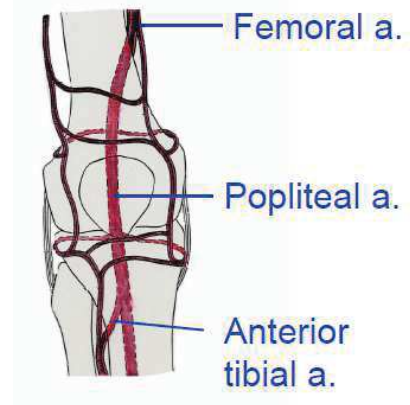


L67 Vascular Supply to the Limbs

A. Anatomical Features of Vascular Supplies

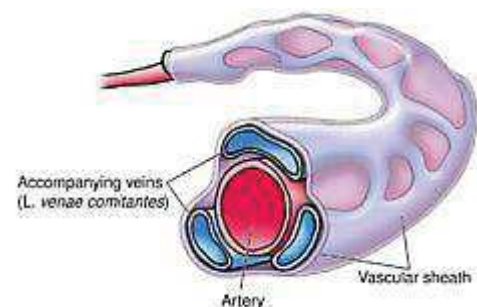
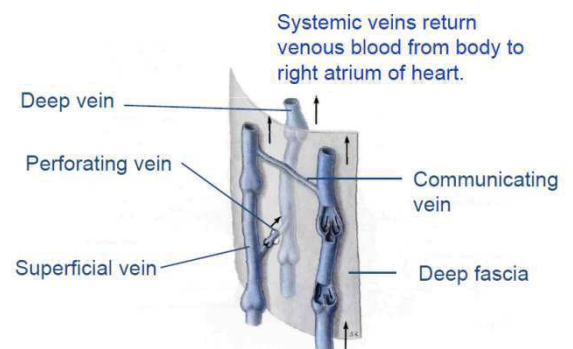
1. Arterial Anastomoses

- ▶ **Arterial anastomoses:** a segment of artery joining two different arteries
- ▶ Provide alternative channels (**collateral circulation**) for blood to reach a given tissue or organ, especially if the main artery supplying a tissue or organ is slowly occluded
- ▶ Eg. **genicular arteries** linking **femoral**, **popliteal** and **tibial arteries** around the knee joint → collateral circulation for blockage of popliteal artery



2. Veins

- ▶ Most veins follow the course of an artery and are not specifically named (except large veins or those that do not accompany an artery)
- ▶ Classification of systemic veins:
 - **Deep veins** travel with arteries and found deep in muscles
 - Share the same name with the artery
 - Drain deeper structures such as muscles, bones and joints
 - **Superficial veins** running in superficial fascia and some are externally visible
 - Drain subcutaneous tissues
 - Clinical importance: **venipuncture** and **transfusion**; those in lower limb prone to **varicosities**
- ▶ **Deep and superficial veins** communicate by **perforating** or **communicating veins** piercing the **deep fascia**
 - **Deep fascia:** well-defined layer of connective tissue separating superficial tissues and deep tissues
- ▶ **Valves** help direct blood from superficial to deep veins
- ▶ **Venous tributary:** a smaller vein that drains into a larger vein



- ▶ Mechanisms of venous return:
 - Valves
 - Muscular pump (for **deep veins** found between muscles)
 - Pulsation of adjacent artery (for **venae comitantes**)
 - **Venae comitantes**: deep veins accompanying medium-sized arteries are usually paired

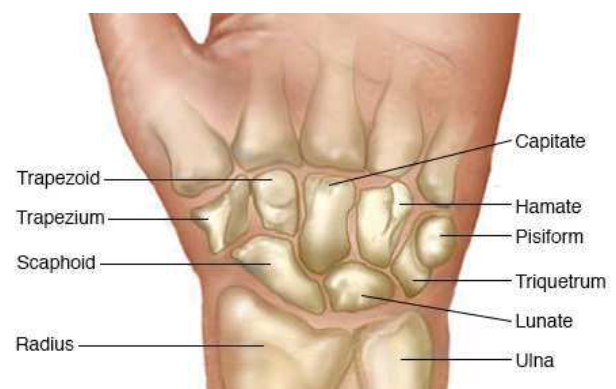
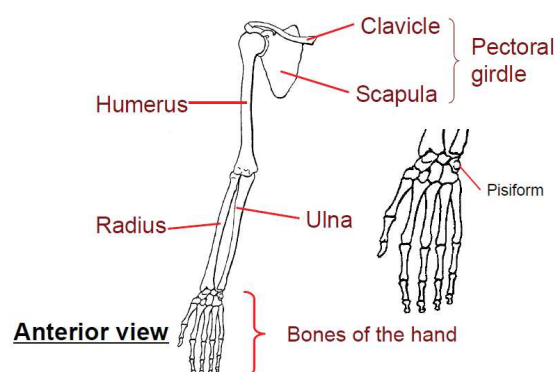
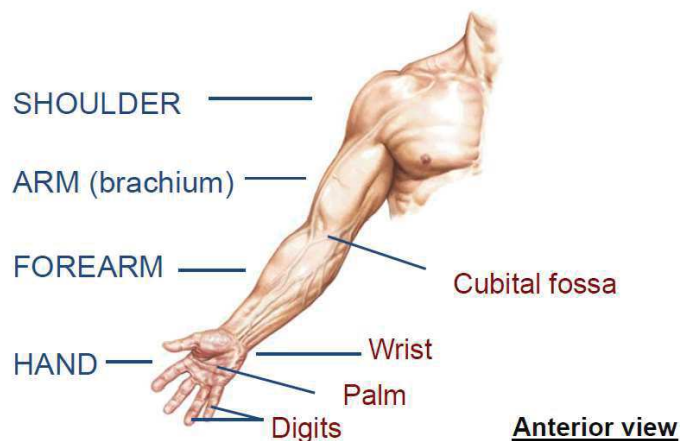
*Terminology: an artery supplies a region while a vein drains a region

3. Lymphatics

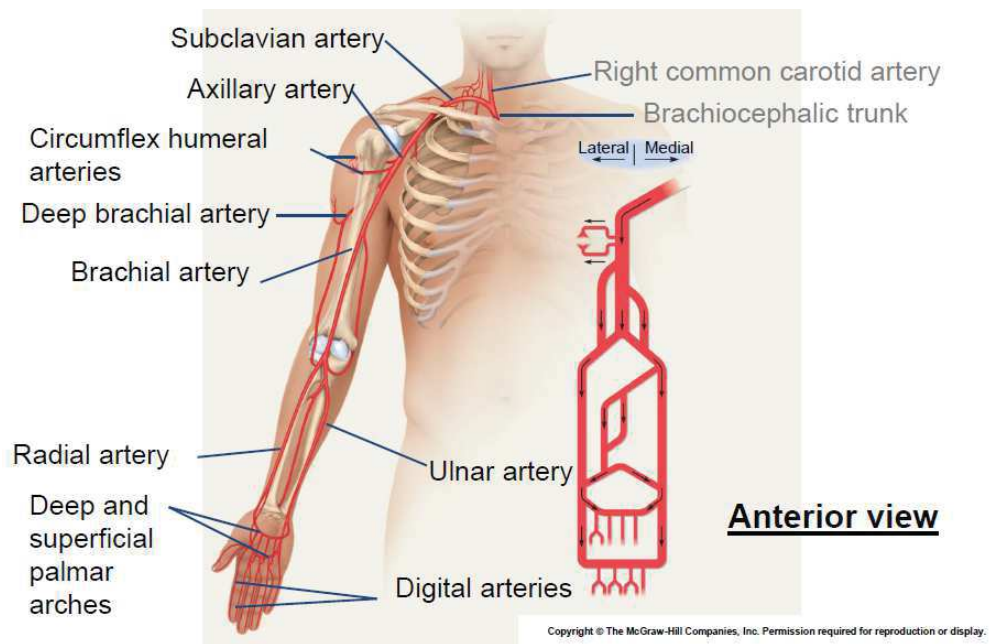
- ▶ **Lymphatic capillaries** drain lymph from tissues and return it to bloodstream
- ▶ **Lymphatic vessels** in limbs divided into:
 - **Superficial lymphatic collecting vessels** in the subcutaneous tissue travel along superficial veins
 - **Deep lymphatic vessels** accompany the deep blood vessels

