

Vascular Anatomy of the Lower Limbs

Anatomy Team 434

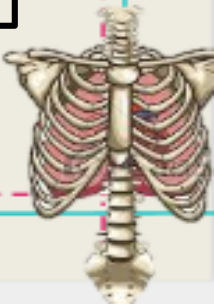
Color Index:

- **Important Points**
- Helping notes
- **Explanation**

If you have any complaint or suggestion please don't hesitate to contact us on:
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OBJECTIVES

- List the main arteries of the lower limb.
- Describe their origin, course distribution & branches
- List the main arterial anastomosis
- List the sites where you feel the arterial pulse.
- Differentiate the veins of LL into superficial & deep
- Describe their origin, course & termination and tributaries



ORIGIN

FEMORAL ARTERY

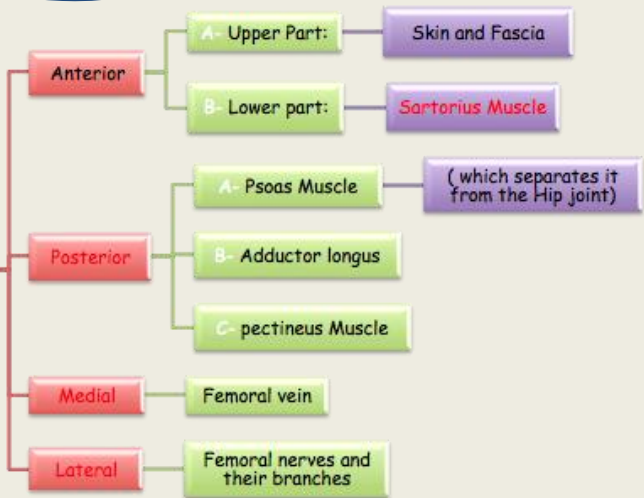
It is the main Arterial supply of the lower limb

it is the continuation of the **external iliac artery**

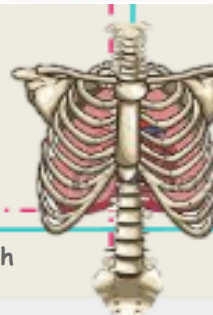
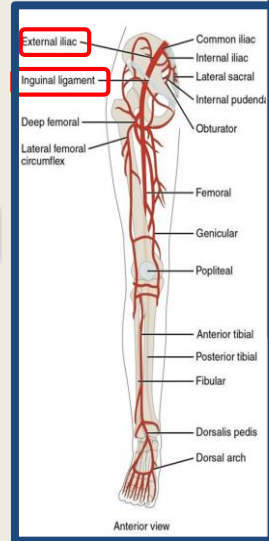
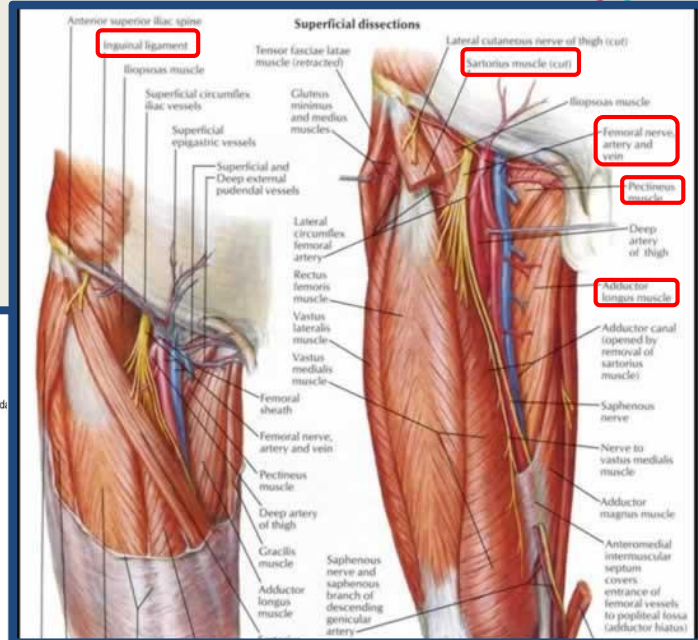
LOCATION

Behind the inguinal ligament in the midway **between** Superior anterior iliac spine and the **pubic symphysis** . It ends at the opening of adductor magnus as the **popliteal artery**.

RELATIONS



It descends vertically towards the adductor tubercle
 -It terminates by passing through the adductor hiatus (in adductor magnus) and entering the popliteal artery.



- In the **front** of hip joint → femoral artery
 - In the **back** of hip joint → sciatic nerve

- artery and vein inside the femoral sheath but the nerve outside the sheath
 - artery, vein and nerve inside femoral triangle.

