Vascular anatomy of the lower limb

Musculoskeletal block- Anatomy-lecture 17

Editing file

Reviewed by Razan AlRabah & Khalid Alkhani

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 the lower limb into superficial & deep.
- ✓ Describe their origin, course & termination and tributaries.

Color guide :
Only in boys slides in **Green**
Only in girls slides in **Purple**
important in **Red**
Doctor note in **Blue**
Extra information in **Grey**

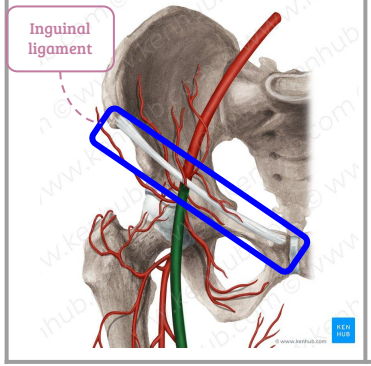
For best understand check this:https://youtu.be/JNczJx2ju3I

Femoral artery

- Is the **main arterial supply** to the lower limb
- It is the continuation of the external iliac artery

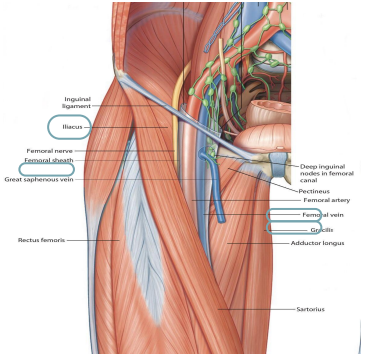
Beginning

It **enters** the **thigh behind** the **inguinal ligament** point (midway **between** the **anterior superior iliac spine** & the **symphysis pubis**



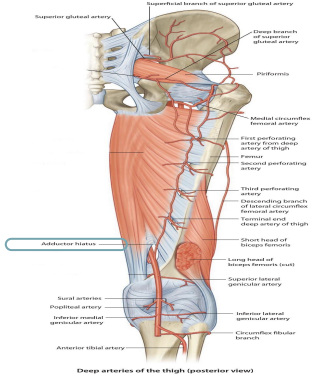
Relations

In the **femoral triangle** the artery is **superficial** covered only by skin & fascia.
Posterior: Hip joint, separated from it by psoas muscle
Medial: femoral **vein**.
Lateral: femoral **nerve** & its branches



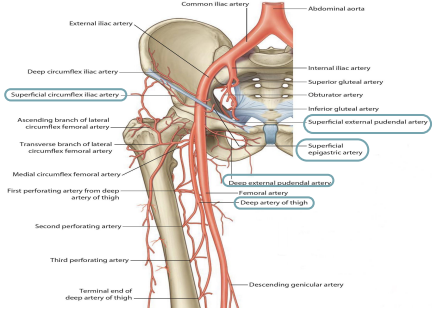
Terminations

Terminates by **passing through** the **adductor canal** (deep to sartorius)
It exits the canal by passing **through** the **adductor hiatus** and **becomes the popliteal artery**



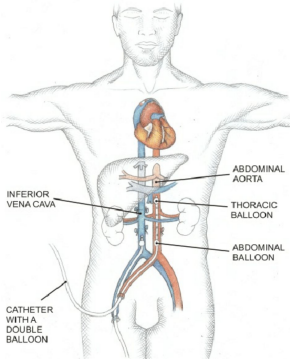
Branches

The femoral artery supplies: **lower abdominal wall**, **thigh** & **external genitalia** 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)



Cannulation of FA:

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.



Profunda femoris artery:

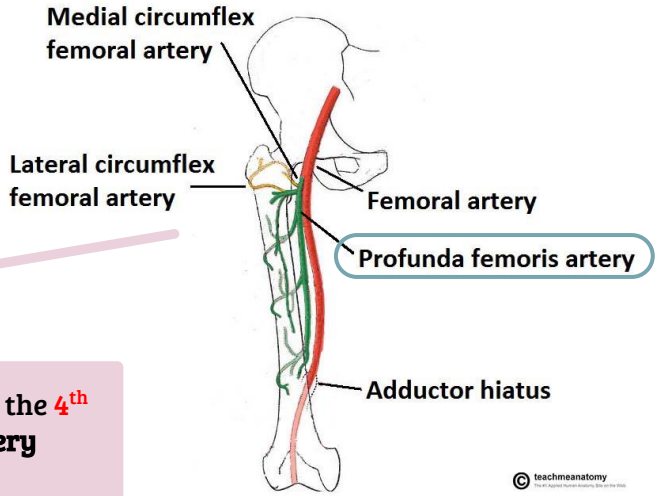
It is the main arterial supply to the thigh

