



The A to Z of The Heart

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INTRODUCTION

This is the first major update of the *A to Z of the Heart* and, there has been a greater emphasis placed on the clinical section, which has occurred in most of the A to Zs. This is due to feedback which plays an important role in the structure of the all A to Zs. It is hoped that pathological considerations of the heart and its vessels will make up a new book on the failure of the cardiovascular system one of the many in the new series of the *A to Z of the failure of...* The first of which is the *A to Z of Bone & Joint Failure*.

Please feel free to comment and contribute to any and all aspects of these publications.

As usual the material may be viewed along with the other A to Zs on the following sites <http://www.aspenpharma.com.au/atlas/student.htm>
www.amandasatoz.com

ACKNOWLEDGEMENT

would like to thank Aspenpharmacare Australia in particular Mr Greg Lan CEO, and Mr Robert Koster. Thank you also to Ante Mihaljevic and everyone who provided valuable feedback.

DEDICATION To self determination – to thine own self be true.

HOW TO USE THIS BOOK

The structure of the A to Z books grows and develops with each publication, but the principle of listing structures in an alphabetical manner as far as possible and hence making the book its own index for easy retrieval has been maintained. However this is now done after first dividing the material into a number of main topics and introducing overviews of the main structures discussed and their clinical applications. The topics in this case are: the components of the circulatory system, the structure of the heart and then the blood supply of the organs and tissues in the body – listed alphabetically. Major blood vessels are illustrated – showing their branches and relations and finally clinical considerations and methods to examine the cardiovascular system are described.

This book is cross-referenced with all the other A to Zs

Thank you

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ISBN 978 1 9219301 6 4

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Abbreviations

A	= atrium, (pl atria) / actions /movements of a joint	HS	= heart sounds
ACF	= anterior cranial fossa	IC	= intracellular / intercostal
AF	= atrial fibrillation	ICS	= intercostal space
adj.	= adjective	IVC	= inferior vena cava
aka	= also known as	jt(s)	= joints = articulations
alt.	= alternative	L	= left
AM	= arachnoid mater	LA	= Left Atrium
ANS	= autonomic nervous system	lat.	= lateral
ant	= anterior	LL	= lower limb
art.	= artery	lig	= ligament
AS	= Alternative Spelling, generally referring to the diff. b/n British & American spelling	LP	= low pressure
ASD	= atrial septal defect	Lt.	= Latin
assoc.	= associated with	MCL	= mid clavicular line
AV	= atrioventricular	med.	= medial
B	= blood	MI	= myocardial infarction
BBB	= blood brain barrier	N	= nerve
bc	= because	NS	= nervous system/nerve supply
BF	= blood flow	NT	= nervous tissue
BM	= basement membrane	nv	= neurovascular bundle
BP	= brachial plexus	P	= pressure
bpm	= beats per minute	PAD	= peripheral artery disease
br	= branch (of a vessel)	PaNS	= parasympathetic nervous system
BS	= blood supply / blood stream	pl.	= plural
b/n	= between	PM	= pia mater
cap.	= capillary	PN	= peripheral nerve
c.f.	= compared to	post.	= posterior
CM	= cardiac muscle	proc.	= process
cm	= cell membrane	prox.	= proximal
CMC	= cardiac muscle cells	R	= Right
CNS	= central nervous system	RA	= Right atrium
CO	= cardiac output	RA	= regarding/in reference to
collat.	= collateral	S	= sacral
CP	= cervical plexus	S1	= first heart sound
Cr	= cranial	S2	= second heart sound
CSF	= Cerebrospinal fluid	SA	= sinoatrial
CT	= connective tissue	sing.	= singular
CVA	= cerebrovascular accident = stroke	SC	= spinal cord
dist.	= distal	SN	= spinal nerve
DM	= dura mater	SR	= sarcoplasmic reticulum
e.g.	= example	subcut.	= subcutaneous
EC	= extracellular (outside the cell)	supf	= superficial
ECG	= electrocardiogram	SS	= signs and symptoms
Gk.	= Greek	SVC	= superior vena cava
H	= hormone(s)	SyNS	= sympathetic nervous system
HB	= heart beat	T	= thoracic
HF	= heart failure	UL	= upper limb, arm
HP	= high pressure	V	= vertebra / ventricle
HR	= heart rate	VC	= vertebral column
		WM	= white matter
		w/n	= within
		w/o	= without
		wrt	= with respect to
		&	= and



Common Terms used in Cardiology / Vascular anatomy

Ablation - surgical or catheter scarring of cardiac tissue.

Accessory Pathway - alternative connecting pathway b/n the A & the V - besides the bundle of His resulting syndrome is – Wolf-Parkinson-White syndrome

Actin - one of the 2 contractile fibres of the cardiac & skeletal muscle - the “thin” filament (see also Myosin)

Action Potential - electrical activities of a cell from depolarization to repolarization (5 phases 0-5) involving Calcium, Potassium and Sodium ions

Adrenergic mimicking receptors of the sympathetic NS - adrenaline opposite of cholinergic

Afterload - P needed by the V to eject blood - in the R this is small (the pressure around 30mmHg) - the diastolic pressure of the pulmonary trunk - in the L it is the diastolic P of the aorta + peripheral resistance

Amplitude - the height/depth of the waves in an ECG in mm

Anastomosis - the surgical connection of separate or severed tubular hollow organs to form a continuous channel. - a series of interconnecting blood channels allowing for several directions of BF so that B can reach tissue despite blockages

Aneurysm - a localized dilatation of an artery or heart chamber caused by disease or weakening of the muscle in the wall - tunica media.

Angina / Angina Pectoris - Chest pain or discomfort due to lack of oxygen - anoxia or ischemia in the muscle tissue (myocardium) generally bc of coronary artery disease. Angina is a symptom of a condition called myocardial ischemia. May also manifest as : aching, burning, discomfort, heaviness, numbness, pressure, tightness, &/or tingling in the chest, back, neck, throat, jaw or arms.

Angiography - an X-ray that uses dye injected into arteries so that coronary artery anatomy can be studied wrt disease diagnosis. Coronary angiography is done during a cardiac catheterization. see also angiograms

Angioplasty - An insertion of a balloon at the end of a catheter, blown up to compress the clogged area of the artery against the arterial wall and so dilate the lumen which is then removed.

Anticoagulants - also known as: "Blood thinners". Medications that slow blood clotting time. Anyone on anticoagulants needs regular blood tests to determine clotting time eg. Prothrombin time = PT = Prottime.

Aorta - the largest artery in the body and the primary BV leading from the heart to the body.

Aortic Valve - the valve that regulates BF from the heart to the aorta.

Apex - (of the Heart) the inferior aspect or bottom of the heart 5th ICS, L MCL, where the HB is the strongest

Arrhythmia - lack of rhythm or HB, abnormal heartbeat (= Dysrhythmia), caused by a disruption of the normal functioning of the heart's electrical conduction

system. Normally, contraction is coordinated. Arrhythmias/Dysrhythmias result in ineffective and uncoordinated contractions of the CM causing an irregular pulse, CO, CAD, rheumatic heart disease, BP, acute MI, hyperthyroidism and some medications are associated with the development of arrhythmias. Listed below are the types of arrhythmias

- Fibrillation: can be atrial or ventricular. Ineffective beats. see also fibrillation
- Tachycardia: fast heart beat, usually > 110 bpm.
- Bradycardia: slow heart beat, usually < 50 bpm

Arteriole - small artery

Arteriosclerosis - Commonly called "hardening of the arteries", this includes a variety of conditions that cause artery walls to thicken and lose elasticity. It can occur because of fatty deposits in the inner lining of arteries (atherosclerosis), calcification of the wall of the arteries, or thickening of the muscular wall of the arteries from chronically elevated BP. It also is associated with aging diabetes, hyperlipidaemia & hypertension etc. see also Atherosclerosis

Artery - a BV that carries blood away from the heart.