FEMORAL VEIN & ARTERY : (See Figure 1)

- 1- At the **inguinal ligament** : it is located medially to the femoral artery
- 2- At the **apex of the femoral triangle** : it is located posteriorly to the femoral artery
- 3- At the **opening of the adductor magnus** : it is located laterally to the femoral artery

BRANCHES OF THE FEMORAL ARTERY (1) :

(See Figure 2)

- 1- Superficial Epigastric
- 2- Superficial Circumflex iliac
- 3- Superficial external pudendal
- 4- Deep external pudendal
- 5- Profunda femoris (Deep artery of thigh)

Cannulation of Femoral Artery :

It is used for **left cardiac angiography**.

A long catheter is inserted percutaneously into the artery and passed up the external iliac artery, common iliac artery and aorta to the left ventricle.

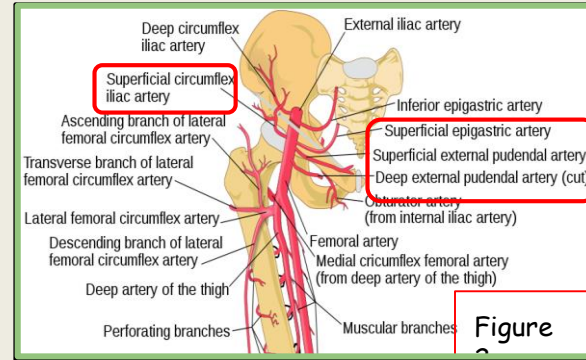


Figure 2

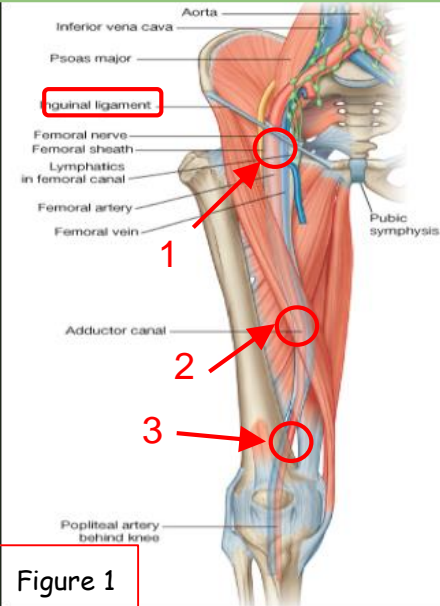
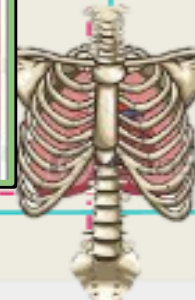
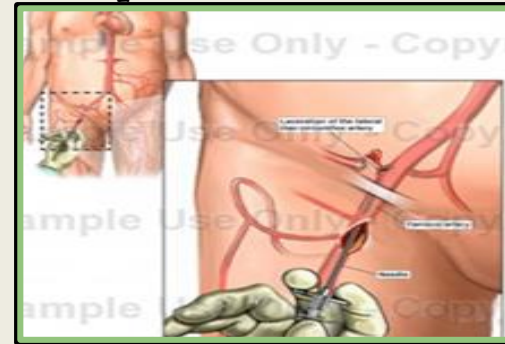


Figure 1



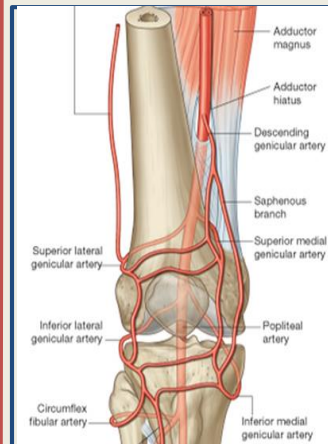
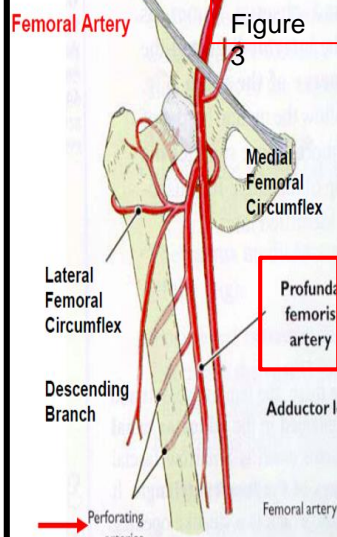
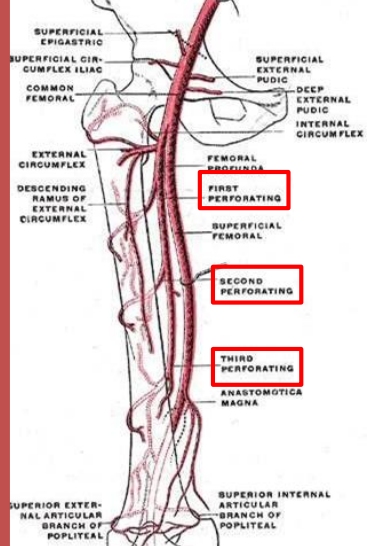
THE PROFUNDA FEMORIS ARTERY :(1)

