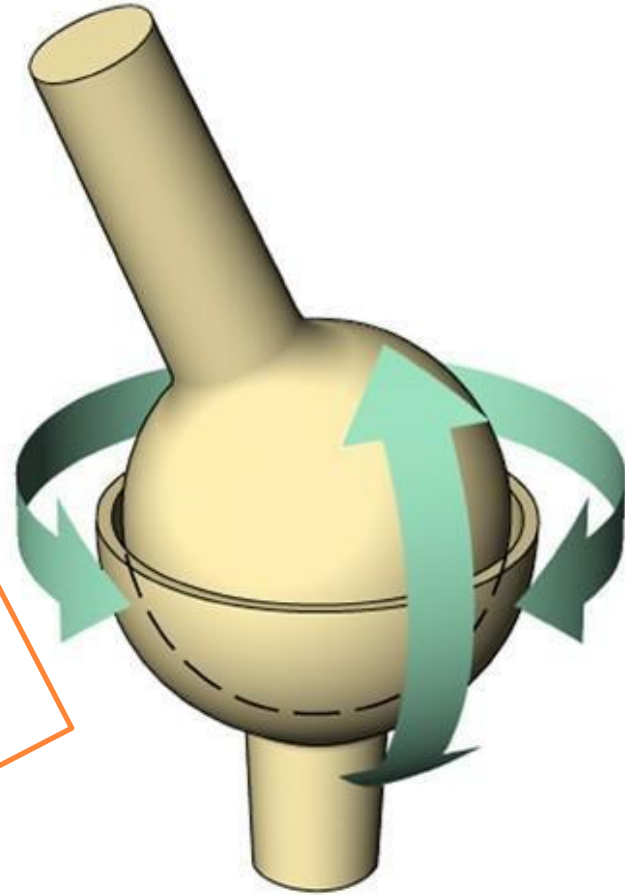


JOINTS OF THE LOWER LIMB

HIP JOINT

Type:

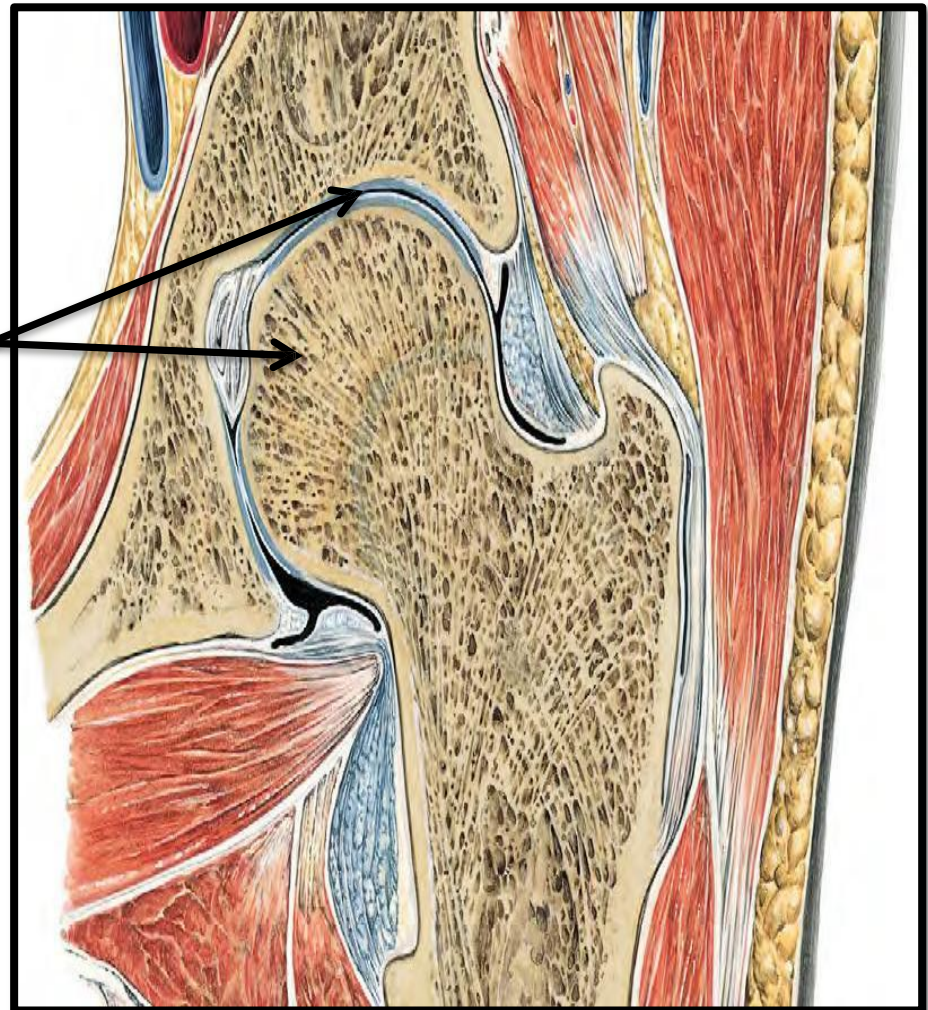
Synovial multi-axial
ball-and-socket
joint.



Articular surfaces:

- a. head of femur
- b. lunate surface of acetabulum

Which is deepened by the fibrocartilaginous *labrum acetabulare*



3-Nerve Supply:

Femoral nerve
Obturator nerve
Sciatic nerve

The hip joint is innervated primarily by the **sciatic, femoral and obturator** nerves. These are the same nerves which innervate the knee, which explains why ***pain can be referred to the knee from the hip and vice versa.***

important

MAIN LIGAMENTS OF THE HIP JOINT

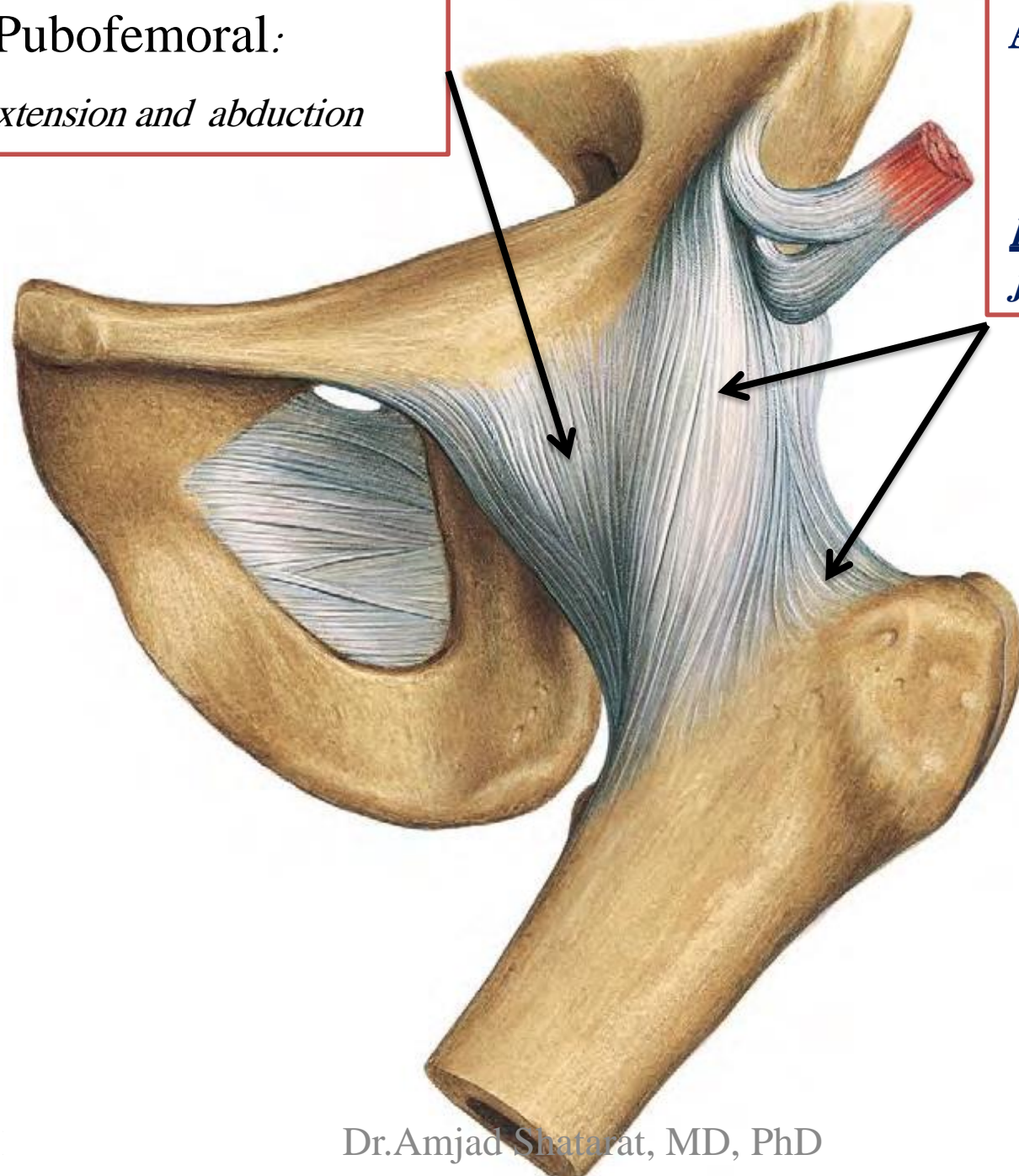
5/22/2021

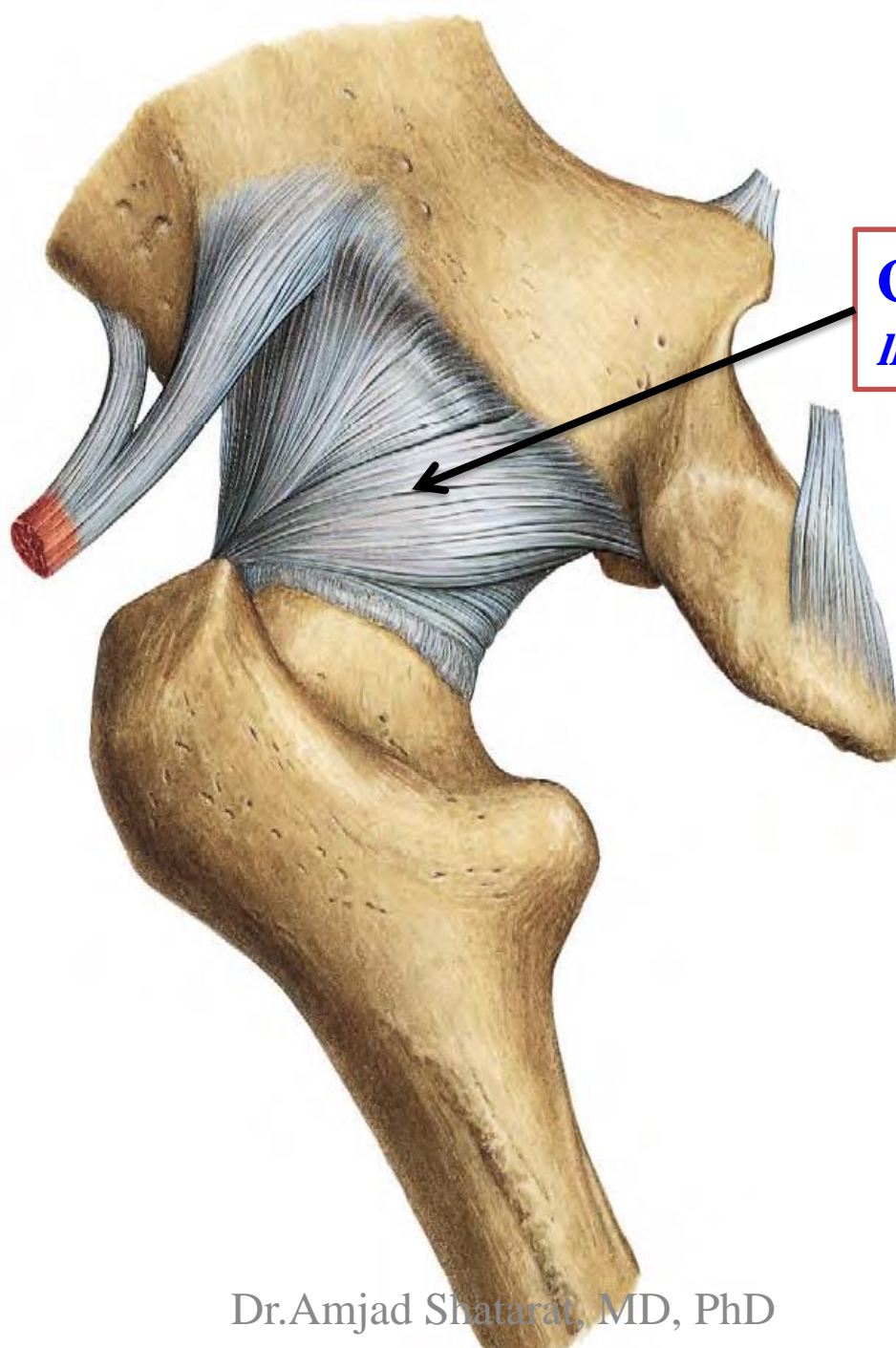
Dr.Amjad Shatarat, MD, PhD
School of Medicine

B-Pubofemoral:

Limits extension and abduction

A-Iliofemoral: *is a strong, inverted Y-shaped ligament Prevents hyperextension of hip joint during standing*





C-Ischiofemoral:
limits extension

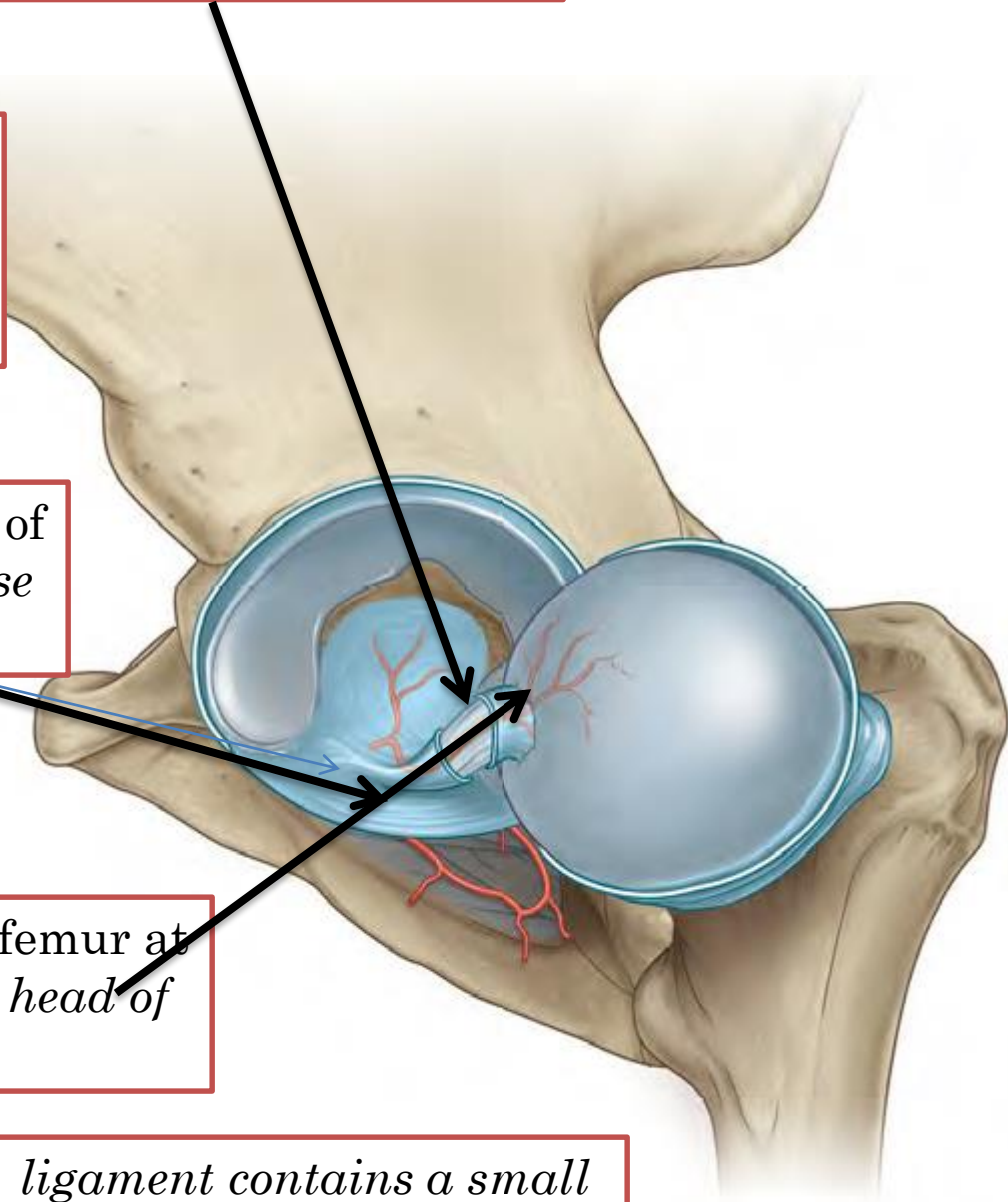
D-The ligament of head of femur *ligamentum teres*

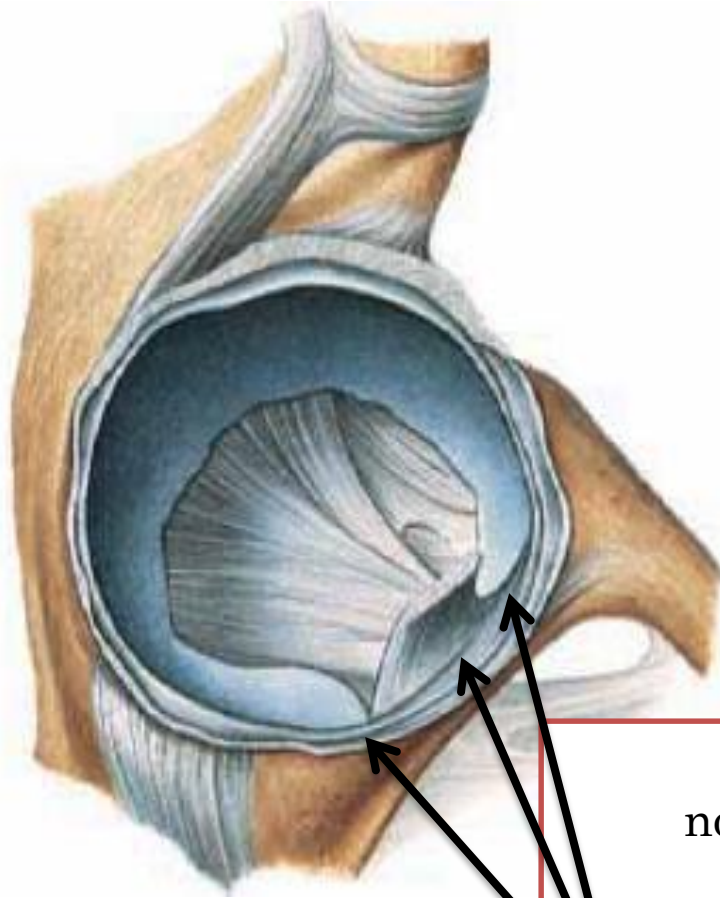
- primarily a synovial fold conducting a blood vessel
- is weak and of little importance in strengthening the hip joint

- Its wide end attaches to the margins of the acetabular notch and the *transverse acetabular ligament*;

- *its narrow end* attaches to the femur at the *fovea for the ligament of the head of femur*.

- Usually, the ligament contains a small artery to the head of the femur





The
non-articular lower part of the
acetabulum,
the *acetabular notch*, is closed off
below by the
E-transverse acetabular ligament



Movements

➤ Flexion is performed by *the iliopsoas, rectus femoris, and sartorius*

➤ Extension is performed by *the gluteus maximus* and the hamstring muscles (*They cross behind the hip and they can extend*)

➤ Abduction is performed by *the gluteus medius and minimus*, assisted by the sartorius, tensor fasciae latae, and piriformis.

➤ Adduction is performed by *the adductor longus and brevis and the adductor fibers of the adductor magnus.*

These muscles are assisted by the pectineus and the gracilis.

