

GROSS ANATOMY OF THE CENTRAL AND PERIPHERAL ARTERIAL SYSTEMS

CHAPTER 1

UPPER EXTREMITY | ARTERIES

AORTIC ARCH

1st – Innominate/Brachiocephalic Artery

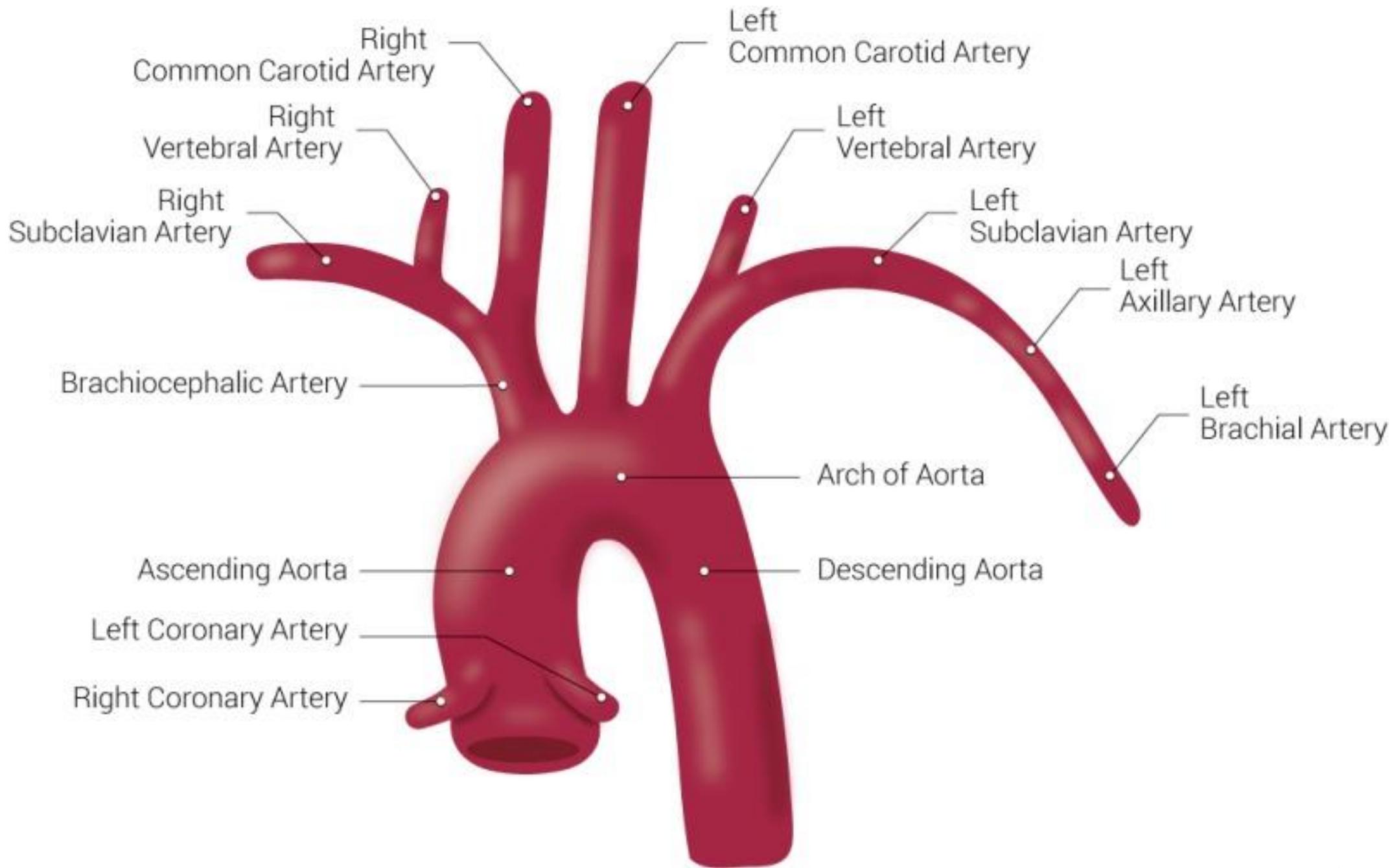
- Bifurcates into Right Subclavian and Right CCA
 - Right Subclavian Artery
 - Arises from the innominate artery laterally after traveling cephalad for 4-5 cm
 - Right Common Carotid Artery
 - Arises from the innominate artery coursing proximally towards the brain

2nd – Left Common Carotid Artery

- Arises directly from the transverse Aortic Arch

3rd – Left Subclavian Artery

- Arises directly from the transverse Aortic Arch



SUBCLAVIAN

- ❑ Arches above clavicle
- ❑ Travels laterally and downward to the outer border of the first rib

Important branches:

- Vertebral
- Thyrocervical
- Internal thoracic
- Costocervical
- Internal Mammary (commonly used for coronary artery bypass)

AXILLARY

- ❑ A continuation of the subclavian artery
- ❑ Becomes the brachial artery after giving off the following branches:
 - Superior artery
 - Thoracic artery
 - Thoracoacromial artery
 - Lateral thoracic artery
 - Subscapular artery
 - Anterior and Posterior humeral artery
 - Thoracodorsal artery

BRACHIAL

- ❑ Continuation of the Axillary artery
- ❑ Courses down the upper arm to 1 cm below the bend of the elbow
- ❑ Divides into the Radial and Ulnar arteries

RADIAL

- ❑ Smaller of the terminal branches of the brachial artery
- ❑ Descends along the lateral aspect of the forearm
- ❑ Helps form the Superficial Palmar Arch with one branch
- ❑ Crosses medially to form the Deep Palmar Arch with the deep branch of the ulnar artery (level of the hand)
- ❑ Terminates in the Deep Palmar Arch

ULNAR

- ❑ Larger of the terminal branches of the brachial artery
- ❑ Descends along the medial aspect of the forearm
- ❑ Gives off a branch to form the Deep Palmar Arch
- ❑ Terminates at the Superficial Palmar Arch (level of the hand)