B. Vascular Supply to Upper Limbs

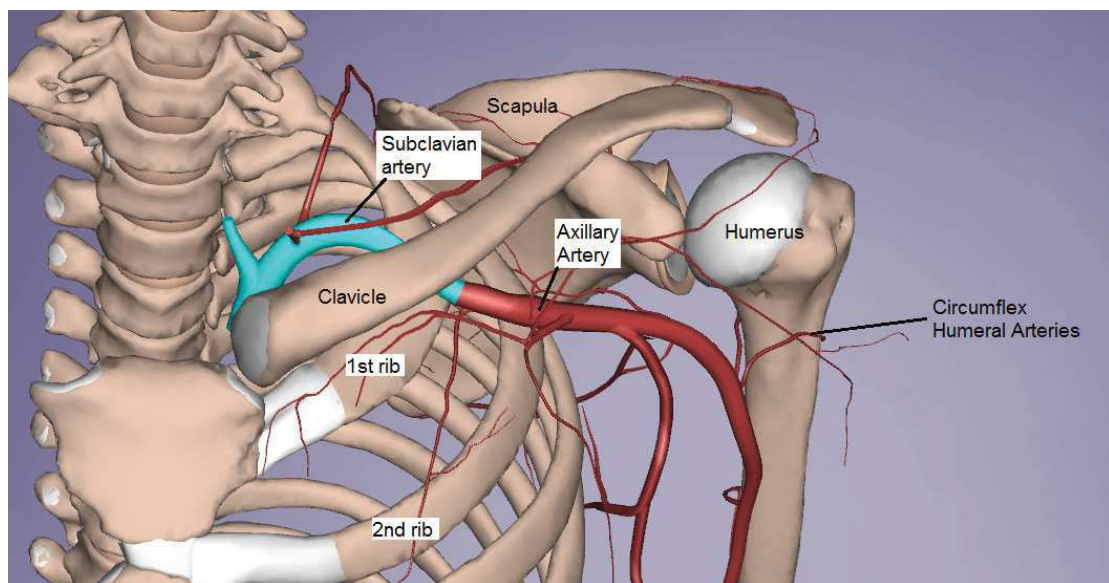
1. Anatomical Overview on the Upper Limb



2. Main Arteries of the Upper Limb



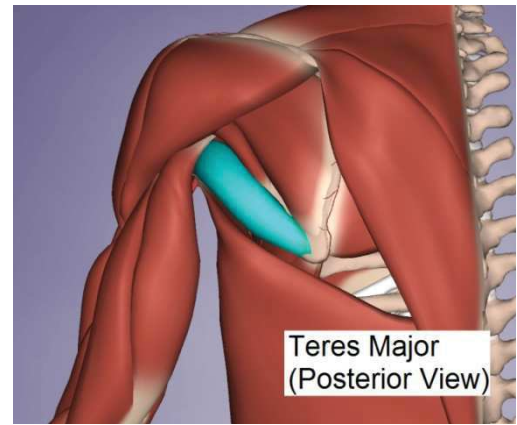
a. Subclavian Artery



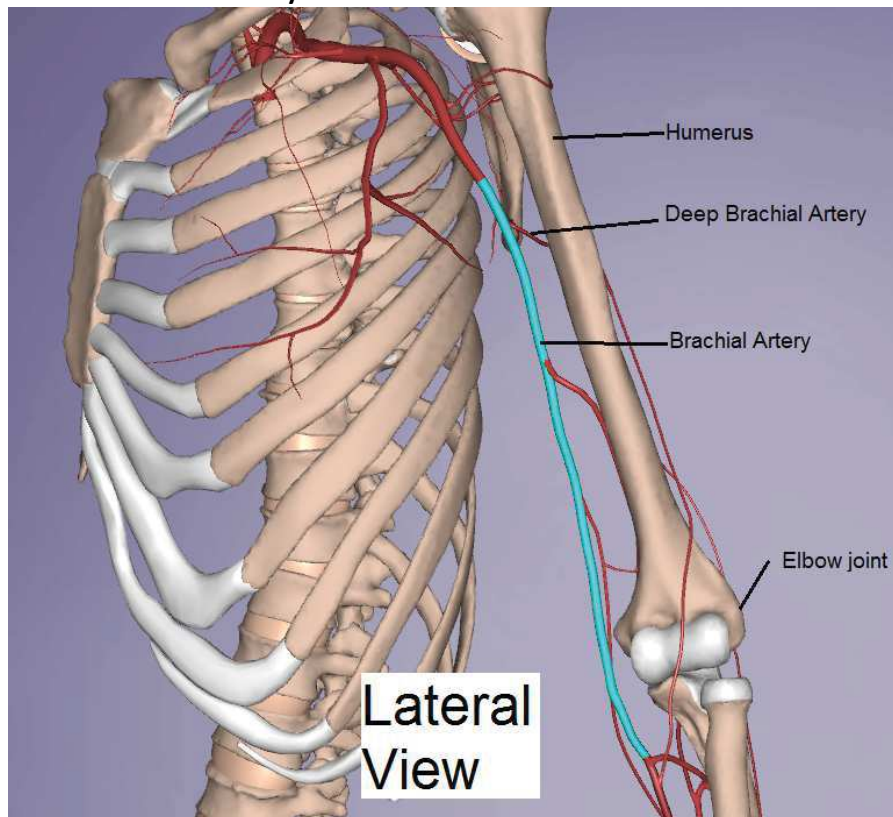
- ▶ **Left subclavian artery** arises directly from **aorta**
- ▶ **Right subclavian artery** is a branch of **brachiocephalic trunk**
- ▶ Becomes the **axillary artery** at lateral border of 1st rib
- ▶ Pulse can be palpated posterior to midpoint of clavicle where the artery passes over the 1st rib

b. Axillary Artery

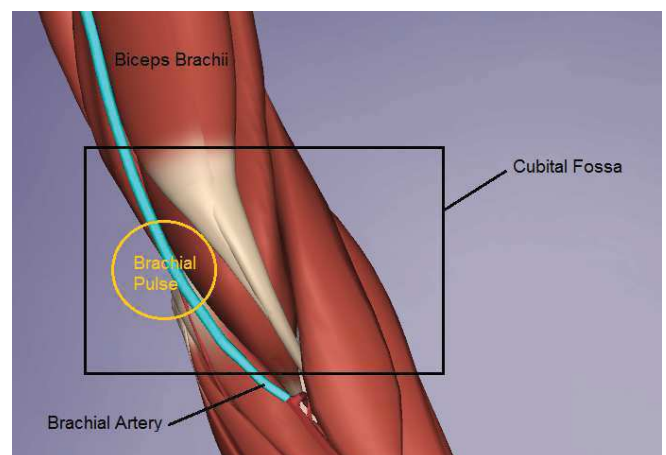
- ▶ Direct continuation of **subclavian artery**
- ▶ Located in the **axilla** (armpit)
- ▶ Begins at lateral border of 1st rib and ends at lower border of **teres major**
- ▶ Gives off branches to supply pectoral region, scapular region and shoulder and **anterior and posterior circumflex humeral arteries** (encircle surgical neck of **humerus**)



c. Brachial Artery



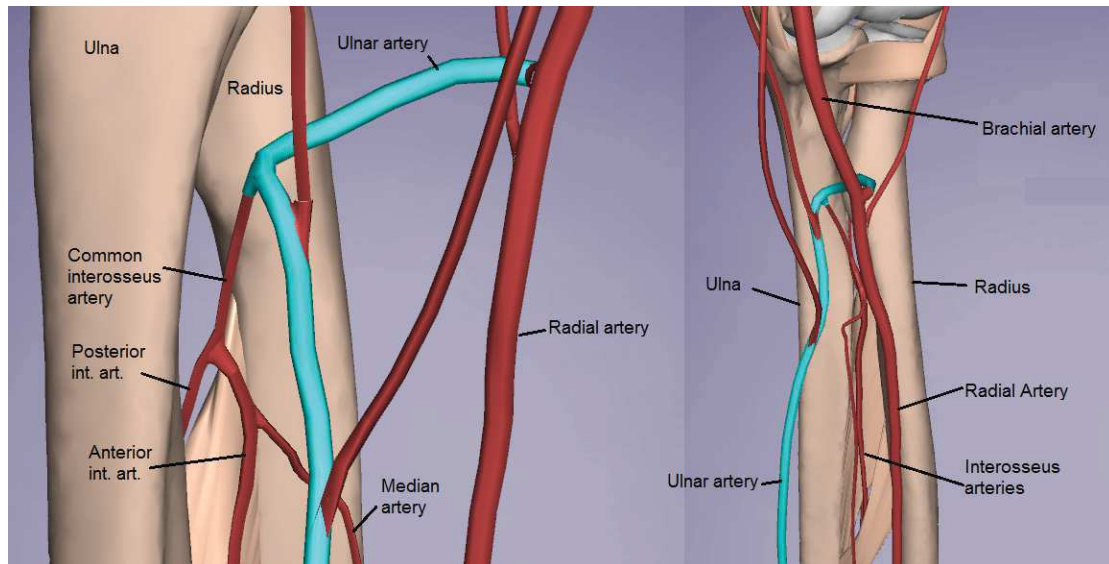
- ▶ Direct continuation of **axillary artery**
- ▶ Ends just distal to elbow
- ▶ Supplies muscles in the anterior compartment of the arm
- ▶ Pulse can be palpated in **cubital fossa**, medial to **biceps brachii tendon**
- ▶ Clinical significance: most common site of blood pressure measurement



