref2](#), [ref3](#), [ref4](#)

globalisation [ref1](#), [ref2](#)

Gnostics [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

Google [ref1](#), [ref2](#), [ref3](#), [ref4](#)

government

behavioural scientists and psychologists, advice from [ref1](#), [ref2](#)
definition [ref1](#)

Joint Biosecurity Centre (JBC) [ref1](#)

people, abusive relationship with [ref1](#)

Great Reset [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#)

fascism [ref1](#), [ref2](#), [ref3](#)

financial system [ref1](#)

Human 2.0 [ref1](#)

water and food, control of [ref1](#)

green parties [ref1](#)

Griesz-Brisson, Margarite [ref1](#)

guaranteed income [ref1](#), [ref2](#), [ref3](#)

H

Hancock, Matt [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

hand sanitisers [ref1](#)

heart [ref1](#), [ref2](#)

hive-minds/groupthink [ref1](#), [ref2](#), [ref3](#)

holographs [ref1](#), [ref2](#), [ref3](#), [ref4](#)

hospitals, empty [ref1](#)

human, meaning of [ref1](#)

Human 2.0 [ref1](#)

addiction to technology [ref1](#)

artificial intelligence (AI) [ref1](#), [ref2](#)

elimination of Human 1.0 [ref1](#)

fertility, decline in [ref1](#)

Great Reset [ref1](#)

implantables [ref1](#)

money [ref1](#)

mRNA [ref1](#)

nanotechnology [ref1](#)

parents, replacement of [ref1](#), [ref2](#)

Smart Grid, connection to [ref1](#), [ref2](#)

synthetic biology [ref1](#), [ref2](#), [ref3](#), [ref4](#)

testosterone levels, decrease in [ref1](#)

transgender = transhumanism [ref1](#), [ref2](#), [ref3](#)

vaccines [ref1](#), [ref2](#), [ref3](#), [ref4](#)

human sacrifice [ref1](#), [ref2](#), [ref3](#)

Hunger Games Society [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#)

Huxley, Aldous [ref1](#), [ref2](#), [ref3](#)

I

identity politics [ref1](#), [ref2](#), [ref3](#)

Illuminati [ref1](#), [ref2](#)

illusory physical reality [ref1](#)

immigration [ref1](#), [ref2](#), [ref3](#), [ref4](#)

Imperial College [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#)

implantables [ref1](#), [ref2](#)

incomes, destruction of [ref1](#), [ref2](#)

Infinite Awareness [ref1](#), [ref2](#), [ref3](#), [ref4](#)

Internet [ref1](#), [ref2](#) *see also* social media

artificial intelligence (AI) [ref1](#)

independent journalism, lack of [ref1](#)

Internet of Bodies (IoB) [ref1](#)

Internet of Everything (IoE) [ref1](#), [ref2](#)

Internet of Things (IoT) [ref1](#), [ref2](#)

lockdowns [ref1](#)

Psyop (psychological operation), Covid as a [ref1](#)
trolls [ref1](#)

intersectionality [ref1](#)

inversion

Archons [ref1](#), [ref2](#), [ref3](#)

climate change hoax [ref1](#)

energy [ref1](#)

Judaism [ref1](#), [ref2](#), [ref3](#)

symbolism [ref1](#)

Wetiko factor [ref1](#)

Wokeness [ref1](#), [ref2](#), [ref3](#)

Islam

Archons [ref1](#)

crypto-Jews [ref1](#)

Islamic State [ref1](#), [ref2](#)

Jinn and Djinn [ref1](#), [ref2](#), [ref3](#)

Ottoman Empire [ref1](#)

Wahhabism [ref1](#)

isolation *see* **social distancing** *and* **isolation**

Israel

China [ref1](#)

Cyber Intelligence Unit Beersheba complex [ref1](#)

expansion of illegal settlements [ref1](#)

formation [ref1](#)
Global Cult [ref1](#)
Judaism [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)
medical experiments, consent for [ref1](#)
Mossad [ref1](#), [ref2](#), [ref3](#), [ref4](#)
Palestine-Israel conflict [ref1](#), [ref2](#), [ref3](#)
parents, replacement of [ref1](#)
Sabbatians [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)
September 11, 2001, terrorist attacks on United States [ref1](#)
Silicon Valley [ref1](#)
Smart Grid [ref1](#), [ref2](#)
United States [ref1](#), [ref2](#)
vaccines [ref1](#)
Wetiko factor [ref1](#)

Italy

fear [ref1](#), [ref2](#), [ref3](#)
Lombardy [ref1](#), [ref2](#), [ref3](#)
vaccines [ref1](#)

J

Johns Hopkins University [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#)
Johnson, Boris [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#)
Joint Biosecurity Centre (JBC) [ref1](#)