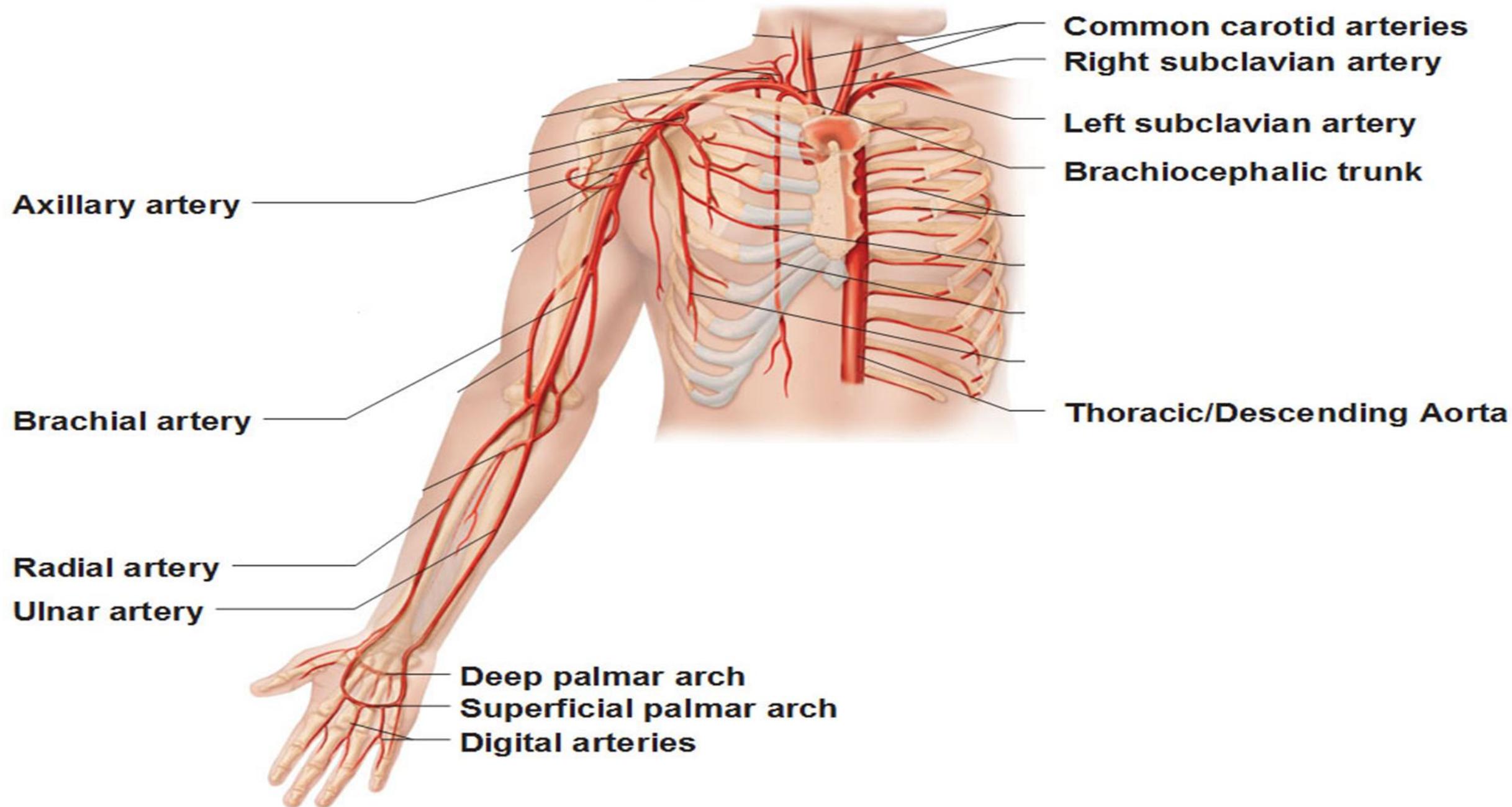
PALMAR ARCH

- ❑ **Superficial** – anastomosis formed primarily by the ulnar artery
“USA”
- ❑ **Deep** – formed by the anastomosis of the distal segment of the radial artery with the deep palmar branch of the ulnar artery
“RAD”
- ❑ Approximately 1/3 of the Superficial Palmar Arches are formed by the ulnar artery alone
- ❑ 1/3 are completed by a branch of the radial
- ❑ 1/3 are completed by other branches
 - Primarily the medial artery distal segment of the ulnar artery
 - Radial artery branch

DIGITAL

- ❑ Arise from the palmar arches
- ❑ Each palmar digital artery had two dorsal branches anastomosing with the dorsal digital arteries
 - Lateral branch
 - Medial branch

Arteries of the Upper Limb and Thorax



THORACIC AND ABDOMINAL | ARTERIES

ASCENDING AORTA

- ❑ Arises from the left ventricle
- ❑ Has two branches:
 - ❑ Right coronary artery
 - ❑ Left coronary artery

AORTIC ARCH

- ❑ Formed by the ascending aorta
- ❑ Gives off three branches:
 - ❑ Innominate
 - ❑ Left common carotid artery
 - ❑ Left subclavian artery

