Joints of the Lower Limb

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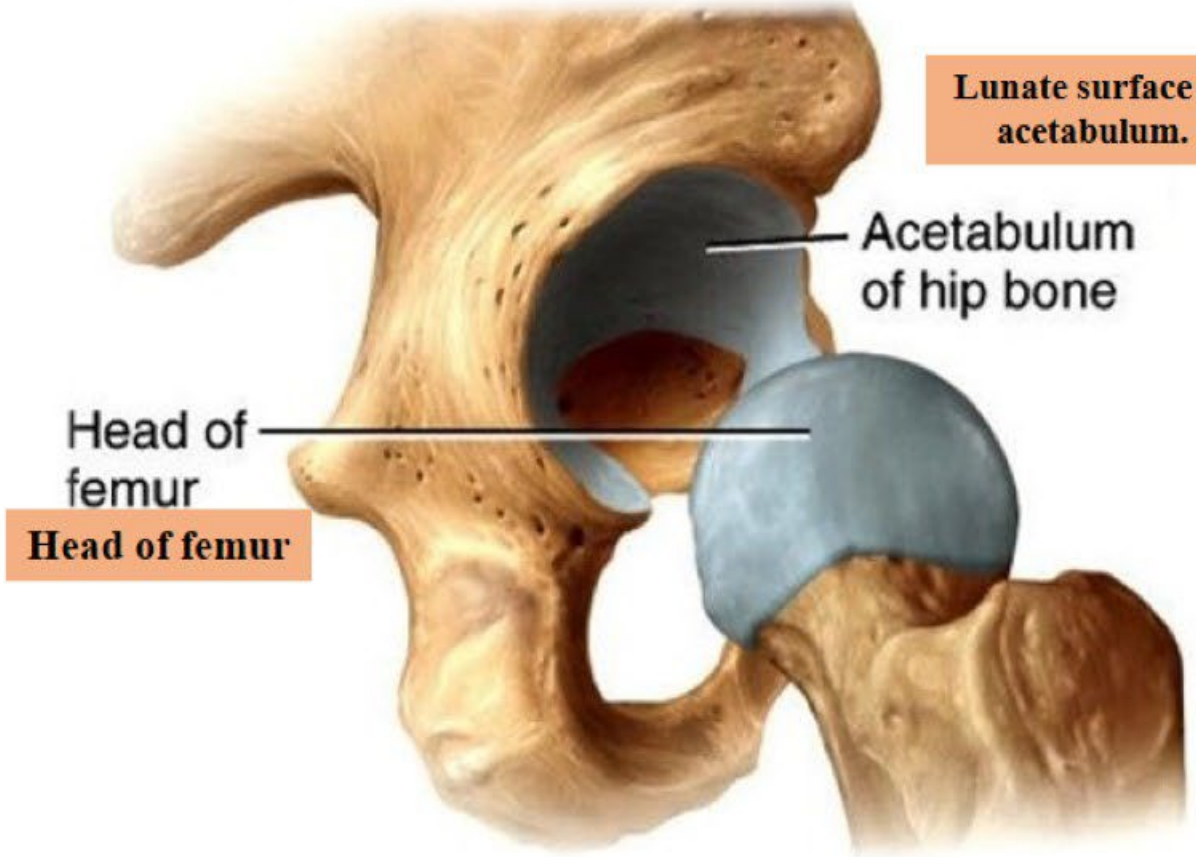
Hip joint

Type:

- ✓ Synovial ball & socket.

Articular surface:

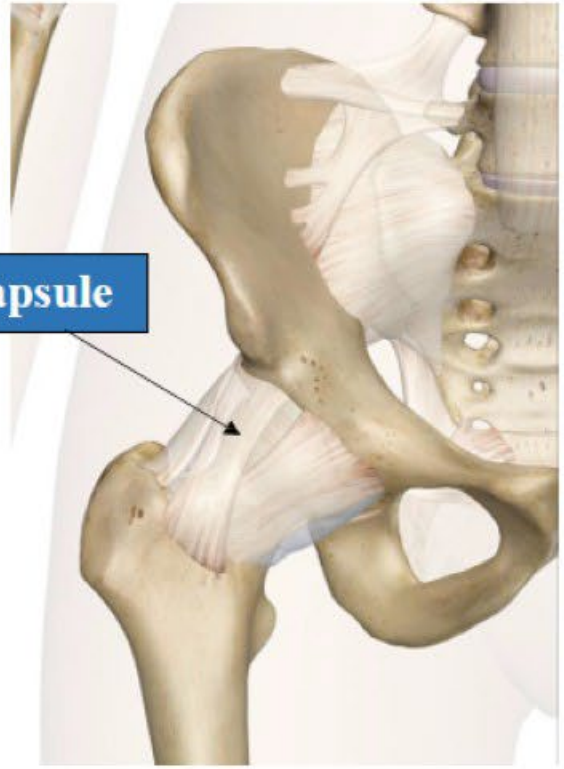
- ✓ Lunate surface of the acetabulum.
- ✓ Head of femur.

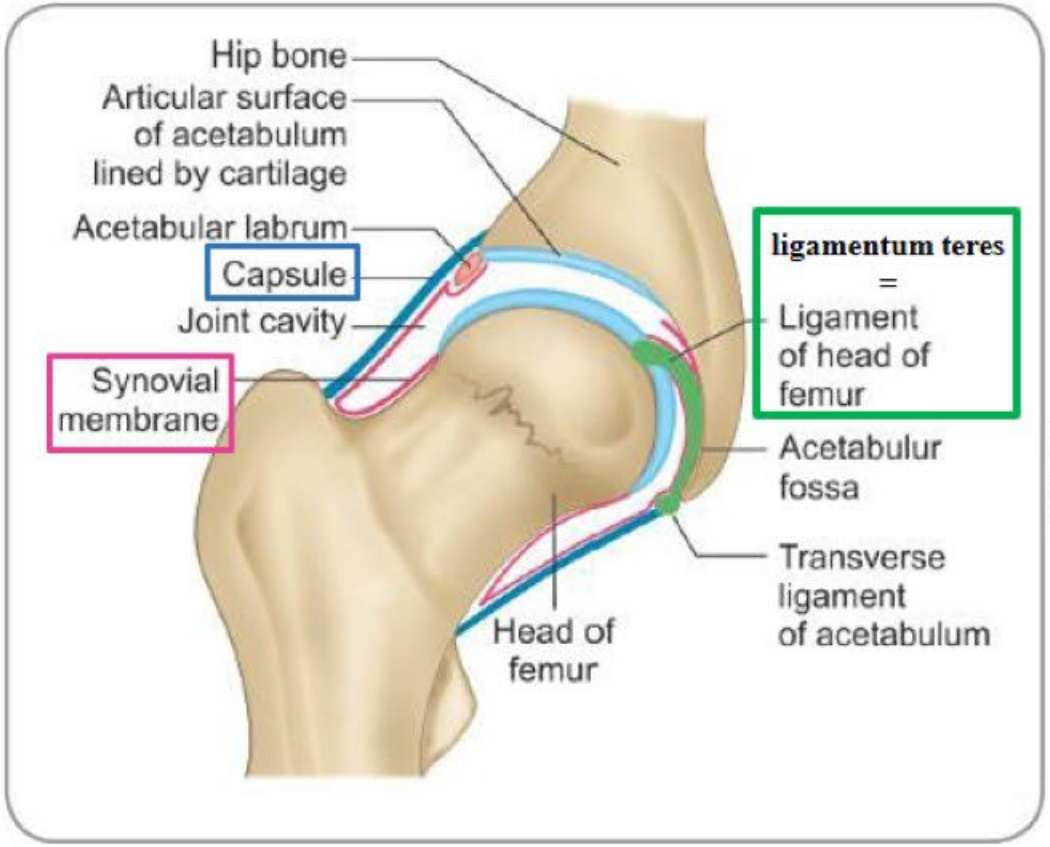


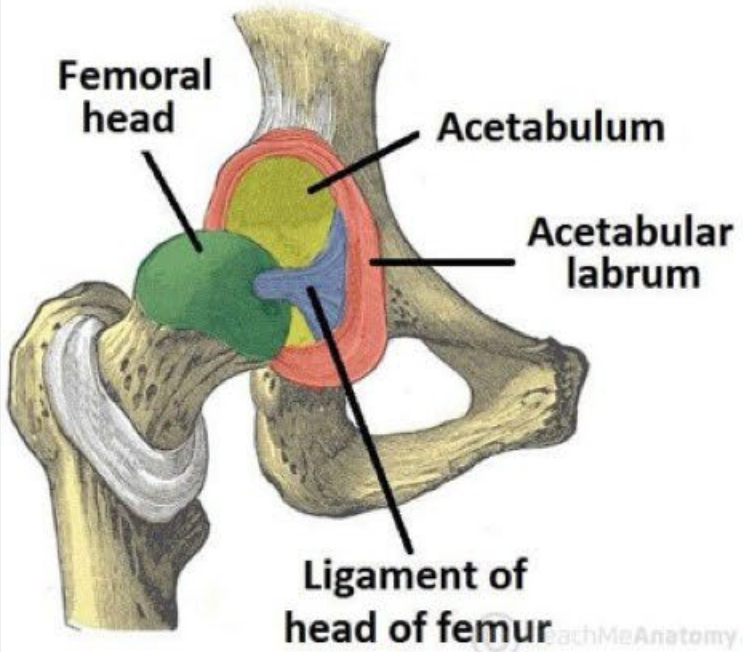
Synovial membrane:

- ✓ Lines the capsule.
- ✓ Reflected to cover the ligamentum teres.

Hip joint


Capsule

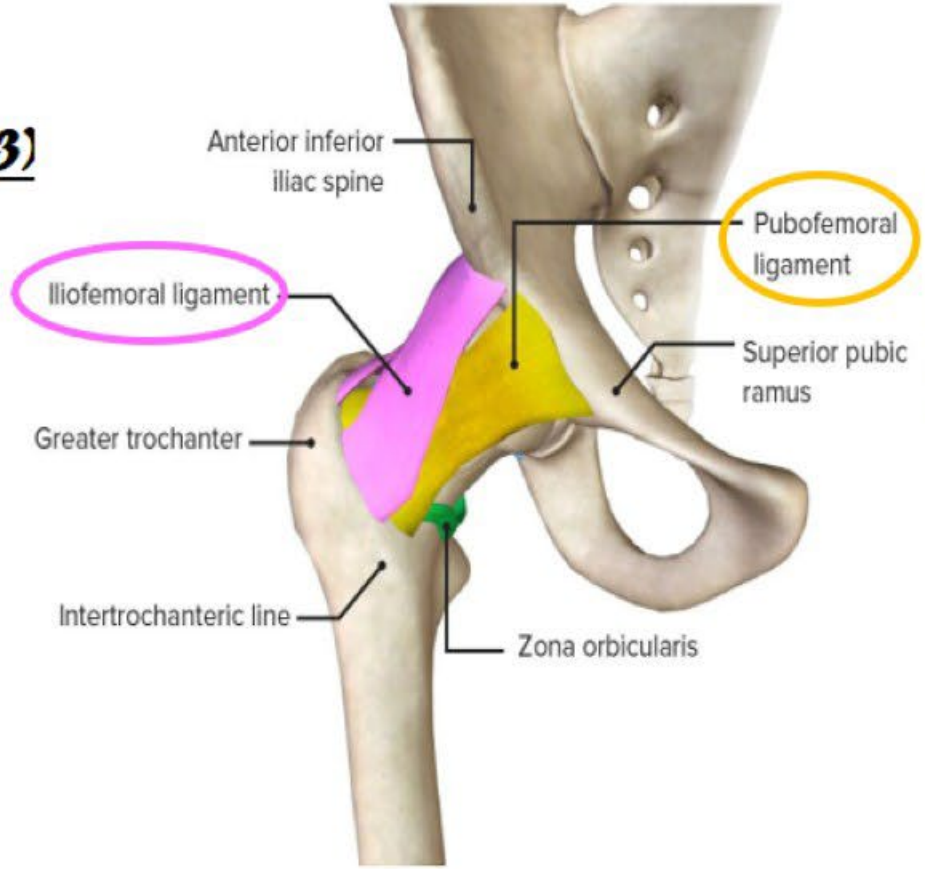

Hip bone
Articular surface of acetabulum lined by cartilage
Acetabular labrum
Capsule
Joint cavity
Synovial membrane
ligamentum teres = Ligament of head of femur
Acetabulur fossa
Transverse ligament of acetabulum
Head of femur

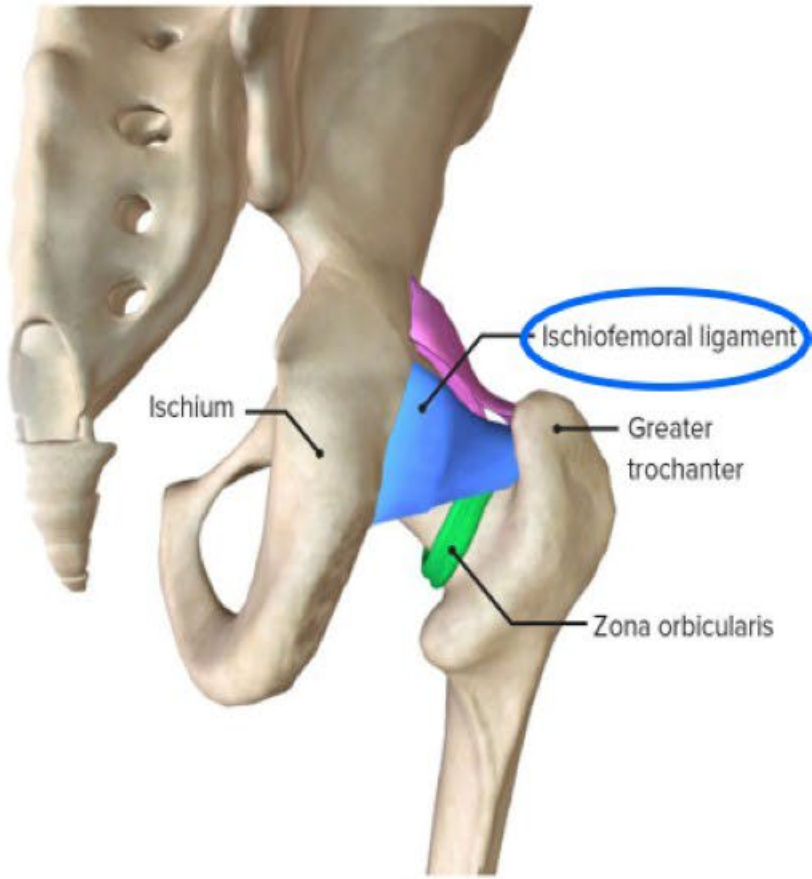

Femoral head
Acetabulum
Acetabular labrum
Ligament of head of femur

Hip joint

Ligaments:

- ***Capsular ligaments:*** **(3)**
  - ✓ Iliofemoral ligament.
  - ✓ Pubofemoral ligament.
  - ✓ Ischiofemoral ligament.

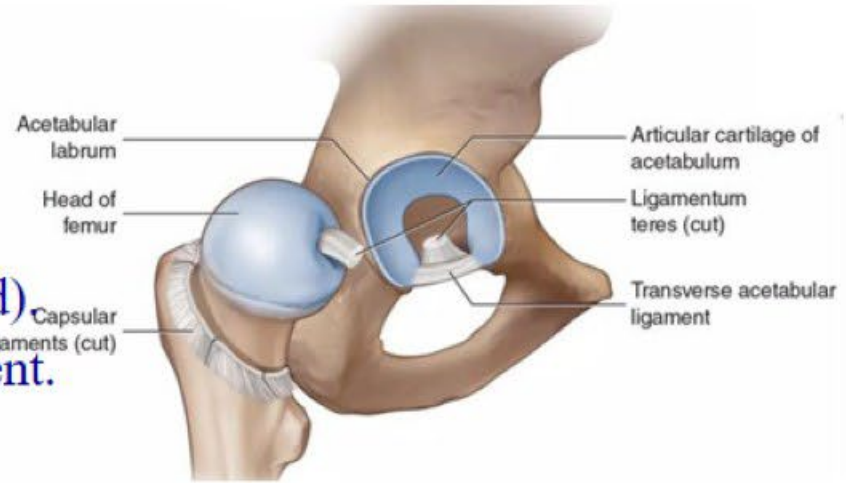


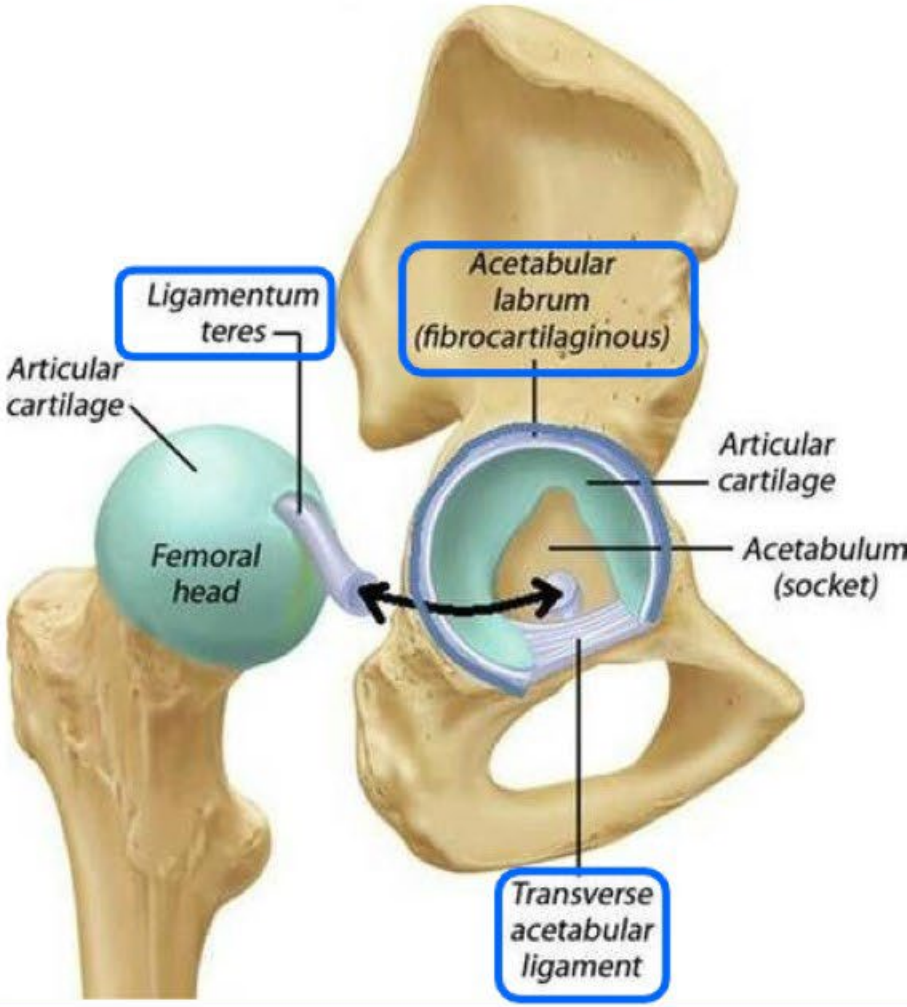


Hip joint

Ligaments:

- ***Non capsular ligaments:***
  (3)
  - ✓ Ligamentum teres
    (round ligament of the head)
  - ✓ Transverse acetabular ligament.
  - ✓ Labrum acetabular.



