MED439
KING SAUD UNIVERSITY

Vascular anatomy of the lower limb

Musculoskeletal Block - Lecture 18

Objective:

- ✓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 andtributaries

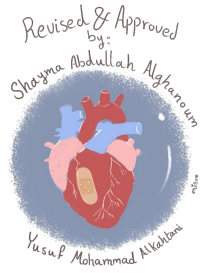
Color index:

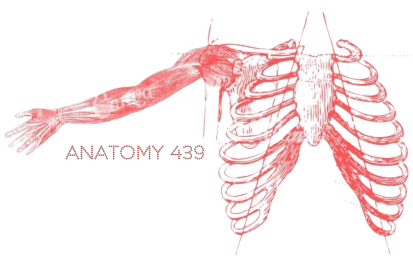
Important

In male's slides only

In female's slides only

Extra information, explanation





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Arteries of the lower limb:

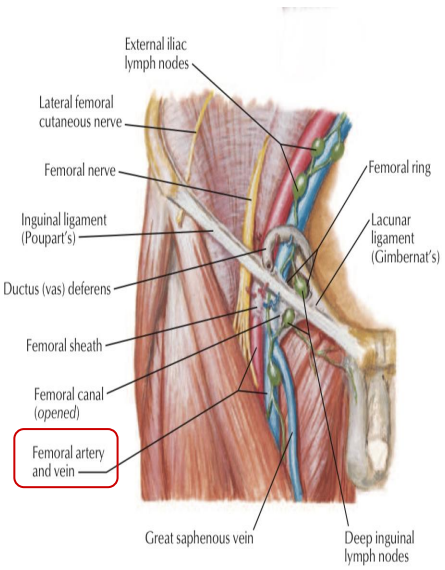
Helpful video

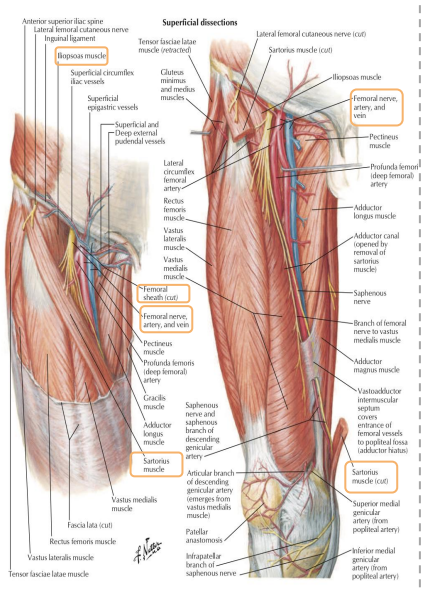
Helpful video

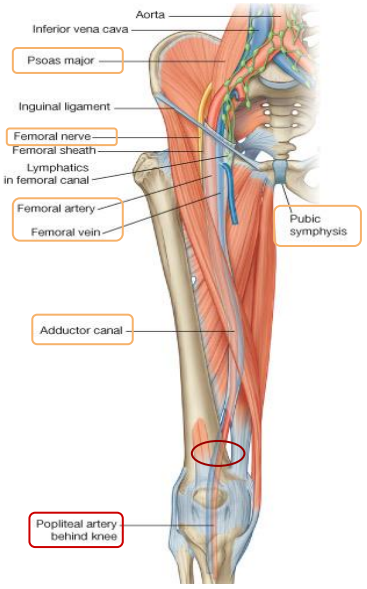
• Femoral artery

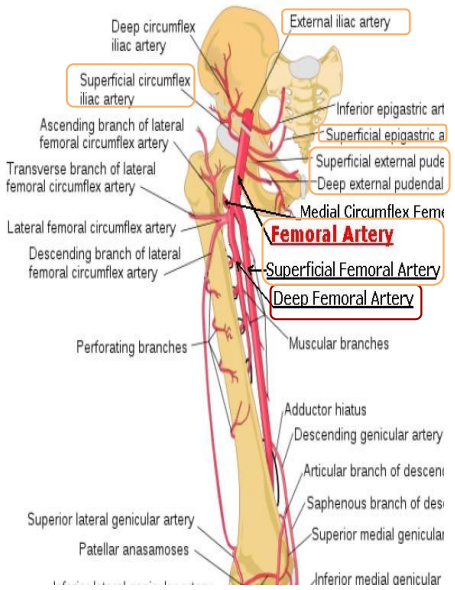
➔ Is the main arterial supply to the lower limb.
➔ It is the continuation of the **External Iliac artery.**