Judaism

anti-Semitism [ref1](#), [ref2](#), [ref3](#)
Archons [ref1](#), [ref2](#)
crypto-Jews [ref1](#)
inversion [ref1](#), [ref2](#), [ref3](#)
Israel [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)
Labour Party [ref1](#)
Nazi Germany [ref1](#), [ref2](#), [ref3](#), [ref4](#)
Sabbatians [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

Silicon Valley [ref1](#)
Torah [ref1](#)
United States [ref1](#), [ref2](#)
Zionists [ref1](#), [ref2](#), [ref3](#)

K

Kaufman, Andrew [ref1](#), [ref2](#), [ref3](#), [ref4](#)
knowledge [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#)
Koch's postulates [ref1](#)
Kurzweil, Ray [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#)
Kushner, Jared [ref1](#), [ref2](#)

L

Labour Party [ref1](#), [ref2](#)
Lanka, Stefan [ref1](#), [ref2](#)
Lateral Flow Device (LFD) [ref1](#)
Levy, Paul [ref1](#), [ref2](#), [ref3](#)
Life Program [ref1](#)
lockdowns [ref1](#), [ref2](#), [ref3](#)
 amplification tampering [ref1](#)
 Archons [ref1](#)
 Behavioural Insights Team [ref1](#)
 Black Lives Matter (BLM) [ref1](#)
 care homes, deaths in [ref1](#)
 children
abuse [ref1](#), [ref2](#)
mental health [ref1](#)
 China [ref1](#), [ref2](#)
 computer models [ref1](#)
 consequences [ref1](#), [ref2](#)
 dependency [ref1](#), [ref2](#), [ref3](#)

domestic abuse [ref1](#)
fall in cases [ref1](#)
fear [ref1](#), [ref2](#), [ref3](#), [ref4](#)
guaranteed income [ref1](#)
Hunger Games Society [ref1](#), [ref2](#), [ref3](#)
interaction, destroying [ref1](#)
Internet [ref1](#), [ref2](#)
overdoses [ref1](#)
perception [ref1](#)
police-military state [ref1](#), [ref2](#)
protests [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)
psychopathic personality [ref1](#), [ref2](#), [ref3](#)
reporting/snitching, encouragement of [ref1](#), [ref2](#)
testing [ref1](#)
vaccines [ref1](#)
Wetiko factor [ref1](#)
WHO [ref1](#)
love [ref1](#), [ref2](#), [ref3](#)
Lucifer [ref1](#), [ref2](#), [ref3](#)

M

Madej, Carrie [ref1](#), [ref2](#)
Magufuli, John [ref1](#), [ref2](#)
mainstream media [ref1](#)
BBC [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#)
censorship [ref1](#), [ref2](#)
China [ref1](#)
climate change hoax [ref1](#)
fear [ref1](#), [ref2](#)
Global Cult [ref1](#), [ref2](#)
independent journalism, lack of [ref1](#)
Ofcom [ref1](#), [ref2](#), [ref3](#)

perception [ref1](#), [ref2](#)

Psyop (psychological operation), Covid as a [ref1](#)

Sabbatians [ref1](#), [ref2](#)

social disapproval [ref1](#)

social distancing and isolation [ref1](#)

United States [ref1](#), [ref2](#)

vaccines [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

Mao Zedong [ref1](#), [ref2](#), [ref3](#)

Marx and Marxism [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#)

masculinity [ref1](#)

masks/face coverings [ref1](#), [ref2](#), [ref3](#)

 censorship [ref1](#)

 children [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

 China, made in [ref1](#)

 dehumanisation [ref1](#), [ref2](#), [ref3](#)

 fear [ref1](#), [ref2](#)

 flu [ref1](#)

 health professionals [ref1](#), [ref2](#), [ref3](#), [ref4](#)

 isolation [ref1](#)

 laughter [ref1](#)

mass non-cooperation [ref1](#)

microplastics, risk of [ref1](#)

mind control [ref1](#)

multiple masks [ref1](#)

oxygen deficiency [ref1](#), [ref2](#), [ref3](#)

police [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

pollution, as cause of plastic [ref1](#)

Psyop (psychological operation), Covid as a [ref1](#)

reframing [ref1](#), [ref2](#)

risk assessments, lack of [ref1](#), [ref2](#)

self-respect [ref1](#)

surgeons [ref1](#)