Asystole - absence of a HB - flat line ECG

Atherectomy also known as: Rotarooter. A procedure that uses a catheter and special cutting or grinding tools to remove plaque from artery walls

Atherosclerosis - a form of arteriosclerosis that is caused by a buildup of plaque &/or fatty deposits in the inner lining of an artery.

Atrial Fibrillation (AF) - A disorder of HR and rhythm in which the heart's 2 small, upper chambers (A) quiver rapidly like a bowl of gelatin and empty blood into the heart's lower chambers (V) in a disorganized manner. This may result in blood pooling and clotting in the A. Causes of AF include dysfunction of the SA node, coronary artery disease, rheumatic heart disease, hypertension and hyperthyroidism.

Atrial Septal Defect (ASD) - an abnormal hole in the wall b/n the R & L atria.

Atrium (pl Atria) - Lt antrum = waiting room – top chambers R & L of the heart - 1/3 of the volume of the V or lower chamber.

AV node - see junction

AV junction - see junction

Base - "of the Heart" top of the heart located in the 4th ICS

"Beta stimulation" - responses come from adrenergic = sympathetic stimulation, 1 the HR, contraction force, 2 the bronchial dilatation

Blood Pressure (BP) - The force or pressure exerted by the heart against the walls of the arteries. When the arterioles (smaller arteries) constrict (narrow), the blood must flow through a smaller "pipe" and the pressure rises. High BP adds to the workload of the heart and arteries.

Optimal BP is < 120/80 mm Hg. High BP = hypertension, >140/90 mm Hg - 120-139/80-89 mm Hg are considered pre-hypertension. Hypertension increases the risk of: angina, atherosclerosis, CVA, HF, kidney failure, MI & PAD.

Bradycardia - an abnormally slow HB, usually < 60 bpm opposite of Tachycardia

Bundle of His - a pacemaker (40-60bpm) and part of the cardiac conducting system it transmits the electrical stimulation/depolarization through the AV septum to the R & L Purkinje fibres

Bundle branches - part of the cardiac conducting system = bundle of His + Purkinje bundles R+ L

Bundle-branch Block - an interruption of the cardiac conducting system - Purkinje fibres are insulated to conduct the signal rapidly through the Vs – if either side is blocked the other must travel further and hence depolarization is slower - elongating the QRS complex

Burst - a run of 3 or more ectopic HBs

Calcium Ion Channel - part of the SR enlarged in the heart where Ca²⁺ can efflux &/or influx rapidly to allow for contraction of the CMCs

Capillaries - the smallest vessels b/n arteries & veins. Site of gas and nutrient exchange b/n B and T.

Capture - effective depolarization of the A or Vs by a pacemaker

Cardiac Arrest - the sudden stopping of HBs & respiration – clinical death.

Cardiac Cath or Cardiac Catheterization a catheter is inserted into a BV in the arm or groin (after local anaesthesia) and threaded up to the heart, a dye is injected and X-rays are taken of the heart arteries, to investigate blockages or narrowing of the BVs

Cardiac Output (CO) - the volume of B pumped from the V in 1 min. (generally referring to the LV)

Cardiac Tamponade - excess fluid b/n the parietal and visceral layers of the pericardium - this restricts cardiac contraction SS – jugular distention + diminished difference b/n systolic and diastolic BPs

Cardioversion - the restoration of normal HB by electrical counter shock or by use of medication.

Cardiomyopathy - a disease or disorder of the CM causing it to lose its pumping strength.

Carotid Artery - major artery of the H&N - from the aorta

Catecholamines - Hs and substances of the symNS = adrenalin + noradrenalin AKA epinephrine + norepinephrine + dopamine

Catheter a thin, flexible tube

Cholesterol - a soft, waxy substance found among the lipids or fats in the BS and in all the body's cells. It forms cm and some Hs. Cholesterol and other fats are transported to in the BS by lipoproteins, and can move in and out of cells bc of their fatty nature. There are several kinds of cholesterol, but the most important are low-density lipoprotein (LDL) considered "bad" cholesterol bc they carry triglycerides, high-density lipoprotein (HDL) considered "good".

Cholinergic - refers to substances containing quaternary ammonium salts

Cholinergic - Hs and substances of the PaNS = acetylcholine antagonists to

the sympathetic NS substances see also catecholamines

Chordae Tendineae - tendons connecting the AV valves with the papillary muscles

Chronotropic - concerning HR

Chrono - time

Complete heart block - A & Vs fire independently

Complex - a collection of waveforms QRS complex or ECG complex

Computed Tomography (CT or CAT scan) - a method of examining body organs by scanning them with X-rays and using a computer to construct a series of cross-sectional scans along a single axis.

Conduction - the process of transporting the depolarization stimulus (electrical stimulus) throughout the heart A ⇒ Vs in a specific pathway or along a N.

Conductivity - the ability to conduct an impulse to another region or another cell

Congenital - existing at birth.

Congestive cardia failure (CCF) - Blood volume coming in is more than that able to be pumped out - leading to fluid backup - backup from the LV results in fluid overload in the lungs - in the RV results in venous fluid retention - swelling of dependent parts such as ankles and sacrum.

Coronary Artery Bypass Graft also known as: CABG, "Cabbage". Surgery done to bypass the blocked coronary artery. Uses a vein from the leg or chest to carry the blood as "a bridge" around the blocked coronary artery.

Coronary Arteries - Two arteries arising from the aorta that arch down over the top of the heart & branch out in additional arteries that provide B to the heart muscle

Coronary Artery Disease (CAD) - Conditions that cause narrowing of the coronary arteries, reducing BF to the CM. Blockage or narrowing may be due to clots, lipids &/or plaques. Severe cases can result in heart attack.

Coronary Artery Bypass Grafting (CABG) - heart surgery in which a section of a BV is grafted to the coronary artery to bypass the blocked section of the coronary artery and improve the BF to the heart.

Defibrillation - the process of depolarizing the whole heart and creating an asystole in order to re-establish a sinus rhythm

Defibrillator - an electronic device used to establish a normal HB.

Depolarization - rapid influx of positive ions across the cell membrane to allow contraction

Dextrocardia - the heart is in the R thorax and chambers are reversed - rare

Diastole - phase of relaxation in the cardiac cycle first A and then Vs lasts up to 2X as long as the systole, allows for the chambers to fill

Dyskinetic - a sub-optimal contracting myocardium due to ischaemia

Dysrhythmia - arrhythmia abnormal rhythm

Echocardiogram - a study using high-frequency sound waves to picture or visualize the heart chambers, the thickness of the muscle wall, the heart valves

and major BVs located near the heart. This is a non-invasive procedure.

Echocardiography - the use of ultrasound in the diagnosis of cardiovascular lesions and in recording the size, motion, and composition of various cardiac structures.