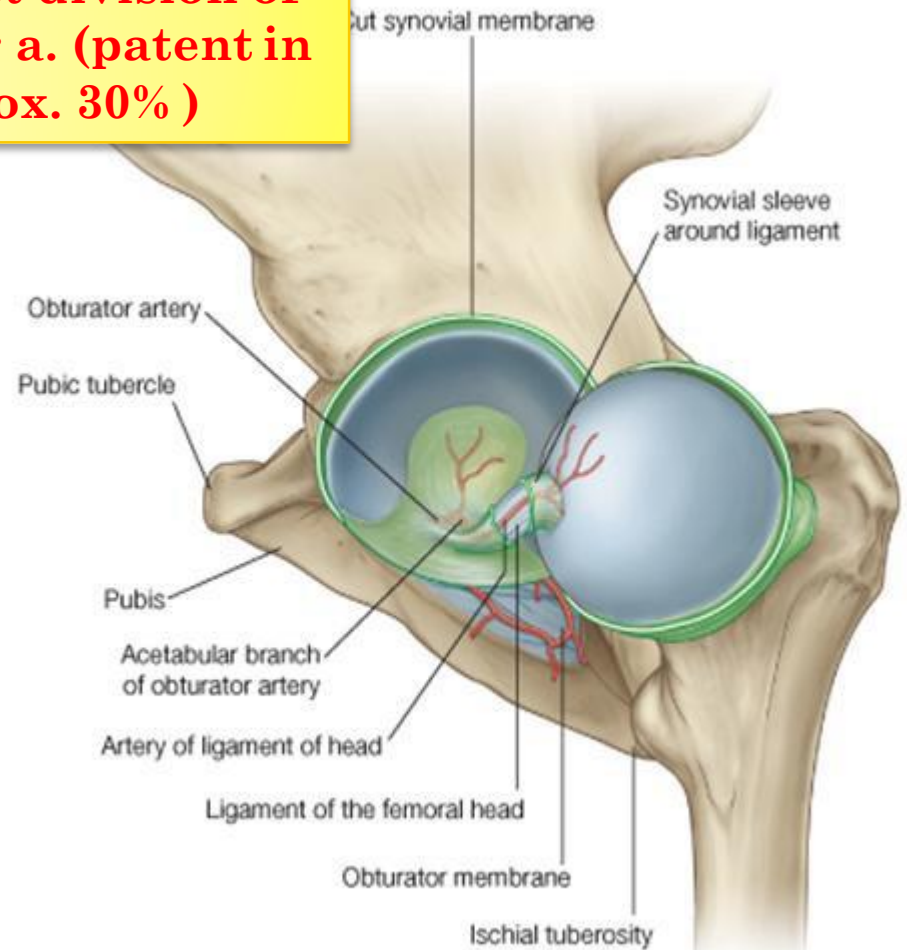
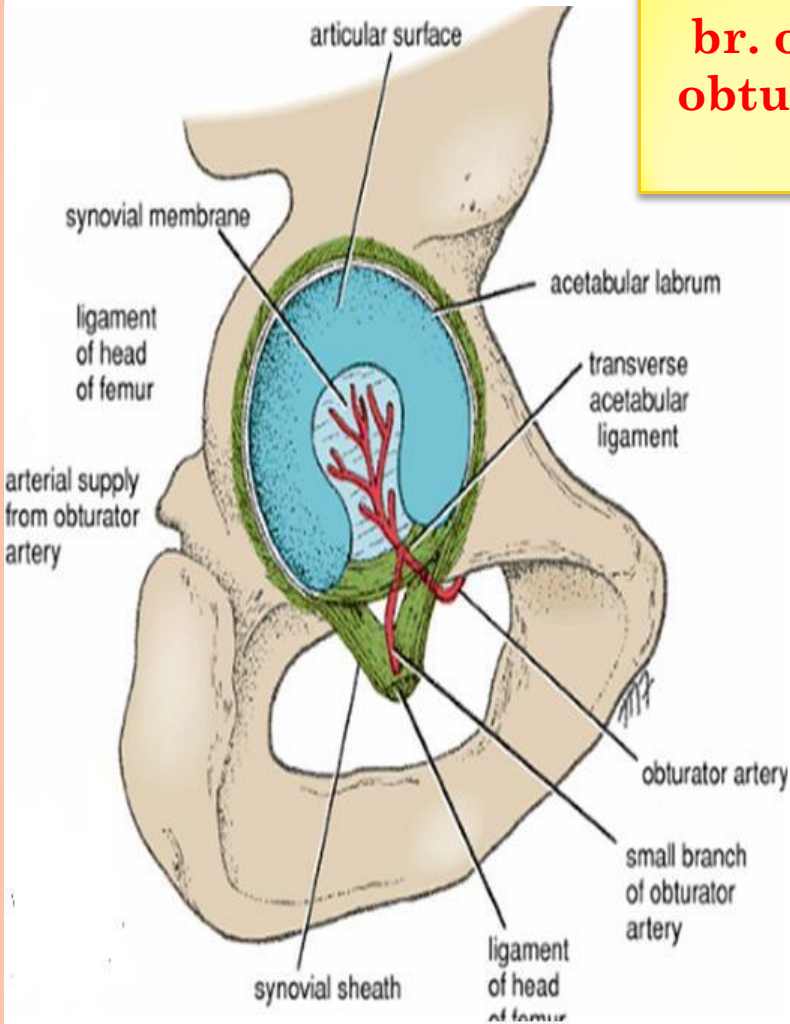
➤ Lateral rotation is performed by *the short lateral rotator muscles* and assisted by the *gluteus maximus*.

➤ Medial rotation is performed by **the anterior fibers** of the **gluteus medius** and **gluteus minimus** and the **tensor fasciae latae**.



11-Blood supply of the head of the femur

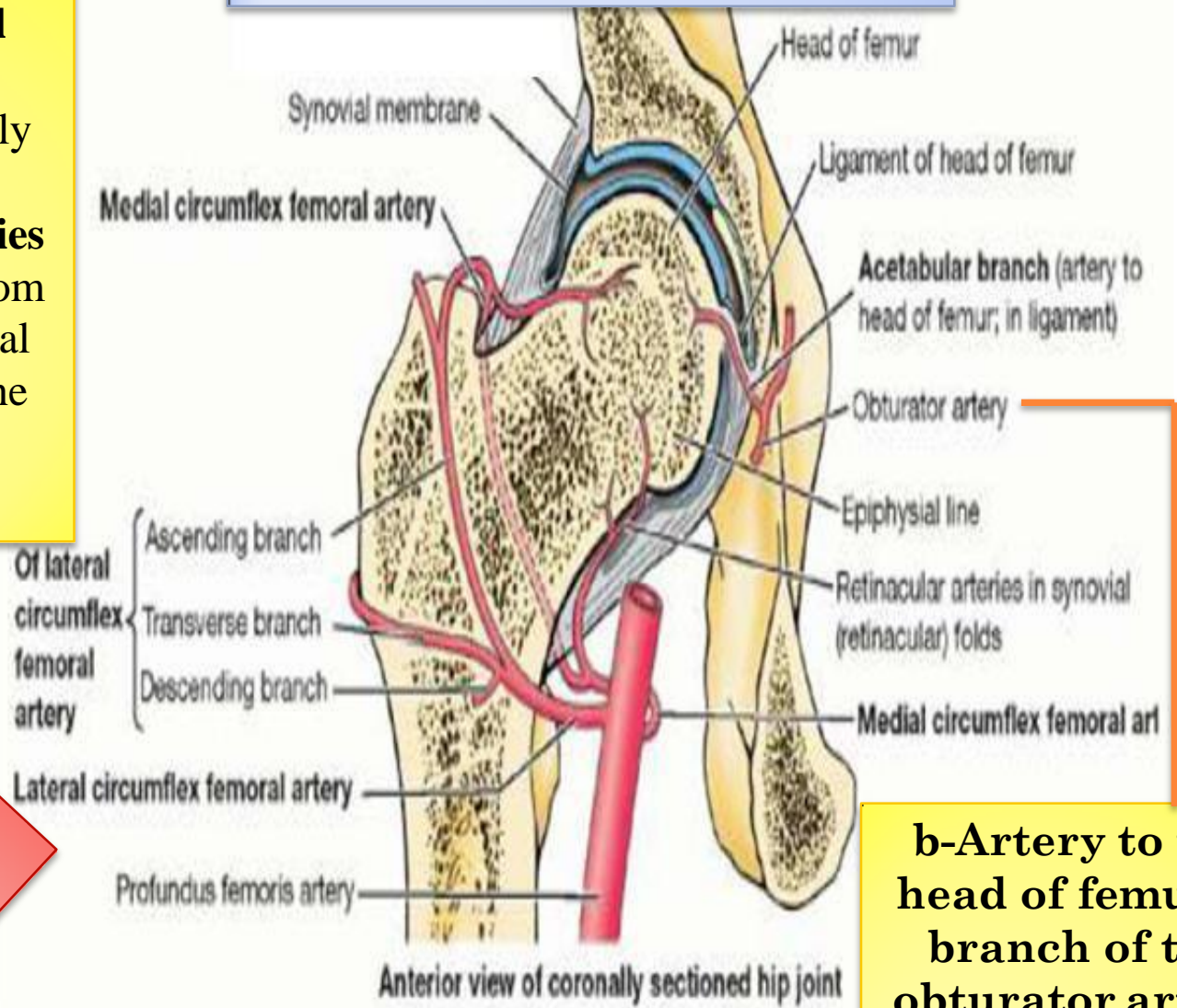
-Acetabular (foveolar) br. of post division of obturator a. (patent in approx. 30%)



a-Medial and lateral circumflex femoral arteries

The main blood supply is from **the retinacular arteries** arising as branches from the circumflex femoral arteries (especially the *medial circumflex femoral artery*).

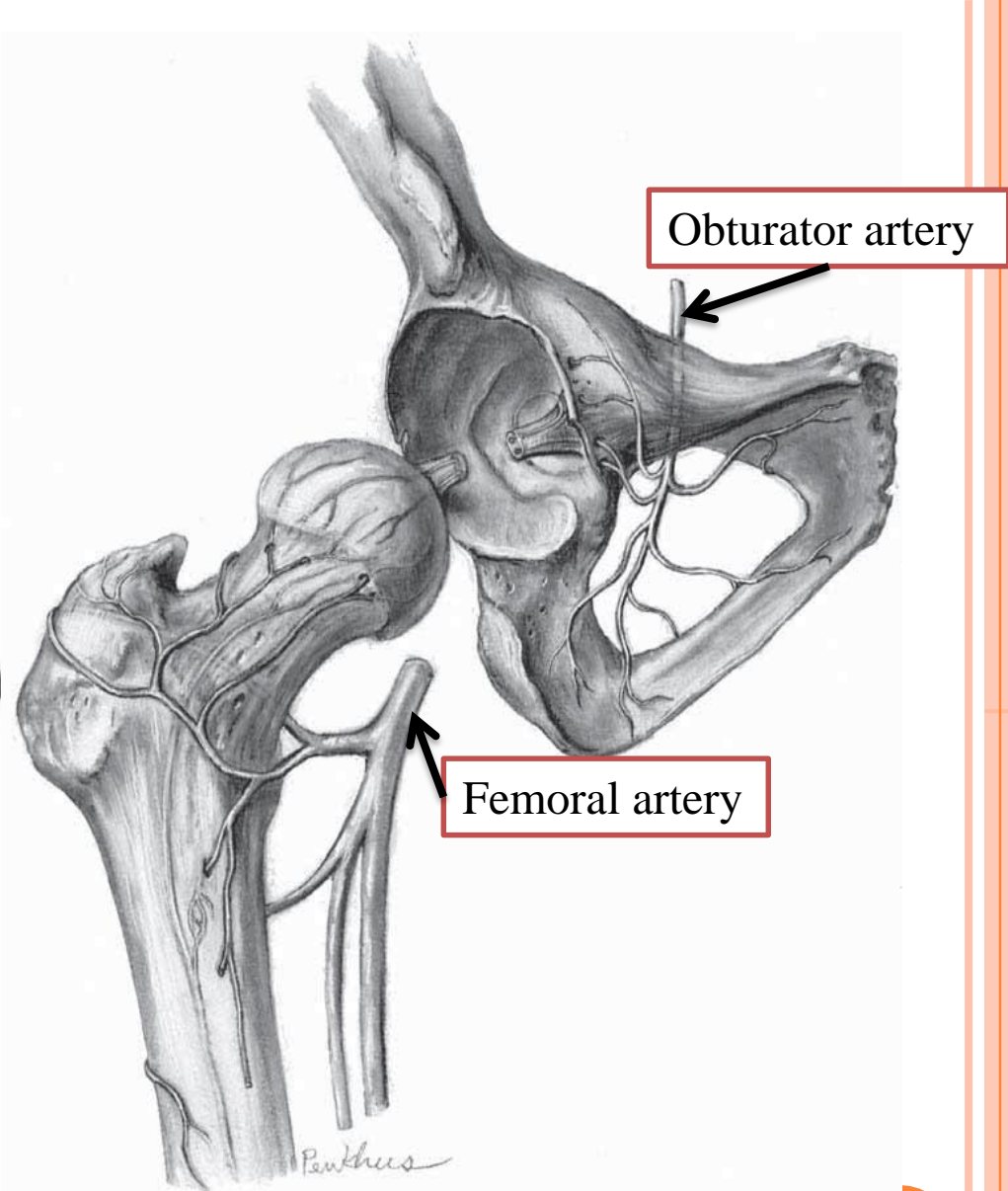
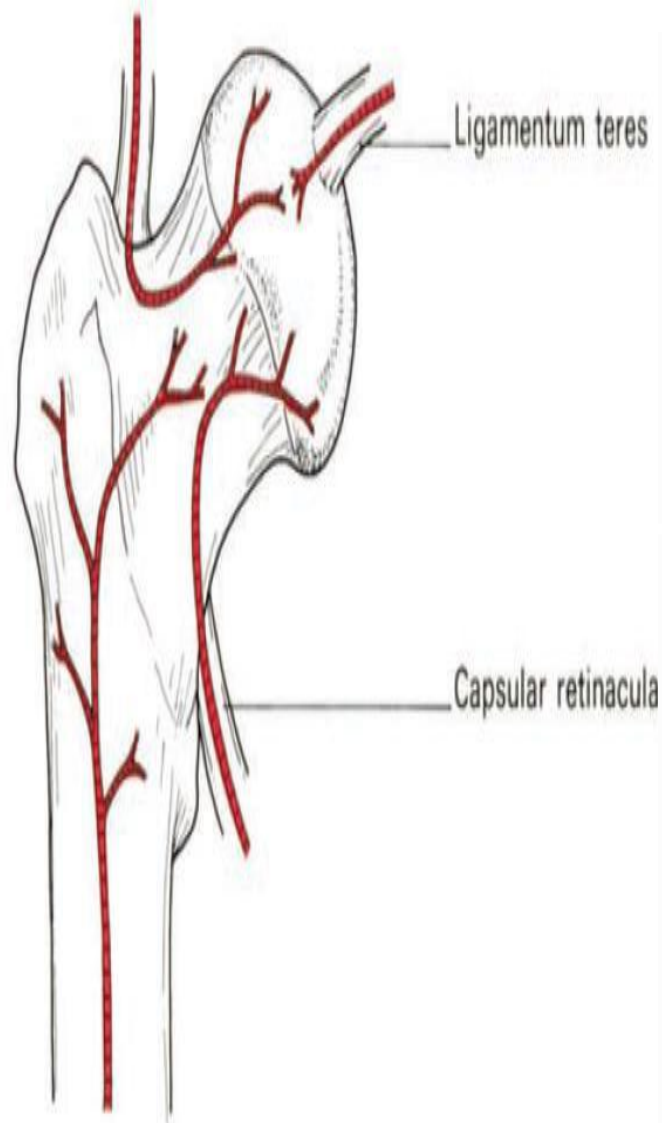
Blood supply of the head of the femur



b-Artery to the head of femur, a branch of the obturator artery that traverses the ligament of the head.

Blood supply of the head of the femur

5/22/2021



12- Fractures of the neck of femur

The upper end of the femur is a common site for fracture
in the elderly

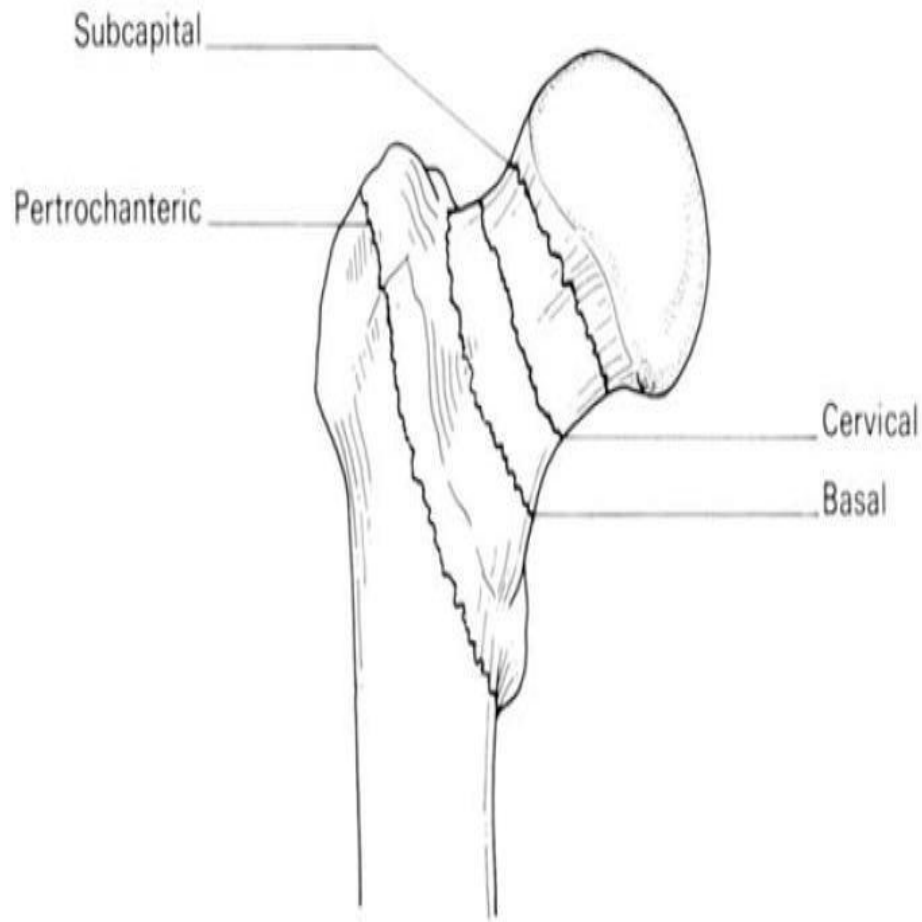
The neck may break
1-immediately beneath the head

subcapital
2-near its midpoint

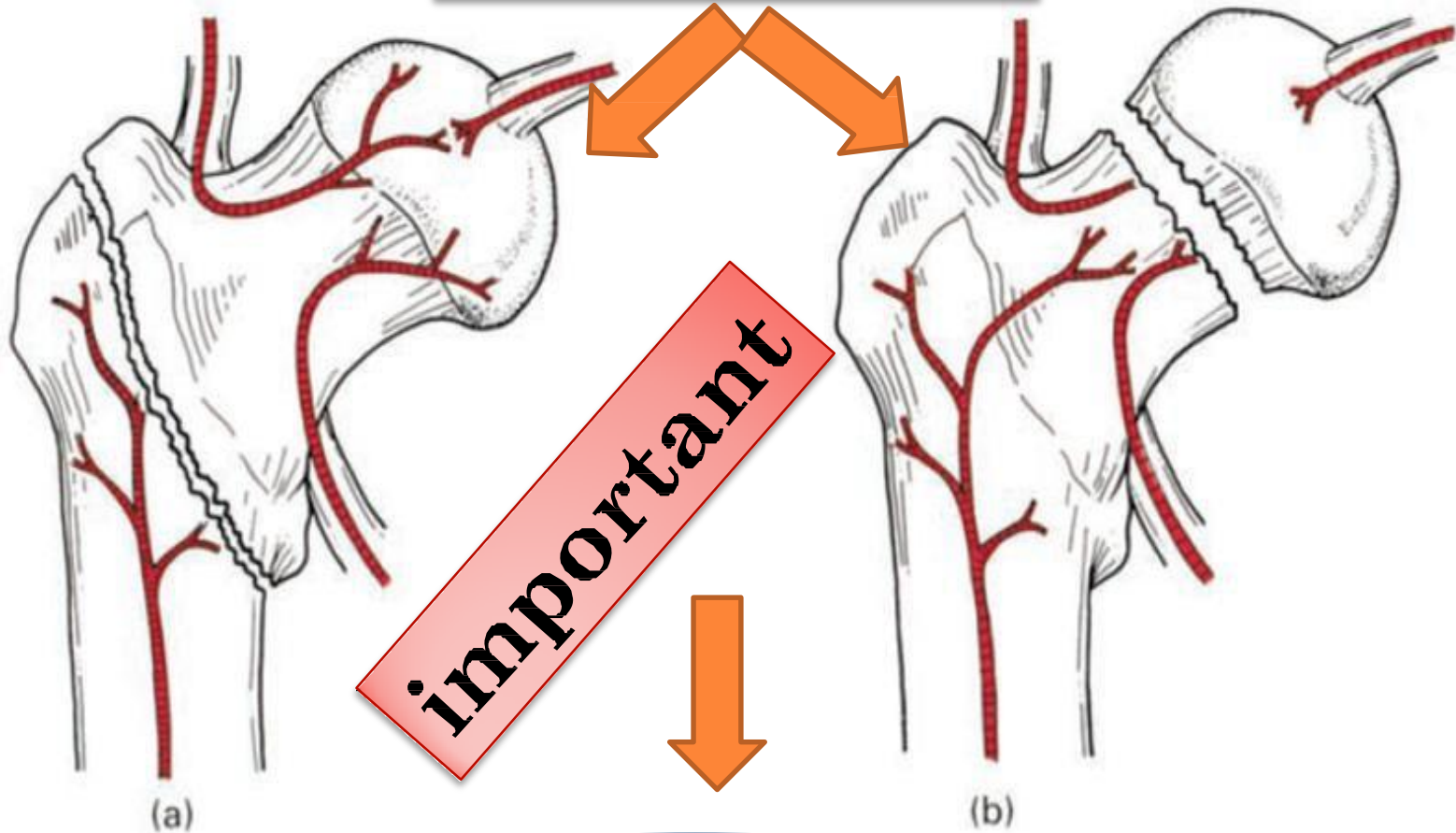
cervical
3-adjacent to the trochanters

basal
4-the fracture line may pass between, along or just below the trochanters

pretrochanteric



Neck fracture will result in



(a) A pertrochanteric fracture does not damage the retinacular blood supply—aseptic bone necrosis does not occur. (b) A subcapital fracture cuts off most of the retinacular supply to the head—aseptic bone necrosis is common. Note that the blood supply via the ligamentum teres is negligible in adult life.