DESCENDING THORACIC AORTA

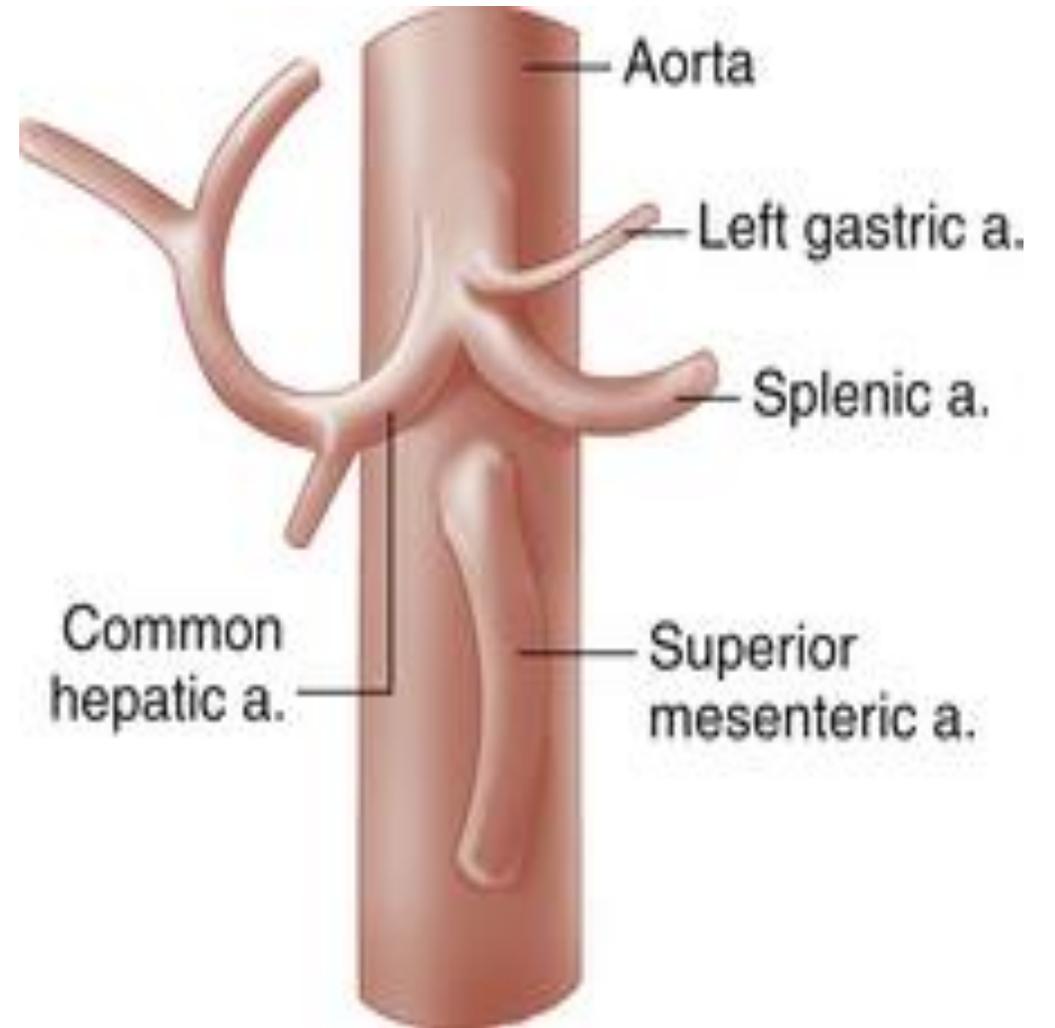
- ❑ Extends from the aortic arch inferiorly to the diaphragm
- ❑ Once it passes through the diaphragm, it becomes the abdominal aorta

ABDOMINAL AORTA

- ❑ Major visceral branches of the abdominal aorta include:
 - ❑ Celiac axis
 - ❑ Superior mesenteric artery
 - ❑ Renal arteries
 - ❑ Inferior mesenteric artery

CELIAC AXIS

- ❑ Also called the celiac trunk or celiac artery
- ❑ Feeds the stomach, liver, pancreas, duodenum, and spleen
- ❑ Branches into the left gastric, splenic, and common hepatic arteries



SUPERIOR MESENTERIC ARTERY

- ❑ Feeds the small intestine, cecum, ascending colon, and part of the transverse colon
- ❑ Located approximately 1 cm distal to the celiac artery
- ❑ Can occasionally share a common trunk with the celiac artery

RENAL ARTERIES

- ❑ Supply blood to the kidneys, suprarenal glands, and ureters
- ❑ Multiple renal arteries are not uncommon bilaterally
- ❑ Right renal artery is the only vessel seen posterior to the IVC
- ❑ Left renal artery is found posterior to the left renal vein

INFERIOR MESENTERIC ARTERY

- ❑ Arises from the distal abdominal aorta approximately 3-4 cm above the bifurcation
- ❑ Supplies the left half of the transverse colon, the descending, iliac, and sigmoid colon, and part of the rectum

OTHER MAJOR BRANCHES

❑ Parietal branches include:

❑ Inferior phrenic artery

❑ Lumbar arteries

❑ Middle sacral arteries

❑ Terminal branches of the abdominal aorta include the right and left common iliac arteries

