

JOINTS OF THE LOWER LIMB

BY DR. AMJAD SHATARAT

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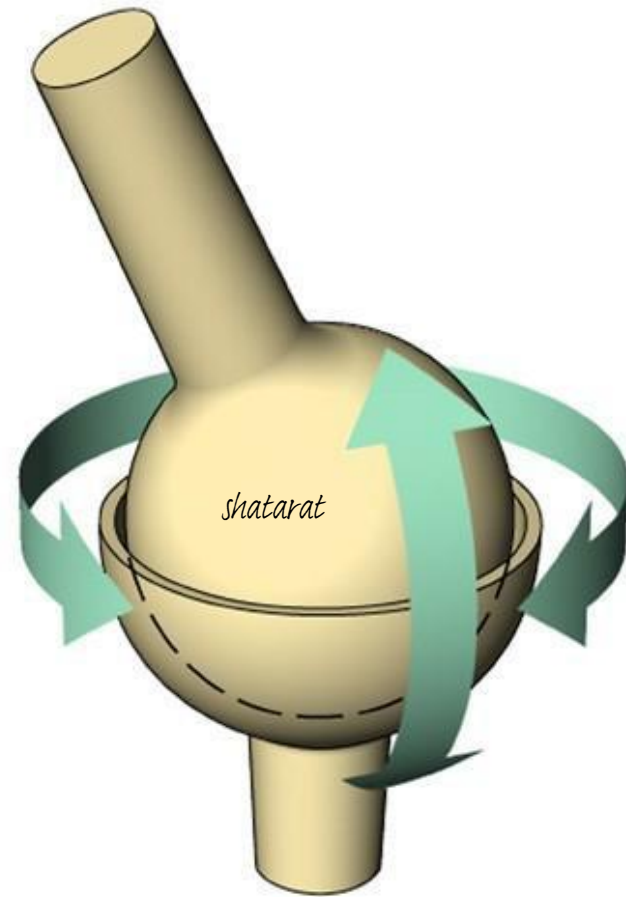
HIP JOINT

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1-Type:

Synovial multi-axial ball-and-socket joint.

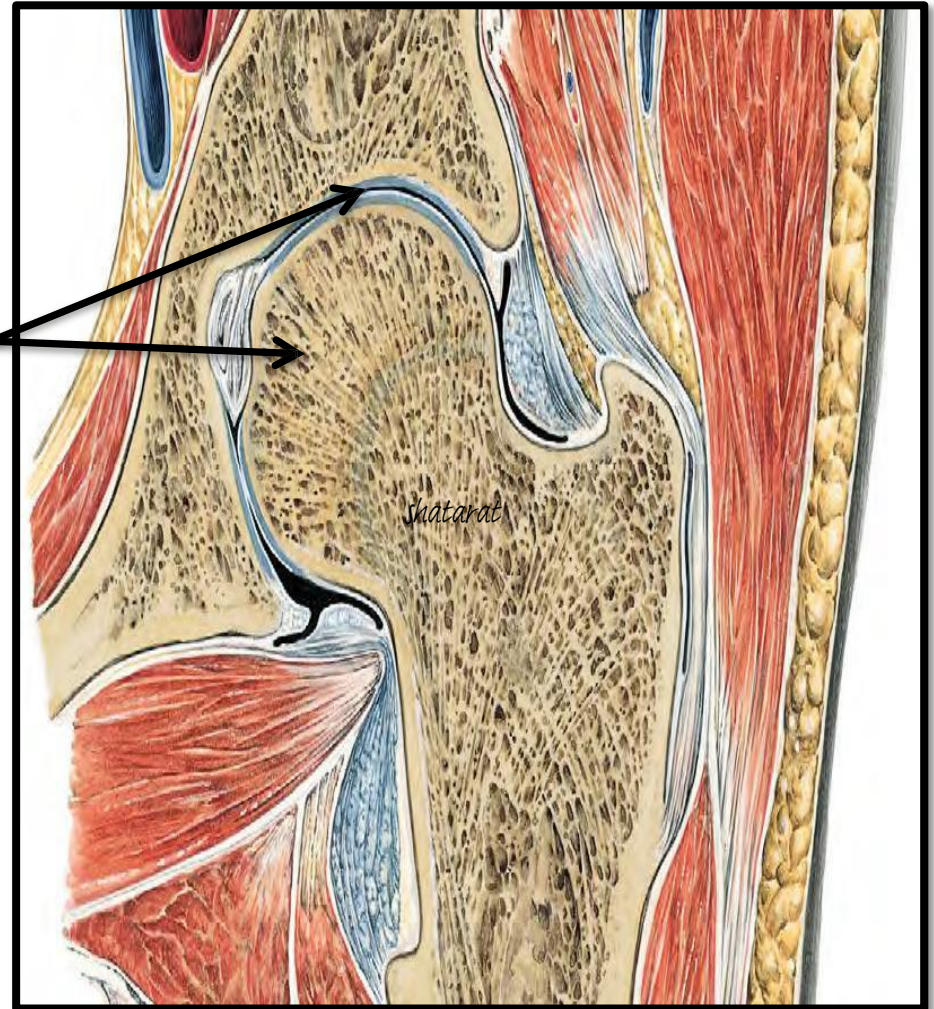


2-Articular surfaces:

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

Which is deepened by the fibrocartilaginous *labrum acetabulare*

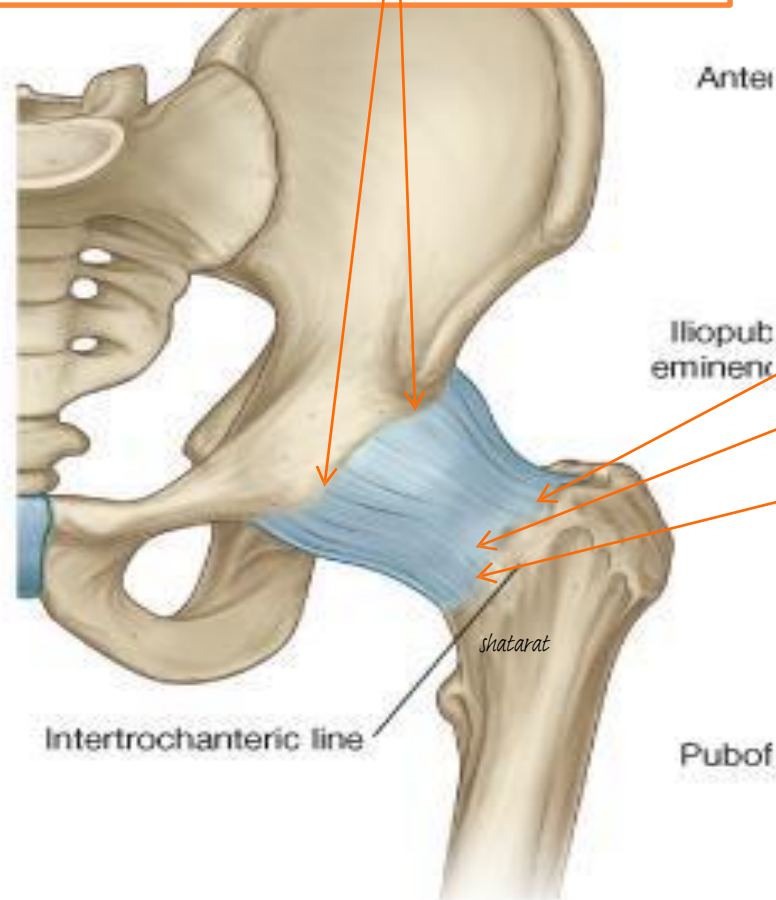
3-Nerve
Supply: Femoral
nerve Obturator
nerve Sciatic nerve



4- The capsule of the hip is attached

proximally to the margins of the acetabulum

Capsule



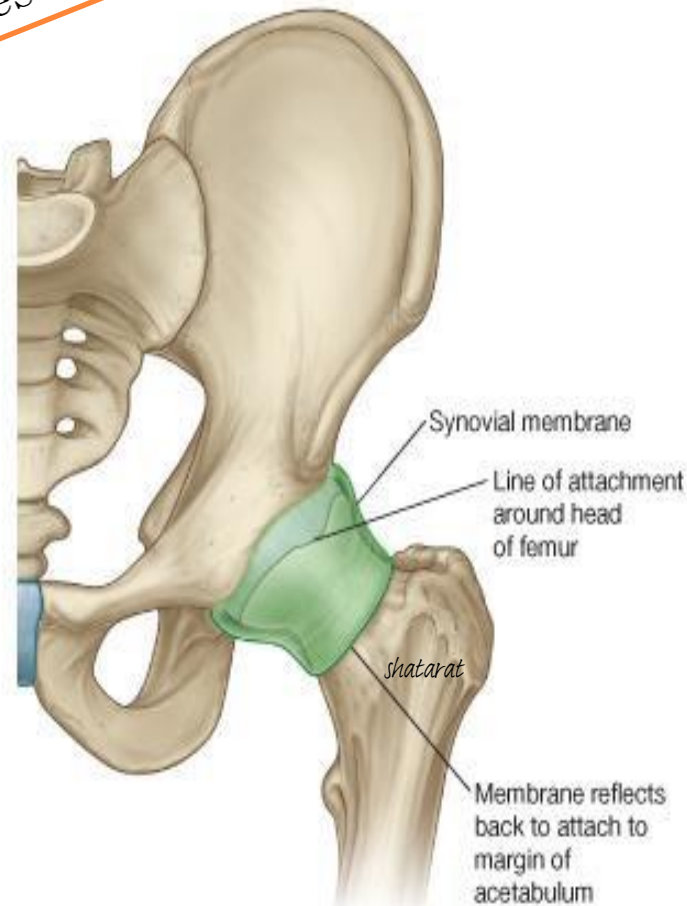
Distally, it is attached along the intertrochanteric line, the bases of the greater and lesser trochanters

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**posteriorly,
to the femoral
neck about 0.5 in
(12mm) from the
intertrochanteric
crest.**

What does this mean?

Part of the neck posteriorly
is extra -capsular



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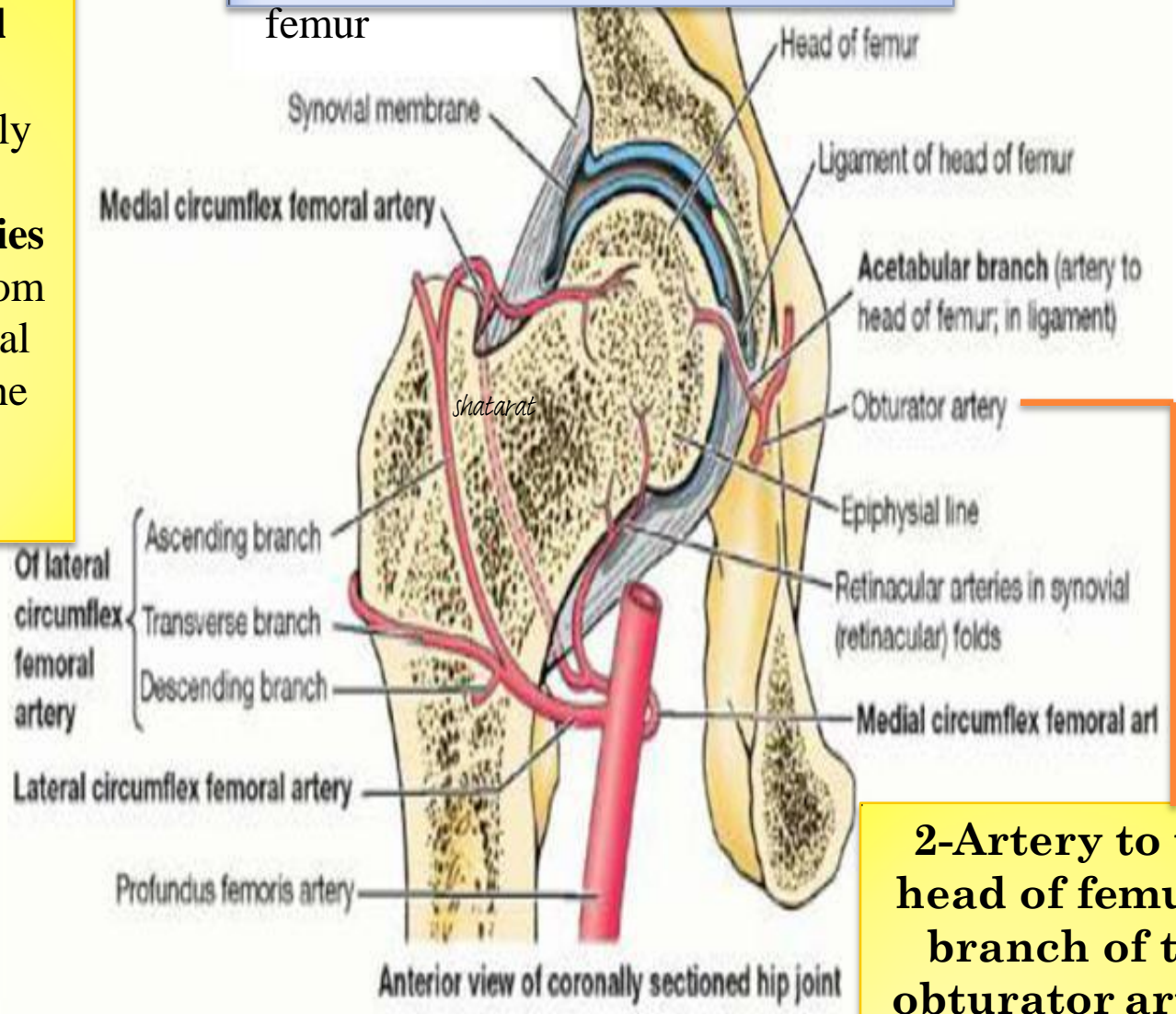
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Figure 6.31 Synovial membrane of the hip joint.

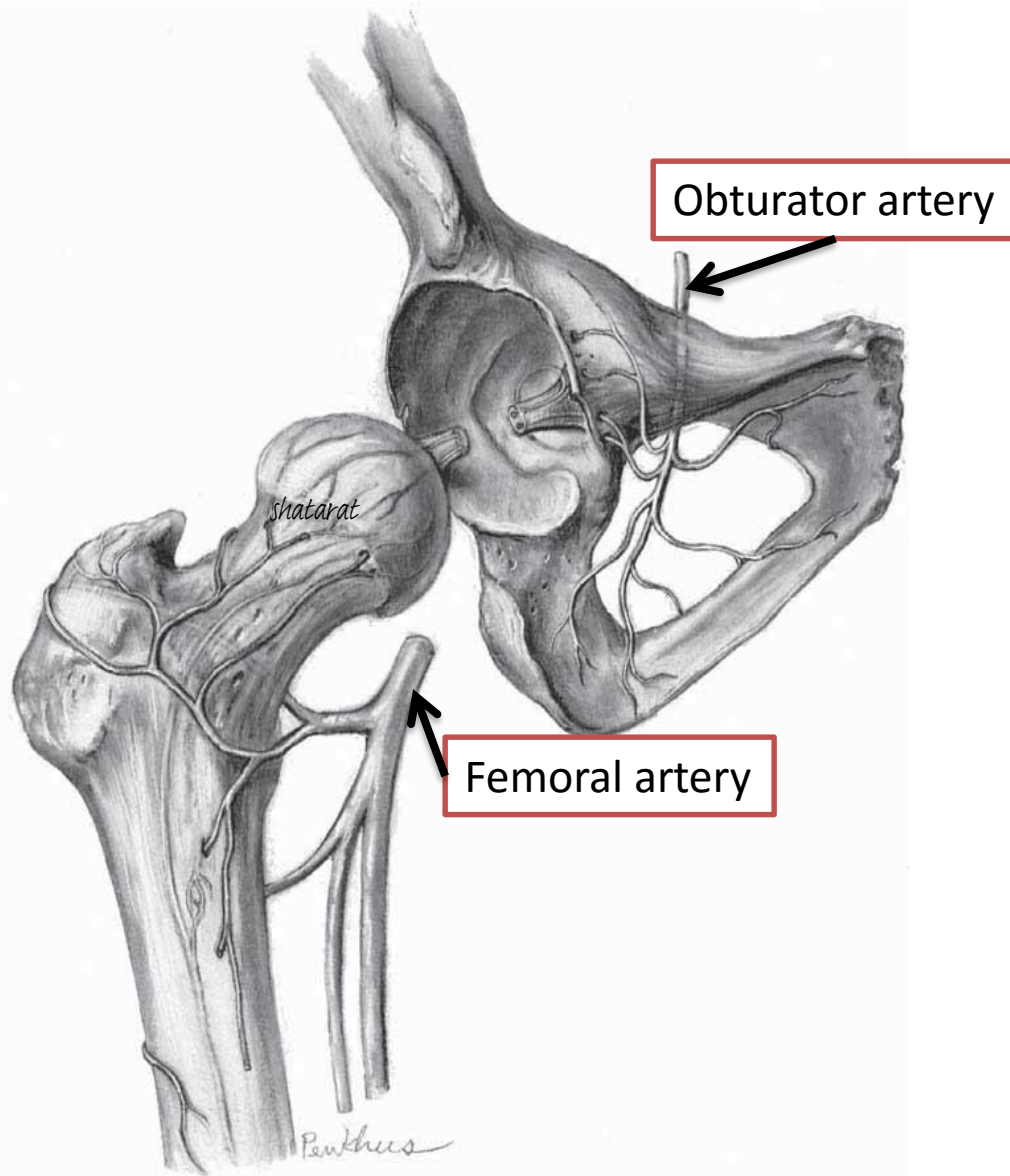
1-Medial and lateral circumflex femoral arteries

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

5- Blood supply of the head of the femur



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



1-The Trochanteric Anastomosis

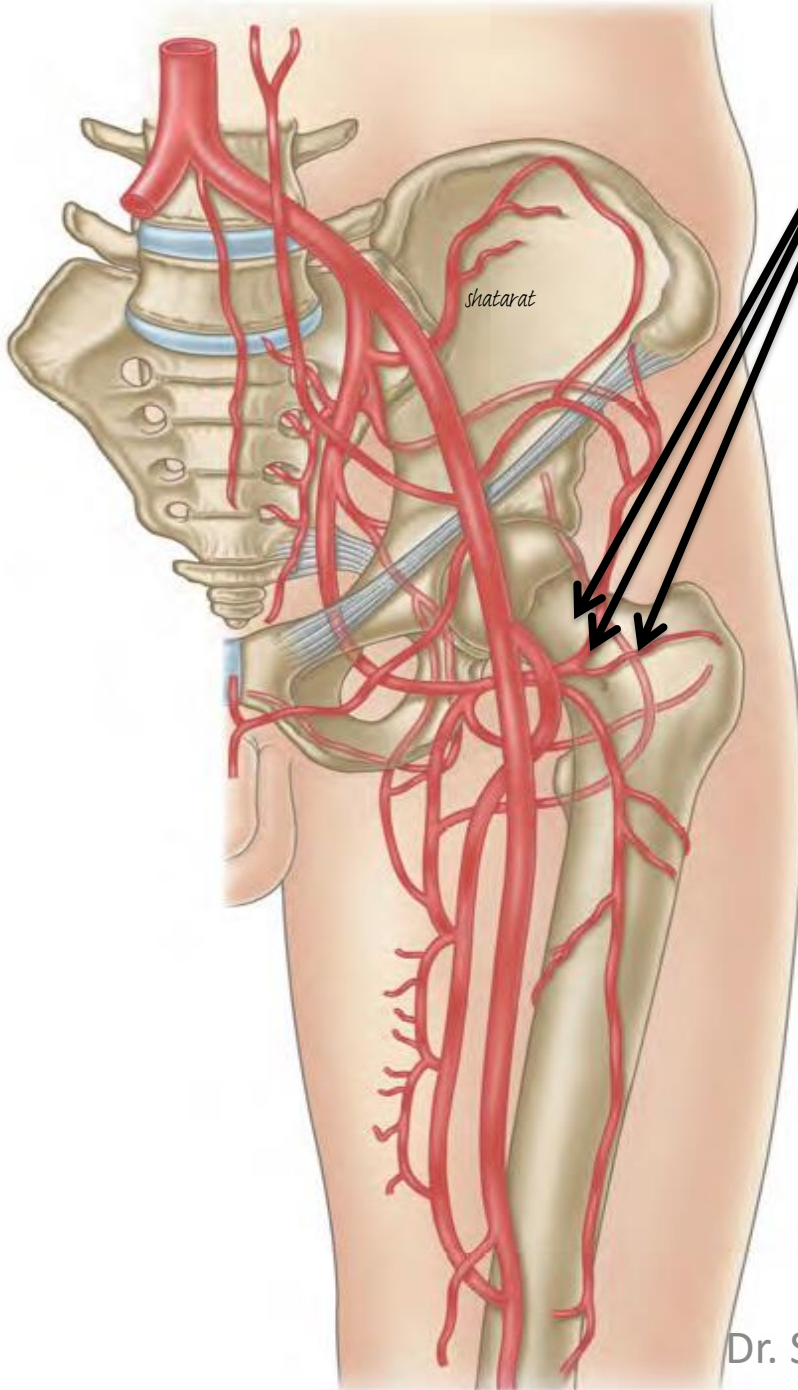
The trochanteric anastomosis :

Branches pierce the capsule to give the main blood supply to **THE HEAD OF THE FEMUR**

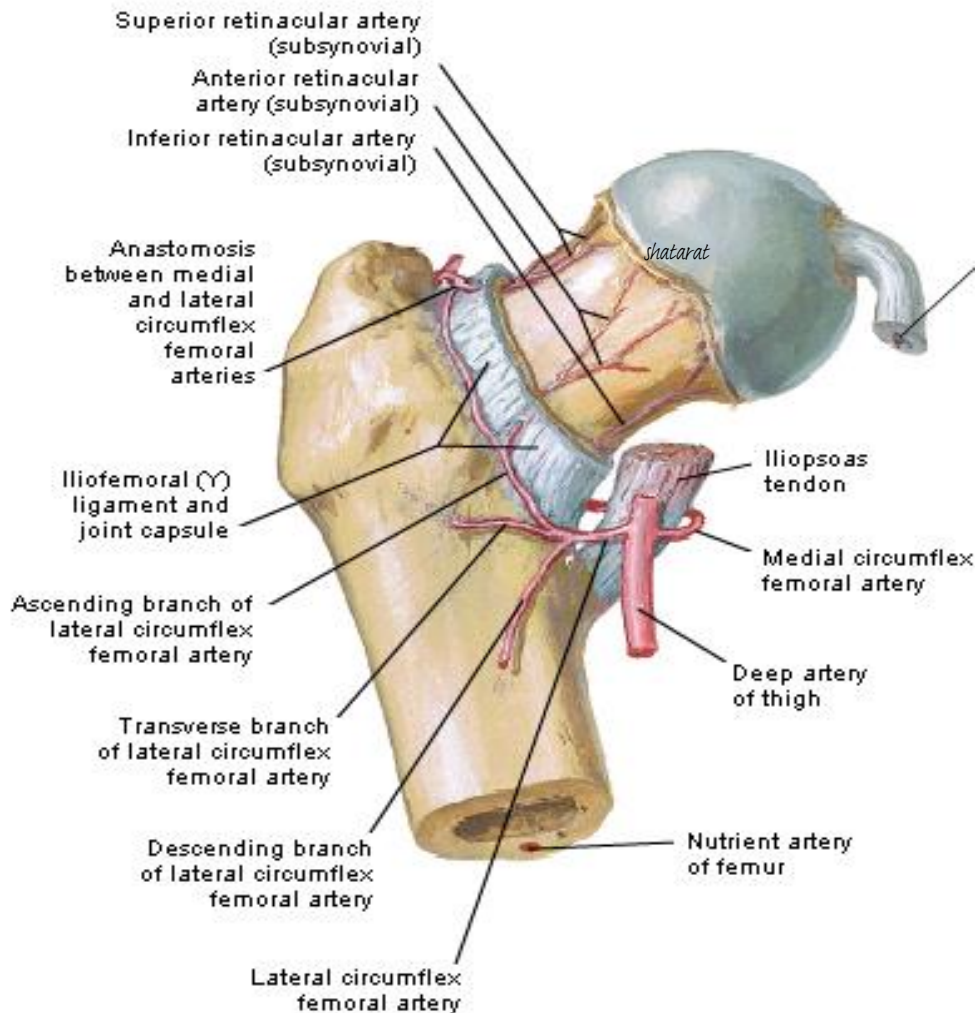
The following arteries take part in the anastomosis:

A) The superior gluteal artery, the inferior gluteal artery and the obturator artery (from the internal iliac artery)

B) The medial femoral circumflex artery, and the lateral femoral circumflex artery (from the femoral artery)



2-The Cruciate Anastomosis



The Cruciate Anastomosis

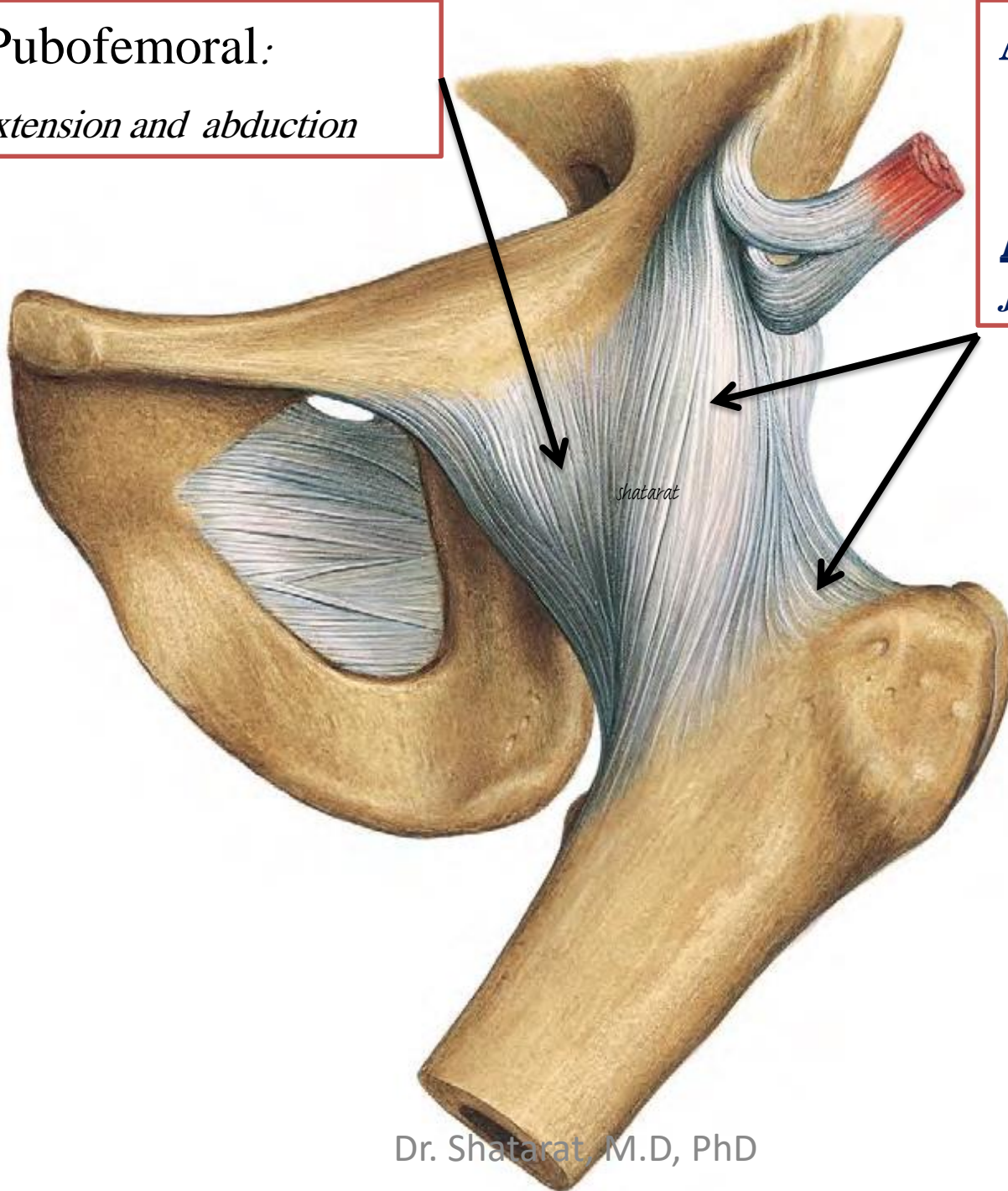
The cruciate anastomosis is situated at the level of the lesser trochanter of the femur and, together with the trochanteric anastomosis, provides a connection between the internal iliac and the femoral arteries

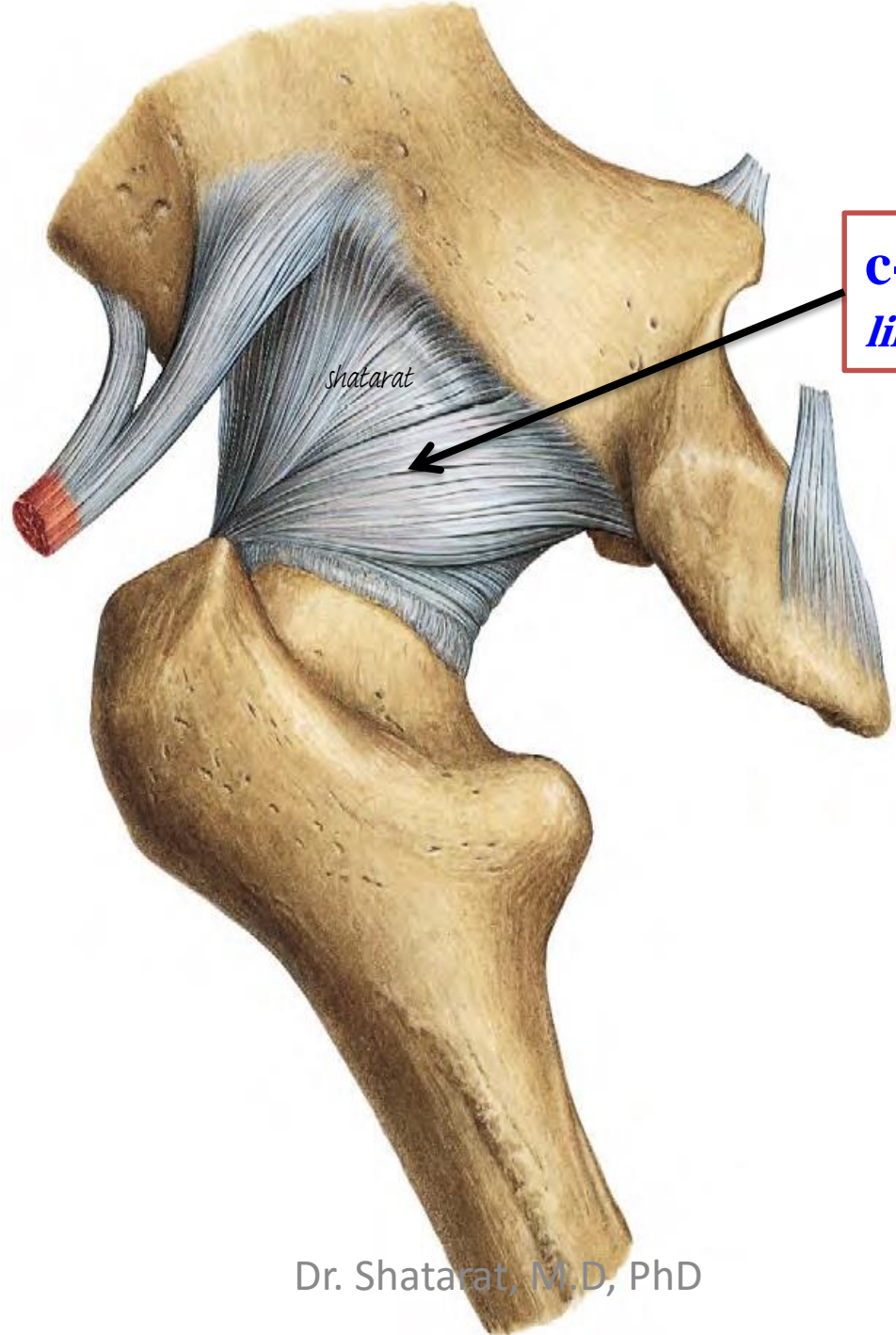
7-MAIN LIGAMENTS OF THE HIP JOINT

b-Pubofemoral:

Limits extension and abduction

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

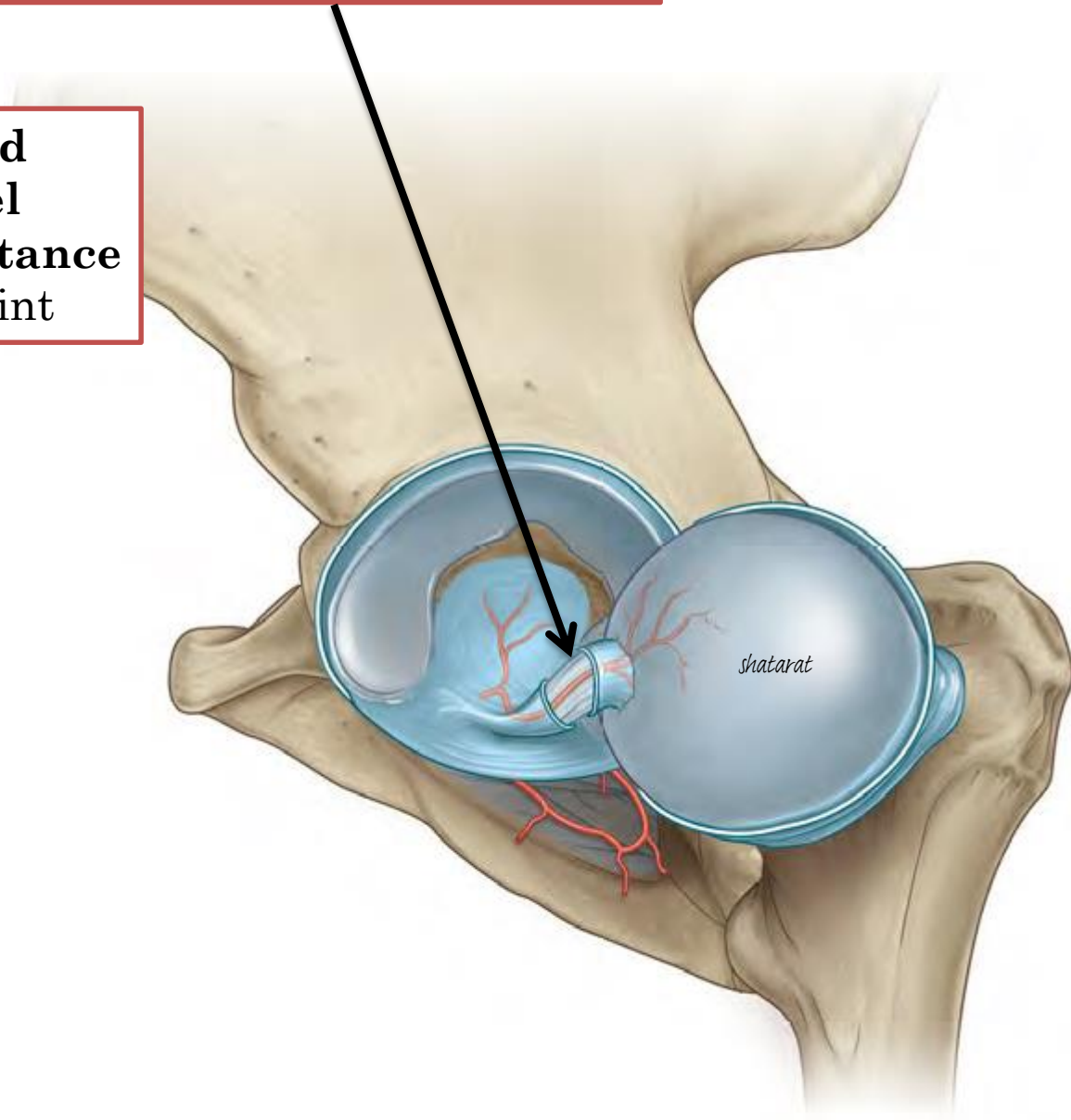


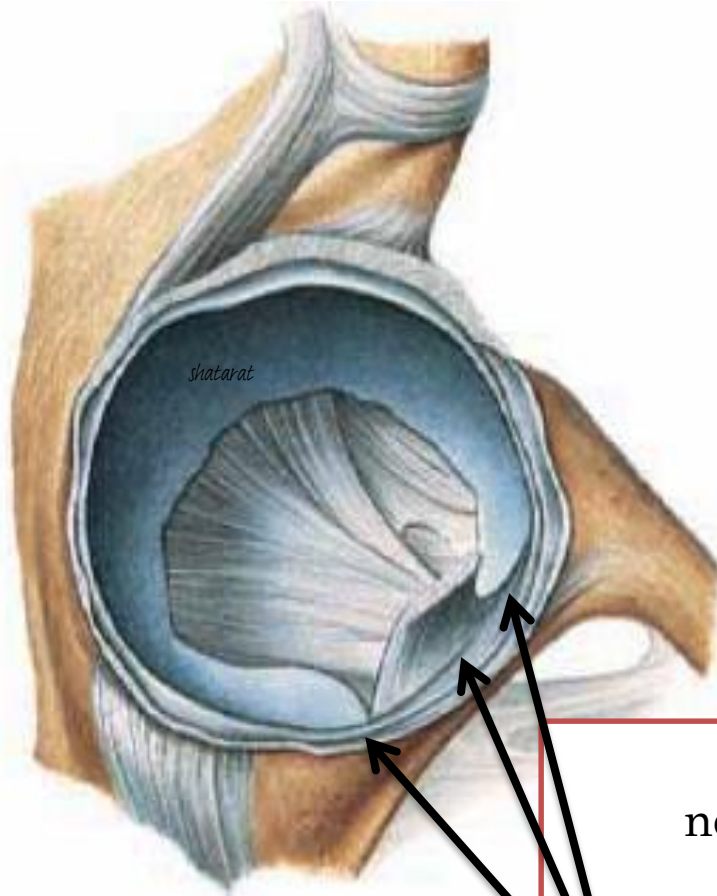


c-Ischiofemoral:
limits extension

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





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

SELF-STUDY

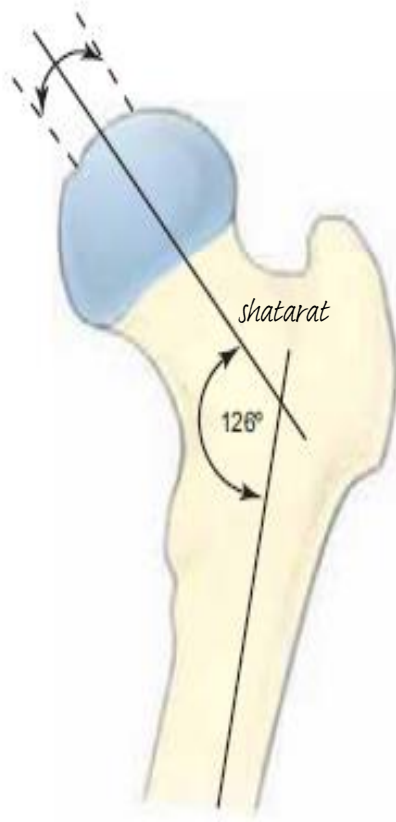
- Flexion is performed by *the iliopsoas, rectus femoris, and sartorius*
- Extension is performed by *the gluteus maximus and the hamstring muscles.*
- Abduction is performed by *the gluteus medius and minimus*, assisted by the sartorius, tensor fasciae latae, and piriformis.
- Adduction is performed 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 muscle* 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.*

Flexion is limited by the hamstring muscle group. Extension is limited by the ligamentous thickening of the capsule; abduction, by the adductor group of muscles; adduction, by the tensor muscle and fascia of the abductor muscles; and rotation, by the fibrous capsular



^ - ANGLE OF INCLINATION

it is the angle between the neck and shaft of the femur



Approx. 125°

typically ranges from 115 to 140 degrees

is about 160° in the young child and
about 125° in the adult

ANKLE JOINT

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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

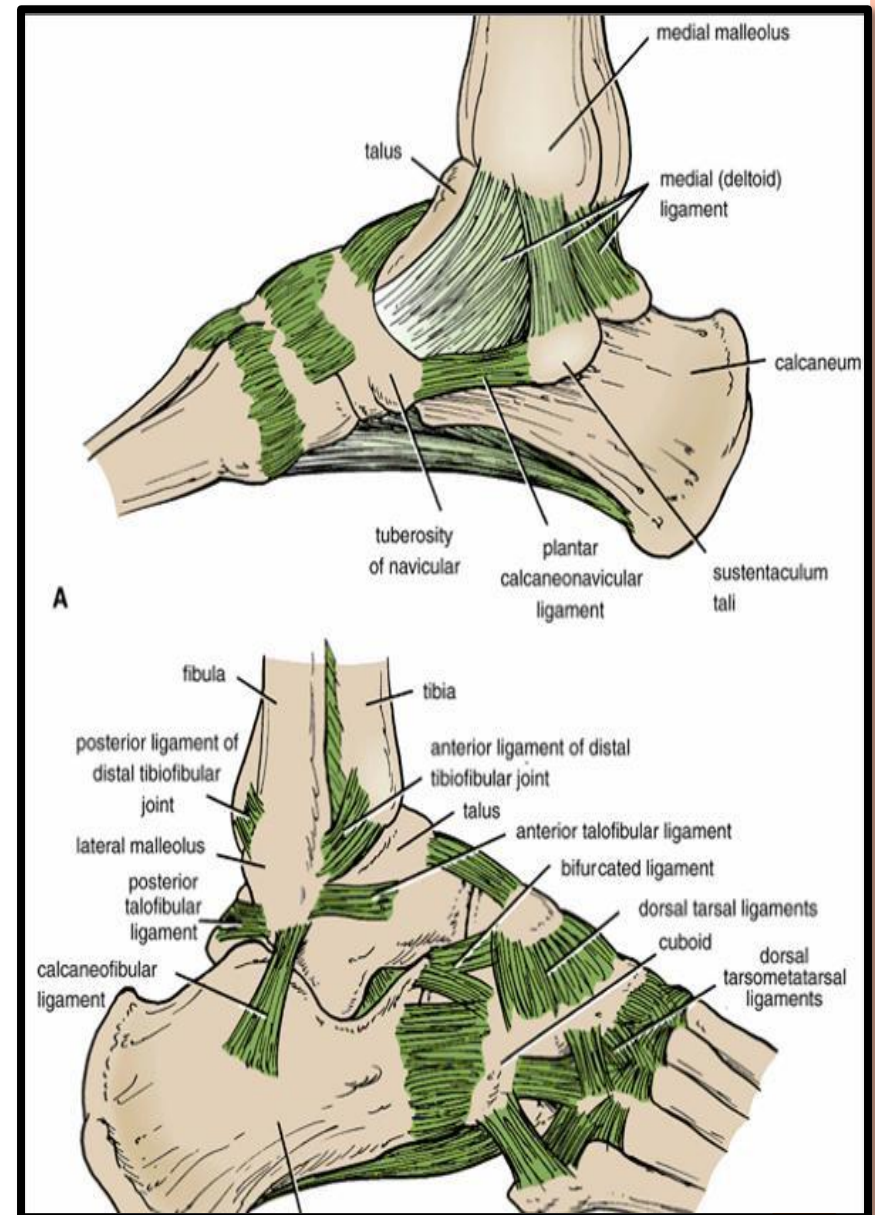
The lateral ligament

Movements

Self-study

Dorsiflexion is performed by the **tibialis anterior, extensor hallucis longus, extensor digitorum longus, and peroneus tertius.** (muscles of the anterior compartment of the leg)

Plantar flexion is performed by the **gastrocnemius, soleus, plantaris, peroneus longus, peroneus brevis, tibialis posterior, flexor digitorum longus, and flexor hallucis longus.** (all the muscles of lateral and posterior compartment except **popliteus** muscle)



Proximal Tibiofibular Joint

➤ Articulation

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

The articular surfaces are flattened and covered by hyaline cartilage.

➤ Type

This is a synovial, plane, gliding joint.

➤ Capsule

The capsule surrounds the joint and is attached to the margins of the articular surfaces.

➤ Ligaments

Anterior and posterior ligaments strengthen the capsule.

➤ Synovial Membrane

The synovial membrane lines the capsule and is attached to the margins of the articular surfaces.

➤ Nerve Supply

The common peroneal nerve supplies the joint.

Movements

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

Read only

Read only

Read only

Read only

Read only



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

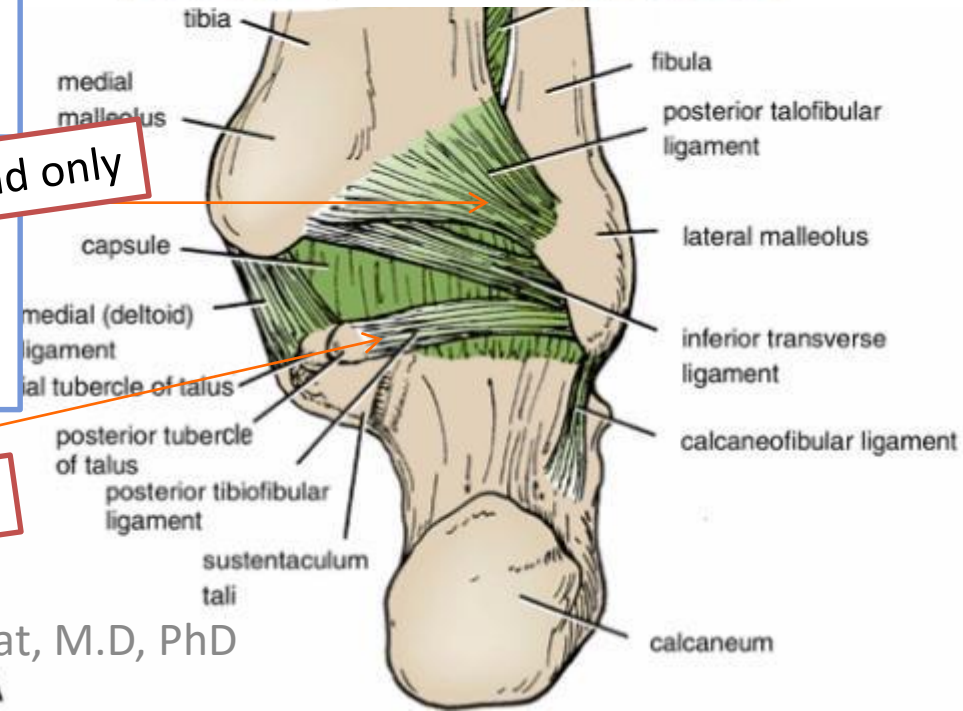
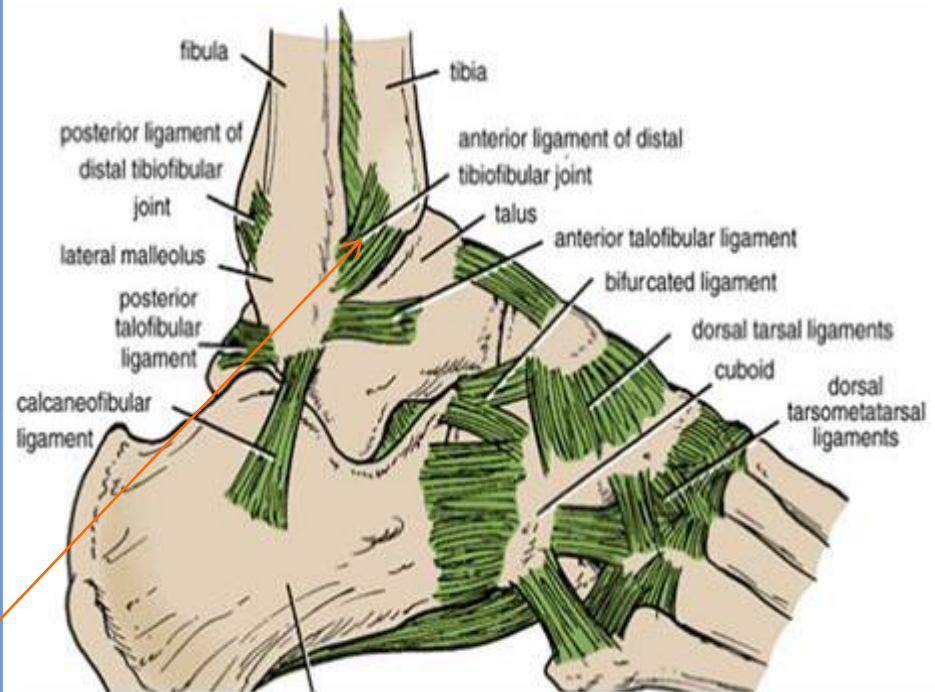
1 The **interosseous ligament** is a strong, thick band of fibrous tissue that binds the two bones together.

Read only

2 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

3 The **inferior transverse ligament**



KNEE JOINT

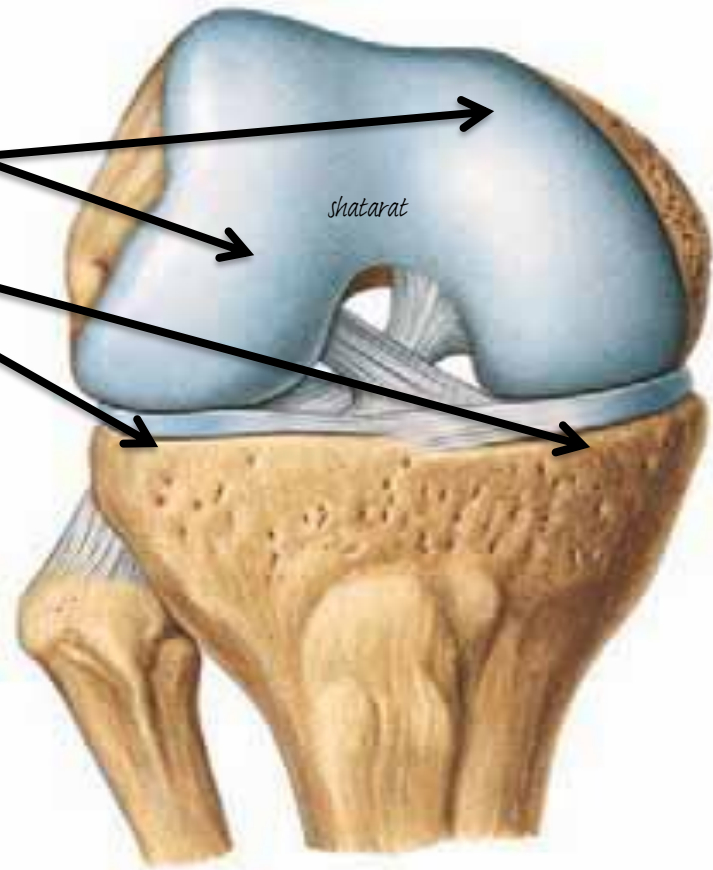
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Knee Joint

➤ 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**

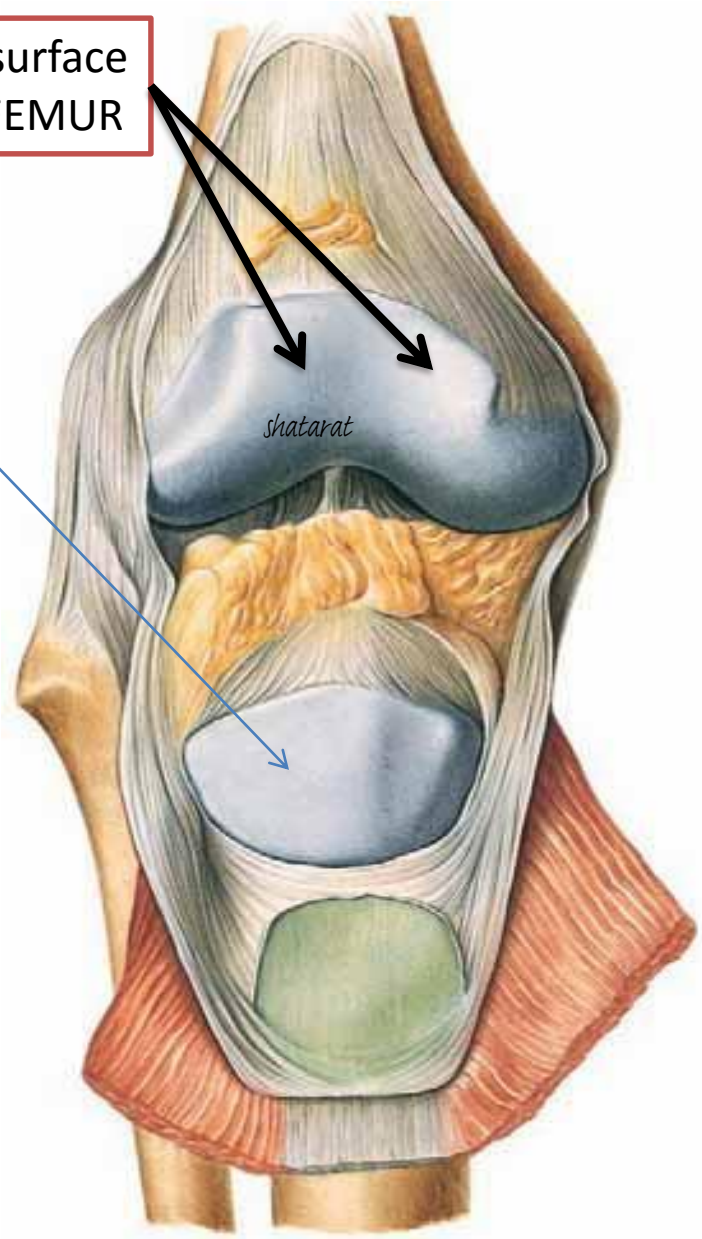
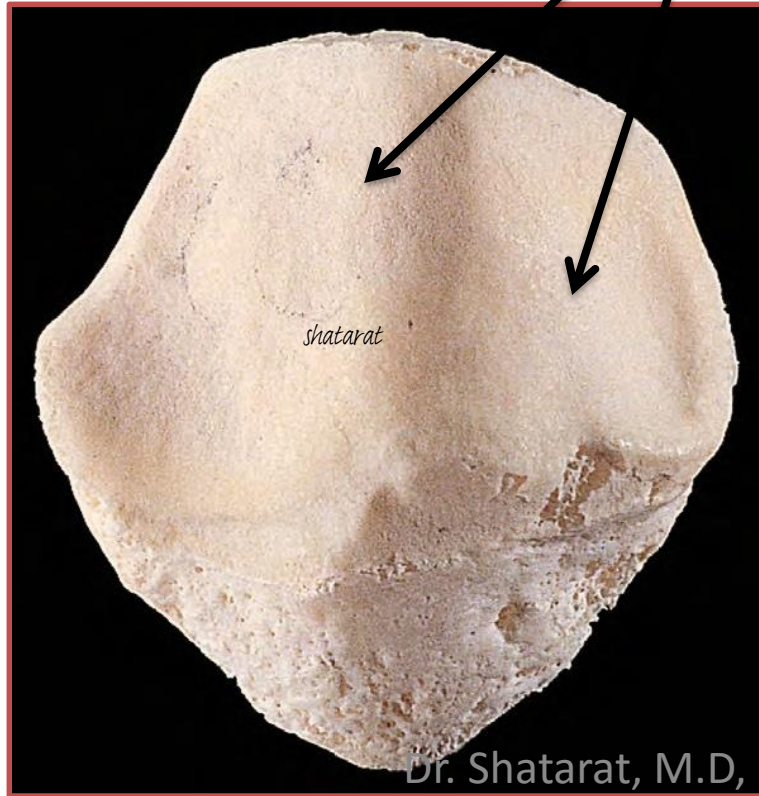
and



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

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

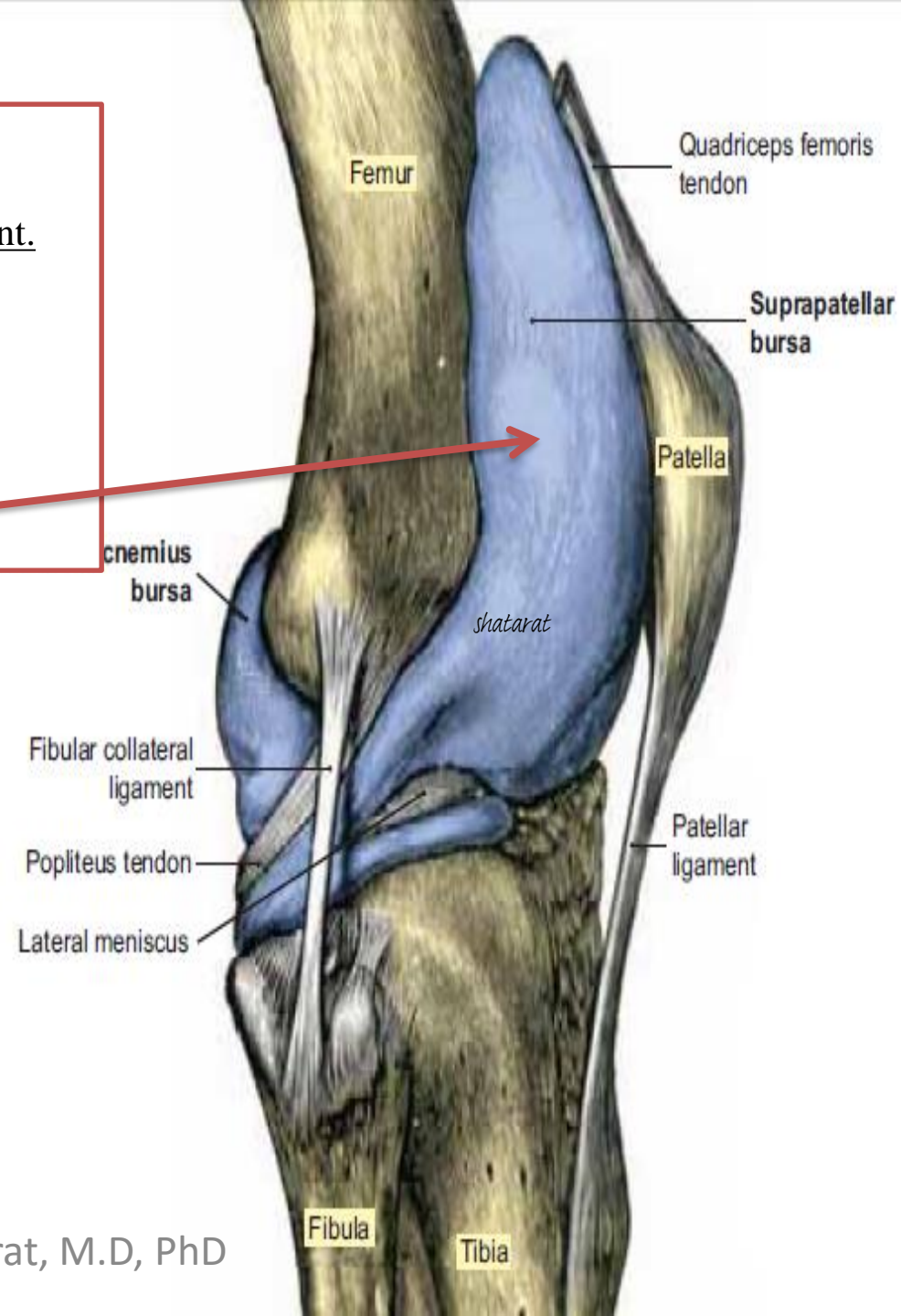
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❖ The joint between the *patella and femur* is a *synovial* joint of the *plane gliding* variety.

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**

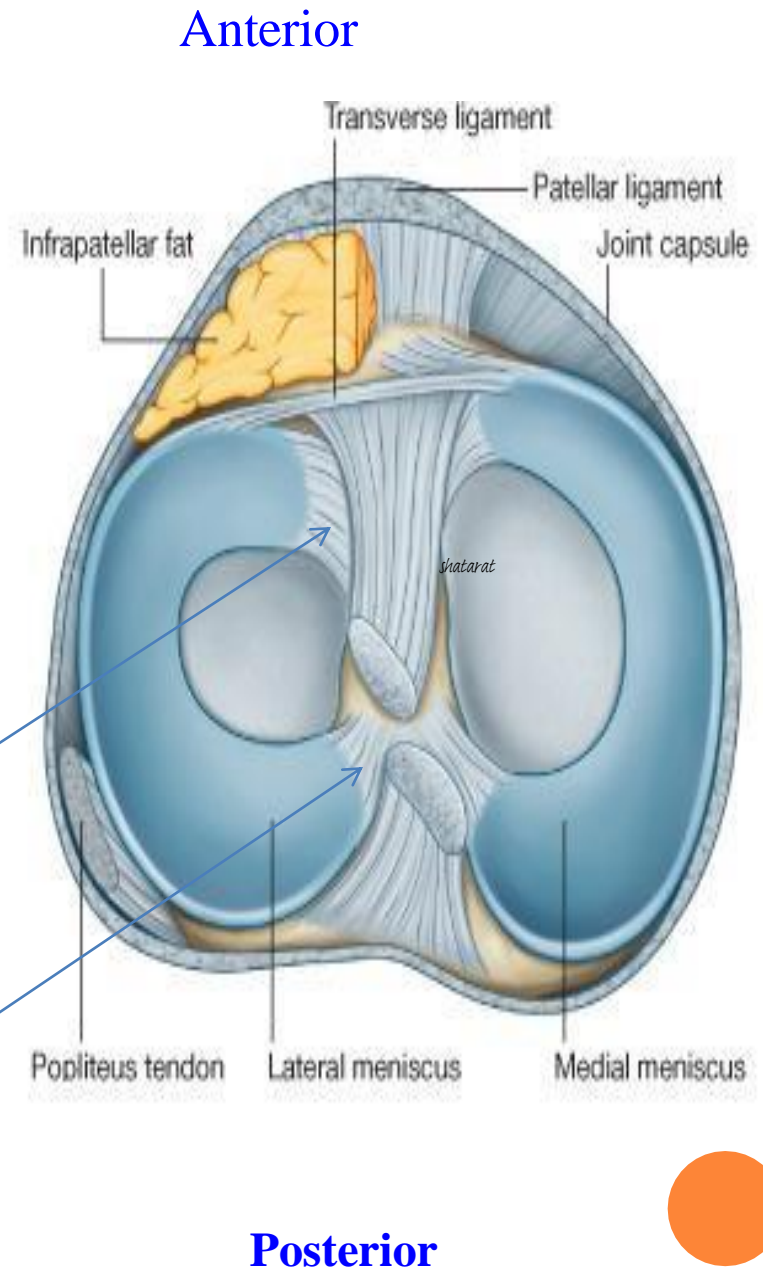


4-Menisci

➤ **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.**



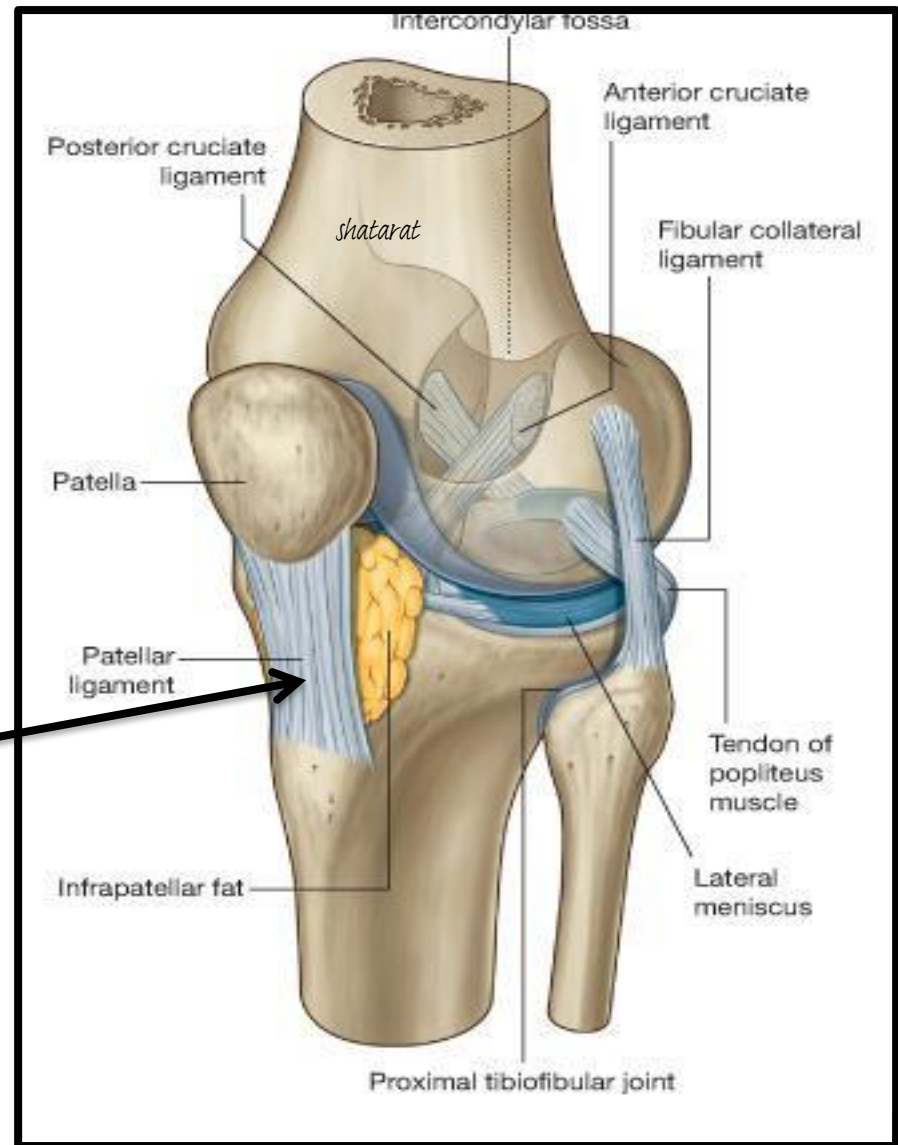
5-Ligaments of the knee joint

❖ *The ligaments may be divided into*

A-Extracapsular Ligaments

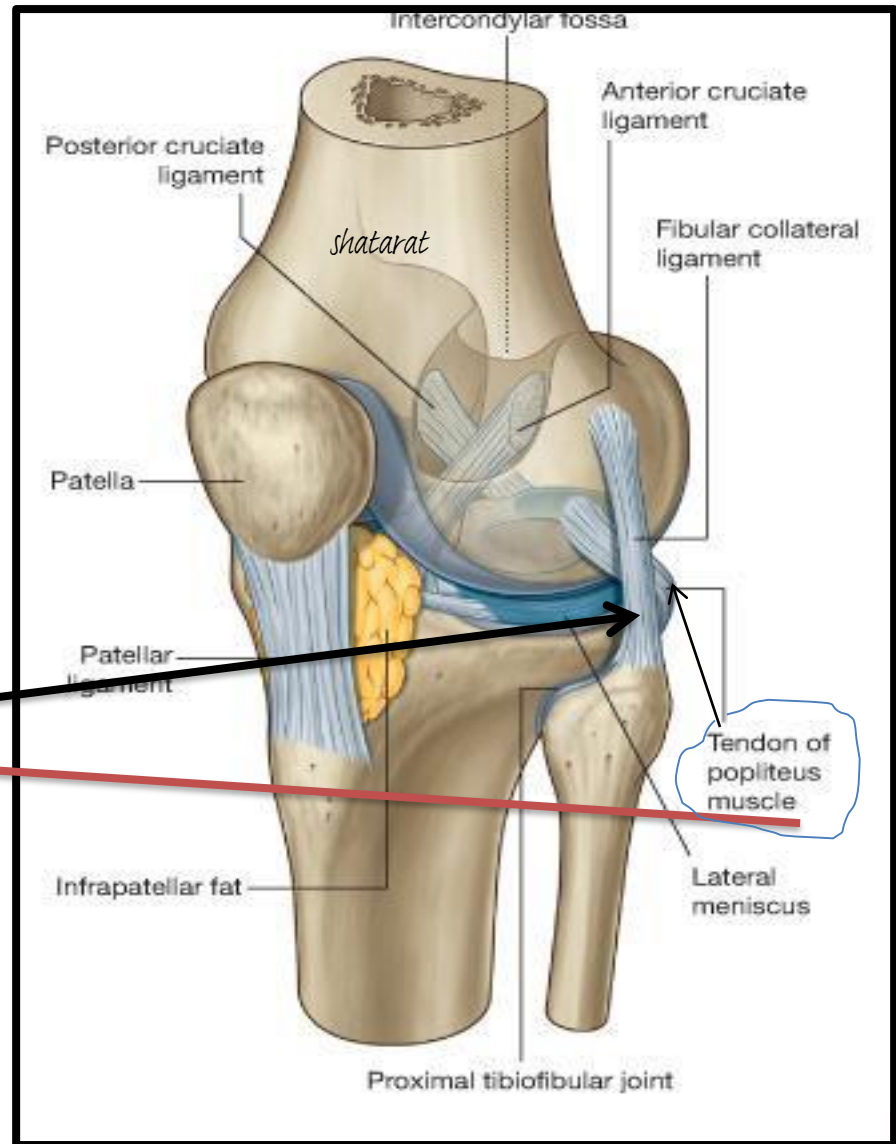
The ligamentum patellae

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***.

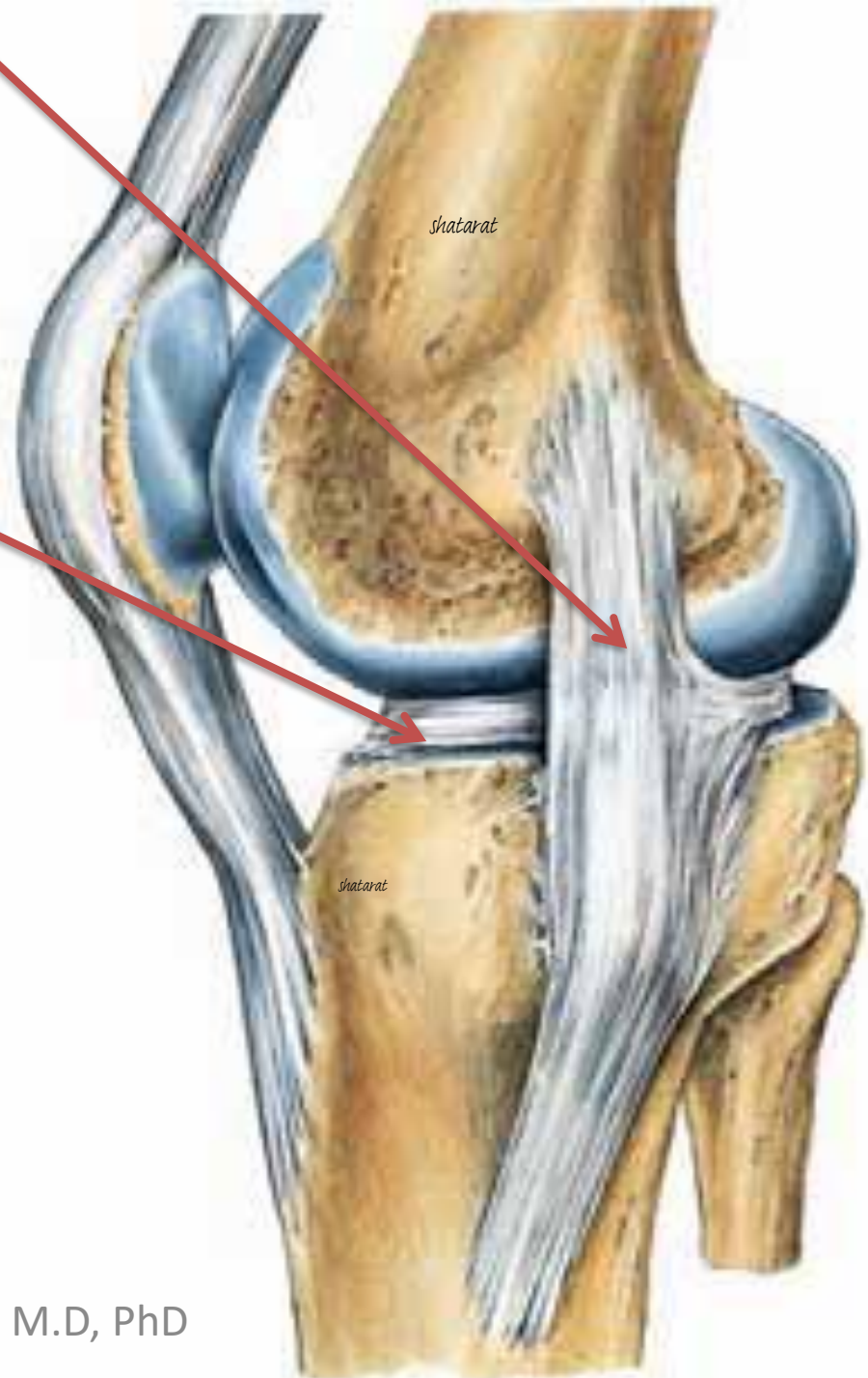


The tendon of the popliteus muscle intervenes between the ligament and the lateral Meniscus (thus, the ligament is not attached to the lateral meniscus)

What does this mean?

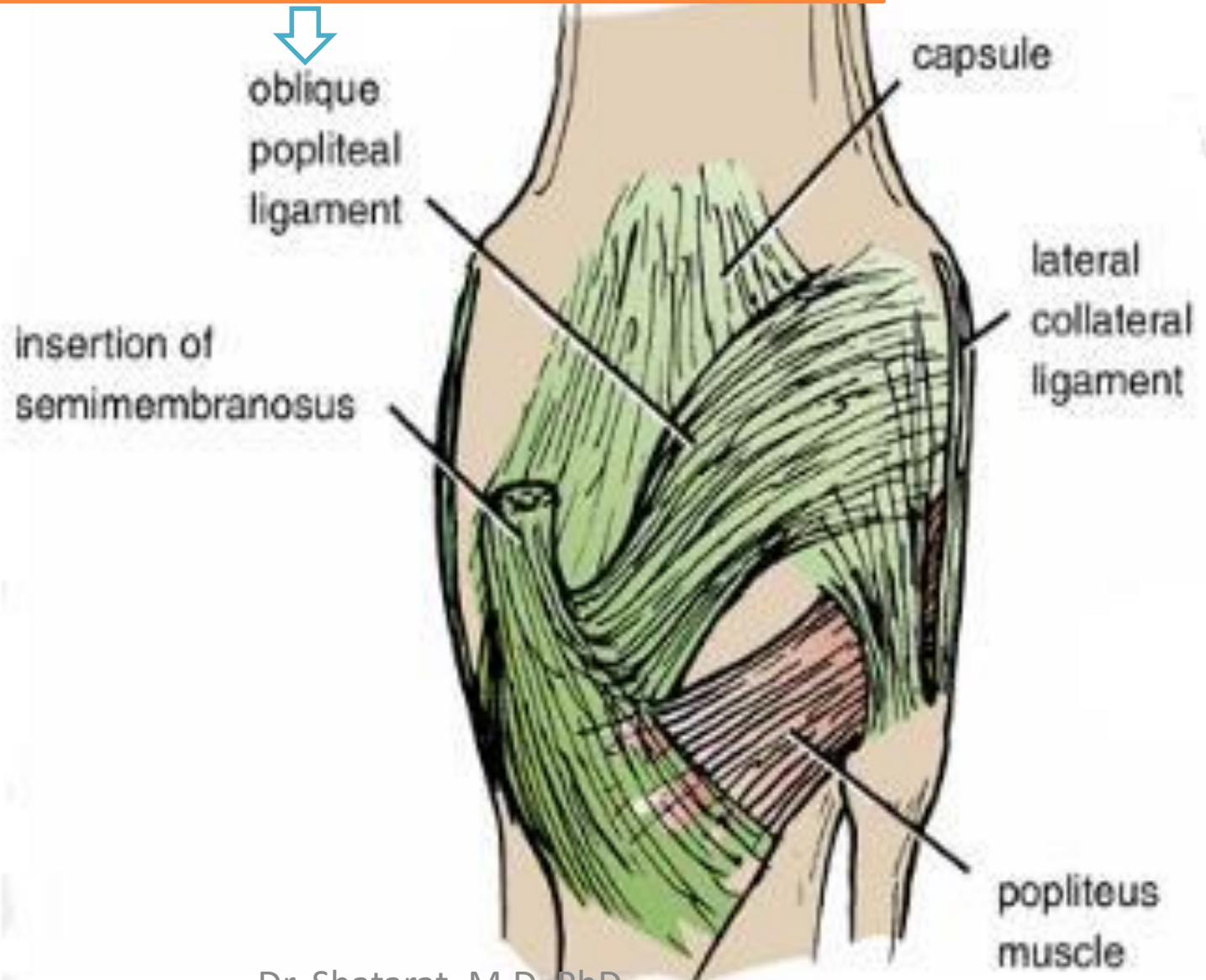
The medial collateral ligament is a ***flat band*** and is attached above to ***the medial condyle*** of the femur and below to ***the medial surface*** of the ***shaft of the tibia***. **It is firmly attached to the edge of the medial meniscus ?!**

What does this mean?



❖ The oblique popliteal ligament

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

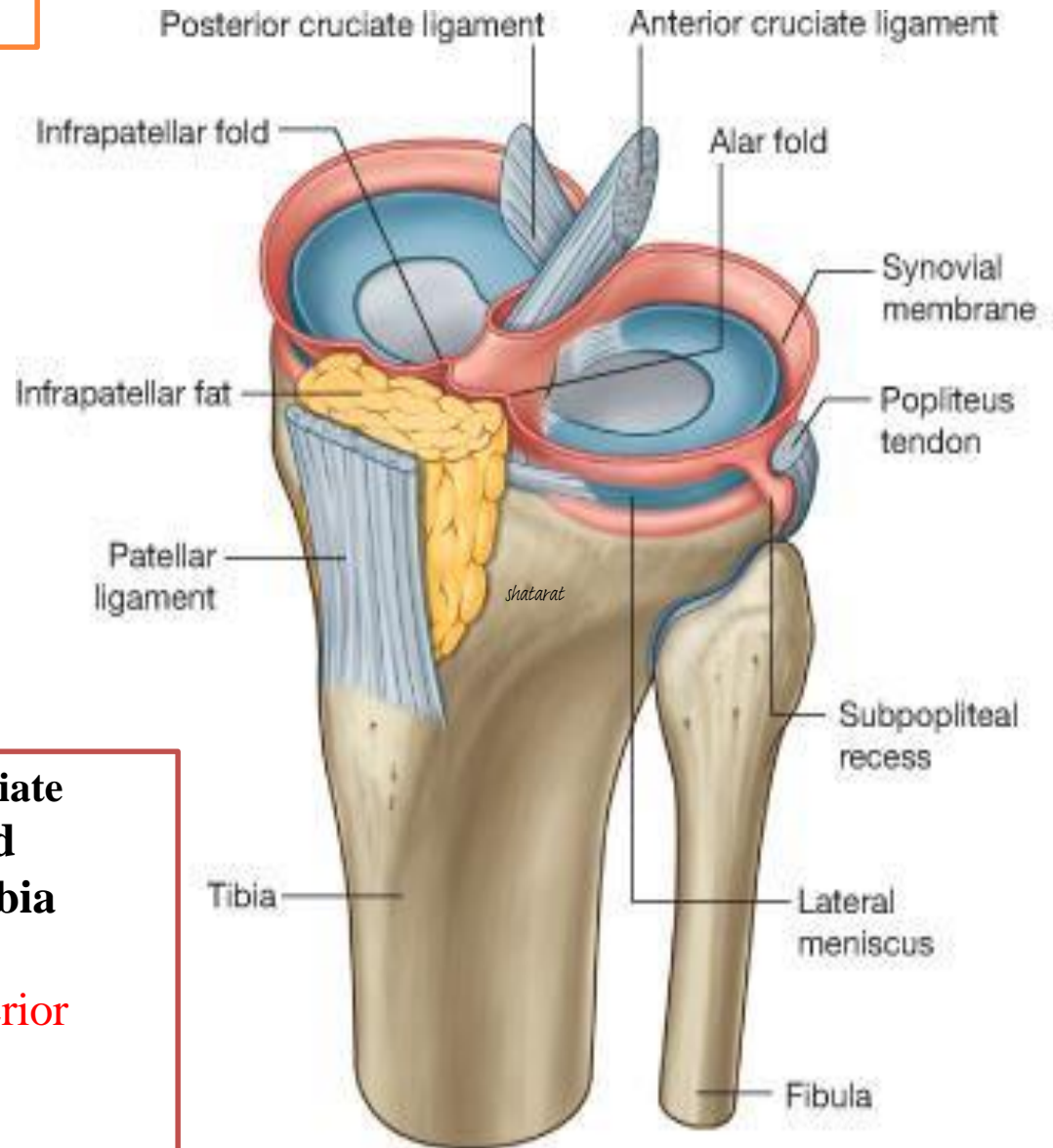


**B-
Intracapsular
Ligaments**

**The cruciate
ligaments**

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

The **anterior** and **posterior** cruciate
ligaments are the main bond
between the femur and the tibia
during the joint's range of
movement. They prevent **posterior**
and **anterior displacement**,
respectively

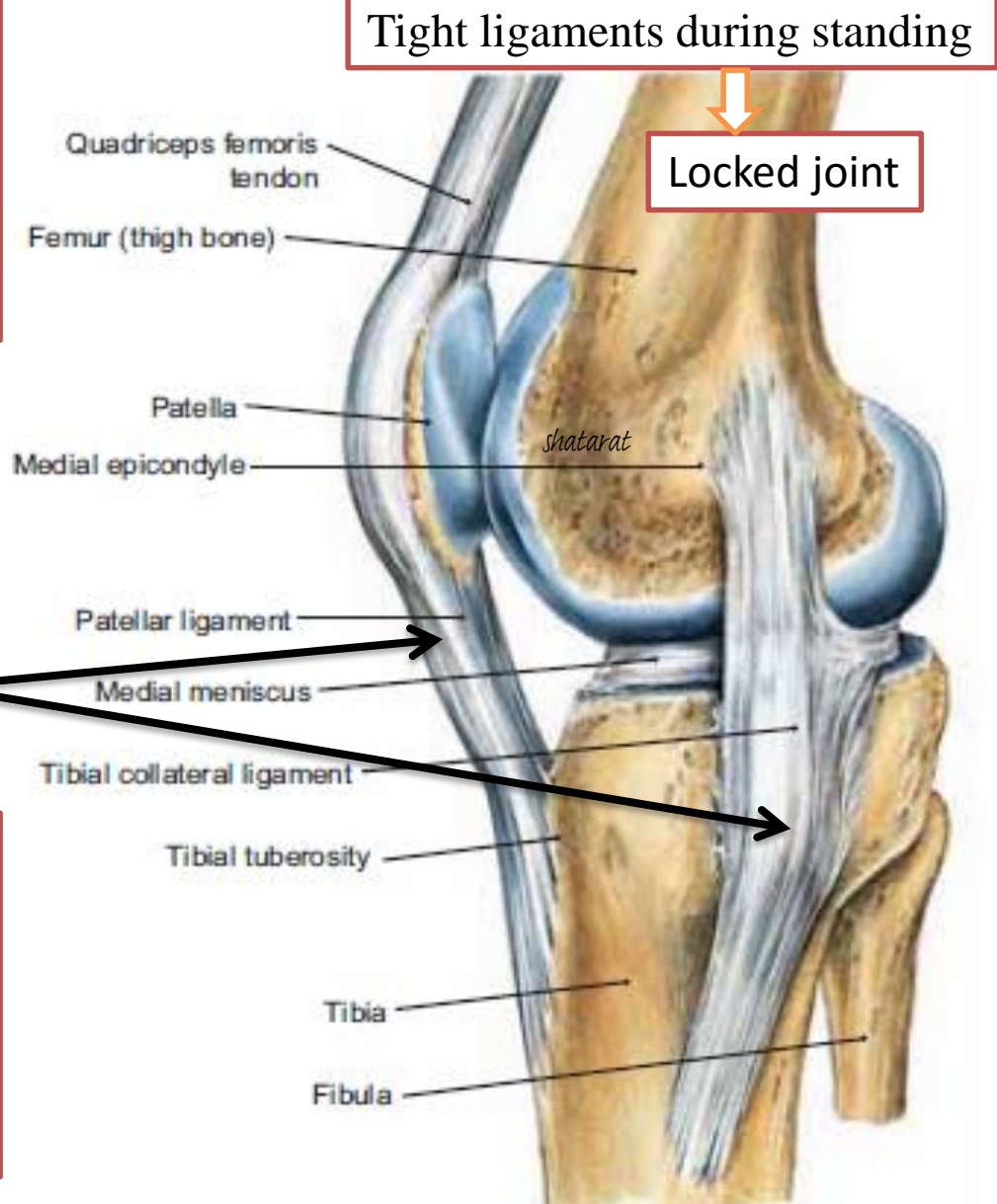


6.Locking mechanism

➤ When standing, the knee joint is '**locked**' which reduces the amount of muscle work needed to maintain the standing position

➤ The locking mechanism is achieved **by medial rotation of the femur on the tibia during extension**. Medial rotation and full ***extension tighten all the associated ligaments***

Another feature that keeps the knee extended when standing is that the **body's center of gravity** is positioned along a vertical line that passes **anterior to the knee joint**.



The extended knee is said to be in the locked position

Before flexion of the knee joint can occur, it is essential that the major ligaments be untwisted to permit movements between the joint surfaces.

This ***unlocking*** or untwisting process is accomplished by the ***popliteus muscle***, which **laterally rotates** the femur on the tibia

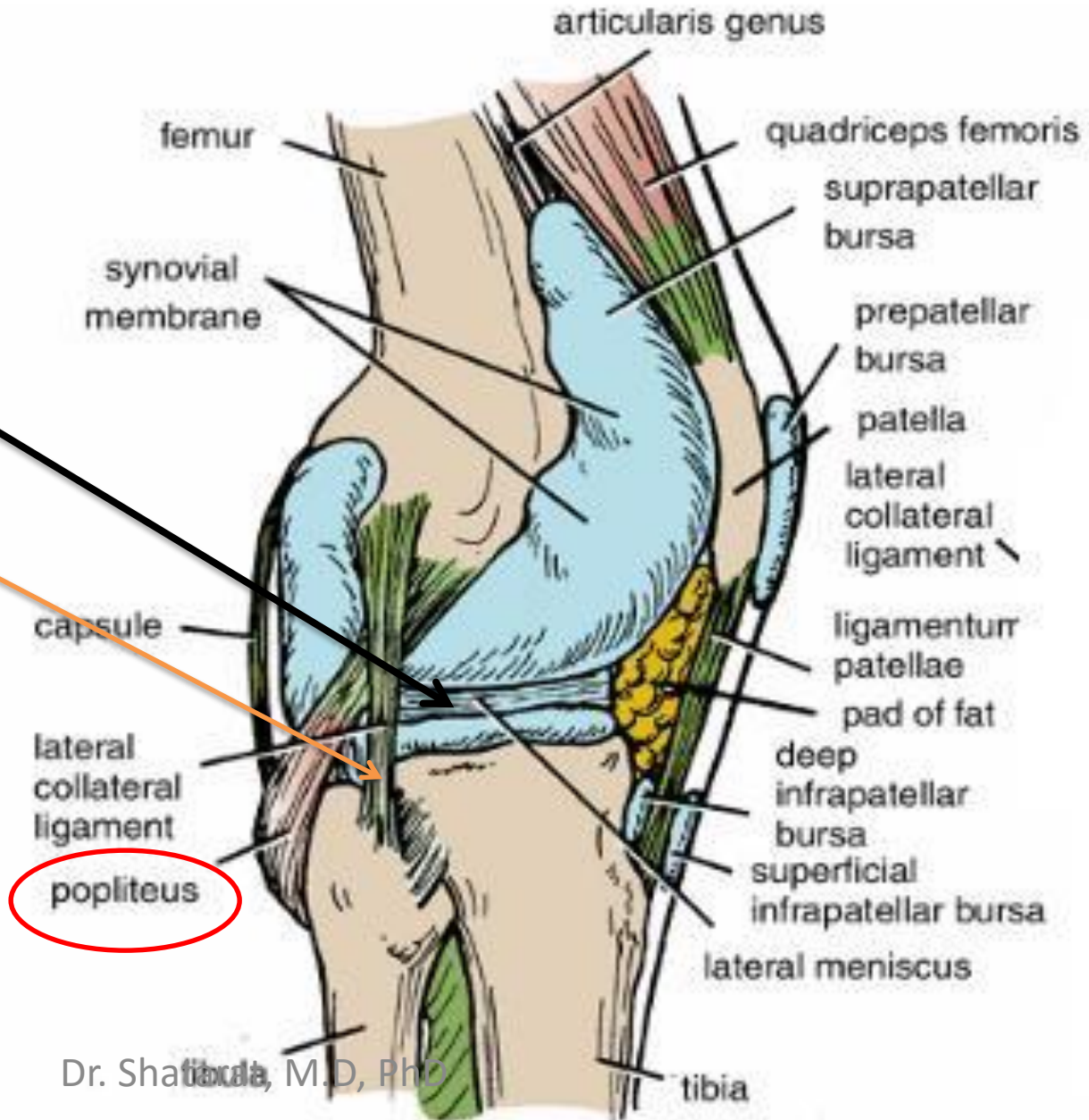
untight ligaments during flexion

↓
unlocked joint



The muscle arises within the capsule of the knee joint

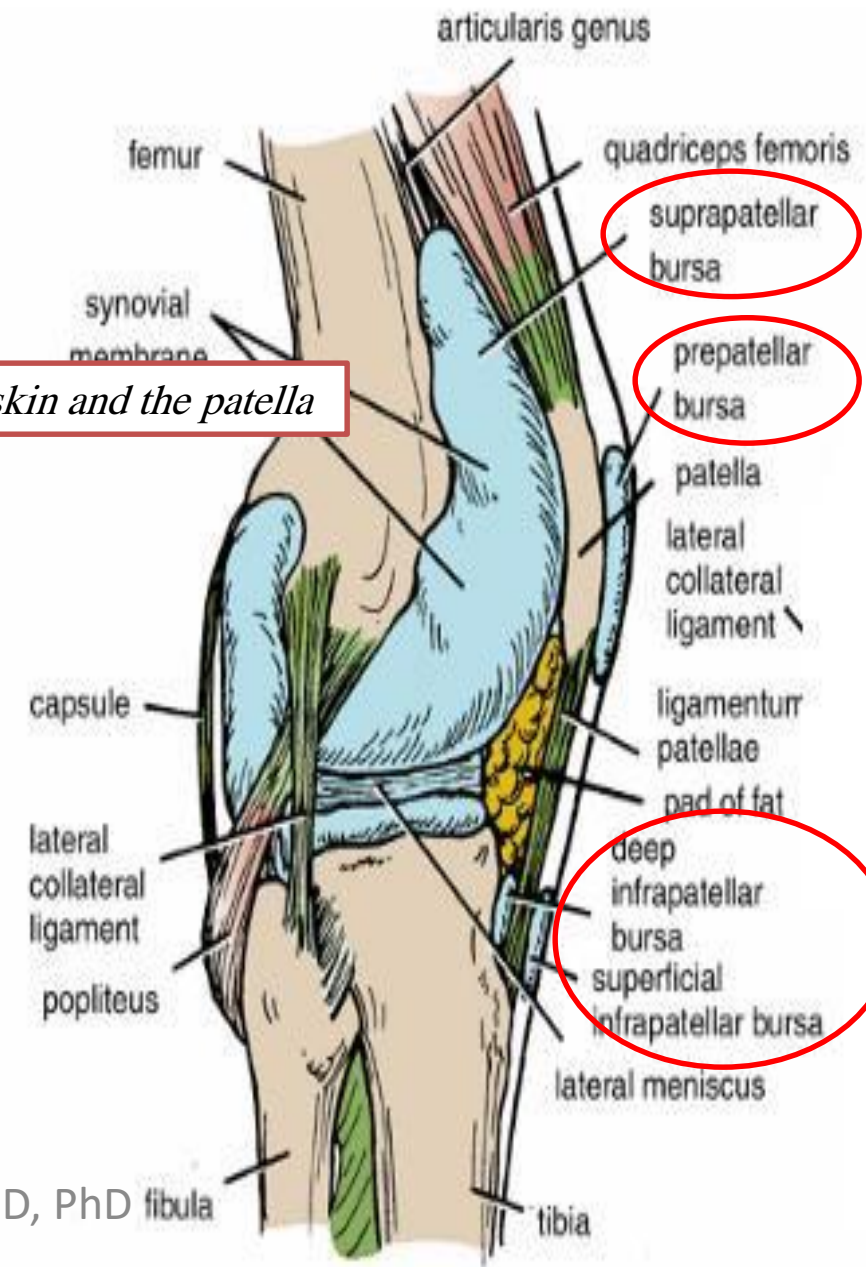
- its tendon separates the **lateral meniscus** from the **lateral ligament of the joint.**
- It emerges through the lower part of the posterior surface of the capsule of the joint to pass to its insertion.



7-Bursae Related to the Knee Joint

Prepatellar bursitis (“housemaid's knee”)

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



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.



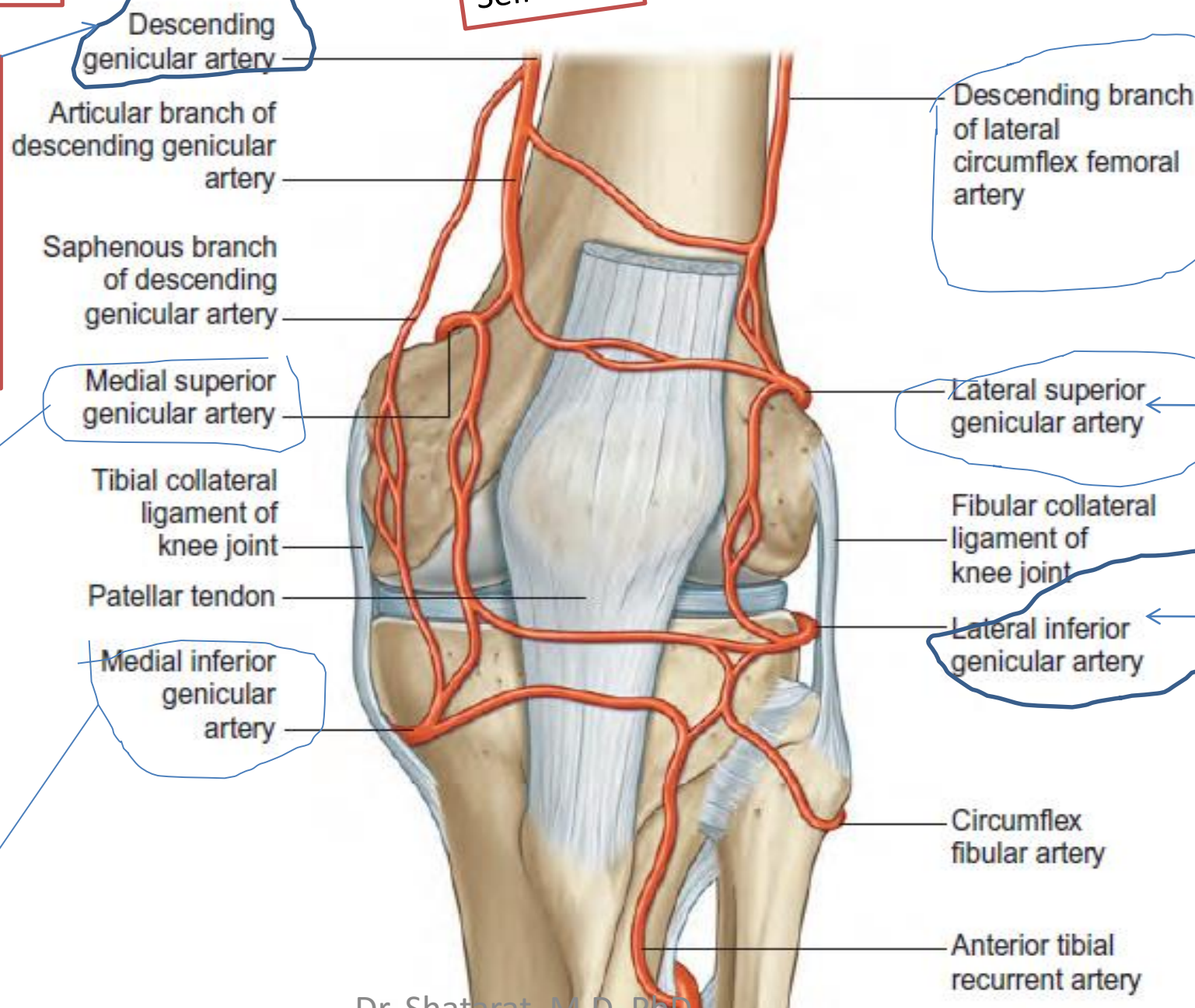
10- blood supply

Self-study

Branch of the femoral artery in the adductor canal

From the popliteal artery

From the popliteal artery



Descending genicular artery

Articular branch of descending genicular artery

Saphenous branch of descending genicular artery

Medial superior genicular artery

Tibial collateral ligament of knee joint

Patellar tendon

Medial inferior genicular artery

Descending branch of lateral circumflex femoral artery

Lateral superior genicular artery

Fibular collateral ligament of knee joint

Lateral inferior genicular artery

Circumflex fibular artery

Anterior tibial recurrent artery

Anterior