Ectopic - wrt the heart a depolarizing wave originating outside the SA node

Ejection Fraction - the measurement of the B pumped out of the Vs compared to the total amount of B in the V (Normal is 60%).

Electrocardiogram (ECC or EKG) - a test that records the electrical activity of the heart, shows abnormal rhythms and detects heart muscle damage (heart attacks), graph of the electrical conduction system of the heart

Electrolytes - elements or chemicals, generally anions or cations, needed to enable the body and heart to work properly. The most frequently tested are: Sodium, Potassium, Calcium & Chloride; levels outside the normal range cause cardiac (heart) and other problems.

Electrophysiological Study (EPS) - a cardiac catheterization to study electrical current in patients who have arrhythmias.

Endocarditis - inflammation of the endocardium generally to infection that may affect heart valves and the aorta.

Endocardium - smooth innermost layer of the heart, covers all chambers and the valves - continuous with the endothelium lining the BV lumen

Endotracheal Tube (ETT) - a tube inserted into the trachea (wind pipe) to provide a passageway for air.

Enzymes AKA cardiac enzymes - term used wrt when there is suspected cardiac muscle damage and cell death - certain enzymes are released from these cells and their levels rise acutely.

Epicardium - the membrane that covers the outside of the heart - fused with the visceral pericardium often used interchangeably with this term, supports the cardiac vessels before they penetrate the myocardium

Excitability - a cell's ability to respond to an impulse by depolarizing or by spontaneous depolarization

Extrasystole - premature depolarizing complex or HB

Fibrillation - rapid irregular contractions of the heart muscle.

Atrial fibrillation 350-600 bpm but only a max of 240 bpm can pass through to the ventricles (no P waves - narrow QRS complex)

Flutter - ineffective contractions of the heart muscles.

Heart Attack AKA **myocardial infarction** is the sudden interruption or insufficiency of the supply of blood to the heart, typically resulting from occlusion or obstruction of a coronary artery and often characterized by severe chest pain.

Heart Block - impaired conduction of the impulse that regulates the HB - may cause sudden attacks of unconsciousness.

Heart-lung Machine - a machine that pumps and oxygenates blood during

open-heart surgery.

Heart rate - number of QRS complexes on an ECG – note this may not be the same as the pulse rate

Heart Valve Prolapse - a condition of the heart valve in which it is partially open when it should be closed.

His-Purkinje system - the electrical network of fibres which includes the Bundle of His, bundle branches and Purkinje fibres

Hyperkalaemia - increased potassium levels in the B

Hypertension - high BP = diastolic > 90 mmHg and systolic >140 mmHg

Hypokalaemia - decreased potassium levels in the B

Hypotension - low BP = diastolic < 70mg systolic <90 mmHg

Hypoxia - a sub therapeutic B oxygen level resulting in reduced energy production and level of lactic and pyruvic acid (anaerobic metabolism)

Incompetence - re valves indicates a valve which allows regurgitation – backflow of blood

Infarction - cell death due to anoxia

Intravascular Echocardiography - echocardiography used in cardiac catheterization.

Invasive procedure - a procedure, test or surgery that involves going through the skin or muscle or into a vein or artery, such as a Cardiac Catheterization

Ischemia - reduced oxygen supply - in the heart generally refers to reduced BS due to plaque blockage in the coronary arteries.

Ischemic Heart Disease - a disease characterized by reduced BS to the heart.

Junction - as in AV junction b/n the A & the Vs - allows the impulse to go from the A to the Vs, and slows it via the AV node (a supraventricular structure) and the bundles of His. If the sinus does not generate an impulse the AV junction will fire at 40-60 bpm

Left Ventricular Assist Device (LVAD) - a mechanical pumping device that is surgically implanted; it helps maintain the pumping action of the heart and often used in patients who are waiting for a heart transplant.

Lymphatic - a vessel which carries fluid to the heart

MAZE - known as the micro-MAZE, this innovative videoscopic operation offers a surgical remedy for AF w/o opening the chest or stopping the heart. With the micro-MAZE operation, access to the heart is achieved through 3 one - centimeter (keyhole) incisions on each side of the patient's chest.

Mechanical Valves - artificial valves made from metal, plastic, and/or pyrolytic carbon.

Mediastinum - the region in the thorax b/n the lungs, ant. boundary - the sternum post. the VC, includes the heart, roots of the great vessels, oesophagus and trachea.

Microvasculature - the network of small BVs arterioles capillaries venules in a tissue

- Minimally Invasive Heart Surgery** - a variety of approaches using smaller incisions to reduce the trauma of surgery and potentially speed recovery.
- Mitral Valve** - the valve that controls the BF b/n the LA & LV in the heart.
- Mitral Valve Prolapse** - a bulge in the valve b/n the LA & LV of the heart that causes backward flow of the blood into the atrium.
- Murmur** - a specific sound emanating from the chest in addition to the normal HS.
- Myocardial Infarct** - also called "heart attack"; the sudden interruption or insufficiency of the supply of B to the heart, typically resulting from occlusion or obstruction of a coronary artery and often characterized by severe chest pain
- Myocardial infarction** AKA **Heart attack** death of myocardial tissue due to anoxia.
- Myocardial Ischemia** - insufficient BF to part of the heart.
- Myocardium** - the muscle of the heart = heart muscle - middle layer responsible for contraction
- Myocyte** - muscle cell, may be smooth or striated then cardiac or skeletal
- Myosin** - the "thick" filament of the 2 filaments which bind together in heart muscle contraction (see also Actin)
- Nodal** - referring to junctional functions
- Non-invasive procedure** - a procedure that can be done outside of the body, such as an X-ray or ECG. (see also invasive procedure)
- NTG-Nitro-Nitroglycerine** - a medication that expands or relaxes arteries to enable B to flow more easily. It can be taken by mouth, spray, skin patch, or intravenously
- P - wave** - wave formed by atrial depolarization
- P - R interval** - time b/n P wave beginning and the beginning of the QRS complex
- Pacemaker** - surgically implanted electronic devices used to stimulate or regulate contractions of the heart muscle.
- Palpitation** - irregular HB that can be felt by a person.
- Pericardium** - 2X layered sac surrounding the heart filled with 30-50 mls of surfactant
- Peripheral Resistance** - the obstruction to BF in the body's tissues
- Plaque** - a build up in the lining of a damaged artery. It can be caused by high B cholesterol, smoking, ↑BP
- Prolapse** - collapse
- Pulmonary Valve** - the heart valve located b/n the RV and the pulmonary artery that controls BF to the lungs.
- Pulmonary Vein** - the vessel that carries newly oxygenated blood to the heart from the lungs.
- Pulse** - the beat of the heart felt in an artery.
- QRS interval** - electrical representation of ventricular depolarization
- Refractory period** - period when the contractile CMCs are not fully repolarized

- absolute refractory period when it is impossible to restimulate the cells due to depolarization no matter how large the stimulating impulse

Regurgitation - is BF in the opposite direction from normal.

Rheumatic Heart Disease - a condition resulting from certain strep infections that occasionally cause disease in the joints & heart valves.

Rhythm - cardiac beating rhythm normally started from the SA node – AKA sinus rhythm (80-120 bpm) - Junctional rhythm when the contraction is started by the AV node generally 60-100 bpm (P waves absent – QRS shortened PR interval inverted see also ECG)

Risk factors - habits or characteristics which can increase the likelihood of developing heart disease.