(See Figure 3)

- **SUPPLIES** the medial compartment of the thigh
- **ARRISES** from the lateral side of the femoral artery
(4 cm below the inguinal ligament)
- **PASSES** medially behind the femoral vessel

BRANCHES PROFUNDA FEMORIS ARTERY :

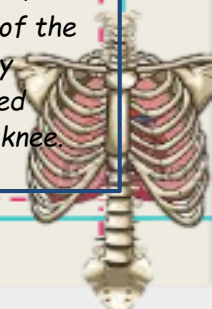
- 1- Medial and lateral circumflex arteries
 - 2- three perforating arteries
- " it ends by becoming the **4th perforating arteries** .



ANASTOMOSIS AROUND KNEE

Genicular Anastomosis

Formed from the Genicular arteries. It compensates for the narrowing of the Popliteal artery during prolonged flexion of the knee.



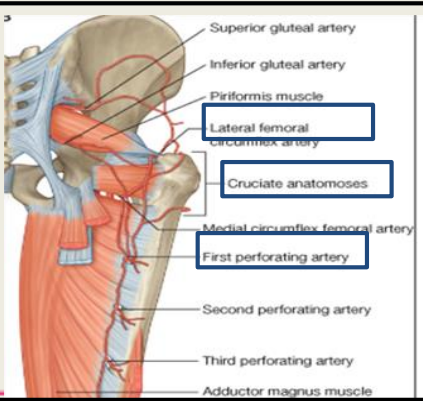
Arterial Anastomosis

Superior gluteal.
Inferior gluteal.
Lateral femoral.
Medial femoral.

Cruciate anastomosis (2)

It supplies blood to the lower limb in case of ligation of the femoral artery.

- It is formed by the union of :
- superiorly: Inferior gluteal
 - Inferiorly: First perforating
 - transversely: Medial & Lateral circumflex femoral
 - Provides connection between Internal iliac and Femoral arteries



Trochanteric Anastomosis

Formed from anastomosis of medial & lateral circumflex femoral arteries. Its main function is to supply the head & neck of femur.

(1) : It is an important, large and deep artery of thigh

(2) cruciate anastomosis *شبكة الصليب لارتباط الازواء*

POPLITEAL ARTERY

- It is the continuation of the **FEMORAL ARTERY**
- it **ENTERS** the **Popliteal fossa** through an opening in the **adductor magnus** (1)

RELATIONS AND BRANCHES:

1- ANTERIOR:

A- Popliteal surface of the femur. **B-** knee joint.
C- popliteus muscle

2-POSTERIORLY:

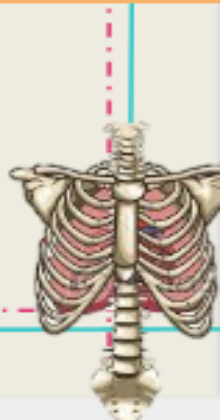
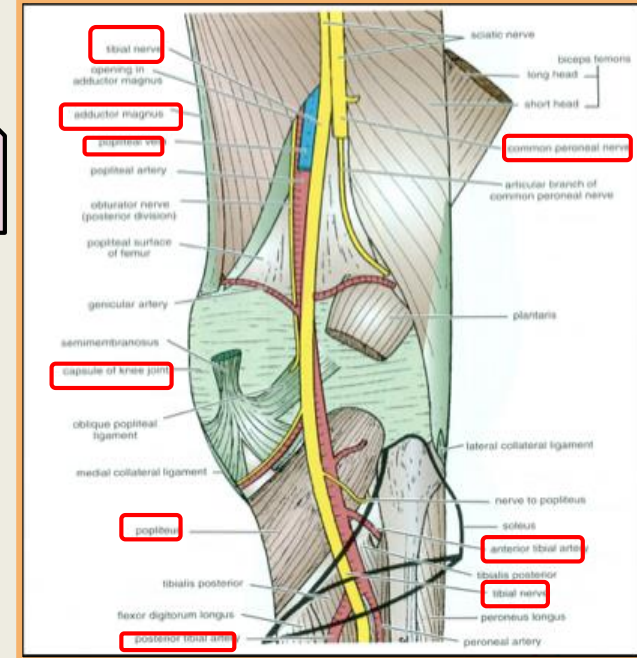
A-Tibial nerve . **B-** skin and fascia
C- popliteal vein. **D-** Branches: Muscular and articular to the knee joint

4-BRANCHES:

Muscular & Articular(Five Genicular branches to the articular capsule and ligaments of the knee joint).