Beginning	Relations	Termination *In girls slide	Branches
It enters the thigh **behind** the inguinal ligament **at the Mid** Inguinal Point **(Midway between** the anterior superior iliac spine and the symphysis pubis**)**	**Anterior:**In the femoral triangle the artery is superficial covered only by Skin & fascia(Upper part) Lower part: passes behind the Sartorius.	**terminates by passing** through the Adductor Canal (deep to sartorius)	**supplies:** Lower abdominal wall, Thigh & External Genitalia
	Posterior: Hip joint , separated from it by Psoas muscle, Pectineus & Adductor longus.		**through the following branches:** 1.Superficial Epigastric. 2.Superficial Circumflex Iliac. 3.Superficial External Pudendal. 4.Deep External Pudendal. 5.Profunda Femoris (Deep Artery of Thigh)
	Medial: Femoral vein.	**It exits the canal** by passing through the Adductor Hiatus and becomes the Popliteal artery.	
	Lateral: Femoral nerve and its Branches		









Femoral A. & Femoral V. *in boys slides	**At the inguinal ligament:** The vein lies medial to the artery.	**At the apex of the femoral triangle:** The vein lies posterior to the artery.	**At the opening in the adductor magnus:** The vein lies lateral to the artery.

*For a clearer view of the pictures just zoom in as possible as you can

Extra notes:

-any injury in the Femoral triangle is so dangerous due to the superficiality of the Femoral Artery.
- the femoral artery and vein are enclosed within the Femoral sheath while the Femoral nerve lies outside the sheath.
-the Superficial External Pudendal and Deep External Pudendal. Arteries supply the genitals
-At the Adductor Hiatus the Artery will descend downward and the Vein will ascend upward .

➢ Profunda Femoris Artery

What is it & Where does Arise from?

It is the main arterial supply to the thigh.
It is an important, large artery.
It arises from the lateral side of the femoral artery. (4cm below the inguinal ligament)

Where does it pass?

medially behind the femoral vessels.

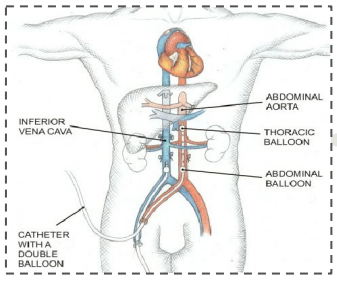
What does it Give (Branches) ?

- Medial (Behind) & lateral (Front) circumflex femoral arteries.
- Three perforating arteries.

Where does it End?

It ends by becoming the **4th** perforating artery.

Applied anatomy



Cannulation of The Femoral Artery *In girls slide

-Because of the superficial position of the 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 , aorta to the left ventricle.

Femoral Pulse

It can be palpated just inferior to the Midinguinal point.
-midway between the anterior superior iliac spine and symphysis pubis.

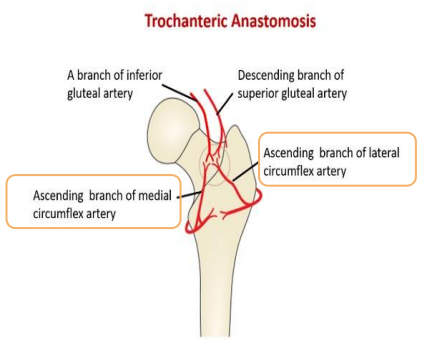
How to Stop bleeding from the femoral artery? *In girls slide

By pressing the artery directly posterior against the superior pubic ramus and the femoral head. (Against the bone)

• ARTERIAL ANASTOMOSIS IN THE LOWER LIMB

Trochanteric anastomosis:

Its main function: is to supply the head & neck of femur.



The Cruciate & Trochanteric anastomosis provide a connection between the internal iliac & femoral arteries

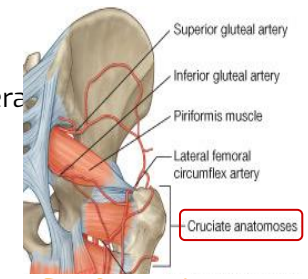
CRUCIATE ANASTOMOSIS:

Where? At the gluteal region

function: It Provides blood supply to the lower limb in case of ligation of the femoral artery.

Anatomical postition: It lies at the level of the lesser trochanter.

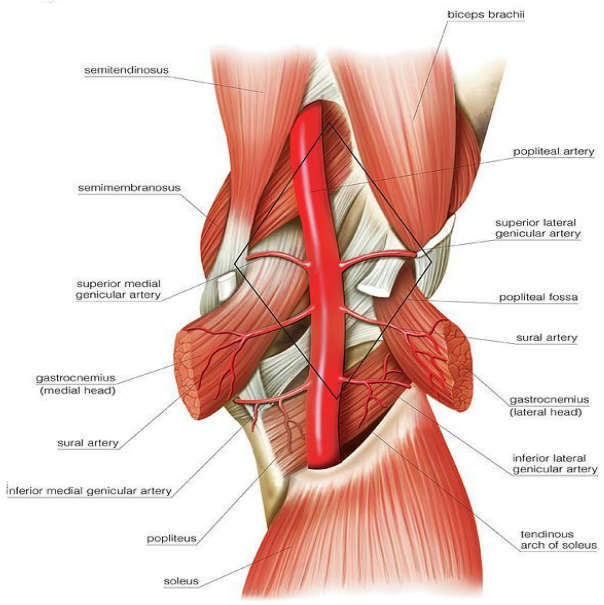
Formed by what?:
the union of Medial & Latera circumflex femoral arteries +
the Inferior gluteal artery +
the First perforating artery.