Non-modifiable risk factors (risk factors that cannot be changed):

- Family history of coronary disease or stroke
- Age
- Sex

Modifiable risk factors (risk factors that can be changed):

- Smoking
- High Blood Pressure (hypertension)
- Diet high in animal fats
- Sedentary lifestyle (couch potato)
- Diabetes
- Stress
- Type "A" personality
- Obesity
- Excessive use of alcohol

Run = burst

Saphenous Vein - a vein on the inside of the leg running from the ankle to the groin that can be used to create bypasses from the aorta to the coronary arteries.

Septal Defect - a congenital abnormality in the septum b/n the L & R Vs.

Septum - the wall that divides the heart chambers.

Semilunar valves - referring to the shape of valves like half moons cups which capture any B wanting to flow backwards found in the atrial valves, veins and lymphatics, CT structure covered with endothelial cells

Sick sinus syndrome - altered sinus rhythm due to fibrous tissue growth and interference around the SA node

Sinoatrial node = SA node area of modified CMCs in upper RA serves as the predominant pacemaker of the heart

Sinus Rhythm - the normal rhythm of the heart (60 to 100 beats per minute).

Stable angina (or chronic stable angina) - refers to "predictable" chest discomfort such as that associated with physical activity or mental or emotional stress. Rest and/or nitroglycerin usually relieve stable angina. vs Unstable angina - Refers to unexpected chest pain and usually occurs at rest. It is

typically more severe and prolonged and is due to a BF to the heart caused by the narrowing of the coronary arteries. Unstable angina or acute coronary syndrome should be treated as an emergency

Stenosis - the valve opening has not formed correctly or has become narrowed and inflexible (or stenotic) reducing the ability of the heart to pump blood out efficiently.

Stent - devices that are placed in the artery to keep the inner wall of the artery open. Small metal coil or mesh tube, permanently left in the artery

Sternotomy - a type of incision in the center of the chest that separates the sternum (chestbone) to allow access to the heart.

Synctium - multiple nuclear bag of cytoplasm

Tachycardia - accelerated HR generally >100 bpm opposite Bradycardia

Telemetry Unit - a small transmitter that is used to send information about the heart via radio transmission to healthcare professionals for evaluation.

Transesophageal Echocardiography (TEE) - a diagnostic test in which a probe is passed through the oesophagus, measuring the sound waves that bounce off the heart.

Transmural - wrt heart across the full thickness of the muscular wall

Tricuspid Valve - the heart valve that controls the BF from the RA into the RV.

Troponin - protein of the CMC involved in contraction - if present in the B indicates muscle death

T-wave - representation of ventricular repolarization

U-wave - indicates repolarization of purkinje fibres or hypokalaemia or digoxin or quinidine medication

Vagal maneuver - stimulation of the vagal N to decrease HR and BP may cause fainting

Valve - there are 4 heart valves: mitral, aortic, pulmonary and tricuspid, that act as one-way "doors" between the chambers of the heart.

Vein - a BV which carries B to the heart

Ventricular fibrillation - chaotic disorganized HB from one or more centres in the V - stops or diminishes CO and if uncorrected results in death needs cardioversion to correct

Ventricular Septal Defect - a common congenital heart defect; an abnormal opening in the septum dividing the Vs allows blood to pass directly from the L to the R V; large openings may cause CCF.

Ventricles - lower heart 2 chambres

Guide to Anatomical Planes and Relations

This is the anatomical position.

A = Anterior Aspect from the front
Posterior Aspect from the back
used interchangeably with ventral and dorsal respectively

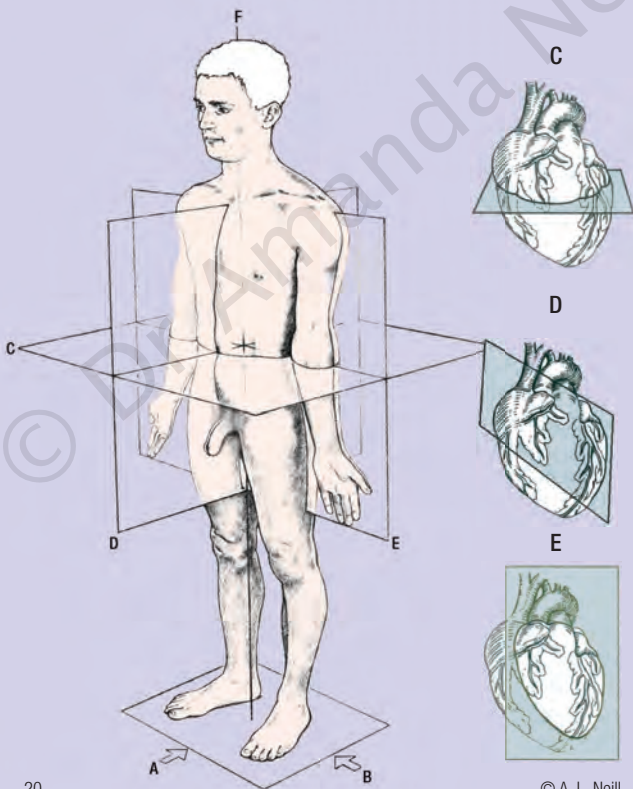
B = Lateral Aspect from either side

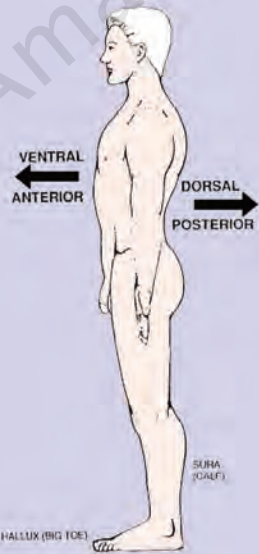
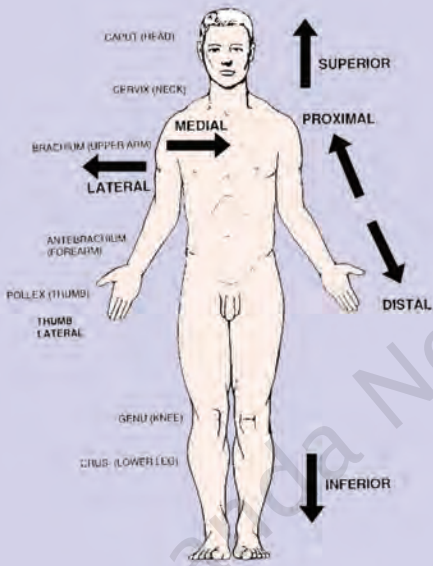
C = Transverse / Horizontal plane

D = Midsagittal plane = Median plane; trunk moving away from this plane = lateral flexion or lateral movement moving into this plane = medial movement; limbs moving away from this direction = abduction; limbs moving closer to this plane = adduction