3-TERMINATION:

it ends At the lower border of the popliteus muscle it divided into two branches:
1-Anterior tibial artery . **SMALL** branch of the popliteal artery
2- Posterior tibial artery. **LARGE** branch of the popliteal artery



(1) : (The deepest structure in the popliteal fossa)

Anterior tibial artery :

-it **ENTERS** the anterior compartment of the leg through an opening on the upper part of the interosseous membrane (smaller than posterior tibial artery)

- It **DESCENDS** with the deep peroneal nerve

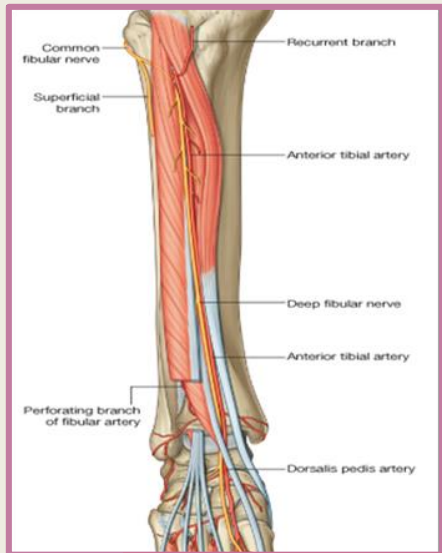
-it's upper part is **DEEP**

- it's lower part (in the front of the lower end of the tibia) is **SUPERFICIAL**

- **Branches:**Muscular& Anastomotic

It supplies structures in the Anterior Compartment of the leg & dorsum of foot.

It ends at the ankle joint midway between the malleoli where it becomes the Dorsalis Pedis artery (dorsal artery of the foot).



Dorsalis Pedis Artery (like nail pedicure)

It is the main source of blood supply to the toes.

It is the continuation of the **ANTERIOR TIBIAL ARTERY**

Begins in front of the ankle joint

It is **superficial** in position

TERMINATION : it terminates at the head of the first dorsal interosseous membrane

JOINS : with the lateral plantar artery to form the plantar arch

BRANCHES :

- 1- first dorsal metatarsal artery
- 2- lateral tarsal artery
- 3- arcuate artery

RELATIONS :

1- it is **CROSSED** by :

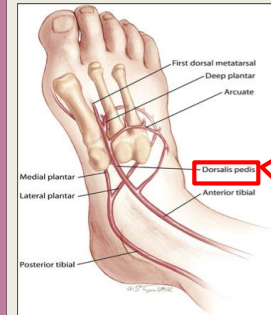
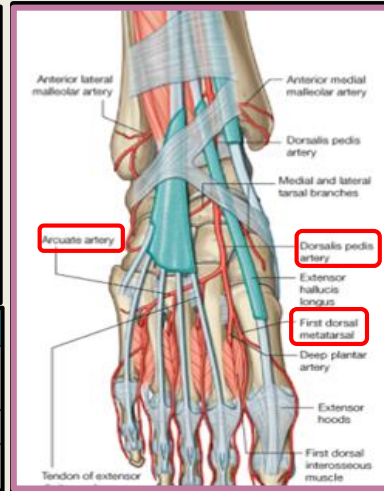
- A - inferior flexor retinaculum
- B- first tendon of the extensor digitorum brevis

2- **MEDIA**LLY :

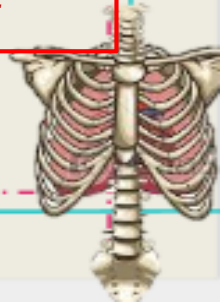
tendon of Extensor hallucis longus

3- **LATER**ALLY :

- A- deep peroneal nerve
- B- extensor digitorum longus



It passes to the 1st interosseous space where it divides into a **deep plantar artery (to the sole to join the plantar arch) and the **first dorsal metatarsal artery**.**



POSTERIOR tibial artery :

It is the **LARGE** branch of the popliteal artery. provides the main blood supply to the **posterior compartment of the leg & sole of the foot**.

ABOVE : lies on the posterior surface of the **tibialis posterior**

BELOW : lies on the posterior surface of the **tibia**
-Its lower part is covered with **Skin and Fascia**

LOCATION :

PASSES : behind the medial malleolus. **DEEP**: in the **flexor retinaculum** .