Where does the Lateral circumflex femoral arteries descend?
Around the knee

POPLITEAL ARTERY

- The continuation of the **femoral artery.**
- the **deepest** structure in the Popliteal Fossa (posterior to the Popliteal Vein & Tibial Nerve)
- it runs close to the **capsule of the knee joint.**
- It enters the Popliteal fossa through an opening in the **Adductor magnus.**
- It Ends at the **lower border of popliteus muscle**
- by dividing into **Anterior** and **Posterior Tibial arteries .**



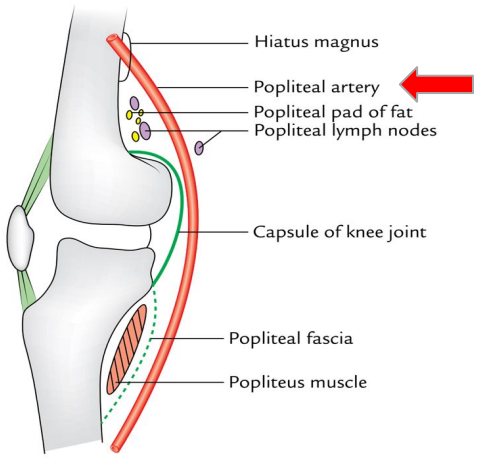
RELATIONS

❖ Anterior:

- Popliteal surface of the femur.
- Knee joint.
- Popliteus muscle.

❖ Posterior:

- Popliteal vein.
- Tibial nerve.
- skin and fascia.



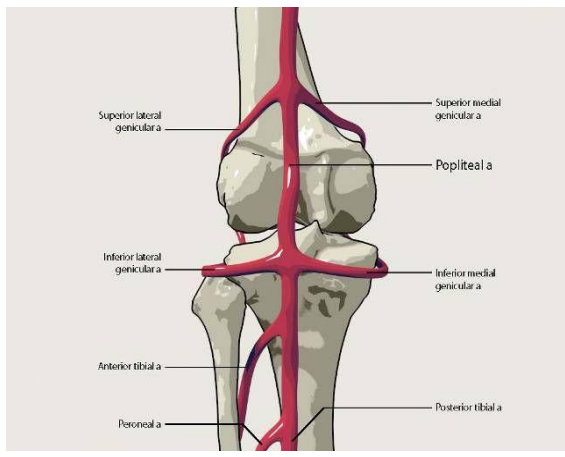
BRANCHES

- Muscular
- Five Genicular branches to the articular capsule and ligaments of the knee joint

Genicular:anatomy of or relating to the knee

genicular anastomosis:

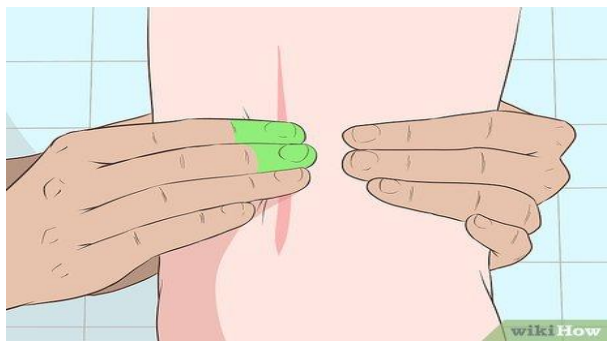
- it is an important anastomosis around the knee.
- It compensates for the narrowing of the Popliteal artery during **prolonged flexion** of the knee.
- Formed from the genicular branches of the popliteal artery.
- Anastomoses provide blood supply when popliteal artery is compressed



Popliteal Pulse:

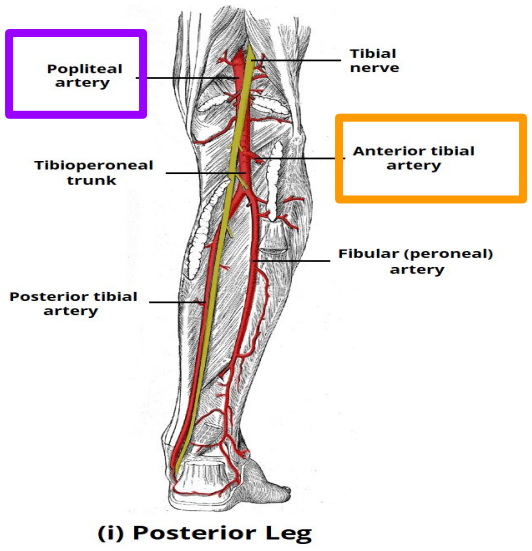
Because of the deep position its pulsations are best felt in the **inferior part of the popliteal fossa** (here the artery is related to the tibia)

Weakening or loss of the popliteal pulse is a sign of **femoral artery obstruction**.