- Medial & lateral circumflex femoral arteries
- Three perforating arteries

It gives:

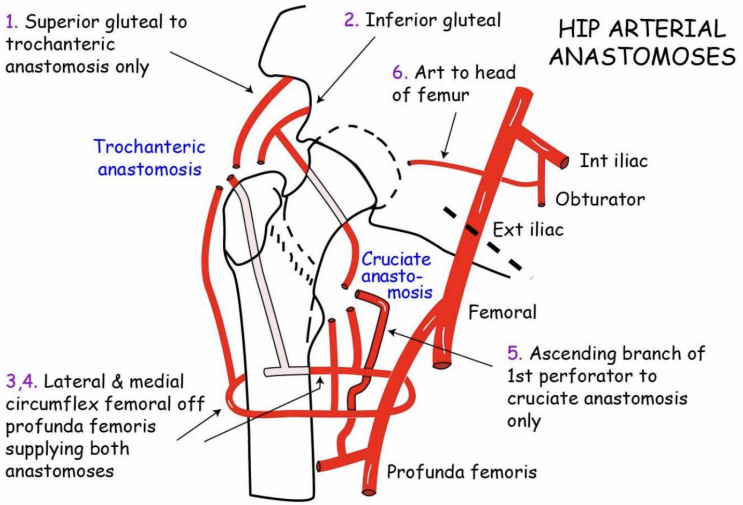
It arises from the lateral side of the femoral artery & passes medially behind the femoral vessels

It ends by becoming the 4th perforating artery

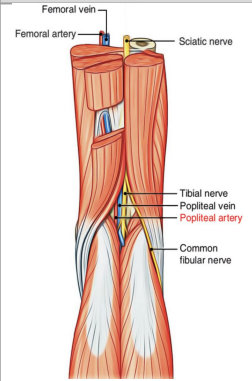


Arterial anastomosis in the lower limb

Cruciate anastomosis	Trochanteric anastomosis
At the gluteal region: ➢ It provides blood supply to the lower limb in case of ligation (انسداد) of the femoral artery ➢ It lies at the level of the neck of the lesser trochanter ➢ It is formed by the union of: ○ medial & lateral circumflex femoral arteries ○ The inferior gluteal artery ○ The first perforating artery	-Formed from anastomosis of branches of Medial & Lateral circumflex femoral arteries + superior and inferior gluteal arteries -Its main function is to supply the head & neck of femur
The cruciate & trochanteric anastomosis provide a connection between the internal iliac & femoral arteries	

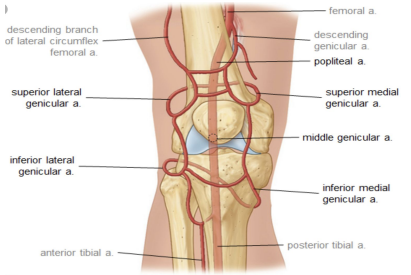


POPLITEAL ARTERY:

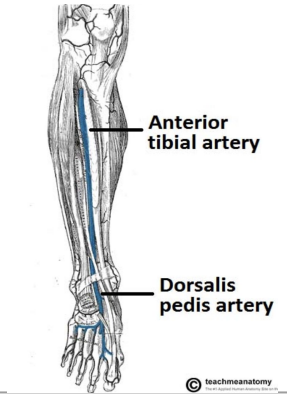
Beginning	Description	Terminates	Divides into:	Branches	Picture
The continuation of the femoral artery.	It is the deepest structure in the Popliteal Fossa (posterior to the Popliteal Vein & Tibial Nerve), it runs close to the capsule of the knee joint.	The lower border of popliteus muscle.	1)Anterior and 2)Posterior Tibial Arteries.	-Muscular -Five Genicular branches to the articular capsule and ligaments of the knee joint.	

