

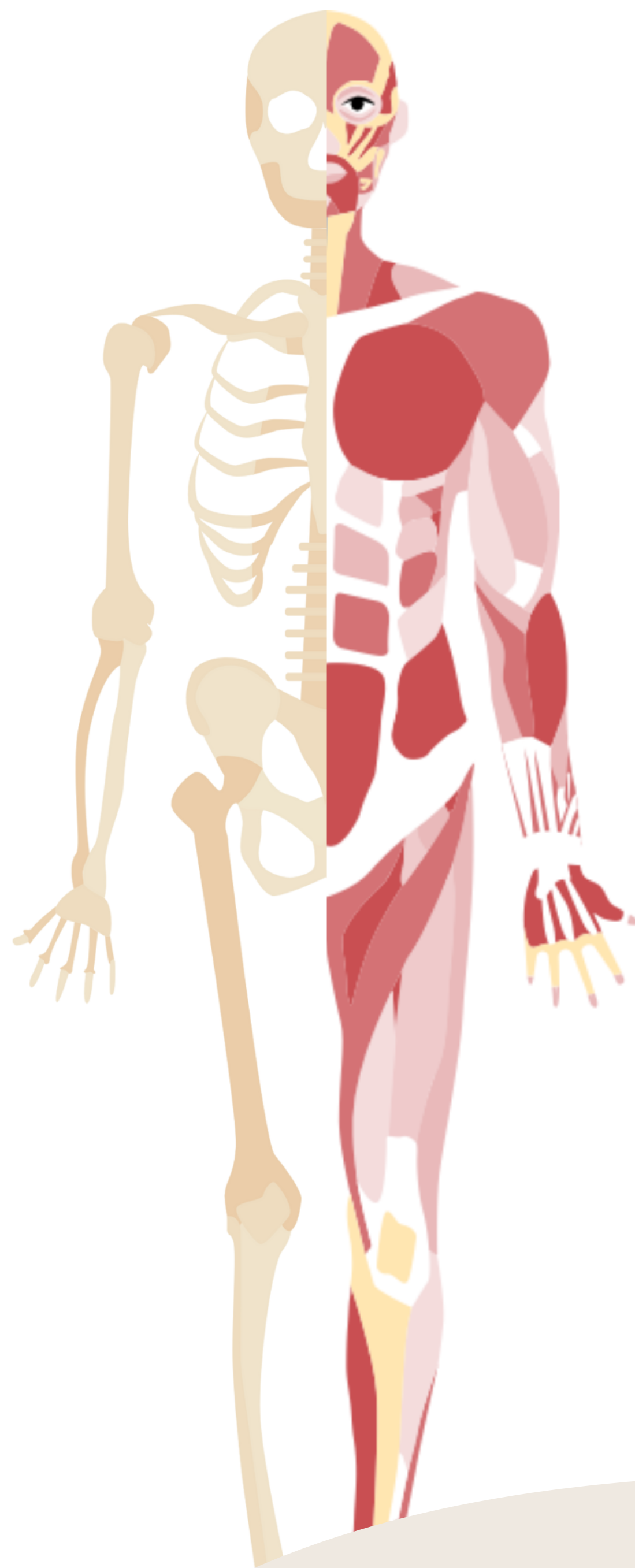
Lecture 17

HIP, KNEE & ANKLE JOINTS

OBJECTIVES

By the end of this lecture, you should be able to:

- List the type & articular surfaces of knee joint.
- Describe the capsule of knee joint, its extra- & intra-capsular ligaments. .
- List the important bursae in relation to knee joint.
- Describe the movements of knee joint.
- Apply Hilton's law about nerve supply of joints.
- List the type & articular surfaces of hip joint.
- Describe the ligaments of hip joints (extra- & intra-capsular ligaments).
- Describe movements of hip joint.
- List the type & articular surfaces of ankle joint.
- Describe the ligaments of ankle joints. Describe movements of ankle joint.
- Apply Hilton's law about nerve supply of joints.



Color Index:

- Main text
- Boys' Slides
- Girls' Slides
- Important
- Dr's Notes
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Editing File

Hip joint

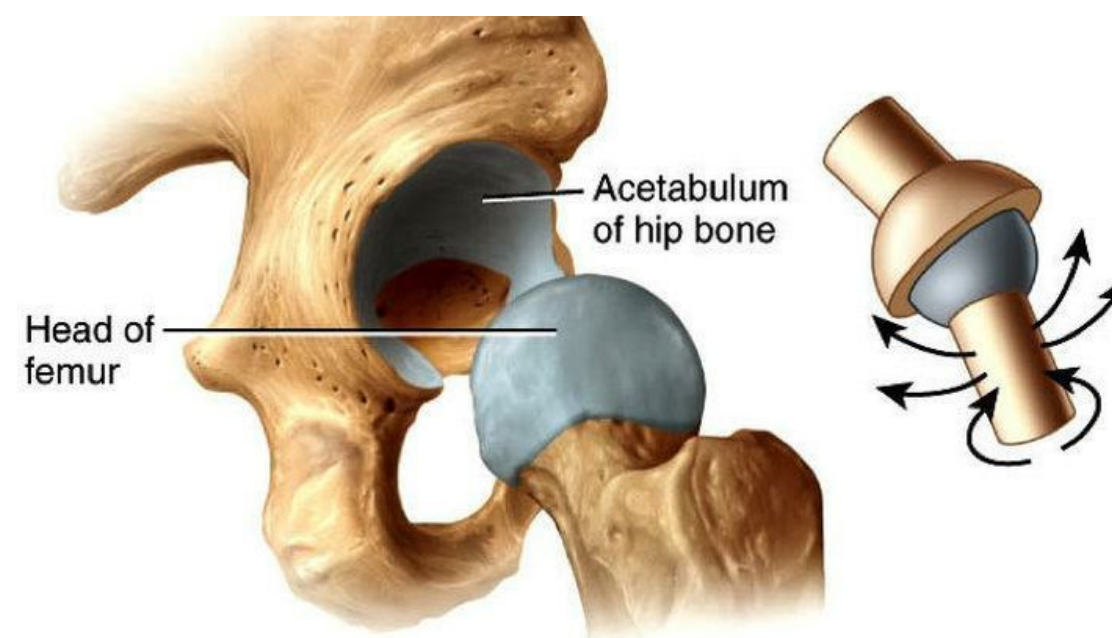


Type

it is a **synovial, ball & socket** joint.

Articular Surface

Acetabulum of hip (pelvic) bone.
Head of femur



ligaments

Extracapsular (3)

Iliofemoral ligament: Y-shaped strong ligament, anterior to joint, limits extension.

Pubofemoral ligament: antero-inferior to joint, limits abduction & lateral rotation.

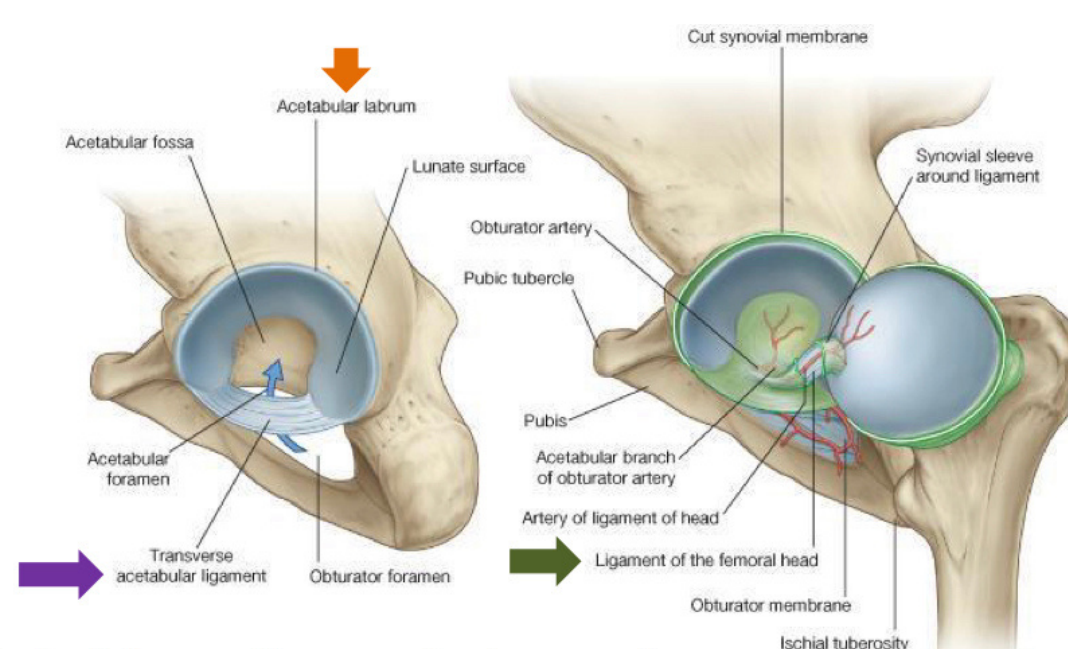
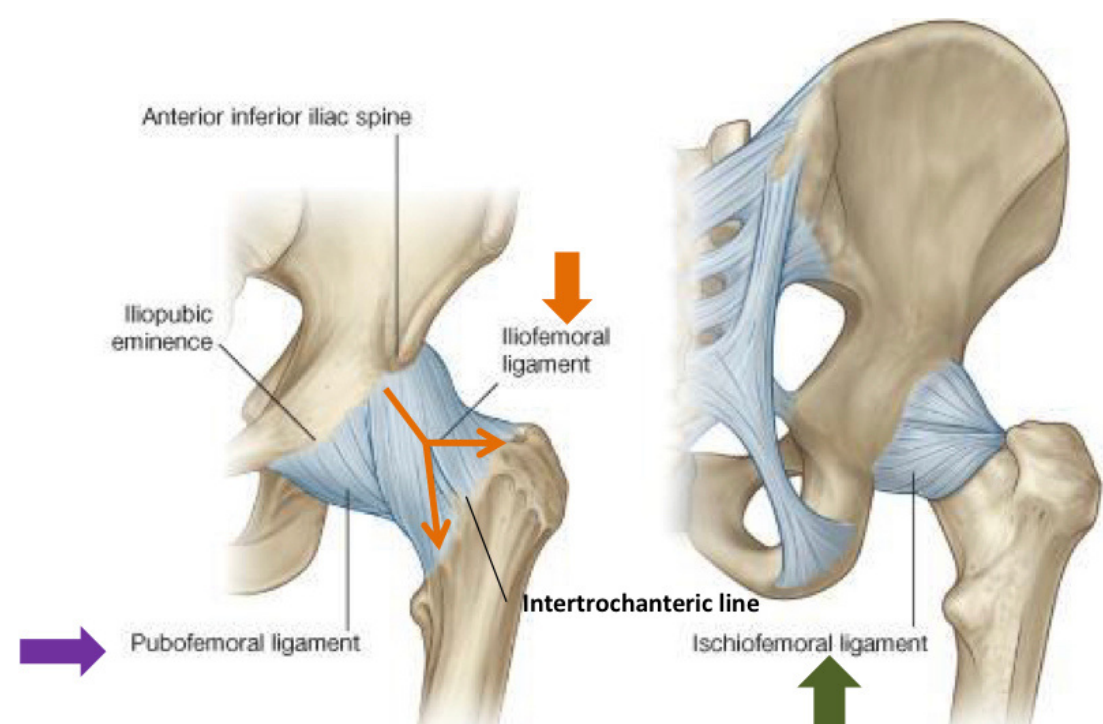
Ischiofemoral ligament: posterior to joint, limits medial rotation.

Intracapsular (3)

Acetabular labrum: fibro-cartilaginous collar attached to margins of acetabulum to increase its depth for better retaining of head of femur (it's completed inferiorly by transverse ligament)

Transverse acetabular ligament: converts acetabular notch into foramen (acetabular foramen) through which pass acetabular vessels.
443dr :is for protection of the vessels not for stability of the joint

Ligament of femoral head: carries vessels to head of femur (Fovea) (branch of obturator artery).