United States [ref1](#)
vaccines [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)
Wetiko factor [ref1](#)
'worms' [ref1](#)
The Matrix movies [ref1](#), [ref2](#), [ref3](#)
measles [ref1](#), [ref2](#)
media see mainstream media
Medicines and Healthcare products Regulatory Agency (MHRA)
[ref1](#), [ref2](#), [ref3](#), [ref4](#)
Mesopotamia [ref1](#)
messaging [ref1](#)
military-police state [ref1](#), [ref2](#), [ref3](#)
mind control [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#) *see also* MKUltra
MKUltra [ref1](#), [ref2](#), [ref3](#)
monarchy [ref1](#)
money *see* **banking, finance and money**
Montagnier, Luc [ref1](#), [ref2](#), [ref3](#)
Mooney, Bel [ref1](#)
Morgellons disease [ref1](#), [ref2](#)
mortality rate [ref1](#)
Mullis, Kary [ref1](#), [ref2](#), [ref3](#)
Musk, Elon [ref1](#)

N

Nag Hammadi texts [ref1](#), [ref2](#), [ref3](#)
nanotechnology [ref1](#), [ref2](#), [ref3](#)
narcissism [ref1](#)
Nazi Germany [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#)
near-death experiences [ref1](#), [ref2](#)
Neocons [ref1](#), [ref2](#), [ref3](#)

Neuro-Linguistic Programming (NLP) and the Delphi technique
[ref1](#)

NHS (National Health Service)

amplification cycles [ref1](#)

Common Purpose [ref1](#), [ref2](#)

mind control [ref1](#)

NHS England [ref1](#)

saving the NHS [ref1](#), [ref2](#)

vaccines [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

whistle-blowers [ref1](#), [ref2](#), [ref3](#)

No-Problem-Reaction-Solution [ref1](#), [ref2](#), [ref3](#), [ref4](#)

non-human dimension of Global Cult [ref1](#)

nous [ref1](#)

numbers, reality as [ref1](#)

Nuremberg Codes [ref1](#), [ref2](#), [ref3](#)

Nuremberg-like tribunal, proposal for [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#),
[ref6](#), [ref7](#), [ref8](#), [ref9](#), [ref10](#), [ref11](#), [ref12](#)

O

Obama, Barack [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#), [ref9](#), [ref10](#)

O'Brien, Cathy [ref1](#), [ref2](#), [ref3](#), [ref4](#)

Ochel, Evita [ref1](#)

Ofcom [ref1](#), [ref2](#), [ref3](#)

old people [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

Oneness [ref1](#), [ref2](#), [ref3](#)

Open Society Foundations (Soros) [ref1](#), [ref2](#), [ref3](#)

oxygen 406, 528–34

P

paedophilia [ref1](#), [ref2](#)

Page, Larry [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#)

Palestine-Israel conflict [ref1](#), [ref2](#), [ref3](#)

pandemic, definition of [ref1](#)

pandemic and health crisis scenarios/simulations [ref1](#), [ref2](#), [ref3](#),
[ref4](#)

paranormal [ref1](#)

PCR tests [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#)

Pearl Harbor attacks, prior knowledge of [ref1](#)

Pelosi, Nancy [ref1](#), [ref2](#), [ref3](#)

perception [ref1](#), [ref2](#), [ref3](#), [ref4](#)

climate change hoax [ref1](#)

control [ref1](#), [ref2](#), [ref3](#)

decoding [ref1](#), [ref2](#)

enslavement [ref1](#)

externally-delivered perceptions [ref1](#)

five senses [ref1](#)

human labels [ref1](#)

media [ref1](#), [ref2](#)

political parties [ref1](#), [ref2](#)

Psyop (psychological operation), Covid as a [ref1](#)

sale of perception [ref1](#)

self-identity [ref1](#), [ref2](#)

Wokeness [ref1](#)

Phantom Self [ref1](#), [ref2](#), [ref3](#)

pharmaceutical industry *see* **Big Pharma**

phthalates [ref1](#)

Plato's Allegory of the Cave [ref1](#), [ref2](#)

pneuma [ref1](#)

police

Black Lives Matter (BLM) [ref1](#)

brutality [ref1](#)

citizen's arrests [ref1](#), [ref2](#)

common law arrests [ref1](#), [ref2](#)

Common Purpose [ref1](#)
defunding [ref1](#)
lockdowns [ref1](#), [ref2](#)
masks [ref1](#), [ref2](#), [ref3](#), [ref4](#)
police-military state [ref1](#), [ref2](#), [ref3](#)
psychopathic personality [ref1](#), [ref2](#), [ref3](#), [ref4](#)
reframing [ref1](#)
United States [ref1](#), [ref2](#), [ref3](#), [ref4](#)
Wokeness [ref1](#)

polio [ref1](#)

political correctness [ref1](#), [ref2](#), [ref3](#), [ref4](#)

political parties [ref1](#), [ref2](#), [ref3](#), [ref4](#)

political puppets [ref1](#)

pollution [ref1](#), [ref2](#), [ref3](#)

post-mortems/autopsies [ref1](#)