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.

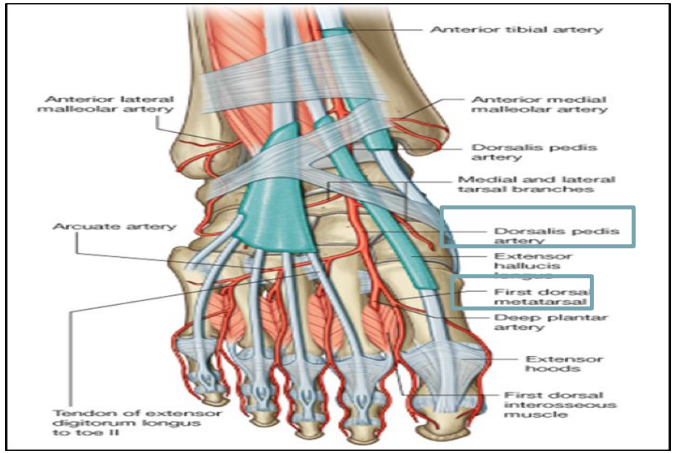


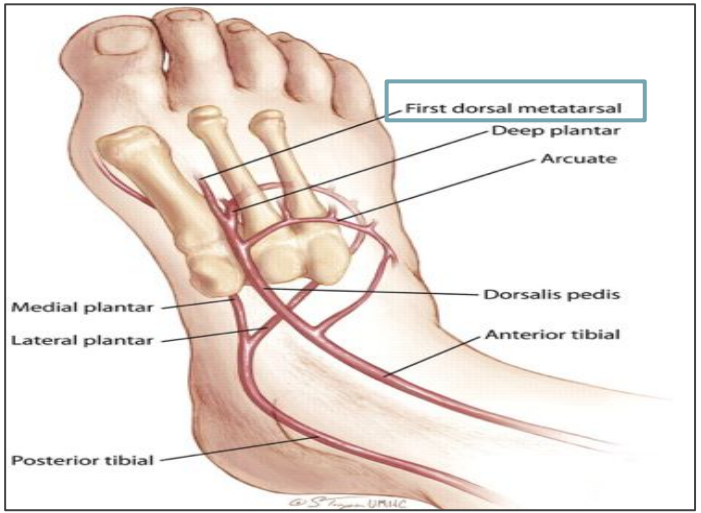
ANTERIOR TIBIAL ARTERY:

Description	Supply	Terminates at	Picture
- It is the smaller terminal branch of the popliteal artery. - It enters the anterior compartment of the leg in company with the Deep Peroneal nerve.	It supplies structures in the Anterior compartment of the Leg & Dorsum of foot.	The ankle joint midway between the malleoli where it becomes the Dorsalis Pedis artery (dorsal artery of the foot).	

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 in position.
- It passes to the 1st interosseous space, where it divides into :
  - A deep plantar artery (to the sole to join the plantar arch)
  - The first dorsal metatarsal artery.