Hip joint movement ☆



HIP Joint

Flexion

- Iliopsoas (mainly)
- Sartorius
- Pectineus
- Rectus femoris



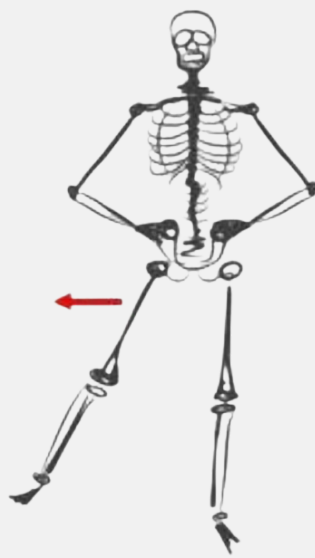
Extension

- Hamstrings (mainly)
- Gluteus maximus (powerful extensor)



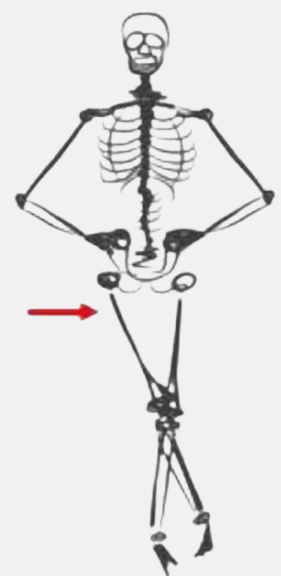
Abduction

- Gluteus medius and minimus
- Sartorius



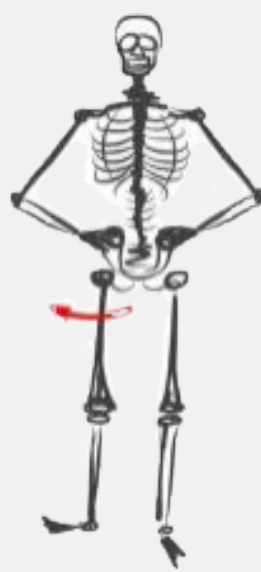
Adduction

- :-Adductors (all adductors muscles)
- Gracilis



Lateral rotation

- Gluteus maximus
- Piriformis
- Quadratus femoris
- Obturator externus and internus



Medial rotation

- Gluteus medius
- Gluteus minimus



Knee joint



is forms of :

- Three bones (tibia, femur , patella)
- three articulations

knee joints articulation

1-Femoro-patellar articulations:

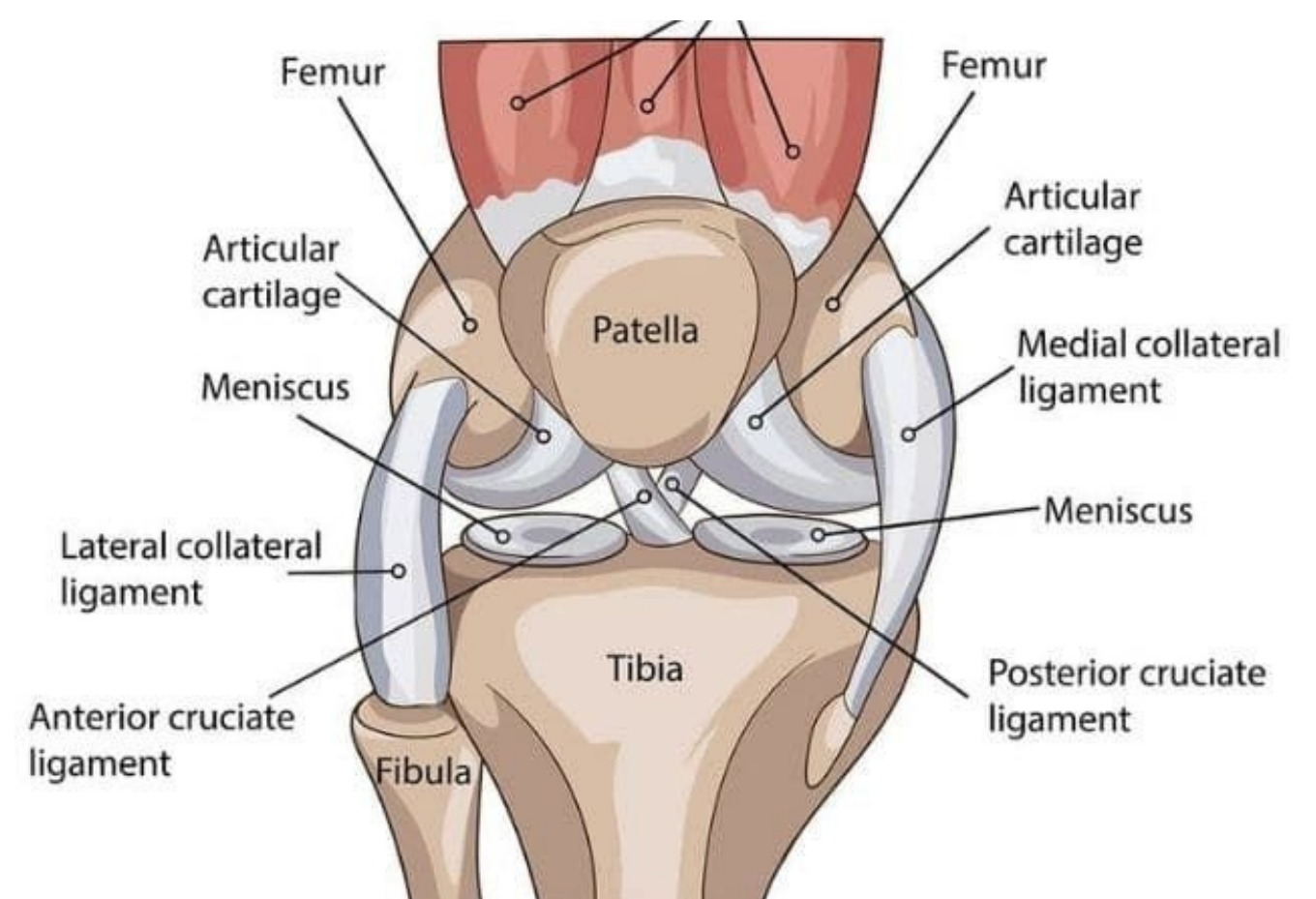
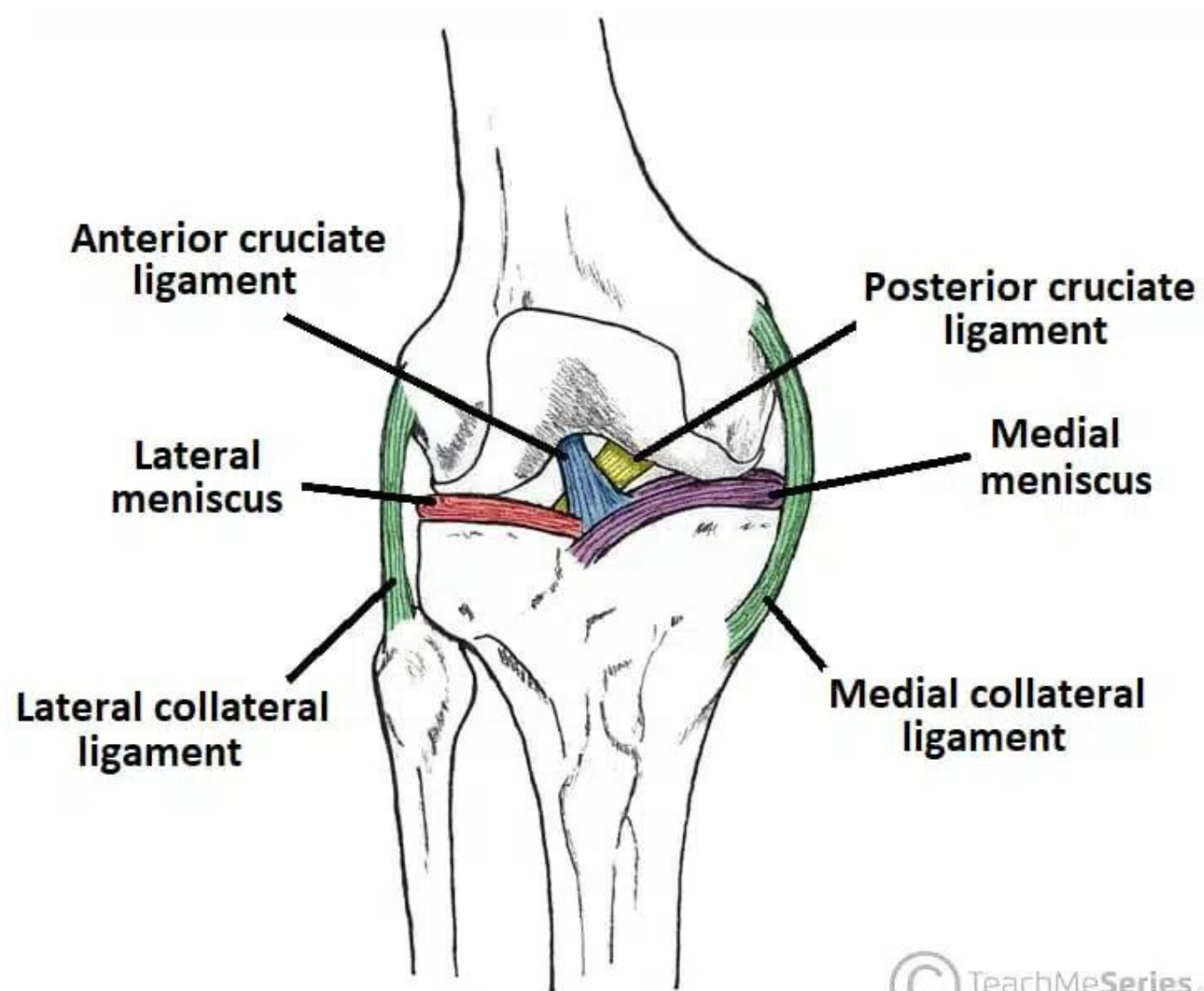
Between the posterior surface of the Patella and patellar surface of femur
(Type: synovial, plane)

Dr's note: because it's a plane , the movement is minimal

2-Femoro-tibial articulations:

Between the 2 femoral condyles and upper surfaces of the 2 tibial condyles
(Type: synovial, modified hinge)

Dr's Note: Because it's hinge, it has flexion and extension movements.
Because it has been modified so that it is not just a hinge, lateral rotation and medial rotation are also involved