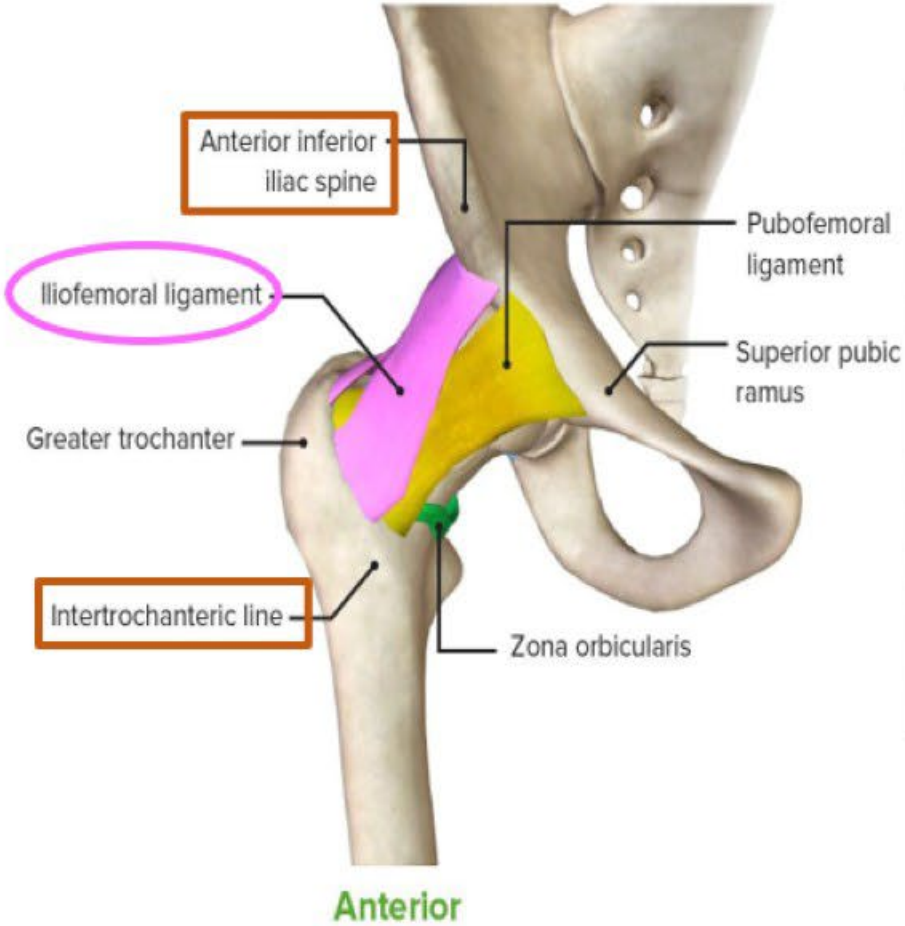


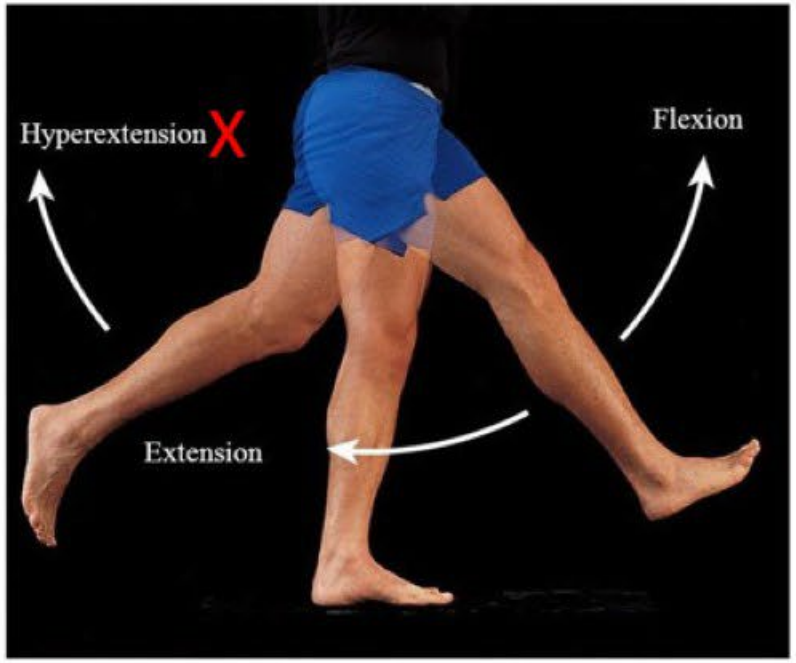
Hip joint

Capsular ligaments:

1. Iliofemoral ligament:

- ✓ Y shaped.
- ✓ Extends from anterior inferior iliac spine to the intertrochanteric line.
- ✓ Supports hip anteriorly.
- ✓ Resists hyperextension



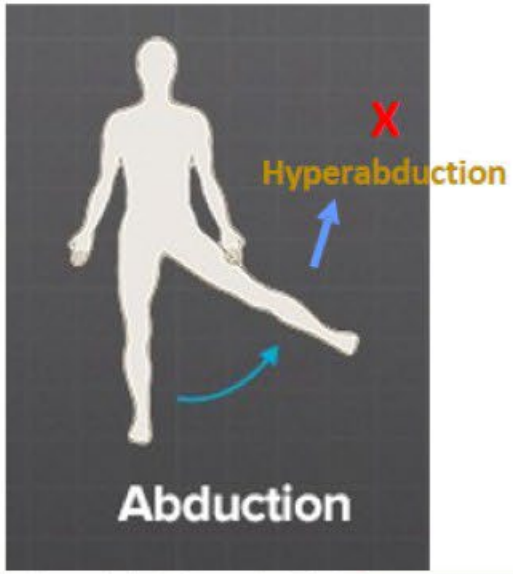


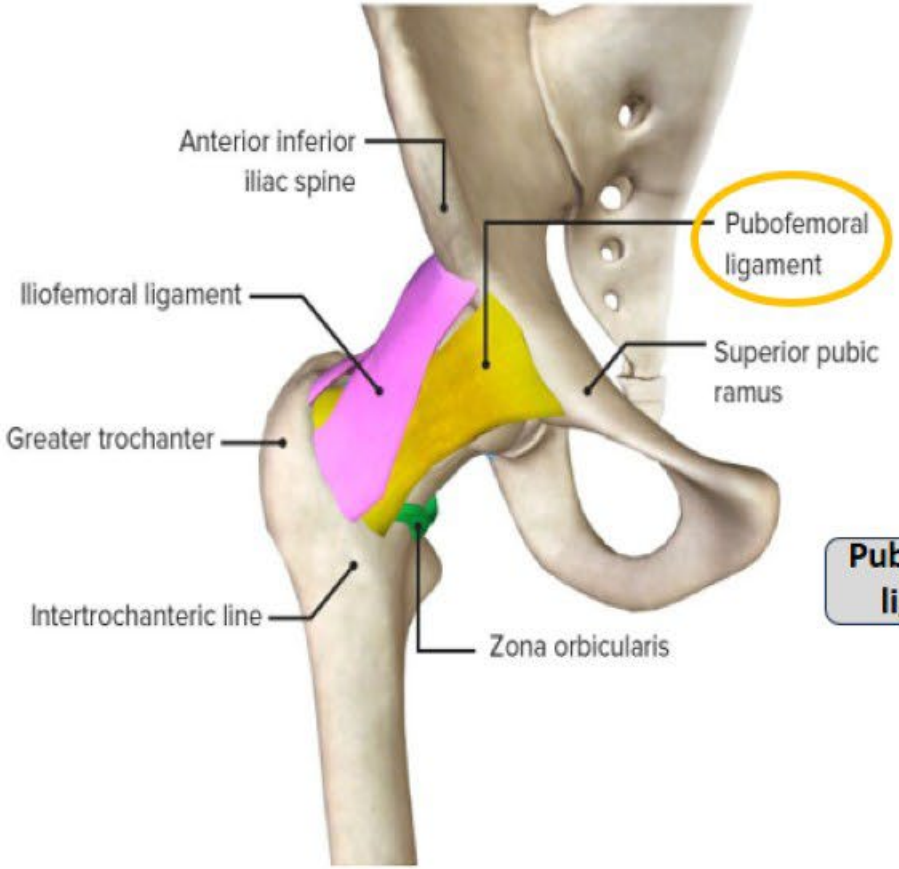
Hip joint

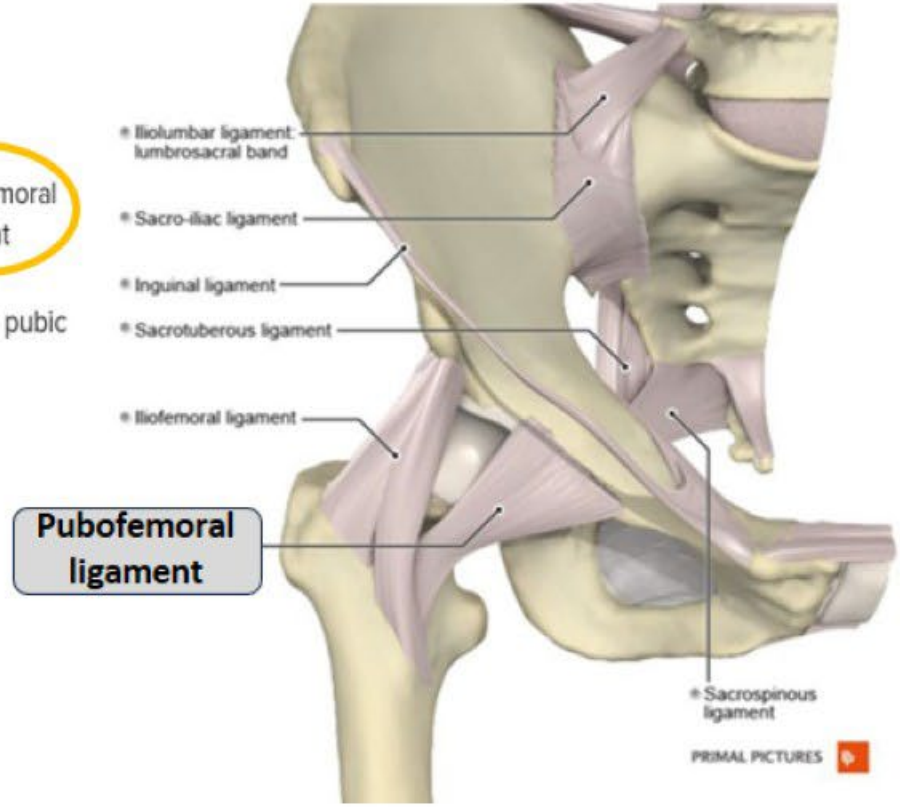
Capsular ligaments:

2. Pubofemoral ligament:

- ✓ △ shaped.
- ✓ Extends from iliopectineal eminence to the anterior part of the capsule.
- ✓ Resists abduction.





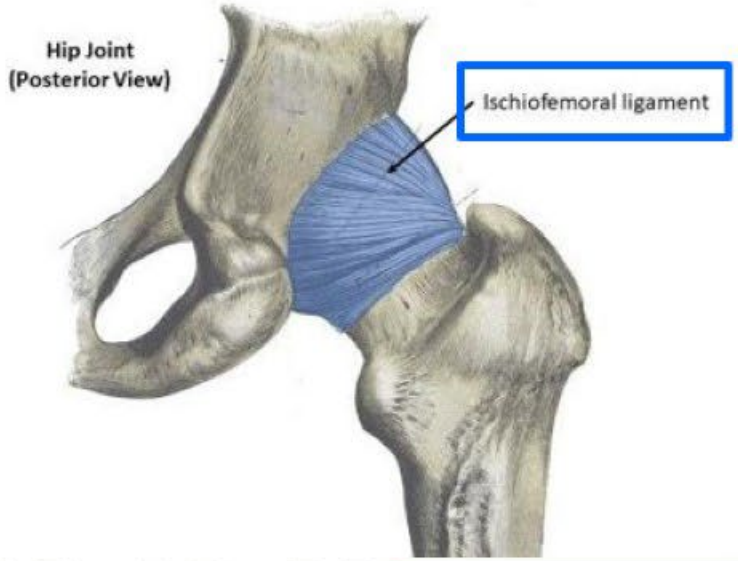


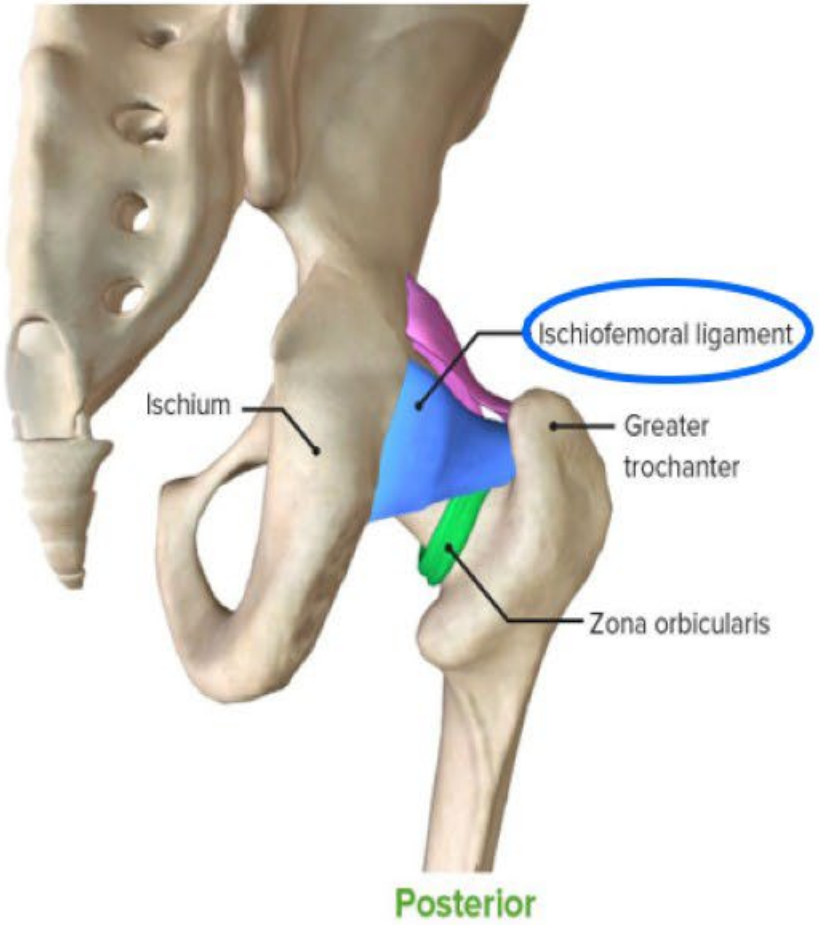
Hip joint

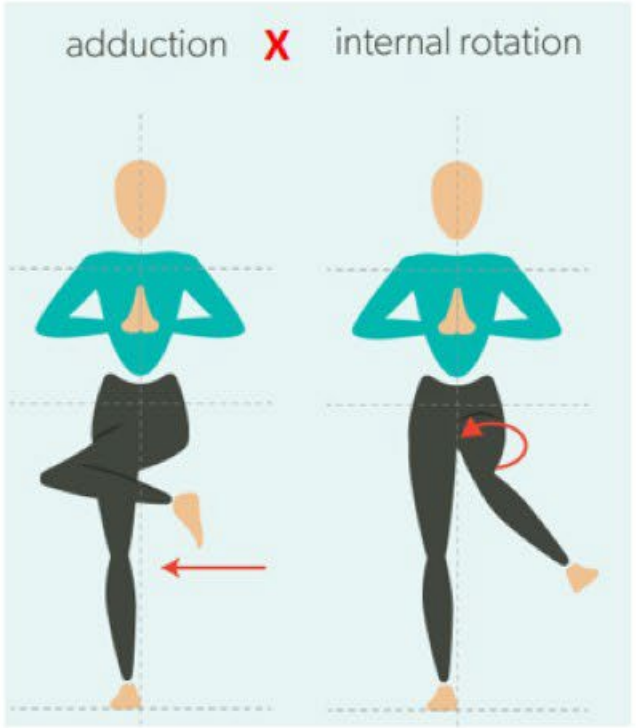
Capsular ligaments:

3. Ischiofemoral ligament:

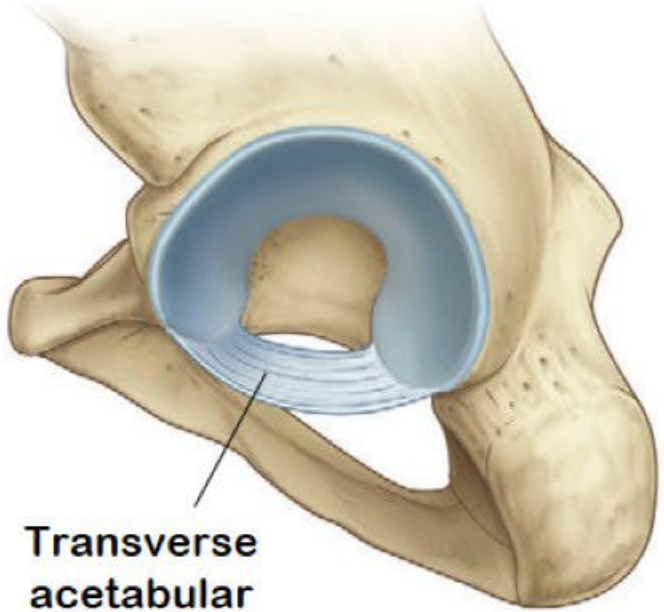
- ✓ Spiral in shape.
- ✓ Extends from the ischium to the posterior part of the capsule.
- ✓ Resists adduction and medial rotation.

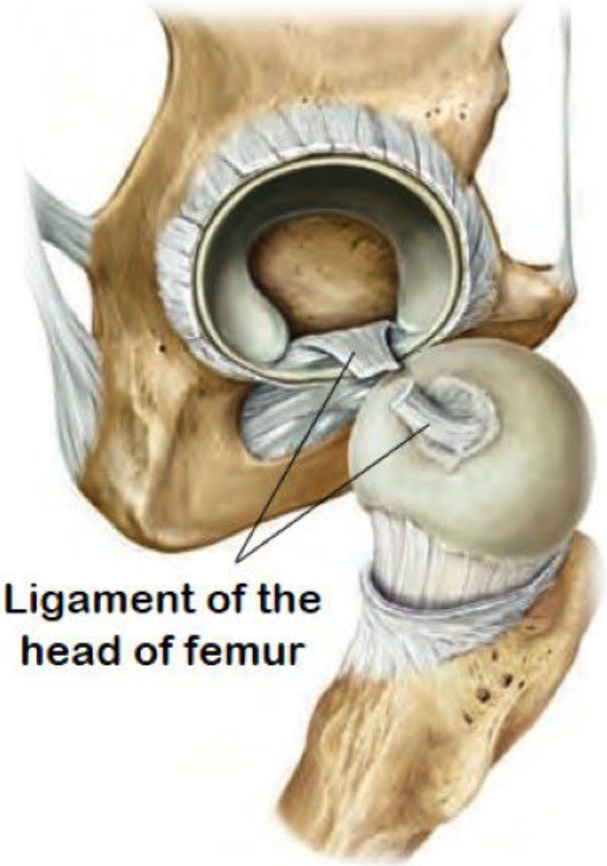


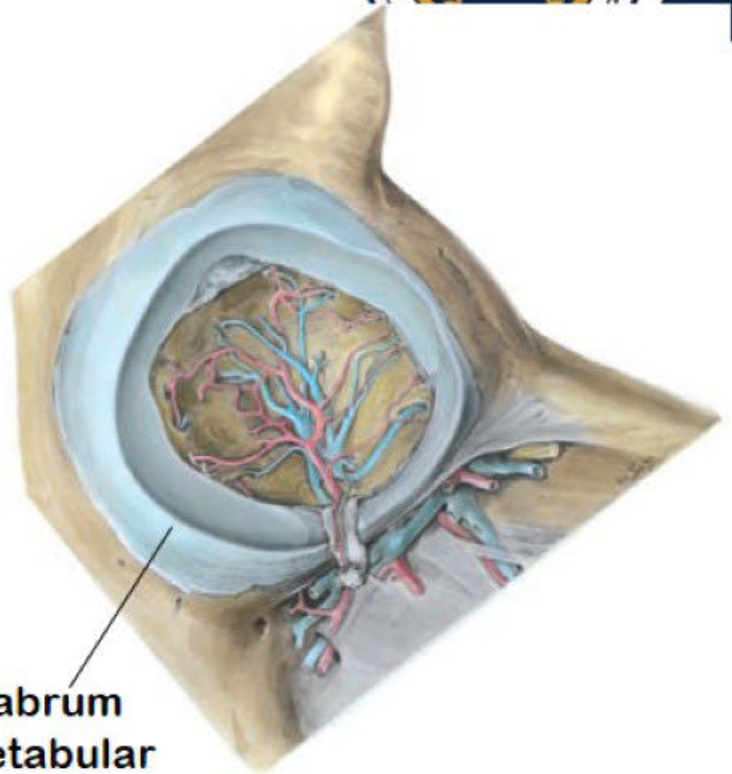




Ligaments:


Transverse acetabular ligament


Ligament of the head of femur


Labrum acetabular

Hip joint

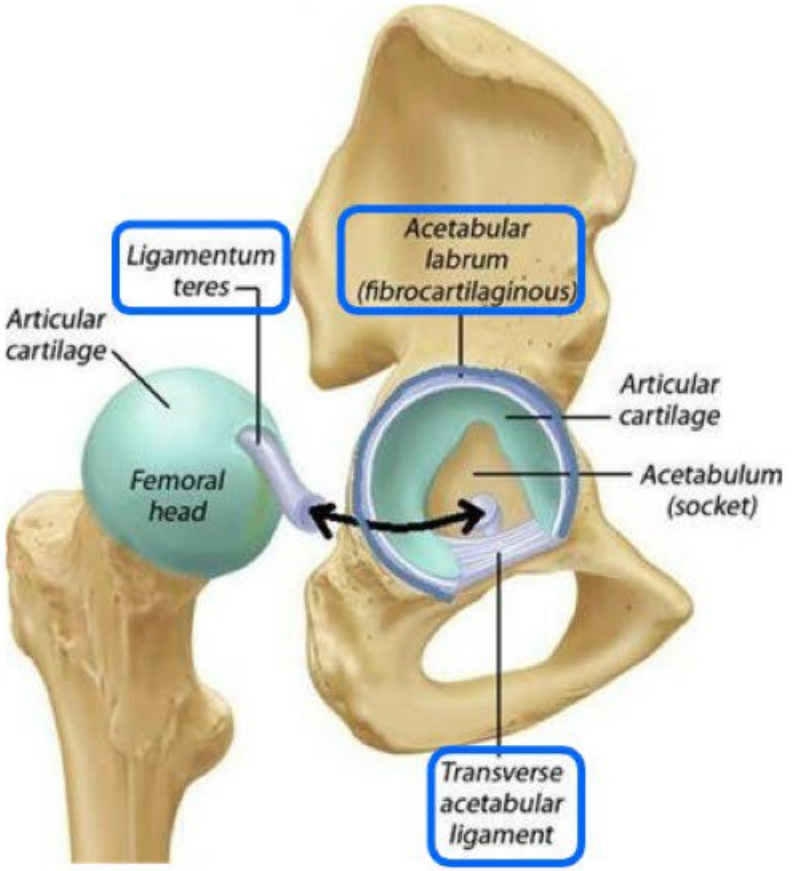
Non capsular ligaments:

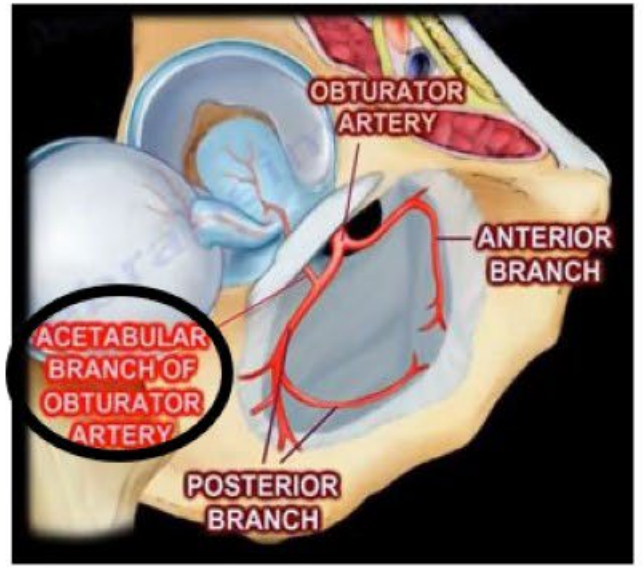
1. Ligamentum teres (round ligament of the head):

- ✓ Extends from the fovea of the head to the transverse acetabular ligament & acetabular notch.
- ✓ It is extra synovial.

