Arteries

Arteries and arterioles carry blood away from the heart.

Capillaries - site of exchange

Venules, veins - return blood to the heart.

Endothelium prevents platelet aggregation and secretes substances that control the diameter of blood vessels.

Tunica media - smooth muscle and connective tissue. Innervated by sympathetic nerves (vasoconstriction). Missing in smallest arteries.

Tunica externa - connective tissue; is vascularized.

Capillaries are most permeable (and more permeable in some parts than others).

Especially so in the liver, spleen, and red marrow, so cells can enter and leave circulation.

Blood flow can vary to different parts of the body, too.
Blood is forced through arteries and arterioles vessel walls are too thick for blood components to pass through.

In capillaries, oxygen and nutrients move out by diffusion; CO$_2$ in (via lipid membrane, channels, etc.)

Blood pressure moves molecules out by filtration
Plasma proteins maintain osmotic pressure of blood

Returning blood to the heart

Venules are continuous with capillaries; take in some returned fluid (rest is retained by tissues or returned to blood by lymphatic System)

Veins have thinner walls; less muscle; but can hold much more blood
Many veins in limbs have valves to prevent Backflow (Varicose veins arise when pressure on valves is prolonged)
Major arteries and veins of the systemic circuit

- Internal jugular vein
- Common carotid artery
- Superior vena cava
- Inferior vena cava
- Renal vein
- Aorta
- Mesenteric vein
- Common iliac vein
- Femoral vein
- Great saphenous vein

The branches of the arch of aorta can be remembered as ABCS:
- A = Arch of Aorta
- B = Brachiocephalic artery
- C = Left common carotid artery
- S = Left subclavian artery

External carotid Artery

ECA after origin from the common carotid artery takes a slightly curved course upwards and anteriorly before inclining backwards to the space behind the neck of the mandible. Within the parotid gland, it branches terminally into the superficial temporal and maxillary arteries. Along its course, it rapidly diminishes in size and as it does so, gives of various branches.
Some Angry Lady Figured Out PMS

Clinical aspects of External Carotid Artery (ECA)

1. The 2 main vessels supplying the meninges are the meningeal branches of the occipital and maxillary arteries. Vasodilation of these vessels creates excessive pressure on the sensory receptors within the meninges, resulting in a headache.

2. Superficial temporal artery is palpable on the zygomatic process.

3. Middle meningeal artery which is the branch of Maxillary artery ascends through the foramen spinosum and helps to supply the meninges. Its practical importance is that it may be torn in a skull fracture and result in the formation of an extradural haematoma.

4. External carotid artery stenosis may follow carotid endarterectomy
Aorta

• The thoracic aorta is contained in the posterior mediastinal cavity.
• It begins at the lower border of the fourth thoracic vertebra where it is continuous with the aortic arch, and ends in front of the lower border of the twelfth thoracic vertebra, at the aortic hiatus in the diaphragm where it becomes the abdominal aorta.

Abdominal Aorta

Celiac Artery
• Left Gastric Artery - Supplies blood to the esophagus and portions of the stomach.
• Hepatic Artery - Supplies blood to the liver.
• Splenic Artery - Supplies blood to the stomach, spleen, and pancreas.

Branches of Abd Aorta

• Superior Mesenteric Artery - Supplies blood to the intestines.
• Inferior Mesenteric Artery - Supplies blood to the colon.
• Renal Arteries - Supplies blood to the kidneys.
• Ovarian Arteries - Supplies blood to the female reproductive organs.
• Testicular Arteries - Supplies blood to the male reproductive organs.

Internal Iliac Artery

• The internal iliac artery (formerly known as the hypogastric artery) is the main artery of the pelvis.
• It is a short, thick vessel, smaller than the external iliac artery, and about 3 to 4 cm in length.
• The internal iliac artery supplies the walls and viscera of the pelvis, the buttock, the reproductive organs, and the medial compartment of the thigh.
• The vesicular branches of the internal iliac arteries supply the bladder.

Branches

iliolumbar artery, lateral sacral artery, superior gluteal artery, inferior gluteal artery, middle rectal artery, uterine artery, obturator artery, inferior vesical artery, superior vesical artery, obliterated umbilical artery, internal pudendal artery
Femoral Artery

- The artery which supplies the greater part of the lower extremity is the direct continuation of the external iliac.
- It runs as a single trunk from the inguinal ligament to the lower border of the Popliteus, where it divides into two branches
- The anterior and posterior tibial. The upper part of the main trunk is named the femoral, the lower part the popliteal.