Knee joint

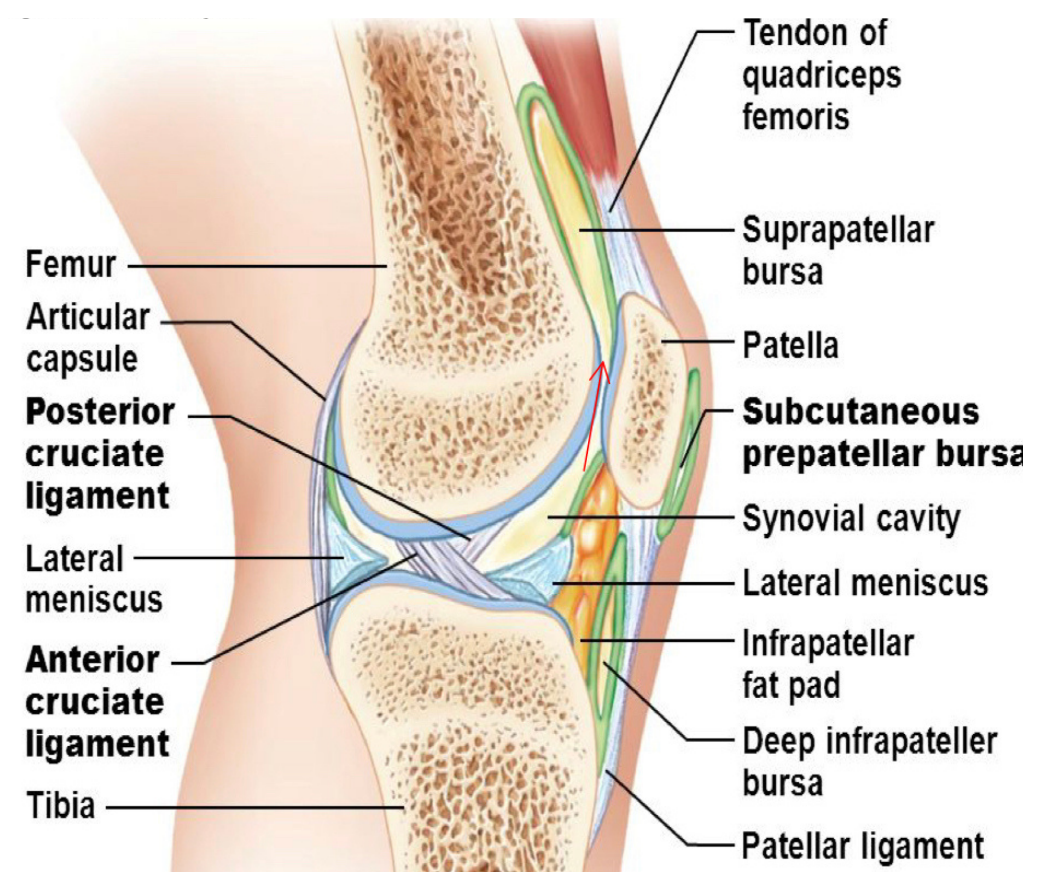
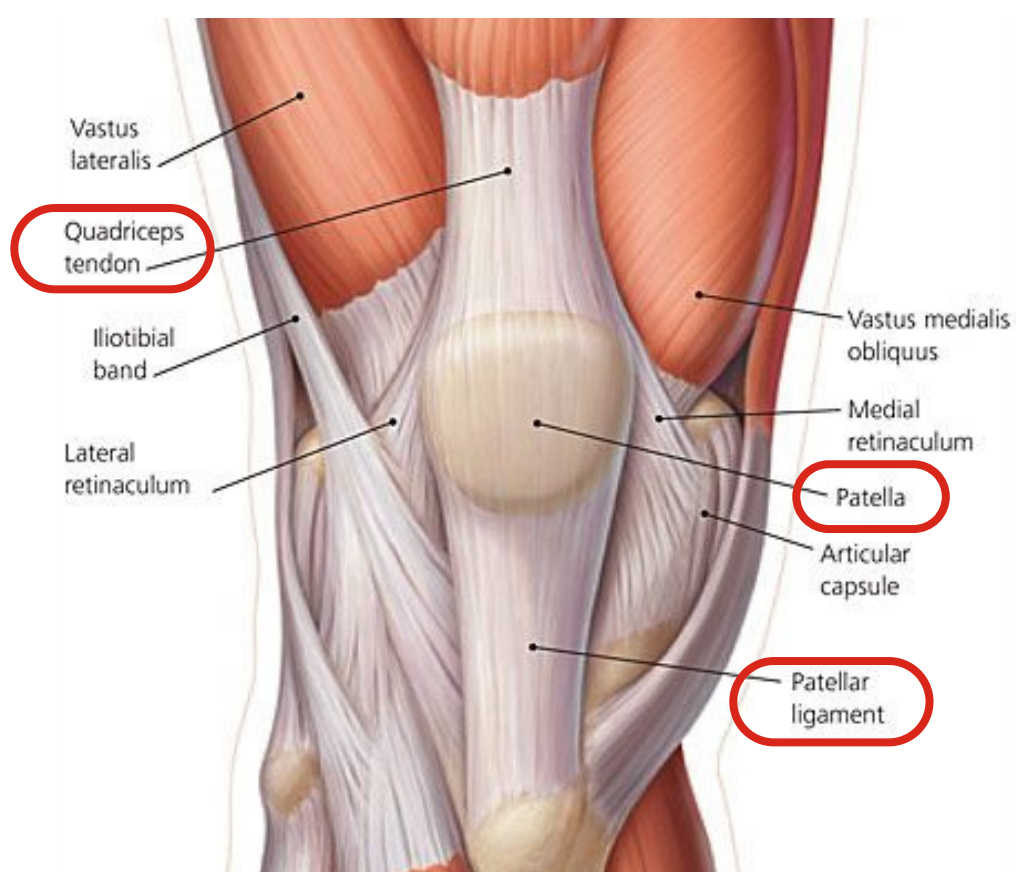
Capsule

The capsule in the knee is deficient anteriorly and replaced by :

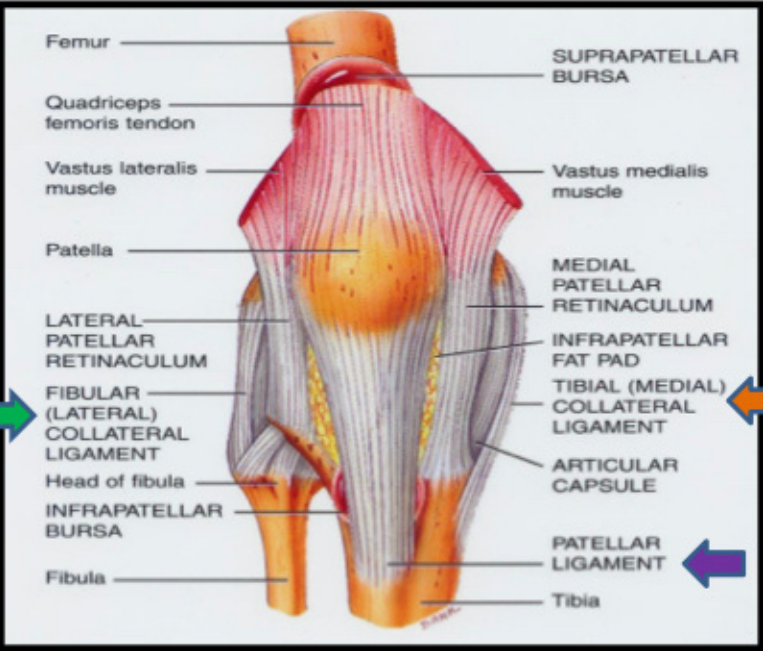
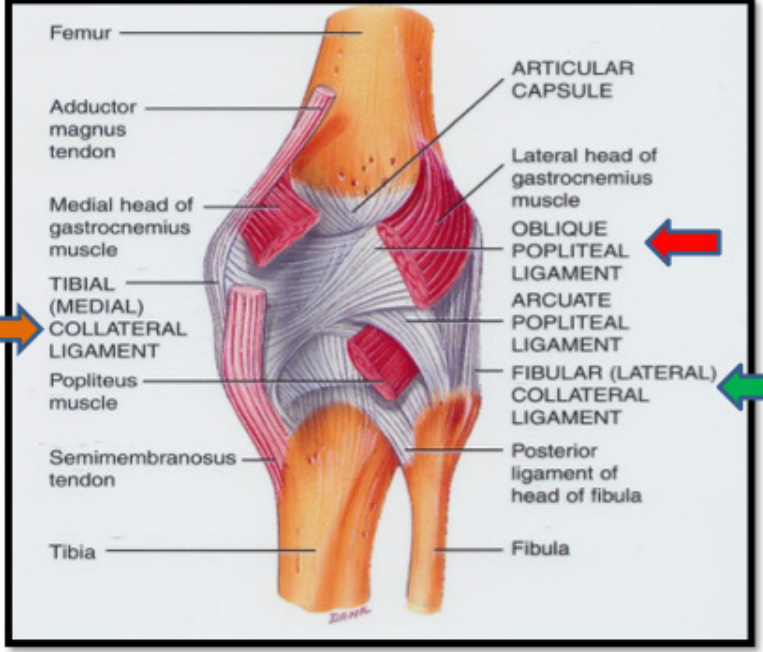
- quadriceps femoris tendon
 - Patella
 - Ligamentum patella
- (They become the capsule)

It possesses two openings;

- One for popliteus tendon -
- one for communication with suprapatellar bursa



Extracapsular Ligament of The Knee

ligament	course	pictures
ligamentum patellae (patellar ligament) :	from patella to tibial tuberosity.	
Medial (tibial) collateral ligament:	from medial epicondyle of femur to upper part of medial surface of tibia. (Firmly attached to medial meniscus). "Prevents unwanted movements" صعب تتحرك، الإصابة سهله	
Lateral (fibular) collateral ligament:	from lateral epicondyle of femur to head of fibula (separated from lateral meniscus by popliteus tendon). سهل الحركة، الإصابة صعبه	
Oblique popliteal ligament:	extension of semimembranosus tendon.	

Medial ligament is stronger than lateral ligament

Intracapsular (STRUCTURES) Ligament of the knee

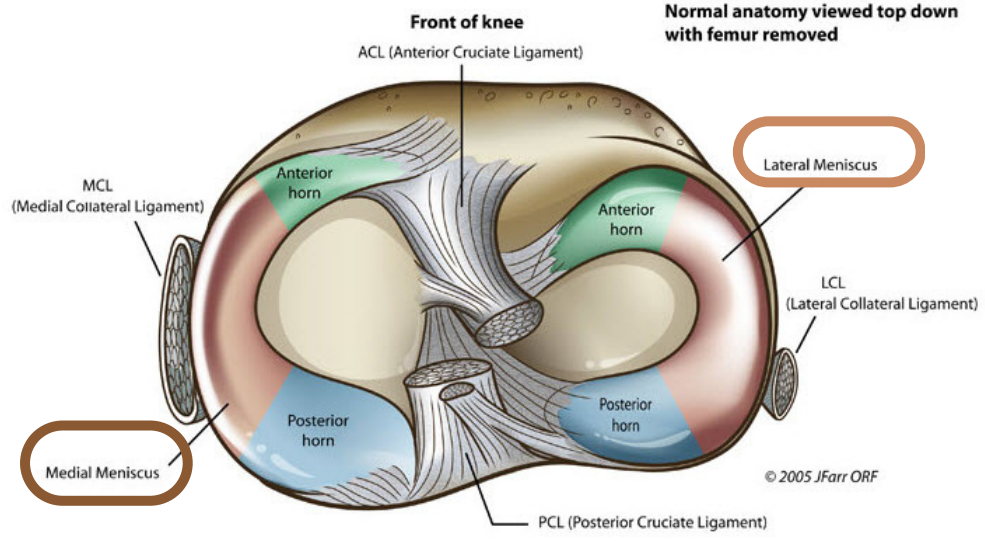
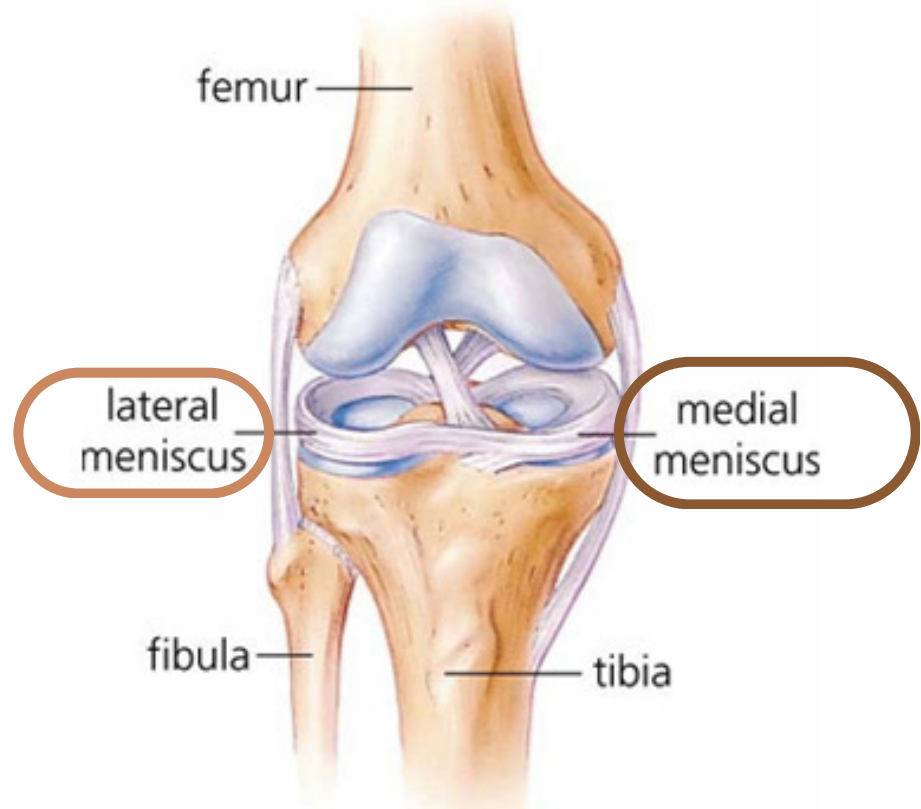
<h2>Menisci</h2>	
(it is a structure not a ligament, it is a cartilage)	
ATTACHMENT	FUNCTION
<p>- Each meniscus is attached by anterior & posterior horns into the upper surface of tibia.</p>	<p>1) They Deepen articular surfaces of tibial condyles.</p> <p>2) They Serve as cushions between tibia & femur</p>
<p>- The outer surface of medial meniscus is also attached to capsule & medial collateral ligament.</p> <p>- Medial meniscus is less mobile & more liable to be injured.</p>	

The menisci of the knees are semicircular **fibrocartilaginous** structures consisting of a hydrophilic extracellular matrix containing a network of collagen fibers, glycoproteins, and proteoglycans maintained by a cellular component.