TERMINATION : it terminates when it divides into :

1- **medial plantar artery** 2- **lateral plantar artery** .

BRANCHES:

1- **peroneal (fibular) artery** [a largest and most important branch that **DESCENDS behind the fibula**]

(The artery of lateral compartment of the leg) which gives:

A- Nutrient artery to the fibula.

B- **perforating branch** (to lower part of front of the leg)

C- shares in anastomosis around the ankle joint.

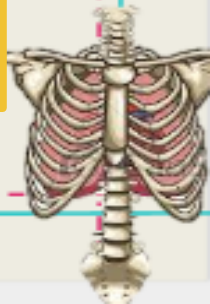
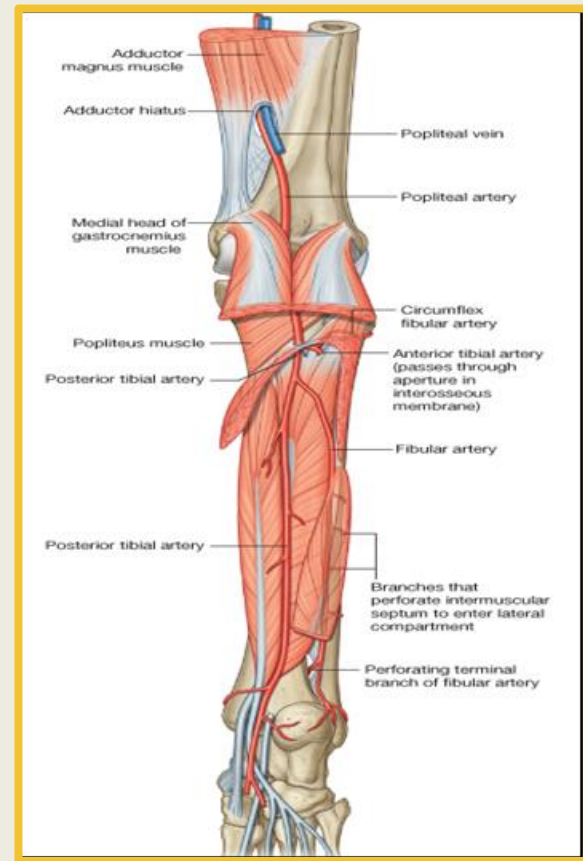
D- Muscular branches to the muscles of the lateral and posterior compartments of the leg.

2- **Nutrients artery to the tibia** [a largest nutrient artery of the body]

3- **anastomotic branches for anastomosis around the ankle joint**

4- **medial and lateral plantar arteries**.

5-**Calcaneal arteries**: supply the heel.



when the heel (calcaneum bone) fractures, they don't use the cast, it's usually union in a short time because of the rich blood supply, but with a rest without moving.

PLANTAR ARTERIES

MEDIAL PLANTAR ARTERIES

Arises beneath the Flexor Retinaculum. The smaller terminal branch of the posterior tibial artery.

Branches: Muscular, Articular and Cutaneous

Ends by supplying the medial side of the big toe.

It supplies mainly the muscles of the great toe, and gives most of plantar digital arteries.

Its superficial branch supplies the skin of the medial side of the sole.

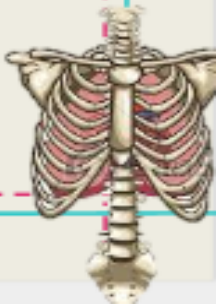
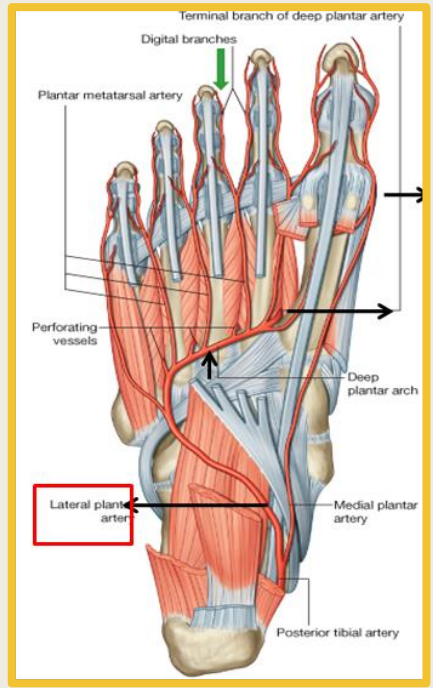
LATERAL PLANTAR ARTERIES

terminal branch The larger

Branches: Muscular, Articular & Cutaneous branches.
The Plantar Arch gives **Plantar Digital Arteries**.