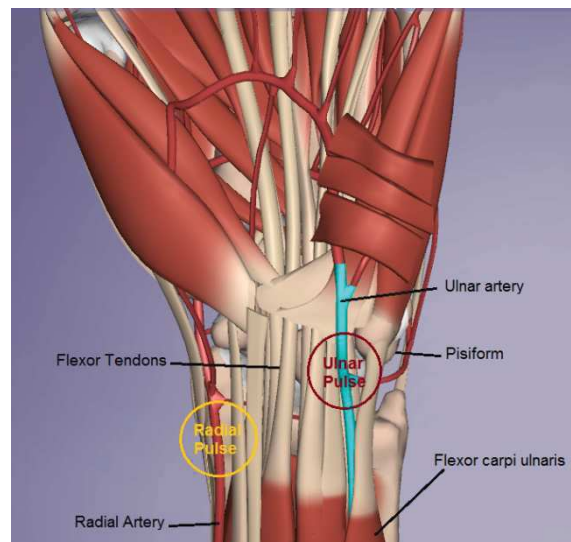
d. Deep Brachial Artery

- ▶ Also called **profunda brachii artery**
- ▶ Branches from **brachial artery**
- ▶ Supplies muscles in the posterior compartment of the arm
- ▶ Takes part in anastomosis around the elbow joint

e. Ulnar Artery



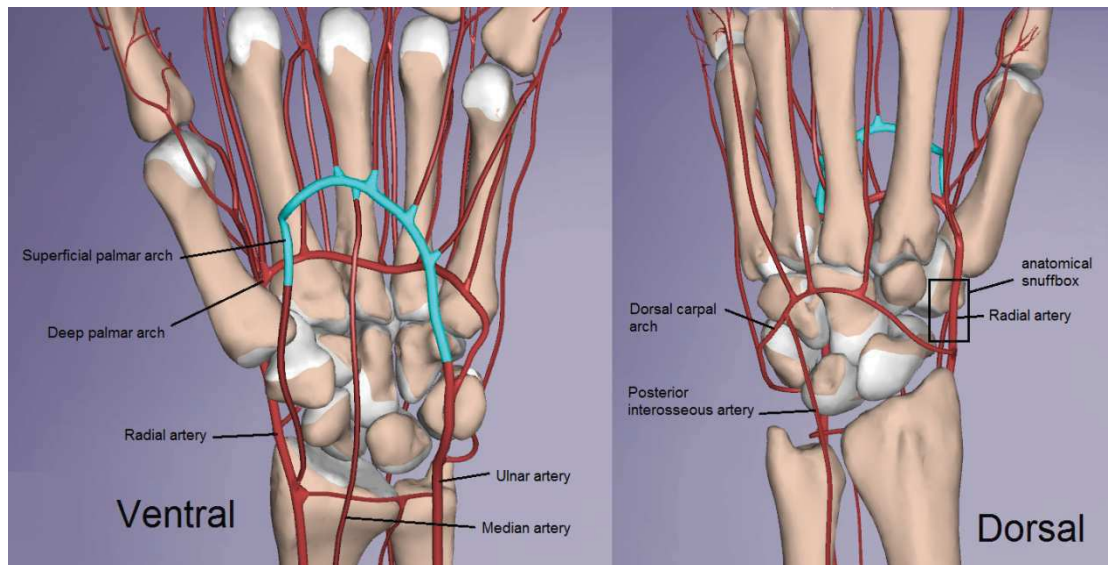
- ▶ Medial branch of **brachial artery**
- ▶ Supplies forearm muscles
- ▶ Gives off **common interosseous artery** which further branches into **anterior** and **posterior interosseous arteries** (on anterior and posterior surfaces of **interosseous membrane** respectively)
- ▶ Pulse can be palpated in front of wrist, lateral to **flexor carpi ulnaris tendon** and **pisiform bone**



f. Radial Artery

- ▶ Lateral branch of **brachial artery**
- ▶ Pulse readily palpable in front of wrist lateral to **flexor tendons** and in the **anatomical snuffbox** (area of depression on dorsum at base of thumb)
- ▶ Supplies lateral forearm muscles

g. Superficial and Deep Palmar Arches

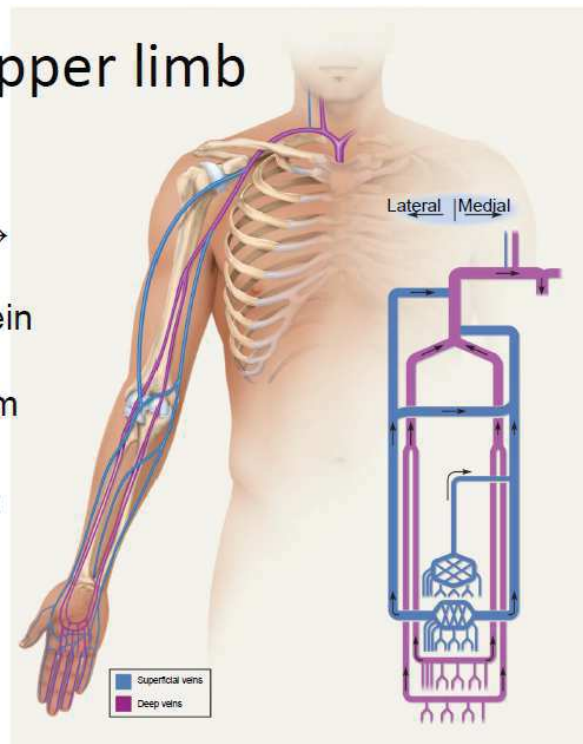


- ▶ Formed by anastomosis of radial and ulnar arteries
- ▶ **Superficial palmar arch**: direct continuation of ulnar artery
- ▶ **Deep palmar arch**: direct continuation of radial artery
- ▶ Together send branches to the digits

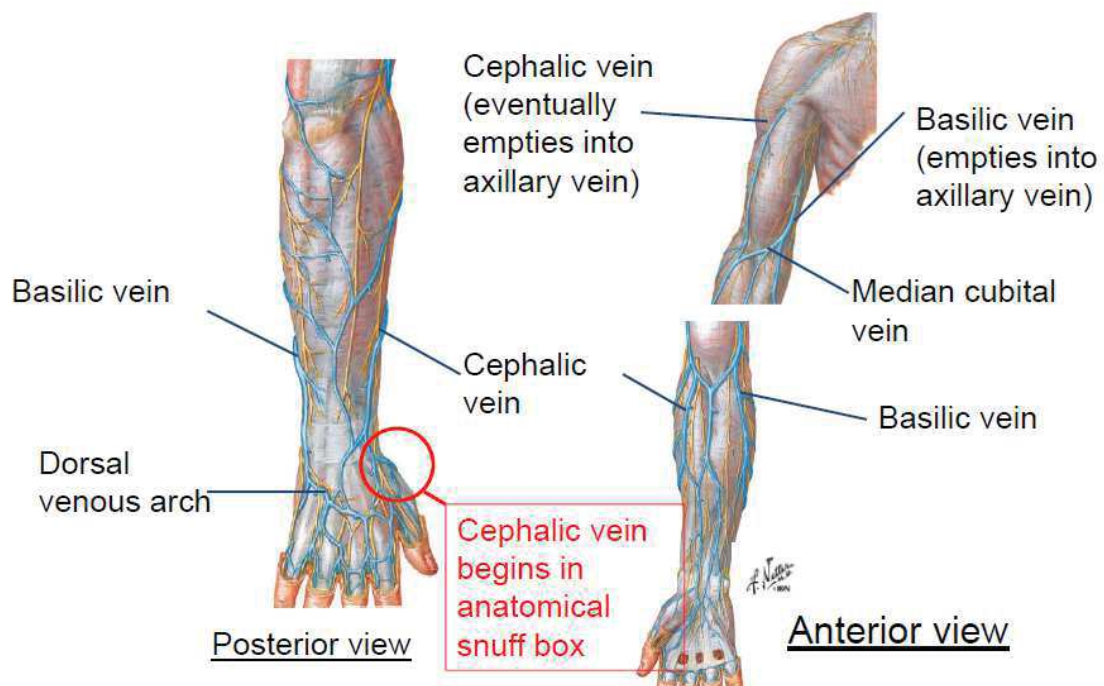
3. Veins of the Upper Limb

Veins of the upper limb

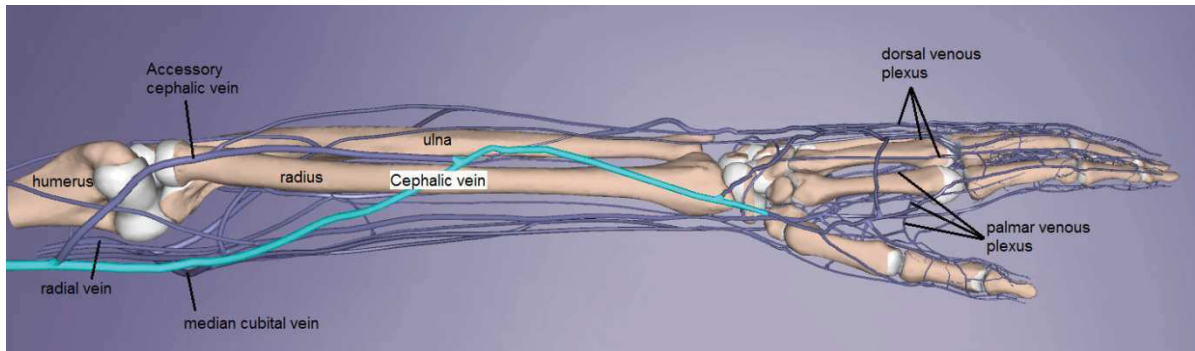
- Deep veins:** drain into axillary vein → subclavian vein → brachiocephalic vein → superior vena cava → right atrium of heart.
- Superficial veins:** drain into deep veins



a. Superficial Veins of the Upper Limb

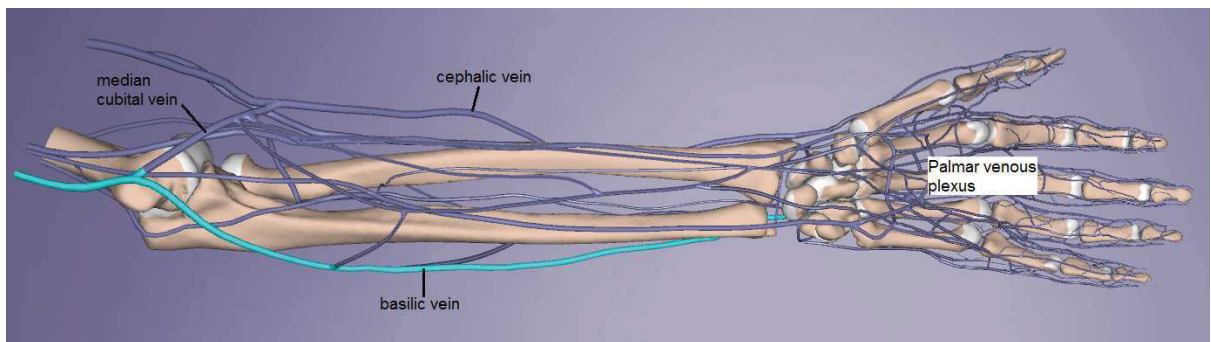


- **Dorsal venous network** on the back of the hand draining to **cephalic** and **basilic veins**