Menisci shapes: They are 2 C shaped plates of fibro-cartilage

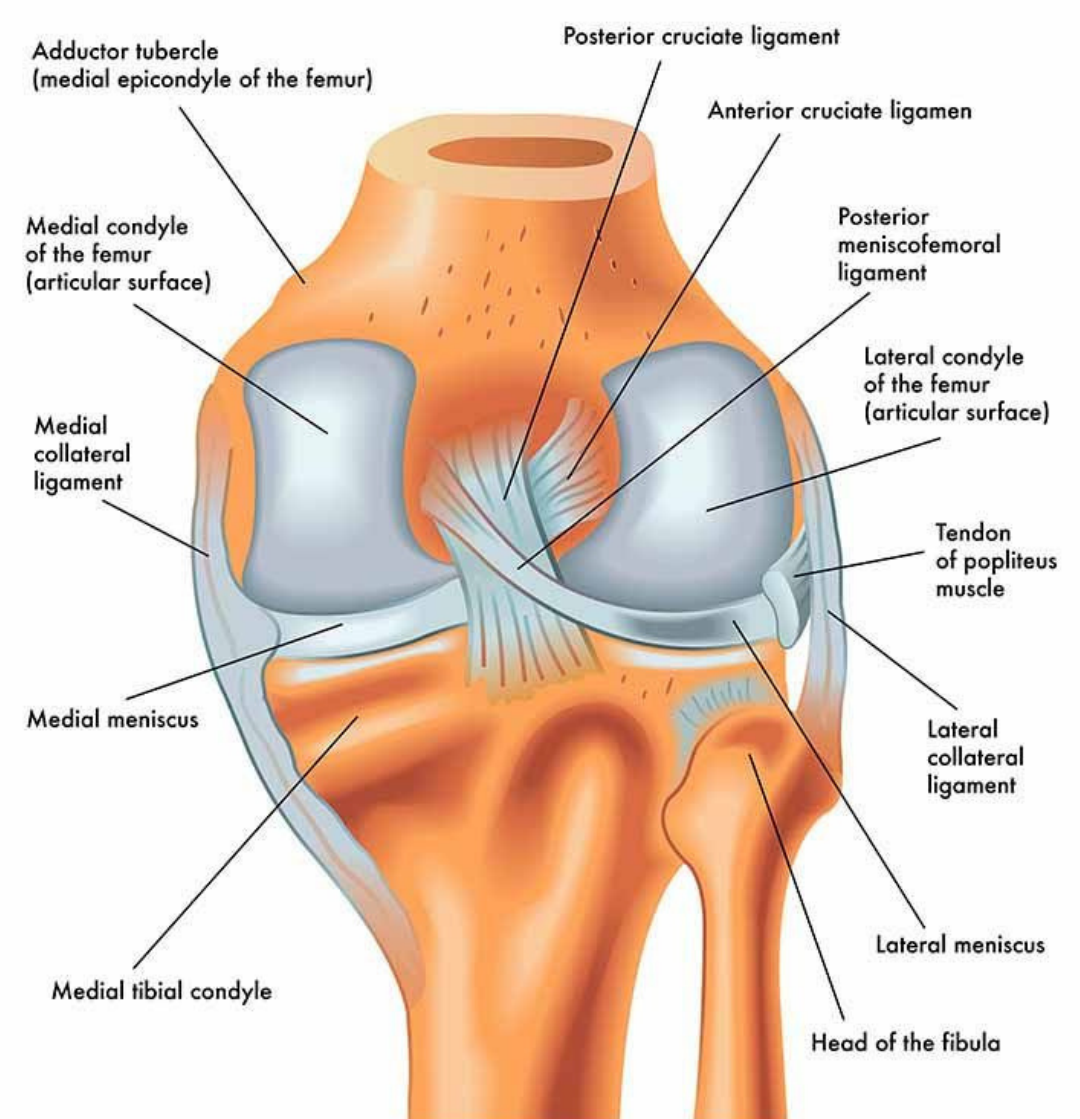
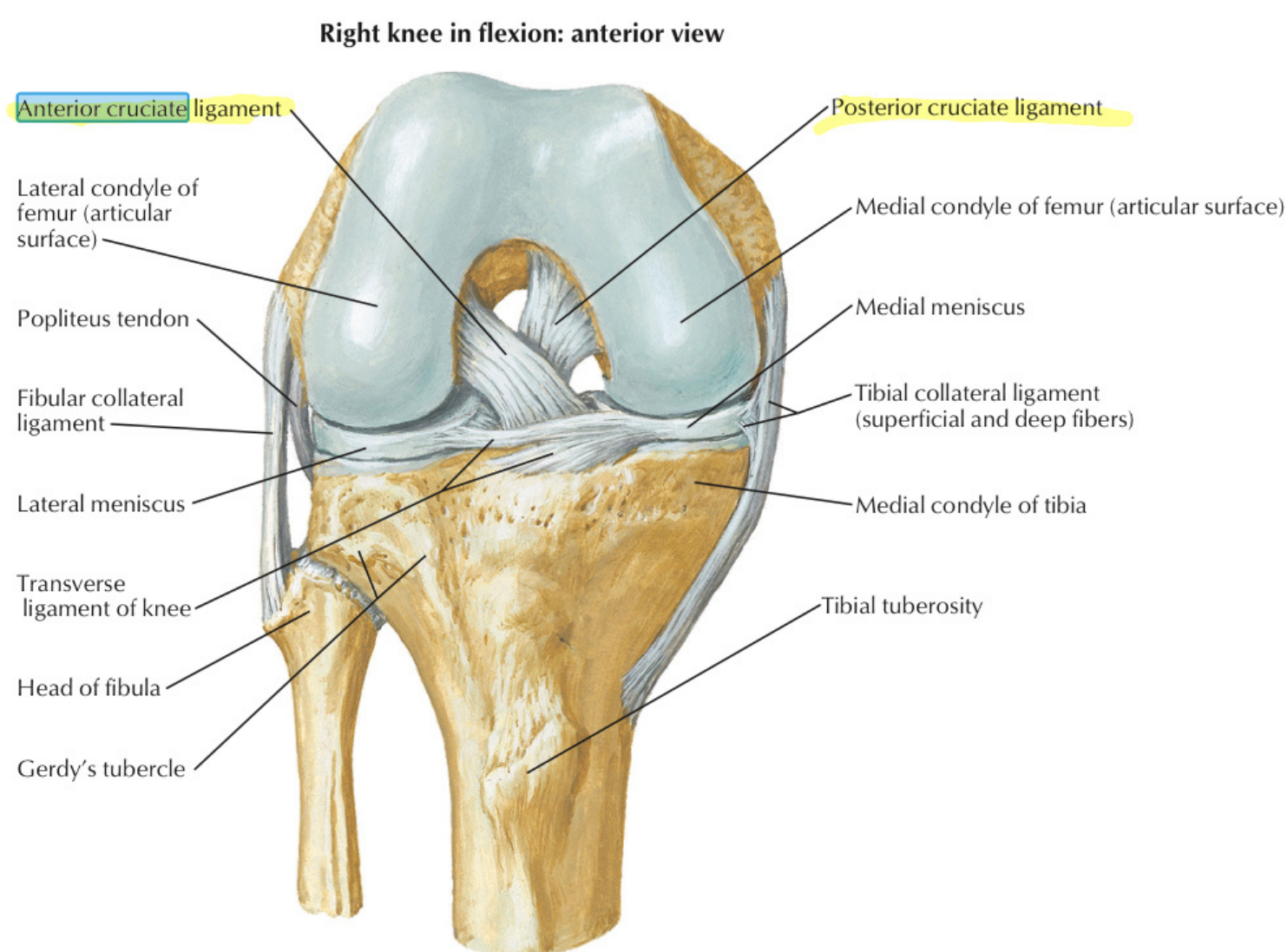
The **lateral meniscus** is small & circular.

The **medial meniscus** is large & oval.
 "It lies on the medial condyle of the femur "which is larger than the lateral"




Intracapsular Ligament of the knee

ATTACHMENT	FUNCTION
<p>anterior cruciate (ACL): from anterior part of the intercondylar area of tibia to posterior part of lateral condyle of the femur.</p>	<p>Prevents the posterior displacement of femur on tibia.</p>
<p>Posterior cruciate (PCL): from posterior part of the intercondylar area of tibia to anterior part of medial condyle of the femur.</p>	<p>Prevents the anterior displacement of femur on tibia</p>



IMPORTANT BURSAE TO KNEE JOINT




 Bursae are small fluid filled sacs that reduce friction between moving parts in your body's joints.

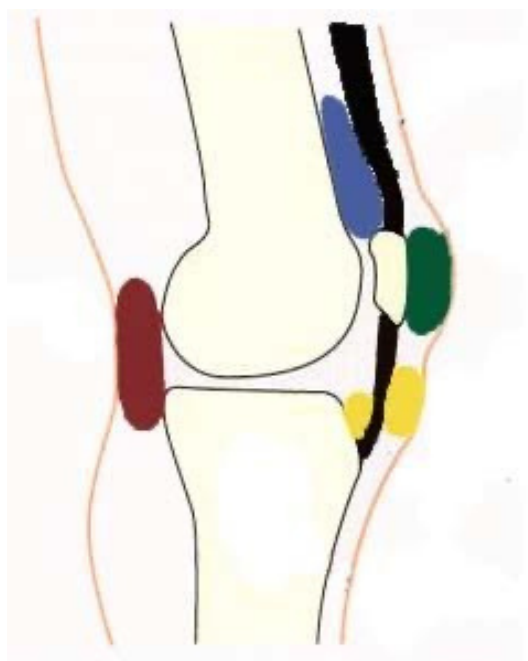
Between patella & skin.



Between femur & quadriceps tendon, communicates with synovial membrane of knee joint.