Postage Stamp Consensus [ref1](#), [ref2](#)

pre-emptive programming [ref1](#)

Problem-Reaction-Solution [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#)

Project for the New American Century [ref1](#), [ref2](#), [ref3](#), [ref4](#)

psychopathic personality [ref1](#)

Archons [ref1](#)

heart energy [ref1](#)

lockdowns [ref1](#), [ref2](#), [ref3](#)

police [ref1](#), [ref2](#), [ref3](#), [ref4](#)

recruitment [ref1](#), [ref2](#)

vaccines [ref1](#)

wealth [ref1](#)

Wetiko [ref1](#), [ref2](#)

Psyop (psychological operation), Covid as a [ref1](#), [ref2](#), [ref3](#), [ref4](#),
[ref5](#)

Pushbackers [ref1](#), [ref2](#), [ref3](#), [ref4](#)

pyramid structure [ref1](#), [ref2](#), [ref3](#), [ref4](#)

Q

QAnon Psyop [ref1](#), [ref2](#), [ref3](#)

R

racism *see also* **Black Lives**

Matter (BLM)

anti-racism industry [ref1](#)

class [ref1](#)

critical race theory [ref1](#)

culture [ref1](#)

intersectionality [ref1](#)

reverse racism [ref1](#)

white privilege [ref1](#), [ref2](#)

white supremacy [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

Wokeness [ref1](#), [ref2](#), [ref3](#)

radiation [ref1](#), [ref2](#)

randomness, illusion of [ref1](#), [ref2](#), [ref3](#)

reality [ref1](#), [ref2](#), [ref3](#)

reframing [ref1](#), [ref2](#)

change agents [ref1](#), [ref2](#)

children [ref1](#)

climate change [ref1](#)

Common Purpose leadership programme [ref1](#), [ref2](#)

contradictory rules [ref1](#)

enforcers [ref1](#)

masks [ref1](#), [ref2](#)

NLP and the Delphi technique [ref1](#)

police [ref1](#)

Wetiko factor [ref1](#)

Wokeness [ref1](#), [ref2](#)

religion *see also* particular religions

alien invasions [ref1](#)

Archons [ref1](#), [ref2](#)
consciousness [ref1](#), [ref2](#)
control, system of [ref1](#), [ref2](#), [ref3](#)
criticism, prohibition on [ref1](#)
five senses [ref1](#)
good and evil, war between [ref1](#)
hidden non-human forces [ref1](#), [ref2](#)
Sabbatians [ref1](#)
save me syndrome [ref1](#)
Wetiko [ref1](#)
Wokeness [ref1](#)

repetition and mind control [ref1](#), [ref2](#), [ref3](#)
reporting/snitching, encouragement of [ref1](#), [ref2](#)
Reptilians/Grey entities [ref1](#)
rewiring the mind [ref1](#)
Rivers, Thomas Milton [ref1](#), [ref2](#)
Rockefeller family [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#), [ref9](#)
Rockefeller Foundation documents [ref1](#), [ref2](#), [ref3](#), [ref4](#)
Roman Empire [ref1](#)
Rothschild family [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#), [ref9](#)
RT-PCR tests [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#)
Russia
 collusion inquiry in US [ref1](#)
Russian Revolution [ref1](#), [ref2](#)
Sabbatians [ref1](#)

S

Sabbatian-Frankism [ref1](#), [ref2](#)
 anti-Semitism [ref1](#), [ref2](#)
 banking and finance [ref1](#), [ref2](#), [ref3](#)
 China [ref1](#), [ref2](#)
 Israel [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

Judaism [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)
Lucifer [ref1](#)
media [ref1](#), [ref2](#)
Nazis [ref1](#), [ref2](#)
QAnon [ref1](#)
Rothschilds [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#)
Russia [ref1](#)
Saudi Arabia [ref1](#)
Silicon Valley [ref1](#)
Sumer [ref1](#)
United States [ref1](#), [ref2](#), [ref3](#)
Wetiko factor [ref1](#)
Wokeness [ref1](#), [ref2](#), [ref3](#)
SAGE (Scientific Advisory Group for Emergencies) [ref1](#), [ref2](#), [ref3](#),
[ref4](#)
SARS-1 [ref1](#)
SARs-CoV-2 [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#)
Satan/Satanism [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#)
satellites in low-orbit [ref1](#)
Saudi Arabia [ref1](#)
Save Me Syndrome [ref1](#)
scapegoating [ref1](#)
Schwab, Klaus [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#), [ref9](#), [ref10](#),
[ref11](#), [ref12](#)
science, manipulation of [ref1](#)
self-identity [ref1](#), [ref2](#), [ref3](#), [ref4](#)
self-respect, attacks on [ref1](#)
September 11, 2001, terrorist attacks on United States [ref1](#), [ref2](#),
[ref3](#), [ref4](#)
77th Brigade of UK military [ref1](#), [ref2](#), [ref3](#)
Silicon Valley/tech giants [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#) *see also*
Facebook