- **Cephalic vein:**

- Visible at anatomical snuffbox
- Runs up the lateral side of forearm and arm
- Drains the lateral part of **dorsal venous network**
- Drains into the **axillary vein** at axilla

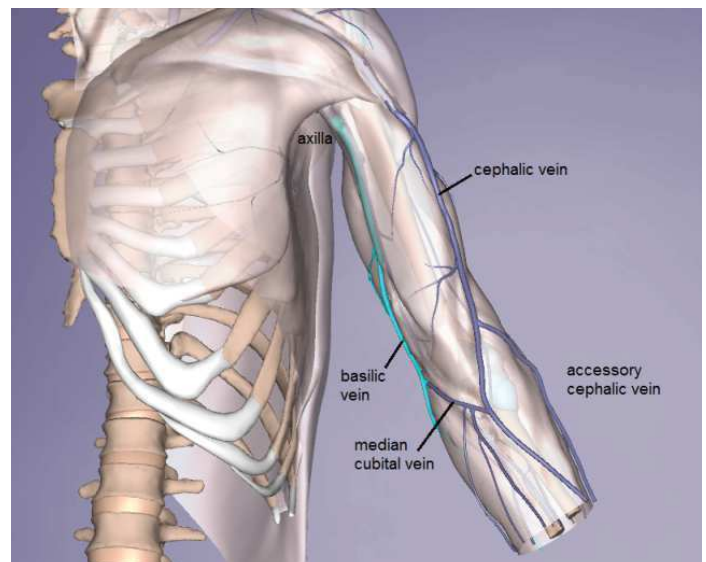


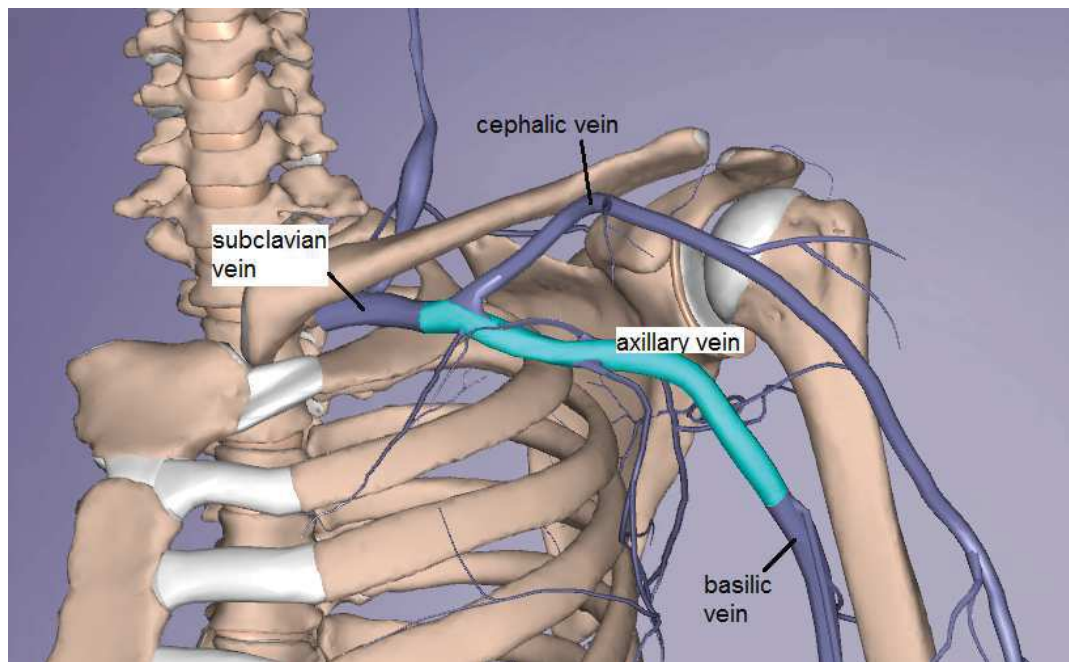
- **Basilic vein:**

- Arises from medial side of dorsal venous network
- Joins brachial veins to form axillary vein

- **Medial cubital vein:**

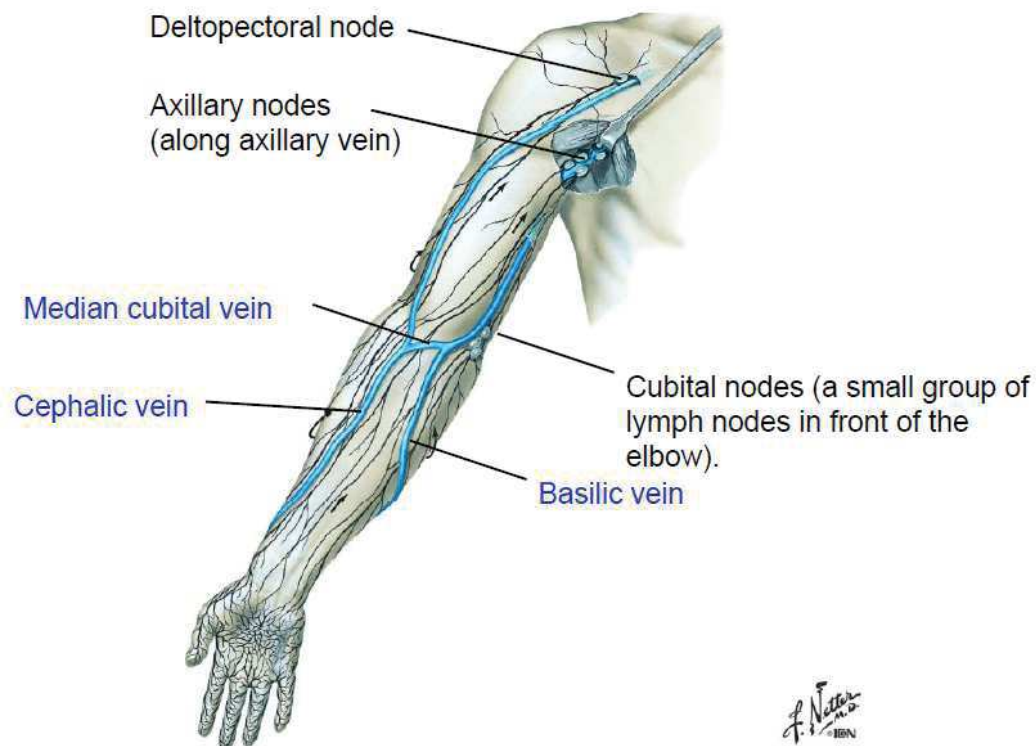
- Anastomosis between cephalic and basilic veins at cubital fossa
- Most common site for drawing blood





- ▶ **Axillary vein** drains into **subclavian vein**, **brachiocephalic vein** and then into **superior vena cava**