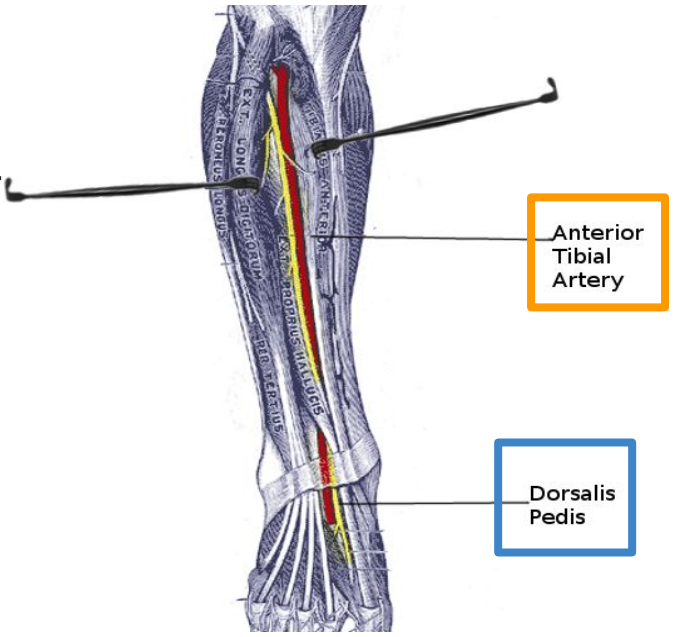


ANTERIOR TIBIAL ARTERY

- It is the **smaller** terminal branch of the **popliteal artery.**
- It enters the anterior compartment of the leg with the Deep Peroneal nerve.(anterior tibial nerve)
- 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 (dor artery of the foot).

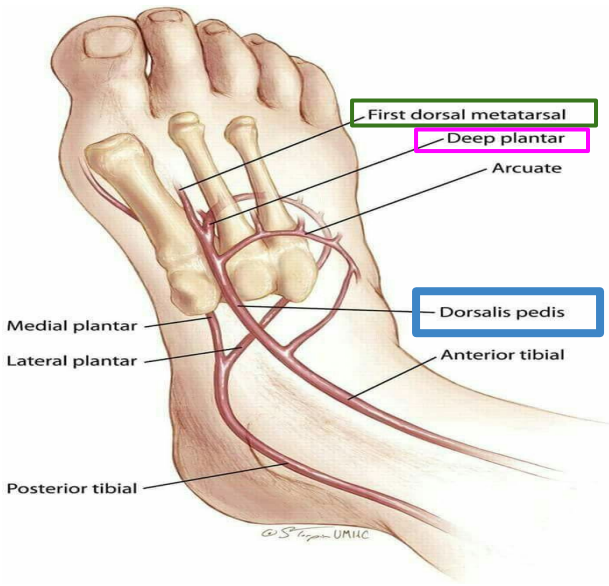


(i) Posterior Leg



DORSALIS PEDIS ARTERY

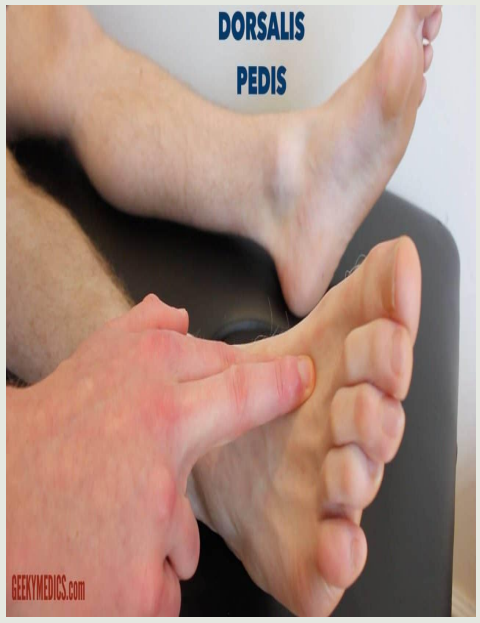
- It is the main source of blood supply to the toes.
- Begins in **front of ankle joint** as the direct continuation of the Anterior Tibial artery.
- It is superficial.
- It passes to the **1st interosseous space** where it divides into
  - **deep plantar artery** (to the sole to join the plantar arch)
  - and the **first dorsal metatarsal artery.**