Function:

- Carries blood supply to the head from the acetabular branch of obturator artery.
- It is too weak to support the head.





Hip joint

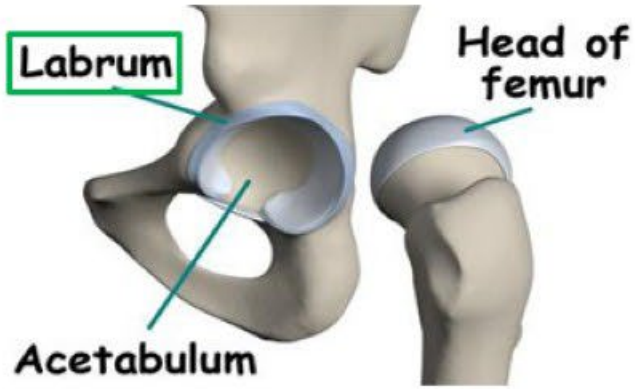
Non capsular ligaments:

2. Transverse acetabular ligament:

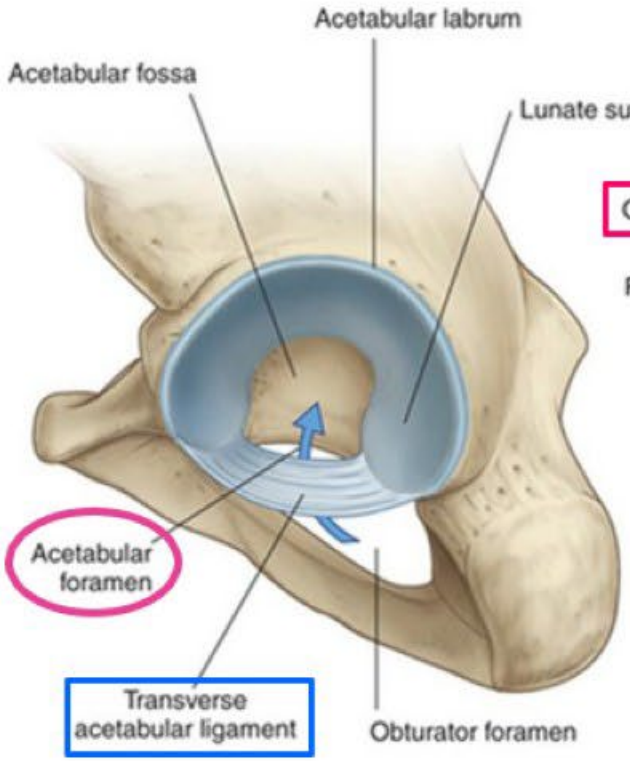
- ✓ Extends between the margins of the acetabular notch.

3. Labrum acetabular:

- ✓ It is a ring of fibrocartilage attached to the margins of the acetabulum.



A



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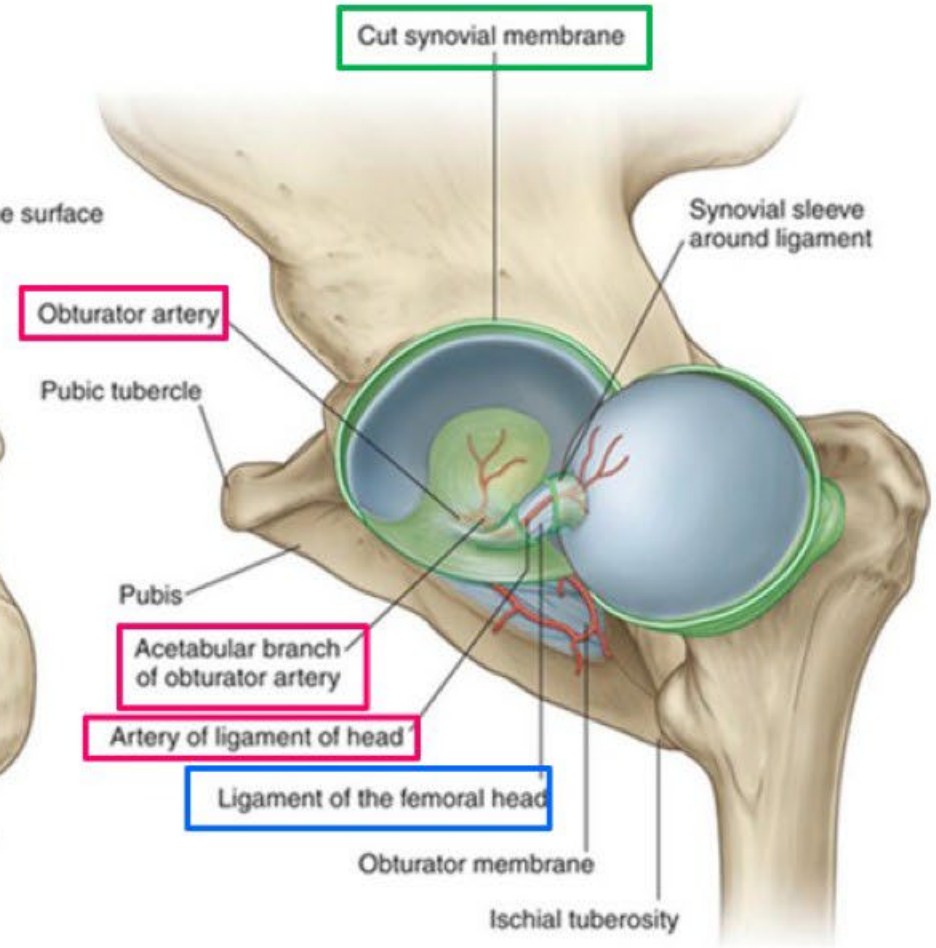

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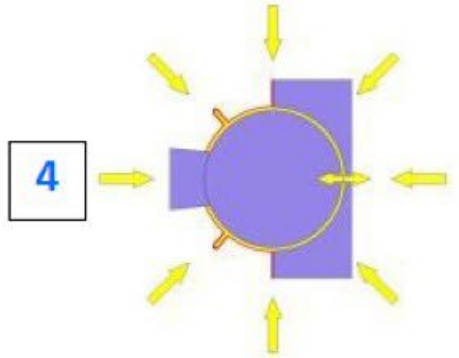
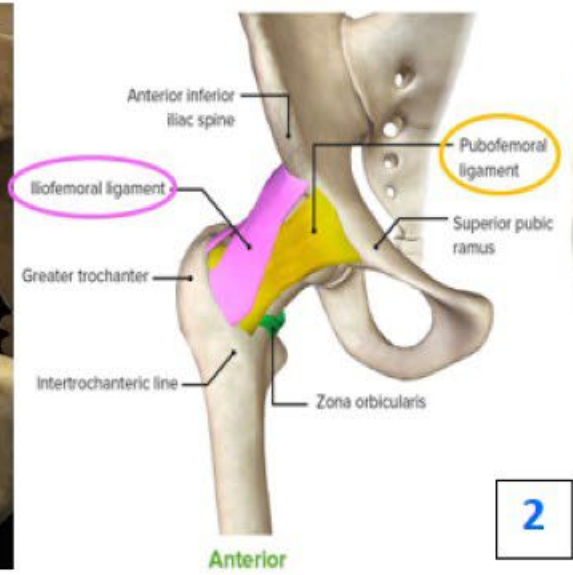
Stability of Hip Joint

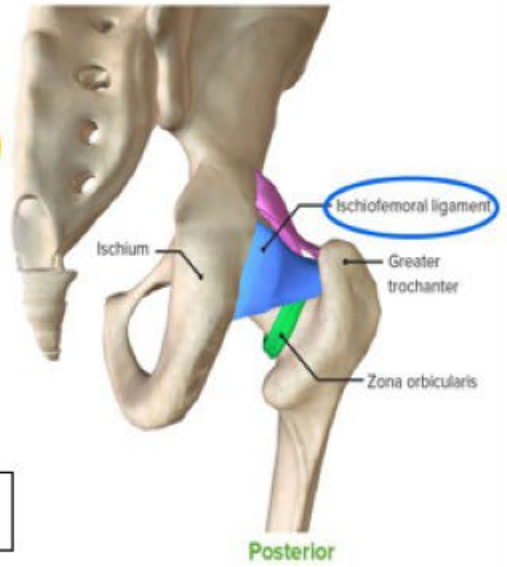
The hip is a stable joint compared to the shoulder joint.

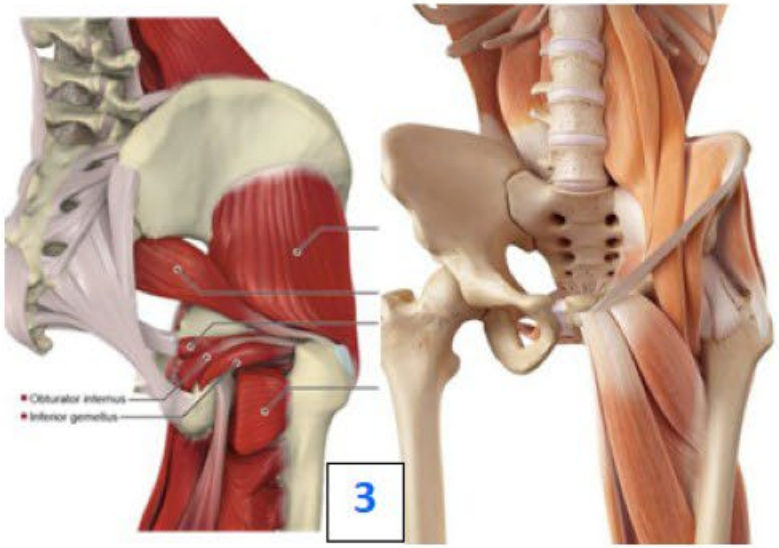
Factors helping its stability:

1. The fitness of its articular surfaces (70% of head of femur in contact with acetabulum).
2. Strong ligaments.
3. Strong surrounding muscles.
4. Suction exists in joint owing to atmospheric pressure.









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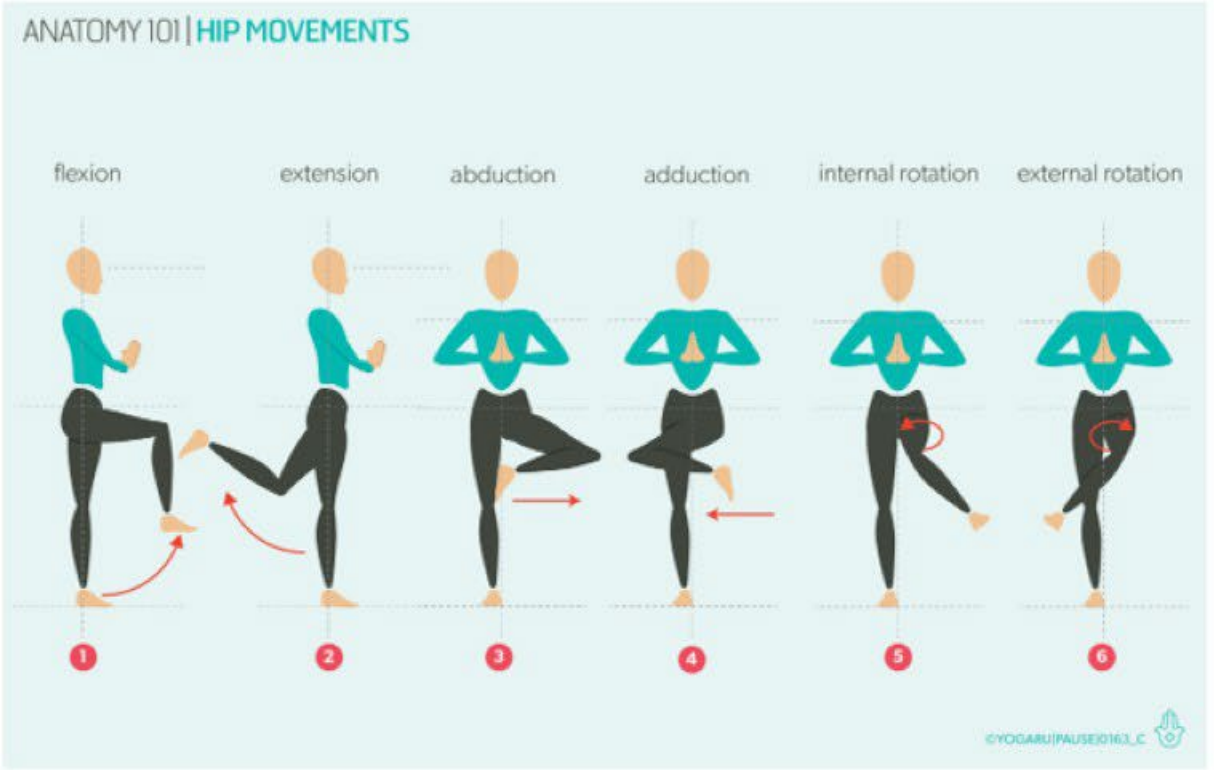
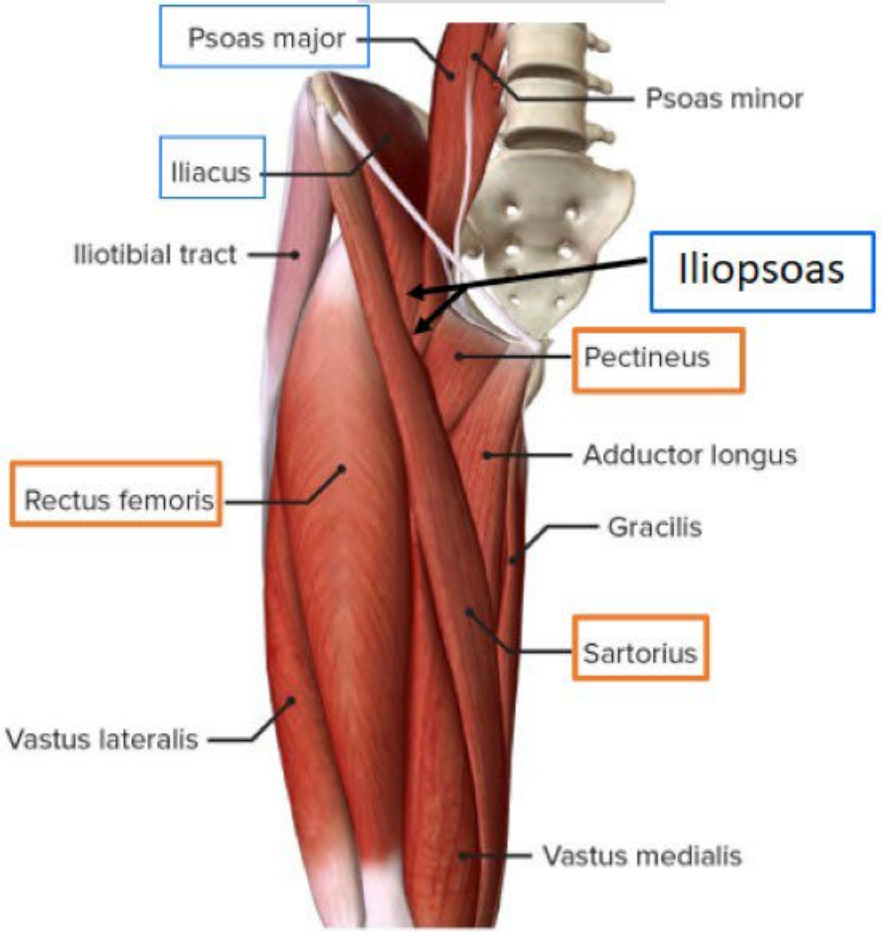
Movements of Hip joint

Movement	Main muscle (s)	Accessory muscles
Flexion	Iliopsoas	1) Sartorius 2) Rectus femoris 3) Pectineus
Extension	Gluteus maximus	1) Biceps femoris 2) Semitendinosus 3) Semimembranosus 4) Ischial part of adductor magnus
Adduction	1) Adductor brevis 2) Adductor longus 3) Adductor magnus	1) Pectineus 2) Gracilis
Abduction	1) Gluteus medius 2) Gluteus minimus	Tensor fascia lata
Lateral rotation	1) Obturator internus 2) Obturator externus 3) 2 gemelli 4) Quadratus femoris	1) Pyriformis 2) Sartorius 3) Gluteus maximus 4) Adductors
Medial rotation	1) Gluteus medius 2) Gluteus minimus	Tensor fascia lata