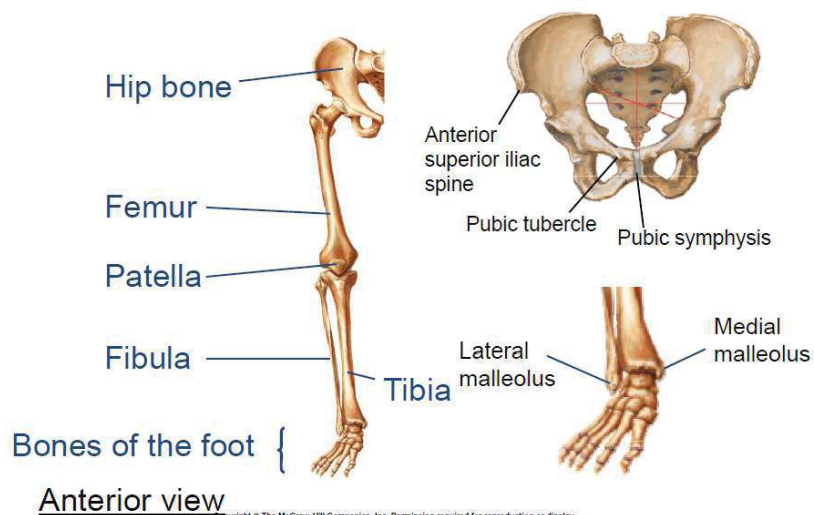
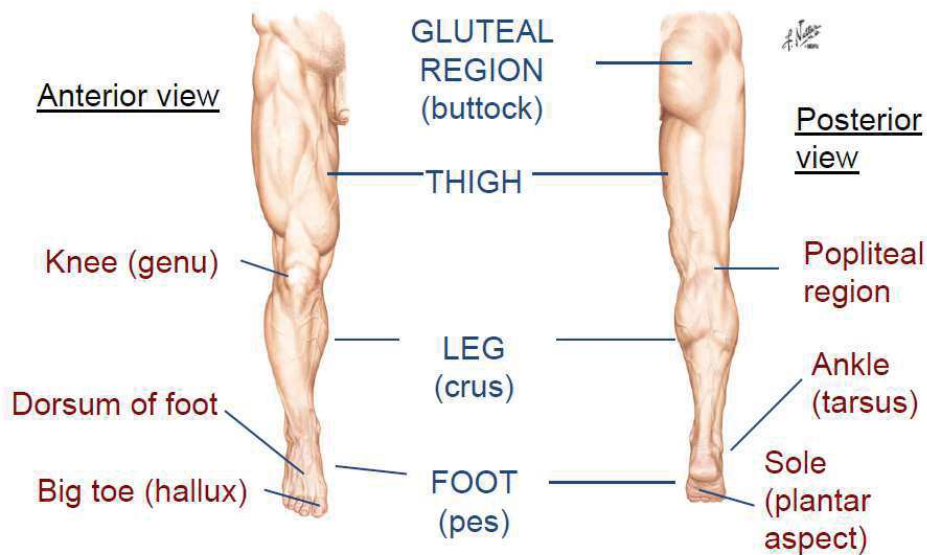
4. Lymphatic Drainage of the Upper Limb



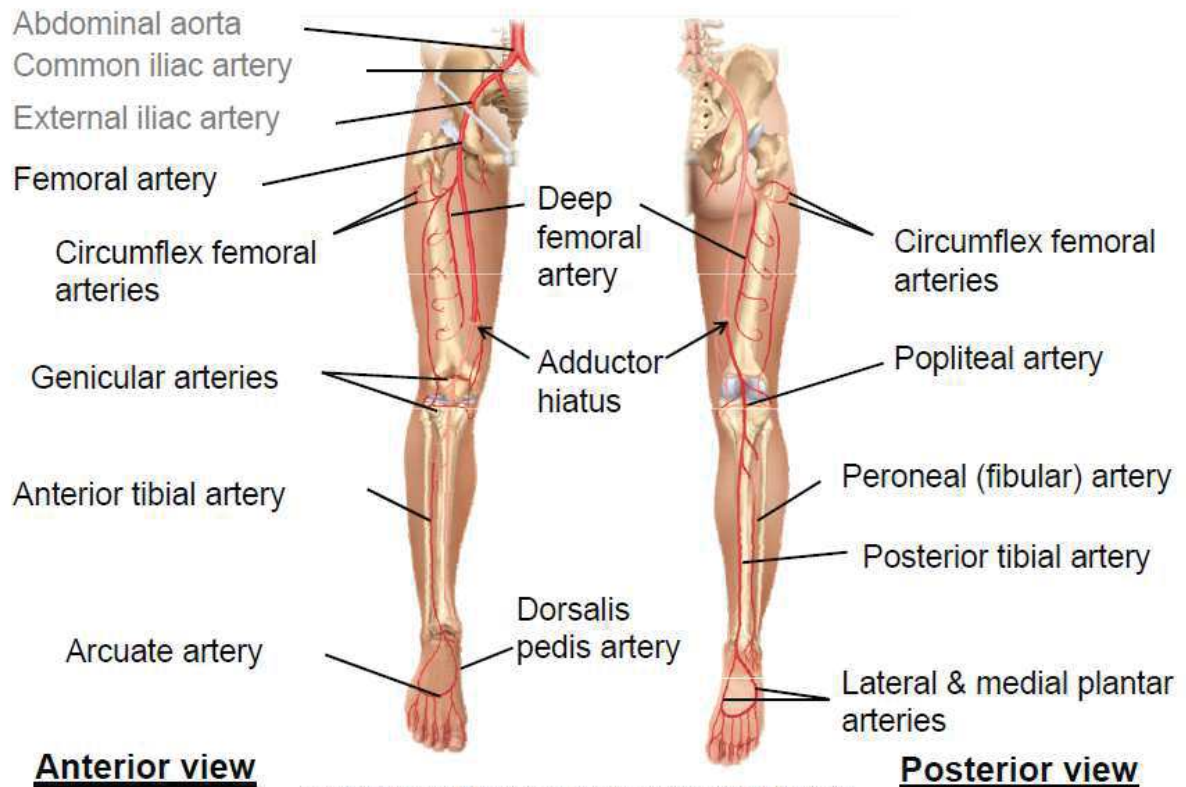
- ▶ **Axillary lymph nodes** drain upper limb, mammary glands, skin and superficial fascia of trunk above level of **umbilicus** and **hip**