DORSALIS PEDIS PULSE

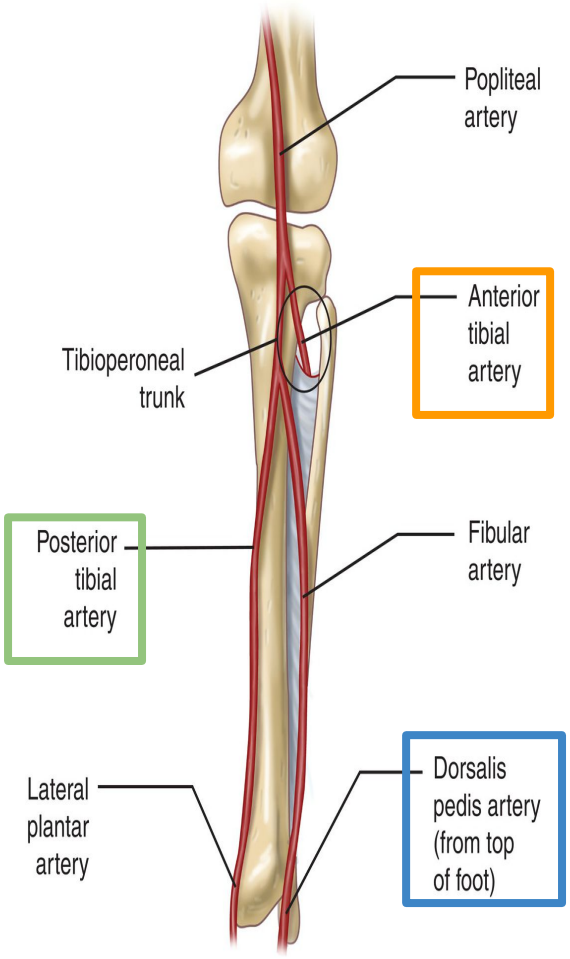
It is easy to be felt being subcutaneous, over the tarsal bones between the **tendons of Extensor hallucis longus** and **Extensor digitorum longus**

- Some people have congenitally non palpable DP pulse, the anomaly is usually bilateral.
- A diminished or absent dorsalis pedis pulse usually suggests vascular insufficiency resulting from **arterial disease.**



POSTERIOR TIBIAL ARTERY

- It is the larger terminal branch of the popliteal artery and provides the main blood supply to the **Posterior compartment of the Leg & Sole of the Foot.**
- Its lower part is covered by skin & fascia only
- It **Terminates** by dividing into: Medial & Lateral plantar arteries.



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BRANCHES

- **Nutrient artery to the tibia** (the largest nutrient artery of the body).
- **Calcaneal arteries:** supply the Heel.
- **Peroneal (Fibular) artery**:The largest and most important branch.

It supplies a nutrient artery to the fibula & Muscular branches to the muscles of the lateral and posterior compartments of the leg and sole of the foot.

- Anastomotic branches to anastomosis around ankle joint.
- Medial & Lateral plantar arteries.

POSTERIOR TIBIAL PULSE

Taken Postero- inferior to the **medial malleolus** (in the groove between the malleolus and the heel).

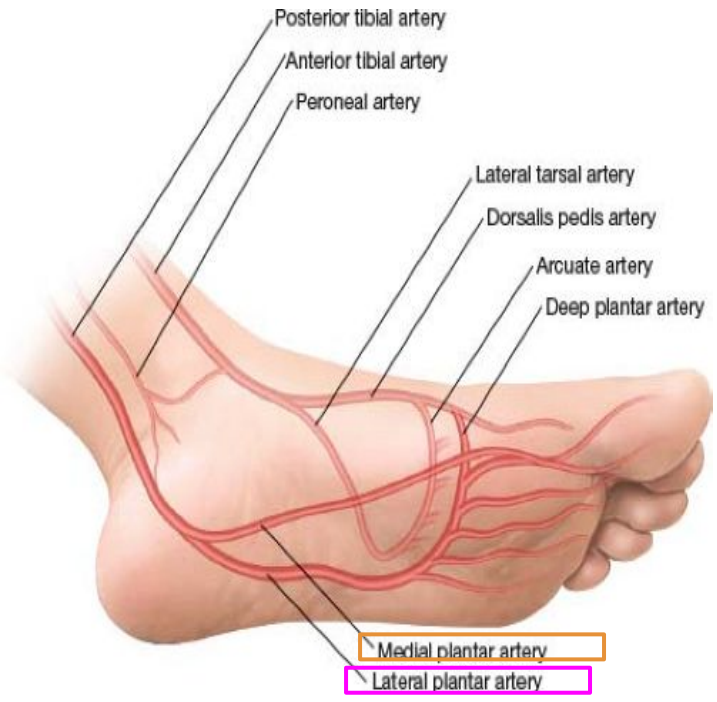
The flexor retinaculum must be relaxed by inverting the foot.

Palpation of PT pulse is essential for examining patients with occlusive peripheral arterial diseases.

PLANTAR ARTERIES

Medial plantar artery :

- The **smaller** terminal branch of the posterior tibial artery.
- It <u>supplies mainly</u> the muscles of the great toe and gives most of plantar digital arteries.
- Its <u>superficial branch supplies</u> the skin of the medial side of the sole.
- Arises beneath the Flexor Retinaculum.
- Gives: Muscular, Articular and Cutaneous branches
- Ends by supplying the medial side of the big toe.