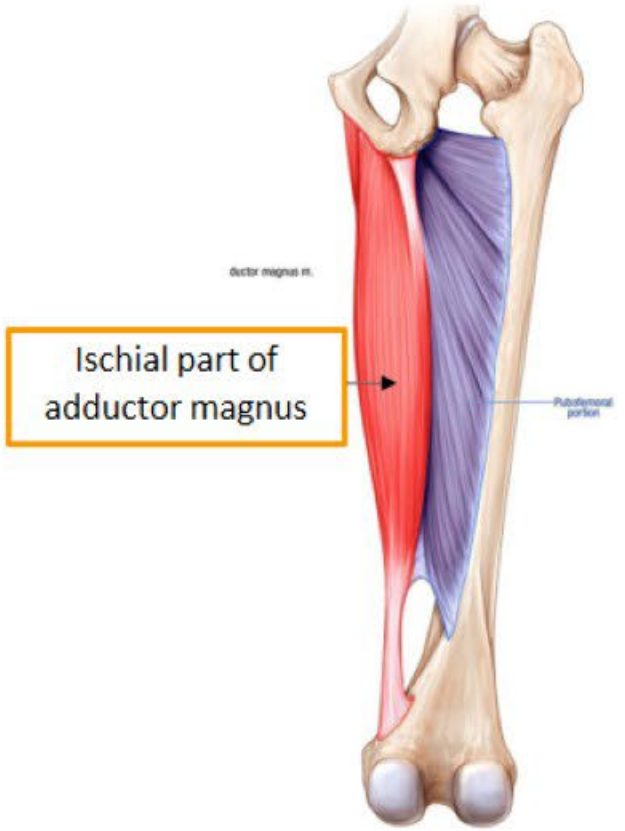


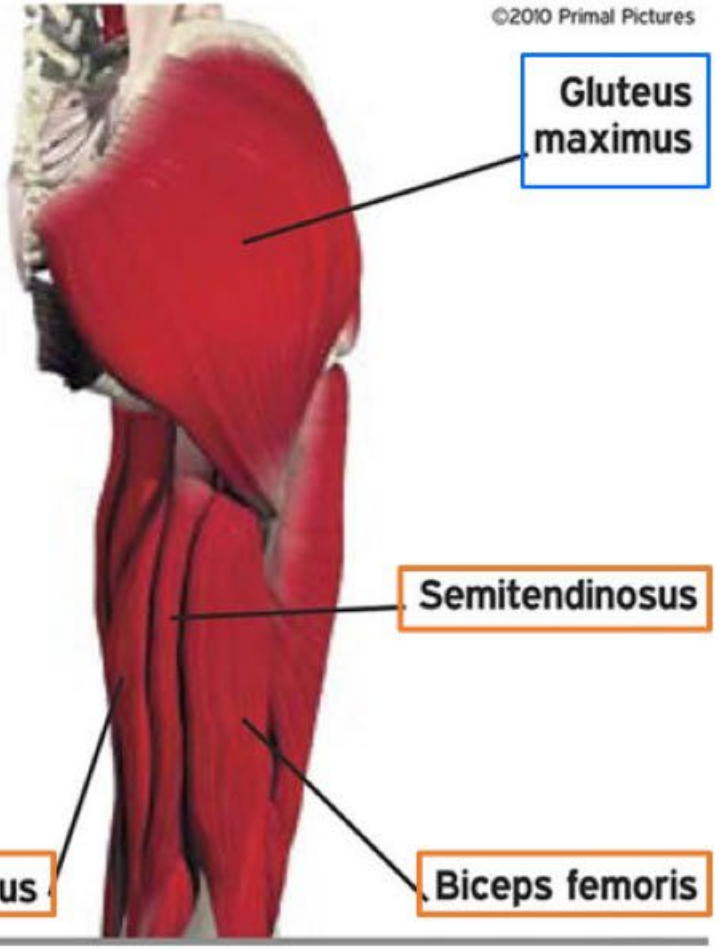
Flexors & Extensors of the Hip Joint

Flexors



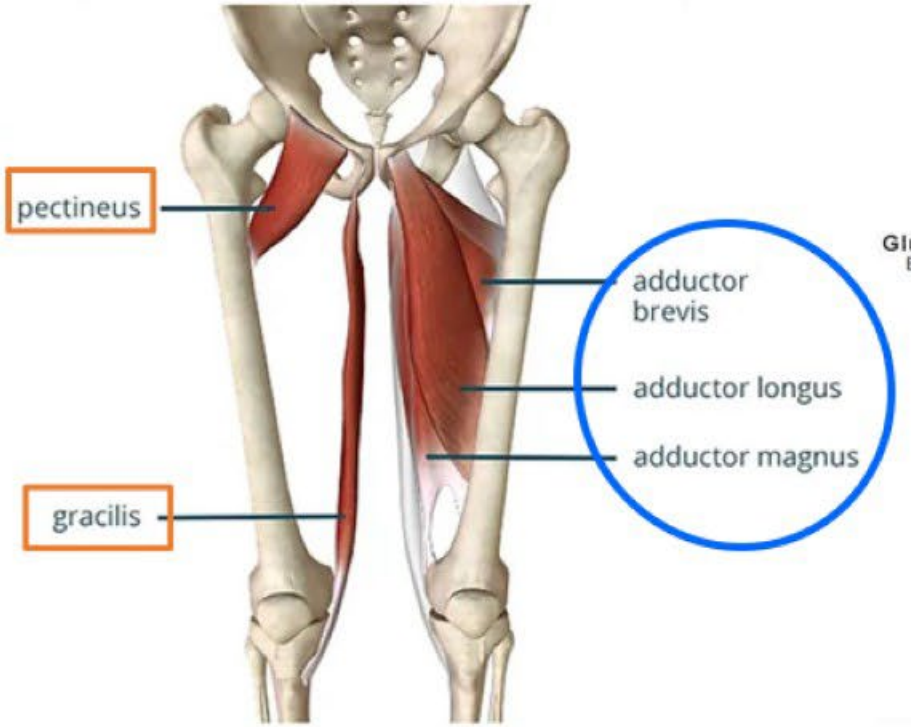
Extensors



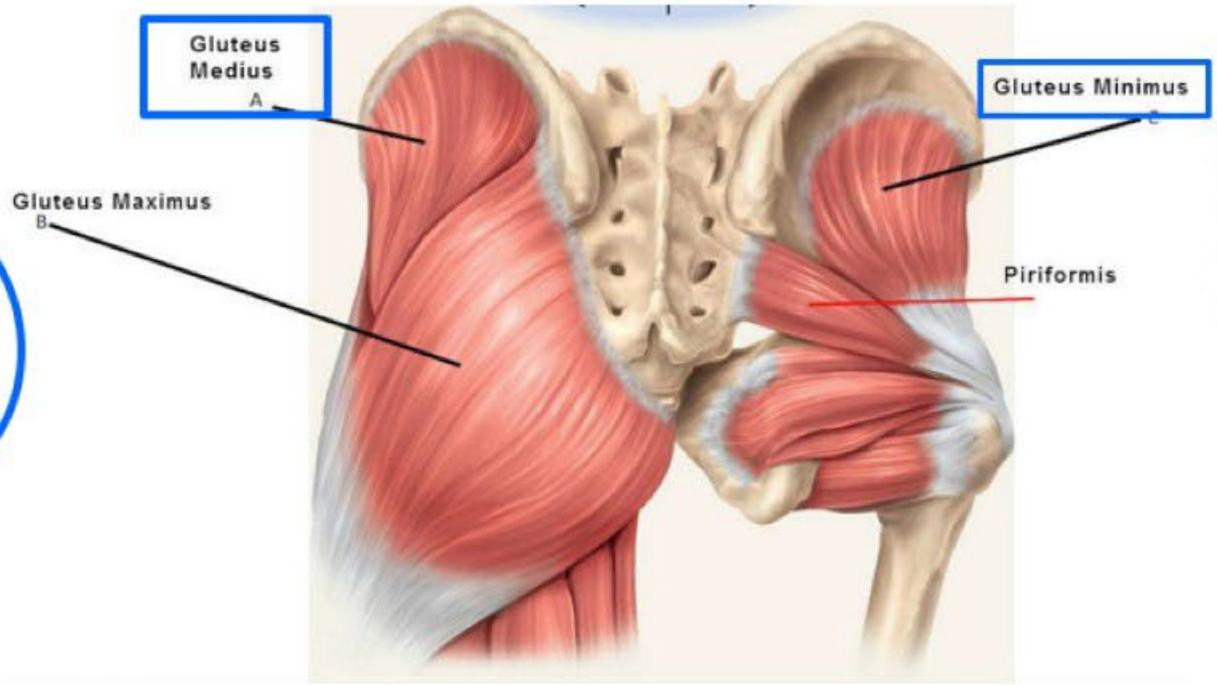


Adductors & Abductors of the Hip Joint

Adductors



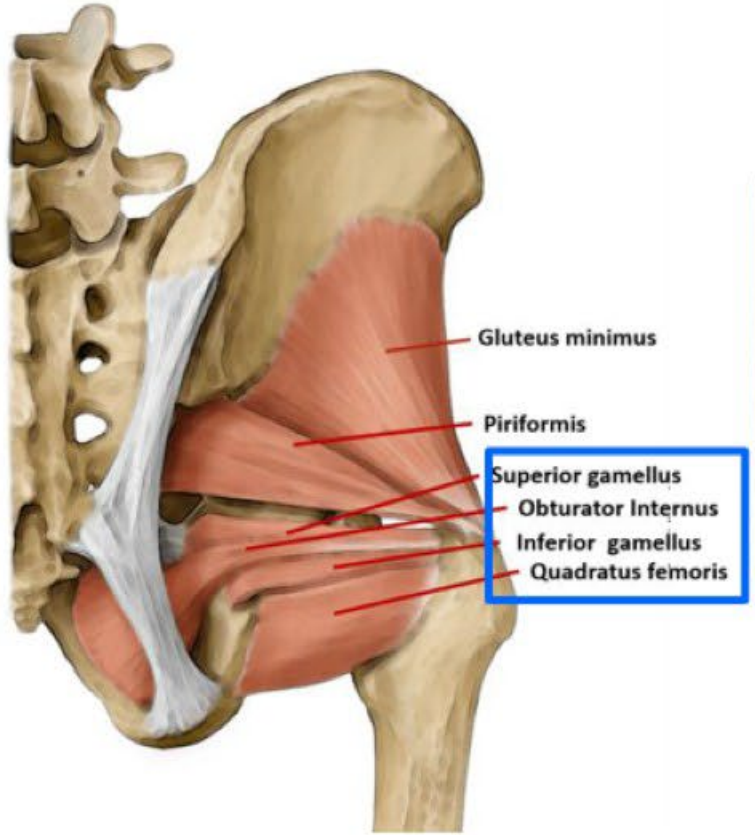
Abductors

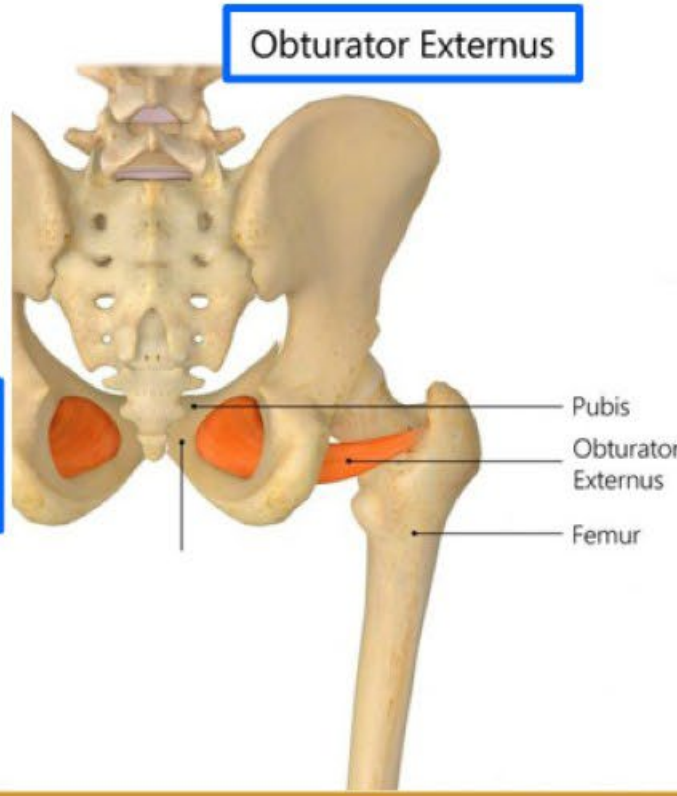


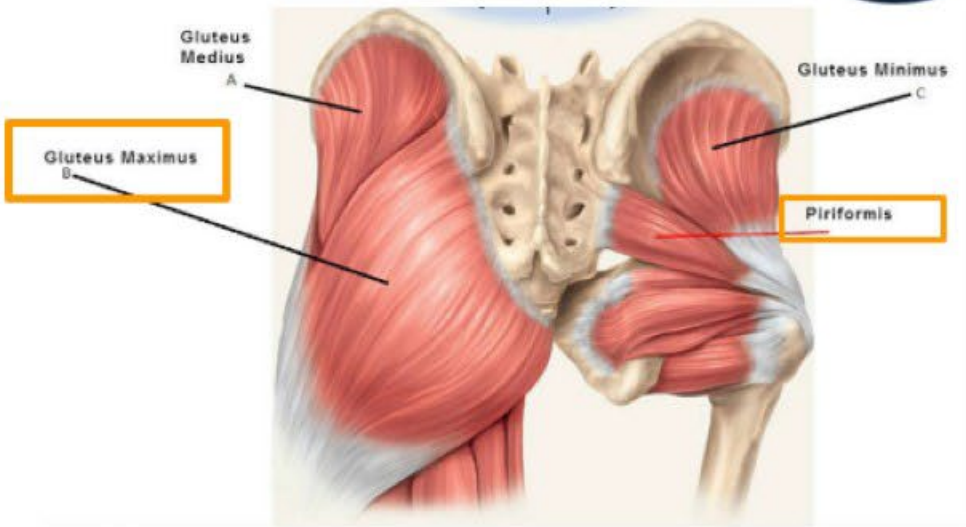
Tensor fascia lata

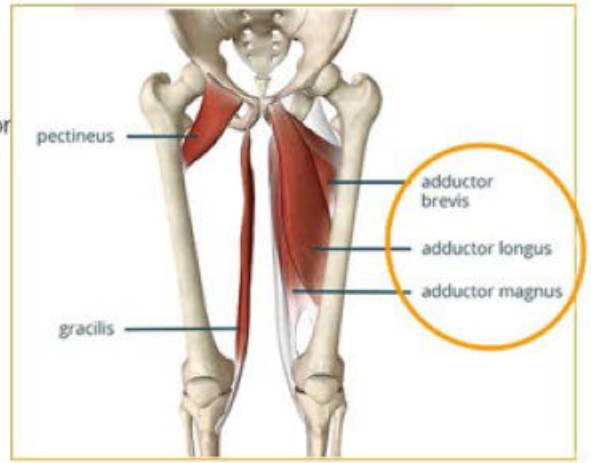
Rotators of the Hip Joint

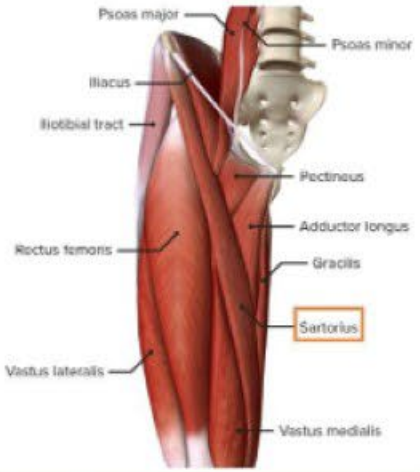
Lateral Rotators





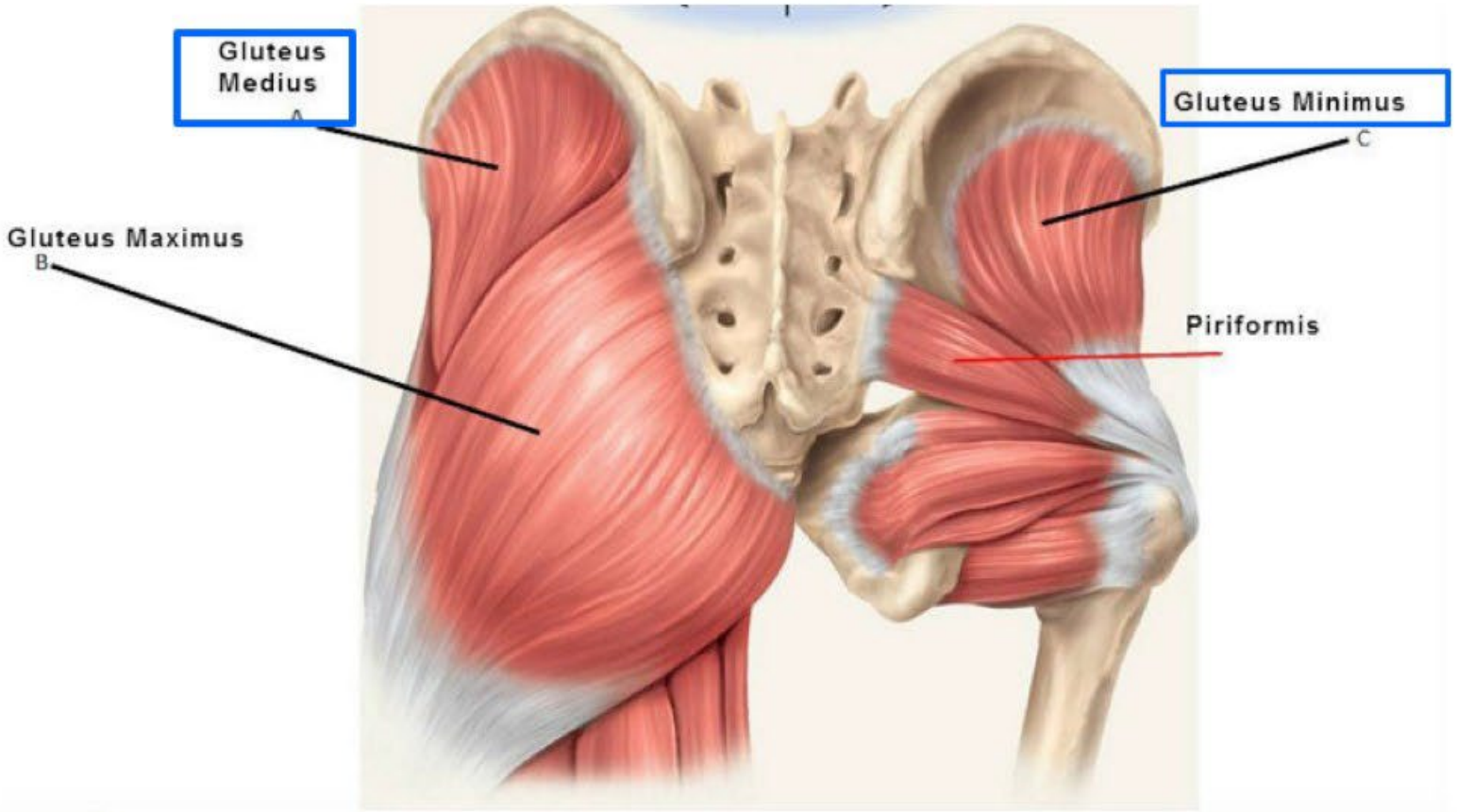




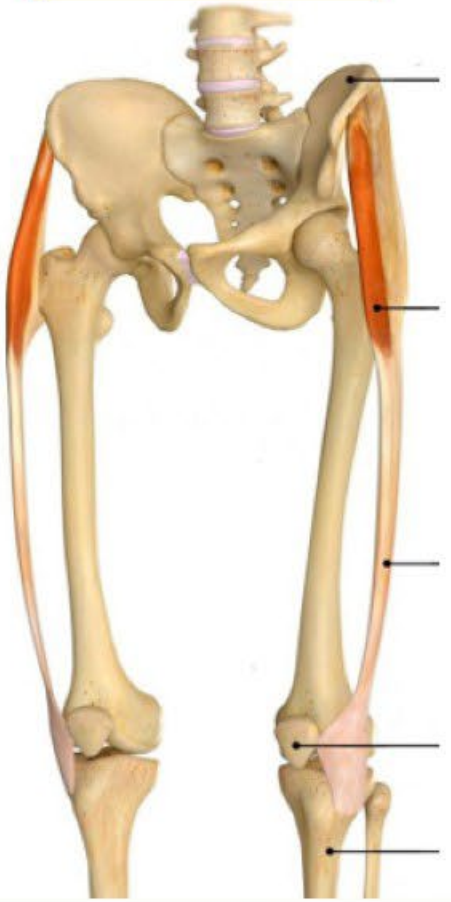


Rotators of the Hip Joint

Medial Rotators



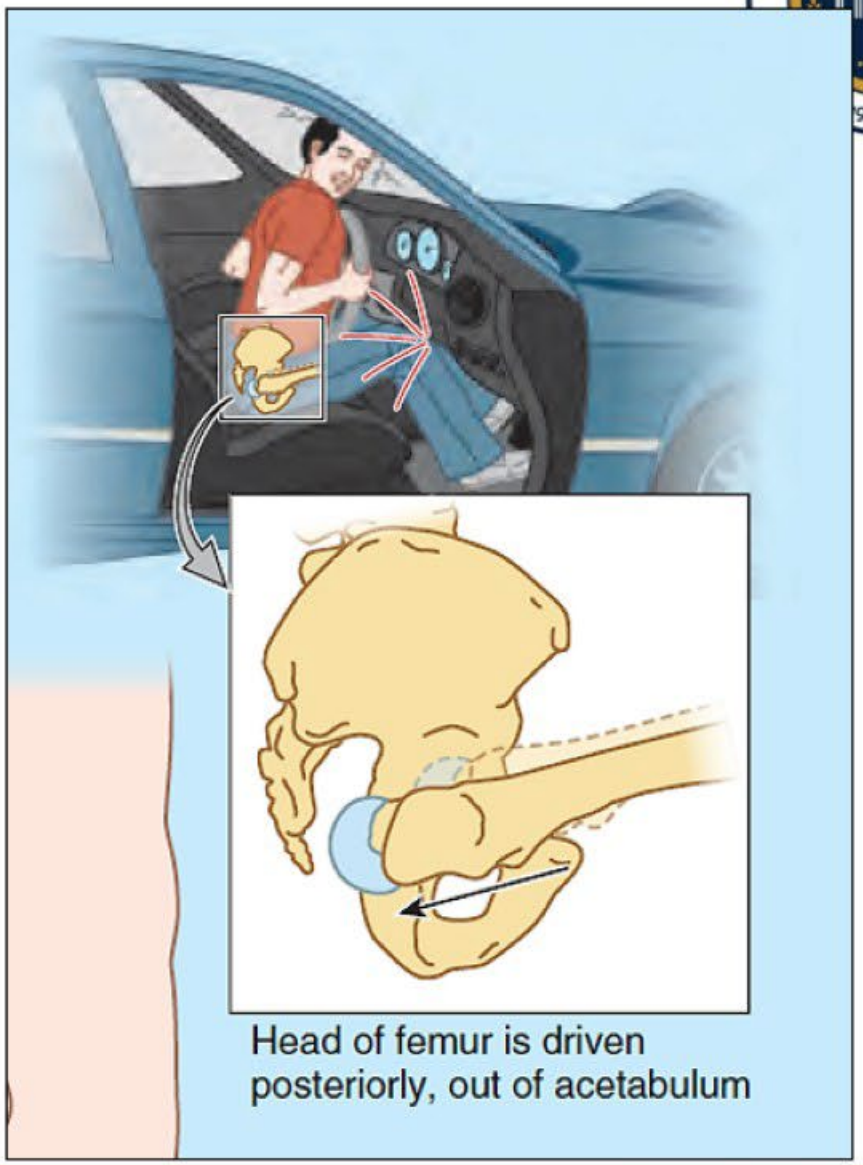
Tensor fascia lata



Hip joint

Dislocation of hip joint

- Dislocation of the hip joint is uncommon because it is very strong and stable.
- Posterior dislocation of the hip joint occur in car accidents when the hip is flexed. It may injury sciatic nerve.