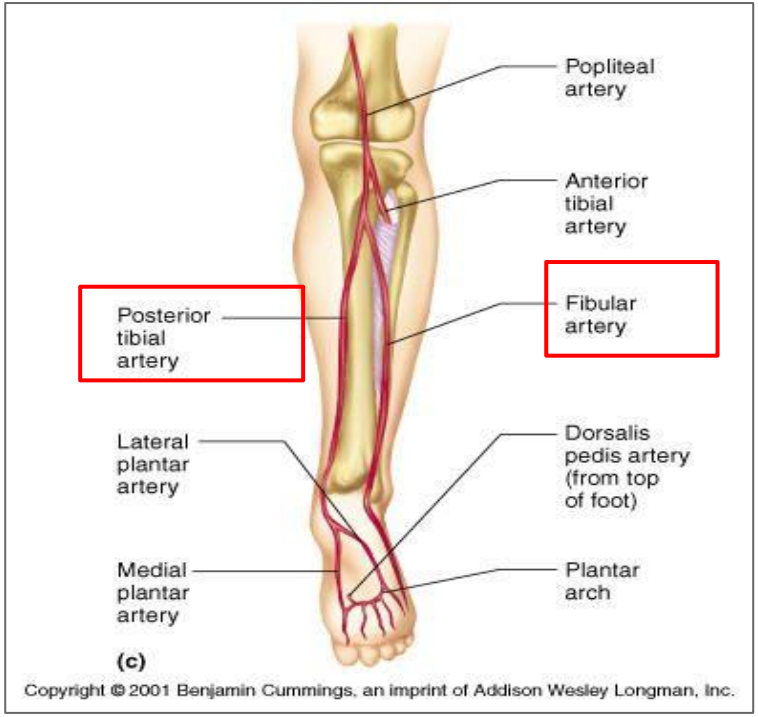


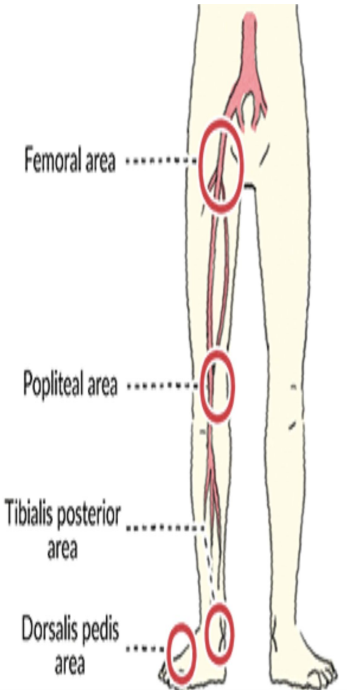


POSTERIOR TIBIAL ARTERY

Terminates:	dividing into: Medial & Lateral plantar arteries.
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.

- ❖ It is the larger terminal branch of the popliteal artery and provides the **main blood**
- ❖ Its lower part is covered by skin & fascia only.
- ❖ Supply to the Posterior compartment of the Leg & Sole of the Foot.



Arterial pulse	Femoral Pulse	Popliteal Pulse	Dorsalis Pedis pulse (DP)	POSTERIOR TIBIAL PULSE	Picture
Site of pulse	It can be palpated just inferior to the Mid-inguinal point	Because of the deep position of the artery, its pulsations are best felt in the inferior part of the popliteal fossa (here the artery is related to the tibia)	It is easily felt being subcutaneous, over the tarsal bones between the tendons of (Extensor hallucis longus and Extensor digitorum longus)	Taken posteriorly inferior to the medial malleolus (in the groove between the malleolus and the heel)	
Clinical relevance	Weakening or loss of the popliteal pulse is a sign of femoral artery obstruction .	We can stop bleeding from the femoral artery By pressing the artery directly posterior against the superior pubic ramus and the femoral head.	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.	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:

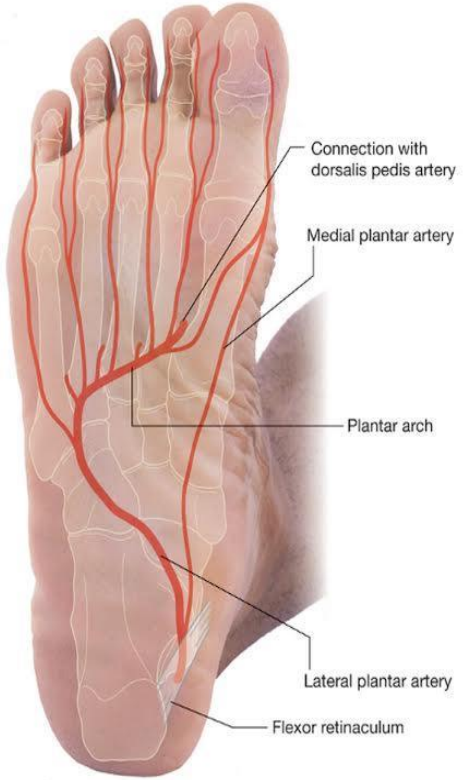
- The smaller terminal branch of the posterior tibial artery.
- It supplies mainly the muscles of the great toe, and gives most of plantar digital arteries.
- Its superficial branch supplies the skin of the medial side of the sole.