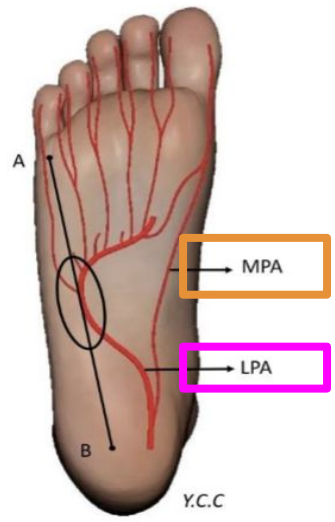
Lateral plantar artery :

The **larger** branch

At the base of the **5th** metatarsal bone,
it curves medially to form the Deep Plantar Arch.
Joins the Dorsalis pedis artery at the proximal end of the 1st intermetatarsal space.

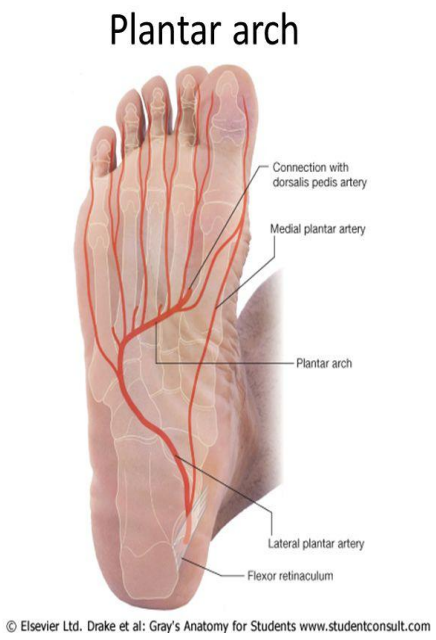
Gives: Muscular, Articular & Cutaneous branches.

The Plantar Arch gives Plantar Digital Arteries.



Plantar Arch

- <u>completed by</u> the medial plantar artery and <u>branch</u> from dorsalis pedis artery.
- The arch supplies the skin, fascia and muscles in the sole and plantar digital arteries to the adjacent digits .



Veins of the lower limb

Helpful video

The veins of the lower limb are classified into superficial and deep veins.

The blood passes from the superficial to the deep veins.

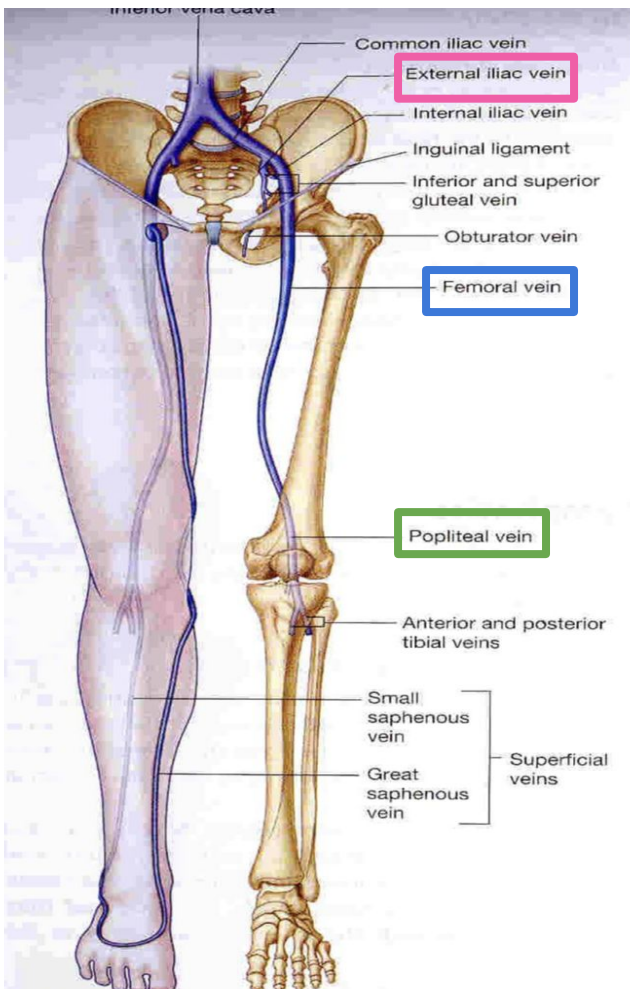
The superficial and deep veins have valves which are more numerous in the deep veins.

Superficial veins	Deep veins
lie in the subcutaneous tissue • Classified into: 1- GSV (Great saphenous vein) 2- SSV (short saphenous vein)	deep to the deep fascia and accompany(join) all major arteries: - femoral vein - popliteal vein

Deep Veins

Femoral veins

-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**.