At the base of the 5th metatarsal bone, it curves medially to **Lateral Plantar Artery** form the **Plantar Arch**. which is completed by the medial plantar artery and branch from dorsalis pedis artery. Joins the Dorsalis pedis artery at the proximal end of the 1st intermetatarsal space.

The arch supplies the skin, fascia and muscles in the sole and plantar digital arteries to the adjacent digits .



Where to Feel the Peripheral Arterial Pulse ?

Femoral : (1)

Inferior to the *lingual ligament* and midway between the anterior superior iliac spine and symphysis pubis.

- How to Stop blood flow in the femoral artery?

By pressing the femoral artery directly posterior against the superior pubic ramus and the femoral head

Popliteal : (2)

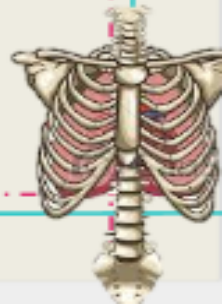
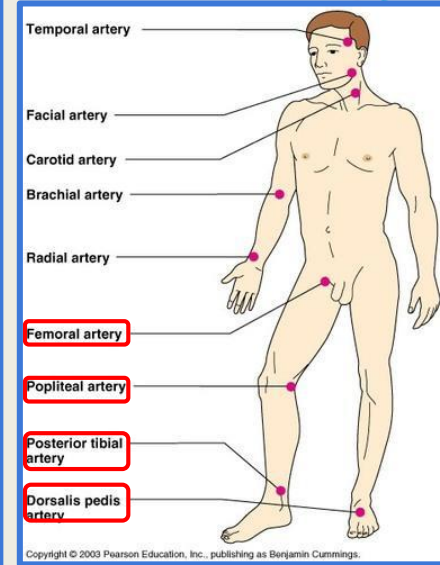
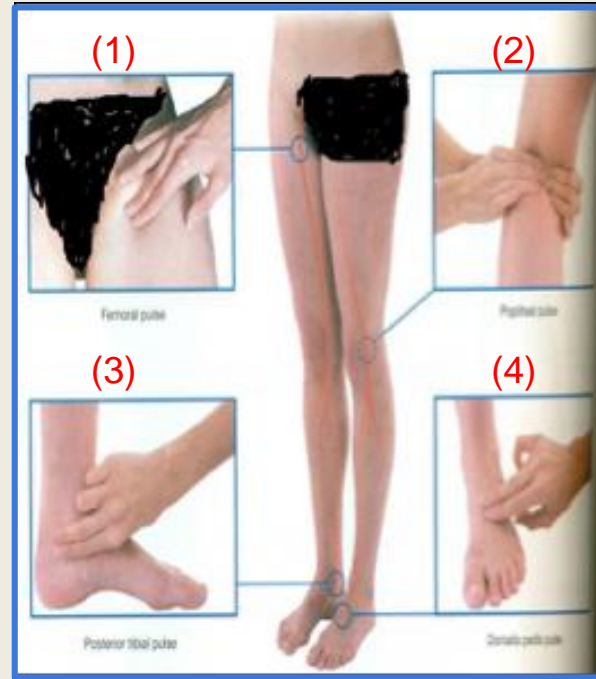
Deep in the popliteal fossa medial to the midline (weakening or loss of the popliteal pulse is a sign of femoral artery obstruction)

Posterior tibial : (3)

Posteroinferior to the medial malleolus in the groove between the malleolus and the heel (flexor retinaculum must be relaxed by inverting the foot) is essential for examining patients with **occlusive peripheral arterial diseases** انسداد الشرايين الطرفية

Dorsalis pedis : (4)

Over the tarsal bones between the tendons of *extensor hallucis longus* and *extensor digitorum* ,Some people have congenitally non palpable A diminished or absent *dorsalis pedis* pulse usually suggests *ascular insufficiency*



VEINS OF THE LOWER LIMB :

The veins of the lower limb are classified into : **Superficial** (in the subcutaneous tissue) & **Deep** (to the deep fascia and accompany all major arteries).

SUPERFICIAL veins :

Dorsal Venous arch (network) Receives most of the blood of the foot through Digital and Communicating veins

Drained on: - Medial side by the Great Saphenous vein.