Lateral plantar:

- The larger branch.
- At the base of the 5th metatarsal bone, it curves medially to form

Plantar Arch :

- Completed by the medial plantar artery and branch from DP artery.
- The arch supplies the skin, fascia and muscles in the sole and plantar digital arteries to the adjacent digits .



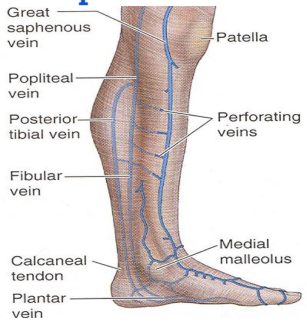
Veins to the lower limb

- The veins of the lower limb are classified according to their position into superficial and deep.
- The superficial & deep veins have valves,which are more numerous in the deep veins.
- The blood passes from the superficial to the deep veins.

Superficial veins	Deep veins
lie in the subcutaneous tissue.	deep to the deep fascia and accompany all major arteries.
➔ greater saphenous & lesser saphenous vein.	➔ Femoral & Popliteal veins. ➔ **venae comitantes :** -Deep veins ,usually they are paired and accompany arteries. (venae comitantes) -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.

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 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.



Deep Veins

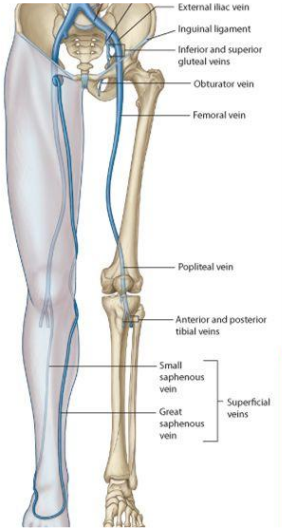
Popliteal vein

- Formed by the union of venae comitantes around the anterior & posterior tibial arteries.
- lies posterior to the popliteal artery.

Femoral vein

(It is a continuation of popliteal vein after it passes through popliteal fossa)

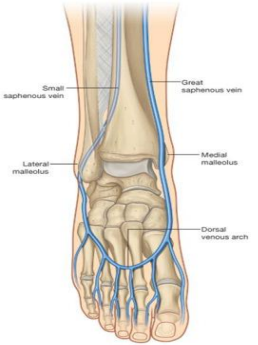
- It enters the thigh by passing through the opening in the adductor magnus .
- It leaves the thigh in the intermediate compartment of the femoral sheath.
- Passes behind the inguinal ligament to become the External iliac vein

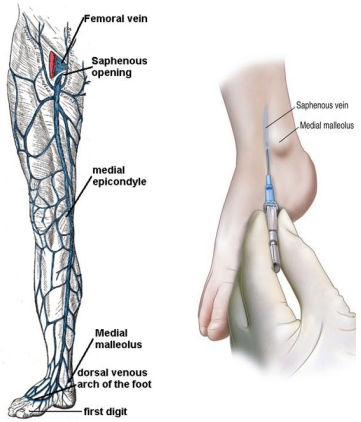
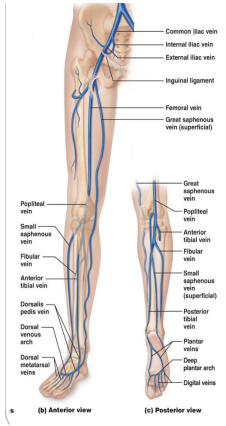


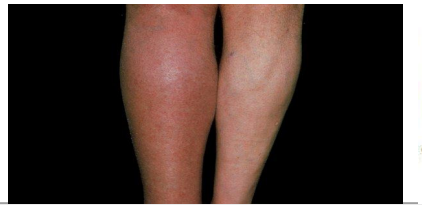
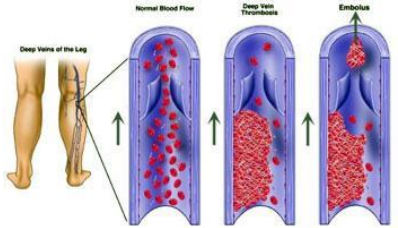
Superficial Veins

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.