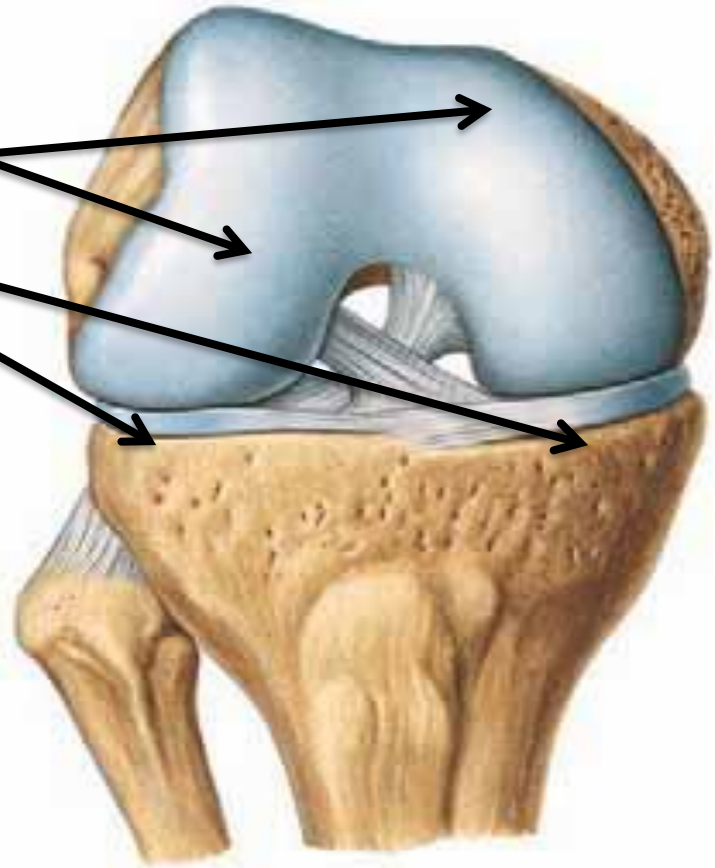
Important

Knee Joint

➤ Is the most **complicated** joint in the body!!!!

1-Consists of two condylar joints between:
A-The **medial and lateral condyles** of the **femur**
and **The condyles of the tibia**

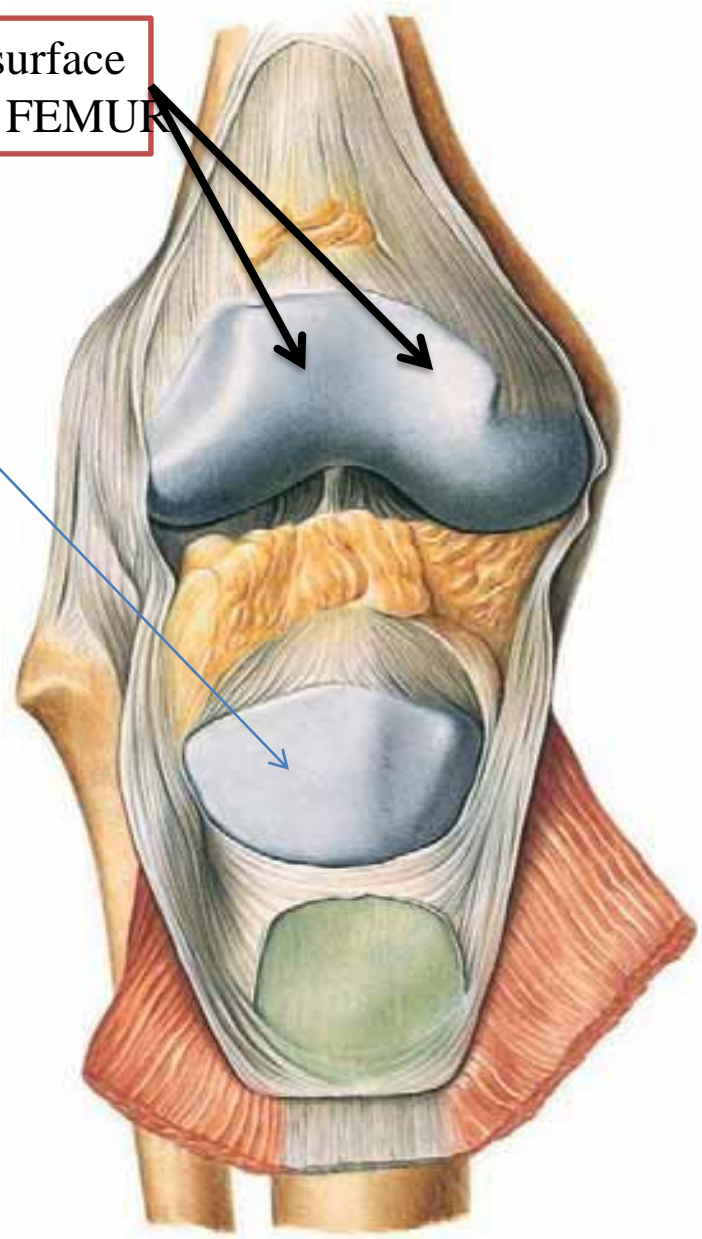
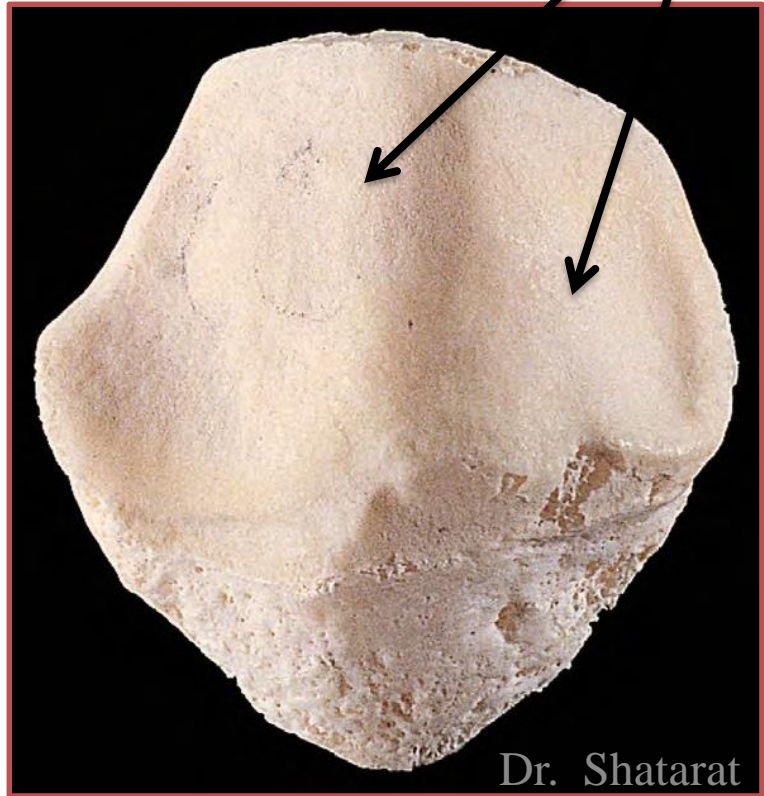
and



B- a **gliding joint**
between the **patella** and the **patellar surface**
of the **femur**

Note that the fibula is not directly involved in
the joint.

Patellar surface
OF THE FEMUR



2-Type OF JOINT

```
graph TD; A[2-Type OF JOINT] --> B["The joint between the femur and tibia is a synovial joint of the hinge variety, but some degree of rotatory movement is possible."]; A --> C["❖ The joint between the patella and femur is a synovial joint of the plane gliding variety."]; B --> D[MEDIAL AND LATERAL ROTATION];
```

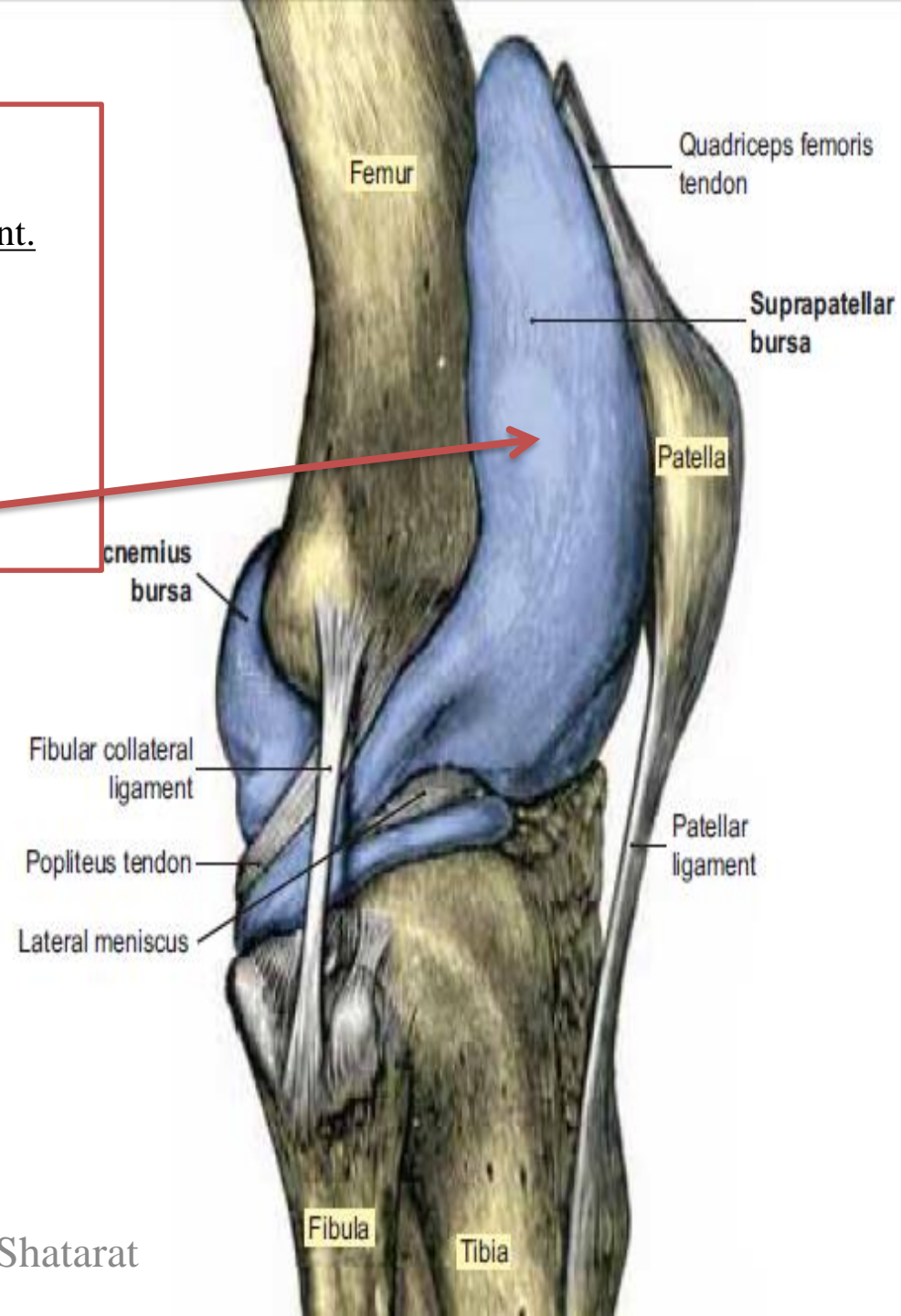
The joint between the *femur and tibia* is a *synovial* joint of the *hinge variety*, but some degree **of rotatory movement** is possible.

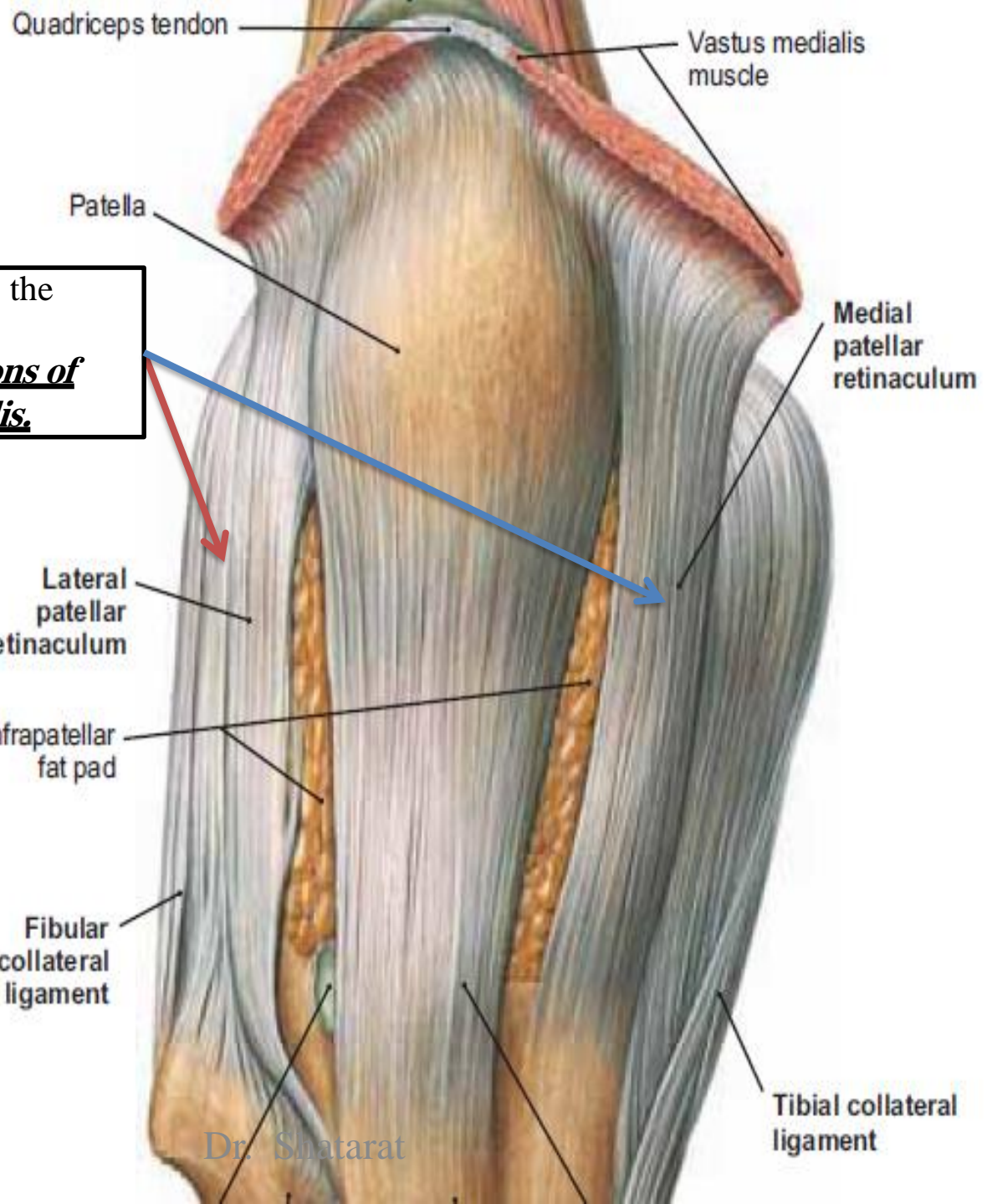
❖ The joint between the *patella and femur* is a *synovial* joint of the *plane gliding* variety.

MEDIAL AND LATERAL ROTATION

3 - Capsule

- ❖ The capsule is attached to *the margins of the articular surfaces*
- ❖ surrounds the sides and posterior aspect of the joint.
- ❖ On the front of the joint, ***the capsule is absent*** permitting the synovial membrane to pouch upward beneath the quadriceps tendon, forming **the suprapatellar bursa**





❖ On each side of the patella, the capsule is strengthened by *expansions from the tendons of vastus lateralis and medialis.*

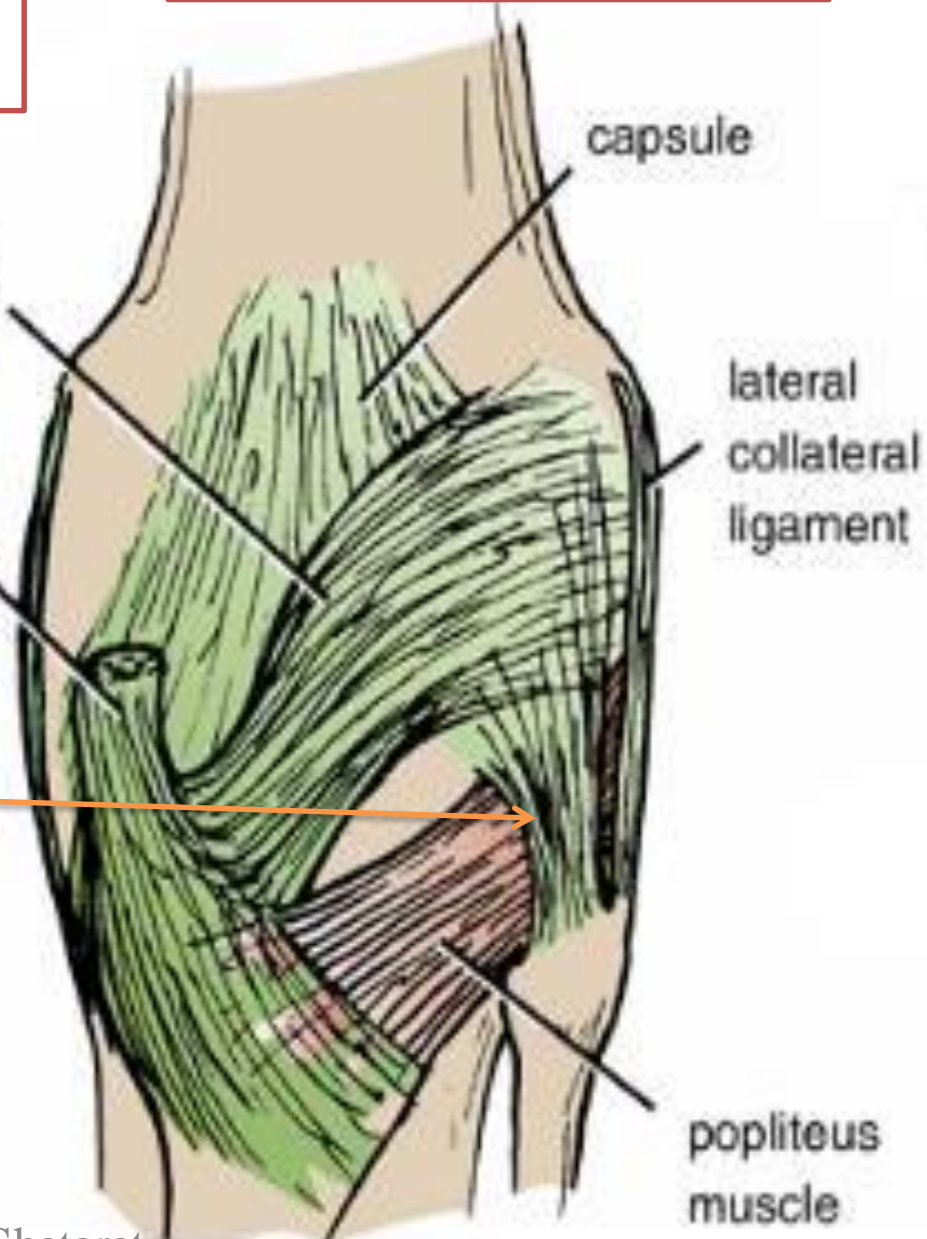
Posterior view of the knee joint

❖ Behind the joint, the capsule is strengthened by an expansion of the semimembranosus muscle called the **oblique popliteal ligament**

oblique popliteal ligament

insertion of semimembranosus

❖ An opening in the capsule behind the lateral tibial condyle permits the tendon of the **popliteus to emerge**