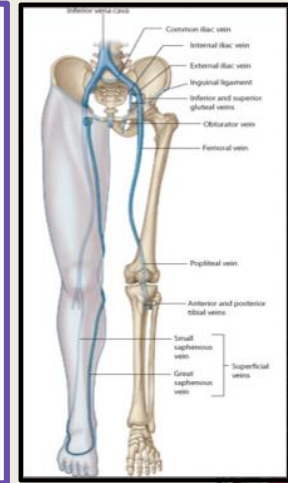
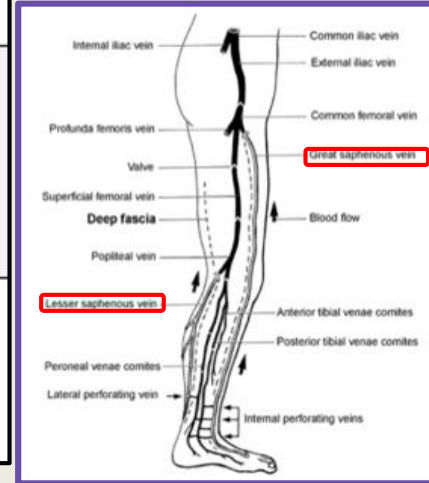
- Lateral side by the Small saphenous vein

Saphenous Cutdown

When the **GSV** (1) is not visible (as in infants ,obese ,patients & in shock), it can always be located anterior to the medial malleolus.

Saphenous cutdown is used to insert a cannula for prolonged administration of blood, plasma or drugs.

| Great Saphenous Vein | Small Saphenous Vein |
|--|--|
| The Longest Superficial vein of the body. | - |
| Begins from the medial end of the dorsal venous arch (as the medial marginal vein). | Originates from the lateral end of the dorsal venous arch. |
| Ascends: In front of the Medial Malleolus accompanied by the (Saphenous nerve). Posterior the Medial Condyle of the femur. Passes through the Saphenous Opening (2.5-3.25) cm below and lateral to the pubic tubercle. | Ascends: Behind the lateral Malleolus in company with the Sural nerve. Along the middle of the back leg. |
| Terminates in: Femoral Vein. | Termination : 1-It may join the Great Saphenous vein. 2- Or Bifurcates: One branch joins the Great saphenous and the other joins the Popliteal vein. |



DEEP veins : Popliteal & Femoral

1) Popliteal vein

Formed by the union of venae comitantes around the anterior & posterior tibial arteries

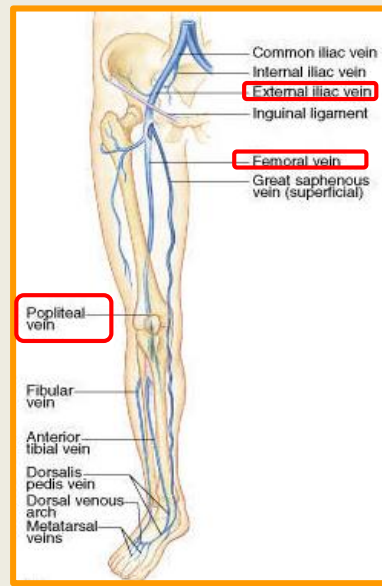
Lies posterior to popliteal artery

2) Femoral vein

-It enters the thigh by passing through the opening in the adductor magnus .

-It leaves the thigh in the intermediate compartment of the femoral sheath.

-Passes behind the inguinal ligament to become the **External iliac vein**



(VENAE COMITANTES)

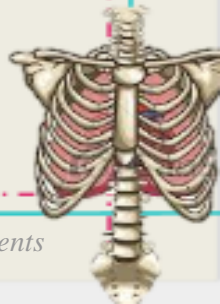
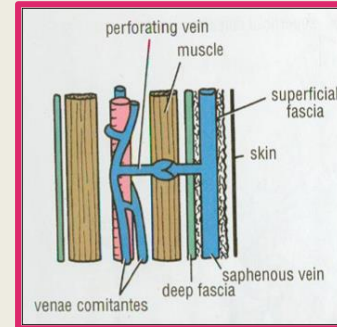
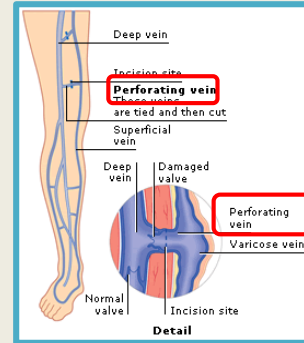
Deep veins, accompany all the major arteries and their branches.

Usually paired.

They are contained within the vascular sheath of the artery, whose pulsations help to compress and move blood in the veins

PERFORATING VEINS

Arise from the superficial veins and penetrate the deep fascia close to their origin. Connect the superficial veins (**Great Saphenous vein**) with the deep veins along the medial side of the calf. Their valves only allow blood to flow from the superficial to the deep veins



* The perforating veins pass through the deep fascia at an oblique angle so during muscular contraction, they are compressed. This also prevents blood flowing from the deep to the superficial veins.