Israel [ref1](#)

Sabbatians [ref1](#)

technocracy [ref1](#)

Wetiko factor [ref1](#)

Wokeness [ref1](#)

simulation hypothesis [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

Smart Grid [ref1](#), [ref2](#), [ref3](#)

artificial intelligence (AI) [ref1](#)

China [ref1](#), [ref2](#)

control centres [ref1](#)

the Field [ref1](#)

Great Reset [ref1](#)

Human 2.0 [ref1](#), [ref2](#)

Israel [ref1](#), [ref2](#)

vaccines [ref1](#)

Wetiko factor [ref1](#)

social disapproval [ref1](#)

social distancing and isolation [ref1](#), [ref2](#), [ref3](#)

abusive relationships [ref1](#), [ref2](#)

children [ref1](#)

flats and apartments [ref1](#)

heart issues [ref1](#)

hugs [ref1](#)

Internet [ref1](#)

masks [ref1](#)

media [ref1](#)

older people [ref1](#), [ref2](#)

one-metre (three feet) rule [ref1](#)

rewiring the mind [ref1](#)

simulation, universe as a [ref1](#)

SPI-B [ref1](#)

substance abuse [ref1](#)

suicide and self-harm [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

technology [ref1](#)

torture, as [ref1](#), [ref2](#)

two-metre (six feet) rule [ref1](#)

women [ref1](#)

social justice [ref1](#), [ref2](#), [ref3](#), [ref4](#)

social media *see also* **Facebook bans on alternative views** [ref1](#)

 censorship [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#)

 children [ref1](#)

 emotion [ref1](#)

 perception [ref1](#)

 private messages [ref1](#)

 Twitter [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#)

 Wetiko factor [ref1](#)

 YouTube [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

Soros, George [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#)

Spain [ref1](#)

SPI-B (Scientific Pandemic Insights Group on Behaviours) [ref1](#),
[ref2](#), [ref3](#), [ref4](#)

spider and the web [ref1](#), [ref2](#), [ref3](#), [ref4](#)

Starmer, Keir [ref1](#)

Statute Law [ref1](#)

Steiner, Rudolf [ref1](#), [ref2](#), [ref3](#)

Stockholm syndrome [ref1](#)

streptomycin [ref1](#)

suicide and self-harm [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

Sumer [ref1](#), [ref2](#)

Sunstein, Cass [ref1](#), [ref2](#), [ref3](#)

swine flu (H1N1) [ref1](#), [ref2](#), [ref3](#)

synchronicity [ref1](#)

synthetic biology [ref1](#), [ref2](#), [ref3](#), [ref4](#)

synthetic meat [ref1](#), [ref2](#)

T

technology *see also* **artificial intelligence (AI); Internet;**

social media addiction [ref1](#), [ref2](#), [ref3](#), [ref4](#)

Archons [ref1](#), [ref2](#)

the cloud [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#)

cyber-operations [ref1](#)

cyberwarfare [ref1](#)

radiation [ref1](#), [ref2](#)

social distancing and isolation [ref1](#)

technocracy [ref1](#)

Tedros Adhanom Ghebreyesus [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#),
[ref8](#), [ref9](#), [ref10](#), [ref11](#), [ref12](#), [ref13](#)

telepathy [ref1](#)

Tenpenny, Sherri [ref1](#)

Tesla, Nikola [ref1](#)

testosterone levels, decrease in [ref1](#)

testing for Covid-19 [ref1](#), [ref2](#)

anal swab tests [ref1](#)

cancer [ref1](#)

China [ref1](#), [ref2](#), [ref3](#)

Corman-Drosten test [ref1](#), [ref2](#), [ref3](#), [ref4](#)

death certificates [ref1](#), [ref2](#)

fraudulent testing [ref1](#)

genetic material, amplification of [ref1](#)

Lateral Flow Device (LFD) [ref1](#)

PCR tests [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#)

vaccines [ref1](#), [ref2](#), [ref3](#)

Thunberg, Greta [ref1](#), [ref2](#), [ref3](#)

Totalitarian Tiptoe [ref1](#), [ref2](#), [ref3](#), [ref4](#)

transgender persons

activism [ref1](#)

artificial wombs [ref1](#)

censorship [ref1](#)
child abuse [ref1](#), [ref2](#)
Human 2.0 [ref1](#), [ref2](#), [ref3](#)
Wokeness [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)
women, deletion of rights and status of [ref1](#), [ref2](#)
young persons [ref1](#)

travel restrictions [ref1](#)