❑ Carries blood to the pelvis, abdominal wall, and lower limbs

LOWER EXTREMITY | ARTERIES

COMMON ILIAC

Terminal branches of the Aorta

Right Common Iliac

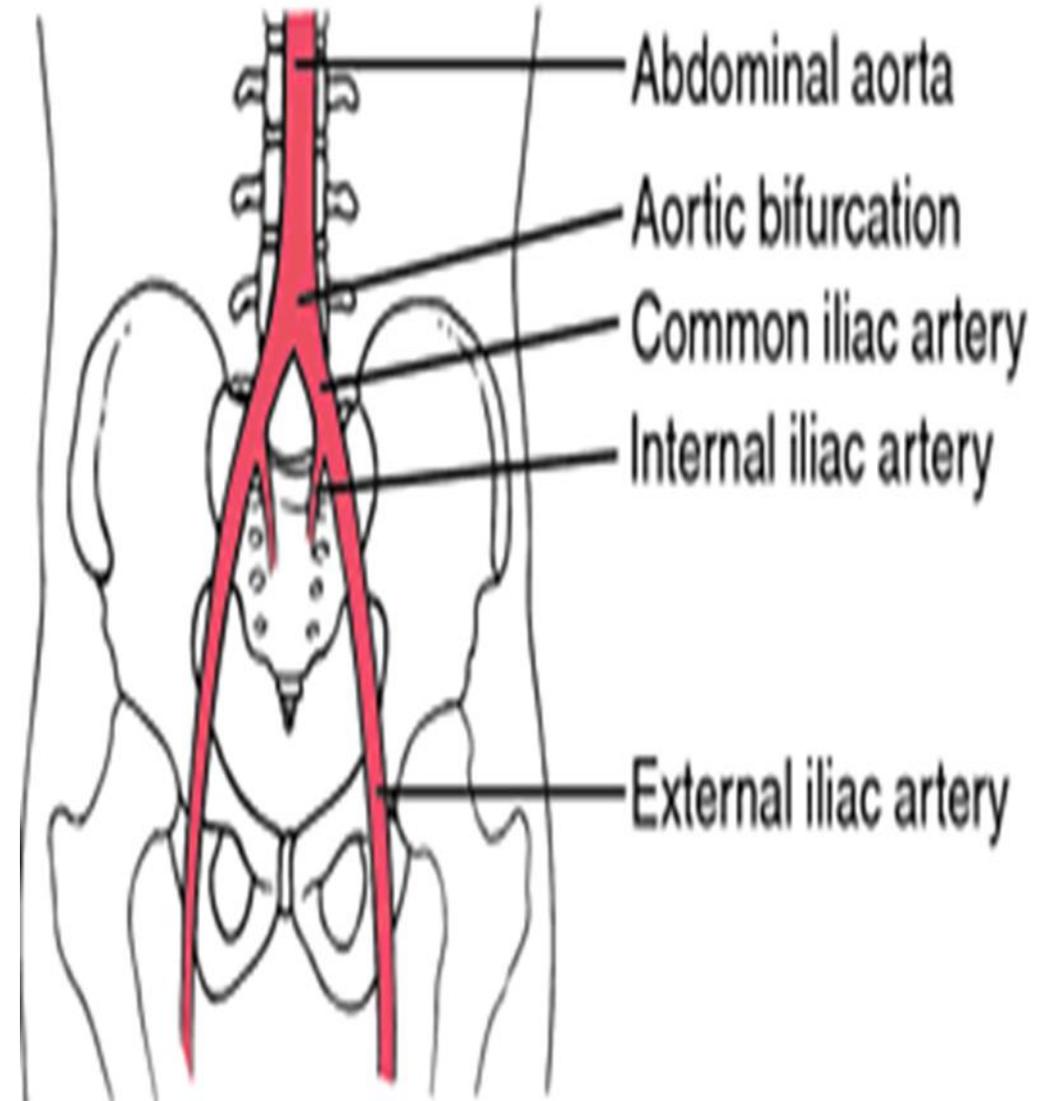
- Approximately 5 cm in length

Left Common Iliac

- Approximately 4 cm in length

Common Iliac arteries divide into:

- Internal Iliac
- External Iliac



INTERNAL ILIAC

- Also known as *hypogastric artery*
- Descend into the pelvis, dividing into:
 - Anterior
 - Posterior
- Supplies the:
 - Pelvic viscera and wall
 - Buttocks
 - Genital organs
 - Medial thigh
 - Perineum

EXTERNAL ILIAC

- ❑ Larger than the Internal Iliac Artery
- ❑ Branches into:
 - Inferior Epigastric Artery
 - Arises anteriorly just proximal to the inguinal ligament
 - Supplies the abdominal muscles and peritoneum
 - Used in TRAM or CABG procedures
 - Deep Circumflex Iliac Artery
 - Arises laterally near the inguinal ligament
 - Supplies the abdominal muscles

COMMON FEMORAL

- ❑ Is a continuation of the External Iliac Artery (becomes the Common Femoral Artery at the inguinal ligament)
- ❑ Divides into:
 - Superficial Femoral
 - Deep Femoral
 - Also known as “Profunda Femoris”

SUPERFICIAL FEMORAL

- ❑ Descends along the anteromedial part of the thigh in the femoral triangle
- ❑ Courses the length of the thigh
- ❑ Passes through a hiatus in the adductor magnus muscle (Also known as **Adductor Canal** or **Hunter's Canal**) to enter the popliteal fossa
 - Tunnel in the middle third of the thigh through which the femoral vessels reach the popliteal fossa

FEMORAL TRIANGLE

- ❑ Also known as *Scarpa's Triangle*
- ❑ Depressed area of the thigh lying distal to the inguinal fold
- ❑ Its borders are:
 - Medial margin of the sartorius
 - Medial margin of the adductor longus
 - Inguinal ligament superiorly
- ❑ Also contains nerves, fat and lymphatics

PROFUNDA FEMORIS

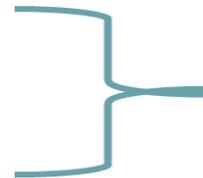
- ❑ Also known as Deep Femoral Artery
- ❑ Large lateral branch arising approximately 5 cm distal to the inguinal ligament

Responsible for perfusion to:

- Adductor muscle
- Extensor muscle
- Flexor muscle

POPLITEAL

- ❑ Continuation of the Superficial Femoral Artery
- ❑ As the SFA passes through Hunter's Canal it becomes the popliteal artery
- ❑ Has several branches that include:
 - Genicular arteries
 - Gastrocnemius arteries
- ❑ Popliteal divides into:
 - Anterior Tibial Artery
 - Tibioperoneal Trunk



“Trifurcation”

ANTERIOR TIBIAL

- ❑ First branch of the distal Popliteal Artery
- ❑ Passes superficial to the interosseous membrane and courses anteriorly along the interosseous membrane
- ❑ Distally the ATA courses to the anterior aspect of the tibia
 - Becomes Dorsalis Pedis Artery

DORSALIS PEDIS ARTERY

- ❑ Continuation of the Anterior Tibial Artery
- ❑ ATA becomes more superficial as it passes anteriorly to the lateral malleolus and becomes the DPA distal to the ankle
- ❑ Traverses the dorsal aspect of the foot towards the base of the great toe
- ❑ Branches:
 - Tarsal
 - Arcuate
 - First dorsal metatarsal arteries

TIBIOPERONEAL TRUNK

- ❑ Second branch of the distal Popliteal Artery
- ❑ Sometimes referred to as the “*proximal segment of the Posterior Tibial Artery*”
- ❑ Branches into:
 - Posterior Tibial Artery
 - Peroneal Artery