E = Coronal plane

F = Median





Anatomical Movements



Hip flexion



Hip extension



Hip abduction



Hip adduction



Hip lateral and medial rotation



Hip circumduction



Knee flexion



Knee extension

Blood supply Brain & Spinal Cord overview

Brain

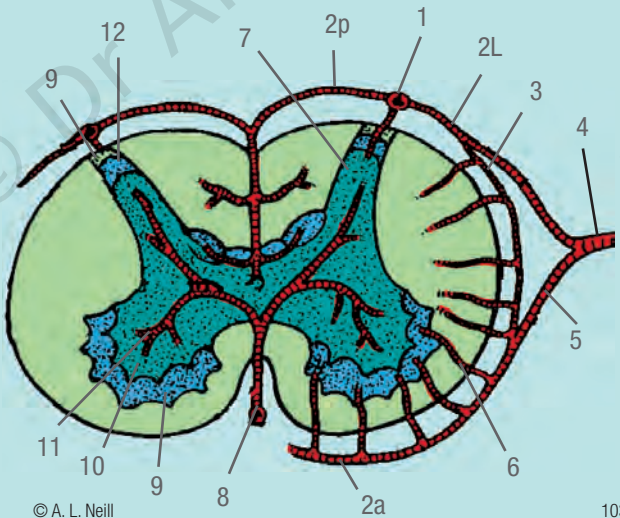
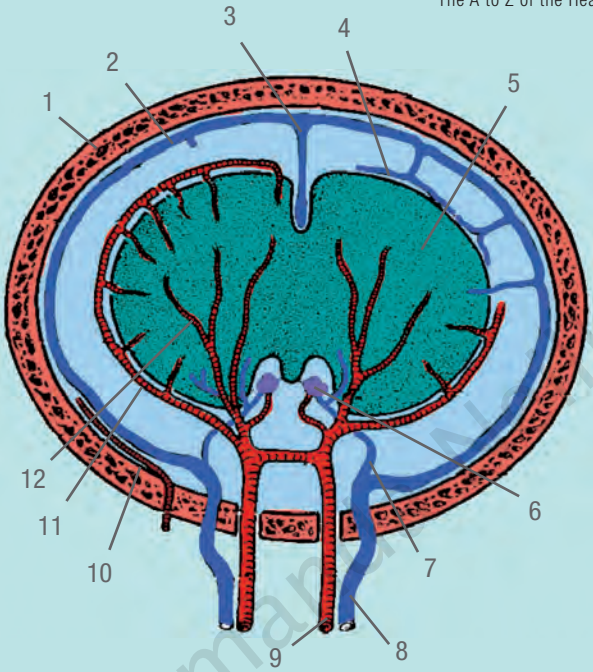
Schema of the brain – coronal

- 1 Skull = bony covering
- 2 meningeal vein
- 3 DM around the venous sinuses + communicating vessel
- 4 external cerebral vein
- 5 brain – nervous tissue
- 6 choroid plexus
- 7 deep cerebral vein
- 8 extracranial vein
- 9 extracranial art
- 10 meningeal art
- 11 superficial cerebral art

Spinal Cord

Schema of the SC – transverse

- 1 posterior spinal art
- 2 radicular branches a = anterior / L = lateral / p = posterior
- 3 arterial vasocorona
- 4 lateral artery
- 5 anterior radicular artery
- 6 branches of the superficial arterial network
- 7 anterior spinal artery
- 8 sulcal art = ant. spinal art. (lies in the sulcus of the SC)
- 9 marginal zone (of Lissauer)
- 10 anterior horn = ventral motor horn
- 11 deep spinal art
- 12 substantia gelatinosa



Blood supply of the Brain

Inferior view – Arterial supply

The brain cannot be deprived of arterial blood for longer than 1 minute. The circle of Willis is the core of the BS from which the main arteries originate.

- 1 anterior spinal art.
- 2 vertebral art. – paired
- 3 post. inf. cerebellar art.
- 4 ant. inf. cerebellar art.
- 5 basilar artery – from the fusion of the paired vertebral arteries
- 6 pontine branches
- 7 post. cerebral art.
- 8 Circle of Willis = arterial circle ,
- 9 middle cerebral art
- 10 ant. cerebral art.
- 11 cerebellar arteries

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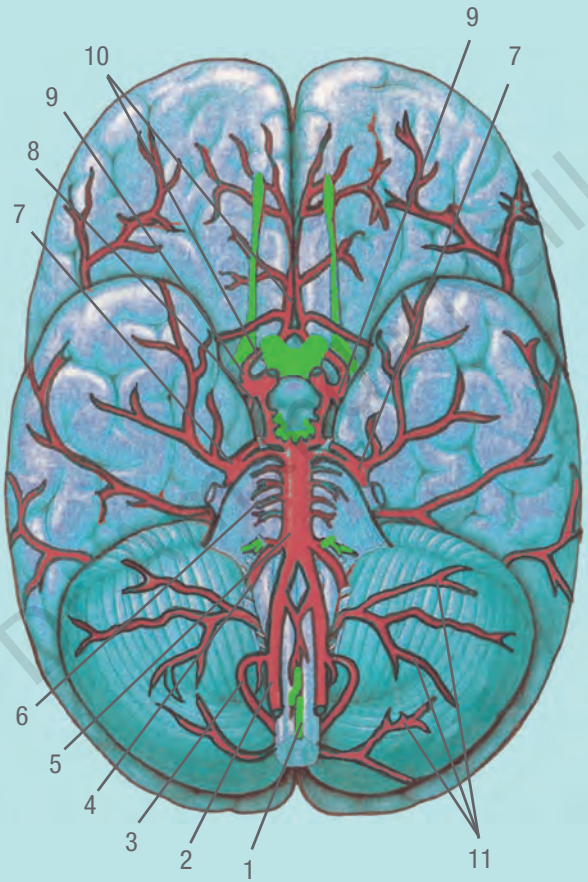
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Blood supply of the Brain

Lateral view – venous drainage

On the surface of the brain there are many BVs which drain into a series of sinuses - endothelial lined channels b/n the 2 layers of the DM. They anastomose extensively and have no valves relying on gravity, cranial pressure and head movements for drainage.

Superficial vessels drain to the superior sagittal sinus (1s) and deeper vessels drain to the straight sinus (4). The eyeball and facial areas drain to the cavernous sinus (8) and may bring infection into the cranial cavity.

- 1 sagittal sinus i = inferior / s = superior
- 2 connecting anastomosing veins
- 3 deep posterior cerebral veins
- 4 straight sinus
- 5 transverse sinus
- 6 sigmoid sinus (s-shaped)
- 7 petrosal sinus i = inferior / s = superior
- 8 cavernous sinus
- 9 internal jugular vein

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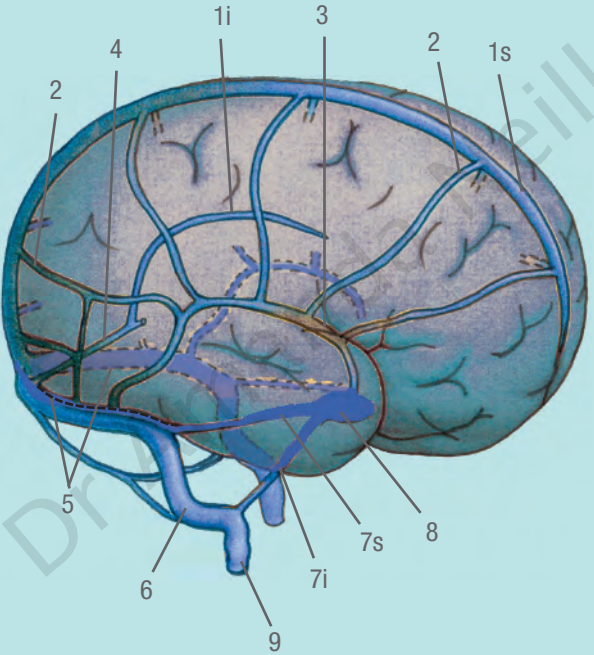
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Blood supply of the Brainstem