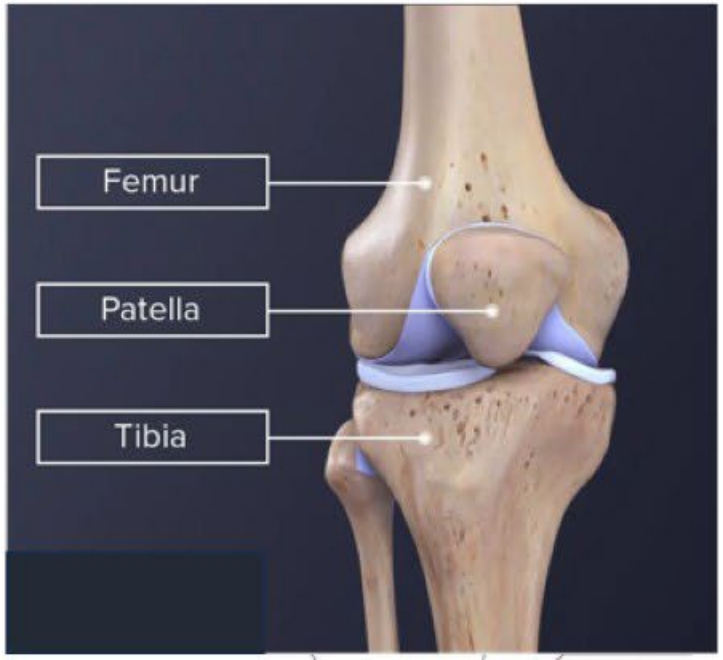
Knee joint

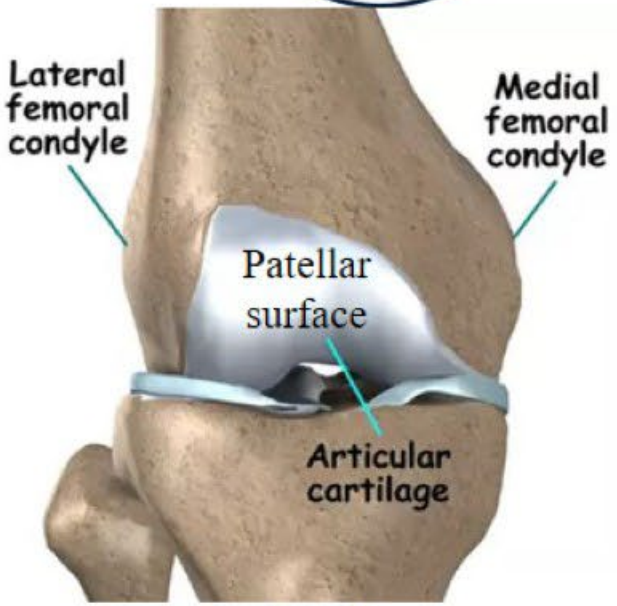
Type:

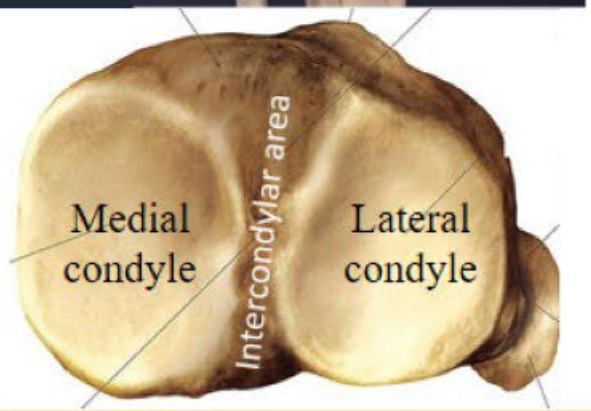
- ✓ Synovial condylar.
- ✓ The largest joint in the body.

Articular surface:

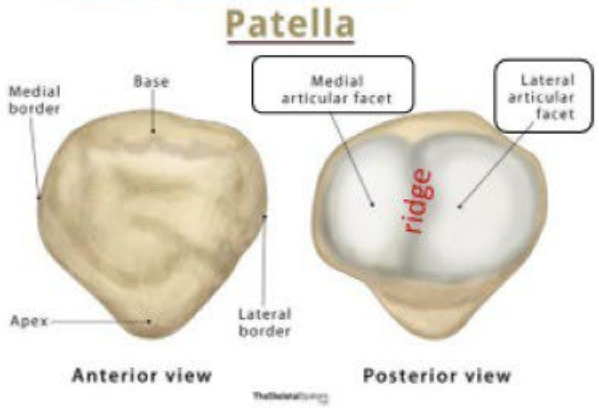
- ✓ **Femur:**
  - 2 femoral condyles separated by the intercondylar notch.
  - Its anterior part articulates with the patella & is called patellar surface.
- ✓ **Tibia:**
  - 2 tibial condyles separated by intercondylar area.
  - The articular surface of the medial condyle is large & oval while the lateral condyle is small & rounded.
- ✓ **Patella:**
  - Triangle-shaped sesamoid bone.
  - It has a small medial & large lateral articular surface separated by a ridge.







Superior view upper end tibia

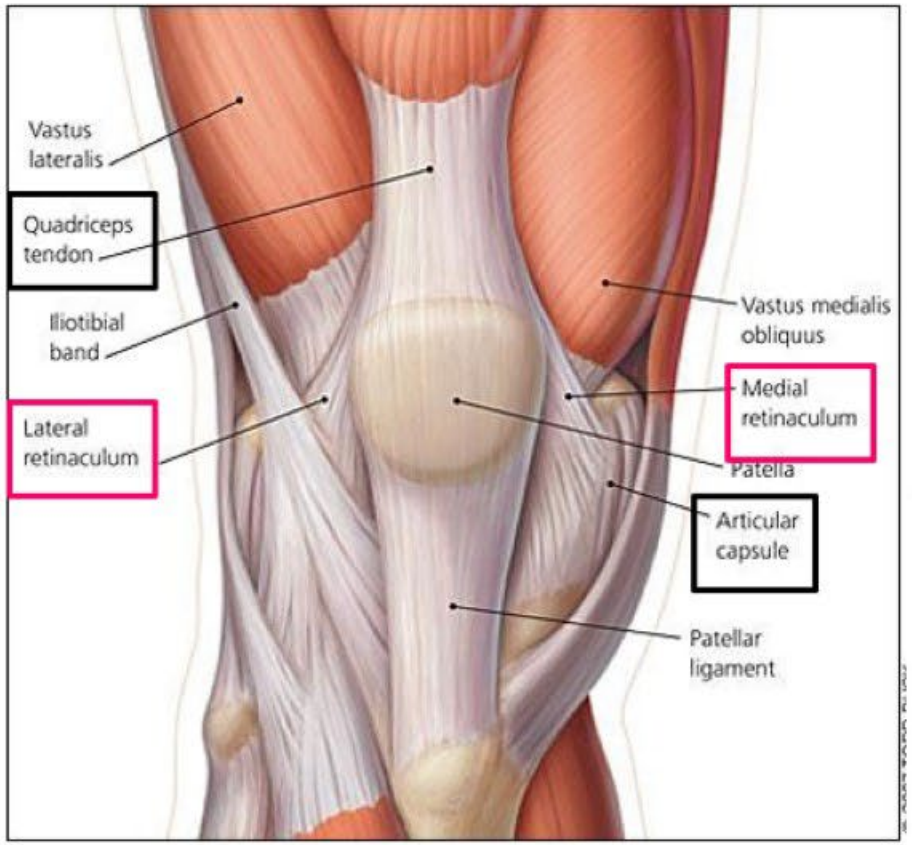


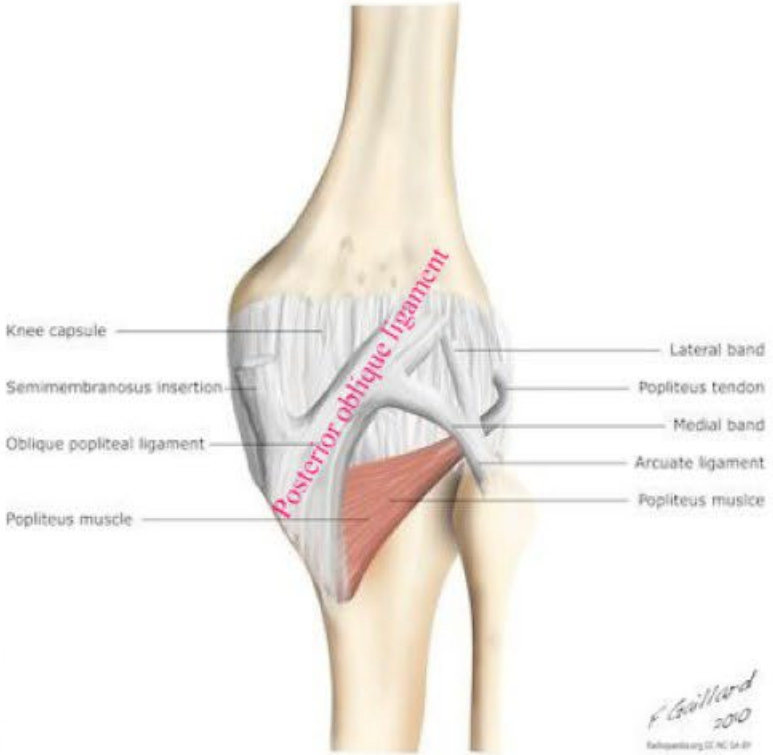
Knee joint

Capsule:

Attachment:

- Attached to the margins of the articular surfaces.
- Replaced anteriorly by the quadriceps tendon.





Strengthened by:

Laterally:

- Lateral patellar retinaculum.

Medially:

- Medial patellar retinaculum.

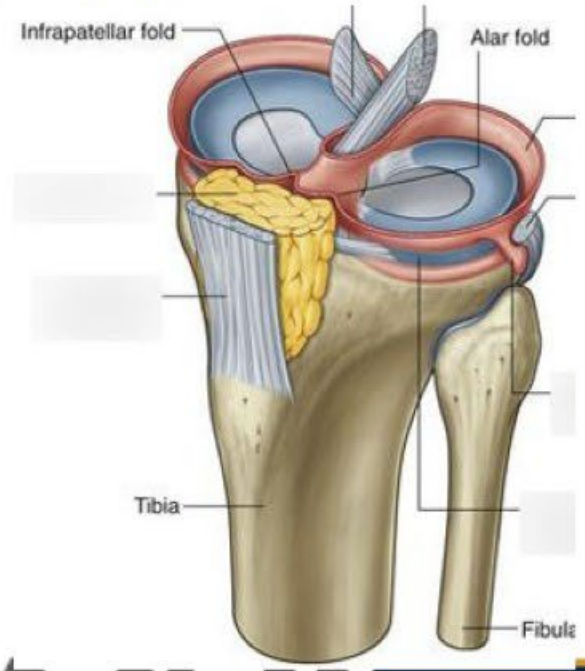
Posteriorly:

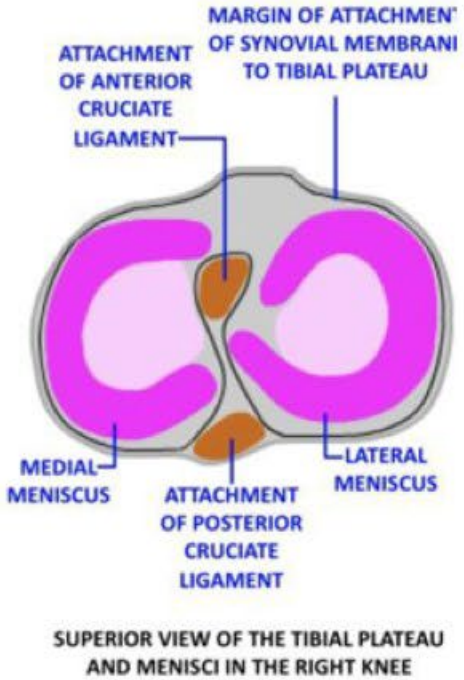
- Posterior oblique ligament.

Knee joint

Synovial membrane:

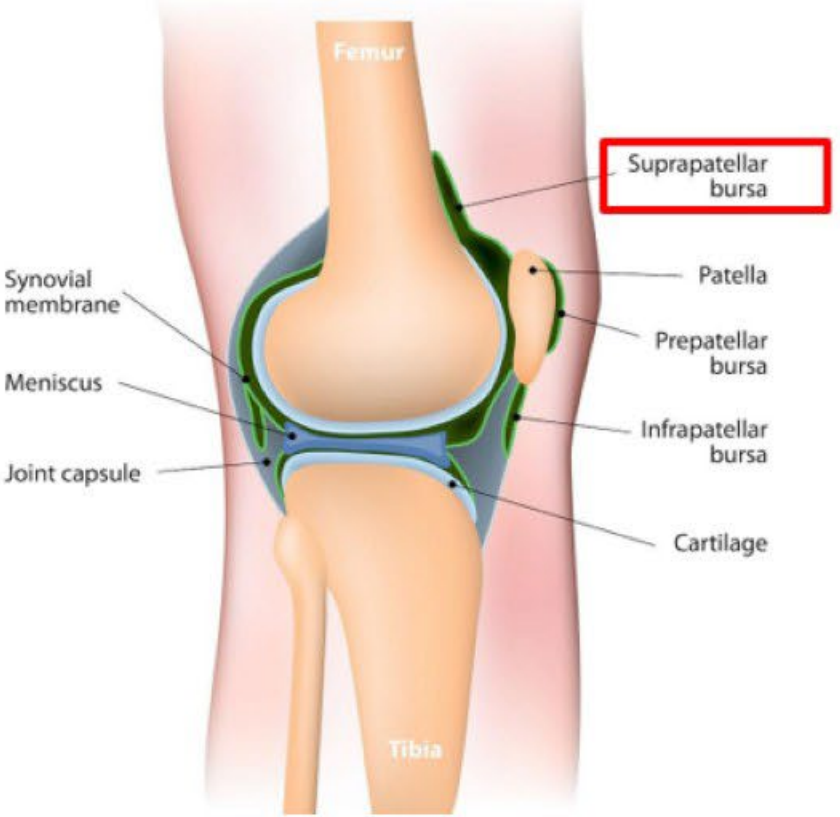
- ✓ lines the capsule & covers the non-articular parts of the bones inside the capsule.
- ✓ The cruciate ligaments are extra synovial.
- ✓ The menisci are not covered with it.
- ✓ It extends above the patella deep to the quadriceps forming the suprapatellar bursa.





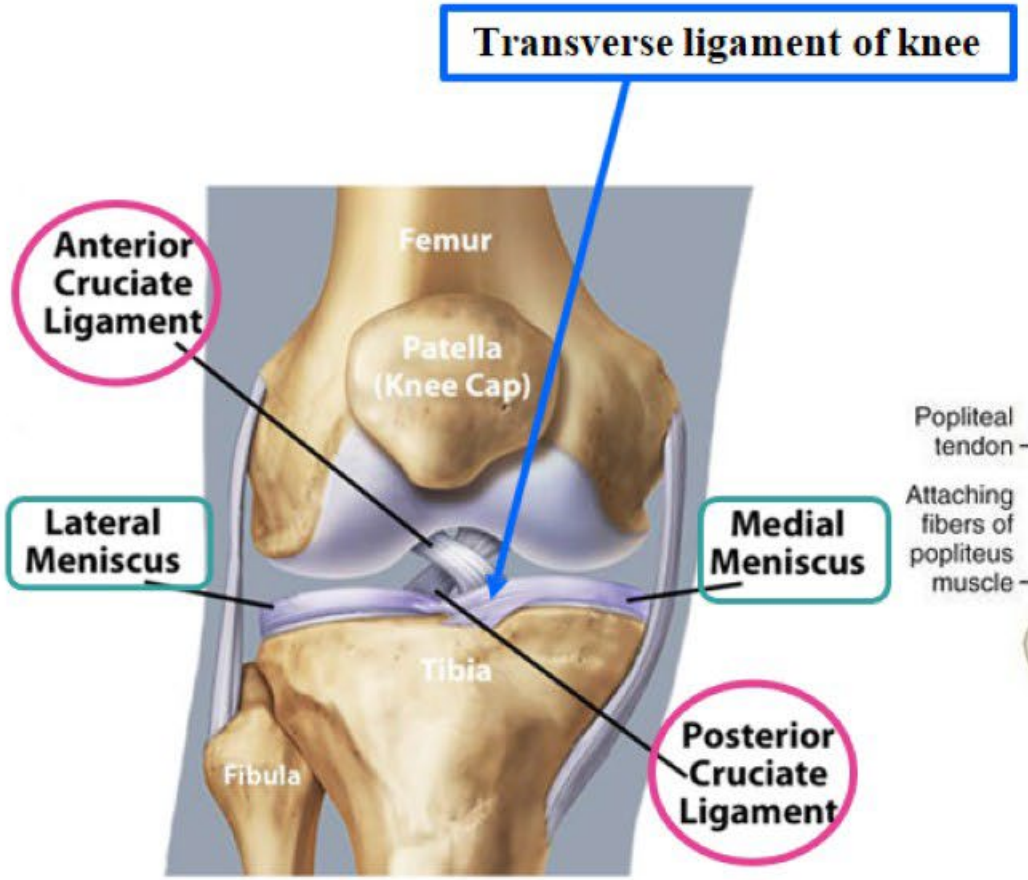
SUPERIOR VIEW OF THE TIBIAL PLATEAU AND MENISCI IN THE RIGHT KNEE

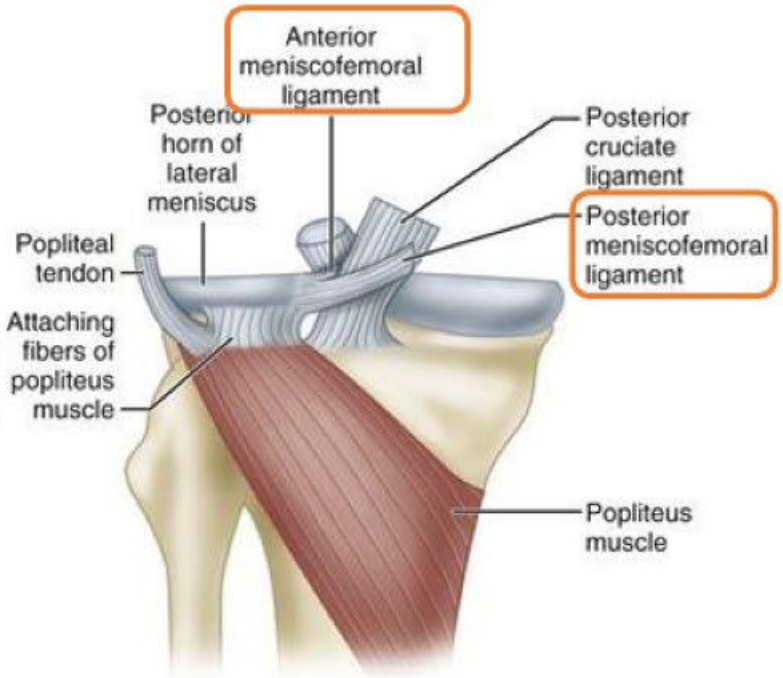
Synovial joint of the knee



Structures inside the knee joint

- Menisci.
- Cruciate ligaments.
- Transverse ligament of knee.
- Menisco-femoral ligament.





