Major Body Arteries

Khaleel Alyahya, PhD, MEd
www.khaleelalyahya.net
Resources

01. Essential of Human Anatomy & Physiology
By Elaine Marieb and Suzanne Keller

02. Atlas of Human Anatomy
By Frank Netter

03. Gray’s Anatomy
By Richard Drake, Wayne Vogl & Adam Mitchell

04. Clinical Anatomy
By Richard Snell

05. KENHUB
www.kenhub.com
Objectives

▪ Define the artery and understand the general principle of the arterial system.
▪ Describe the aorta and its divisions and list the branches from each part.
▪ List major arteries and their distribution in the head & neck, thorax, abdomen and upper & lower limbs.
▪ List main sites of arterial pulsation.
▪ Define arterial anastomosis, describe its significance and list the main sites of anastomosis.
▪ Define end arteries and give examples.
Introduction

- Blood vessels are the part of the circulatory system that transports blood throughout the human body.

- There are three major types of blood vessels:
  - Arteries, which carry the blood away from the heart.
  - Capillaries, which enable the actual exchange of water and chemicals between the blood and the tissues.
  - Veins, which carry blood from the capillaries back toward the heart.

- The word vascular, meaning relating to the blood vessels, is derived from the Latin vas, meaning vessel.
  - Avascular refers to being without (blood) vessels.
Microscopic Structure

- The arteries and veins have three layers, but the middle layer is thicker in the arteries than it is in the veins:
  - **Tunica Intima** (the thinnest layer): a single layer of simple squamous endothelial cells.
  - **Tunica Media** (the thickest layer in arteries): is made up of smooth muscle cells and elastic tissue.
  - **Tunica Adventitia** (the thickest layer in veins) entirely made of connective tissue.

- Capillaries consist of little more than a layer of endothelium and occasional connective tissue.
Arteries

- Arteries carry blood away from the heart.
- All arteries carry oxygenated blood.
  - except the pulmonary and umbilical arteries, which carry deoxygenated blood to the lungs and to the placenta respectively
- The flow of blood depends on the pumping action of the heart.
- There are no valves in the arteries.
- The branches of arteries supplying adjacent areas normally.
  - anastomose with one another freely providing backup routes for blood to flow if one link is blocked.
Aorta

- It is the largest artery in the body.
- Originates from the left ventricle.
- It is divided into 4 parts.
- It carries oxygenated blood to all parts of the body.
Divisions of Aorta

- Ascending Aorta
- Arch of Aorta
- Descending
  - Thoracic Aorta
  - Abdominal Aorta
Ascending Aorta

- Originates from left ventricle.
- Continuous as aortic arch.
- Branches:
  - Coronary system
    - Right and left coronary arteries
    - Supply the heart
Arch of Aorta

- Originates from left ventricle.
- Continuation of the ascending aorta.
- Leads to descending thoracic aorta.
- Located behind the lower part of manubrium sterni and on the left side of trachea.
- Branches:
  - Left Subclavian artery
  - Left Common Carotid artery
  - Brachiocephalic trunk
    - Right Subclavian artery
    - Right Common Carotid artery
Common Carotid

- The left common carotid arises from aortic arch.
- The right common carotid arises from brachiocephalic trunk.
- Each common carotid gives two branches:
  - Internal carotid
  - External carotid
External Carotid

- It divides behind neck of the mandible into two terminal branches:
  - Superficial temporal
  - Maxillary artery

- It supplies:
  - Scalp: Superficial temporal artery
  - Face: Facial artery
  - Maxilla: Maxillary artery
  - Tongue: Lingual artery
  - Glands: Superior thyroid artery
Internal Carotid

- Has no branches in the neck and enters the cranial cavity.
- It Supplies:
  - Brain
  - Nose
  - Scalp
  - Eye
ARTERIES OF
UPPER LIMBS
Subclavian Arteries

- Left subclavian arises from aortic arch.
- Right subclavian arises from brachiocephalic trunk
- Main branches:
  - Vertebral artery to supply CNS.
  - Internal thoracic artery to supply mammary gland and the thoracic wall.
Axillary Artery

- At lateral border of the first rib, it is continuous in the axilla as the **Axillary artery**
  - It is the source of the arterial supply of the upper limb.
- Beyond the lower margin of teres major muscle, the axillary artery become **brachial artery**.
- It descends close to the medial side of the humerus to the cubital fossa to divide into:
  - **Radial artery**: The smaller terminal branch
  - **Ulnar artery**: The larger terminal branch
- The superficial and deep **palmar arches** are formed by both ulnar & radial arteries.
ARTERIES OF THORACIC
Descending Thoracic Aorta

- It is the continuation of aortic arch.
- At the level of the 12th thoracic vertebra, it is continuous as the abdominal aorta which passes through the Diaphragm.
- Branches:
  - Pericardial
  - Esophageal
  - Bronchial
  - Posterior intercostal
Descending Abdominal Aorta

- It enters the abdomen through the aortic opening of diaphragm.
- At the level of L4, it divides into two common Iliac arteries.
- There are single and paired are branches of descending abdominal aorta.
Single Abdominal Branches

- Celiac Trunk
  - Left gastric artery to stomach
  - Hepatic artery to liver and pancreas
  - Splenic artery to spleen
- Superior Mesenteric Artery
  - Pancreas
  - Small and large intestine
  - Right 2/3 of Transverse Colon
- Inferior Mesenteric Artery
  - Large intestine
  - Left 1/3 of transverse colon & descending colon
  - Rectum and anal canal
Paired Abdominal Branches