Trudeau, Justin [ref1](#), [ref2](#), [ref3](#)

Trump, Donald [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#), [ref9](#), [ref10](#),
[ref11](#)

Twitter [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#)

U

UKColumn [ref1](#), [ref2](#)

United Nations (UN) [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#) *see also* **Agenda 21/Agenda 2030 (UN)**

United States [ref1](#), [ref2](#)

American Revolution [ref1](#)

borders [ref1](#), [ref2](#)

Capitol Hill riot [ref1](#), [ref2](#)

children [ref1](#)

China [ref1](#), [ref2](#)

CIA [ref1](#), [ref2](#)

Daily Pass tracking system [ref1](#)

demographics by immigration, changes in [ref1](#)

Democrats [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#)

election fraud [ref1](#)

far-right domestic terrorists, pushbackers as [ref1](#)

Federal Reserve [ref1](#)

flu/respiratory diseases statistics [ref1](#)

Global Cult [ref1](#), [ref2](#)

hand sanitisers, FDA warnings on [ref1](#)

immigration, effects of illegal [ref1](#)
impeachment [ref1](#)
Israel [ref1](#), [ref2](#)
Judaism [ref1](#), [ref2](#), [ref3](#)
lockdown [ref1](#)
masks [ref1](#)
mass media [ref1](#), [ref2](#)
nursing homes [ref1](#)
Pentagon [ref1](#), [ref2](#), [ref3](#), [ref4](#)
police [ref1](#), [ref2](#), [ref3](#), [ref4](#)
pushbackers [ref1](#)
Republicans [ref1](#), [ref2](#)
borders [ref1](#), [ref2](#)
Democrats [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)
Russia, inquiry into collusion with [ref1](#)
Sabbatians [ref1](#), [ref2](#), [ref3](#)
September 11, 2001, terrorist attacks [ref1](#), [ref2](#), [ref3](#), [ref4](#)
UFO sightings, release of information on [ref1](#)
vaccines [ref1](#)
white supremacy [ref1](#), [ref2](#), [ref3](#), [ref4](#)
Woke Democrats [ref1](#), [ref2](#)

V

vaccines [ref1](#), [ref2](#), [ref3](#)
adverse reactions [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)
Africa [ref1](#)
anaphylactic shock [ref1](#), [ref2](#), [ref3](#), [ref4](#)
animals [ref1](#), [ref2](#)
anti-vax movement [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)
AstraZeneca/Oxford [ref1](#), [ref2](#), [ref3](#), [ref4](#)
autoimmune diseases, rise in [ref1](#), [ref2](#)
Big Pharma [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#)

bioweapon, as real [ref1](#), [ref2](#)
black and ethnic minority communities [ref1](#)
blood clots [ref1](#), [ref2](#)
Brain Computer Interface (BCI) [ref1](#)
care homes, deaths in [ref1](#)
censorship [ref1](#), [ref2](#), [ref3](#)
chief medical officers and scientific advisers, financial interests of
[ref1](#), [ref2](#)
children [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#), [ref9](#), [ref10](#)
China [ref1](#), [ref2](#)
clinical trials [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#)
compensation [ref1](#)
compulsory vaccinations [ref1](#), [ref2](#), [ref3](#)
computer programs [ref1](#)
consciousness [ref1](#)
cover-ups [ref1](#)
creation before Covid [ref1](#)
cytokine storm [ref1](#)
deaths and illnesses caused by vaccines [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)
definition [ref1](#)
developing countries [ref1](#)
digital tattoos [ref1](#)
DNA-manipulation [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#), [ref9](#),
[ref10](#)
emergency approval [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)
female infertility [ref1](#)
funding [ref1](#)
genetic suicide [ref1](#)
Global Cult [ref1](#)
heart chakras [ref1](#)
hesitancy [ref1](#)
Human 2.0 [ref1](#), [ref2](#), [ref3](#), [ref4](#)
immunity from prosecution [ref1](#), [ref2](#), [ref3](#)

implantable technology [ref1](#)
Israel [ref1](#)
Johnson & Johnson [ref1](#), [ref2](#), [ref3](#), [ref4](#)
lockdowns [ref1](#)
long-term effects [ref1](#)
mainstream media [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)
masks [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)
Medicines and Healthcare products Regulatory Agency (MHRA)
[ref1](#), [ref2](#)
messaging [ref1](#)
Moderna [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#)
mRNA vaccines [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#), [ref9](#)
nanotechnology [ref1](#), [ref2](#)
NHS [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)
older people [ref1](#), [ref2](#)
operating system [ref1](#)
passports [ref1](#), [ref2](#), [ref3](#), [ref4](#)
Pfizer/BioNTech [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#)
polyethylene glycol [ref1](#)
pregnant women [ref1](#)
psychopathic personality [ref1](#)
races, targeting different [ref1](#)
reverse transcription [ref1](#)
Smart Grid [ref1](#)
social distancing [ref1](#)
social media [ref1](#)
sterility [ref1](#)
synthetic material, introduction of [ref1](#)
tests [ref1](#), [ref2](#), [ref3](#)
travel restrictions [ref1](#)
variants [ref1](#), [ref2](#)
viruses, existence of [ref1](#)
whistle-blowing [ref1](#)