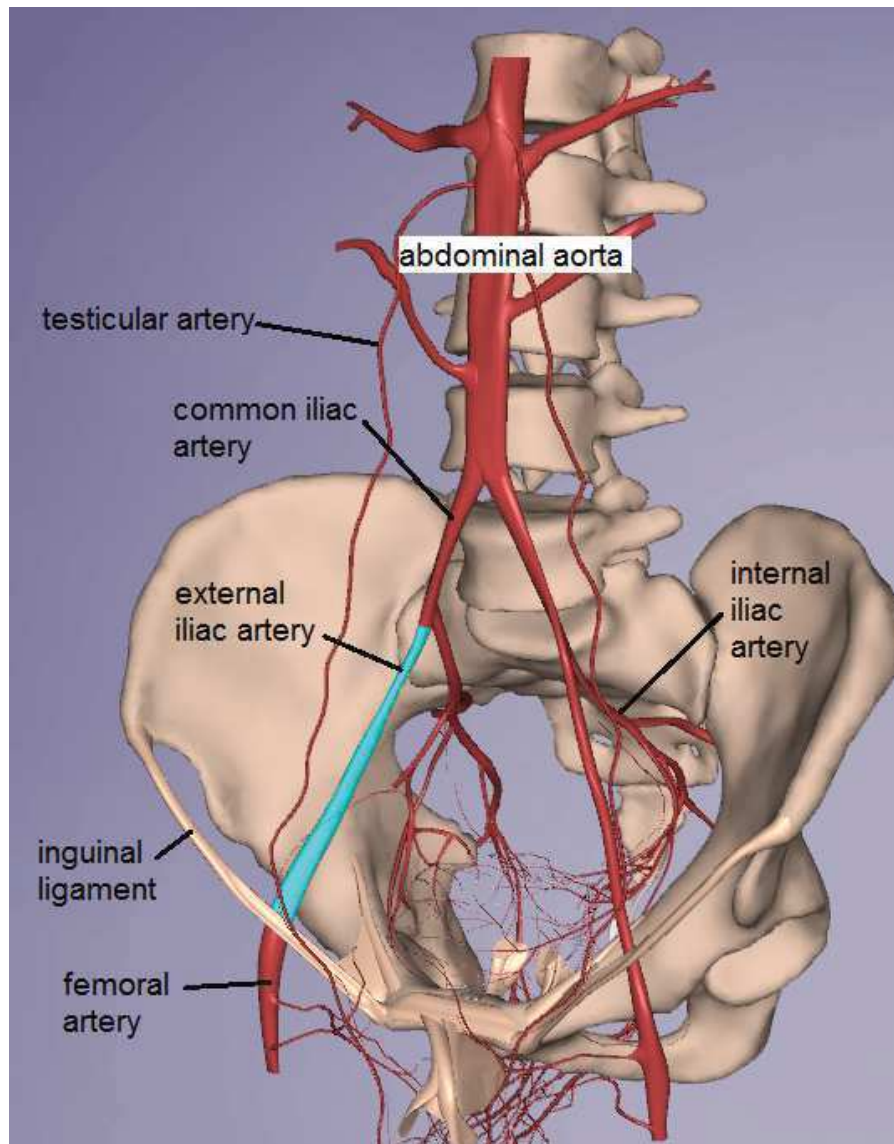
C. Vascular Supply to the Lower Limbs

1. Anatomical Overview on the Lower Limbs



2. Main Arteries of the Lower Limb

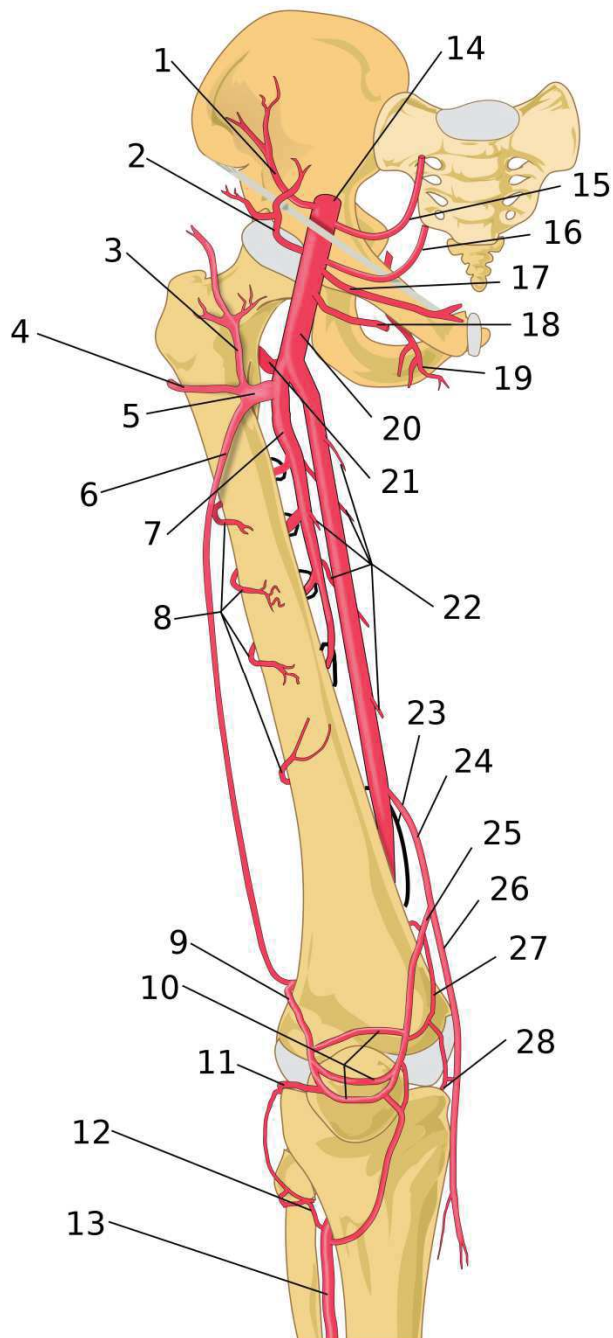




a. External Iliac Artery

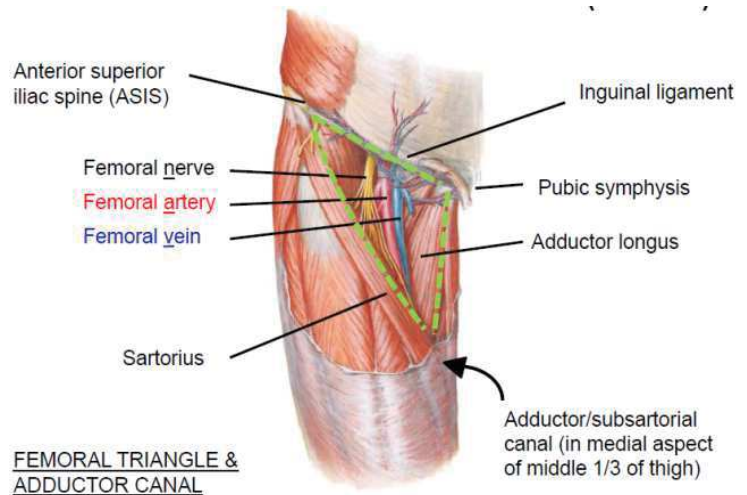
- ▶ **External iliac artery** arises from the **common iliac artery**
- ▶ Supplies the lower limbs via the **femoral artery**
- ▶ Becomes the **femoral artery** when pass through the **inguinal ligament**

b. Femoral Artery



- 1 - Deep circumflex iliac artery
- 2 - Superficial circumflex iliac artery
- 3 - Ascending branch of lateral femoral circumflex artery
- 4 - Transverse branch of lateral femoral circumflex artery
- 5 - LATERAL CIRCUMFLEX FEMORAL ARTERY
- 6 - Descending branch of lateral femoral circumflex artery
- 7 - DEEP FEMORAL ARTERY
- 8 - Perforating branches
- 9 - Superior lateral genicular artery
- 10 - Patellar anastomoses
- 11 - Inferior lateral genicular artery
- 12 - Circumflex fibular branch of anterior tibial artery
- 13 - ANTERIOR TIBIAL ARTERY
- 14 - EXTERNAL ILIAC ARTERY
- 15 - Inferior epigastric artery
- 16 - Superficial epigastric artery
- 17 - Superficial external pudendal artery
- 18 - Deep external pudendal artery (cut)
- 19 - Obturator artery (from internal iliac artery)
- 20 - FEMORAL ARTERY
- 21 - MEDIAL CIRCUMFLEX FEMORAL ARTERY (from deep femoral artery)
- 22 - Muscular branches
- 23 - ADDUCTOR HIATUS
- 24 - Descending genicular artery
- 25 - Articular branch of descending genicular artery
- 26 - Saphenous branch of descending genicular artery
- 27 - Superior medial genicular artery
- 28 - Inferior medial genicular artery

- ▶ **Femoral artery**: direct continuation of the **external iliac artery**
- ▶ Enters **femoral triangle** at **mid-inguinal point**
 - **Femoral triangle** bound by **inguinal ligament**, **adductor longus** and **Sartorius** and is covered by skin and fascia only
 - Clinical significance: can be easily accessible for cannulation



- **Mid-inguinal point** is the mid-point of the imaginary line joining **anterior superior iliac spine (ASIS)** and **pubic symphysis**
- ▶ Passes through **Hunter's** (or **adductor** or **subsartorial**) **canal** in the medial aspect of the middle third of thigh
- ▶ Passes through **adductor hiatus** to enter **popliteal fossa** and become the **popliteal artery**
 - **Adductor hiatus**: a gap in **adductor magnus** muscle
- ▶ Note V-A-N arrangement from medial to lateral

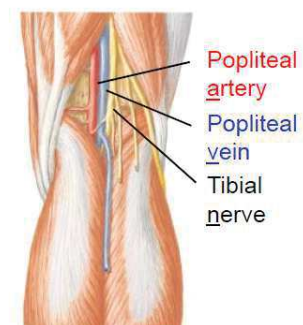
c. Deep Femoral Artery

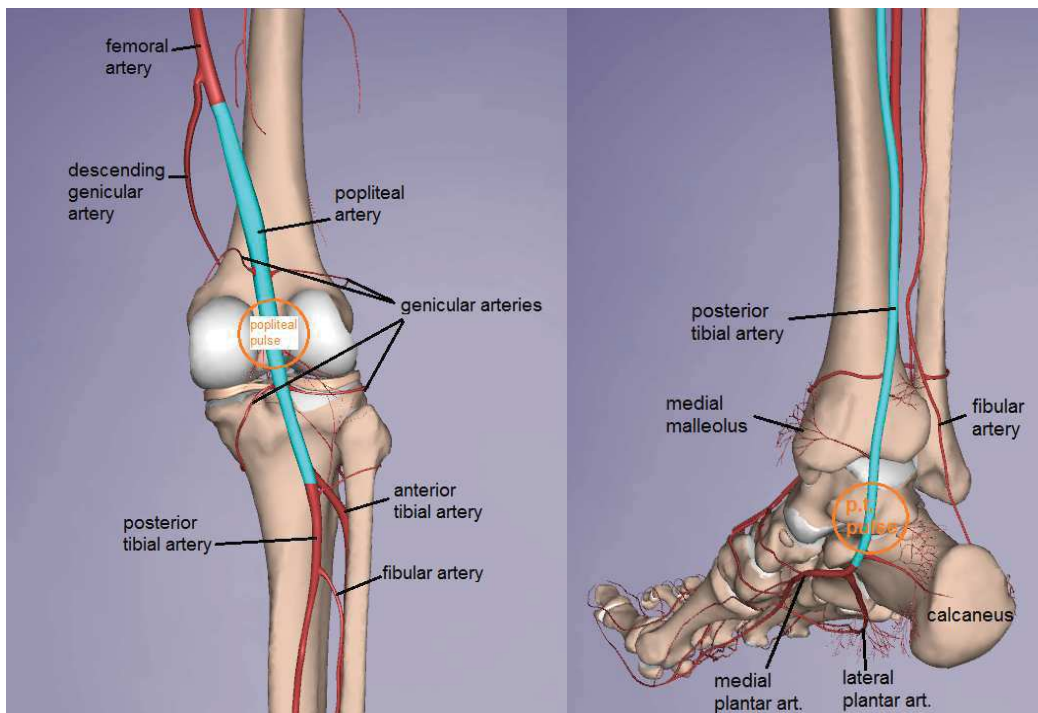
- ▶ Also called **profunda femoris artery**
- ▶ Branch of femoral artery
- ▶ Main arterial supply to thigh
- ▶ Branches: **medial** and **lateral circumflex femoral arteries** and 4 **perforating arteries**

d. Popliteal Artery

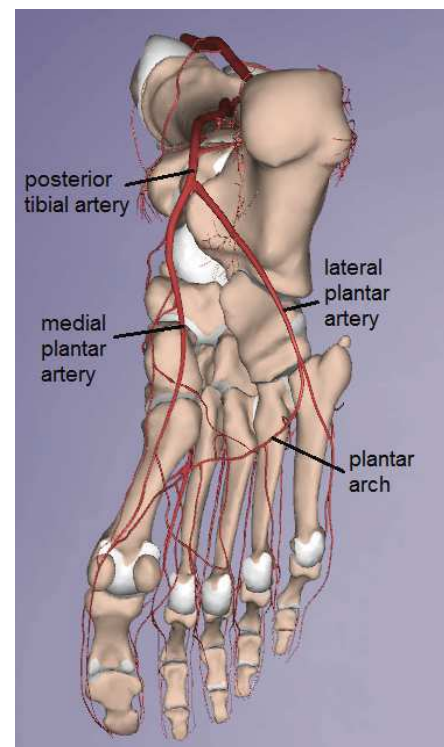
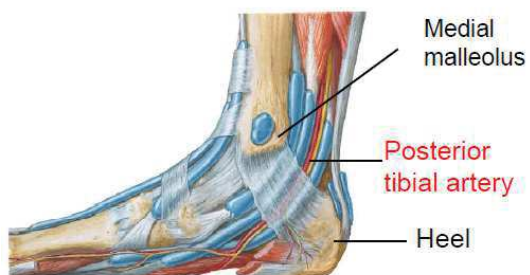
- ▶ Arises from **femoral artery** after it passes through **adductor hiatus**
- ▶ Divides into **anterior** and **posterior tibial arteries**
- ▶ Note A-V-N arrangement from deep to superficial
 - The 'N' is **tibial nerve** not **popliteal nerve**
- ▶ Pulse is more difficult to feel because it is the deepest structure in the popliteal fossa

POPLITEAL FOSSA (right)





Right ankle and foot
(medial view)



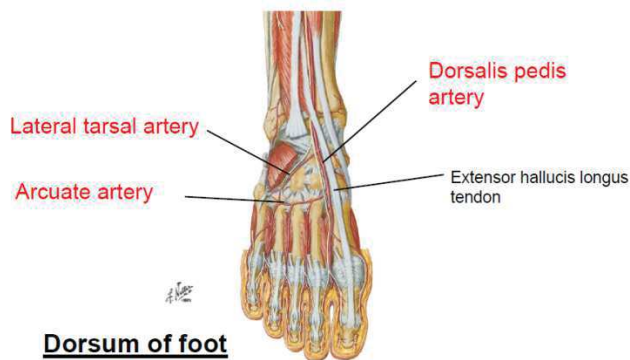
e. Posterior Tibial Artery

- ▶ Travels along the posterior side of the leg
- ▶ Supplies muscles of the posterior compartment of the leg together with its branch **peroneal (fibular) artery**
- ▶ Turns medially at the distal half of the leg to enter foot
- ▶ Divides into **medial** and **lateral plantar arteries** in the foot
- ▶ **Lateral plantar artery** forms the **plantar arch**
- ▶ Pulse: felt midway between tip of **medial malleolus** and medial margin of the heel

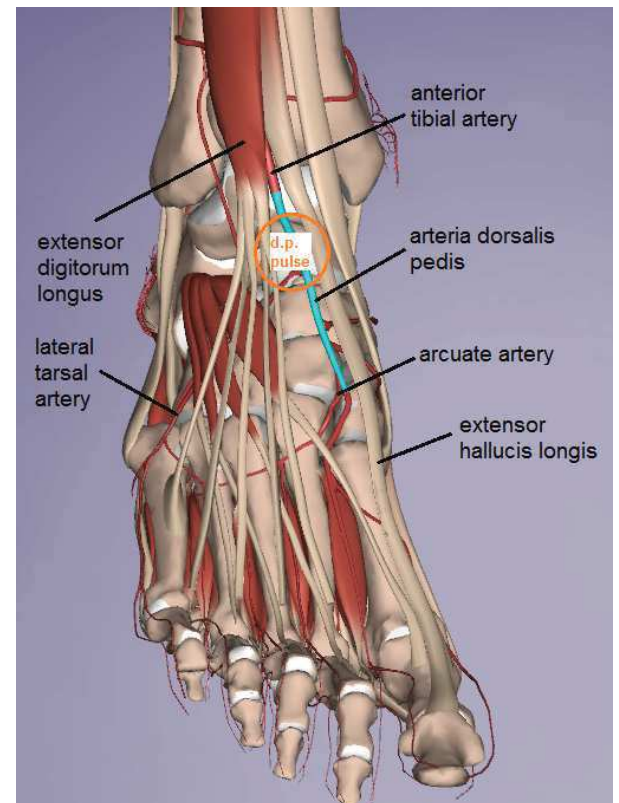
f. Anterior Tibial Artery

- ▶ Arises from **popliteal artery**
- ▶ Enters anterior compartment of leg through an opening in the **interosseous membrane**
- ▶ Continues into foot as **dorsalis pedis artery**
- ▶ Supplies muscles in anterior compartment of leg
- ▶ Pulse palpable in front of ankle midway between the two malleoli

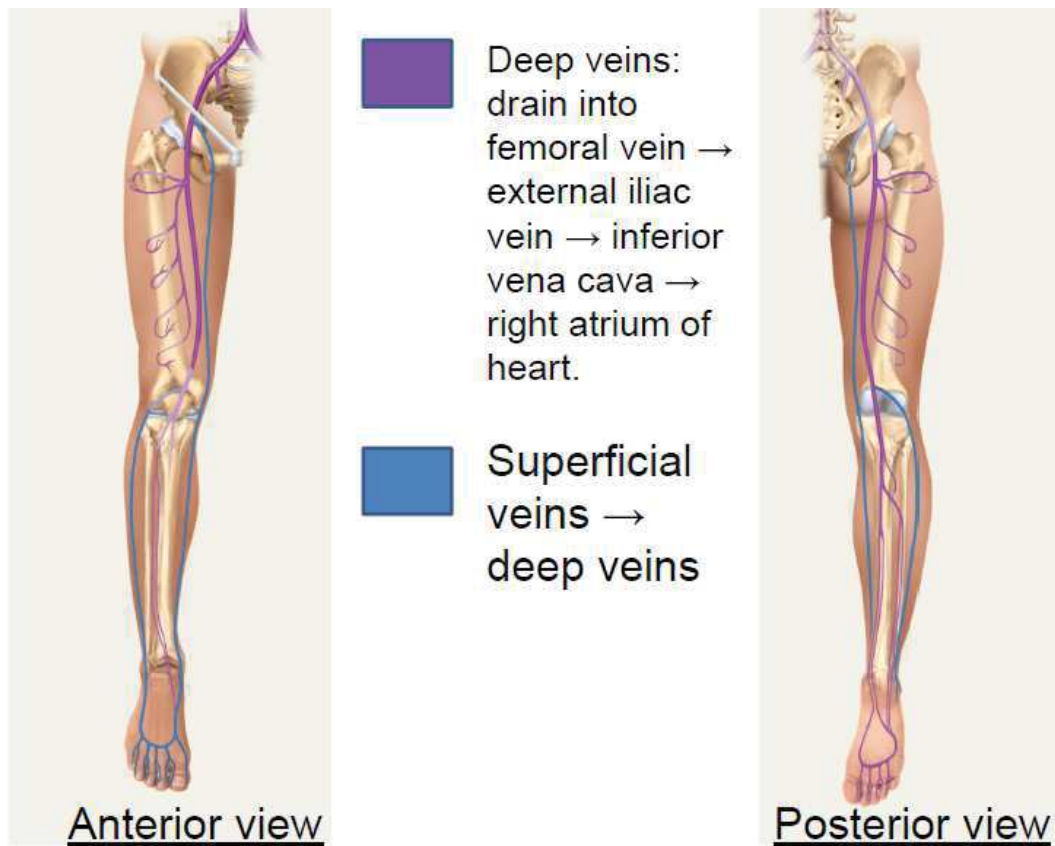
g. Dorsalis Pedis Artery



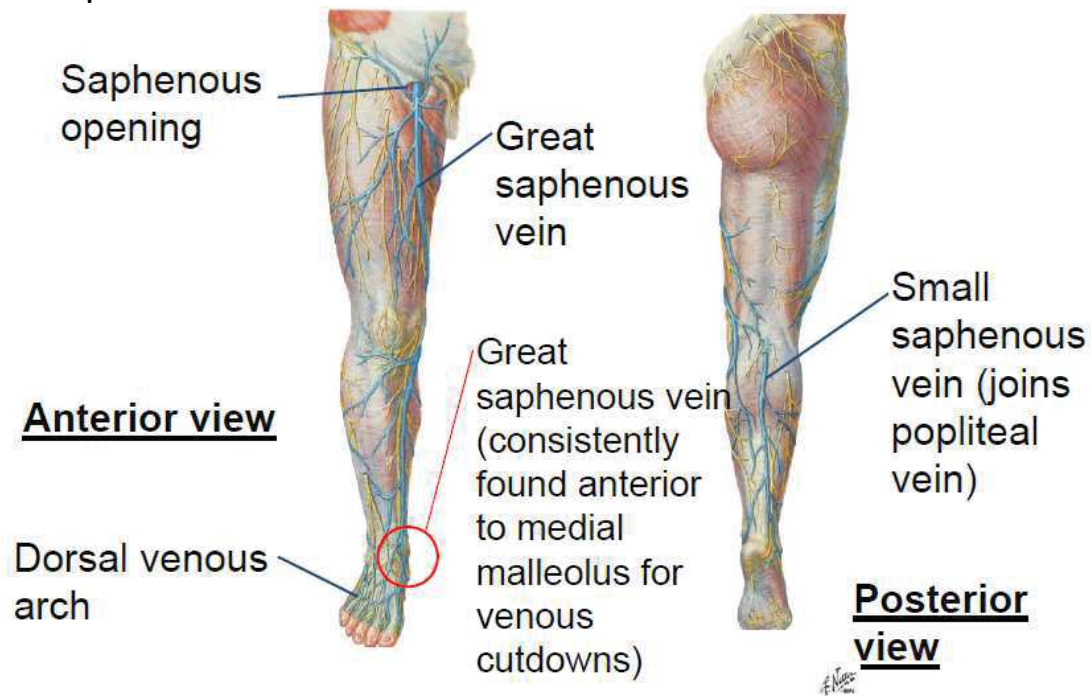
- ▶ Arises from **anterior tibial artery**
- ▶ Pulse readily palpable on dorsum of foot (pressing against **tarsal bones**) just lateral to tendon of **extensor hallucis longus** (extensor muscle for the big toe)

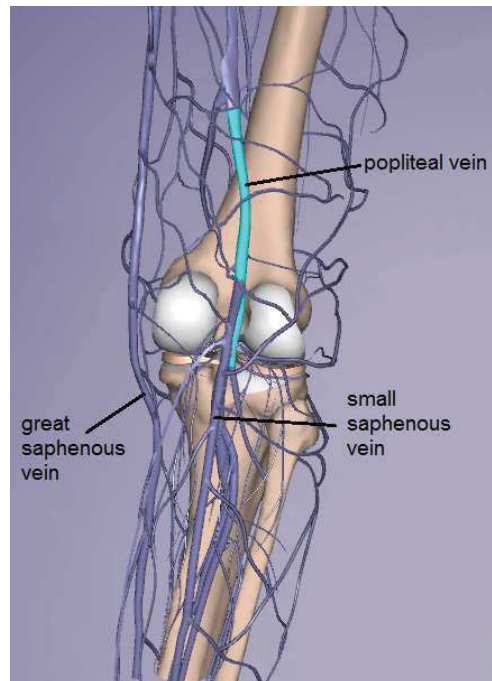
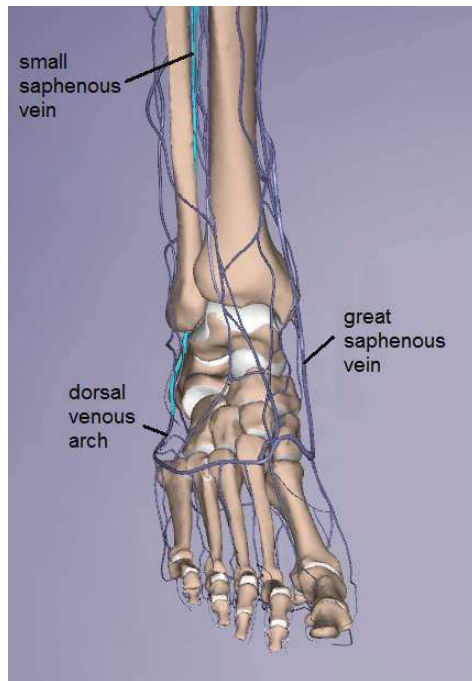


3. Veins of the Lower Limb

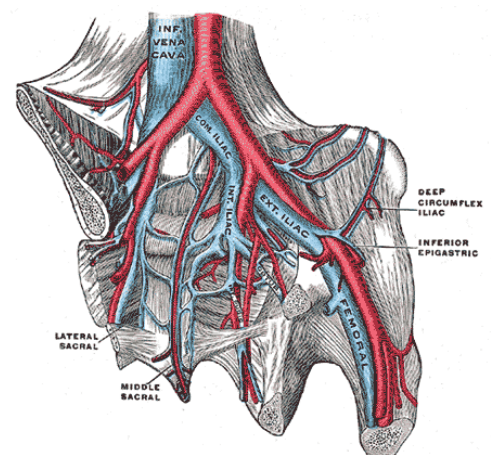
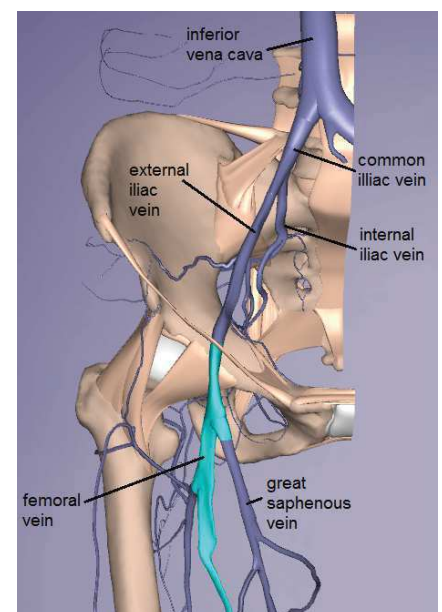


a. Superficial Veins of the Lower Limb

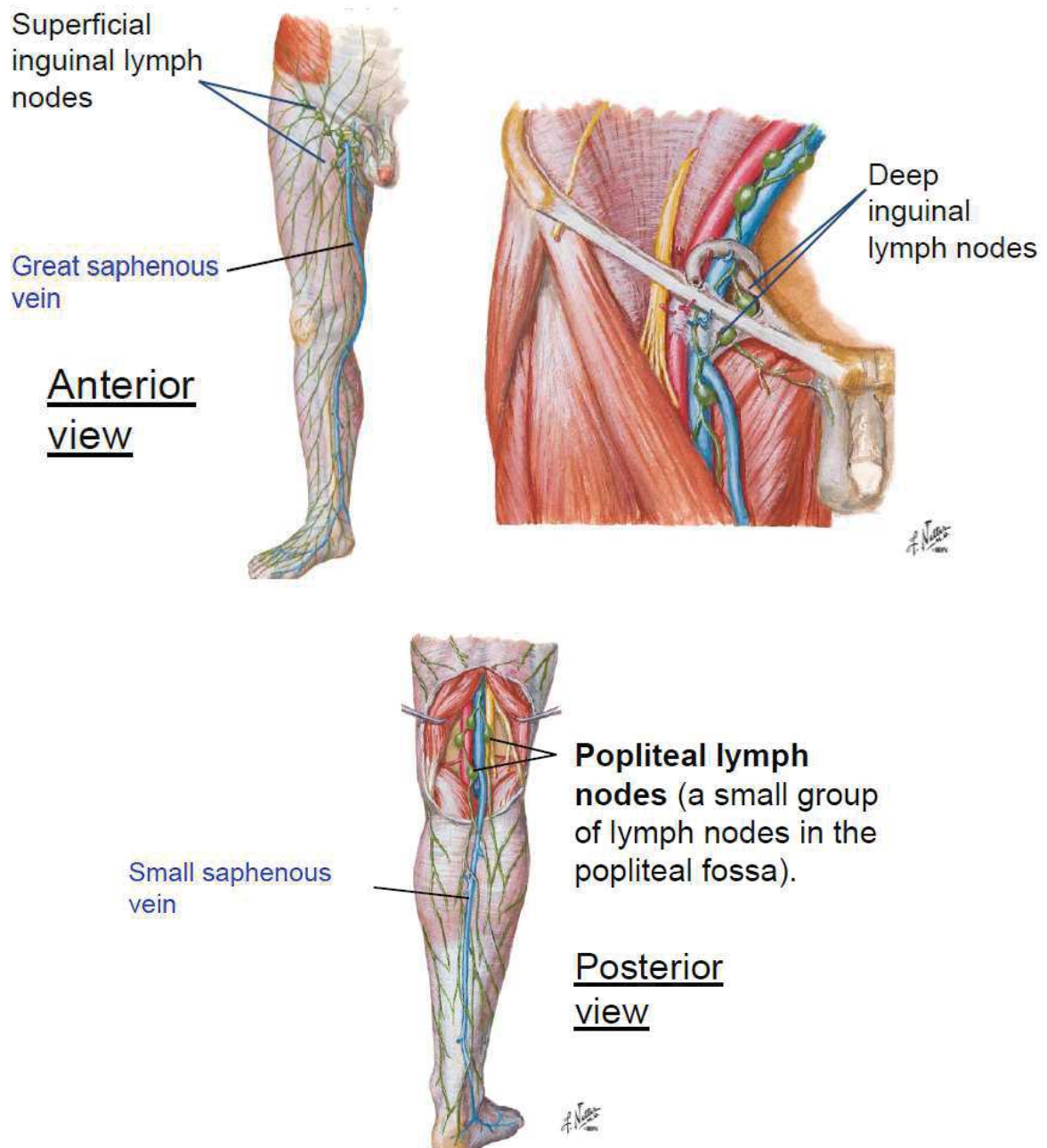




- ▶ **Dorsal venous arch** on dorsum of foot drains tissue on the foot
- ▶ **Great (greater/long) saphenous vein:**
 - Arises from medial side of the arch
 - Passes the region 2-3 cm anterior to medial malleolus
 - Clinical significance: accessible for venous cutdowns
 - Travels up medial side of leg
 - Passes through **popliteal fossa** and then up medial side of thigh
 - Penetrates the deep fascia of the thigh through the **saphenous opening** below the inguinal ligament
 - Drains into **femoral vein**
- ▶ **Small (lesser/short) saphenous vein:**
 - Arises from lateral side of the arch
 - Runs up posterior portion of leg
 - Drain into **popliteal vein** at popliteal fossa
- ▶ **Popliteal vein** arises from small saphenous vein and drains into femoral vein at thigh
- ▶ **Femoral vein** arises from the small saphenous vein and drains into **external iliac vein** and then towards **common iliac vein** (then into **inferior vena cava**)



4. Lymphatic Drainage of the Lower Limb



- **Inguinal lymph nodes** drain lower limb, skin and superficial fascia of the trunk below the **umbilicus**, external genitalia, mucous membrane of lower half of anal canal