Lateral view – arteries only

- 1 pontine cerebral art.
- 2 inferior colliculus
- 3 cerebral aqueduct
- 4 inferior quadrigeminal art.
- 5 superior vermis of cerebellum
- 6 superior cerebellar art.
- 7 dentate gyrus
- 8 anterior inferior cerebellar art.
- 9 cerebellar flocculus and nodulus
- 10 4th ventricle
- 11 posterior inferior cerebellar art.
- 12 central canal
- 13 posterior spinal art.
- 14 vertebral art. (paired vessels)
- 15 anterior spinal art.
- 16 paramedian art.
- 17 cuneate and gracile nuclei
- 18 inferior olivary nuclei
- 19 pons
- 20 basilar art (unpaired – fusion of the vertebrals)
- 21 posterior communicating art. (part of the circle of Willis)

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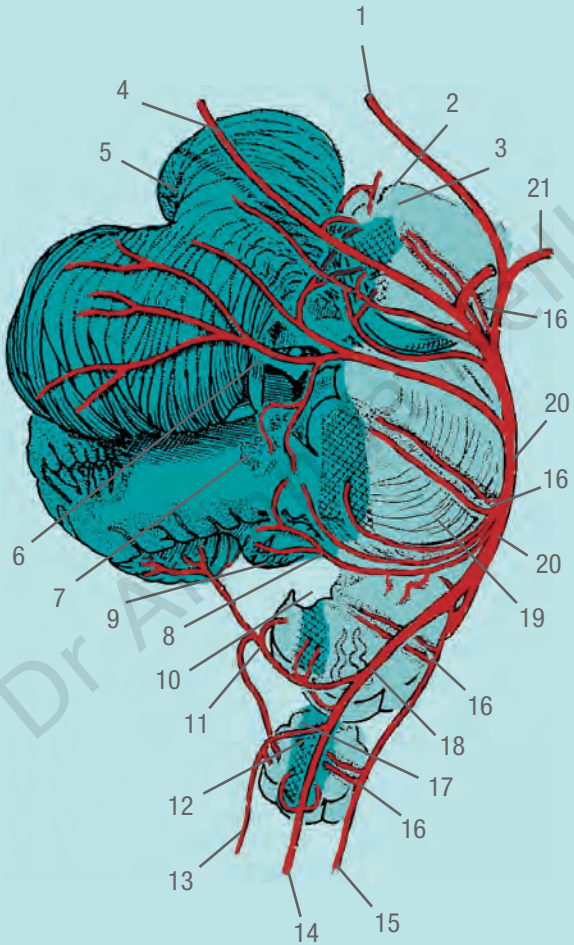
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Blood supply of the Breast

Arterial supply and lymphatics

Anterior view -

The BS of the breasts are intimately related to their lymphatic drainage. There is a rich aa in the BS and the chest and axilla as well as BVs and lymphatic vessels which will cross over to the other breast. Hence spread of disease can occur b/n 1 breast and the other.

- 1 subclavian LNs
- 2 central axillary LNs
- 3 lateral axillary LNs
- 4 subclavian artery
- 5 deep axillary LNs
- 6 subscapular LNs
- 7 thoracic artery with lateral intercostal arteries
- 8 pectoral LNs
- 9 L internal mammary = anterior thoracic art
- 10 br b/n the R & L internal mammary arteries
- 11 anterior intercostal arteries*
- 12 L parasternal LNs – aa with the R nodes
- 13 ant chest wall – pectoral major

* note there is an aa b/n the ant. & lat. IC art.

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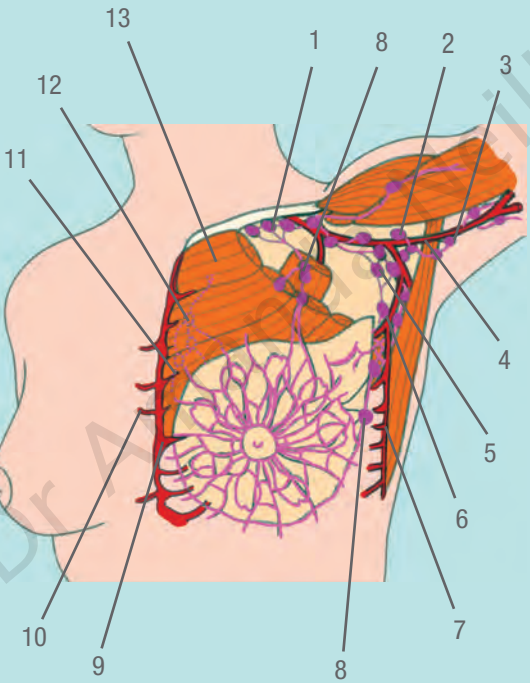
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Blood supply of the Cerebrum

Arterial supply

Inferior view

Lateral view

Sagittal view

The arteries supplying the cerebrum consist of 3 paired branches arising from the arterial circle or Circle of Willis: the anterior, middle and posterior cerebral arteries.

Their supply corresponds roughly although not absolutely with the cerebral lobes.

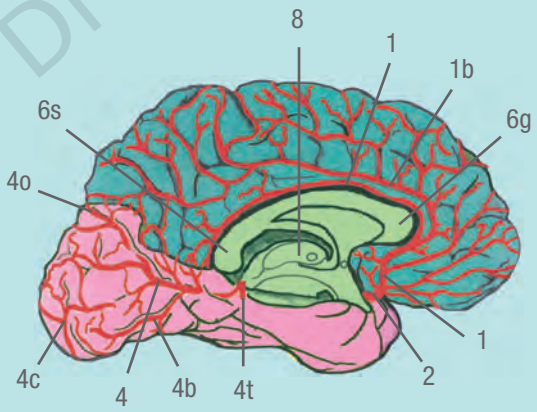
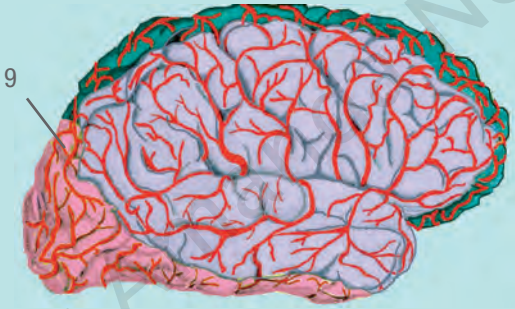
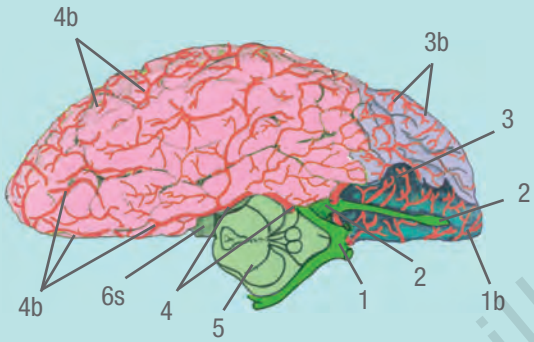
The brain is very sensitive to any deprivation of oxygen and will die if deprived for oxygen completely for longer than 1 min in normal circumstances.