-  Suprapatella bursa
-  Prepatella bursa
-  Infrapatella bursae
-  Semimembranosus bursa

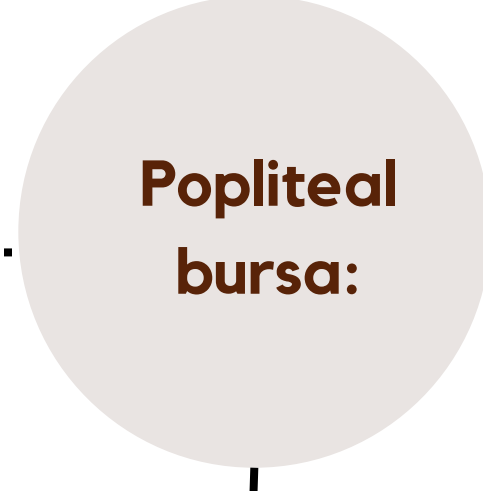
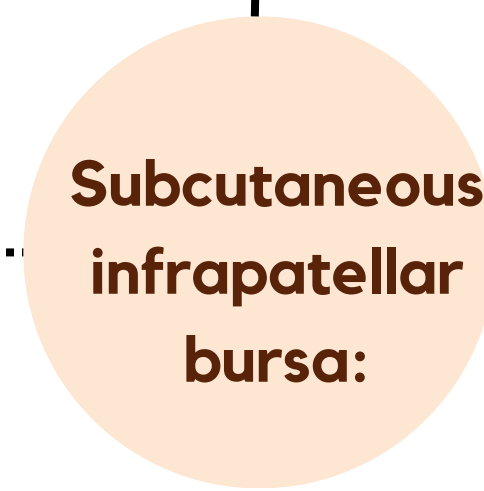


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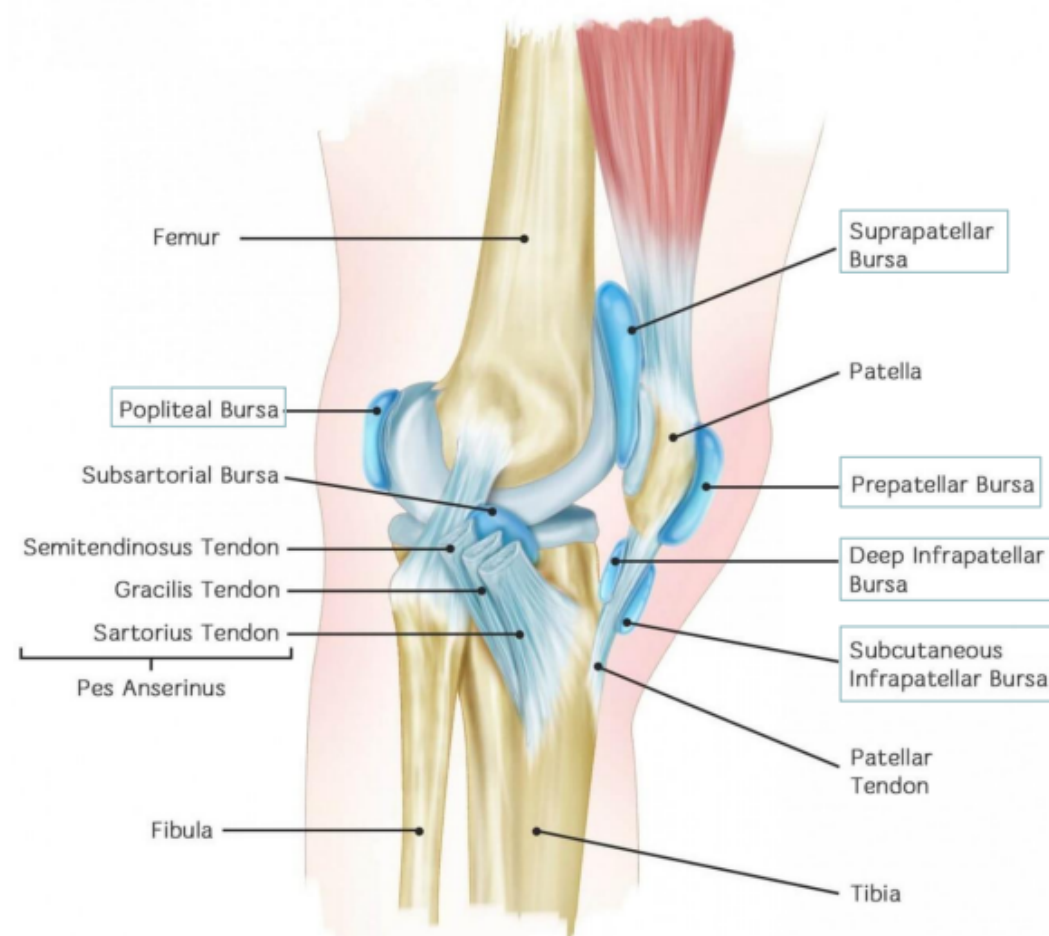
Between tibial tuberosity & skin



Between tibia and ligamentum patella.

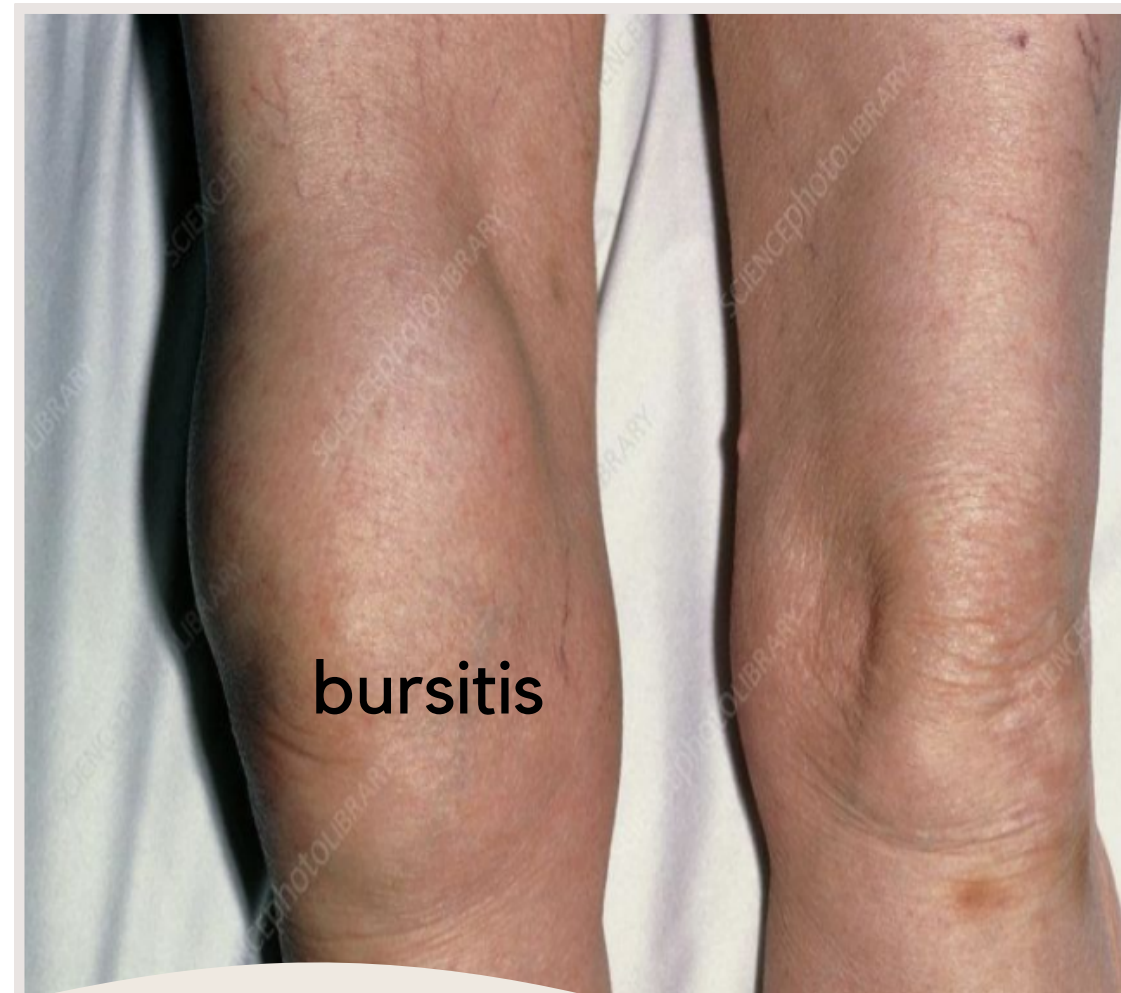
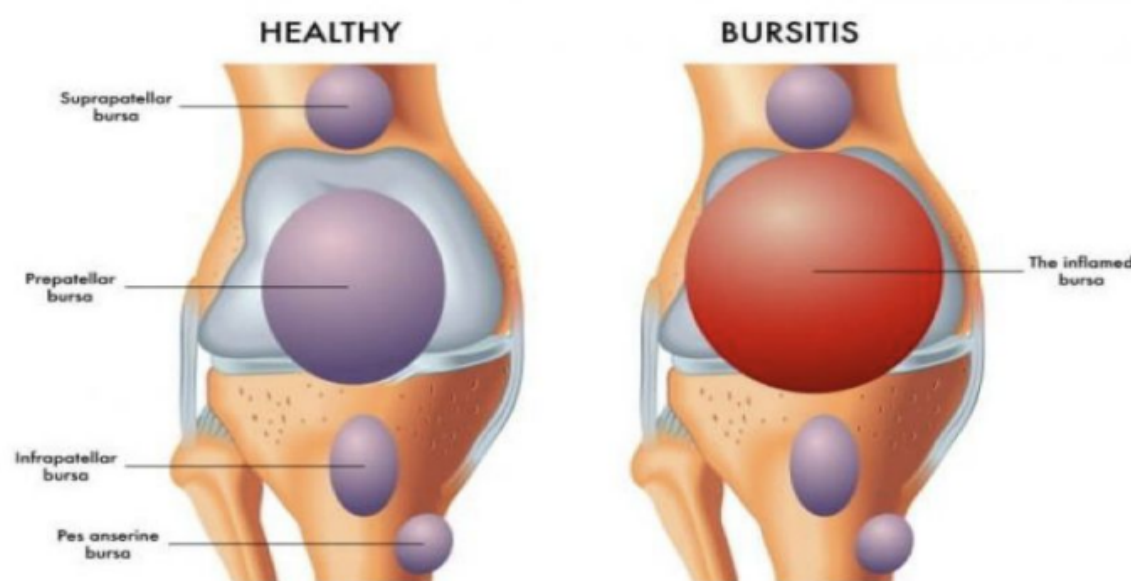
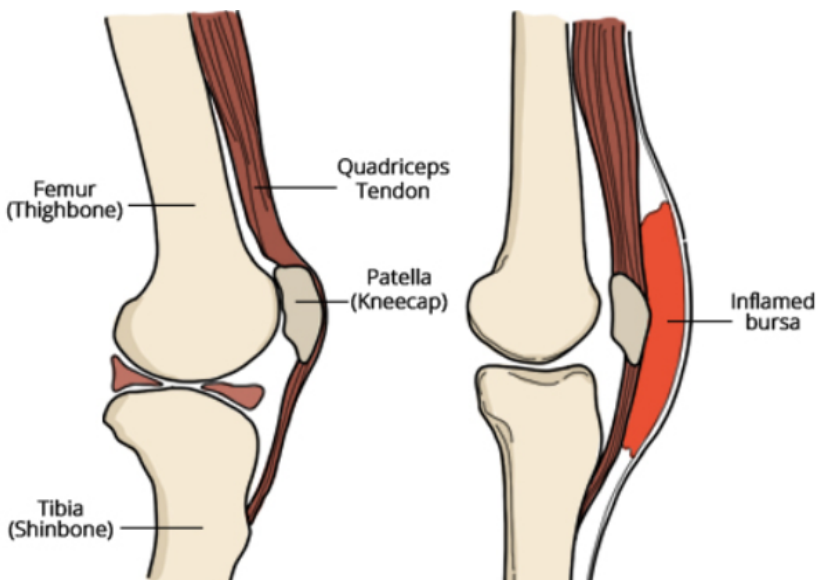


between popliteus tendon & capsule, communicates with synovial membrane of knee joint



Clinical importance: (of the suprapatellar bursa)

- commonly inflamed bursa lead to bursitis



MOVEMENTS OF KNEE JOINT

443 note: if they asked (which muscle does flexion?) and gave me 2 correct answers we choose the muscle that **MAINLY** flex

Extension

By quadriceps femoris

Inactive rotation

(dependent)

• Locking of knee:

(واقف وشاد على نفسه, نفس العسكر)

- slight **lateral rotation of tibia** (or medial rotation of femur) , **at the end of extension**

- Results mainly by **tension of anterior cruciate ligament**

- In locked knee, all ligaments **become tight**

• Unlocking of the knee:

(واقف بس ريلاكس مو شاد مره)

- medial rotation of tibia (lateral rotation of femur), **at the beginning of flexion**

- performed by **popliteus** to relax ligaments & allow easy flexion

Flexion

mainly by hamstring muscles: biceps femoris, semitendinosus & semimembranosus

Assisted by:

- Sartorius,
- gracilis &
- popliteus

Active rotation

(performed when the knee is flexed)

we call it active because it done by a muscles only

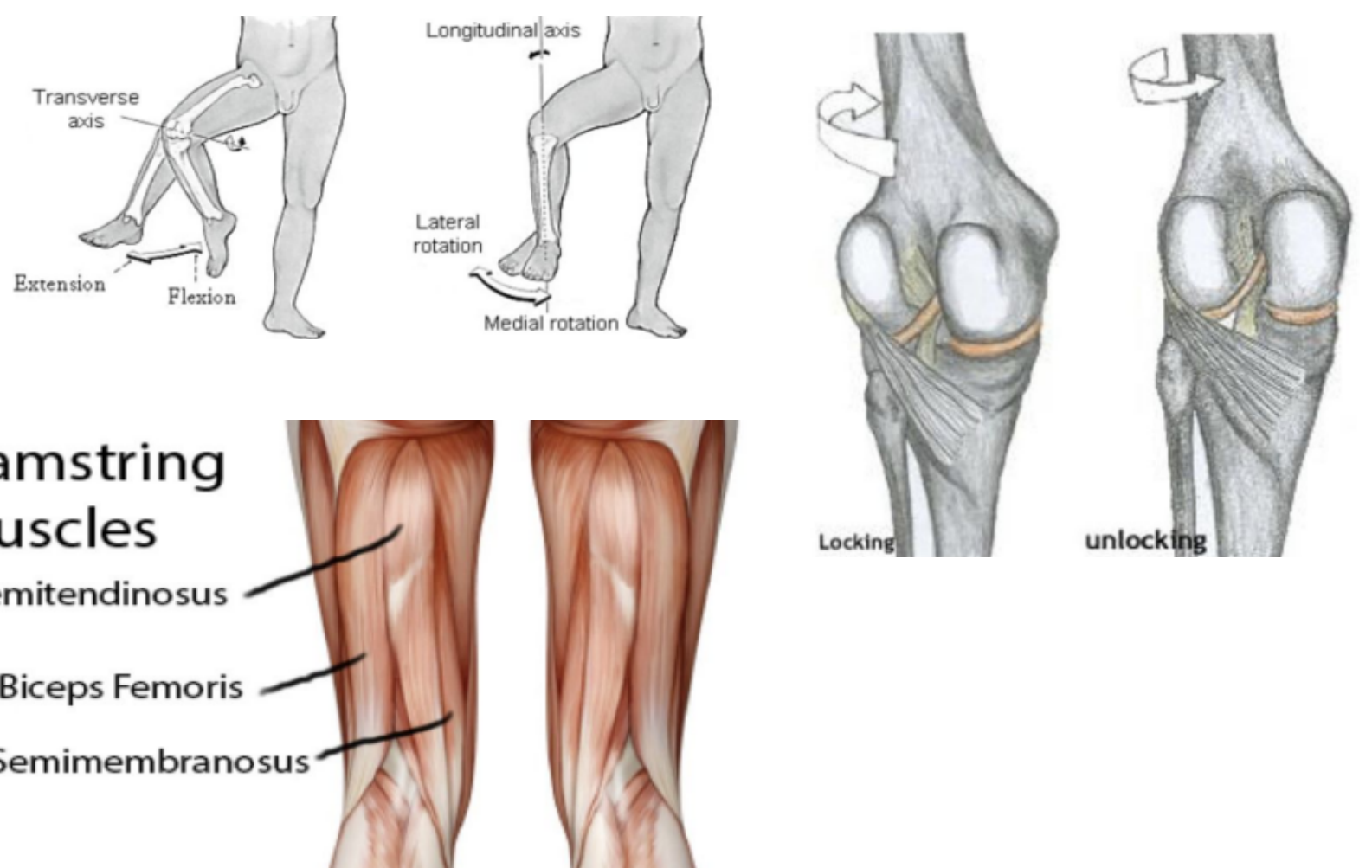
• Medial rotation :

Mainly by: semitendinosus & semimembranosus

Assisted by: sartorius & gracilis

• Lateral rotation :

by biceps femoris



Extra:

Locking	Unlocking
➤ During last 30 degrees of extension	➤ During initial stages of flexion
➤ Medial rotation of femur	➤ Lateral rotation of femur
➤ Helped by quadriceps femoris (mainly vastus medialis)	➤ Helped by popliteus
➤ As standing at attention	➤ As standing at ease
➤ The ligaments are taut	➤ The ligaments are relaxed

ANKLE JOINT

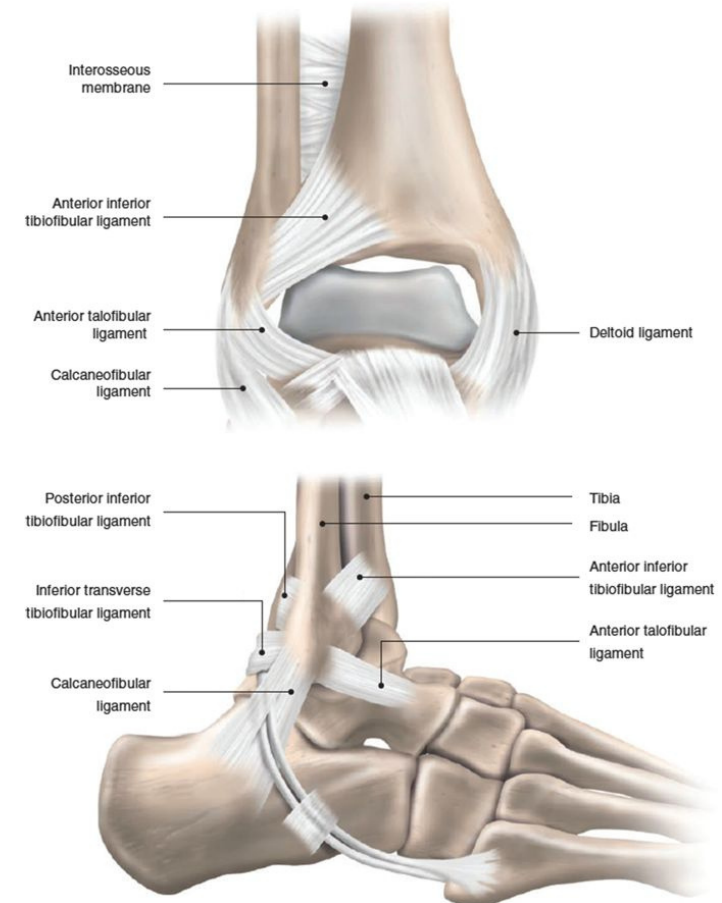


Type

Synovial, hinge joint

Articular surface

Upper : A socket formed by: the lower end of tibia, medial malleolus & lateral malleolus (fibula)
lower : body of talus



Ligaments :

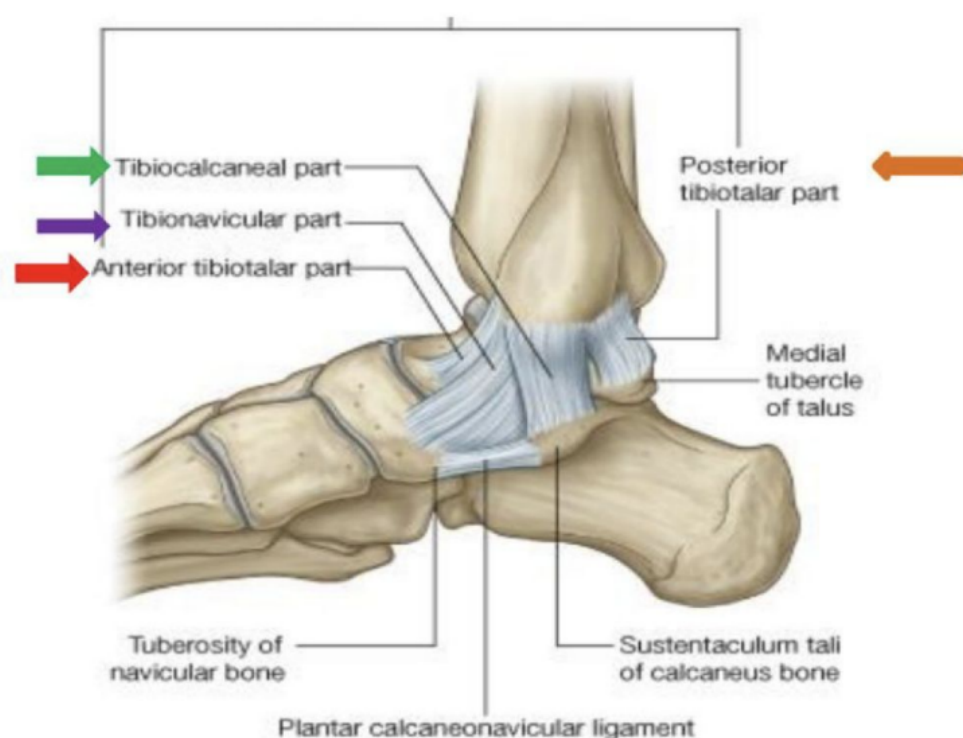
Medial (deltoid) ligament

A strong triangular ligament

Apex: attached to medial malleolus

Base: subdivided into 4 parts:

- **Anterior tibiotalar part.**
- **Posterior tibiotalar part.**
- **Tibionavicular part.**
- **Tibiocalcaneal part.**



Lateral ligament

Composed of 3 separated ligament:

- **Anterior talofibular ligament.**
- **Calcaneofibular ligament.**
- **Posterior talofibular ligament.**



MOVEMENT OF ANKLE JOINT

Dorsiflexion :

Performed by muscles of anterior compartment of leg :

- Tibialis anterior
- Extensor hallucis longus
- Extensor digitorum longus
- Peroneus tertius

Plantar flexion:

Initiated by soleus

Maintained by gastrocnemius

Assisted by other muscles in posterior compartment of leg:

- Tibialis posterior
- Flexor digitorum longus
- Flexor hallucis longus
- Muscles of the lateral compartment of leg (peroneus longus & peroneus brevis)

Inversion :

Muscles perform inversion :

- Tibialis anterior
- Tibialis posterior

Everson:

Performed by:

- Peroneus longus
- Peroneus brevis
- Peroneus tertius (could be absent)

INVERSION & EVERSION MOVEMENT occur at the talo-calcaneo-navicular joint
or we can call it subtalar joint

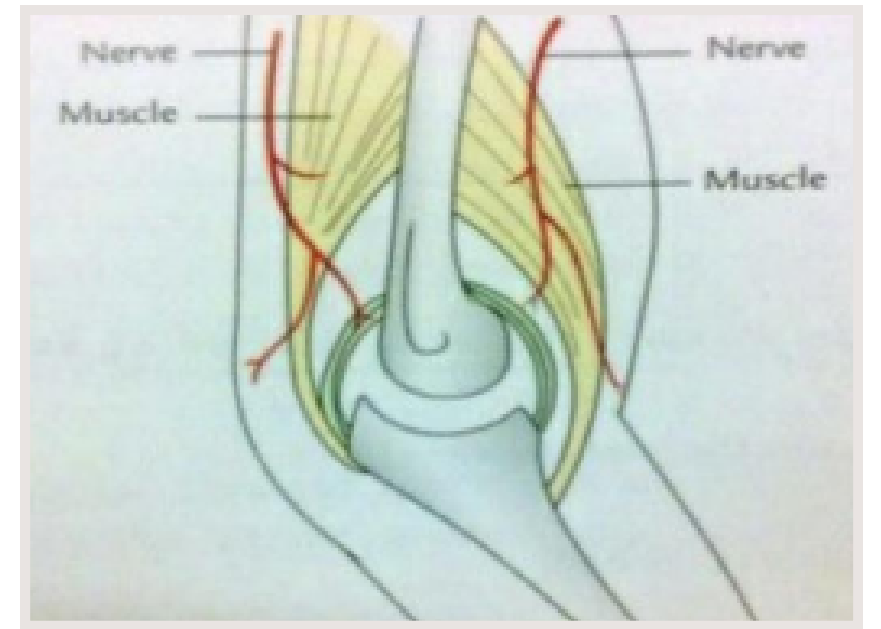


NERVE SUPPLY

Remember **Hilton's law**:

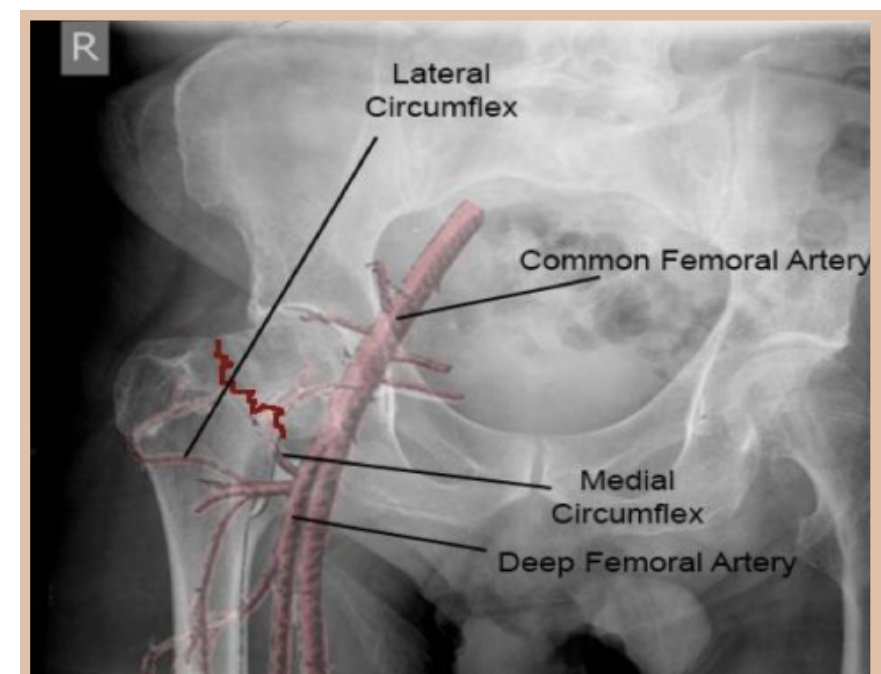
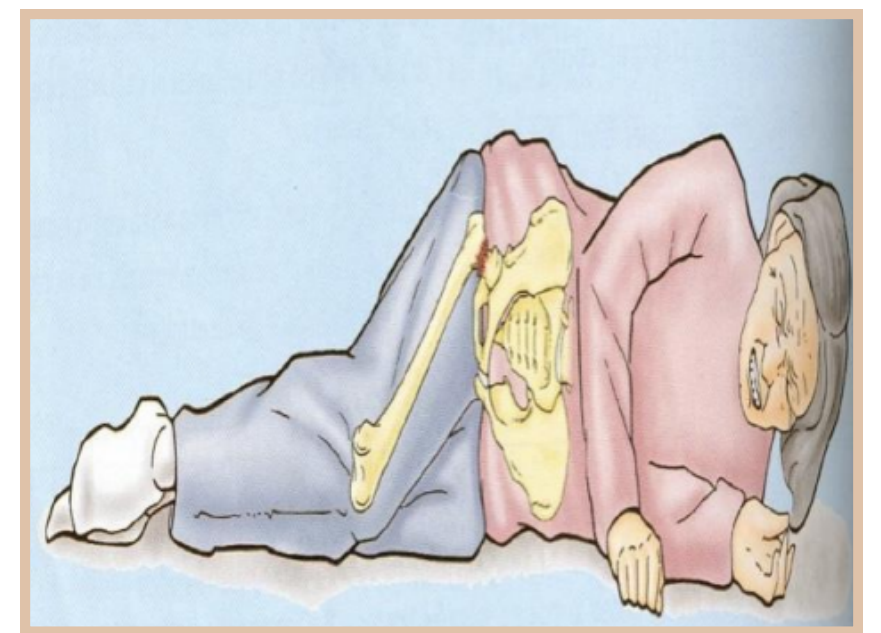
The joint is supplied by **branches** from nerves supplying muscles acting on it

remember that the nerve supply the capsule not the cavity.



Fracture Neck Of The Femur

- It's common after 60 years of age especially in women because of **osteoporosis**.
- In fracture near the head: It results in a **vascular necrosis** of the head of femur.
- Blood supply to femoral head, mainly is **medial femoral circumflex & artery of ligament of femoral head**.
- Displacement of femoral neck fracture will disrupt the blood supply and cause an **Intracapsular hematoma**.



Dislocation Of Hip Bone

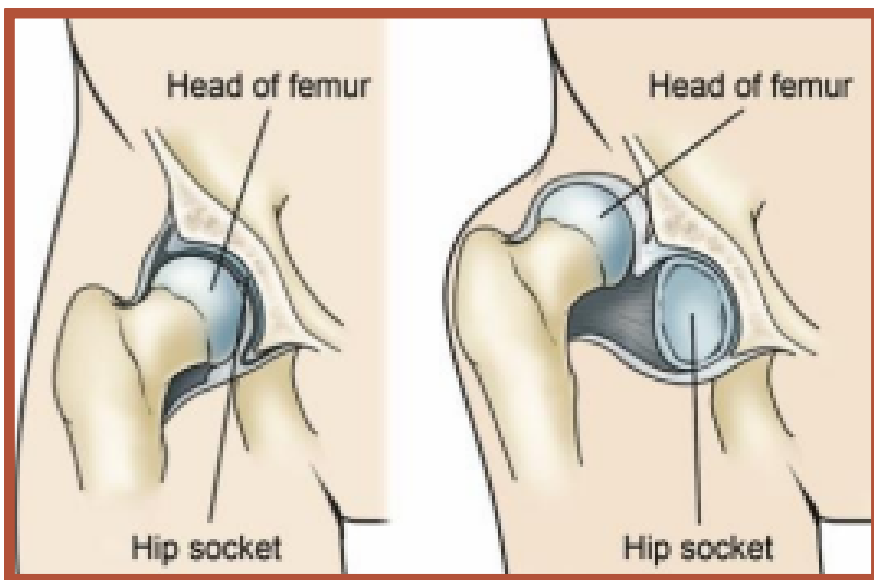
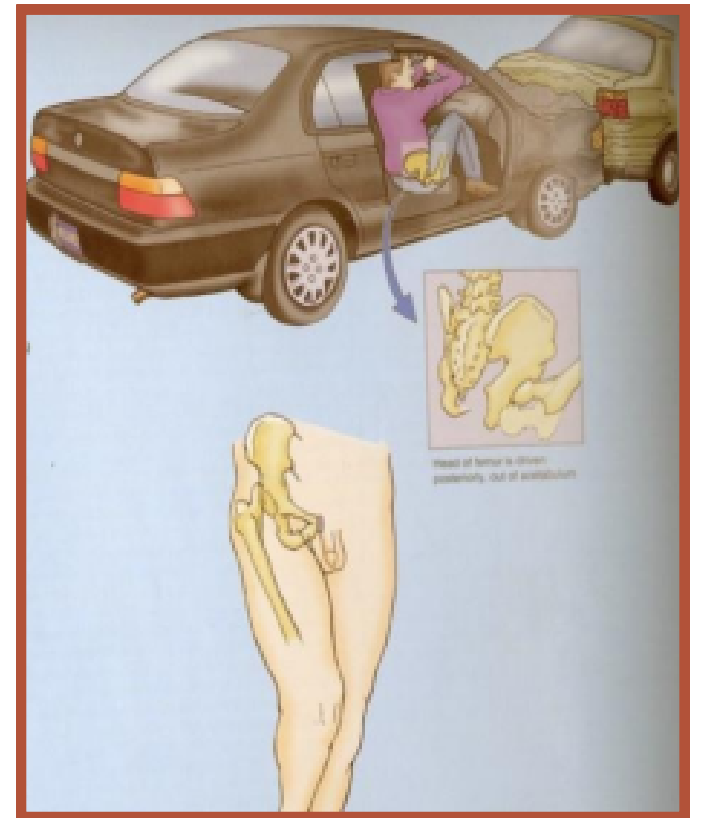
- **Congenital**
- More common in girls and associated with inability to adduct the thigh
- Causes: The upper lip of the acetabulum fails to develop adequately
- The head of the femur rides up out of the acetabulum onto the gluteal surface of the ileum (posteriorly).



Figure 15.16 Congenital dislocation of left hip – note the extra skin creases in the upper thigh

Traumatic Hip Dislocation

- It is common in motor vehicle accidents when the thigh is flexed and adducted.
- The dislocated head is displaced posteriorly to lie on the posterior surface of the ileum.
- In posterior dislocation the **sciatic nerve is liable to be injured.**



Knee Joint Injury

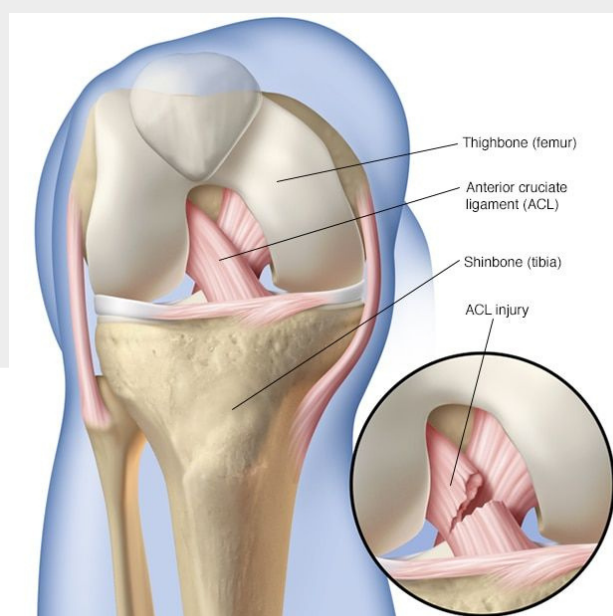
Posterior cruciate ligament injuries

An injury to the posterior cruciate requires powerful force while the knee is in a bent position.
- this happens when someone falls hard onto a bent knee or is in an accident.

هذه الإصابة غالباً تكون في وضعية ان الشخص كأنه يجلس بس يطيح والطيحة تكون على وزنه وخطيرة

Anterior cruciate ligament injuries

-Injuries to the ACL can be serious and require surgery
- A grade 1 sprain is a mild injury to the ACL, while a grade 3 refers to a complete tear.
causes: sports as in football; improperly landing from a jump or quickly changing the direction.



Meniscal tears

these pieces of cartilage can tear suddenly during sporting activities; With a sudden meniscus tear, a pop may be heard or felt in the knee. they may also tear slowly due to aging (degenerative meniscus tear)

Degeneration for the meniscus

What are the kinds of ankle injuries ?

Sprain

- Is a common sports injury, but can also happen any time a sudden twist displaces the ankle joint.
- Is the term that describes damage to ligaments when they are stretched beyond their normal range of motion.
- it ranged from mild to a complete tear or rupture.

Strain

- Refers to damage to muscles and tendons as a result of being pulled or stretched too far.