Structures inside the knee joint

1. Menisci:

Definition:

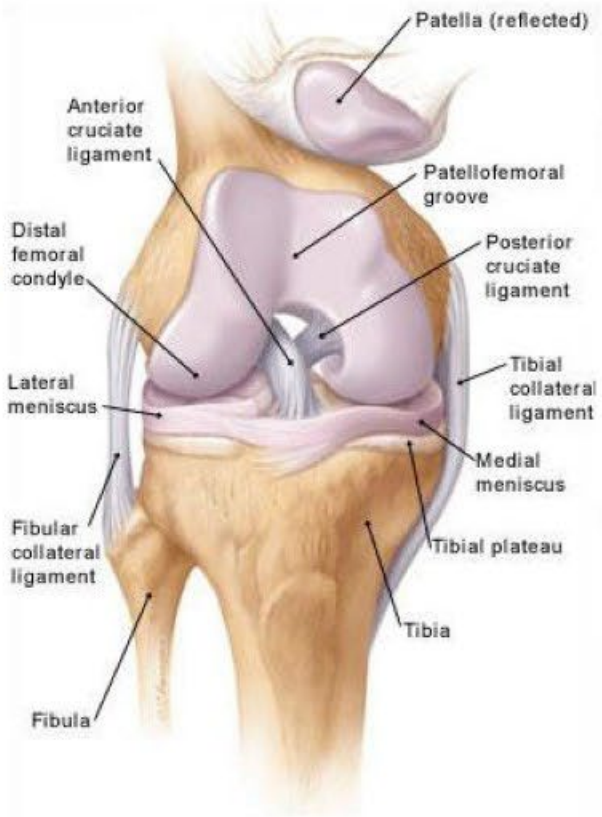
- C-shaped plates of fibrocartilage.

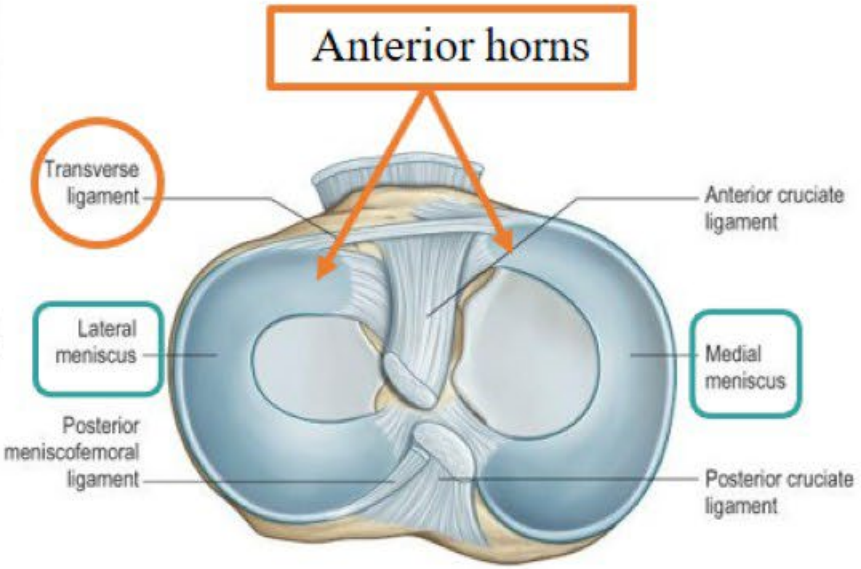
Function:

- Facilitate lubrication of the articular surfaces with synovial fluid.
- Helps the condyles of the tibia to be adapted to those of the femur.

Characters:

- 2 in number.
- Thick in the circumference and thin internally.
- Each has 2 horns (anterior & posterior) attached to the intercondylar area.
- The 2 anterior horns are attached to each other by the transverse ligament of the knee.
- The medial meniscus forms a small part of large circle while the lateral forms a large part of small circle.
- Medial meniscus is more liable to injury than lateral.





Left tibia

Structures inside the knee joint

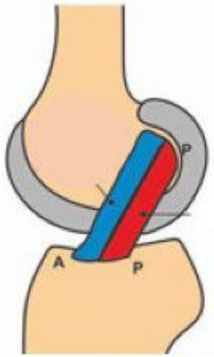
2. Cruciate ligaments:

Definition:

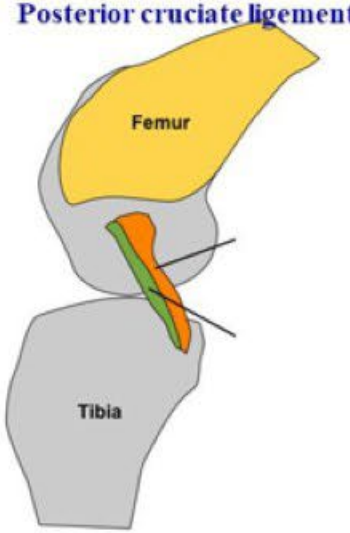
- 2 strong fibrous bands connecting the tibia & femur.

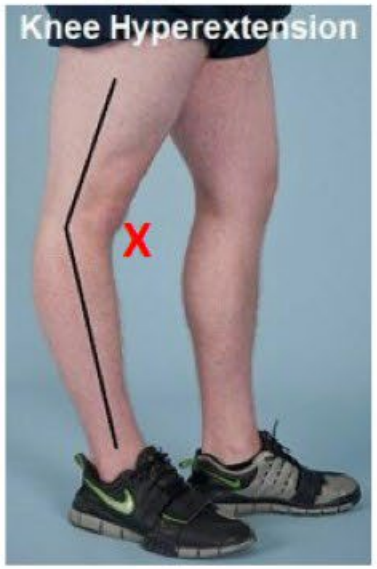
	Anterior Cruciate ligament	Posterior Cruciate ligament
Attachment 1. Tibia 2. Femur	Anterior intercondylar area Lateral condyle (medial surface)	Posterior intercondylar area Medial condyle (lateral surface)
Direction	Upward & backward	Upward & forward
Function	1. Prevents sliding of the femoral condyles backward. 2. Becomes tense during extension. 3. Prevents hyperextension.	1. Prevents sliding of the femoral condyles forward. 2. Becomes tense during flexion.

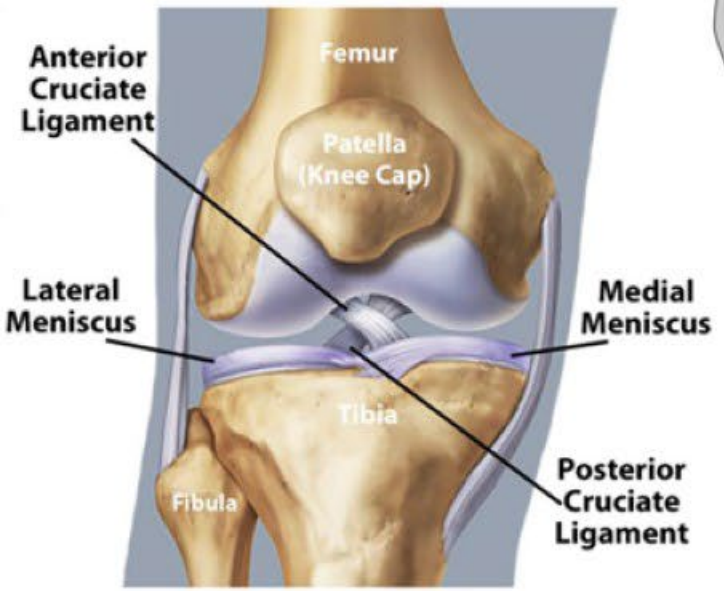
In Knee Extension
Anterior cruciate ligament

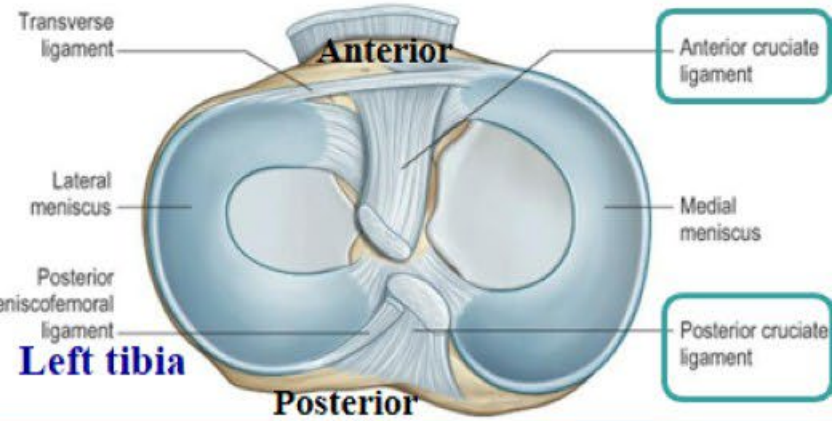


KNEE FLEXION
Posterior cruciate ligement









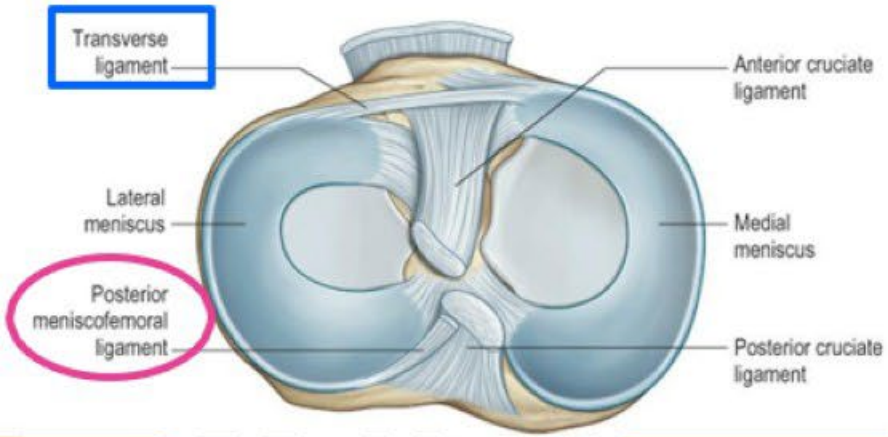
Structures inside the knee joint

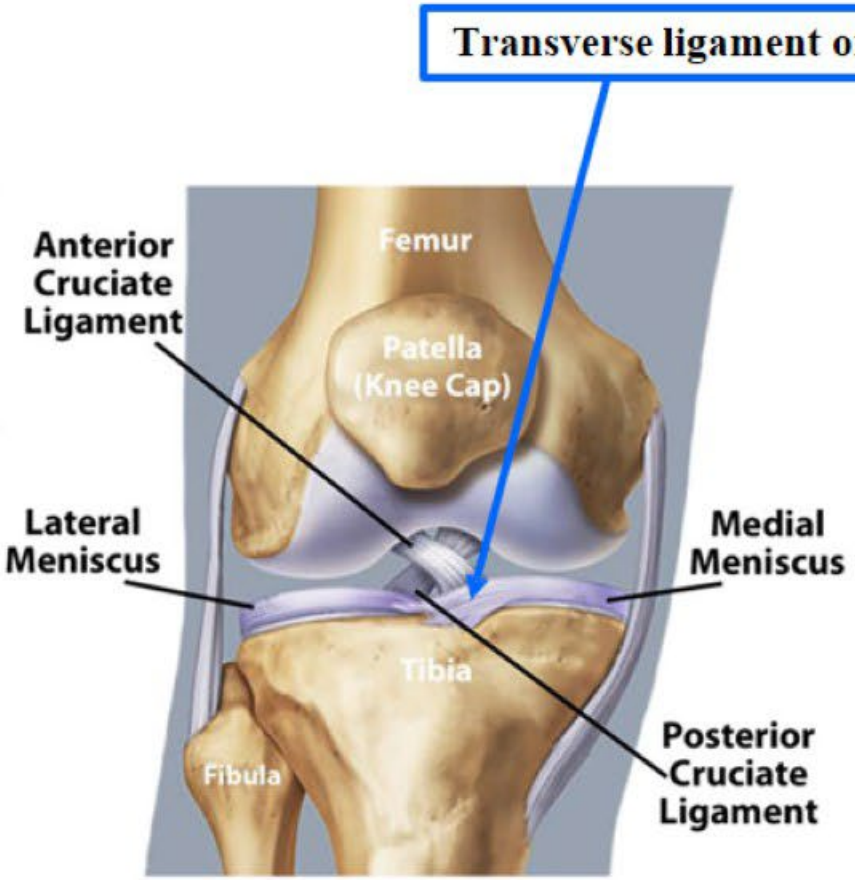
3. Transverse ligament of knee:

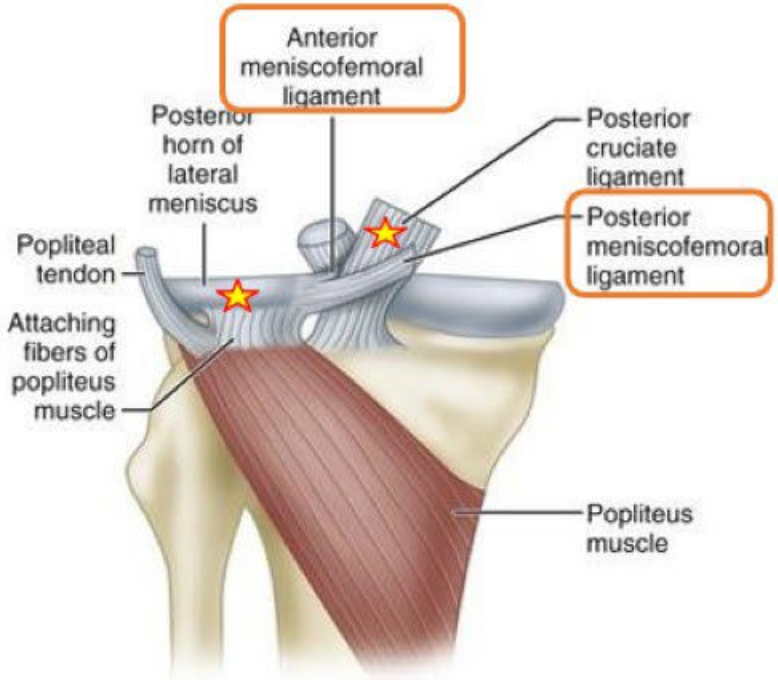
- Connects the 2 anterior horns of the 2 menisci.

4. Menisco-femoral ligament:

- Connects the lateral meniscus to the posterior cruciate ligament.







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Ligaments of the knee joint

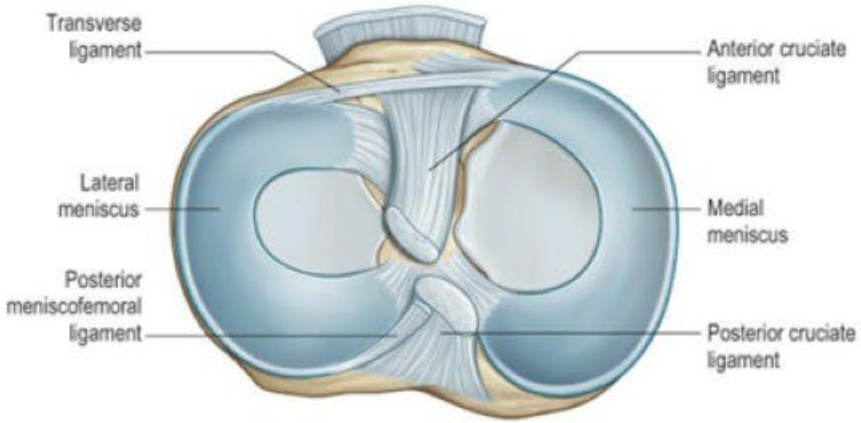
Ligaments inside the joint:

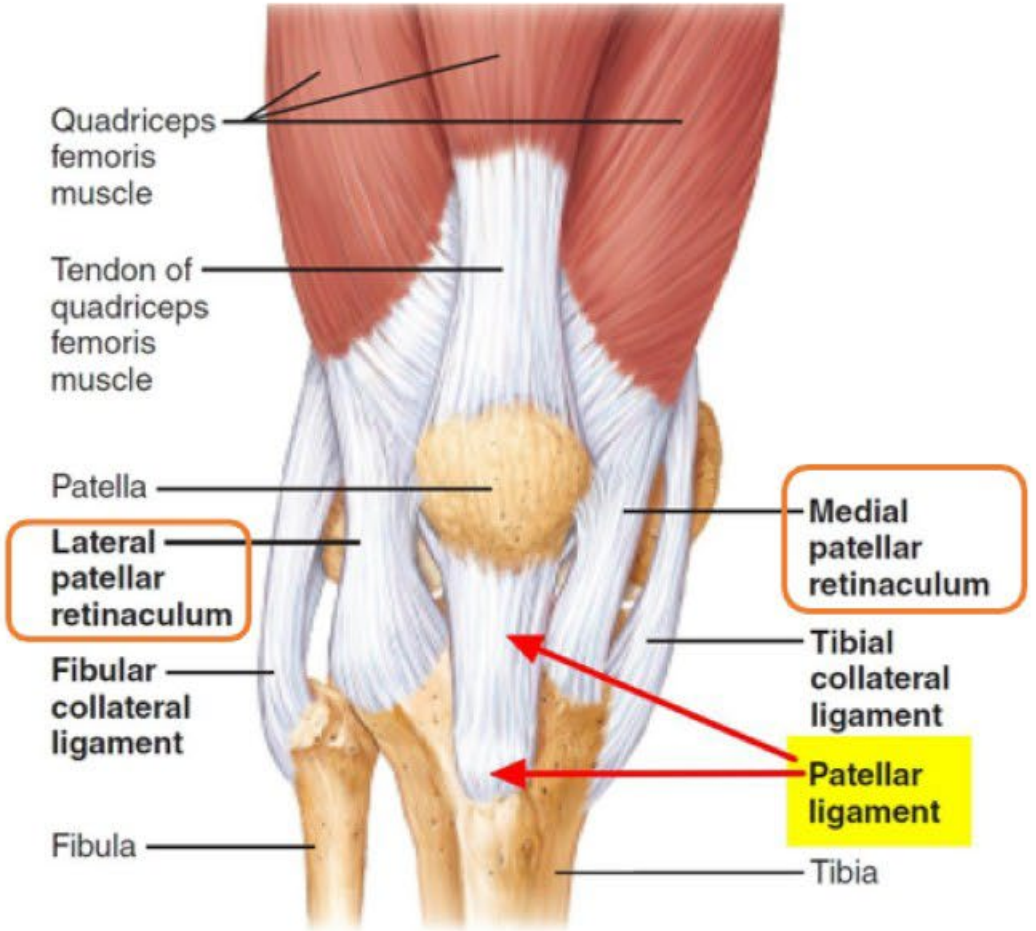
- Cruciate, transverse & menisco-femoral.

Ligaments outside the joint (Accessory ligaments):

1. Ligamentum patellae:

- ✓ Extends from the apex of the patella to the tibial tuberosity.
- ✓ The retinacula enforce it from the sides.