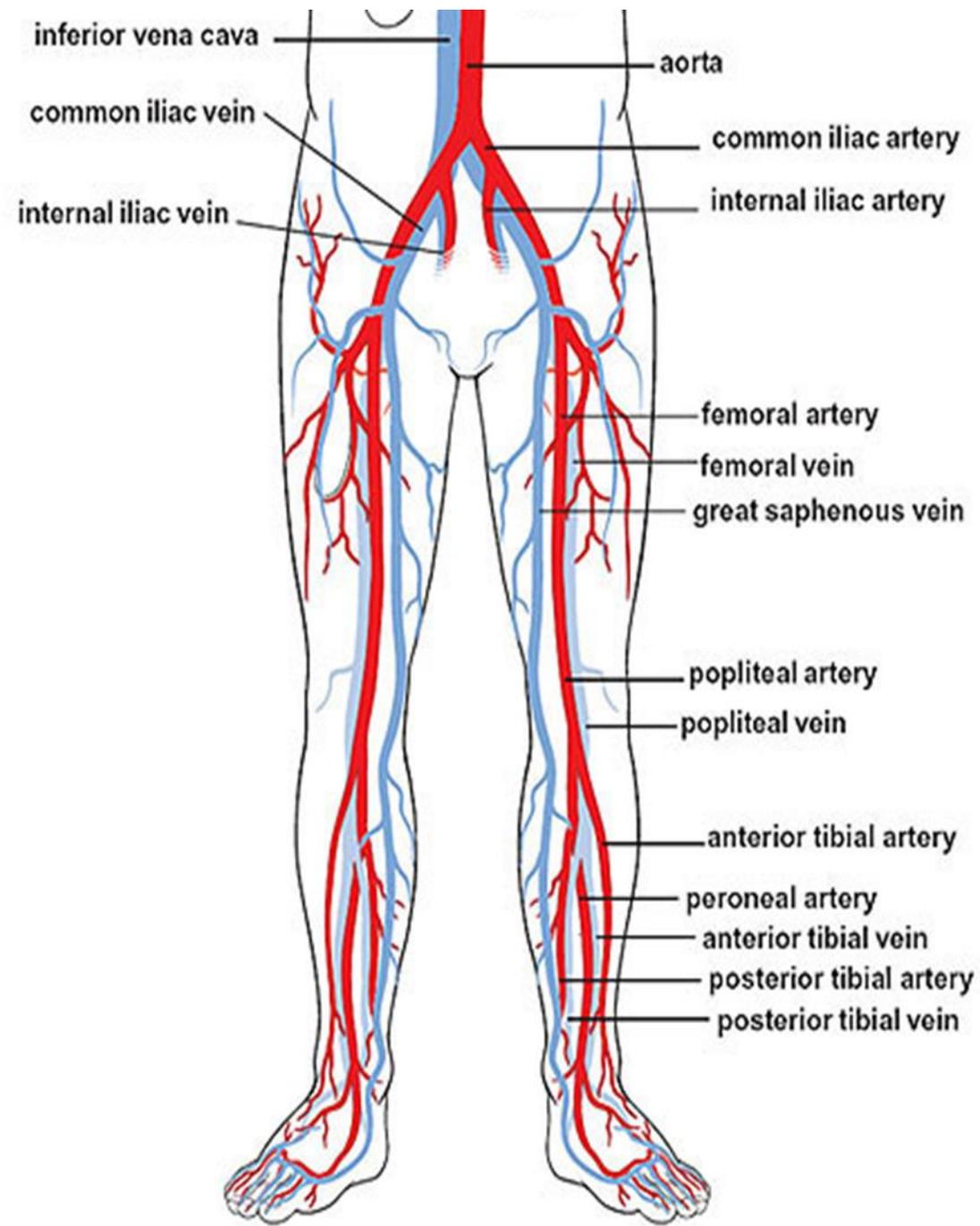
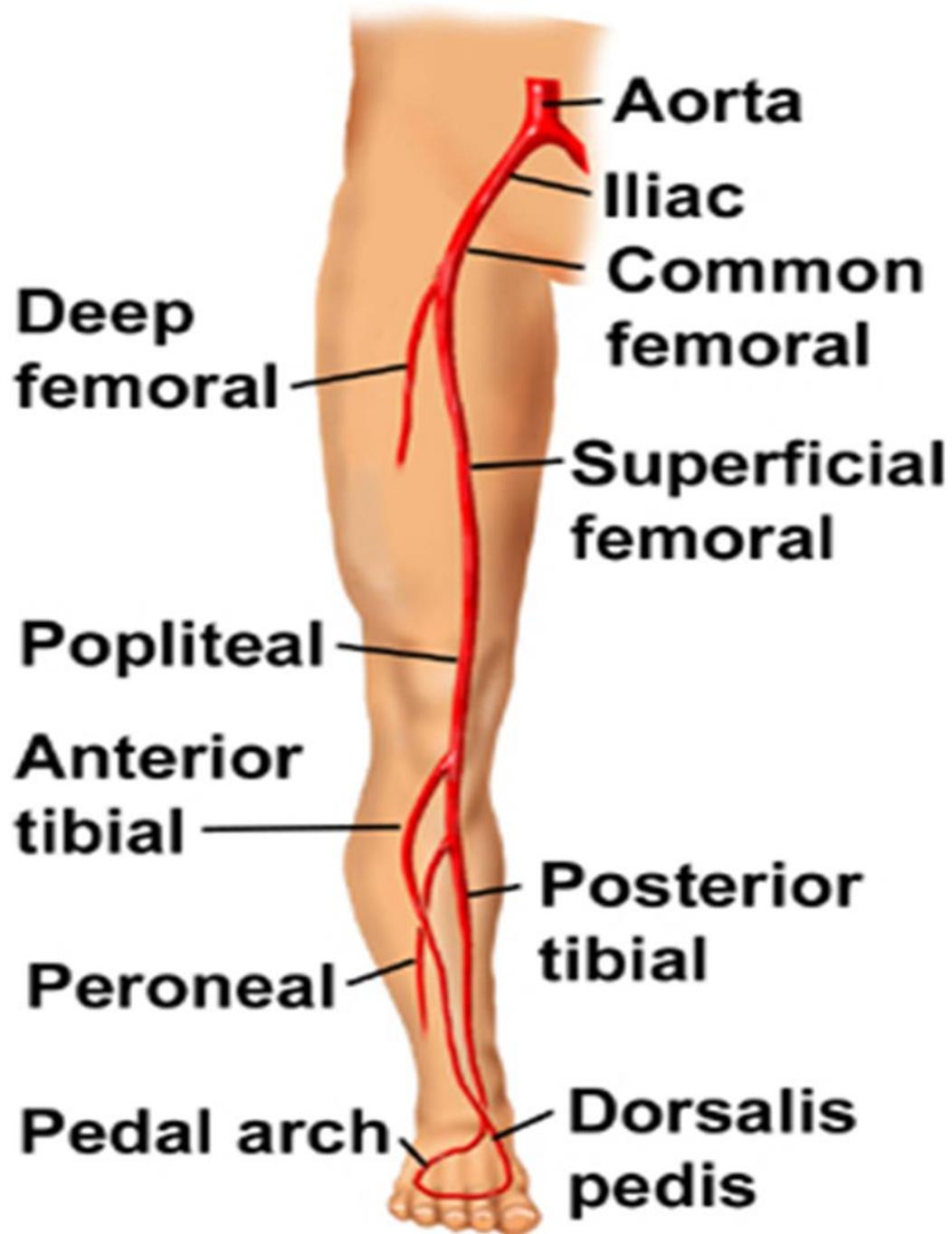
POSTERIOR TIBIAL