A = cerebral tissue supplied by the ant. cerebral art. and its branches

M = cerebral tissue supplied by the middle cerebral art. and its branches

P = cerebral tissue supplied by the post. cerebral artery and its branches

- 1 anterior cerebral artery b = branches
- 2 anterior communicating artery
- 3 middle cerebral artery b = branches
- 4 posterior cerebral artery b = branches /
c = calcarine branch / o = occipital branch
- 5 brainstem
- 6 corpus callosum g = genu / s = splenium
- 7 anterior perforating substance
- 8 thalamus



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Cubital fossa – deep structures

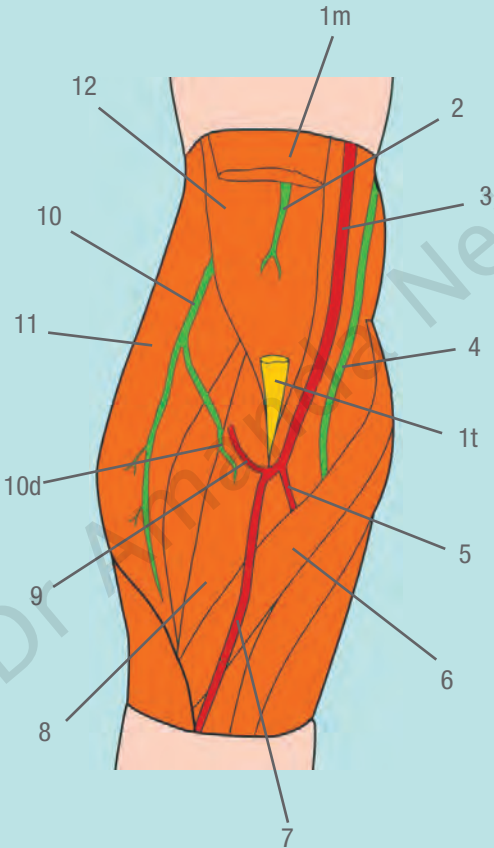
Arterial supply

*Anterior – skin, superficial and deep fascia removed
– superficial muscles divided*

- 1 biceps (cut) m = muscle t = tendon
- 2 musculocutaneous N
- 3 brachial art.
- 4 median N
- 5 ulnar art.
- 6 pronator teres m
- 7 radial art.
- 8 supinator m
- 9 recurrent radial art.
- 10 radial N + d = deep branch
- 11 brachioradialis m
- 12 brachialis m

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Blood supply of Cubital fossa – superficial structures

Anterior – skin and superficial fascia removed

- 1 biceps (cut) a = aponeurosis* m = muscle t = tendon
- 2 cephalic vein
- 3 brachial art.
- 4 median cubital vein
- 5 ulnar art.
- 6 pronator teres m
- 7 deep fascia
- 8 basilic vein*
- 9 medial epicondyle
- 10 brachioradialis m

** Bicipital aponeurosis is part of the deep fascia and pierced when sampling arterial blood from this area*

** basilic and median cubital veins are common sites used for venupuncture. They along with the cephalic vein are part of the superficial venous network of the UL (similar to the saphenous vein and its brs in the LL). They are highly variable and travel in the superficial fat and fascia and are visible through the skin*

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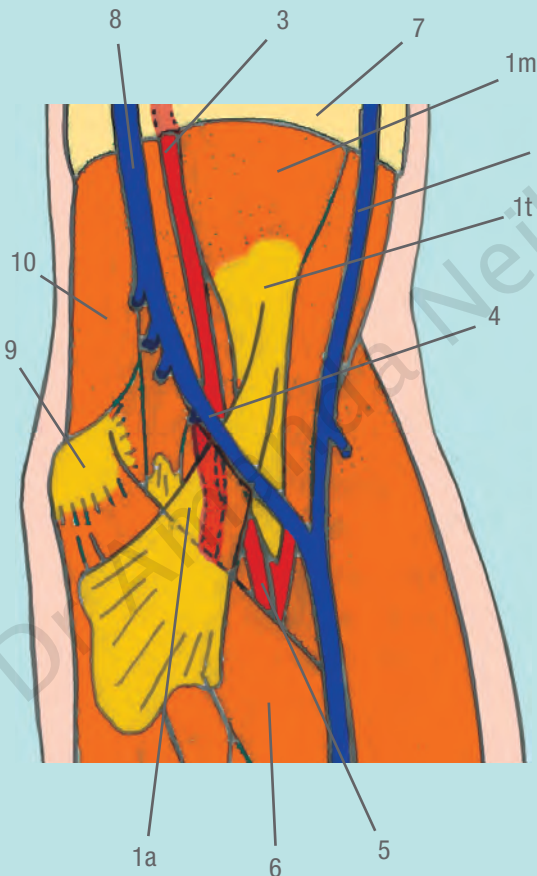
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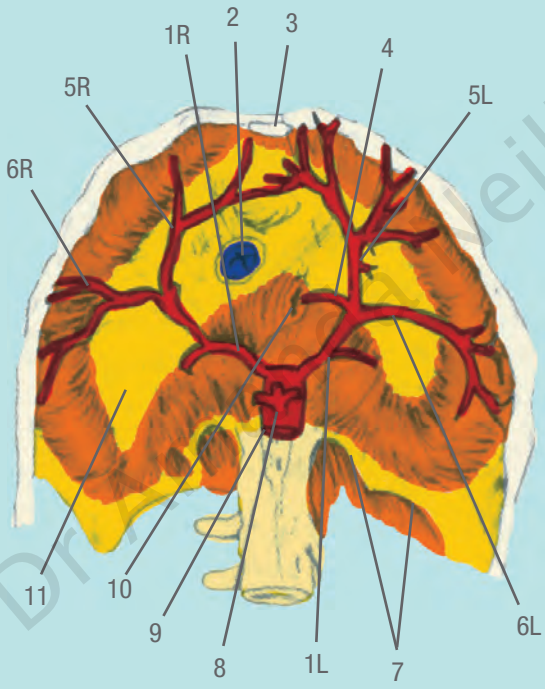


Blood supply of the Diaphragm

The BS of the diaphragm unlike its NS comes from below and is from the 1st systemic paired branches of the abdominal aorta.