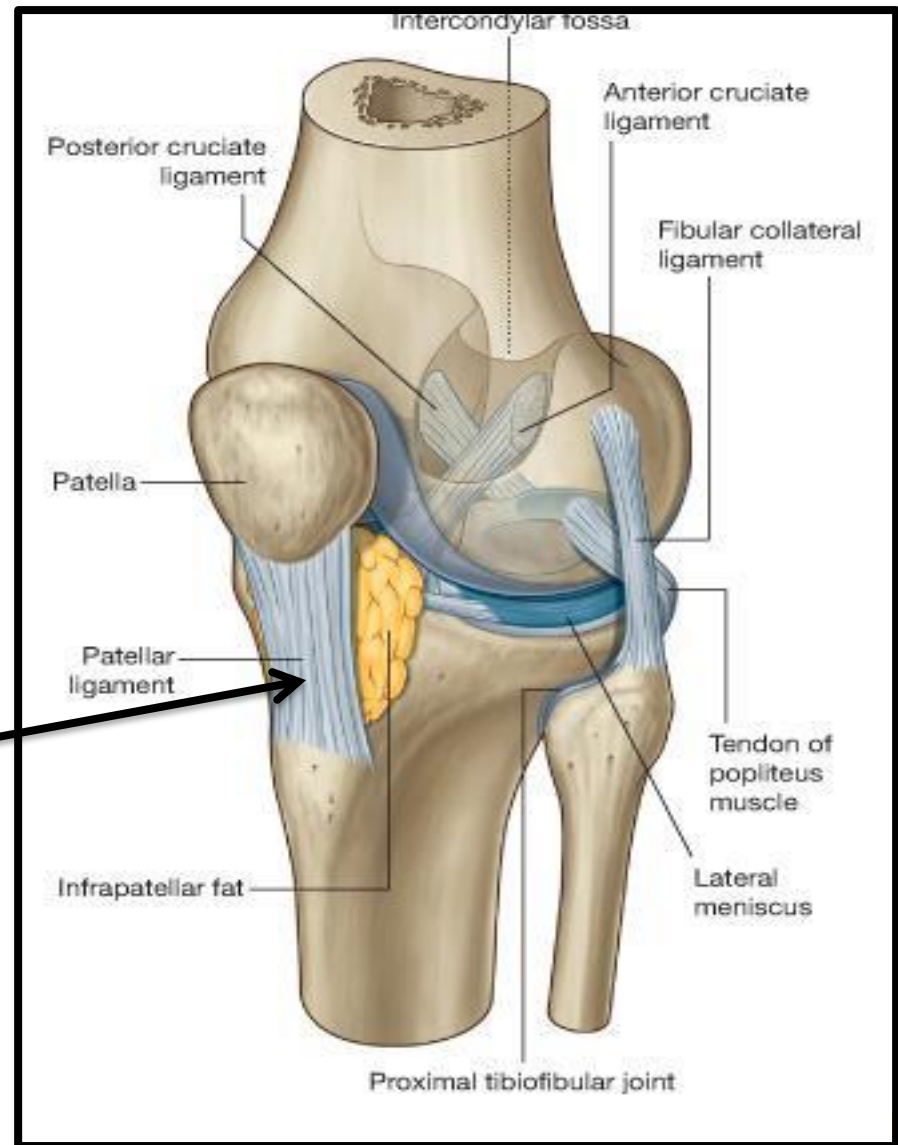
4-Ligaments of the knee joint

❖ *The ligaments may be divided into*

A-Extracapsular Ligaments

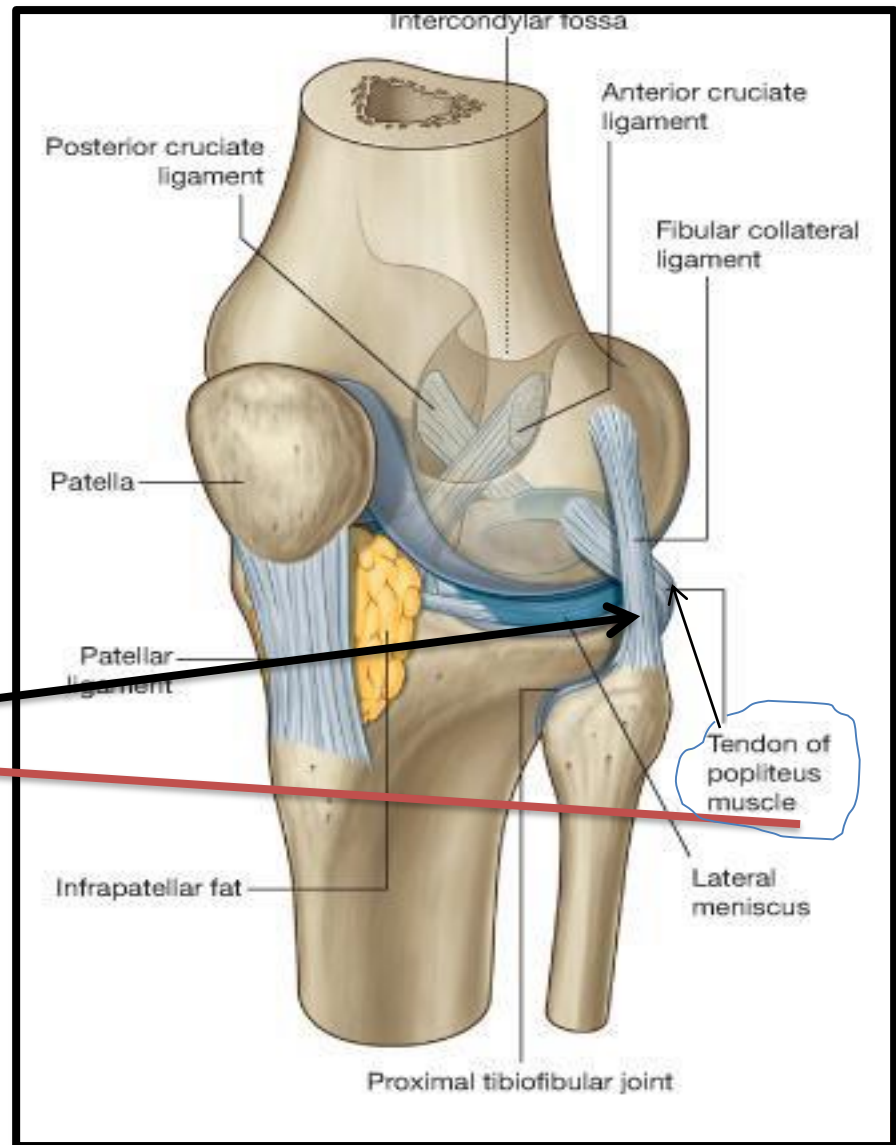
The ligamentum patellae

is attached above to the lower border of the patella and below to the tuberosity of the tibia.



❖ **The lateral collateral ligament**

is ***cordlike*** and is attached above to the ***lateral condyle*** of the femur and below to the ***head of the fibula***.



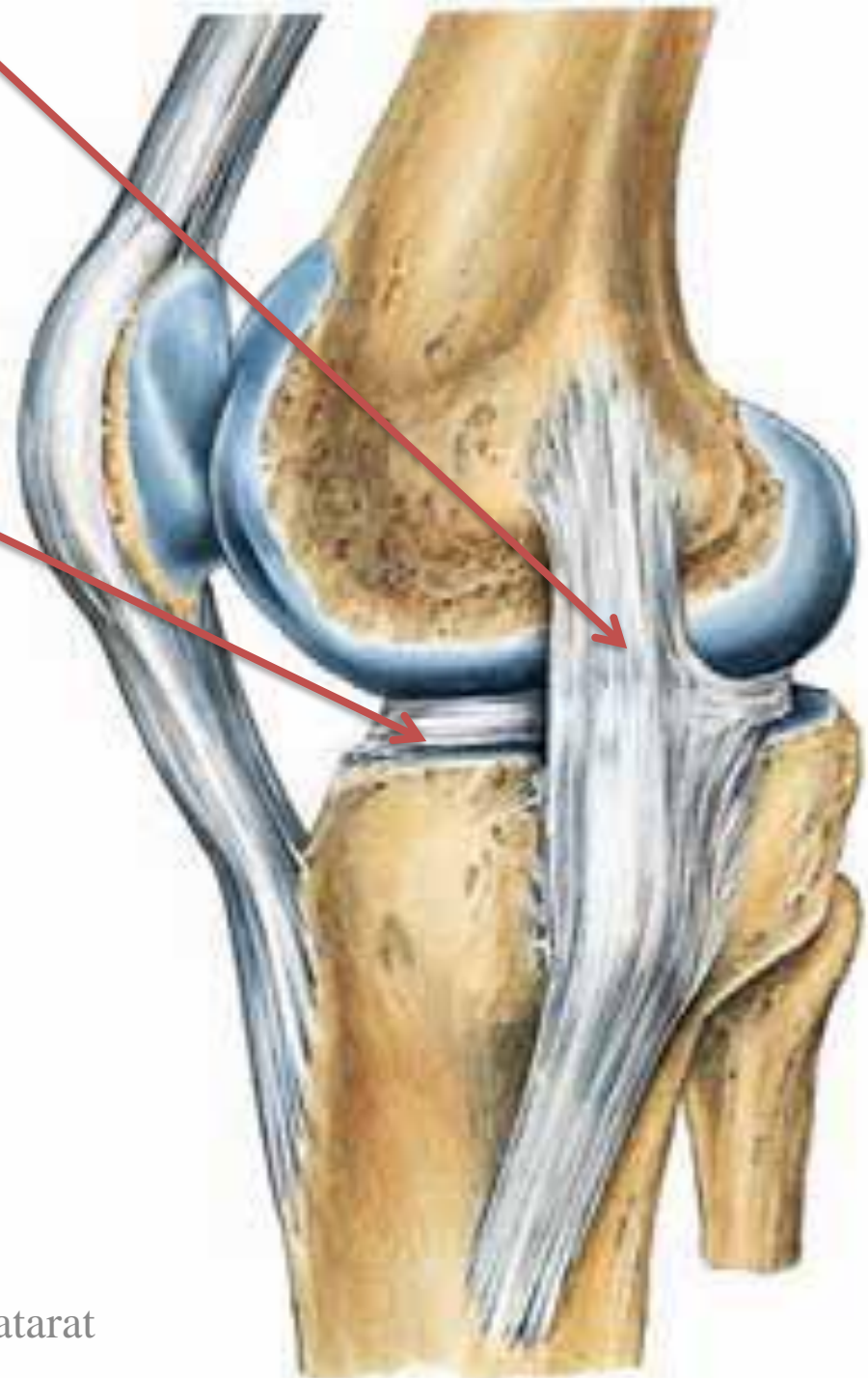
The tendon of the popliteus muscle intervenes between the ligament and the lateral Meniscus (thus, the ligament is not attached to the lateral meniscus)

What does this mean?

The medial collateral ligament is a *flat band* and is attached above to *the medial condyle* of the femur and below to *the medial surface* of the *shaft of the tibia*.

It is firmly attached to the edge of the medial meniscus ?!

What does this mean?

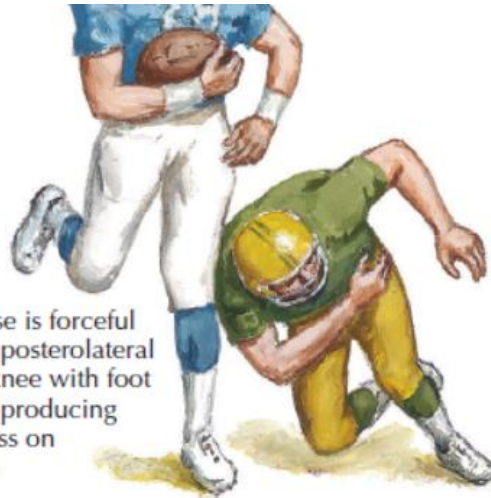


Tibial (medial) and fibular (lateral) collateral ligaments

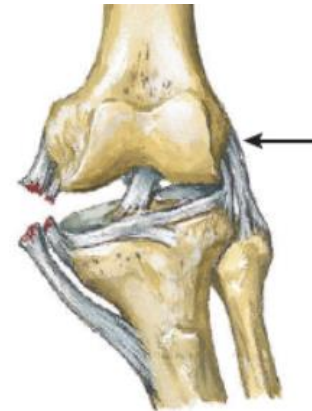
Tibial collateral ligament extends from the medial epicondyle of the femur inferiorly to attach to the medial aspect of the tibia. It is firmly attached to the capsule and medial meniscus. The tibial ligament prevents **lateral displacement** (abduction) of the tibia under the femur.



Injury to the medial collateral ligaments

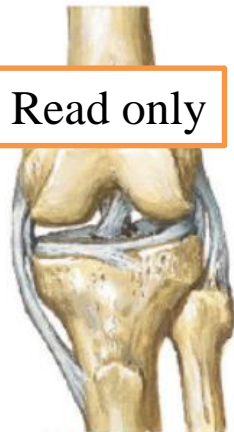


Usual cause is forceful impact on posterolateral aspect of knee with foot anchored, producing valgus stress on knee joint.



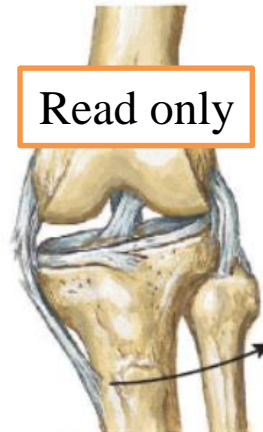
Valgus stress may rupture tibial collateral and capsular ligaments.

Read only



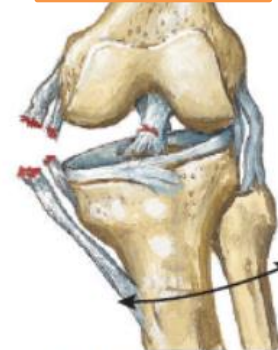
1st-Degree sprain. Localized joint pain and tenderness but no joint laxity

Read only



2nd-Degree sprain. Detectable joint laxity plus localized pain and tenderness

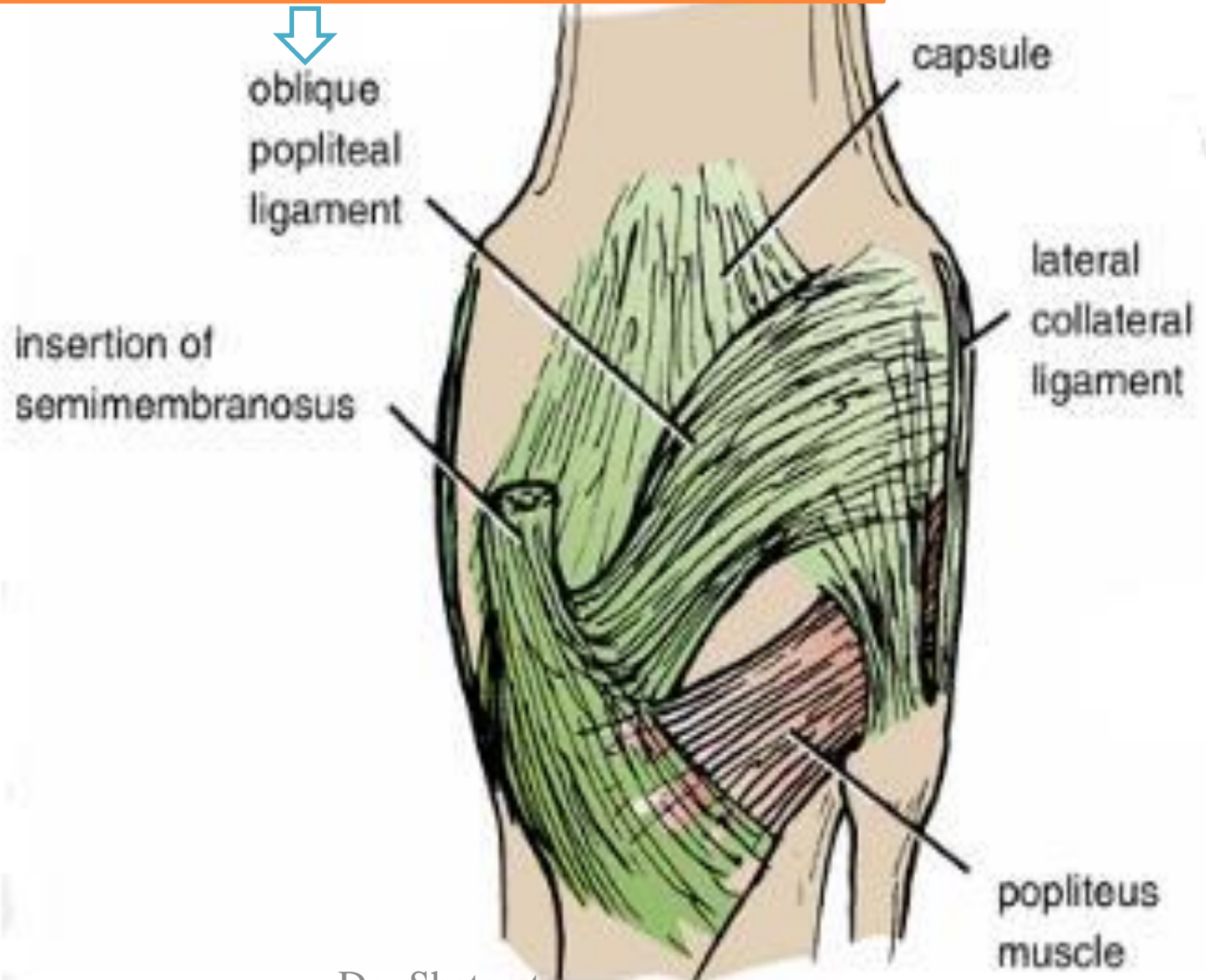
Read only



3rd-Degree sprain. Complete disruption of ligaments and gross joint instability

❖ The oblique popliteal ligament

Is a tendinous expansion derived from the semimembranosus muscle.
It strengthens the posterior aspect of the capsule

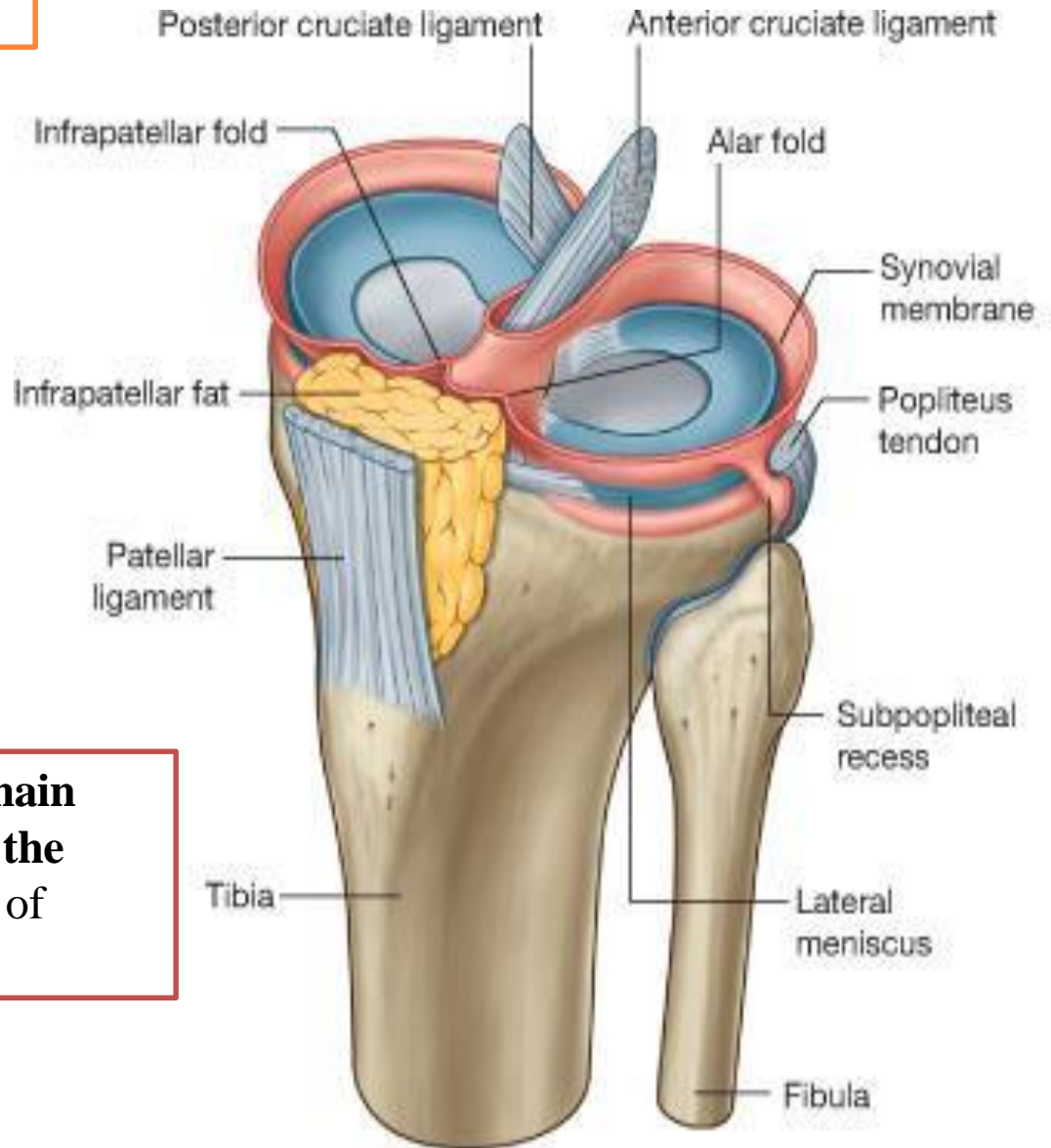


**B-
Intracapsular
Ligaments**

**The cruciate
ligaments**

They are named
anterior and posterior,
according to their
tibial attachments

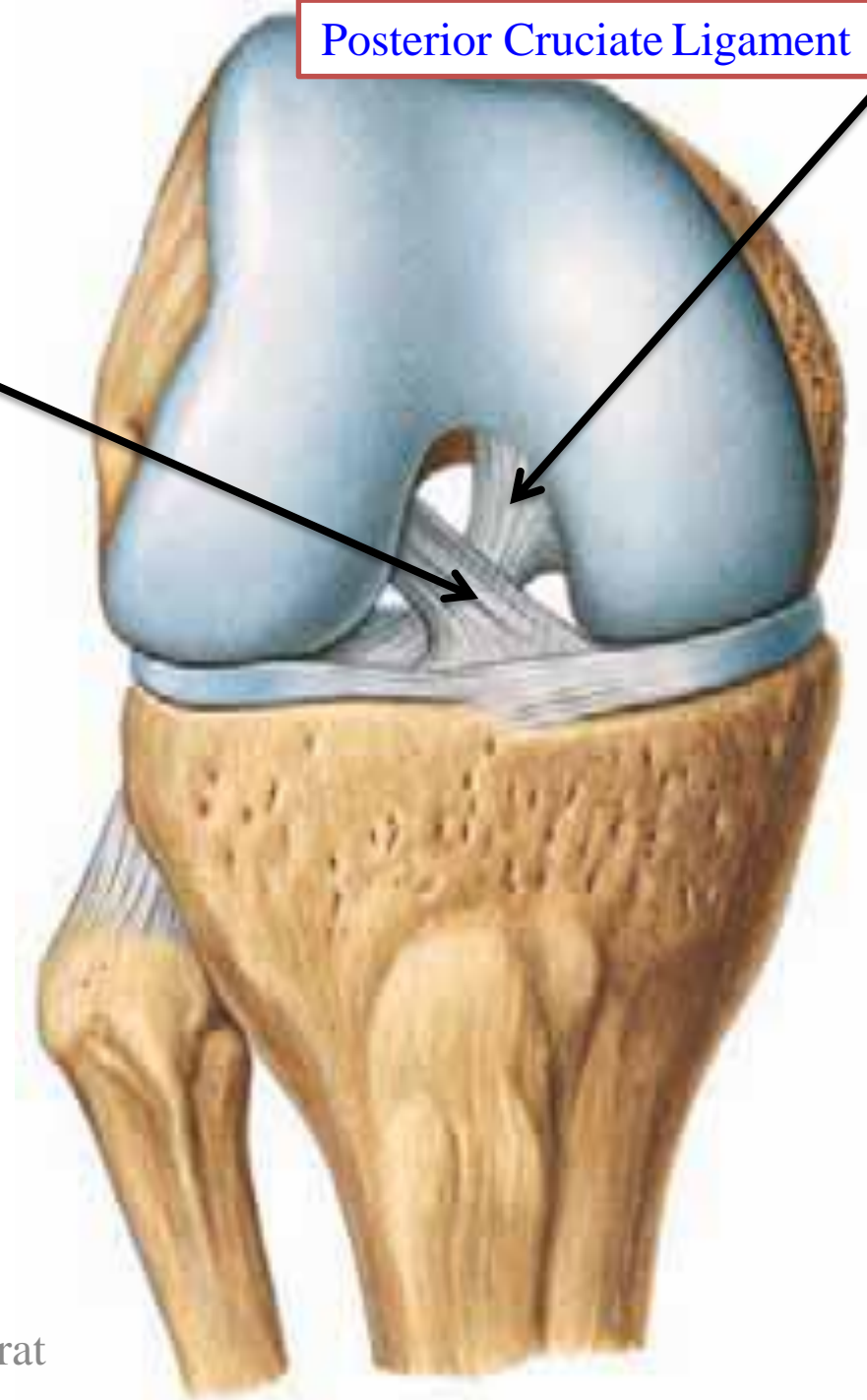
**The cruciate ligaments are the main
bond between the femur and the
tibia during the joint's range of
movement.**