- ❑ One of the two branches of the Tibioperoneal Trunk
- ❑ Begins between the tibia and fibula, extending downward and medially to the midpoint between the medial malleolus and the heel
- ❑ Distal to the medial malleolus divides into:
 - Medial plantar artery
 - Lateral plantar artery

**** Feeds the sole of the foot ****

PERONEAL

- ❑ Originates at the distal portion of the Tibioperoneal Trunk
- ❑ Passes obliquely to the fibula
- ❑ Courses along the medial aspect of the fibula
- ❑ Supplies blood to:
 - Lateral lower leg
 - Calcaneus (heel)



PLANTAR ARCH

☐ Comprised of:

- Digital arteries
 - Terminal branches of Dorsalis Pedis and Posterior Tibial

☐ Deeply situated

☐ Extends from the 5th metatarsal base to the proximal end of the 1st intermetatarsal space

Supplies blood to:

- Skin
 - Fasciae
 - Muscles
- } In the sole of the foot

PLANTAR ARCH

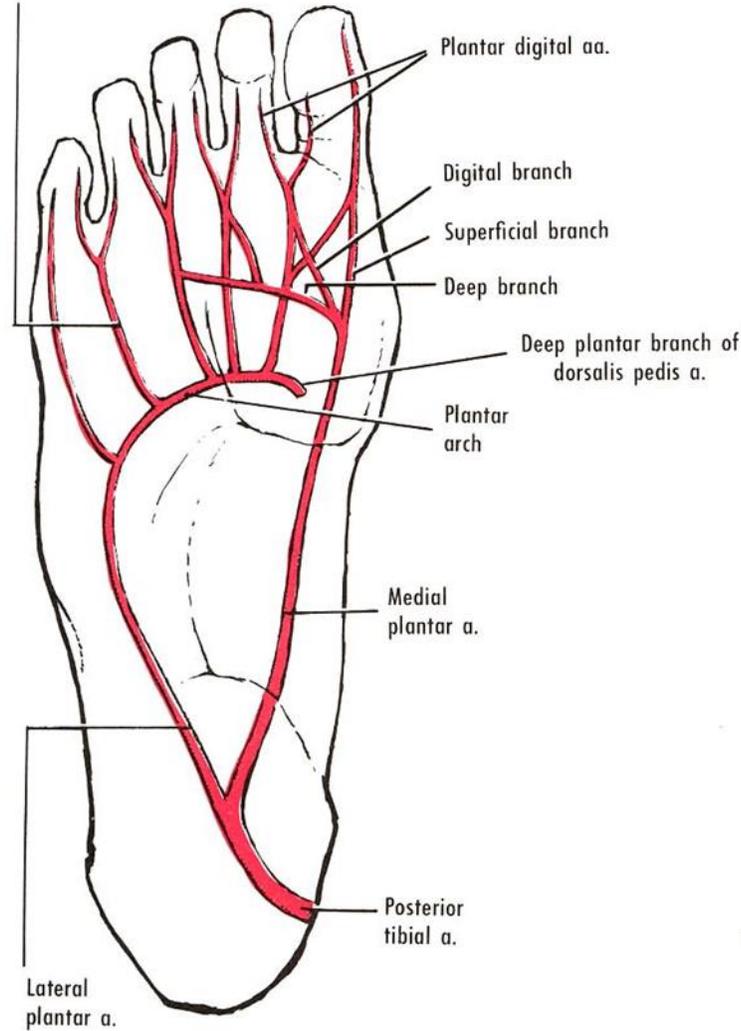
- Deep Plantar Artery
 - Branch of the Dorsalis Pedis Artery
- Lateral Plantar Artery
 - Branch of the Posterior Tibial Artery

Deep Plantar Artery anastomoses with the Lateral Plantar Artery to complete the plantar arch