- 1 phrenic arteries R & L
- 2 opening in the central tendon for IVC
- 3 Sternum
- 4 oesophageal br of L phrenic art. to oesophagus
efferent arterioles
- 5 anterior phrenic art. R & L
- 6 lateral phrenic art. R & L
- 7 medial and lateral arcuate ligaments
- 8 coeliac trunk
- 9 abdominal aorta
- 10 oesophageal opening in crura
- 11 central tendon

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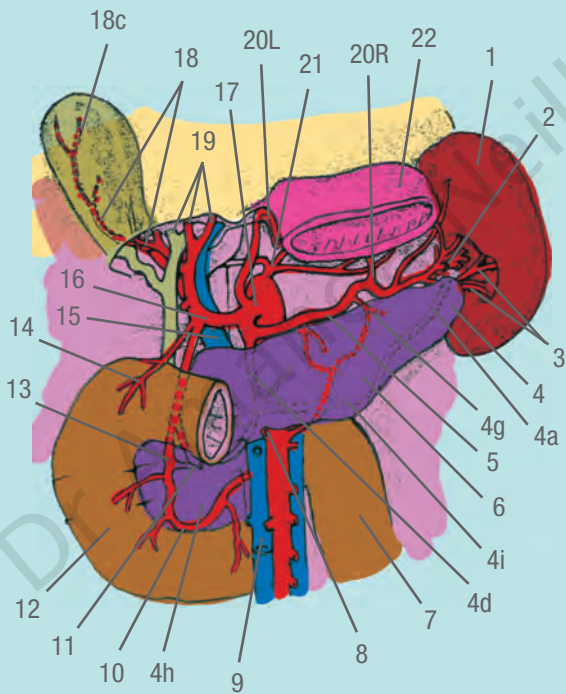
Blood supply of the Duodenum, Gall bladder, Pancreas & Spleen

*Anterior view- stomach cut and removed – showing posterior structures behind the stomach
most veins removed IVC remains*

The stomach overlays the pancreas and duodenum, leaving a space behind, bordered by the omenta. The head of the pancreas lies in the curve of the duodenum. Branches of the coeliac trunk supply all these structures and richly aa. The pancreas is retroperitoneal.

The duodenum has its own mesentery.

- | | |
|-------------------------------------|---------------------------------------|
| 1 Spleen | 16 common hepatic art. |
| 2 L gastroepiploic art | 17 coeliac trunk |
| 3 splenic vessels | 18 gall bladder |
| 4 tail of the pancreas | 18c cystic art |
| 4a art. of the tail of the pancreas | 19 branches of the proper hepatic art |
| 4d dorsal art. of the pancreas | 20 gastric art L&R |
| 4g great pancreatic art. | 21 inf. phrenic art |
| 4h head of the pancreas | 22 stomach – cut |
| 4i inf. pancreatic art. | |
| 5 splenic art. | |
| 6 body of the pancreas | |
| 7 jejunum | |
| 8 middle colic art. | |
| 9 superior mesenteric vein | |
| 10 inf. pancreatoduodenal art | |
| 11 R gastro-epiploic art | |
| 12 duodenum | |
| 13 ant. sup. Pancreatoduodenal art | |
| 14 supraduodenal art. | |
| 15 portal vein | |



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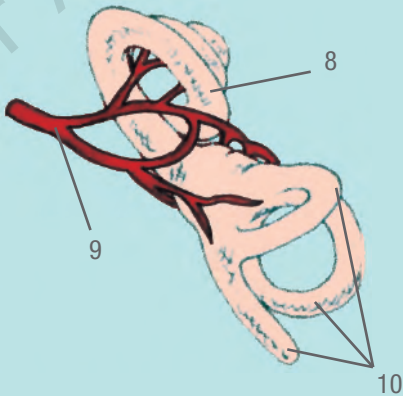
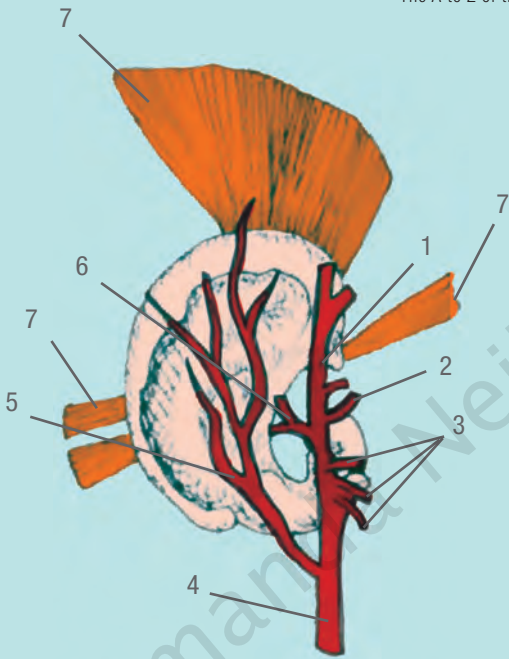
Blood supply of the Ear

Arterial supply only

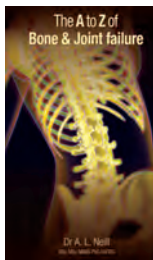
The BS of the ears: - the inner & middle ears are supplied from internal carotid brs.; the outer ear from brs. of the external carotid which via the supf. temporal art. has aas with the opposite side There are also aas b/n the int. & ext carotids.

- 1 supf. temporal art
- 2 ant. auricular art.
- 3 brs to the parotid gland
- 4 temporal art.
- 5 post. auricular art.
- 6 middle temporal art.
- 7 auricularis muscles
- 8 cochlea
- 9 labyrinthine art.
- 10 semicircular canals

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The A to Z of Bones and Joint Failure

ISBN 978-1-921930-04-1

All the bones, joints and ligaments of the body have been covered in the A to Z book on these tissues – so this is the follow-up book on their pathology analysing their failures due to various causes. It goes into the microstructure, development, control and formation and how these tissues interact and change under stress and with age. There are over 280 pages and 350 illustrations in this concise pocket book reference.



The A to Z of the Heart

ISBN 978-0-9806840-6-3

The heart is comprehensively illustrated along with the great vessels. This book also includes illustrations of all the major vascular structures and describes the circulation of the major organs and systems. The clinical section contains examination and testing of the heart and blood vessel flow. Arteries, veins, capillaries and lymphatics their pathways and special features are present in this book of over 240 pages and 300 illustrations.



The A to Z of the Digestive Tract

ISBN 978-1-921930-00-3

The Digestive tract is one long tunnel from food to faeces – its components are individually illustrated, colour tagged and listed alphabetically along with many of its adjunct organs. Their structure and functions are also clearly described along with sectional overviews. In particular detailed descriptions of the intricacies of the oral cavity, the processes of swallowing are included in this book of 240 pages and 300 illustrations.



The A to Z of the Head and Neck Muscles & Bones

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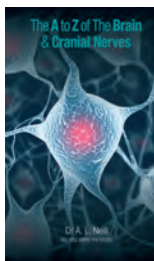
interactions between the many muscular layers of this area, listing alphabetically and illustrating each muscle individually in one section – then examining the individual bones and teeth in the same manner. The skull is also illustrated as a unit, in this book of 280 pages and 300 illustrations.



The A to Z of Surface Anatomy

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The surface anatomy of all anatomical regions and structures are illustrated at several levels from superficial to deep. Methods of locating structures deep in the body using common landmarks are illustrated cross referenced and listed alphabetically. Proportions and relations between limb and regional sizes are charted extensively. Photographs as well as detailed graphics are used extensively, in this book of 240 pages and 300 illustrations.



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ISBN 978-0-9806840-2-5

The brain as an entity and the individual structures within it are illustrated and then listed with their functions alphabetically – sections on the testing and pathways and interactions of cranial nerves are also included in a separate clinical section in this book of 240 pages and 300 illustrations.



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ISBN 978-1-921930-01-0

This book is invaluable as a medical terminology reference – initially designed for the derivation of the anatomical terms; it has expanded to include tables of medical, pathological and other specialist terms; tables of prefixes and suffixes which allow interpretation of terms and lists of abbreviations commonly in use. It also includes forms of address, titles, major medical associations and other useful material. These colour-coded illustrated sections are clear and concise.

Special rates for students and libraries.

The A to Z of The Heart



The A to Zs

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