Anterior view of right knee

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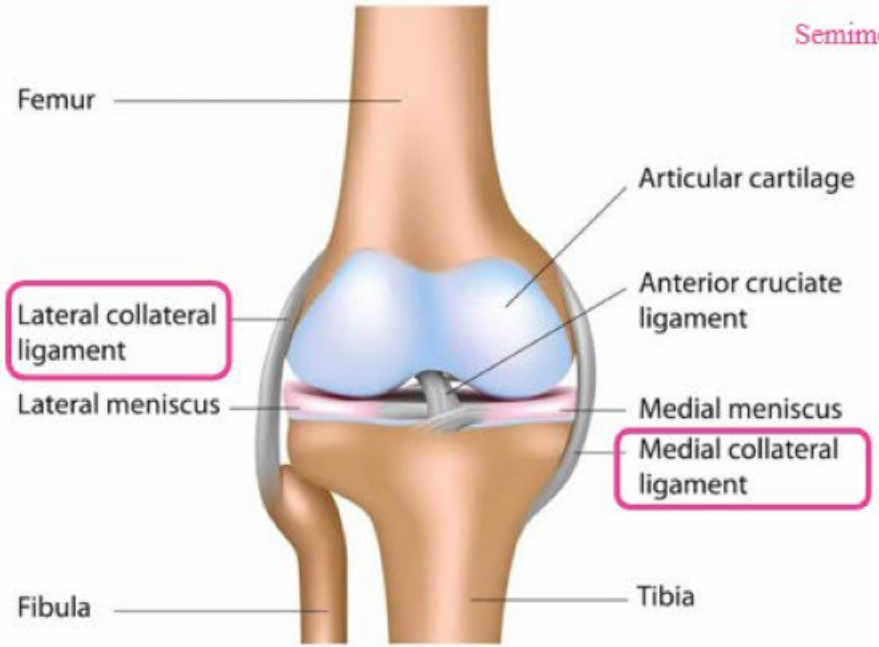
Ligaments of the knee joint

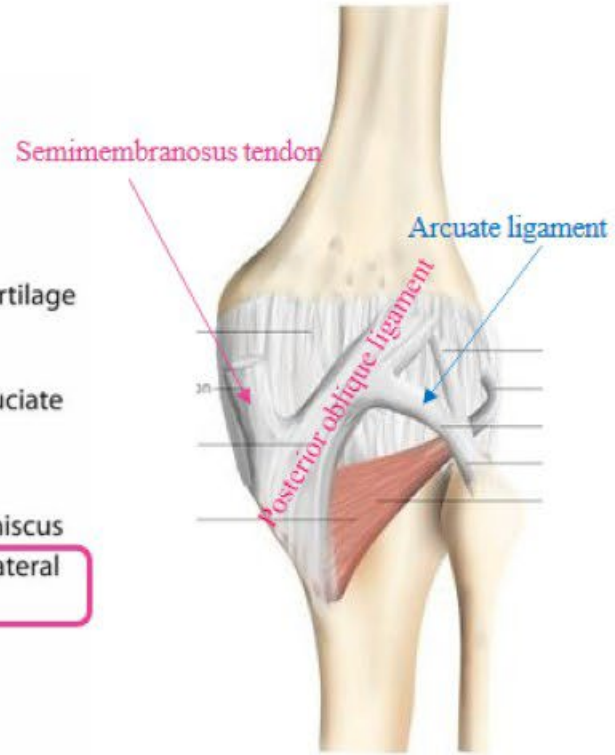
2. **Tibial collateral ligament:**
   - ✓ Extends from the medial epicondyle of femur to the margin of the medial condyle, upper part of the medial surface of tibia & the **medial meniscus**.

3. **Fibular collateral ligament:**
   - ✓ Extends from the lateral epicondyle of femur to the head of the fibula.
   - ✓ It is **not attached** to the lateral meniscus.

4. **Oblique posterior ligament:**
   - ✓ Extends from the medial condyle of tibia to the lateral condyle of femur.
   - ✓ It is an extension of the semimembranosus tendon.

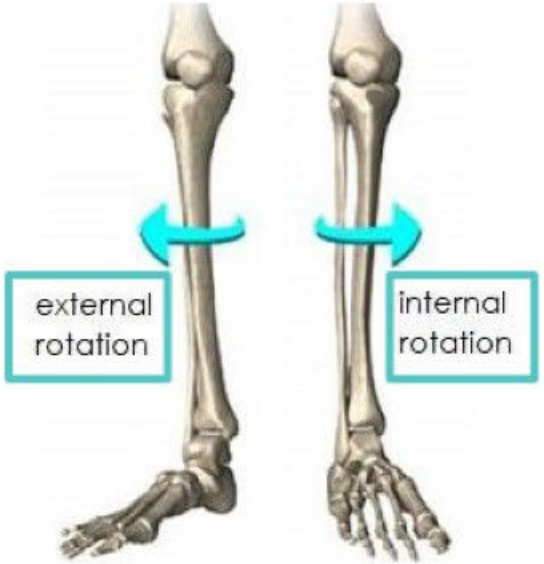
4. **Arcuate popliteal ligament:**
   - ✓ It is a thickening of the posterior capsular fibers.





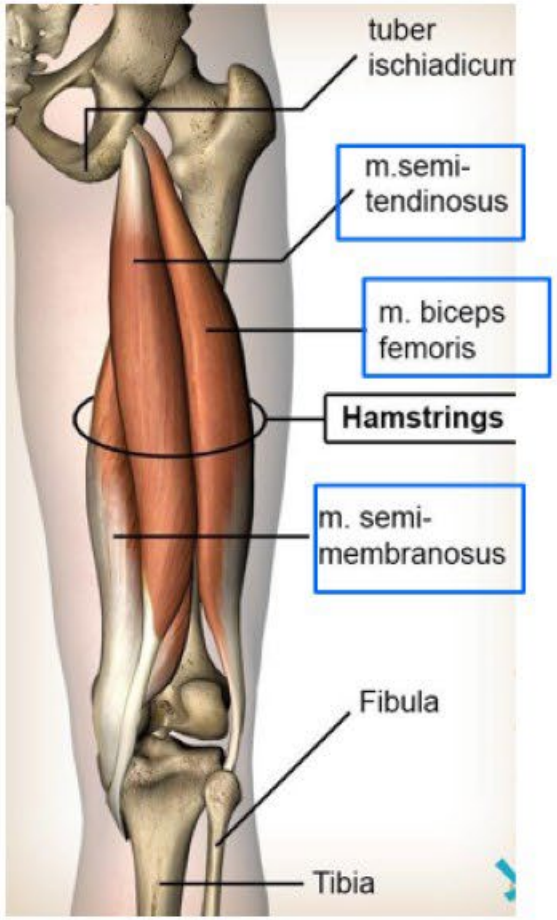
Movements of Knee joint

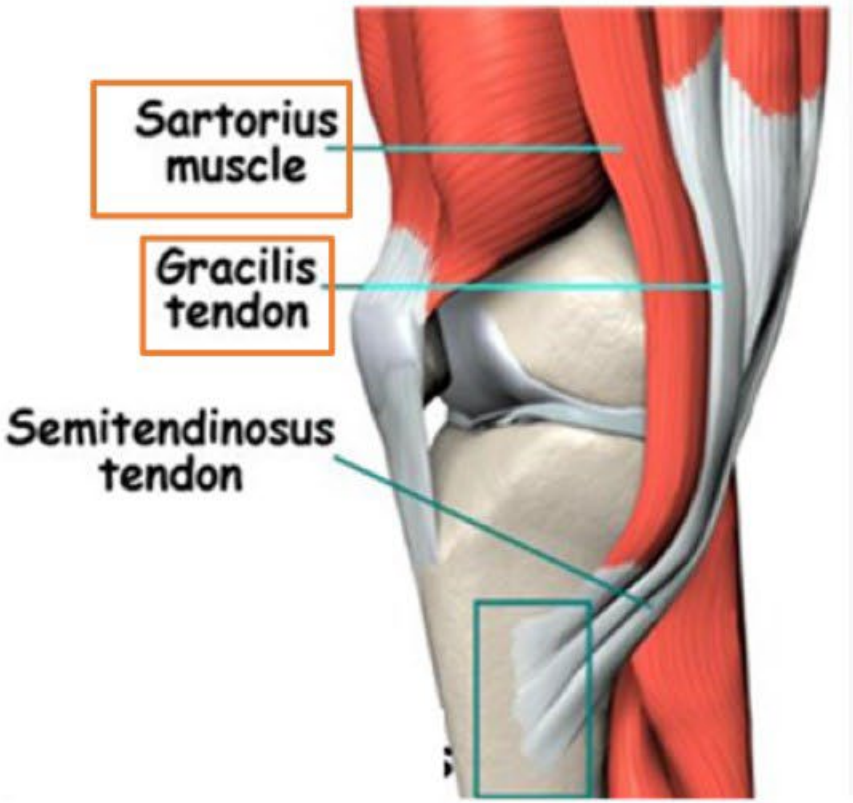
Movement	Main muscles	Accessory muscles
Flexion	(Hamstring muscles) ➢ Biceps femoris ➢ Semitendinosus ➢ Semimembranosus	1) Sartorius 2) Gracilis 3) Popliteus 4) Gastrocnemius
Extension	Quadriceps	Tensor fascia lata
Medial rotation	Popliteus	1) Semitendinosus 2) Semimembranosus 3) Sartorius 4) Gracilis
Lateral rotation	Biceps femoris	------

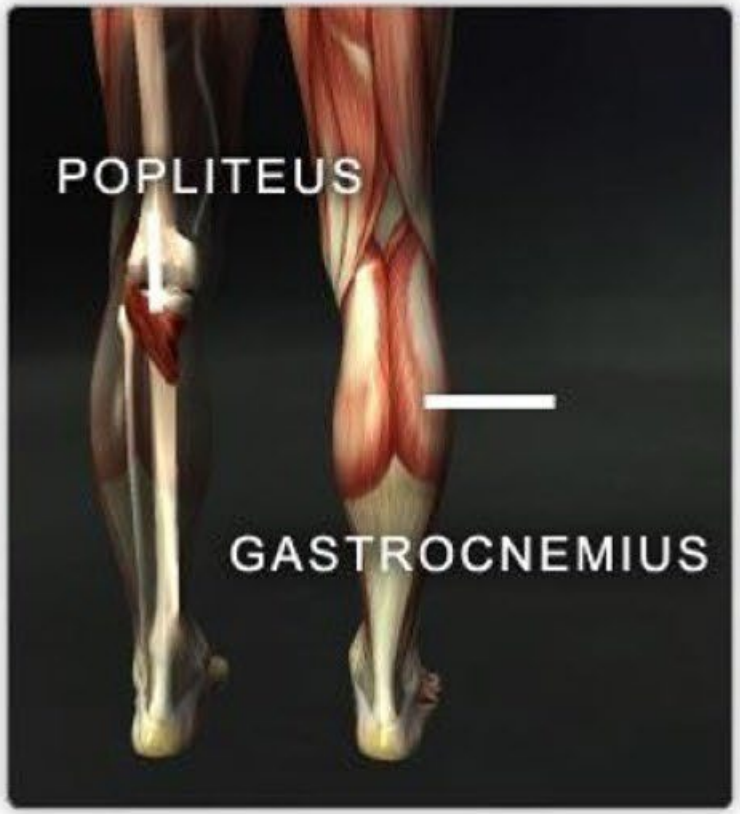


Flexors & Extensors of the Knee Joint

Flexors

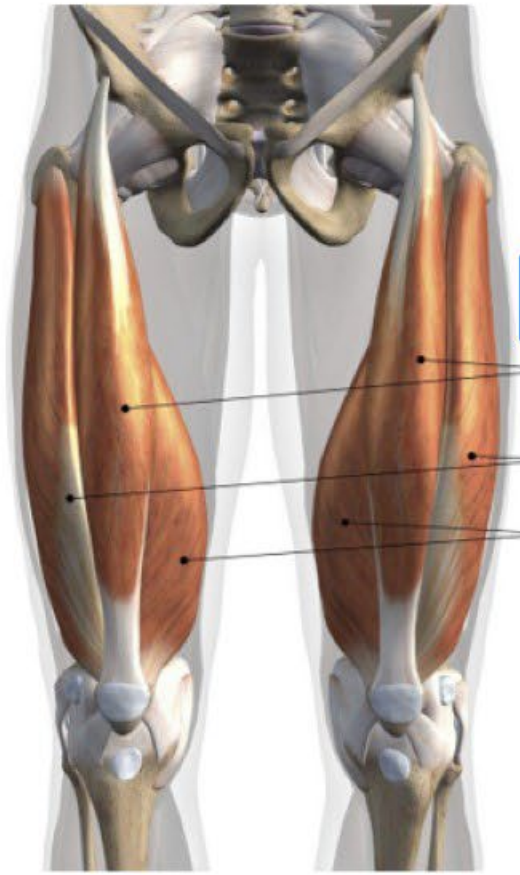






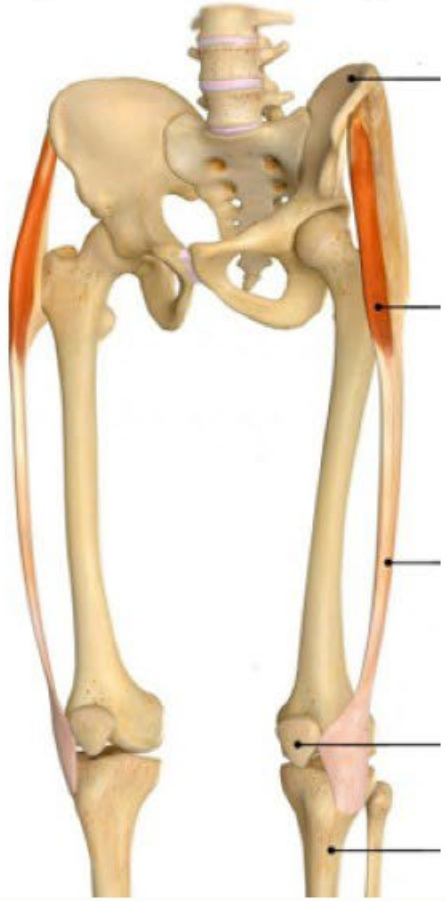
Flexors & Extensors of the Knee Joint

Extensors

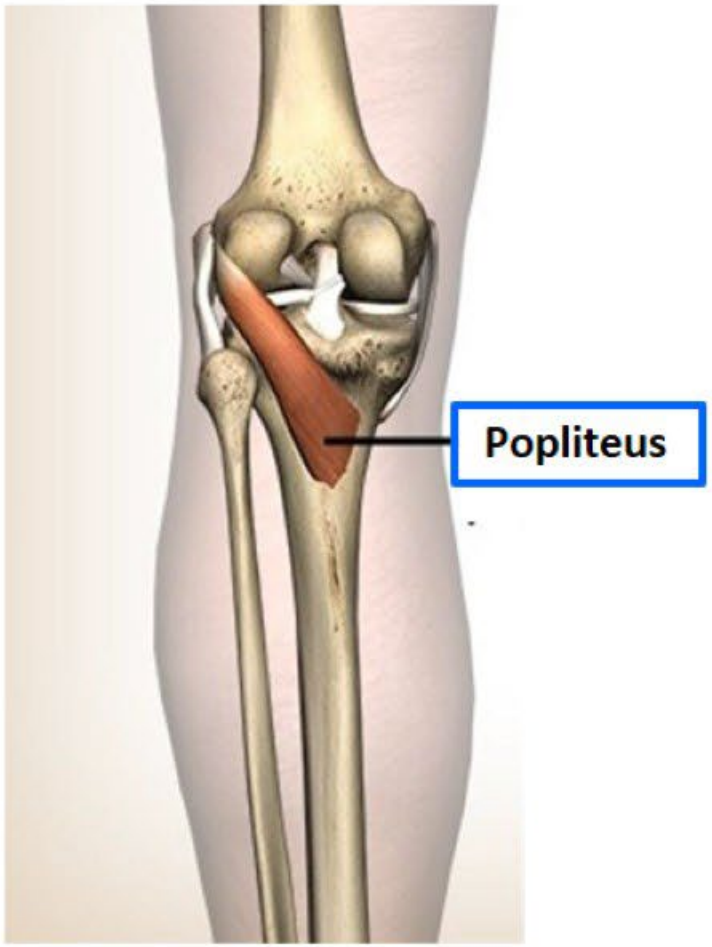


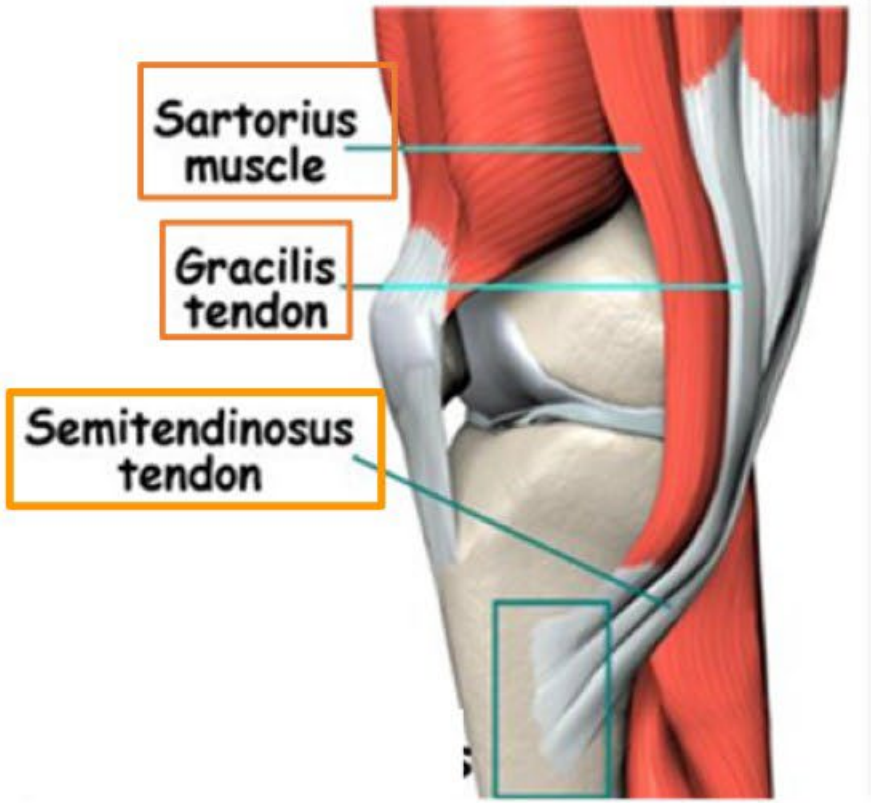
Quadriceps

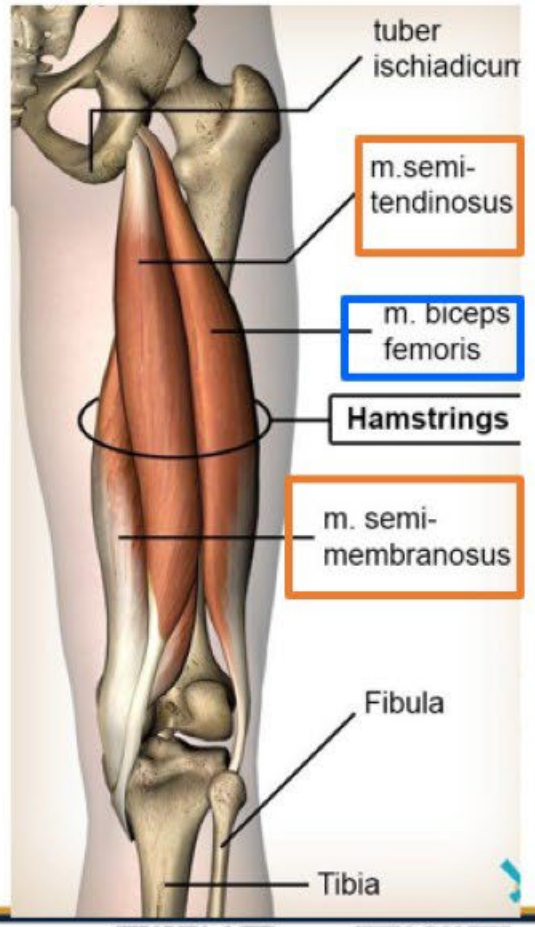
Tensor fascia lata



Rotators of the Knee Joint





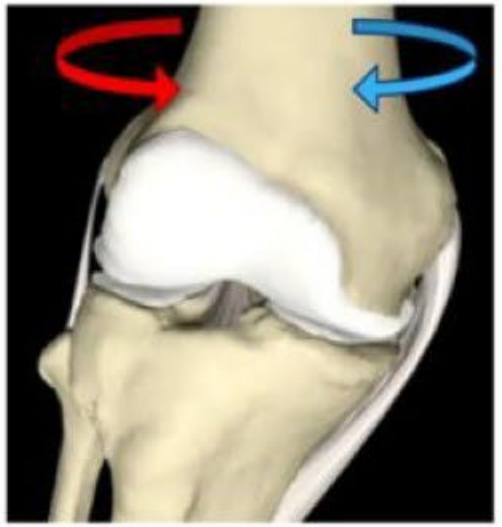


Movements of Knee joint

	Locking	Unlocking
Definition:	Terminal stage of full extension	Early stage of flexion
Mechanism:		
The leg (tibia):	rotated laterally	rotated medially
The thigh (femur):	rotated medially	rotated laterally
Muscles:	Biceps femoris	Popliteus mainly & assessed by semitendinosus, semimembranosus & gracilis.

- **During locking:**
  - All the ligaments are stretched.
  - The joint is stable.
- **To start flexion:**
  - the joint must be unlocked.