The branches of the femoral artery

- Superficial Epigastric; Deep External Pudendal, Superficial Iliac Circumflex, Muscular Superficial External Pudendal, Profunda Femoris.

As the Common femoral artery (CFA) can often be palpated through the skin, it is often used as a catheter access artery

The CFA is susceptible to peripheral arterial disease. When a CFA is blocked through atherosclerosis, percutaneous intervention with access from the opposite CFA may be needed.

The common femoral artery can be used to draw arterial blood. Presence of a femoral pulse has been estimated to indicate a systolic blood pressure of more than 50 mmHg, as given by the 50% percentile.

Popliteal Artery

- In human anatomy, the popliteal artery is defined as the extension of the "superficial" femoral artery after passing through the adductor canal and adductor hiatus above the knee.
- The termination of the popliteal artery is its bifurcation into the anterior tibial artery and posterior tibial artery.

- The branches of the popliteal artery are: anterior tibial artery, posterior tibial artery, sural artery, medial superior genicular artery, lateral superior genicular artery, middle genicular artery, lateral inferior genicular artery, medial inferior genicular artery.
Posterior tibial artery

- The posterior tibial artery of the lower limb carries blood to the posterior compartment of the leg and plantar surface of the foot, from the popliteal artery. It is accompanied by a deep vein, the posterior tibial vein, along its course.
- It typically gives rise to the fibular artery. It also gives rise to medial plantar artery and lateral plantar artery. In addition a calcaneal branch to the medial aspect of the calcaneus.

Anterior tibial Artery

- The anterior tibial artery of the lower limb carries blood to the anterior compartment of the leg and dorsal surface of the foot, from the popliteal artery.
- It is accompanied by a deep vein, the anterior tibial vein, along its course.
- It crosses the anterior aspect of the ankle joint, at which point it becomes the dorsalis pedis artery.
In human anatomy, the axillary artery is a large blood vessel that conveys oxygenated blood to the lateral aspect of the thorax, the axilla (armpit) and the upper limb. Its origin is at the lateral margin of the first rib, before which it is called the subclavian artery. After passing the lower margin of teres major it becomes the brachial artery.

"She Tastes Like Sweet Apple Pie."

First part (1 branch): Superior thoracic artery (Supreme thoracic artery)
Second part (2 branches): Thoraco-acromial artery, Lateral thoracic artery.
Third part (3 branches): Subscapular artery, Anterior humeral circumflex artery, Posterior humeral circumflex artery

It continues down the ventral surface of the arm until it reaches the cubital fossa at the elbow. It then divides into the radial and ulnar arteries which run down the forearm.
Radial Artery

- The artery’s pulse is palpable in the anatomical snuff box and on the anterior aspect of the arm over the carpal bones
- Presence of radial pulse has been estimated to indicate a systolic blood pressure of more than 70 mmHg
- The radial artery is used for coronary artery bypass grafting and is growing in popularity among cardiac surgeons.
Dural venous sinuses

• The dural venous sinuses (also called dural sinuses, cerebral sinuses, or cranial sinuses) are venous channels found between layers of dura mater in the brain.
• They receive blood from internal and external veins of the brain, receive cerebrospinal fluid (CSF) from the subarachnoid space, and ultimately empty into the internal jugular vein.

Clinical relevance

• The sinuses can be injured by trauma. Damage to the dura mater, which may be caused by skull fracture, may result in blood clot formation (thrombosis) within the dural sinuses.
• While rare, dural sinus thrombosis may lead to hemorrhagic infarction with serious consequences including epilepsy, neurological deficits, or death.

Superior vena cava

The superior vena cava (also known as the precava or SVC) is truly superior, a large diameter, yet short, vein that carries deoxygenated blood from the upper half of the body to the heart’s right atrium.

It is formed by the left and right brachiocephalic veins, (also referred to as the innominate veins) which also receive blood from the upper limbs, head and neck, behind the lower border of the first right costal cartilage.

• The azygos vein (which receives blood from the rib cage) joins it just before it enters the right atrium, at the upper right front portion of the heart. It is also known as the cranial vena cava in animals.
• No valve separates the superior vena cava from the right atrium. As a result, the (right) atrial and (right) ventricular contractions are conducted up into the internal jugular vein and, through the sternocleidomastoid muscle, can be seen as the jugular venous pressure. In tricuspid valve regurgitation, these pulsations are very strong.
Superior vena cava syndrome (SVCS)
• is usually the result of the direct obstruction of the superior vena cava by malignancies such as compression of the vessel wall by right upper lobe tumors or thymoma and/or mediastinal lymphadenopathy.
• The most common malignancies that cause SVCS is bronchogenic carcinoma. Cerebral edema is rare, but if it occurs it may be fatal.