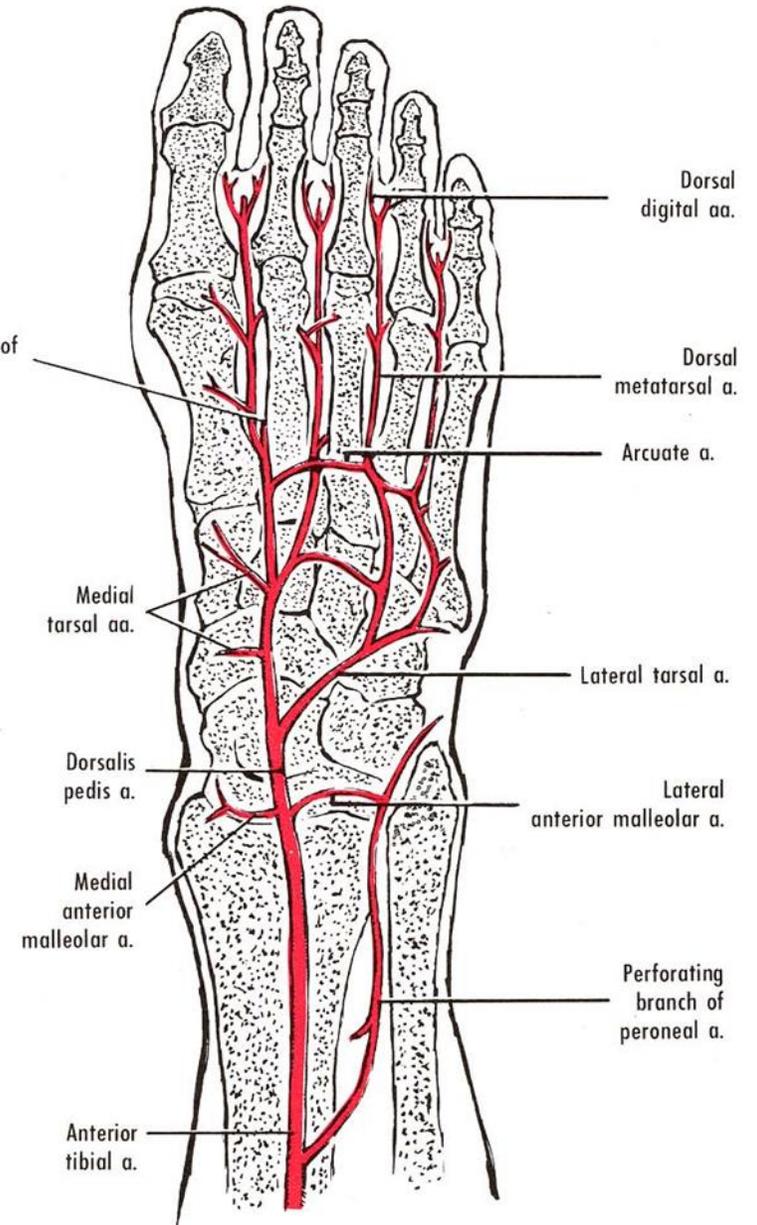
DIGITAL

Plantar and Dorsal Metatarsal arteries distribute blood to the toes

Plantar metatarsal a.



INFERIOR



SUPERIOR

CAPILLARIES

- ❑ Extremely thin walled vessel of the microcirculation
 - Single layer of epithelium
- ❑ Capillaries are only 1 mm long and 8-10 microns in diameter (same as RBC)
- ❑ Supplied by arterioles that transport gases, nutrients, and other essential substances to the capillary beds
- ❑ Capillaries are a vital part of the circulatory system

ARTERIOLES

- Diameter < 1.5mm
- Play a major role in regulating the flow of blood into the capillaries by:
 - Vasoconstriction
 - Vasodilation
- Principle point of resistance in arterial blood flow

MICROSCOPIC ANATOMY OF THE ARTERIAL WALL

ARTERIES

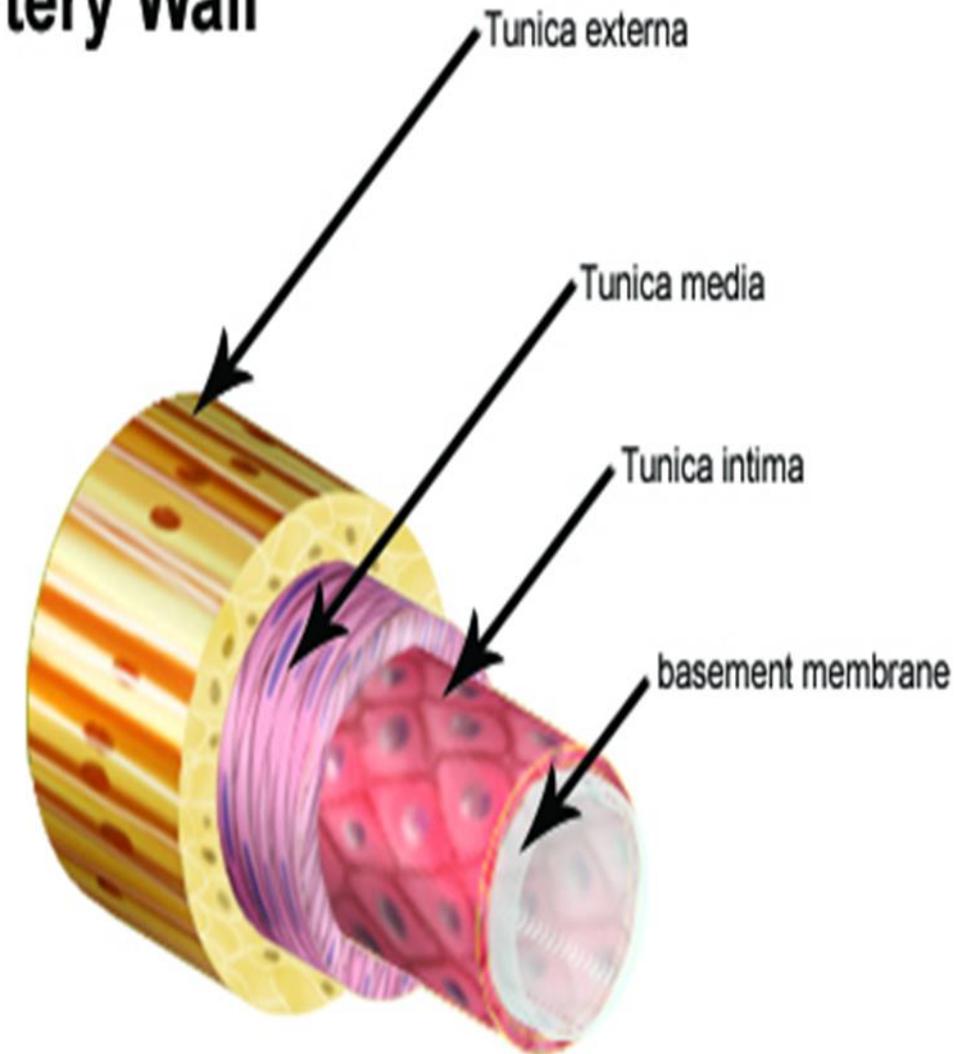
□ Function:

- Transports blood (gases, nutrients, and essential substances) away from the heart to the tissues

□ Composed of 3 layers or tunics:

- Tunica Adventitia – outermost layer
- Tunica Media – middle layer
- Tunica Intima – innermost layer

Artery Wall



TUNICA ADVENTITIA (EXTERNA)

- ❑ Outermost layer
- ❑ Made up of elastic lamina enclosed by fibrous tissue
- ❑ Fibers that make up the elastic lamina run longitudinally
 - Provides great elasticity to the arteries

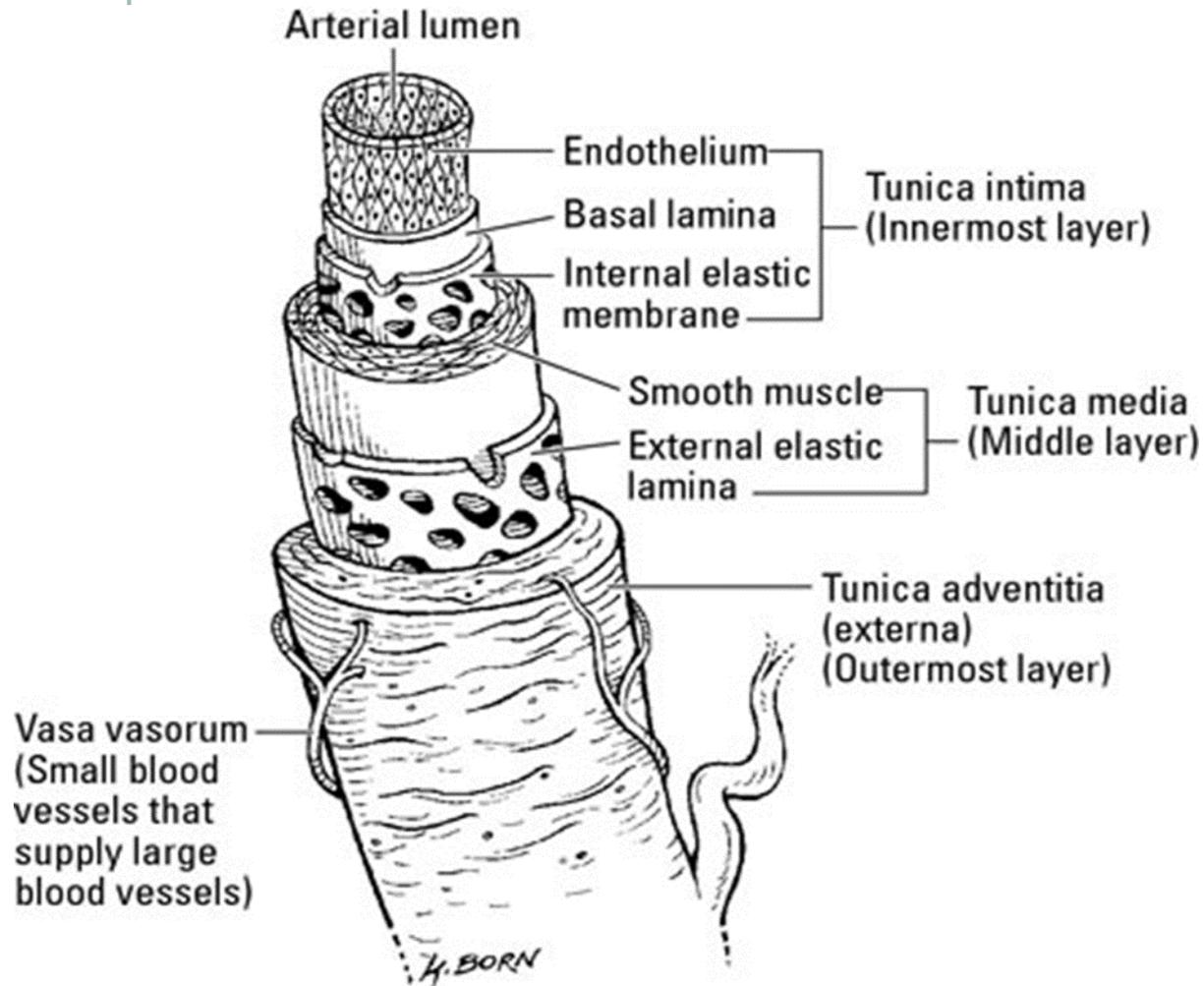
TUNICA MEDIA

- Middle layer
- Composed of smooth muscle layer surrounded by fibrous tissue
- Muscular layer varies in thickness depending on the artery's function
- Muscle fibers are arranged in a circular pattern
 - Allows the muscle fibers to have better control over diameter changes
 - Regulates flow of blood through the artery

TUNICA INTIMA

- ❑ Innermost layer
- ❑ Composed of elastic lamina lined by a layer of endothelial cells one cell thick on the inner surface
- ❑ Endothelial cells provide a smooth lining with no obstruction to blood flow
- ❑ Fibers course in a longitudinal pattern
- ❑ Lumen – hollow center of the artery where blood courses

VASA VASORUM



❑ “Vessels of Vessels”

❑ Tiny vessels on the outside of the tunica adventitia of both arteries and veins

❑ Provides the blood vessels with a source of nutrients as well as a conduit for waste products