WHO [ref1](#), [ref2](#), [ref3](#), [ref4](#)
Wokeness [ref1](#)
working, vaccine as [ref1](#)
young people [ref1](#)
Vallance, Patrick [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#), [ref9](#)
variants [ref1](#), [ref2](#), [ref3](#)
vegans [ref1](#)
ventilators [ref1](#), [ref2](#)
virology [ref1](#), [ref2](#)
virtual reality [ref1](#), [ref2](#), [ref3](#)
viruses, existence of [ref1](#)
visual reality [ref1](#), [ref2](#)
vitamin D [ref1](#), [ref2](#)
von Braun, Wernher [ref1](#), [ref2](#)

W

war-zone hospital myths [ref1](#)
waveforms [ref1](#), [ref2](#)
wealth [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#), [ref9](#) [ref10](#), [ref11](#)
wet market conspiracy [ref1](#)
Wetiko factor [ref1](#)
 alcoholism and drug addiction [ref1](#)
 anti-human, why Global Cult is [ref1](#)
 Archons [ref1](#), [ref2](#), [ref3](#), [ref4](#)
 artificial intelligence (AI) [ref1](#)
 Big Pharma [ref1](#), [ref2](#)
 children [ref1](#)
 China [ref1](#)
 consciousness [ref1](#), [ref2](#)
 education [ref1](#)
 Facebook [ref1](#)

fear [ref1](#), [ref2](#)
frequency [ref1](#), [ref2](#)
Gates [ref1](#), [ref2](#)
Global Cult [ref1](#), [ref2](#)
heart [ref1](#), [ref2](#)
lockdowns [ref1](#)
masks [ref1](#)
Native American concept [ref1](#)
psychopathic personality [ref1](#), [ref2](#)
reframing/retraining programmes [ref1](#)
religion [ref1](#)
Silicon Valley [ref1](#)
Smart Grid [ref1](#)
smartphone addiction [ref1](#), [ref2](#)
social media [ref1](#)
war [ref1](#), [ref2](#)
WHO [ref1](#)
Wokeness [ref1](#), [ref2](#), [ref3](#)
Yaldabaoth [ref1](#), [ref2](#), [ref3](#), [ref4](#)
whistle-blowing [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#)
white privilege [ref1](#), [ref2](#)
white supremacy [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)
Whitty, Christopher [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#), [ref9](#),
[ref10](#)
'who benefits' [ref1](#)
Wi-Fi [ref1](#), [ref2](#), [ref3](#), [ref4](#)
Wikipedia [ref1](#), [ref2](#)
Wojcicki, Susan [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#)
Wokeness
Antifa [ref1](#), [ref2](#), [ref3](#), [ref4](#)
anti-Semitism [ref1](#)
billionaire social justice warriors [ref1](#), [ref2](#), [ref3](#)

Capitol Hill riot [ref1](#), [ref2](#)
censorship [ref1](#)
Christianity [ref1](#)
climate change hoax [ref1](#), [ref2](#)
culture [ref1](#)
education, control of [ref1](#)
emotion [ref1](#)
facts [ref1](#)
fascism [ref1](#), [ref2](#), [ref3](#)
Global Cult [ref1](#), [ref2](#), [ref3](#), [ref4](#)
group-think [ref1](#)
immigration [ref1](#)
indigenous people, solidarity with [ref1](#)
inversion [ref1](#), [ref2](#), [ref3](#)
left, hijacking the [ref1](#), [ref2](#)
Marxism [ref1](#), [ref2](#), [ref3](#)
mind control [ref1](#)
New Woke [ref1](#)
Old Woke [ref1](#)
Oneness [ref1](#)
perceptual programming [ref1](#)
 Phantom Self [ref1](#)
police [ref1](#)
defunding the [ref1](#)
reframing [ref1](#)
public institutions [ref1](#)
Pushbackers [ref1](#), [ref2](#), [ref3](#)
racism [ref1](#), [ref2](#), [ref3](#)
reframing [ref1](#), [ref2](#)
religion, as [ref1](#)
Sabbatians [ref1](#), [ref2](#), [ref3](#)
Silicon Valley [ref1](#)
social justice [ref1](#), [ref2](#), [ref3](#), [ref4](#)

transgender [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

United States [ref1](#), [ref2](#)

vaccines [ref1](#)