Bronchogenic carcinoma-SVC Obstruction

Inferior Vena Cava
• is the large vein that carries de-oxygenated blood from the lower half of the body into the right atrium of the heart.
• It is posterior to the abdominal cavity and runs alongside of the vertebral column on its right side (i.e. it is a retroperitoneal structure).
• It enters the right atrium at the lower right, back side of the heart.

• Health problems attributed to the IVC are most often associated with it being compressed (ruptures are rare because it has a low intraluminal pressure).
• Typical sources of external pressure are an abdominal aortic aneurysm, the gravid uterus and abdominal malignancies, such as colorectal cancer, renal cell carcinoma and ovarian cancer.
• Since the inferior vena cava is primarily a right-sided structure, unconscious pregnant females should be turned on to their left side (the recovery position), to relieve pressure on it and facilitate venous return.
• In rare cases, straining associated with defecation can lead to restricted blood flow through the IVC and result in syncope (fainting).
• Occlusion of the IVC is rare, but considered life-threatening and is an emergency. It is associated with deep vein thrombosis, IVC filters, liver transplantation and instrumentation (e.g. catheter in the femoral vein).

• Muscular movement, such as occurs with physical activity or exercise, massages lymph through the thoracic duct toward the subclavian vein.
• Several branches of lymph vessels feed into the thoracic duct as it courses through the chest, rejoining to form a single segment that intersects with the subclavian vein beneath the clavicle.

It collects most of the lymph in the body (except that from the right arm and the right side of the chest, neck and head, and lower left lobe of the lung, which is collected by the right lymphatic duct) and drains into the systemic (blood) circulation at the left brachiocephalic vein between the left subclavian and left internal jugular veins.

• In adults, the thoracic duct transports up to 4 L of lymph per day.
• The lymph transport in the thoracic duct is mainly caused by the action of breathing, aided by the duct’s smooth muscle and by internal valves which prevent the lymph from flowing back down again.

Lymphatic duct
• largest vessel of the lymphatic system.
• The thoracic duct collects LYMPH from the CISTERNA CHYLII and the left upper body, and drains into the left subclavian VEIN to deliver lymph to the bloodstream.
• a distance of about 16 inches long.
• Rhythmically contract and contains valves to prevent its contents from back flowing.
When the thoracic duct is blocked or damaged a large amount of lymph can quickly accumulate in the pleural cavity, this situation is called chylothorax.

The first sign of a malignancy (especially an intraabdominal one) may be an enlarged Virchow's node, a lymph node in the left supraclavicular area, in the vicinity where the thoracic duct empties into the left subclavian vein.

Axillary lymph nodes

The Axillary lymph nodes are of large size, vary from twenty to thirty in number, and may be arranged in the following groups:
- brachial lymph nodes (or "lateral")
- pectoral axillary lymph nodes (or “anterior”)
- subscapular axillary lymph nodes ("posterior")
- central lymph nodes
- apical lymph nodes (or "medial" or "subclavicular")

About 75% of lymph from the breasts drains into the axillary lymph nodes, making them important in the diagnosis of breast cancer.

Inguinal Lymph nodes

- Inguinal lymph node is a type of lymph node in the inguinal region.
- It can refer to: Superficial inguinal lymph nodes and Deep inguinal lymph nodes
- The superficial inguinal lymph nodes form a chain immediately below the inguinal ligament.
- The superficial nodes drain to the deep inguinal lymph nodes.
Deep inguinal lymph

- The deep inguinal lymph nodes are located medial to the femoral vein and under the cribriform fascia.
- There are approximately 3 to 5 deep nodes. The superior-most node is located under the inguinal ligament and is called Cloquet's node.
- The presence of swollen inguinal lymph nodes are an important clinical sign because swelling may indicate an infection spread from cancers, such as anal cancer and vulvar cancer.

Paraortic LN

- The paraaortic lymph nodes (also known as para-aortic, periaortic, peri-aortic, and lumbar) are a group of lymph nodes that lie in front of the lumbar vertebral bodies near the aorta.
- These lymph nodes receive drainage from the lower gastrointestinal tract and the pelvic organs.