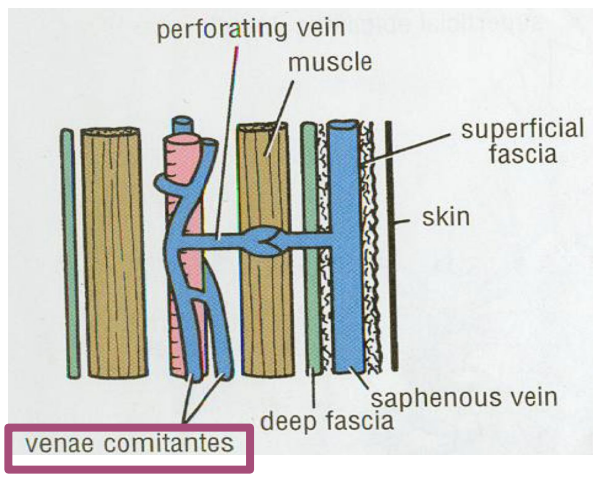


Popliteal vein

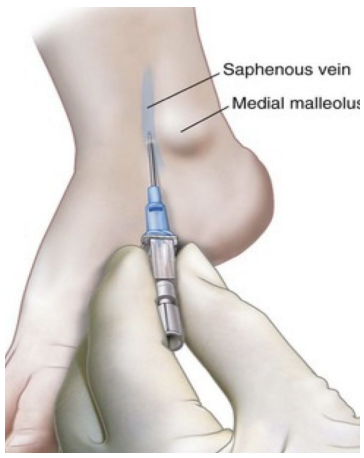
-Formed by the union of venae comitantes around the **anterior and posterior tibial arteries.**
- Lies posterior to popliteal artery.

Venae comitantes

-Deep veins, usually they are paired and accompany arteries.
-They are contained within the **vascular sheath of the arteries**, so the arterial pulsations help to compress and move blood in the veins especially during exercise.



Superficial Veins

	Origin	Course
Great saphenous vein	-**Begins** from the medial end of the dorsal venous arch (as the medial marginal vein) -It is the longest superficial vein of the body 	• **Ascends**: 1- in **front of the Medial Malleolus** accompanied by the (Saphenous nerve). 2- **posterior the Medial Condyle** of the femur. 3- Passes through the **Saphenous Opening** (2.5-3.25)cm below and lateral to the pubic tubercle. • **Terminates in: Femoral Vein.** -Because of its constant position in front of the medial malleolus, it is **used for** sapohenous cutdown especially in infants, obese and shocked patients.
Small saphenous vein	From the lateral end of the dorsal venous arch.	• **Ascends**: **Behind the Lateral Malleolus** along the middle of the back leg. • **Terminates in:** 1- **Popliteal vein** 2- May join Great Saphenous Vein 3- Or Bifurcates: one branch joins the Great Saphenous and the other joins the Popliteal vein.

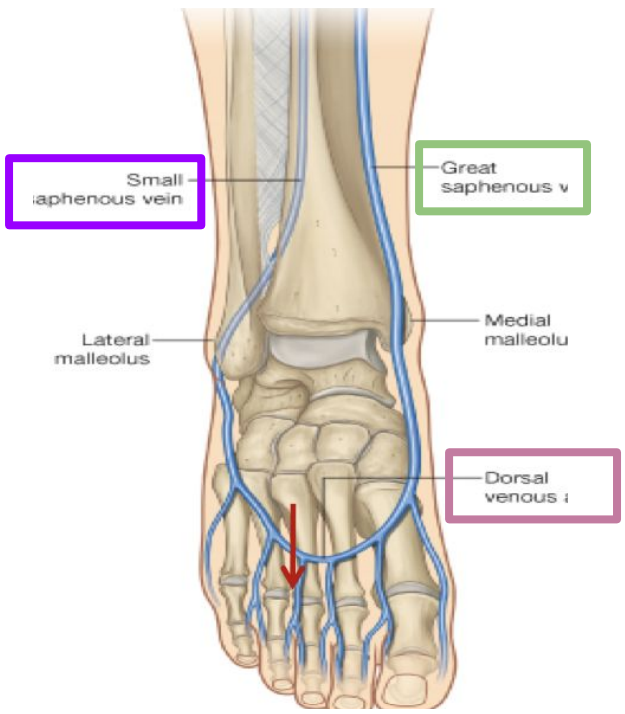
Dorsal Venous arch/network

- **Receives**

most of the blood of the foot through digital and communicating veins.

- **Drained on:**

1-**Medial side** by the Great Saphenous vein.
2- **Lateral side** by the Small Saphenous vein.