Anterior Cruciate Ligament

➤ Is attached to the anterior intercondylar area of the tibia and *passes upward, backward, and laterally*, to be attached to *the posterior part of the medial surface of the lateral femoral condyle*

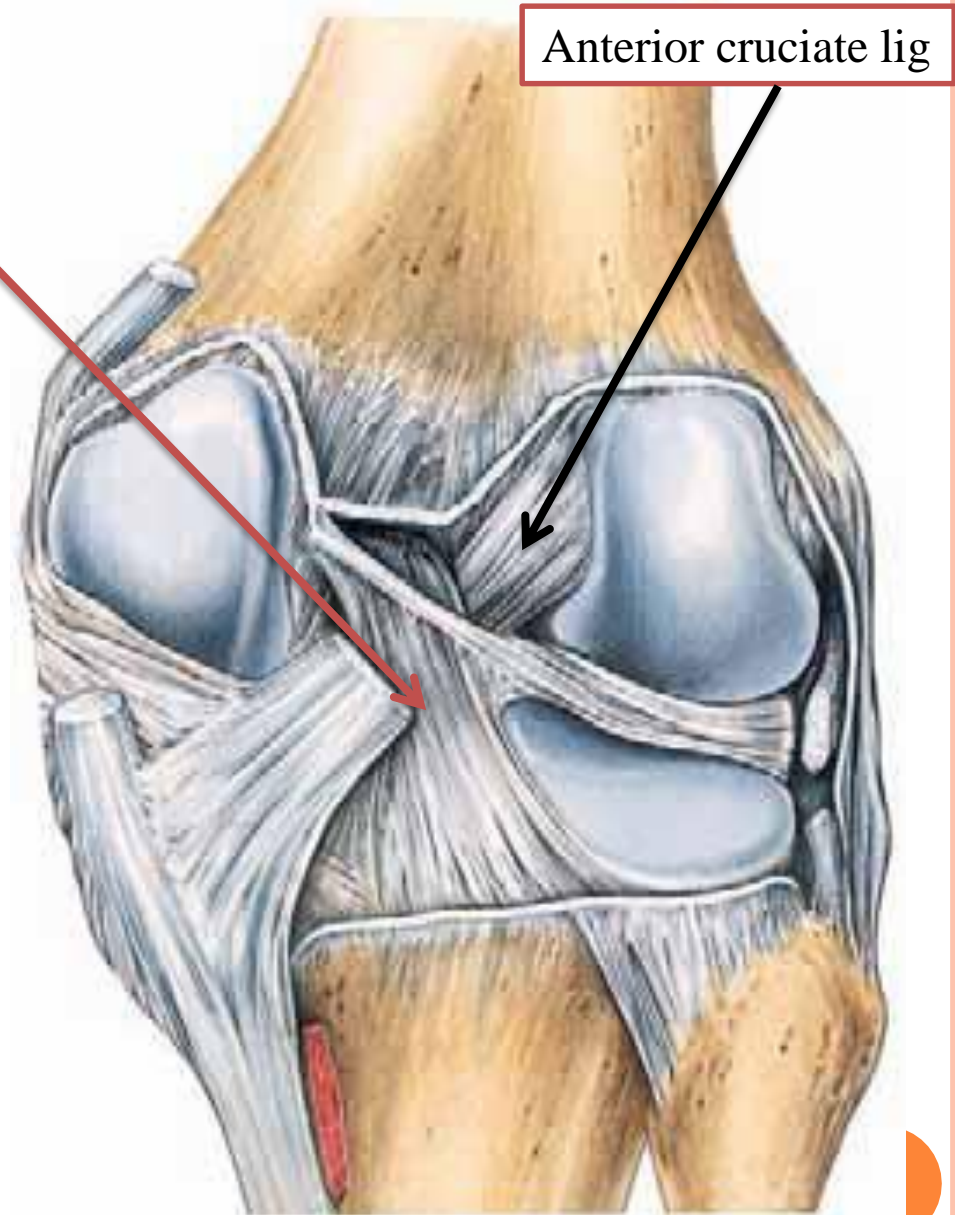
➤ Prevents *posterior displacement* of the femur on the tibia. With the knee joint flexed, the anterior cruciate ligament prevents the tibia from being **pulled anteriorly**.



Posterior Cruciate Ligament

➤ Is attached to **the posterior intercondylar area** of the tibia and **passes upward, forward, and medially** to be attached to the **anterior part of the lateral surface of the medial femoral condyle**

➤ Prevents **anterior displacement** of the femur on the tibia. With the knee joint flexed, the posterior cruciate ligament prevents the tibia from being **pulled posteriorly**.



Anterior cruciate lig

Posterior view of the knee

Clinical Correlate

The tests for the integrity of the anterior and posterior cruciate ligaments are the **anterior and posterior drawer signs.**

Tearing of the anterior cruciate ligaments allows the tibia to be easily pulled **forward** (anterior drawer sign). Tearing of the posterior cruciate ligament allows the tibial to be easily pulled **posteriorly** (posterior drawer sign).

Read only

LELLI'S TEST FOR ACL LESION

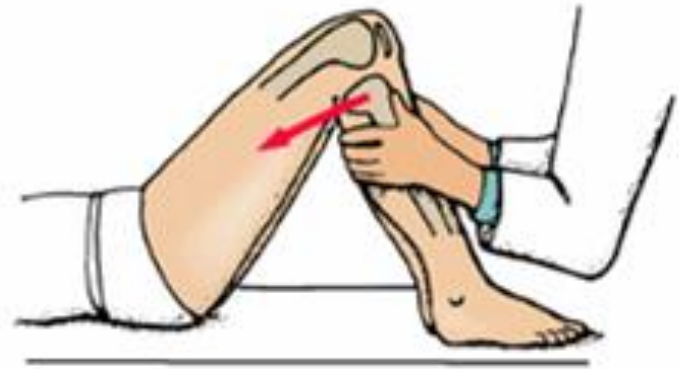
<https://www.youtube.com/watch?v=eEhpwTU3KXg>





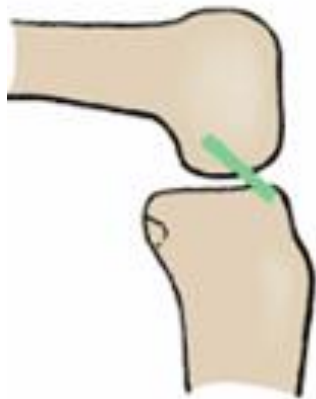
B

test for anterior
cruciate ligament

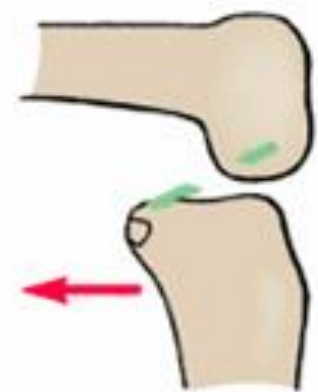
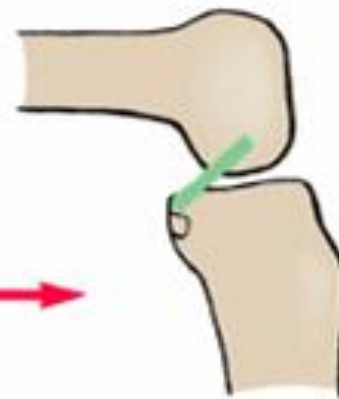


C

test for posterior
cruciate ligament



ruptured anterior
cruciate ligament



ruptured posterior
cruciate ligament

5-Menisci

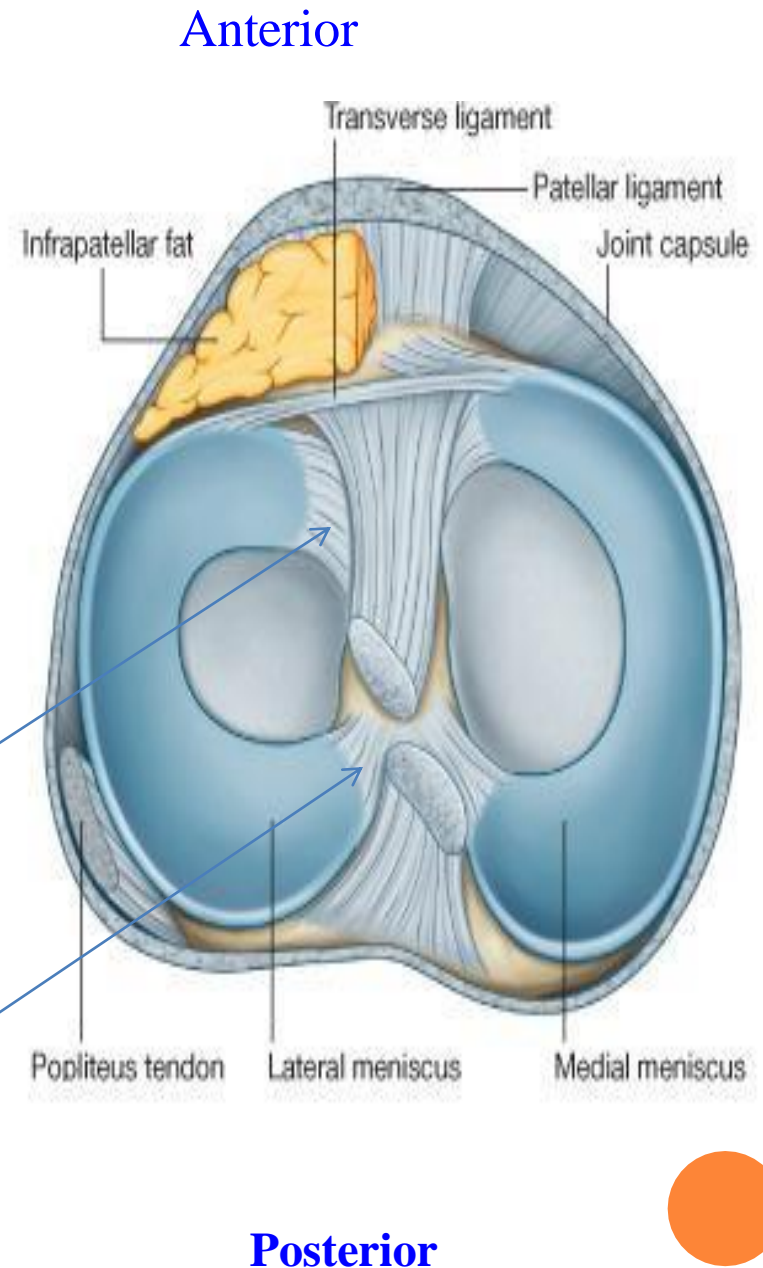
➤ **Medial** and **lateral** menisci are C-shaped sheets of fibrocartilage. (composed of *fibrous connective tissue* and **NOT** of cartilage).

➤ Their function *is to deepen* the articular surfaces of the tibial condyles to receive the convex femoral condyles;
➤ They also serve as *cushions* between the two bones

➤ Each meniscus is attached to the upper surface of the tibia **by anterior and posterior horns.**

5/22/2021

Dr. Shatarat



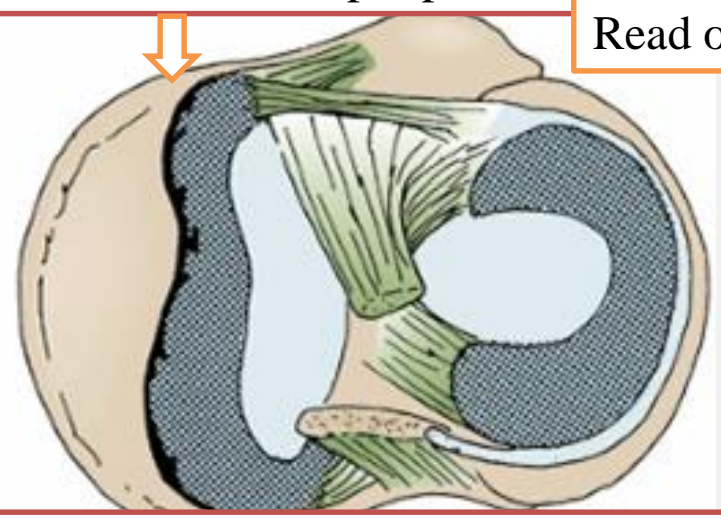
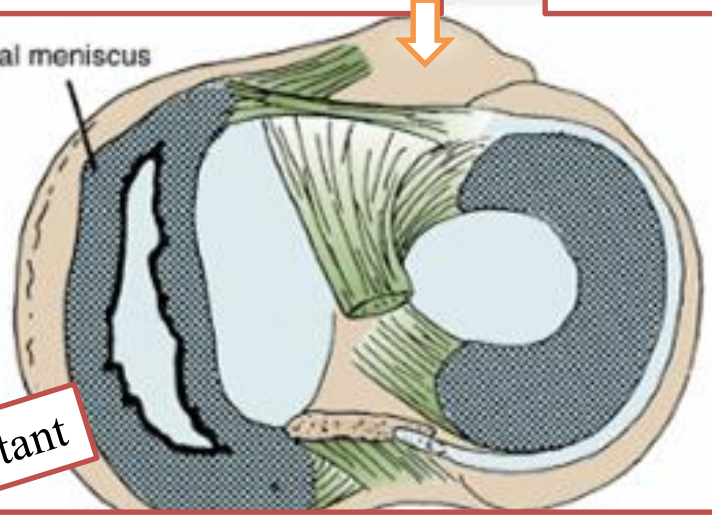
A. Complete bucket handle tear.

B. The meniscus is torn from its peripheral attachment.

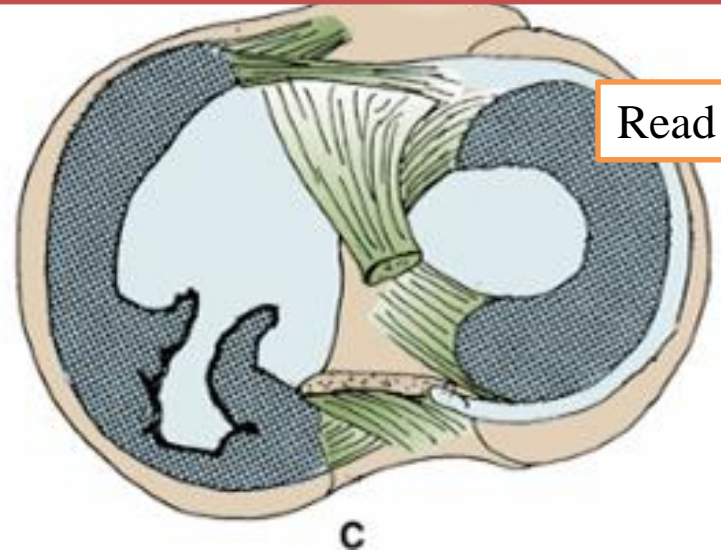
Read only

important

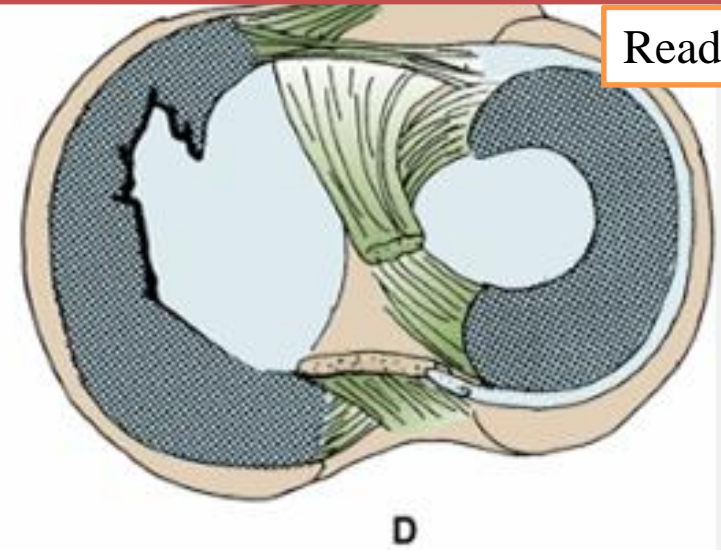
medial meniscus



The most common type of meniscus tear that causes locking is known as a bucket-handle tear. This is where part of the cartilage gets torn, but remains partially attached producing a moveable flap. As the knee moves around, if the flap is large enough it can get wedged in the wrong position, blocking the joint and causing **knee locking**.



Read only



Read only

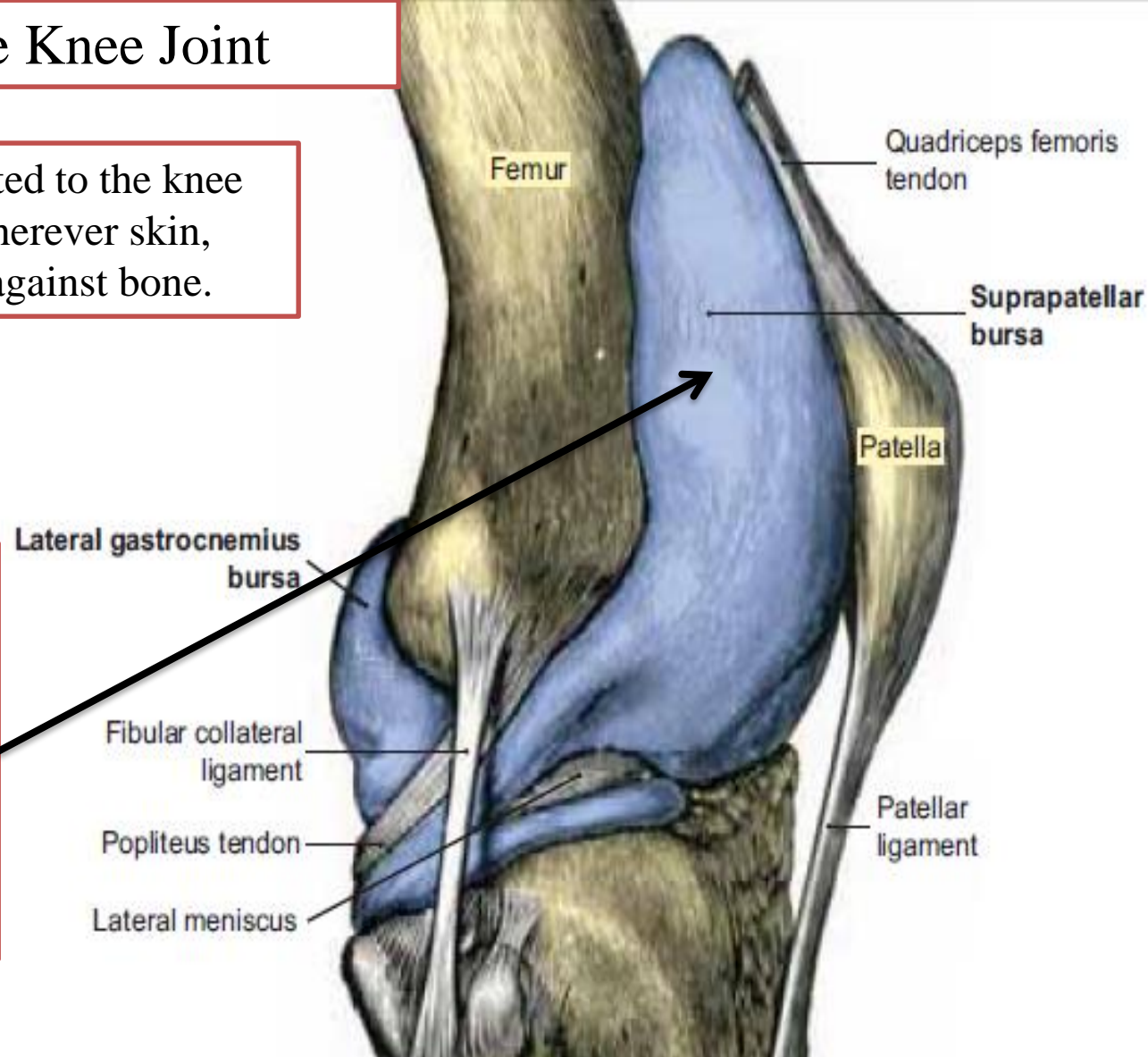
C. Tear of the posterior portion of the meniscus

D. Tear of the anterior portion of the meniscus

6-Bursae Related to the Knee Joint

Numerous bursae are related to the knee joint. They are found wherever skin, muscle, or tendon rubs against bone.

The suprapatellar bursa lies beneath the quadriceps muscle and **communicates with the joint cavity**

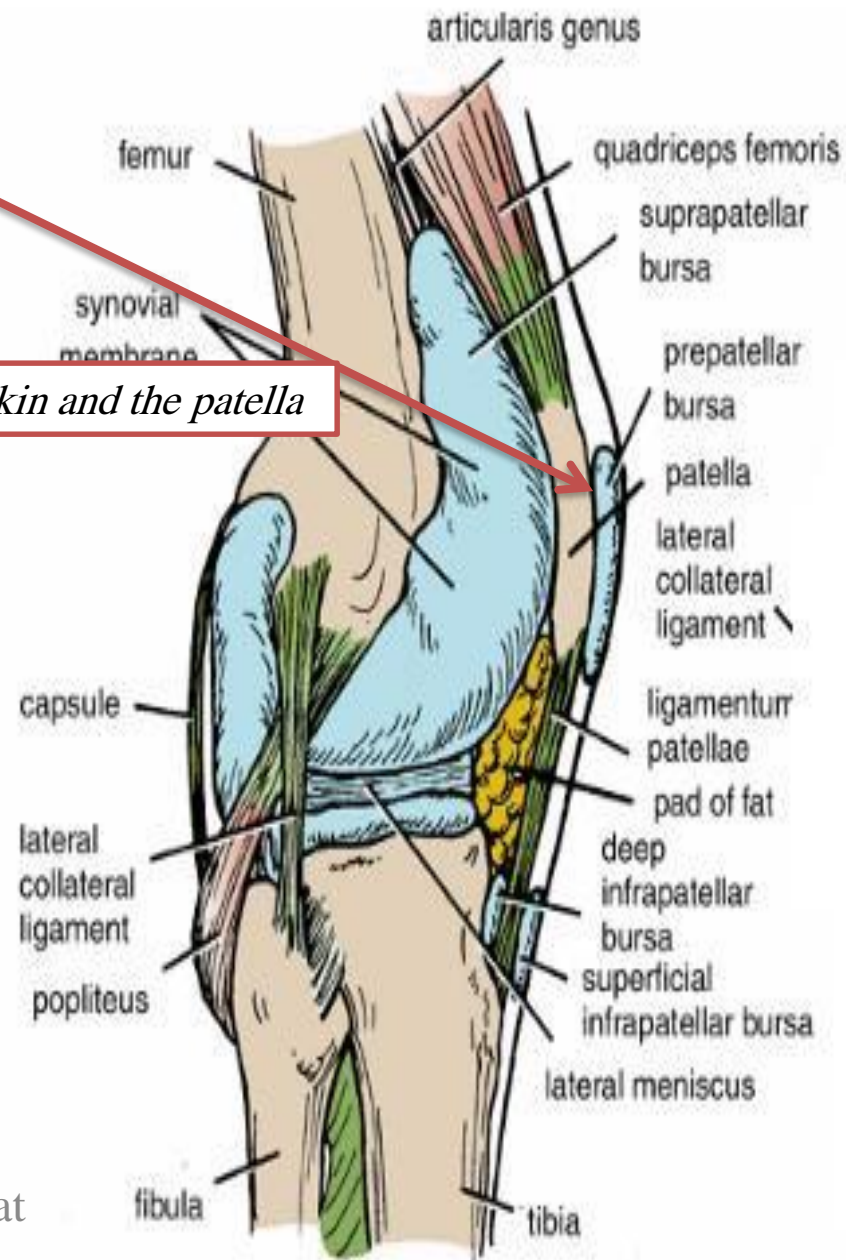


consequently, abrasions or penetrating wounds (e.g., a stab wound) superior to the patella may result in *suprapatellar bursitis* caused by *bacteria entering the bursa from the torn skin*. **The infection may spread to the knee joint.**

The prepatellar bursa lies in the subcutaneous tissue between the skin and the front of the lower half of the patella and the upper part of the ligamentum patellae

Prepatellar bursitis (“housemaid's knee”)

is usually a friction bursitis caused by friction between the skin and the patella



8-Nerve Supply of knee joint
The femoral, obturator, common peroneal, and
tibial nerves supply the knee joint.

Pain can be perceived in the hip???!!!!

9-movements of the knee joint

Flexion

The **biceps femoris, semitendinosus, and semimembranosus** muscles, assisted by **the gracilis, and sartorius**, produce flexion.

Flexion is limited by **the contact of the back of the leg with the thigh.**

Extension

The **quadriceps femoris**.

Extension is limited **by the tension of all the major ligaments of the joint.**

Medial Rotation

The **sartorius, gracilis, and semitendinosus**

Lateral Rotation

The **biceps femoris**

Note:

The stability of the knee *joint depends on the tone of the strong muscles* acting on the joint and the strength of the ligaments.

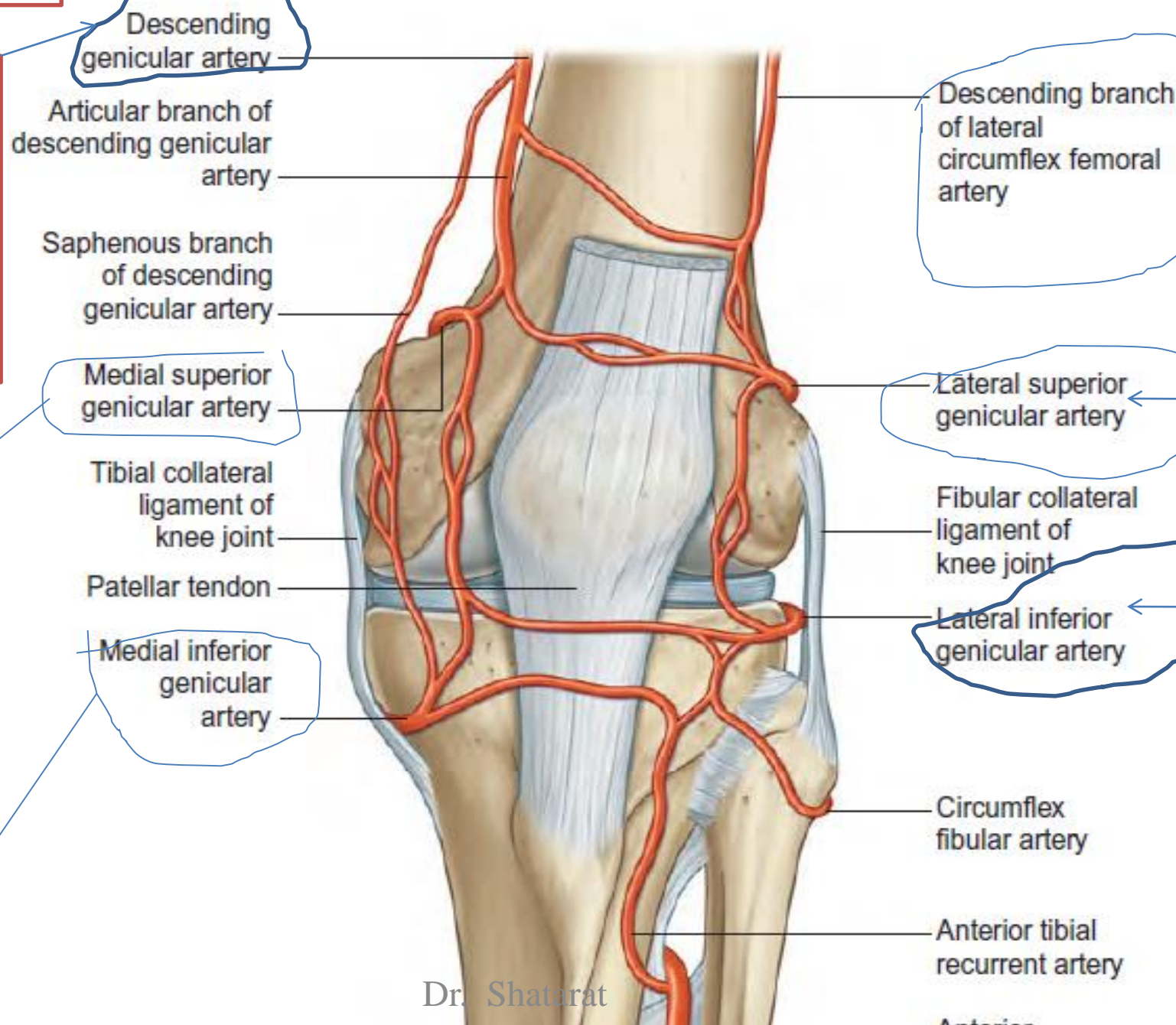


10- blood supply

Branch of the femoral artery in the adductor canal

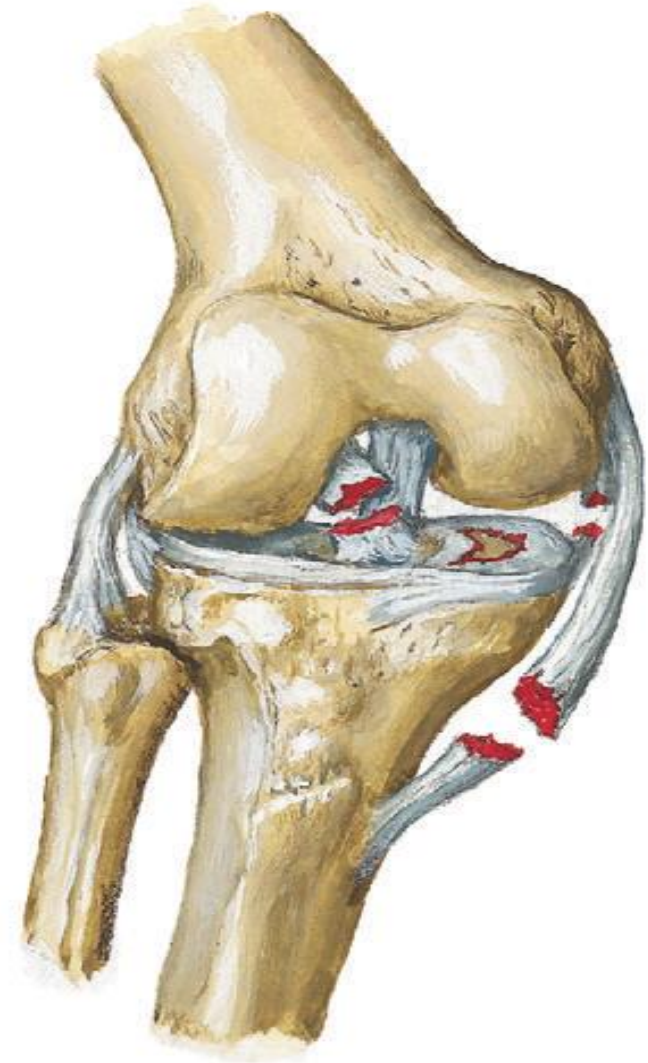
From the popliteal artery

From the popliteal artery



Common Knee Injuries

The 3 most commonly injured structures at the knee are the tibial collateral ligament, the medial meniscus, and the ACL (**the terrible or unhappy triad**)—usually results from a blow to the lateral aspect of the knee with the foot on the ground.



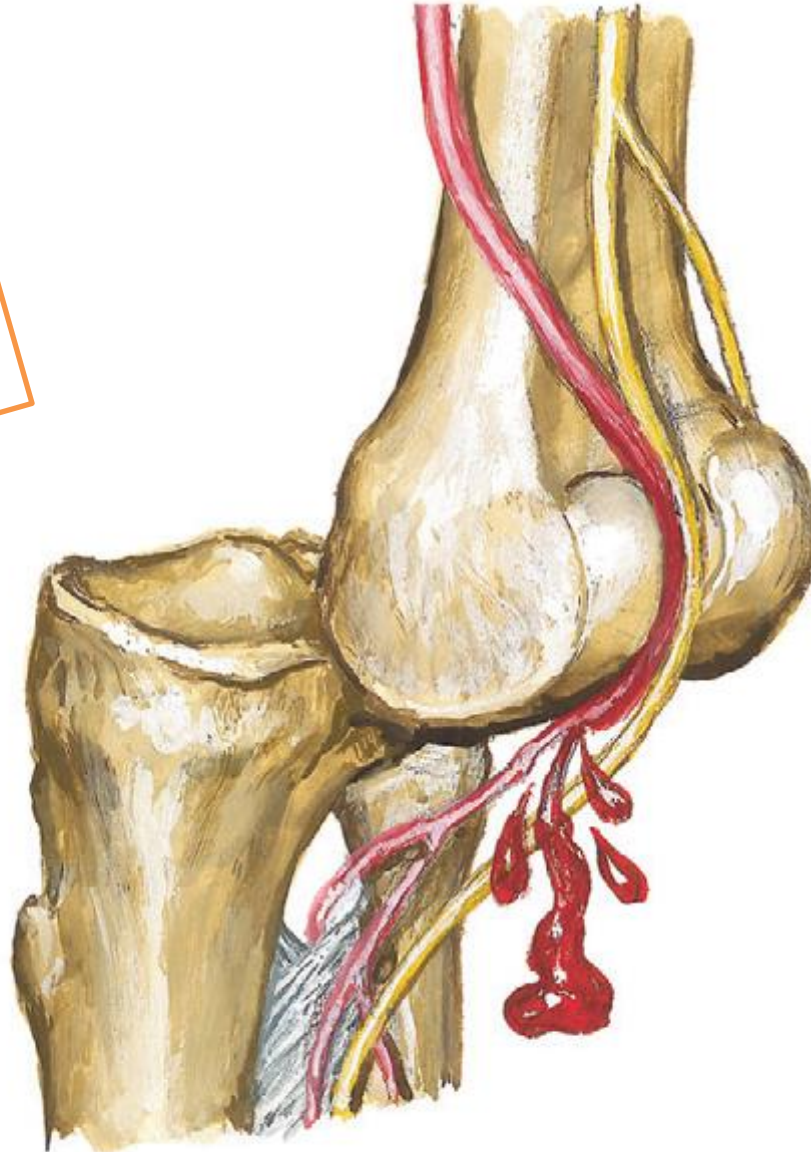
2/15/2016

Posterior Dislocation of the knee joint

May cause



Tear of popliteal artery
or
Tibial common peroneal
nerves



In fractures of the distal third of the shaft of the femur, the same displacement of the distal fragment occurs as seen in fractures of the middle third of the shaft..

However, the distal fragment is smaller and is rotated backward by the gastrocnemius muscle to a greater degree and may exert pressure on the **popliteal artery** and interfere with the blood flow through the leg and foot



Ankle Joint

Type

The ankle is a synovial hinge joint.

Articulation

the lower end of the tibia, the two malleoli, and the body of the talus

Ligaments

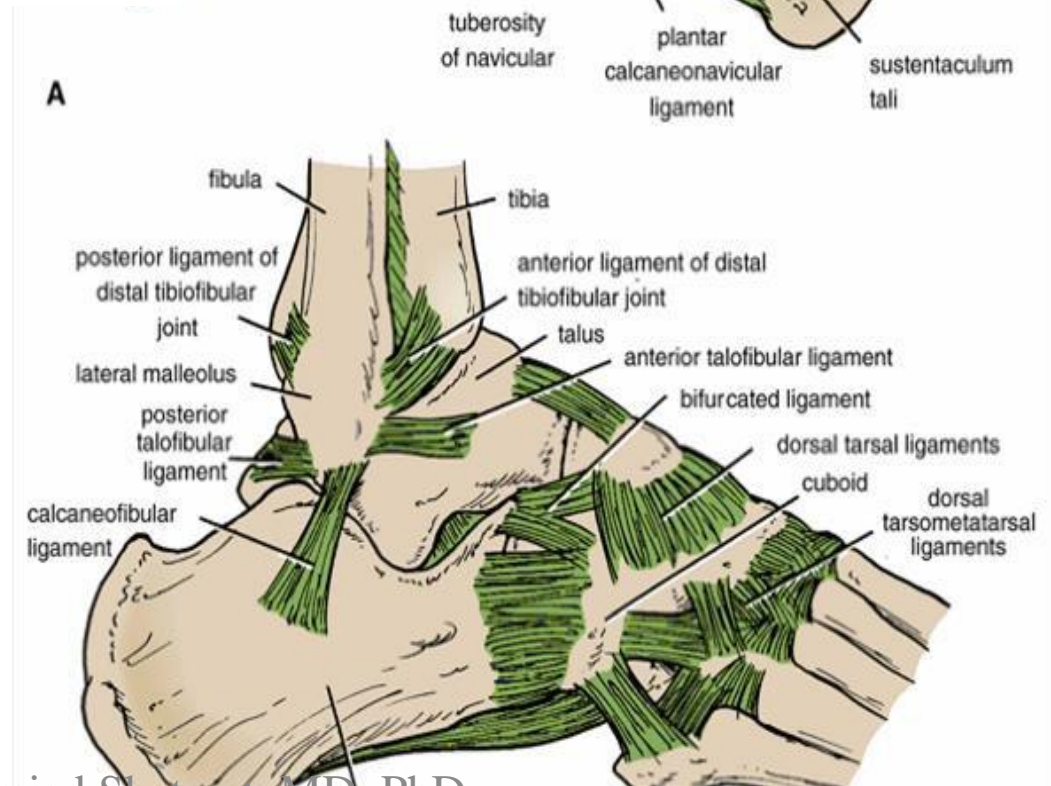
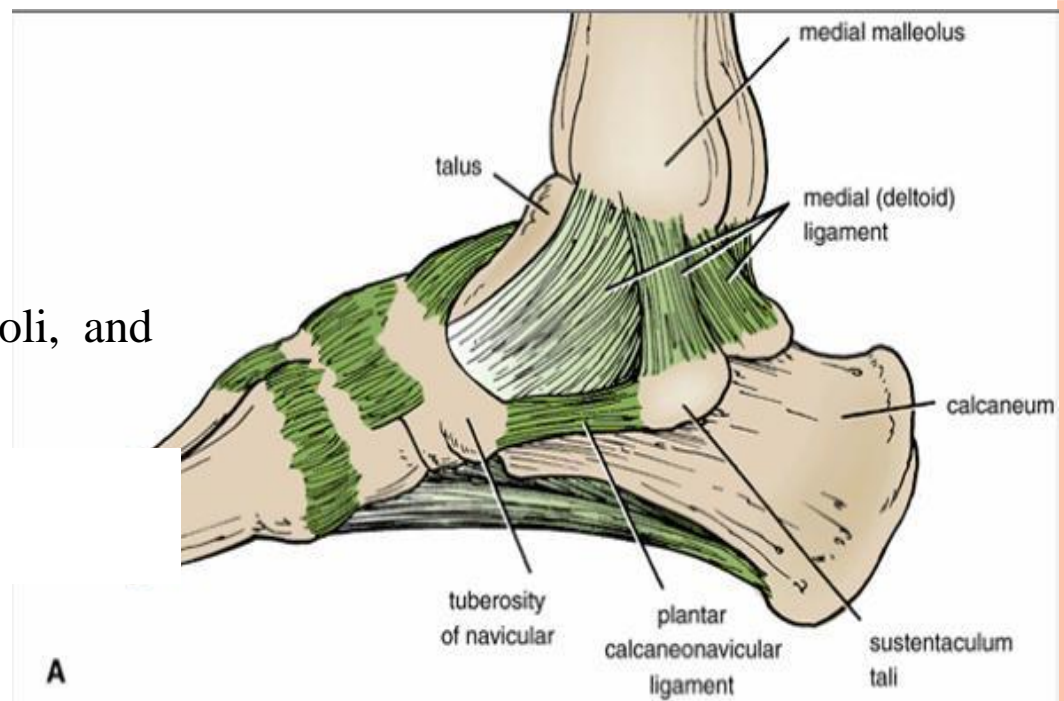
The medial, or deltoid, ligament

The lateral ligament

Movements

Dorsiflexion

Plantar flexion



Proximal Tibiofibular Joint

➤ **Articulation**

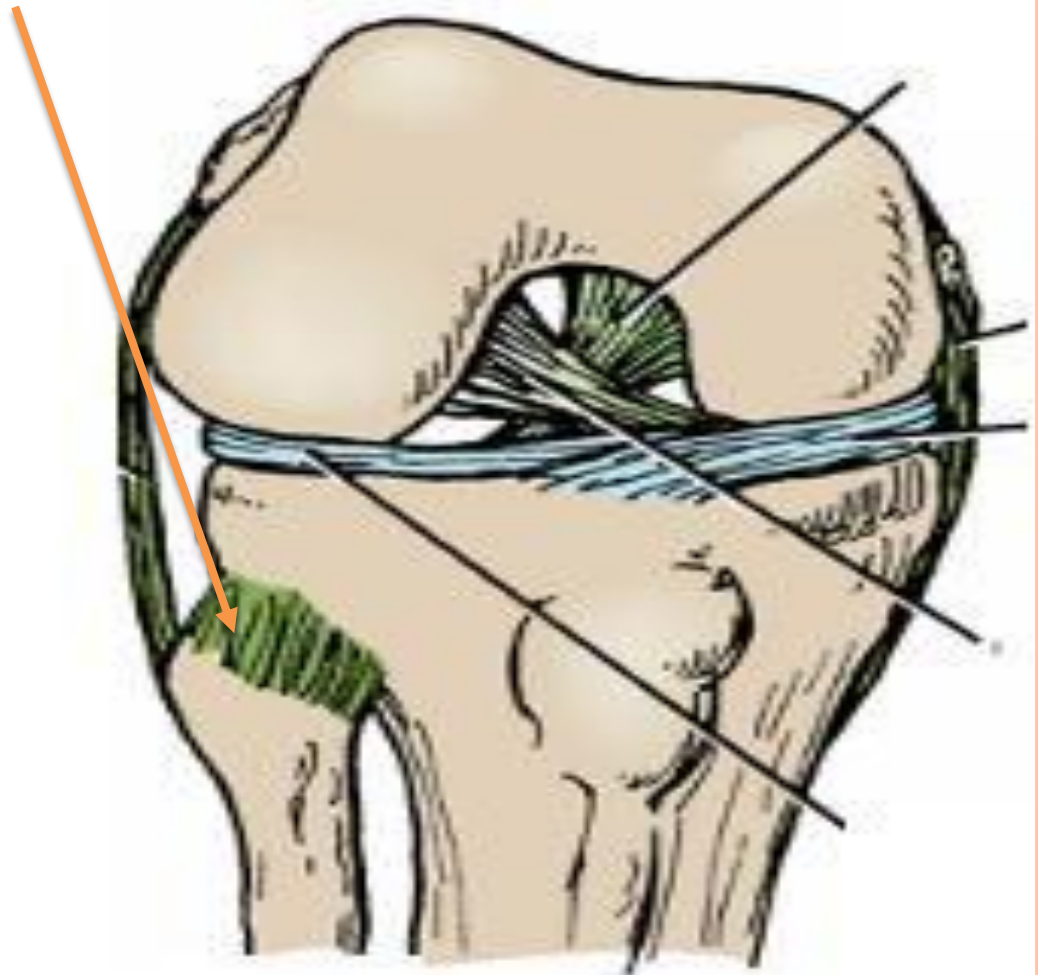
Articulation is between the lateral condyle of the tibia and the head of the fibula).

➤ **Type**

This is a synovial, plane, gliding joint.

➤ **Movements**

A small amount of gliding movement takes place during movements at the ankle joint.



Distal Tibiofibular Joint

➤ Articularion

Articulation is between the fibular notch at the lower end of the tibia and the lower end of the fibula

➤ Type

The distal tibiofibular joint is

a fibrous joint

➤ Capsule

There is no capsule.

Ligaments

Read only

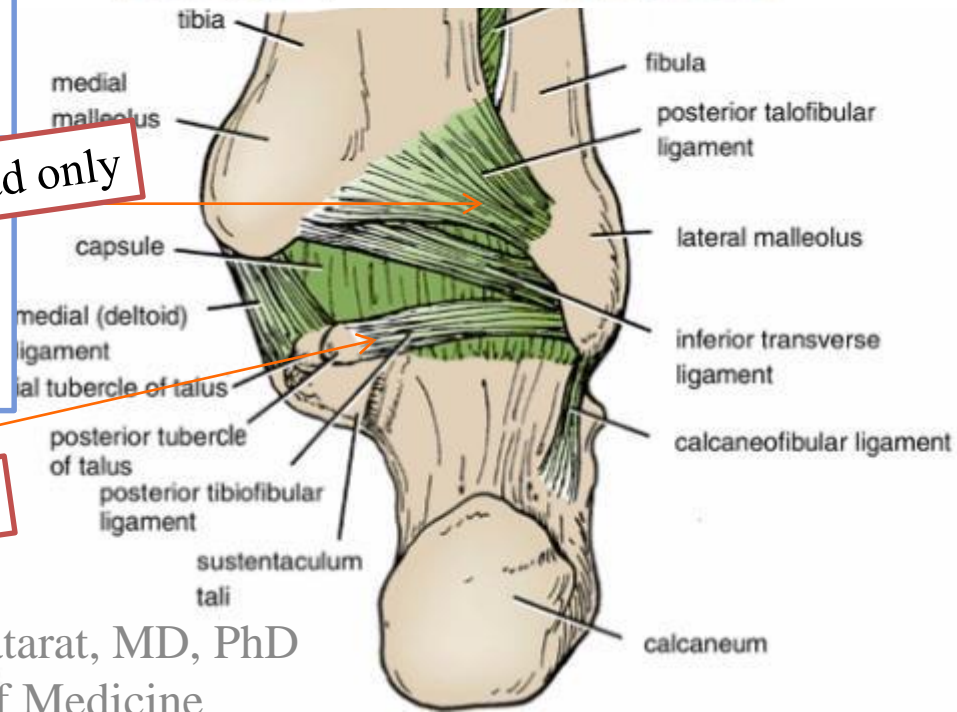
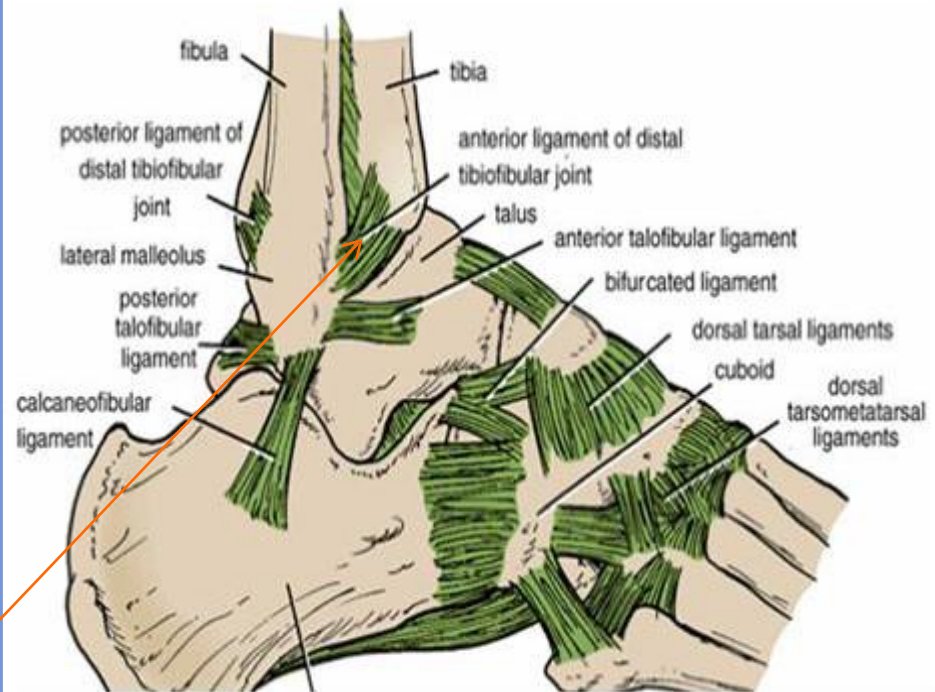
The **interosseous ligament** is a strong, thick band of fibrous tissue that binds the two bones together.

1 The **anterior and posterior ligaments** are flat bands of fibrous tissue connecting the two bones together in front and behind the interosseous ligament

Read only

2 The **inferior transverse ligament**

Read only



Tarsal Joints

1-Subtalar Joint

The subtalar joint is the posterior joint between **the talus and the calcaneum.**

Articulation

is between the inferior surface of the body of the talus and the facet on the middle of the **upper surface of the calcaneum**

Type

These joints are synovial, of the plane variety

Ligaments

Read only

Medial and lateral (talocalcaneal) ligaments strengthen the capsule. The interosseous (talocalcaneal) ligament is strong and is the main bond of union between the two bones. It is attached above to the sulcus tali and below to the sulcus calcanei..

Movements

Gliding and rotatory movements are possible



2-Talocalcaneonavicular Joint

is the anterior joint between the talus and the calcaneum and also involves the navicular bone

Articulation

Articulation is between the rounded head of the talus, the upper surface of the sustentaculum tali, and the posterior concave surface of the navicular bone.

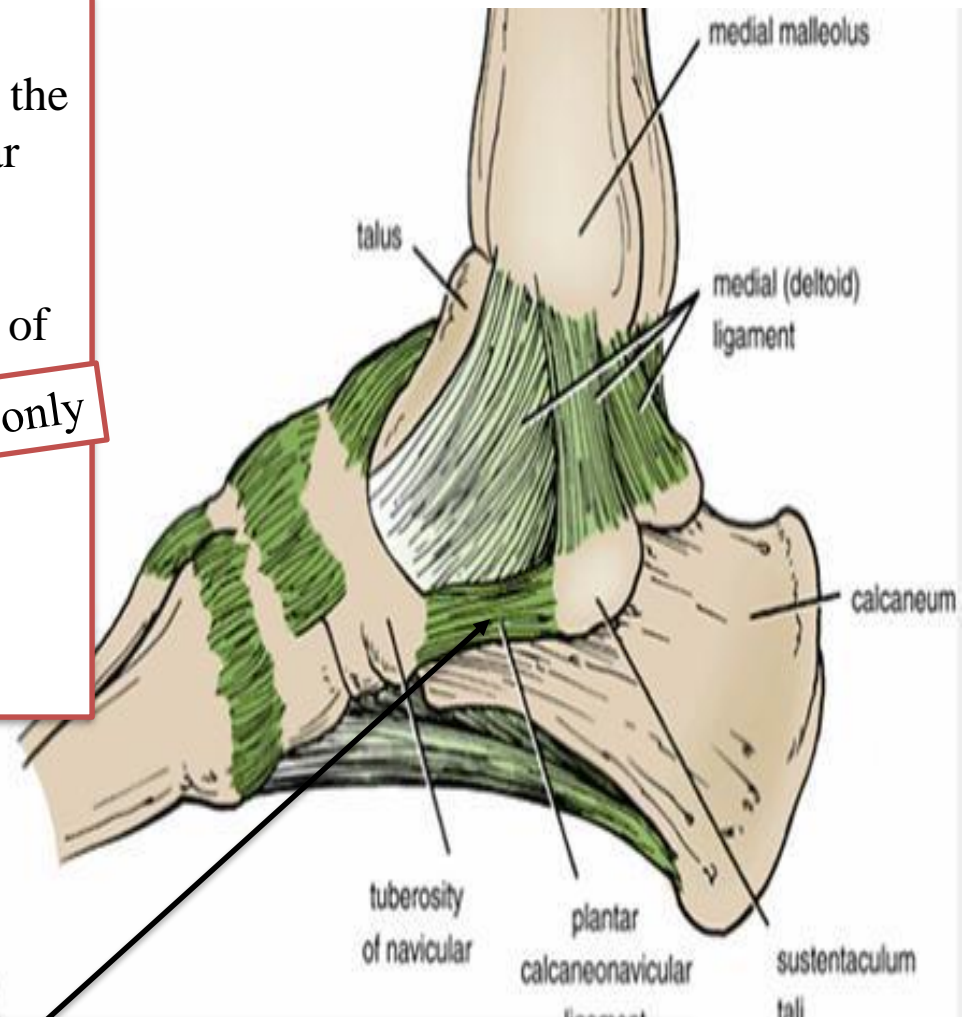
Type

The joint is a synovial joint..

Ligaments.

Read only

Read only



The plantar calcaneonavicular ligament is strong and runs from the anterior margin of the sustentaculum tali to the inferior surface and tuberosity of the navicular bone. The superior surface of the ligament is covered with fibrocartilage and supports the head of the talus..

Movements

Gliding and rotatory movements are possible

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School of Medicine

5/22/2021

3-Calcanecuboid Joint

Articulation

Articulation is between the anterior end of the calcaneum and the posterior surface of the cuboid

The calcaneocuboid joint is synovial, of the plane variety.

Ligaments

The bifurcated ligament

The talocalcaneonavicular and the calcaneocuboid joints are together referred to as the midtarsal or transverse tarsal joints



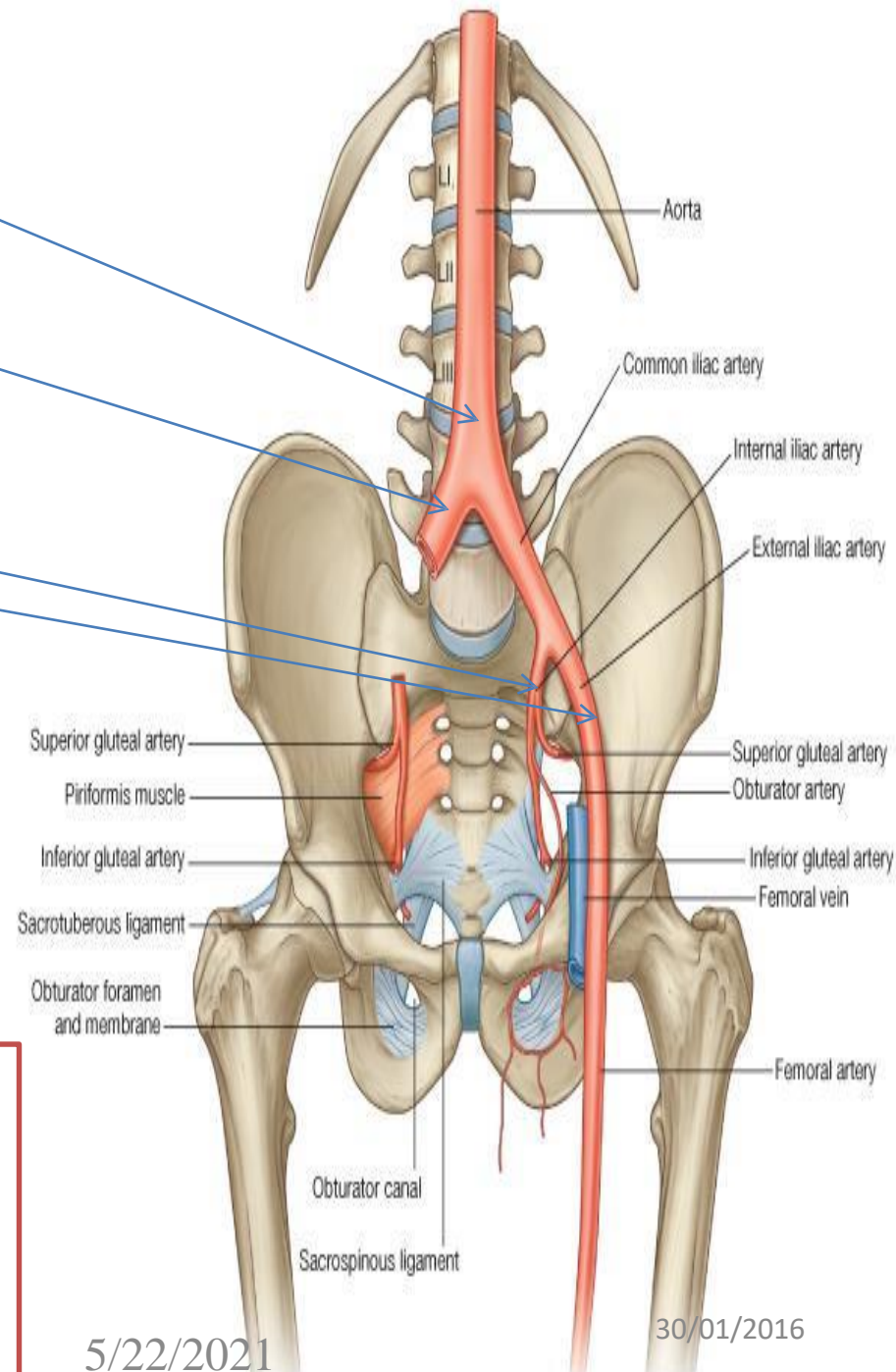
Blood supply of the lower limbs

1- The abdominal aorta divides at the level of **L4** into Right and left **common iliac arteries**

2- Each common iliac artery divides into **external and internal iliac arteries**

3- The external iliac artery becomes **the femoral artery** (**as it passes behind the inguinal ligament**) which will be the **main** blood supply to the whole lower limb

4- **The internal iliac artery** shares in the blood supply of the lower limb through its branches, for example, **the superior and inferior gluteal arteries and obturator**



5- **THE FEMORAL ARTERY** (to be discussed later) begins midinguinal point and ends at the **opening in the adductor magnus** where it becomes

THE POPLITEAL ARTERY

6- **The popliteal artery**

Ends at the lower border of the popliteus muscle by dividing into

ANTERIOR AND POSTERIOR TIBIAL ARTERIES

7- **The anterior tibial artery** supplies the anterior compartment of the leg and terminates

in front of the ankle joint by becoming

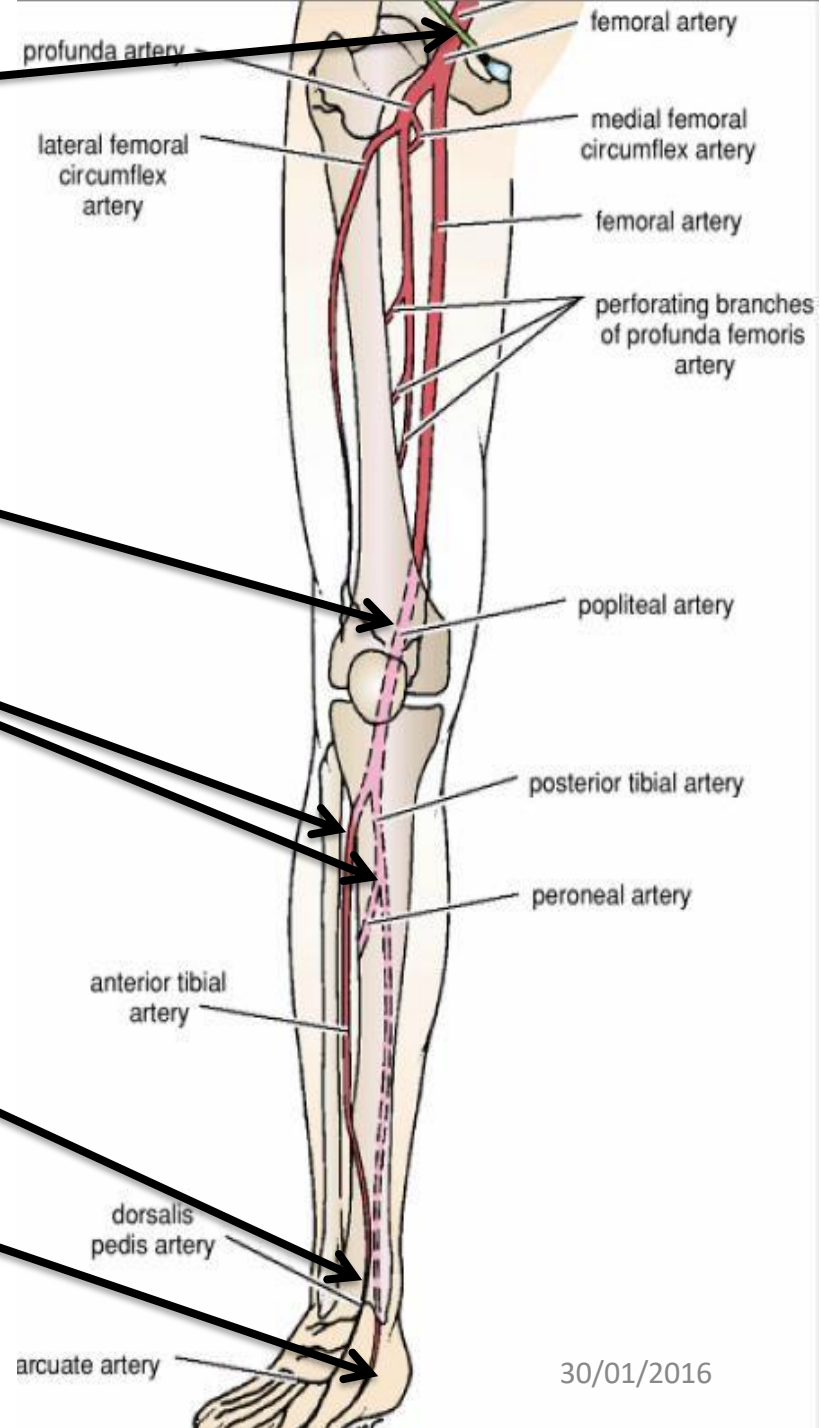
THE DORSALIS PEDIS ARTERY

8- The posterior tibial artery supplies the posterior and the lateral compartments of the leg ends deep to the flexor retinaculum by dividing

Into

MEDIAL AND LATERAL PLANTER ARTERIES

which supply the sole



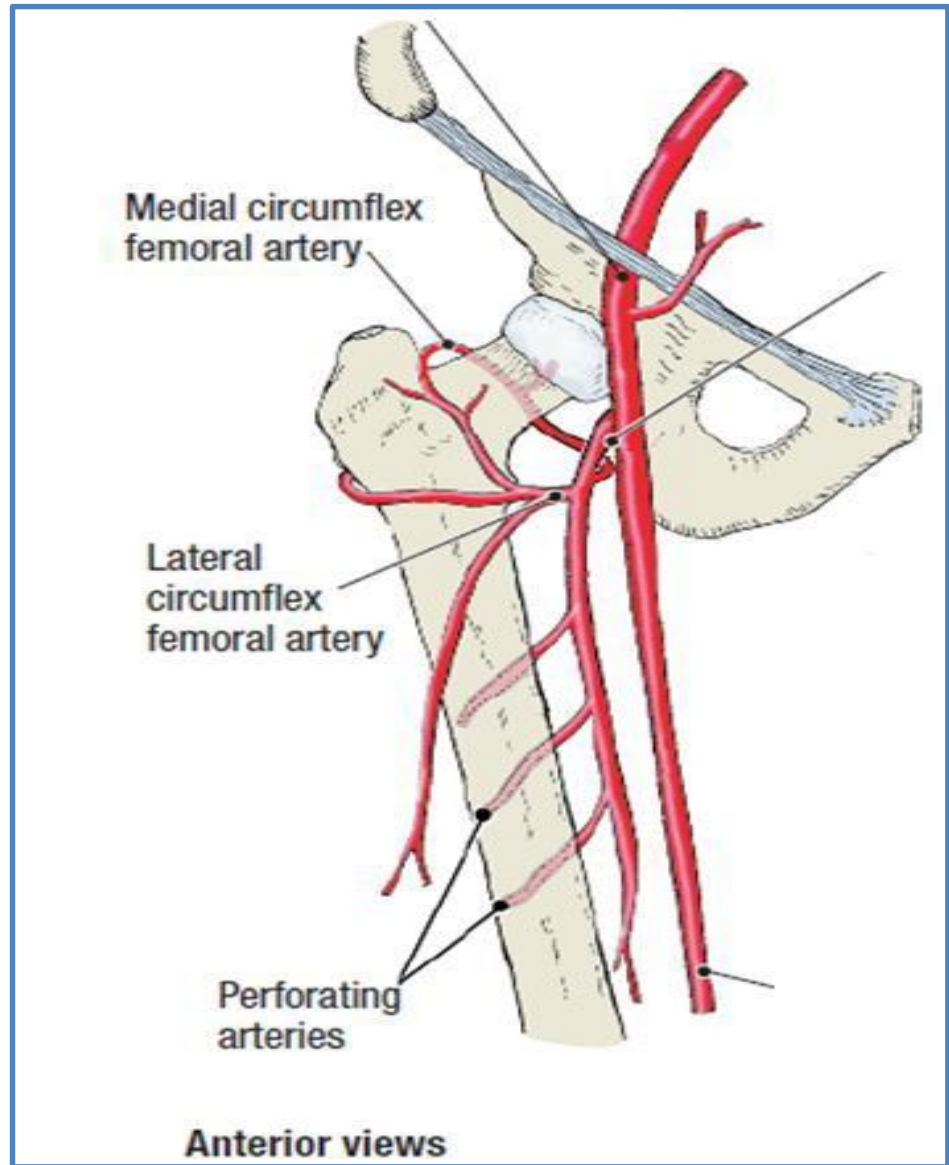
**Where should you palpate the pulse
of
different arteries in the lower limb?**

The femoral artery

In the femoral triangle, its pulse is easily felt just inferior to the inguinal ligament **midway** between the **pubic symphysis** and the **anterior superior iliac spine**.

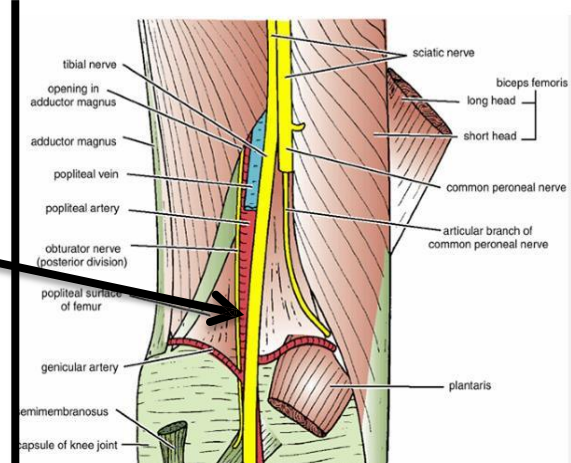


Femoral pulse



The popliteal artery

The popliteal artery pulse is difficult to find, but usually can be detected on deep palpation just medial to the midline of the popliteal fossa.



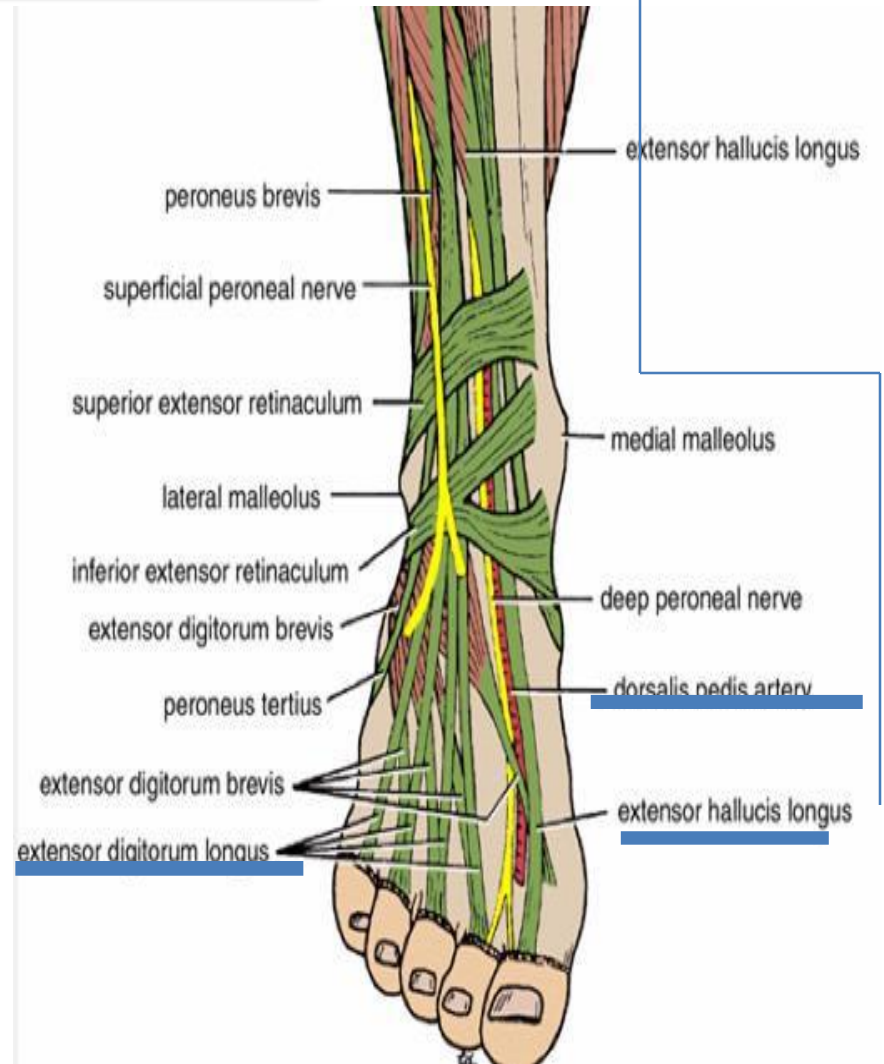
Popliteal pulse

The dorsalis pedis artery

Passes onto the dorsal aspect of the foot and anteriorly over the tarsal bones where it lies **between and is parallel** to the tendon of **extensor hallucis longus** and the tendon of **extensor digitorum longus** to the second toe.



Dorsalis pedis pulse

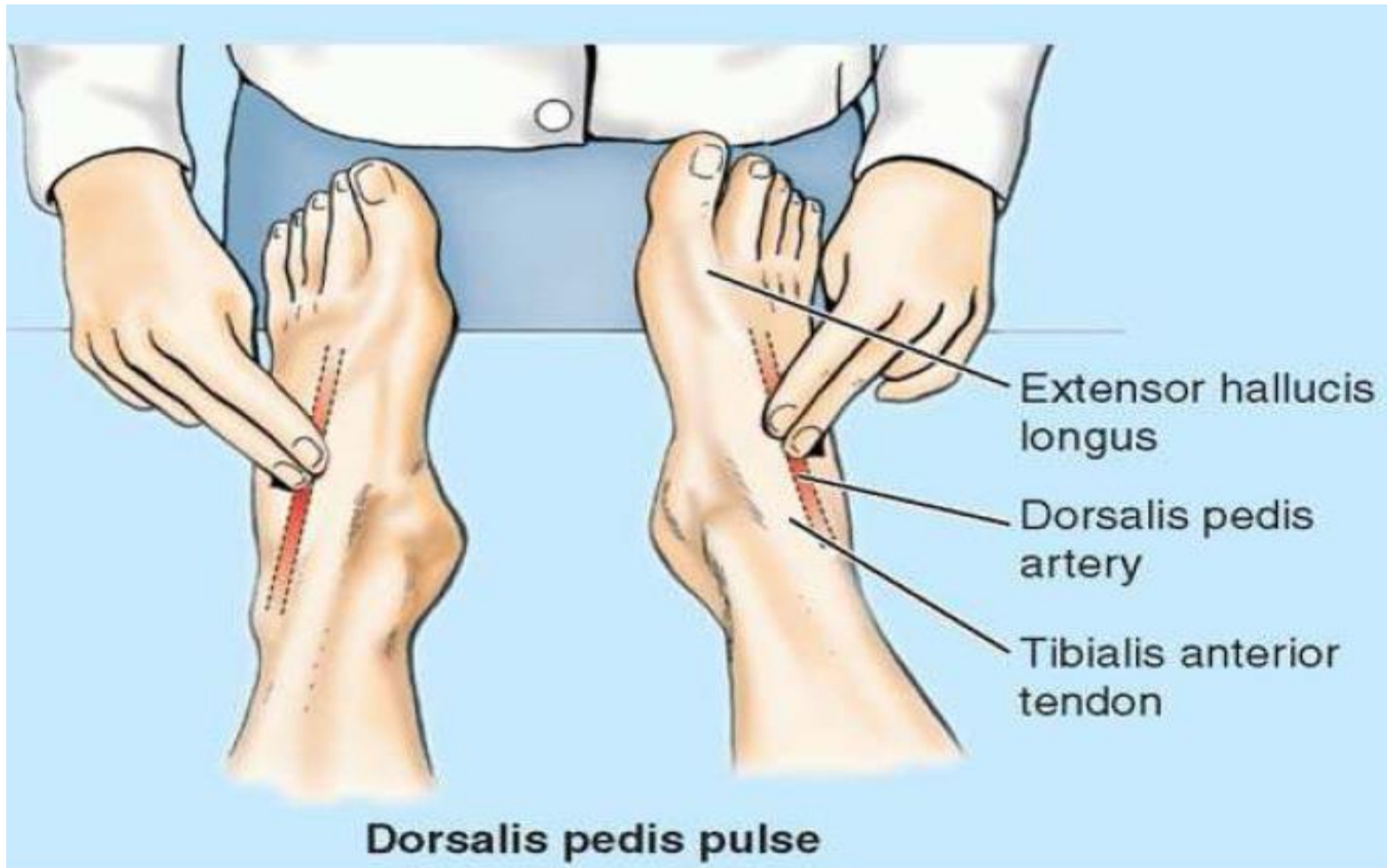


The artery may be absent in around 15% of people

Some healthy

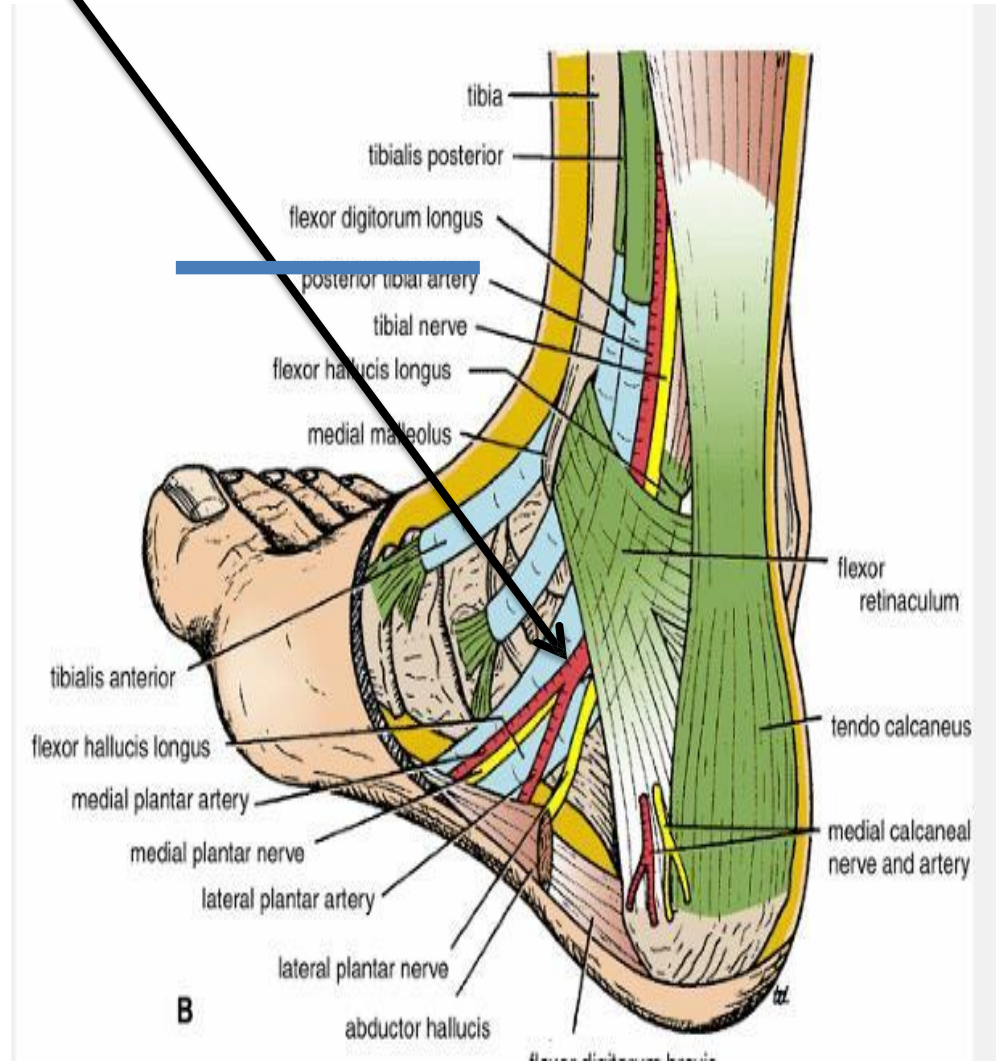
adults (and even children) have *congenitally nonpalpable dorsalis pedis pulses*; the variation is usually bilateral. In these cases,

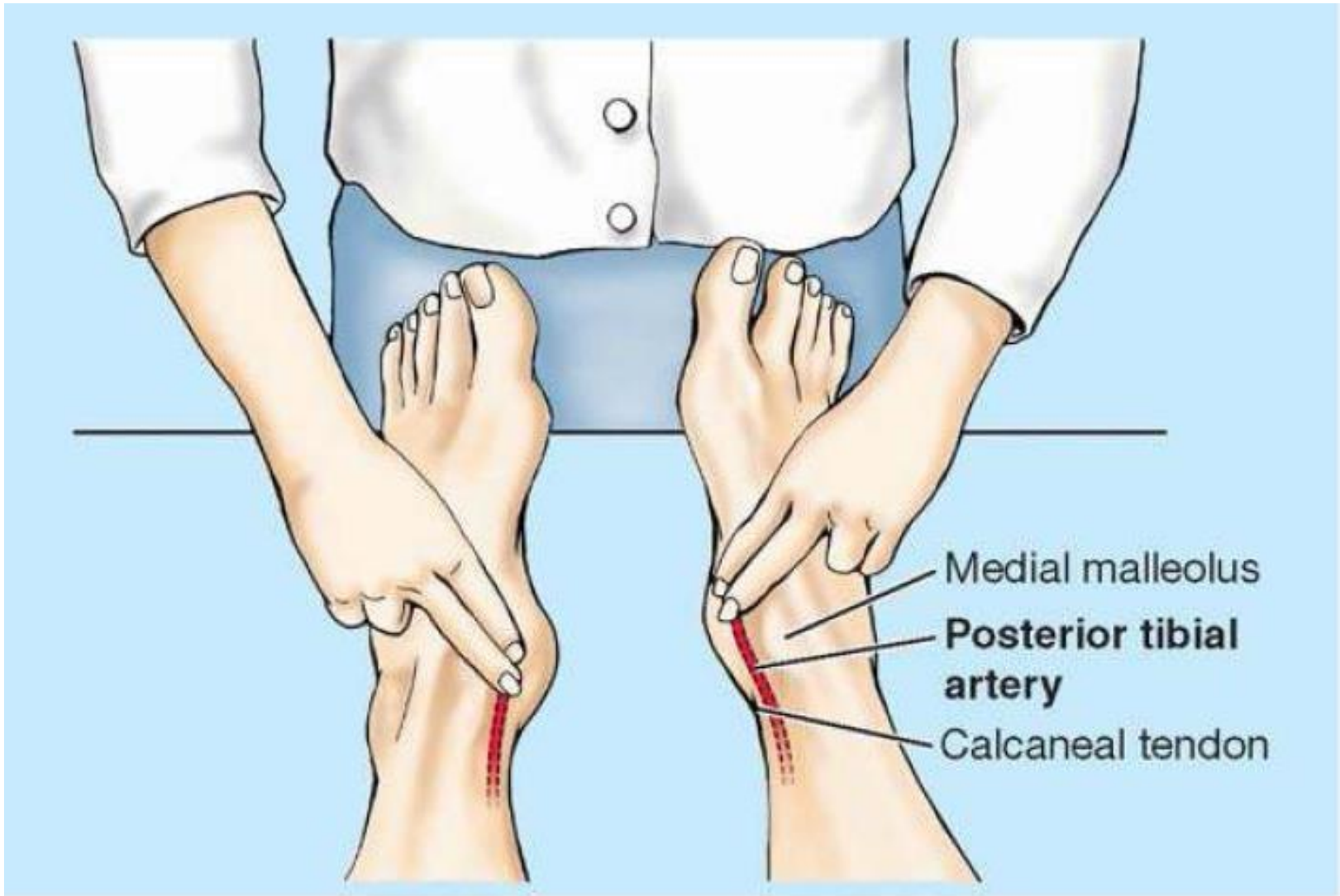
the dorsal artery of the foot is replaced by an enlarged perforating fibular artery.



The posterior tibial artery

Is palpable just
posteroinferior to the
medial malleolus
between the heel and
medial malleolus.





Sciatic Nerve Injury

The following clinical features are present:

Motor: 1-The hamstring muscles are paralyzed, but weak flexion of the knee is possible because of the action **of the sartorius** (femoral nerve) and **gracilis** (**obturator nerve**)

2-All the muscles below the knee are paralyzed,
the foot assume the plantar-flexed position, or

Foot drop

Sensory: Sensation is lost below the knee,

except for a narrow area down the medial side

of the lower part **of the leg and along the medial border of the foot as far as the ball of the big toe** which is supplied by the saphenous nerve (femoral nerve).

common peroneal nerve is in an exposed position as it leaves the popliteal fossa and winds around the neck of the fibula to enter the peroneus longus muscle

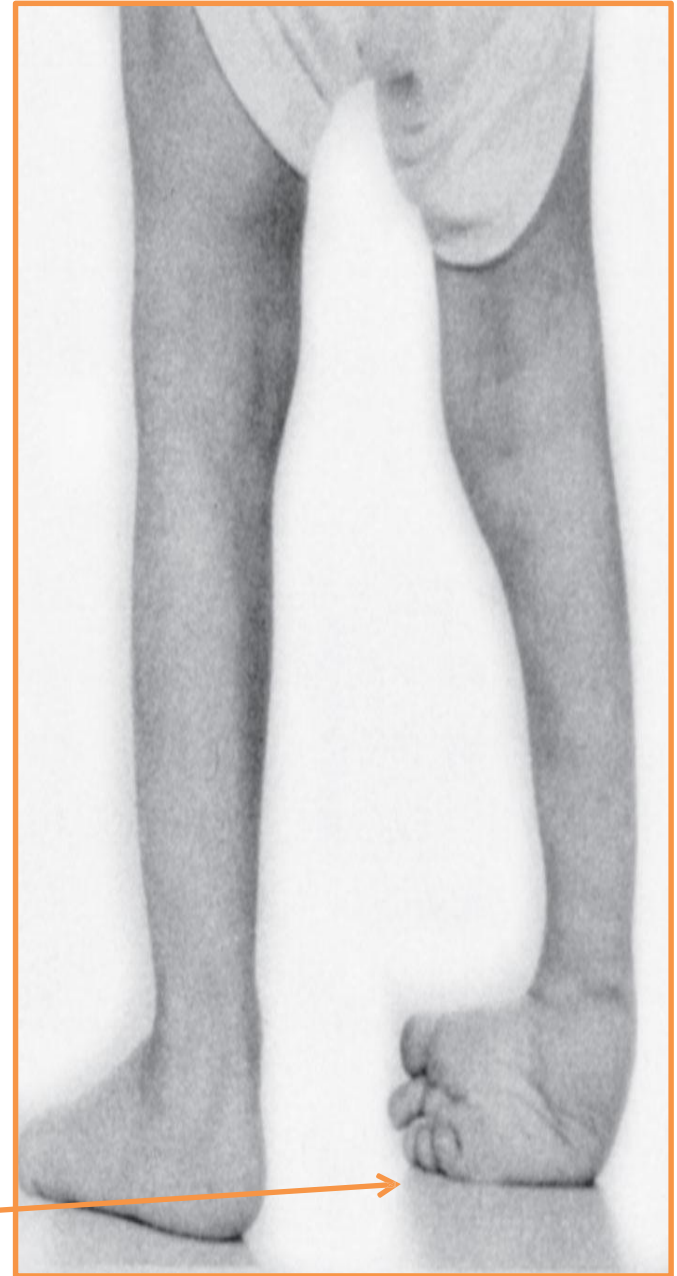
Injury to common peroneal nerve
Paralysis of extensor muscles (supplied by deep peroneal nerve) this means **loss of dorsiflexion of the foot**

Paralysis of peronei muscles (supplied by the superficial peroneal nerve) this means **loss of Eversion of the foot**

The antagonistic muscles (planter flexors and invertors) will take over
this leads to

Foot drop and inversion

Equino varus



Tibial Nerve Injury

Because of its deep and protected position, it is rarely injured.

Complete damage results in the following clinical features:

Motor: All the muscles in the back of the leg and the sole of the foot are paralyzed. The opposing muscles dorsiflex the foot at the ankle joint and evert the foot at the subtalar and transverse tarsal joints, an attitude referred to as

Calcaneovalgus

Sensory: Sensation is lost on the sole of the foot; later, trophic ulcers develop.