VARICOSE VEINS (1)

- It is Dilatation and Degeneration of the superficial veins that may be complicated by ulcers .
- More common in the postero medial part of the lower limb.

- Results because of :incompetence of the valves in the perforating veins
Or valves within the great saphenous itself.

- This allows the passage of high pressure blood from the deep to the superficial veins.



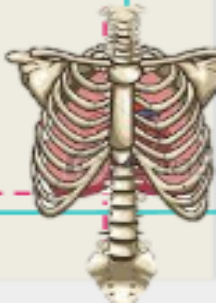
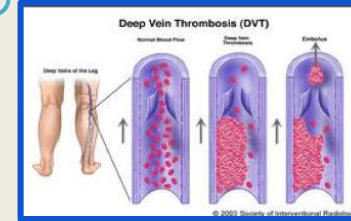
Deep Vein Thrombosis (DVT) (2)

The veins of the lower limb are subject to venous thrombosis after a bone fracture.

Venous stasis is the main cause by pressure on the veins from the bedding during prolonged hospital stay and aggravated by muscular inactivity.

Inflammation (thrombophlebitis) may develop around the vein.

Pulmonary thrombo embolism may occur when a thrombus breaks free from the lower limb vein and passes to the lungs.





Q1: which one of the following is posterior to the femoral artery at the inguinal ligament?

- a)sartorius
- b)pectineus
- c)femoral vein
- d)femoral nerve

Q2: At the opening in the adductor magnus, the femoral vein lies to the femoral artery:

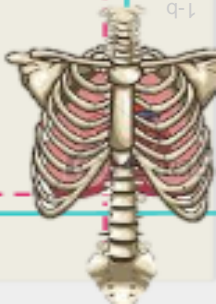
- a)medially
- b)laterally
- c)ventrally
- d)posteriorly

Q3: the great saphenous vein ascends to the medial malleolus:

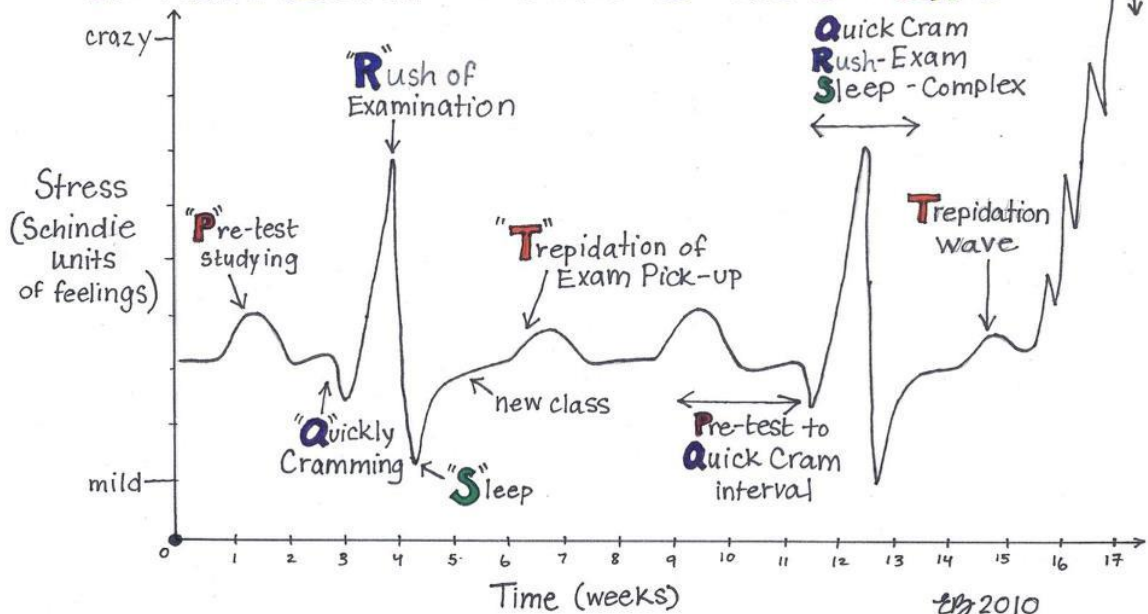
- a)deep
- b)behind
- c)in front
- d)medially

Q4: popliteal vein is formed of.

- a)venae comitantes of anterior tibial artery
- b)continuation of great saphenous vein
- c)venae comitantes of posterior tibial artery
- d)venae comitantes of anterior&posterior tibial artery



HEARTBEAT OF MED SCHOOL LIFE



GOOD
LUCK

Done By Anatomy Team 434