Wetiko factor [ref1](#), [ref2](#), [ref3](#)

young people [ref1](#), [ref2](#), [ref3](#)

women, deletion of rights and status of [ref1](#), [ref2](#)

World Economic Forum (WEF) [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#),
[ref8](#), [ref9](#)

World Health Organization (WHO) [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#),
[ref7](#), [ref8](#), [ref9](#)

AIDs/HIV [ref1](#)

amplification cycles [ref1](#)

Big Pharma [ref1](#), [ref2](#), [ref3](#)

cooperation in health emergencies [ref1](#)

creation [ref1](#), [ref2](#)

fatality rate [ref1](#)

funding [ref1](#), [ref2](#), [ref3](#)

Gates [ref1](#)

Internet [ref1](#)

lockdown [ref1](#)

vaccines [ref1](#), [ref2](#), [ref3](#), [ref4](#)

Wetiko factor [ref1](#)

world number 1 (masses) [ref1](#), [ref2](#)

world number 2 [ref1](#)

Wuhan [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#) [ref8](#)

Y

Yaldabaoth [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#)

Yeadon, Michael [ref1](#), [ref2](#), [ref3](#), [ref4](#)

young people *see also* children addiction to technology [ref1](#)

Human 2.0 [ref1](#)

vaccines [ref1](#), [ref2](#)

Wokeness [ref1](#), [ref2](#), [ref3](#)

YouTube [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#)

WHO 548

Z

Zaks, Tal [ref1](#)

Zionism [ref1](#), [ref2](#), [ref3](#)

Zuckerberg, Mark [ref1](#), [ref2](#), [ref3](#), [ref4](#), [ref5](#), [ref6](#), [ref7](#), [ref8](#), [ref9](#),
[ref10](#), [ref11](#), [ref12](#)

Zulus [ref1](#)

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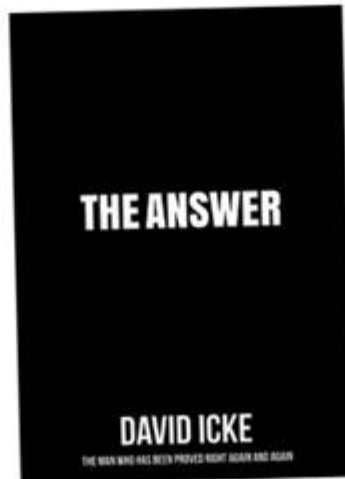
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noun

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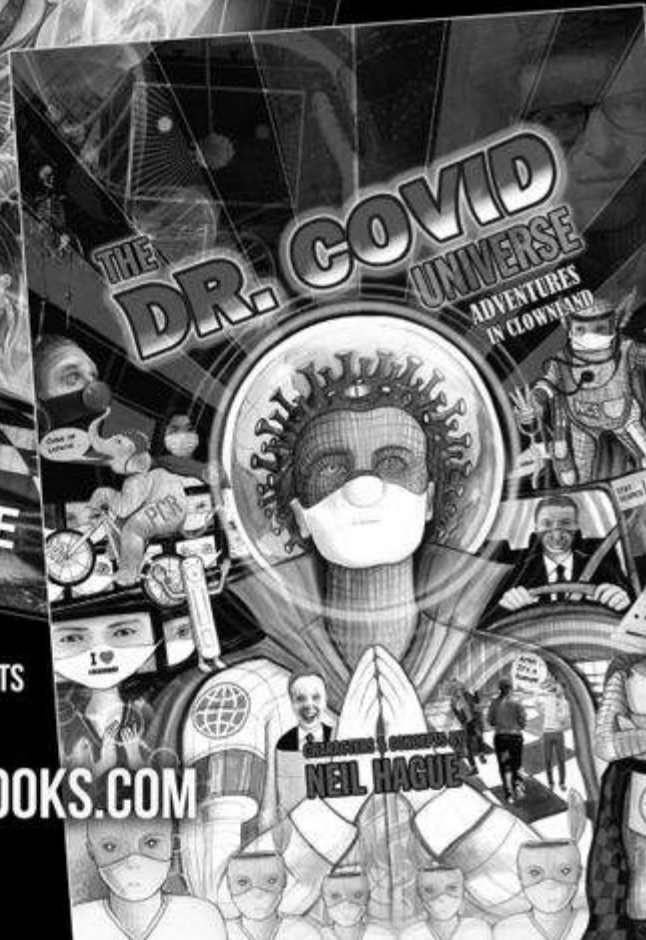
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