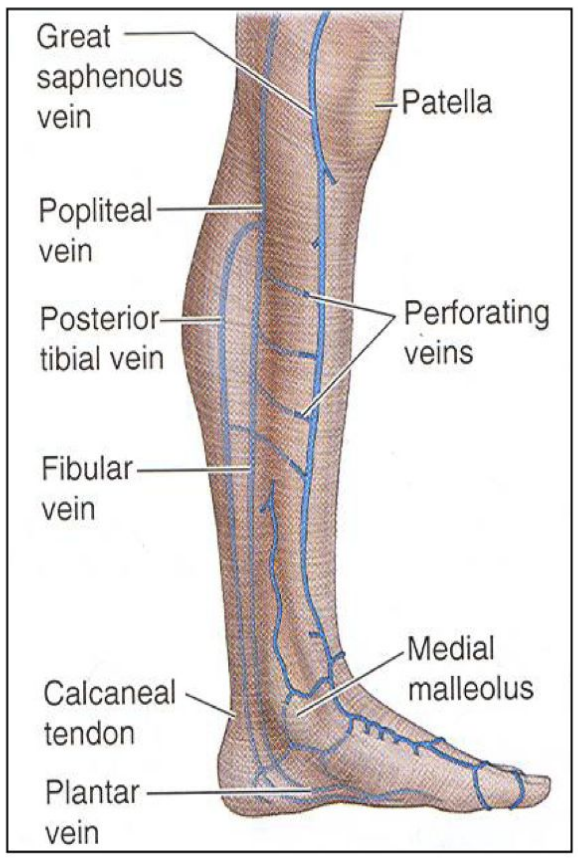
Perforating Veins

-Penetrate the deep fascia close to their origin from the superficial veins. They **contain valves** which normally allow the blood to **flow from the <u>superficial</u> to the <u>deep</u> 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 superficial veins.

-Connect the Great Saphenous vein with the deep veins along the medial side of the calf

Note: it is originated from superficial veins and inserted in deep veins, acts as a connector.



Varicose Veins

-It is dilation and degeneration of the superficial veins that may be complicated by ulcers.

-More common in the postero medial part of the lower limb.

-<u>Results because</u> of incompetence of the valves in the perforating veins, or valves within the great saphenous itself.

-<u>This allows</u> the passage of high pressure blood from the **deep** to the **superficial** veins.

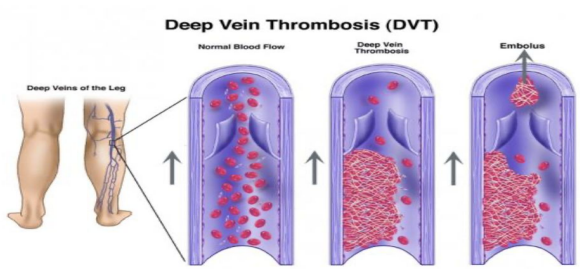
Deep Vein Thrombosis (DVT)

-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.

-Thrombophlebitis may develop around the vein.

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



MCQs

Q1:What is the most important, main arterial supply to the thigh?
A.Profunda femoris
B.Superficial Epigastric.
C.Superficial Circumflex iliac.
D.Deep External Pudendal.

Q2: which of the following has a Medial rotation with the Femoral artery?
A.Adductor longus.
B.Femoral vein.
C.Femoral nerve
D.Pectineus

Q3:How does the Femoral Artery enters the thigh?
A.Medial to the inguinal ligament
B.In front of the inguinal ligament
C.Behind the inguinal ligament
D.lateral to the inguinal ligament

Q4:Where can you feel the Femoral pulse?
A.Lateral to the lingual ligament
B.Posterior to the lingual ligament
C.Medial to the lingual ligament
D.Inferior to the lingual ligament

Q5:popliteal artery continuation of what ?
A. dorsalis pedis artery
B.anterior tibial artery
C. femoral artery
D.tibial artery

Q6: genicular anastomosis compensates for what artery?
A.popliteal artery
B.femoral artery
C. anterior tibial artery
D.posterior tibial artery

Q7:what is the main source of blood supply to the toes. the main arterial supply of the toe?
A.dorsalis pedis artery
B. femoral artery
C.posterior tibial artery
D.anterior tibial artery

Q8: dorsalis pedis artery pass to which interosseous space
A. 2nd
B. 1st
C.3rd
D.5th

Q9:wich of the following accompany all major arteries?
A.perforating veins
B.venae comitantes
C.deep veins
D. Superficial veins

Q10:the popliteal veins is .... to the popliteal artery.
A.anterior
B.posterior
C.superior
D.inferior

Q11:the great saphenous vein is accompanied by?
A.deep veins
B.superficial veins
C.saphenous nerve
D.peroneal nerve

Q12:where is the site of varicose veins?
A.anterior part of lower limb
B.lateral part of lower limb
C.posteromedial part of lower limb

1)A
2)B
3)C
4)D
5)C
6)A
7)A
8)B
9)C
10)B
11)C
12)C

SAQs

Q1) List The two types of Arterial Anastomoses found in the lower limb and what they mainly supply?

Q2) What are the terminal branch of the popliteal artery?

Q1) 1-the Cruciate anastomosis, It Provides blood supply to the lower limb in case of ligation of the femoral artery.
2-the Trochanteric anastomosis, supply the head & neck of femur.
Q2) anterior and posterior tibial arteries

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