The vein	Origin	Course	Picture
Great Saphenous vein	-Begins from the medial end of the dorsal venous arch (as the medial marginal vein). **(The Longest Superficial vein of the body)**	**Ascends:**(has a fixed course) 1. In front of the Medial Malleolus accompanied by the (Saphenous nerve). 2. Posterior the Medial Condyle of the femur. 3. Terminates in Femoral Vein by Passing through the Saphenous Opening (2.5- 3.25) cm below and lateral to the pubic tubercle. Because of its constant position in front of the medial malleolus, it is used for saphenous cutdown especially in infants, obese and shocked patients.	
Small saphenous vein	-Originates from the lateral end of the dorsal venous arch.	**Terminates in:** in any of the following A. Popliteal vein B. It may join the Great Saphenous vein. C. Or Bifurcates: One branch joins the Great saphenous and the other joins the Popliteal vein.	

Deep Vein Thrombosis (DVT	Varicose veins
Venous stasis is the main cause by pressure on the veins from the bedding during prolonged hospital stay and aggravated by muscular .inactivity	It is dilatation and degeneration of the superficial veins that may be complicated by .ulcers
The veins of the lower limb are subject to .venous thrombosis after a bone fracture	**More common in the posteromedial part of the .lower limb**
❖ 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. 	❖ **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.  

MCQs

Question 1: Which of the following form plantar arch ?

A. Medial plantar artery

B. Peroneal artery

C. Lateral plantar artery

D.Dorsalis Pedis Artery

Question 2: Which of the following is Inferior to the lingual ligament and midway between the anterior superior iliac spine and symphysis pubis?

A.Posterior Tibial

B.Popliteal

C.Femoral

D.Dorsalis Pedis

Question 3: At the opening of adductor magnus the femoral vein lies ..... to the femoral artery

A. Lateral

B. Medial

C. Anterior

D.posterior

Question 4: Where is the site of varicose veins ?

A.Posteromedial part of the lower limb.

B.Anterior part of the lower limb.

C.Lateral part of the lower limb.

Question 5: The popliteal vein is ..... to the popliteal artery.

A. Posterior.

B. Anterior.

C. Lateral.

D. Medial.

Question 6:the superficial vein has more valves than the deep vein.

A.true.

B.false

SAQ

Question 1: What are the sites of peripheral arterial pulse?

1-Femoral 2-Popliteal

3-Posterior Tibial 4-Dorsalis Pedis

Question 2 : Mention the terminal branch of Posterior Tibial Artery.

1-medial plantar arteries.

2-lateral plantar arteries.

Answers: Q1.C- Q2.C -Q3.A -Q4.A- Q5.A- Q6.B

Team members

Boys team:

- Khalid AL-Dossari
- Naif Al-Dossari
- Faisal Alqifari
- Salman Alagla
- Ziyad Al-jofan
- Suhail Basuhail
- Ali Aldawood
- Khalid Nagshabandi
- Mohammed Al-huqbani
- Jehad Alorainy
- Khalid AlKhani
- Omar Alammari

Team leaders

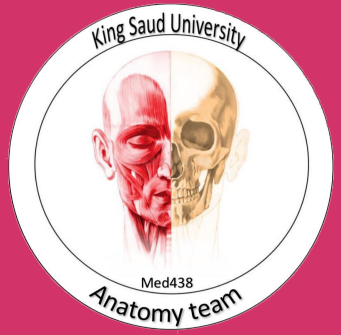
- Abdulrahman Shadid
- ★ Ateen Almutairi

★ =This lecture done by

Girls team :

- Ajeed Al Rashoud
- Taif Alotaibi
- Noura Al Turki
- ★ Amirah Al-Zahrani
- Alhanouf Al-haluli
- Sara Al-Abdulkarem
- Rawan Al Zayed
- Reema Al Masoud
- ★ Renad Al Haqbani
- Nouf Al Humaidhi
- ★ Fay Al Buqami
- Jude Al Khalifah
- ★ Nouf Al Hussaini
- Alwateen Al Balawi
- Rahaf Al Shabri
- Danah Al Halees
- Haifa Al Waily
- Rema Al Mutawa
- Amirah Al Dakhilallah
- Maha Al Nahdi
- Renad Al Mutawa
- Ghaida Al Braithen
- Reham Yousef
- ★ Razan AlZohaifi

Special thank for Anatomy team 436



Good luck

Give us your feedback: