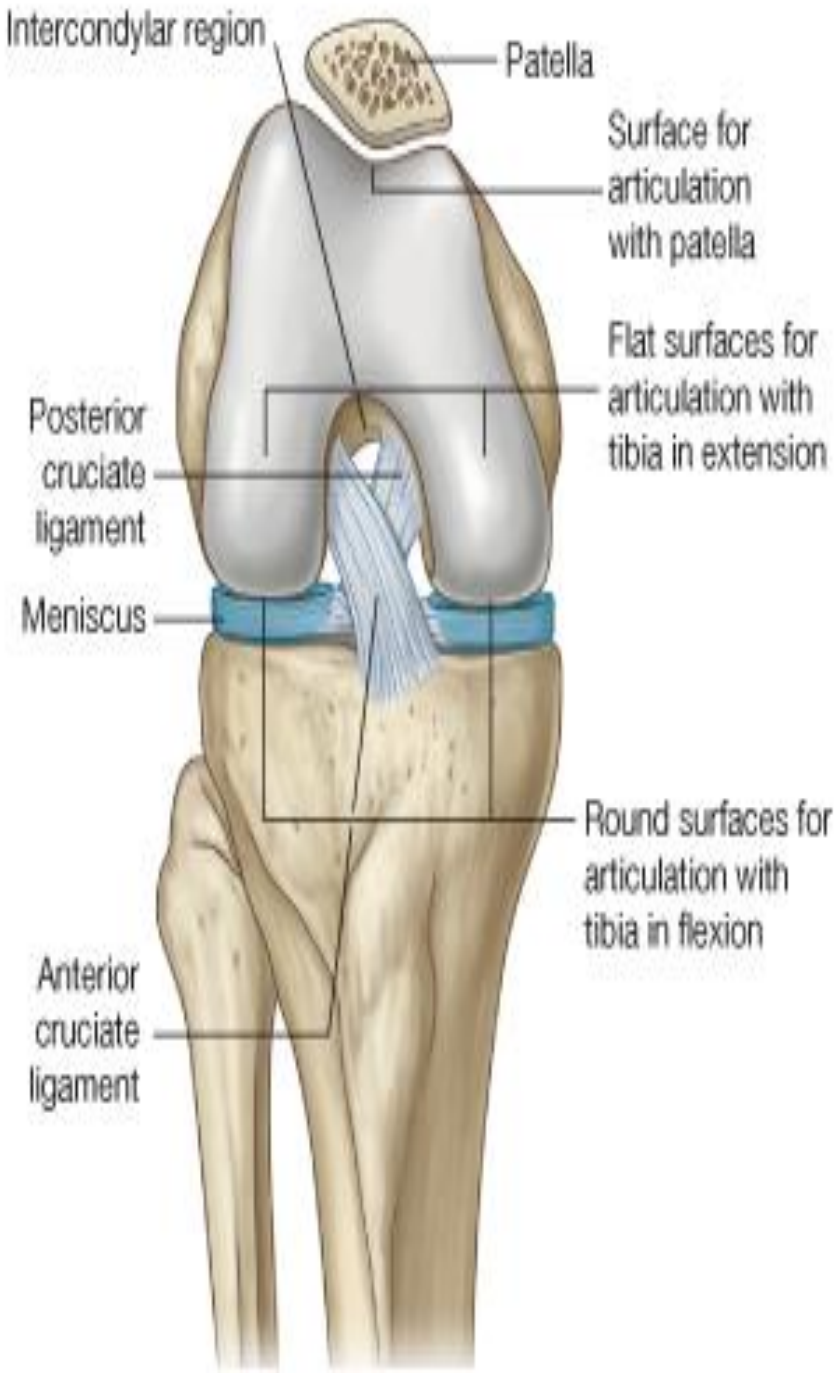
Knee Joint

➢Is the most **complicated** joint in the body

➢Consists of two condylar joints between: The **medial and lateral condyles** of the **femur** and **The condyles of the tibia** and a **gliding joint** between **the patella and the patellar surface of the femur**

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



Type

❖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.

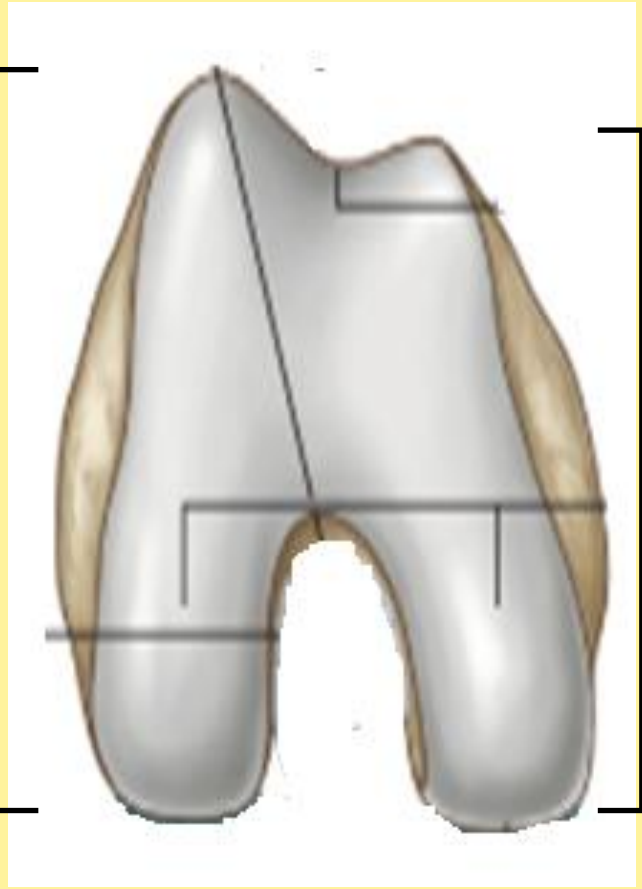
Notice that the lateral condyle of femur is a bit longer than the medial why?!

Lateral condyle of femur (OUTR)

THE OUTER IS STOUTER

prevents lateral dislocation of the patella

Longer than the medial



Medial condyle of femur (INNER)

THE INNER IS THINER

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

Popliteus Muscle

plays a key role in the movements of the knee joint

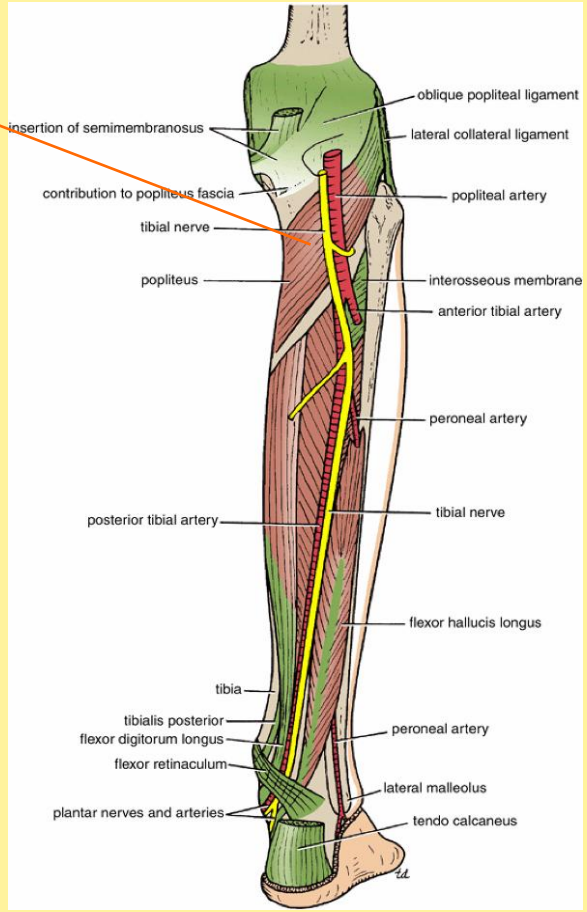
Origin: From the ***lateral surface of the lateral*** condyle of the femur **by *a rounded tendon*** and by a few fibers from ***the lateral semilunar cartilage***

Insertion: The fibers pass downward and medially and are attached to the posterior surface of the tibia, ***above the soleal line.***

•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.



Action: Medial rotation of the tibia on the femur or, if the foot ***is on the ground,***

lateral rotation of the femur on the tibia

➢ The latter action occurs at the commencement of flexion of the extended knee, and *its rotatory action slackens the ligaments of the knee joint*; this action is sometimes referred to **as unlocking the knee joint.**

Capsule

1-The capsule is attached to *the margins of the articular surfaces*

2- surrounds the sides and posterior aspect of the joint.

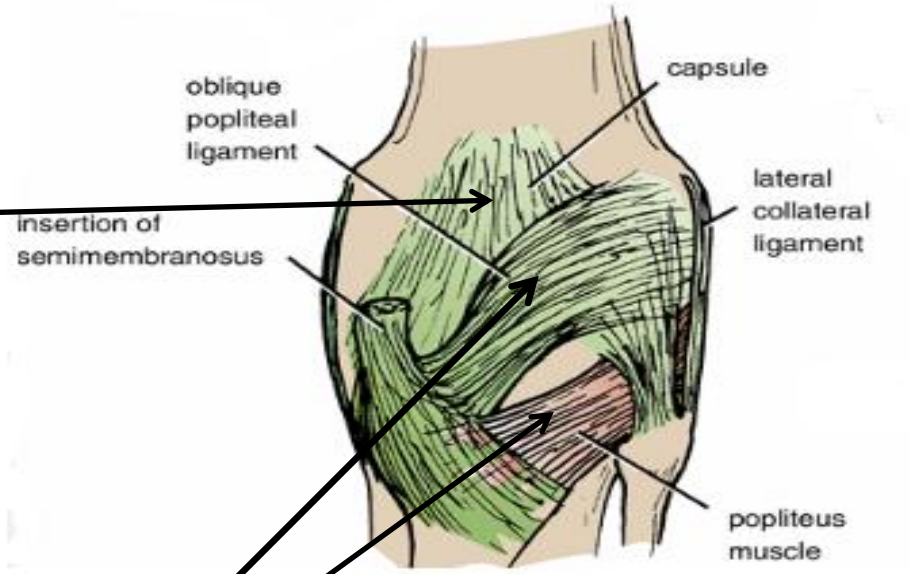
3-On the front of the joint, ***the capsule is absent*** permitting the synovial membrane to pouch upward beneath the quadriceps tendon, forming

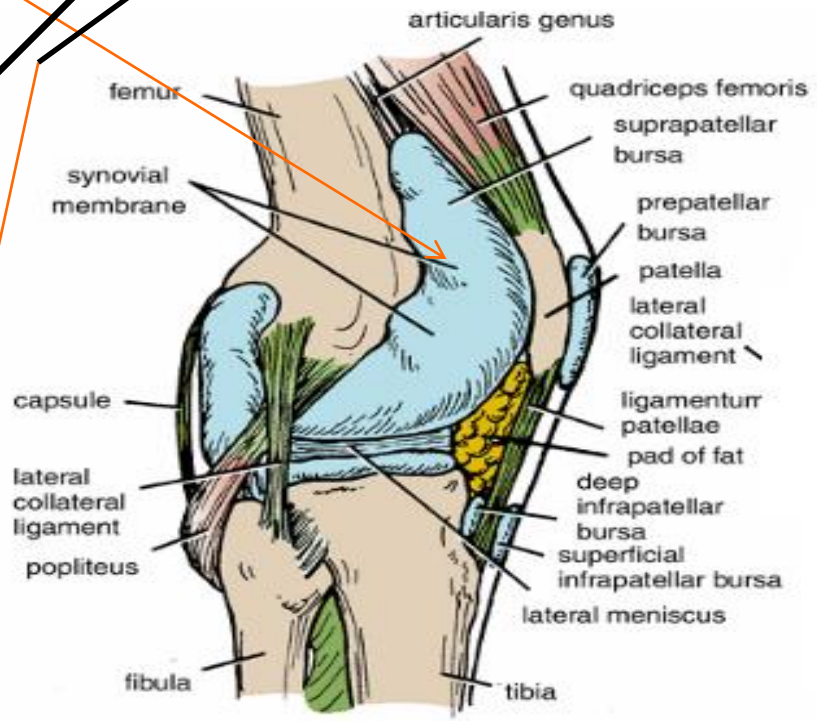
the suprapatellar bursa

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

5- Behind the joint, the capsule is strengthened by an ***expansion of the semimembranous muscle*** called the **oblique popliteal ligament**

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





Ligaments of the knee joint

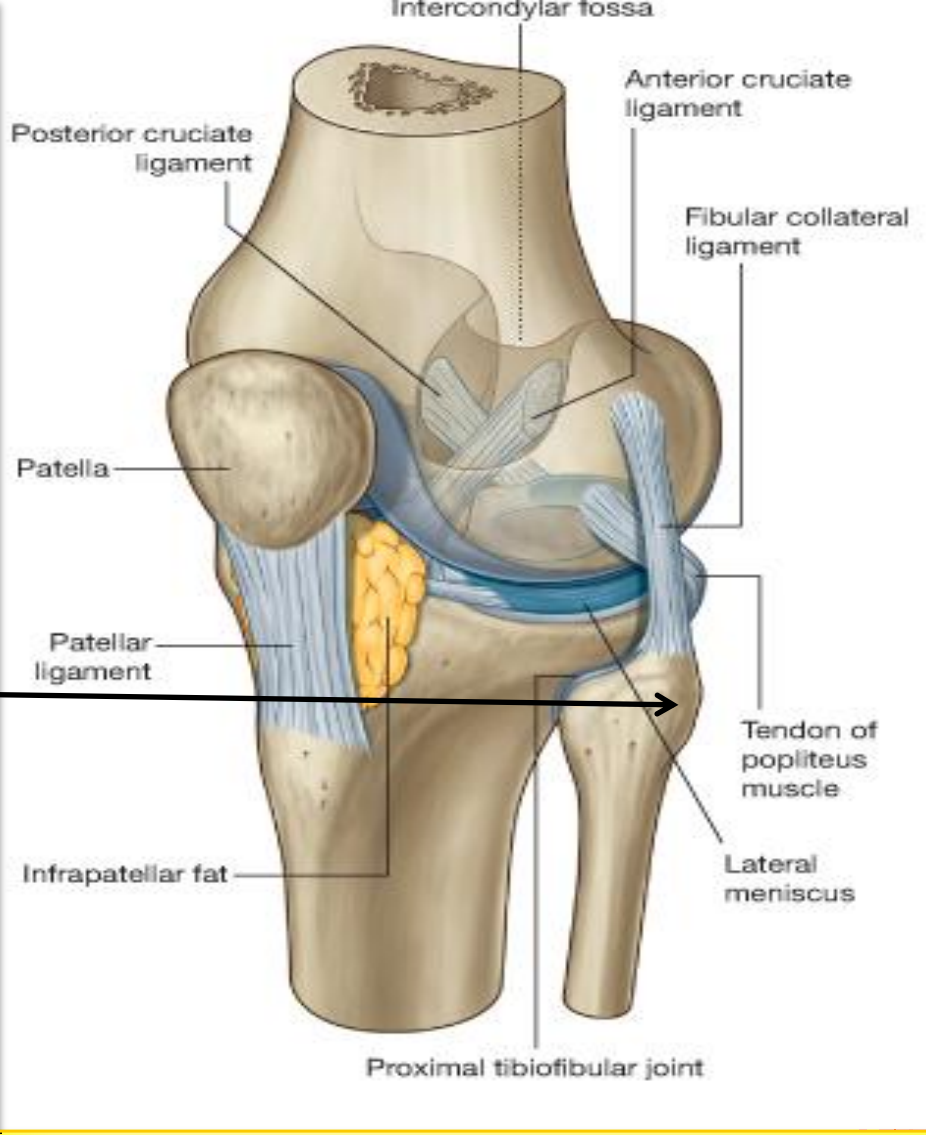
❖ ***The ligaments may be divided into***

1-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)*

❖**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 ?!***



❖**The oblique popliteal ligament**

Is a tendinous expansion derived from the semimembranosus muscle.

It strengthens the posterior aspect of the capsule

2-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

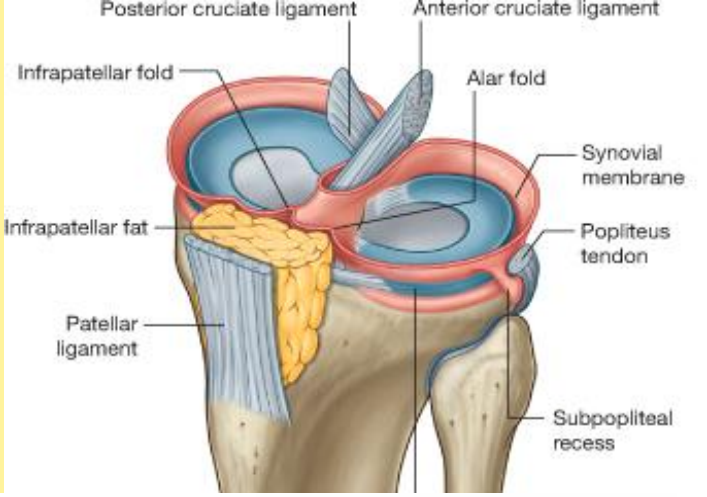
➢Is attached to the **anterior intercondylar area** of the tibia and ***passes upward, backward, and laterally***, to be attached to ***the posterior part of the medial surface of the lateral femoral condyle***

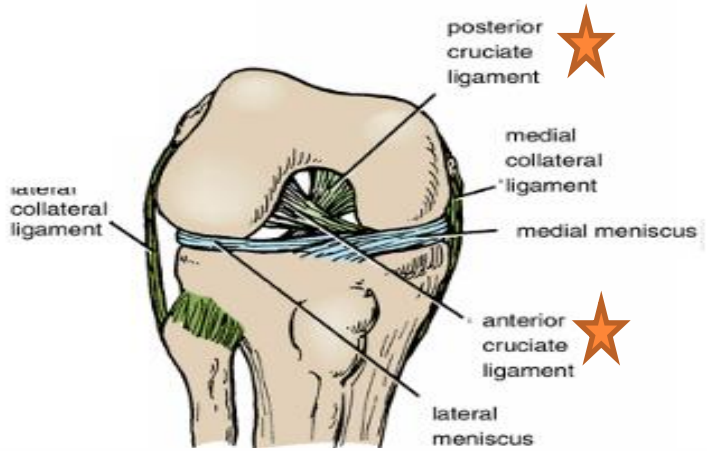
➢Prevents ***posterior displacement*** of the femur on the tibia. With the knee joint flexed, the anterior cruciate ligament prevents the tibia from being **pulled anteriorly.**

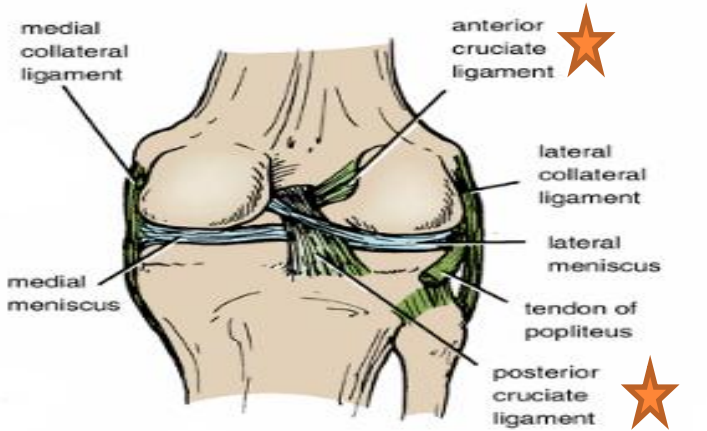
Posterior Cruciate Ligament

➢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**.







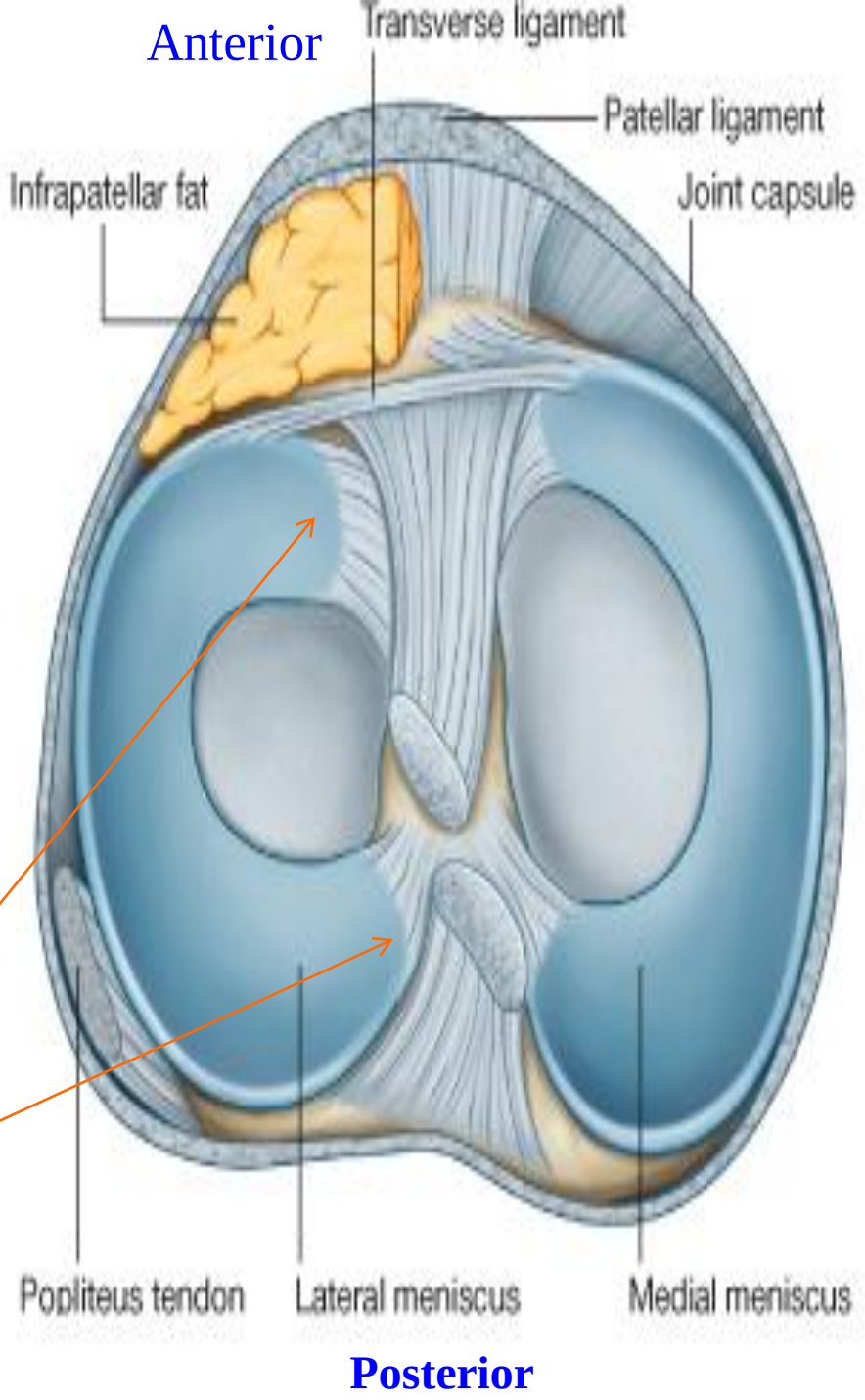
Menisci

➢Medial and lateral menisci are C-shaped sheets of fibrocartilage.

➢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.**



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.

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

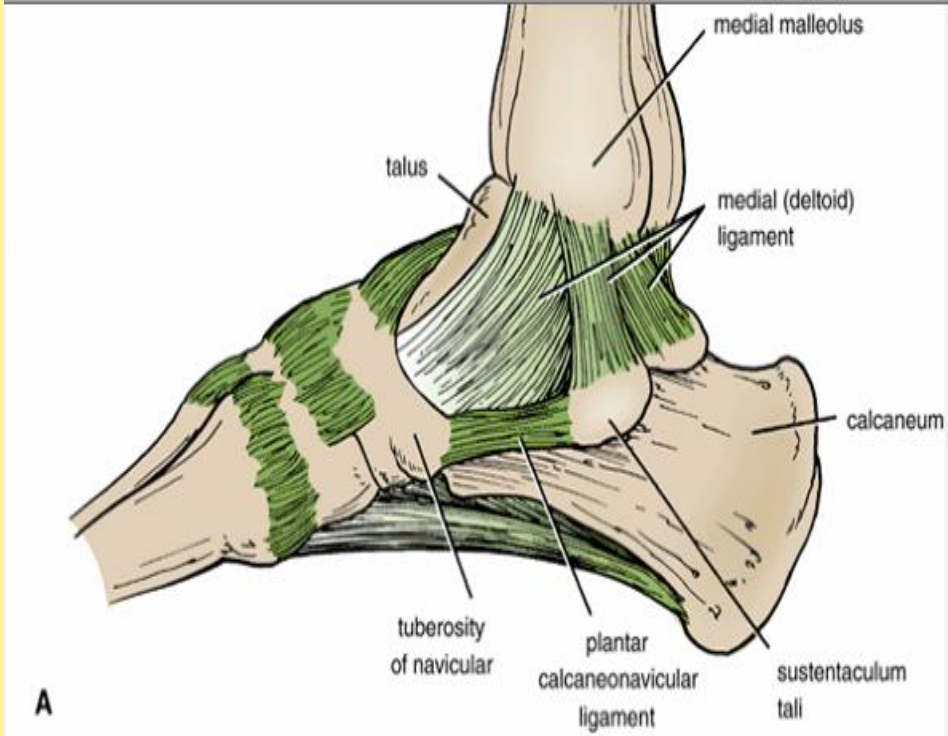
The medial, or deltoid, ligament

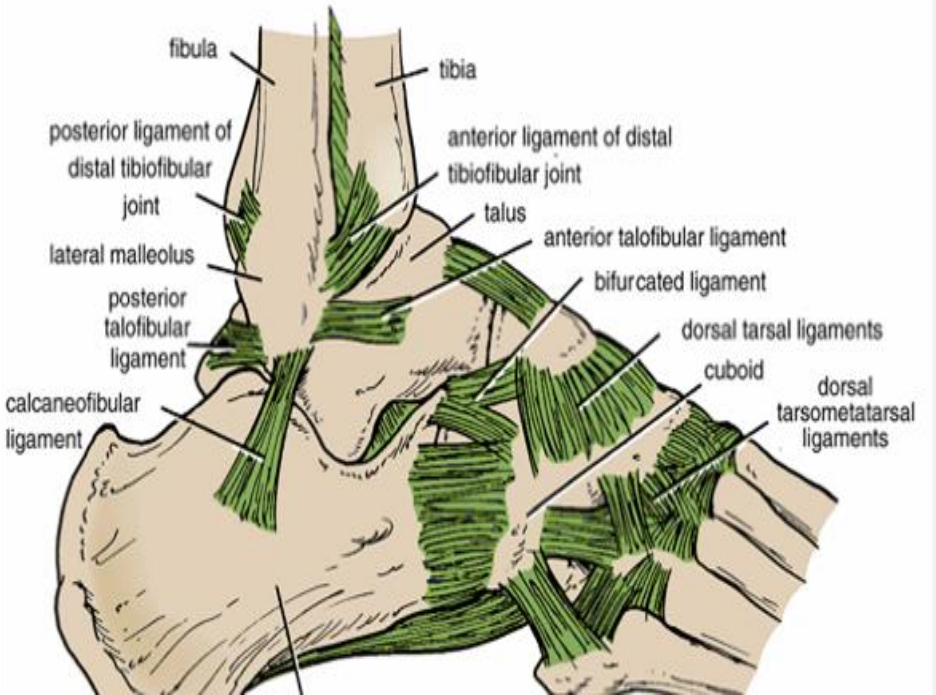
The lateral ligament

Movements

Dorsiflextion 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**

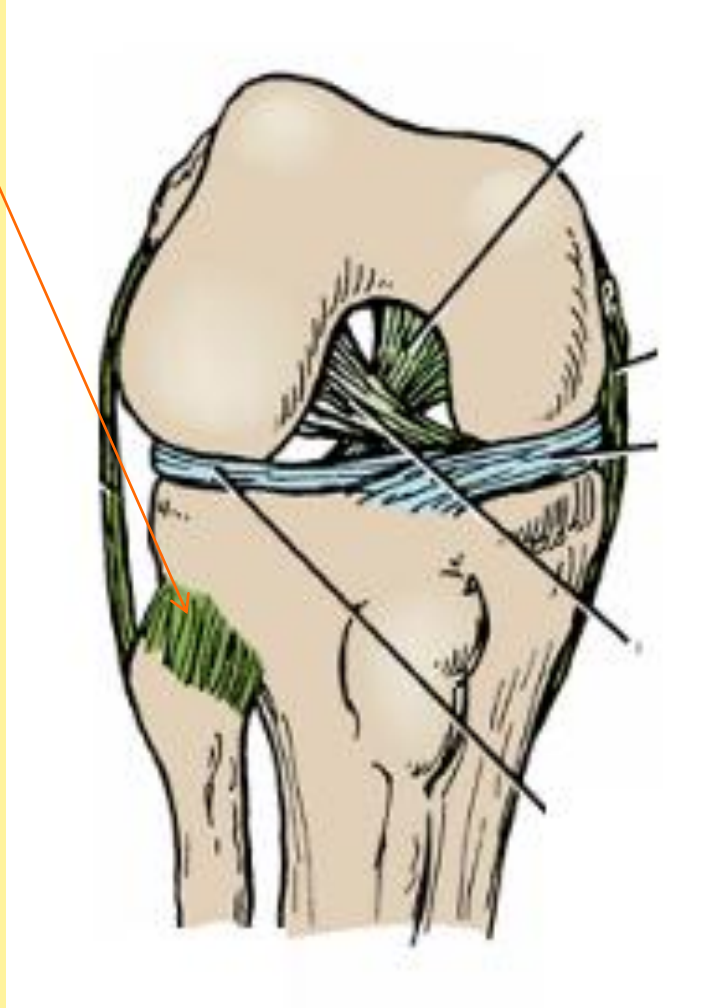
The synovial membrane lines the capsule and is attached to the margins of the articular surfaces.

➢ **Nerve Supply**

The common peroneal nerve supplies the joint.

Movements

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



Patellar Dislocations

The patella is a sesamoid bone lying within the quadriceps tendon. The importance of the lower horizontal fibers of the vastus medialis and the large size of the lateral condyle of the femur in preventing lateral displacement of the patella has been emphasized. Congenital recurrent dislocations of the patella are caused by underdevelopment of the lateral femoral condyle. Traumatic dislocation of the patella results from direct trauma to the quadriceps attachments of the patella (especially the vastus medialis), with or without fracture of the patella

Distal Tibiofibular Joint

➢Articulation

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

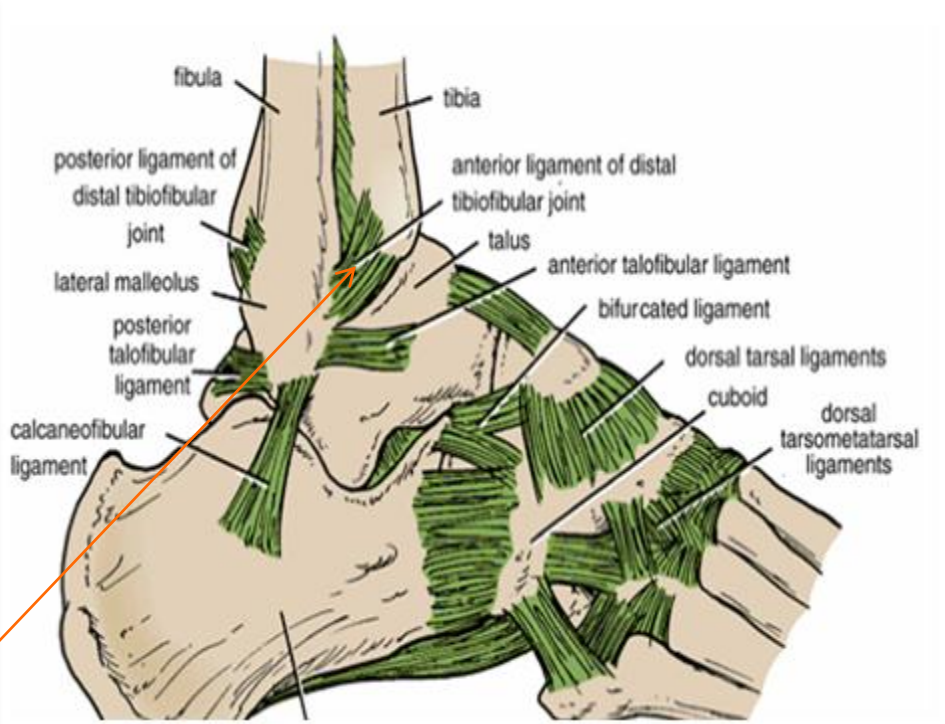
There is no capsule.

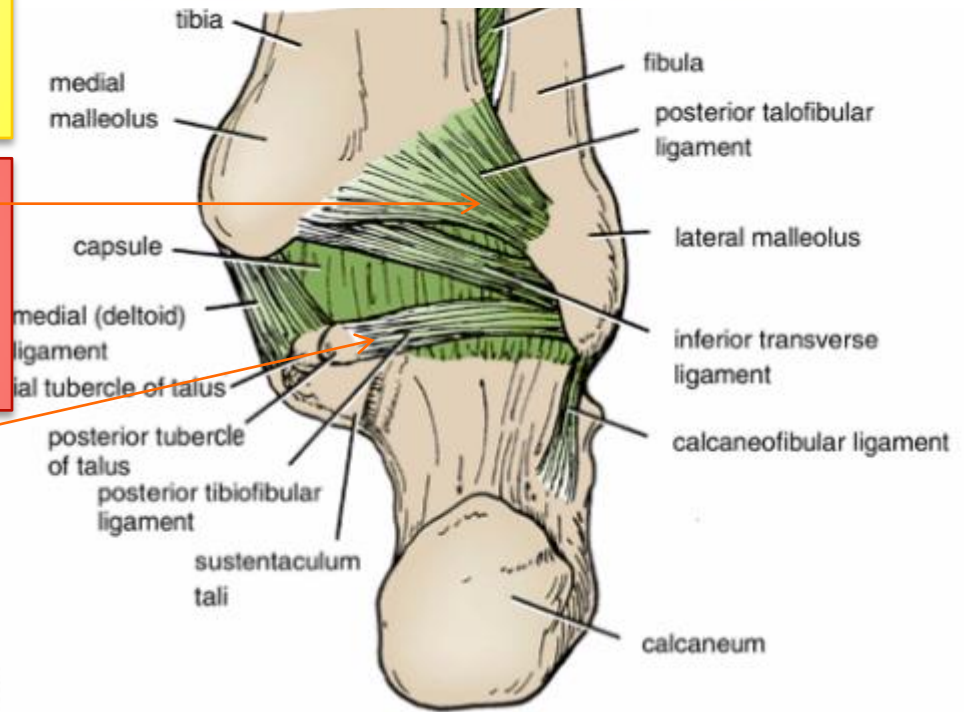
Ligaments

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

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

3-The **inferior transverse ligament**





Tarsal Joints

1-Subtalar Joint

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

Articulation

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

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

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.

3-Calcaneocuboid 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