- Gonadal arteries (Testicular and Ovarian)
- Renal arteries
- Suprarenal arteries
- Common Iliac arteries
Common Iliac

- The Abdominal Aorta terminates, at the level of the 4th lumbar vertebra into:
  - Right common iliac artery
  - Left common iliac artery
- Each divides into external & internal iliac arteries
  - Internal supplies the pelvic region
  - External supplies the lower limbs
ARTERIES OF PELVIC REGION
Internal Iliac Artery

- It supplies the following organs in pelvic region:
  - Uterus
  - Vagina
  - Pelvic Walls
  - Perineum
  - Rectum & Anal Canal
  - Urinary Bladder
ARTERIES OF LOWER LIMBS
External Iliac Artery

- The Source of arterial supply to the lower limb.
- Deep to the inguinal ligament, it become the femoral artery.
- Femoral artery is the main arterial supply to lower limb, and it lies in a sheath with the femoral vein in the anterior components.
- At the popliteal fossa, femoral artery becomes popliteal artery.
- Popliteal artery divides into:
  - Anterior tibial
    - the smaller terminal branch.
    - It continues to the dorsum of foot as the dorsalis pedis artery.
  - Posterior tibial
    - It terminates by dividing into medial & lateral planter arteries to supply the sole of the foot.
Arterial Pulsation

- **Superficial Temporal Pulse** in front of the ear.
- **Facial Pulse** at the lower border of the mandible.
- **Carotid Pulse** at the upper border of thyroid cartilage
- **Subclavian Pulse** as it crosses the 1st rib
- **Radial Pulse** in front of the distal end of the radius
- **Femoral artery** midway between anterior superior iliac spine & symphysis pubis
- **Popliteal artery** in the depths of popliteal fossa
- **Dorsalis Pedis artery** in front of ankle (between the two malleoli)
Arterial Anastomosis

- Anastomosis is the connection of two structures.
- Arterial anastomosis is the joining of branches of arteries supplying adjacent areas.
- What is the main reason for having an arterial anastomosis?
  - To have multiple supply to a region (so in case one artery is blocked, the distal region is still perfused)
- Anatomic end arteries
  - Their terminal branches do not anastomose with branches of adjacent arteries
Sites of Anastomosis

- In the upper limb
  - Scapular anastomosis between branches of Subclavian and Axillary
- Around the elbow
  - Brachial, Radial and Ulnar
- In the lower limb
  - Trochanteric & Cruciate to provide anastomosis between internal iliac and femoral
Summary

**Head & Neck**
- Common carotid
- Internal + External

**Abdomen & Thoracic**
- Descending Thoracic Aorta
- Descending Abdominal Aorta
- Single & Paired branches

**Upper Limbs**
- Subclavian artery
- Axillar + Brachial
- Ulnar + Radial
- Palmar Arches

**Pelvis & Lower Limbs**
- Internal iliac
- External iliac
- Femoral + Popliteal
- Anterior & Posterior Tibial
- Dorsalis pedis + Planter arteries
CLINICAL NOTES
Atherosclerosis of the Carotid Arteries

- Atherosclerotic thickening of the tunica intima of these arteries will reduce blood flow to the brain, resulting in the variety of neurological symptoms include headache, dizziness, muscular weakness.
- If blood flow is completely occluded, a cerebral ischaemia (stroke) will results.
- If atherosclerosis of the carotid arteries is suspected, Doppler study can be used to assess the severity of any thickening.
- In severe cases, the artery can be opened, and the atheromatous tunica intima removed.
- This procedure is called a **carotid endarterectomy**.
Aortic Aneurysm

- The aneurysm describes a dilation of the artery.
- The abdominal component of the aorta is the most common site for aneurysmal changes.
- Patients suffering with an abdominal aortic aneurysm may experience abdominal pulsations, abdominal pain and back pain.
- The aneurysm may also compress nerve roots causing pain and numbness in the lower limbs.
- A patient with an aortic arch aneurysm may have a hoarse voice due to the dilation stretching the left recurrent laryngeal nerve. Patients may also not have any symptoms at all.
- Diagnosis is made from an ultrasound and the weakened vessel wall can be surgically replaced with a piece of synthetic tubing.
- If left untreated, a large aneurysm can rupture. This is a medical emergency and often fatal.
Occlusion of Brachial Artery

- The arm has relatively good anastomotic supply.
- This means that it is well protected from ischaemia in cases of temporary or partial occlusion of the brachial artery.
- However, if the artery is completely occluded (or severed), the resulting ischaemia can cause necrosis of forearm muscles.
- Muscle fibres are replaced by scar tissue and shorten considerably.
- This can cause a characteristic flexion deformity, called Volkmann’s ischaemic contracture.
**Popliteal Aneurysm**

- The popliteal fascia (the roof of the popliteal fossa) is tough and non-extensible, and so an aneurysm of the popliteal artery has consequences for the other contents of the popliteal fossa.
- The tibial nerve is particularly susceptible to compression from the popliteal artery.
- The major features of tibial nerve compression include weakened or absent of plantarflexion and paraesthesia of the foot and posterolateral leg.
- An aneurysm of the popliteal artery can be detected by an obvious palpable pulsation in the popliteal fossa.