Ankle injuries are:
Sprains, Strains,
Fracture ; that affect
bones, ligaments, or
tendons

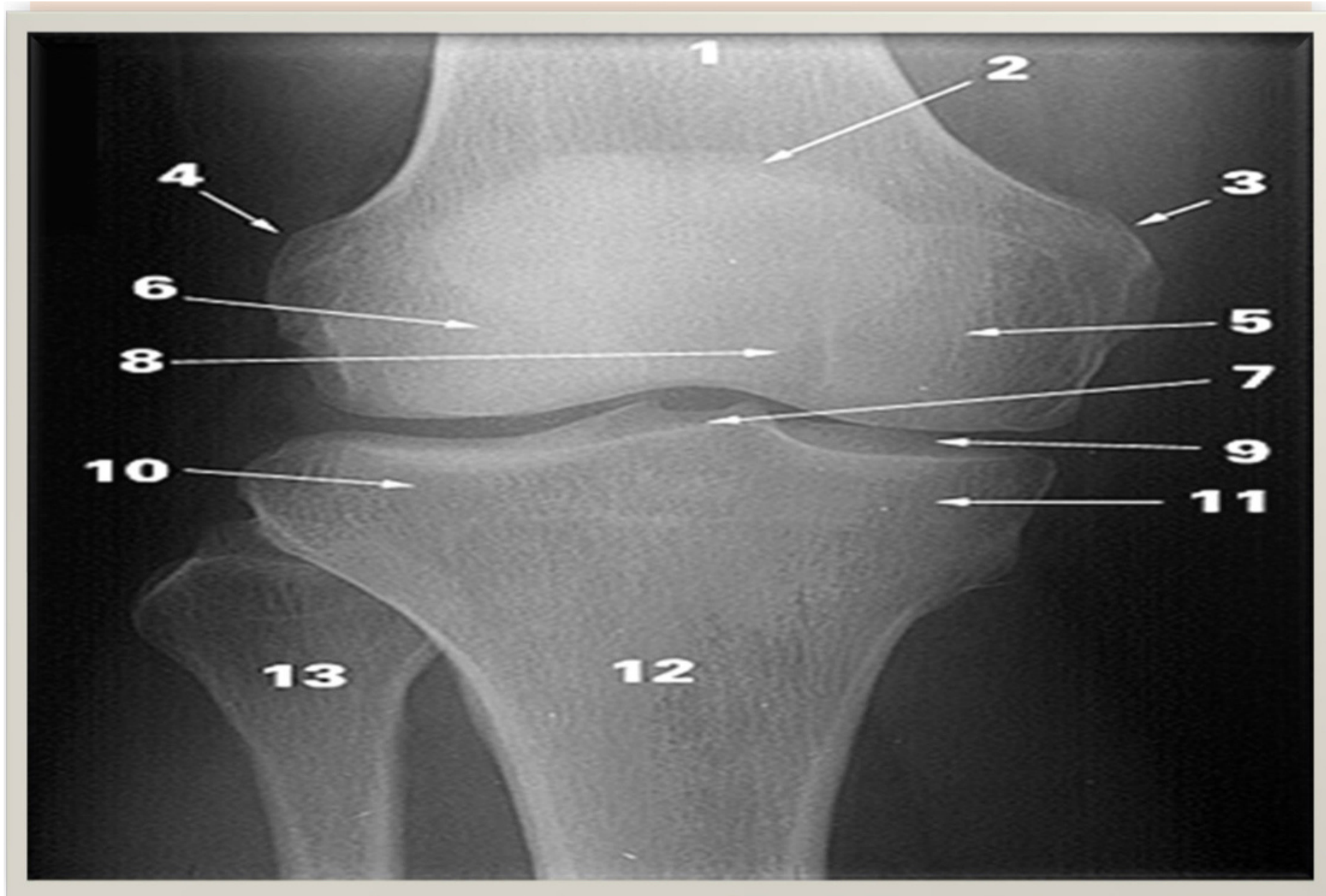


Fracture

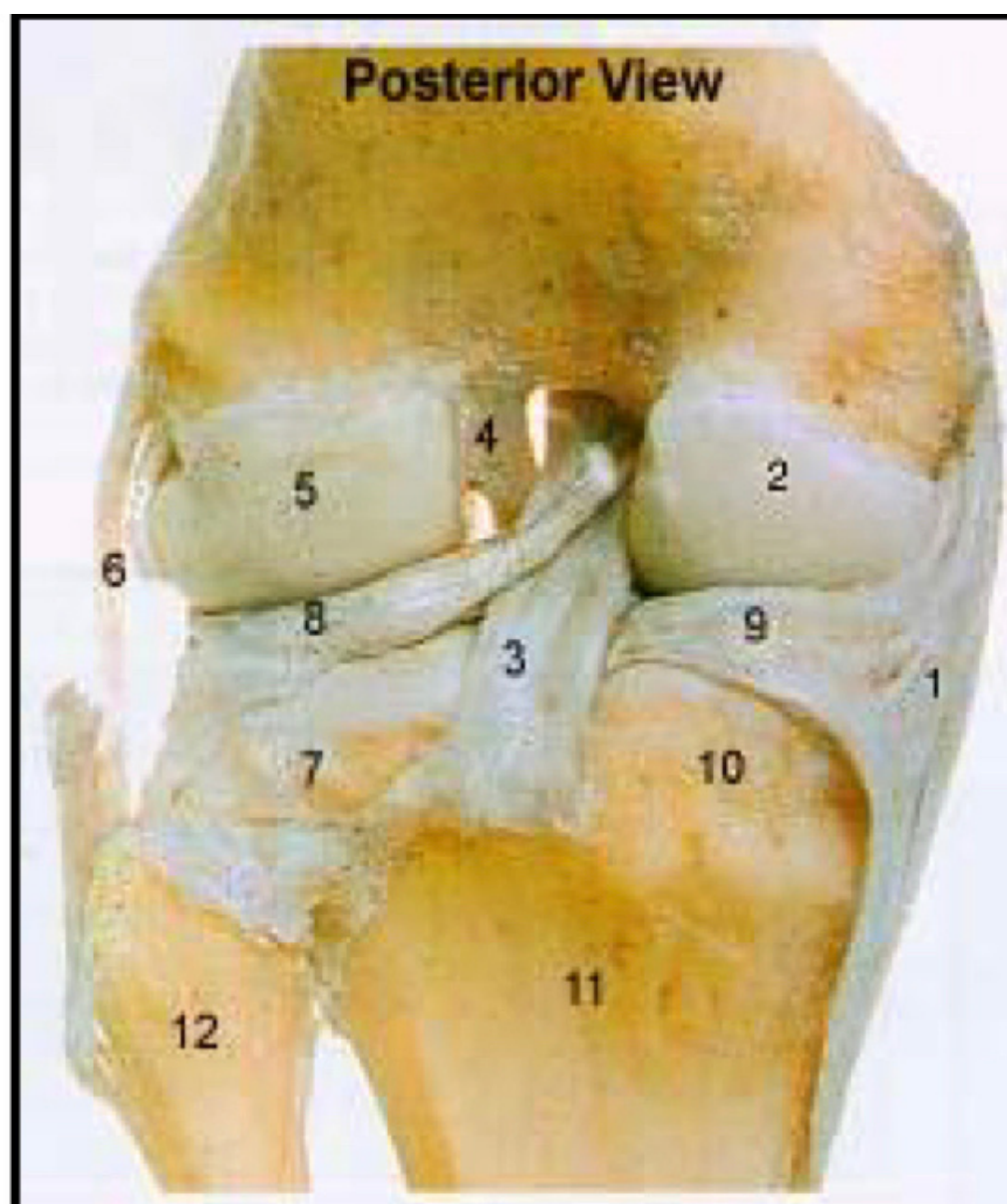
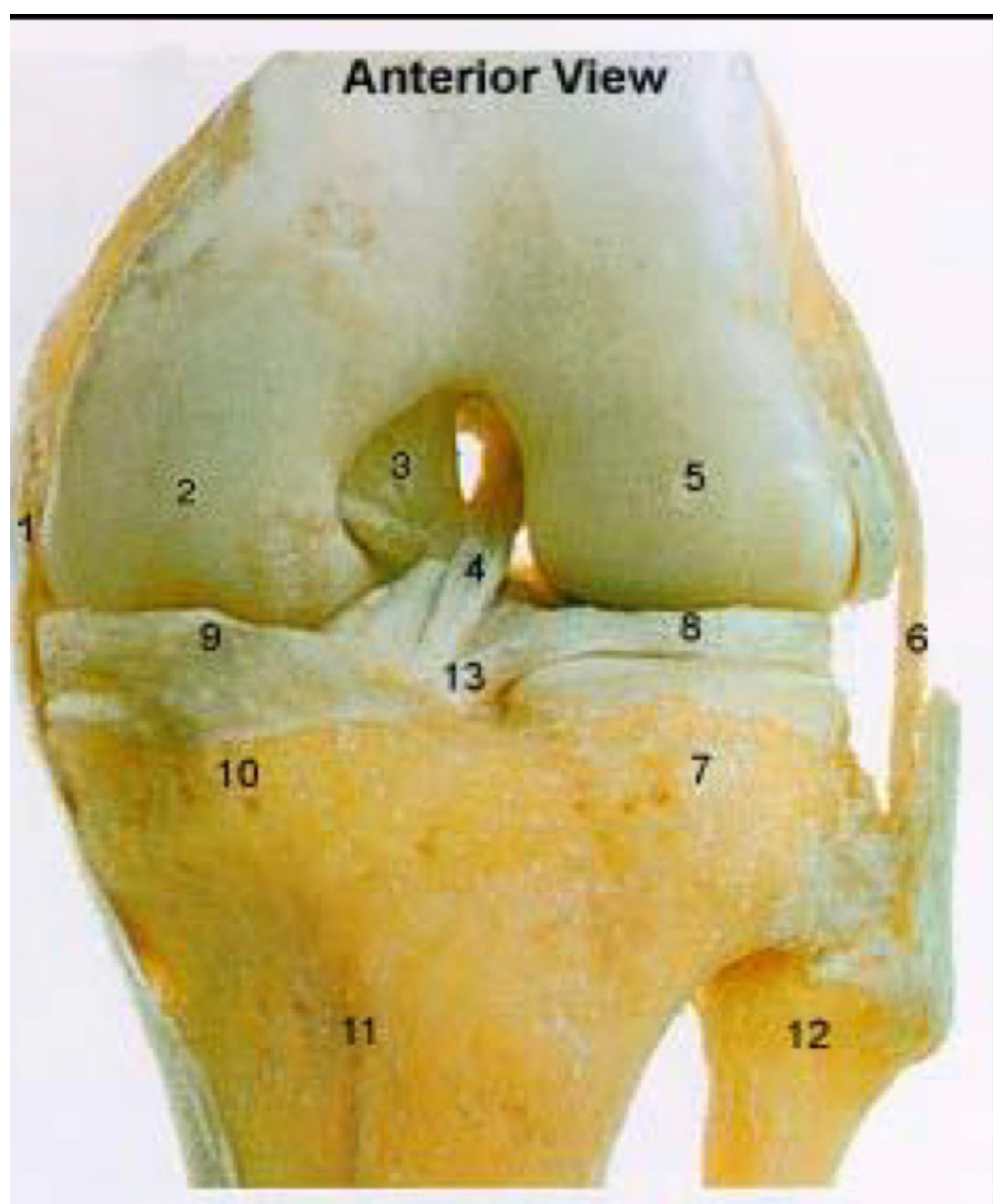
- Describes a break in one or more of the bones in the ankle joint.

IDENTIFY

Boys' Slides



- 1: femur
- 2: patella
- 3: medial epicondyle
- 4: lateral epicondyle
- 5: medial femoral condyle
- 6: lateral femoral condyle
- 7: intercondylar eminence
- 8: intercondylar notch
- 9: femorotibial joint
- 10: lateral condyle of the tibia
- 11: medial condyle of the tibia
- 12: tibia
- 13: fibula



- 1: Medial collateral ligament
- 2: medial femoral condyle
- 3: posterior cruciate ligament
- 4: Anterior cruciate ligament
- 5: lateral femoral condyle
- 6: lateral collateral ligament
- 7: lateral tibial condyle
- 8: lateral meniscus
- 9: medial meniscus
- 10: medial tibial condyle
- 11: tibia
- 12: fibula
- 13: intercondylar eminence

MCQs

6

Which one of the following muscles is powerful extensor to the hip joint?

A- gluteus maximus

B- Quadriceps femoris

C- Sartorius

D- Semitendinosus

7

Which one of the following muscles concerned with unlocking of knee joint

A-Biceps femoris.

B- Semitendinosus

C- Semimembranosus

D- Popliteus

8

Which one of the following joints contributes in inversion and eversion ?

A- Ankle

- Knee

C- Hip

D- Talocalcaneo-
navicular .

9

A patient was admitted to the hospital with traumatic dislocation of the hip joint caused by motor vehicle accident. By clinical examination it was found the posterior dislocation of the hip joint. Which one of the following nerves is most likely to be injured?

A- Femoral

B- Sciatic

C- Obturator

D- Inferior gluteal.

10

A patient was admitted to the hospital complaining of pain and swelling in his right knee after sporting activity. A pop heard or felt in the knee. The diagnosis was torn meniscus. Which one of the following structures is most likely contributes in this diagnosis

A- It is extracapsular structure.

B- The lateral meniscus is larger than the medial.

C- The medial meniscus is more liable to be injured.

D- The lateral meniscus is attached to the capsule.




6- A / 7-D / 8-D / 9-B / 10-C

SAQs

1

patient came to the ER with intracapsular hematoma what is the most likely cause ?

 Fracture neck of femur and injury in medial femoral circumflex & artery of ligament of femoral head

2

why the medial meniscus is less mobile and more liable to be injured ?

 because it attached to capsule & medial collateral ligament

3

If there is a rupture in the obturator artery, what will be affected ?

 the femur, and the ligament of femoral head



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