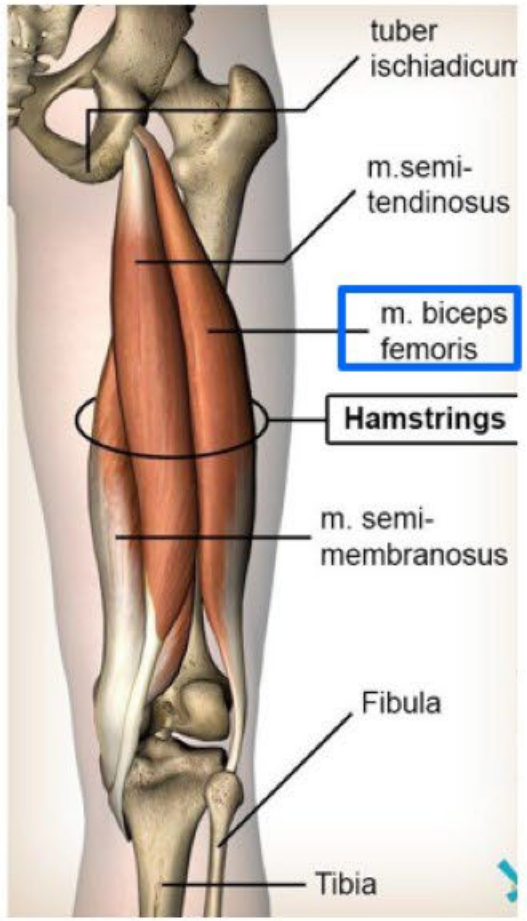
Locking & Unlocking of the Knee



Medial rotation of femur in locking (knee fully extended)

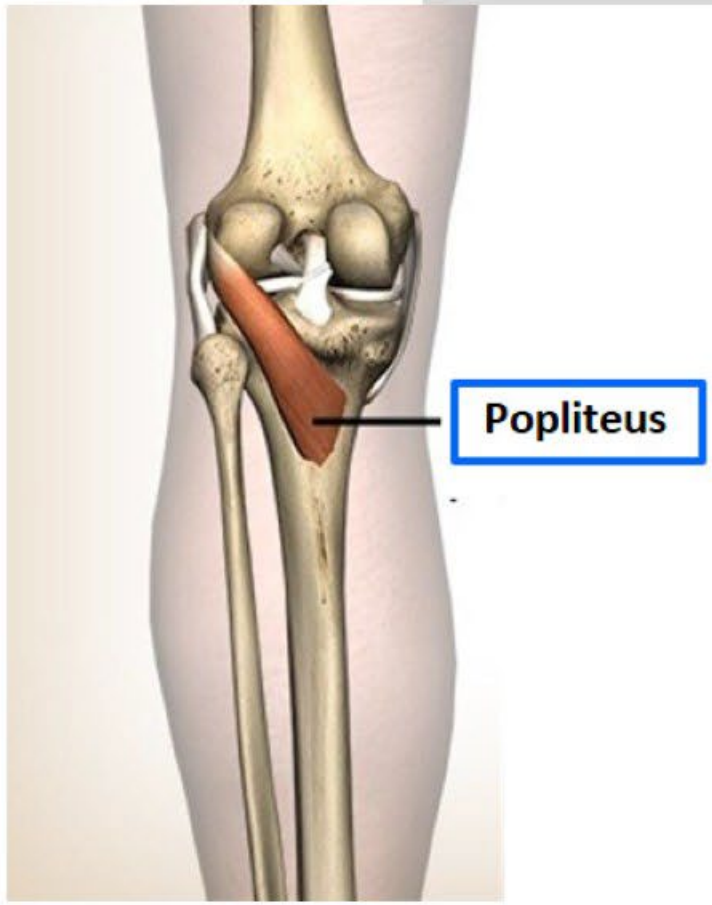
Lateral rotation of femur in unlocking (initiating knee flexion)

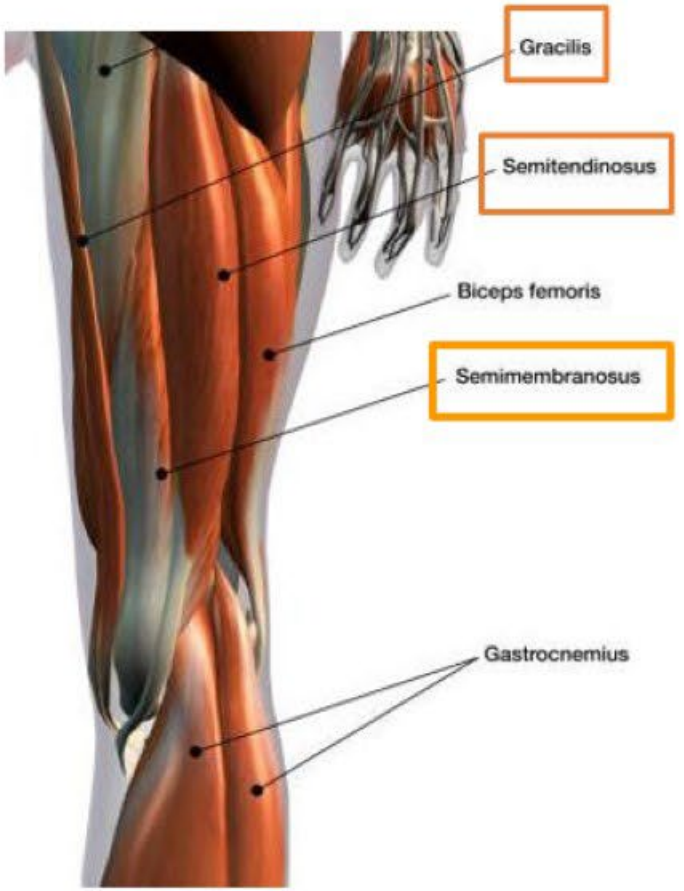
** when tibia is fixed **

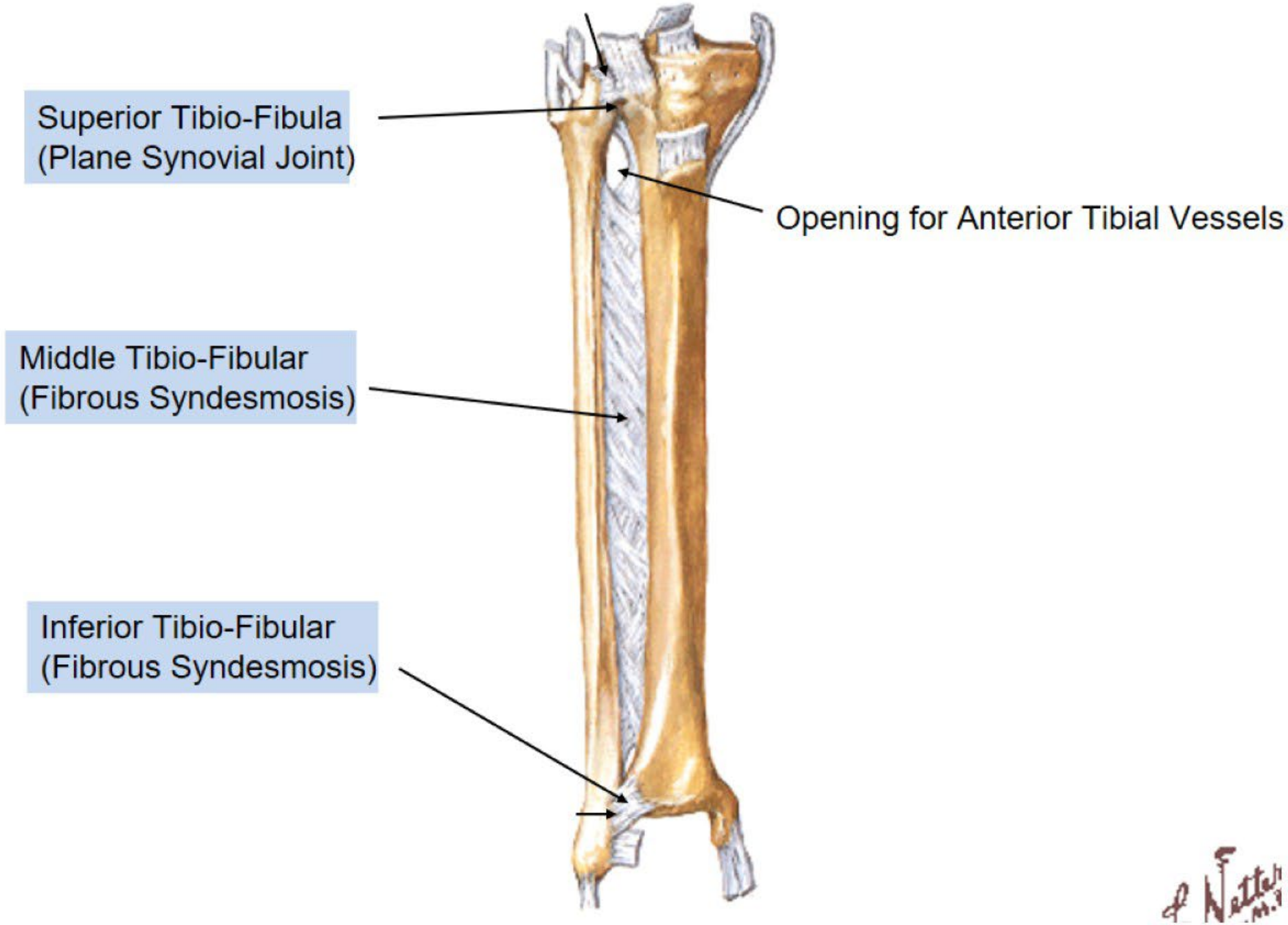


Movements of Knee joint

Unlocking






Superior Tibio-Fibula
(Plane Synovial Joint)
Opening for Anterior Tibial Vessels
Middle Tibio-Fibular
(Fibrous Syndesmosis)
Inferior Tibio-Fibular
(Fibrous Syndesmosis)

Ankle joint

Type:

- ✓ Synovial hinge.

Articular surface:

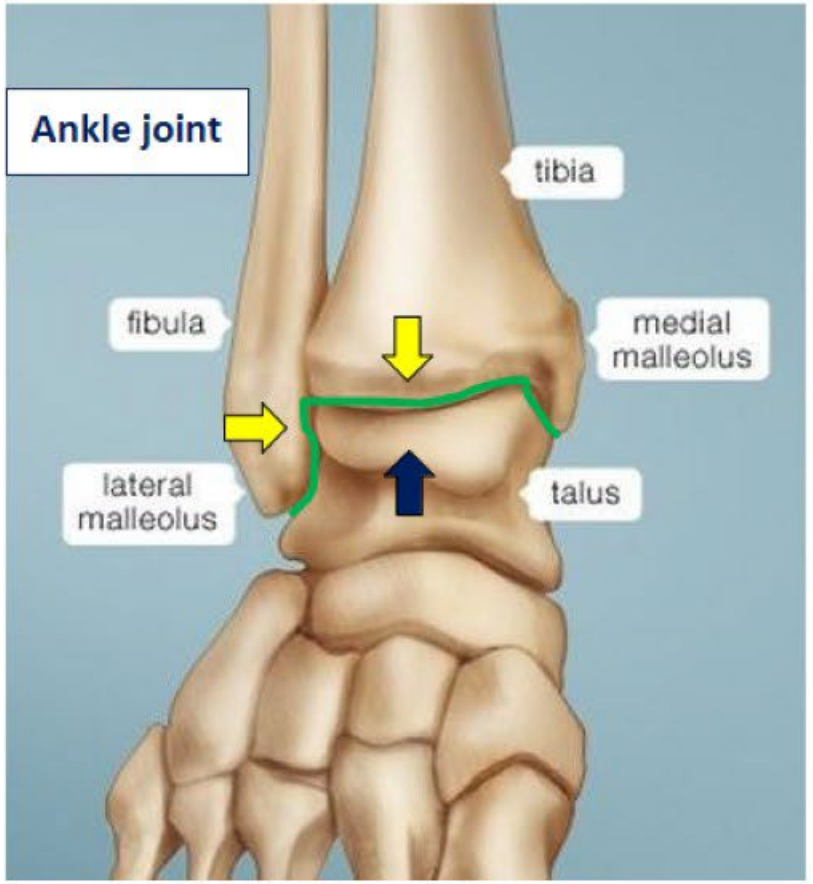
- ✓ **Above:**
  - Lower end of tibia.
  - Smooth articular surface of the lower end of fibula.
- ✓ **Below:**
  - Talus bone (superior, lateral & medial surfaces).

Capsule:

- ✓ attached to the margins of the articular surfaces.

Synovial membrane:

- ✓ lines the inner surface of the capsule.
- ✓ Ascends for a short distance between tibia & fibula.



Ligaments of the Ankle Joint

1. Medial (deltoid) ligament:

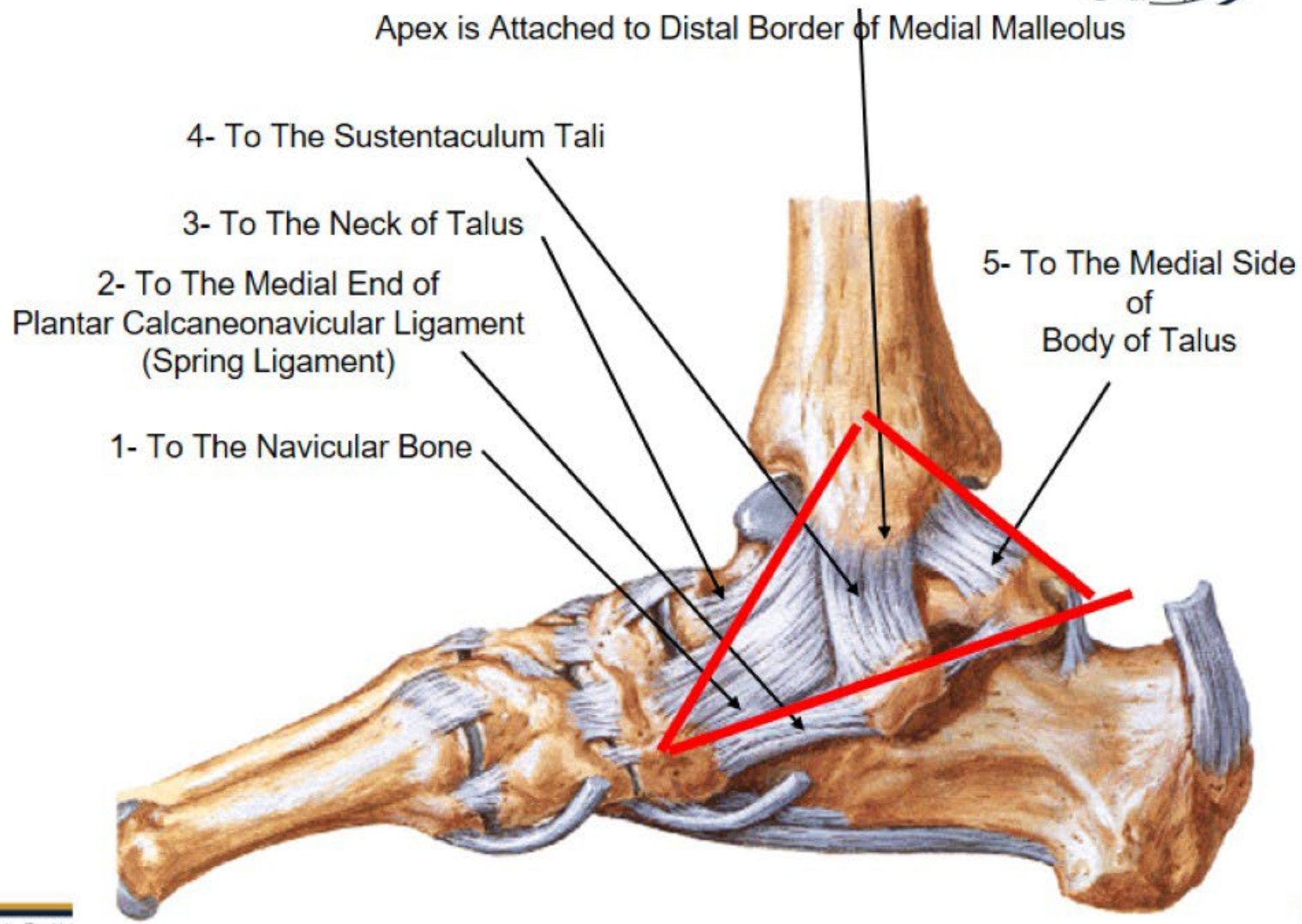
- ✓ the ligament on the medial aspect of the joint.

Attachment:

- **Apex (above):** medial malleolus.
- **Base (below):** navicular bone, spring ligament, talus & sustentaculum tali.

Function:

- Holds the bones to which it is attached.



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Ligaments of the Ankle Joint

2. Lateral ligament:

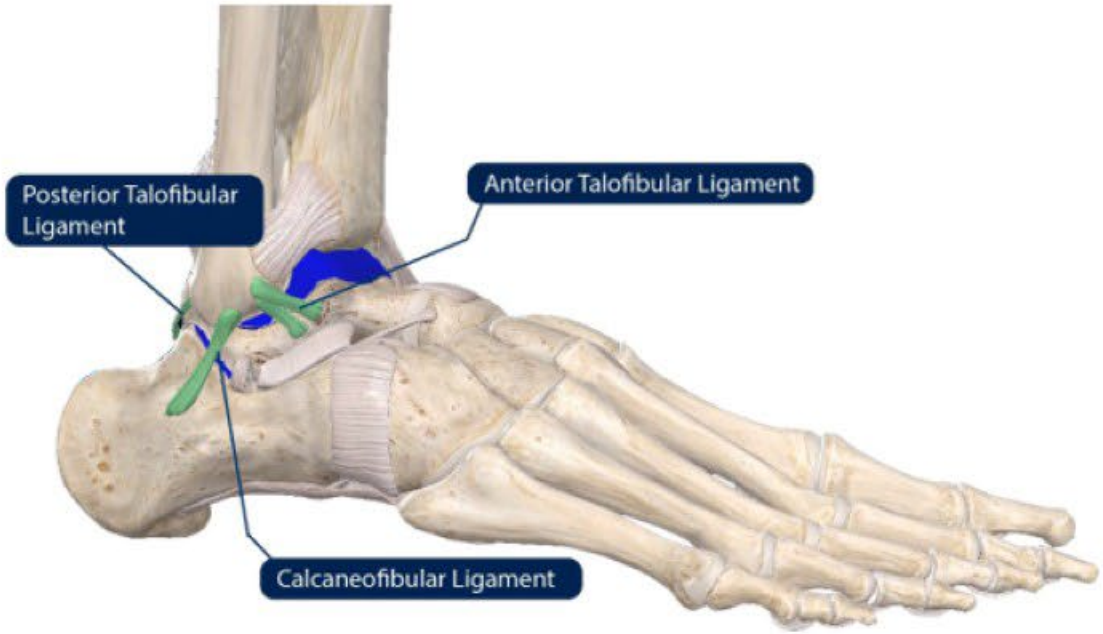
- ✓ Formed of 3 bands.
- ✓ Connects the lateral malleolus to the talus & calcaneus.

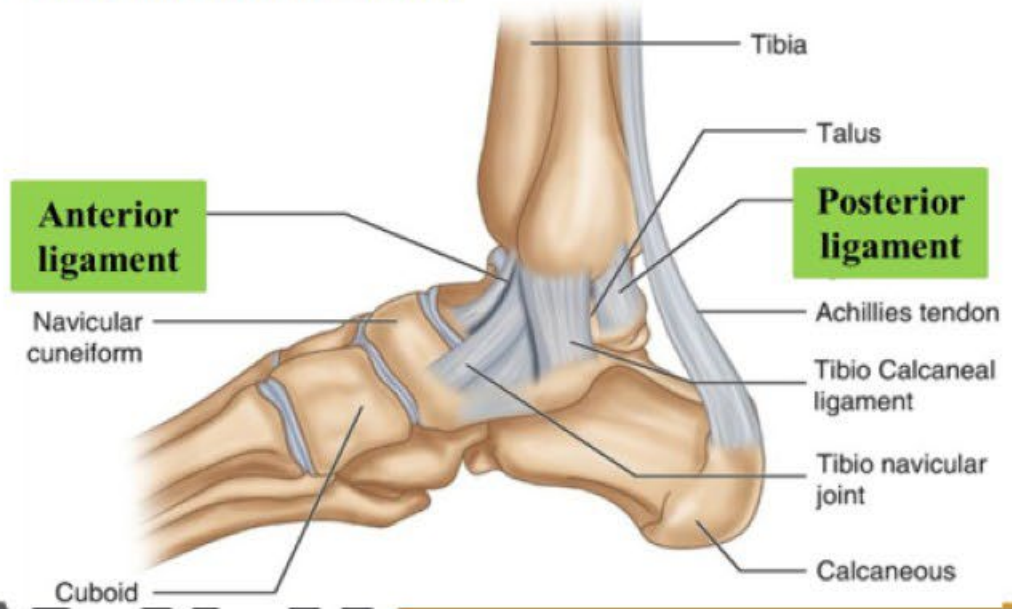
3. Anterior ligament:

- ✓ In front of the joint.

4. Posterior ligament:

- ✓ In the back of the joint.

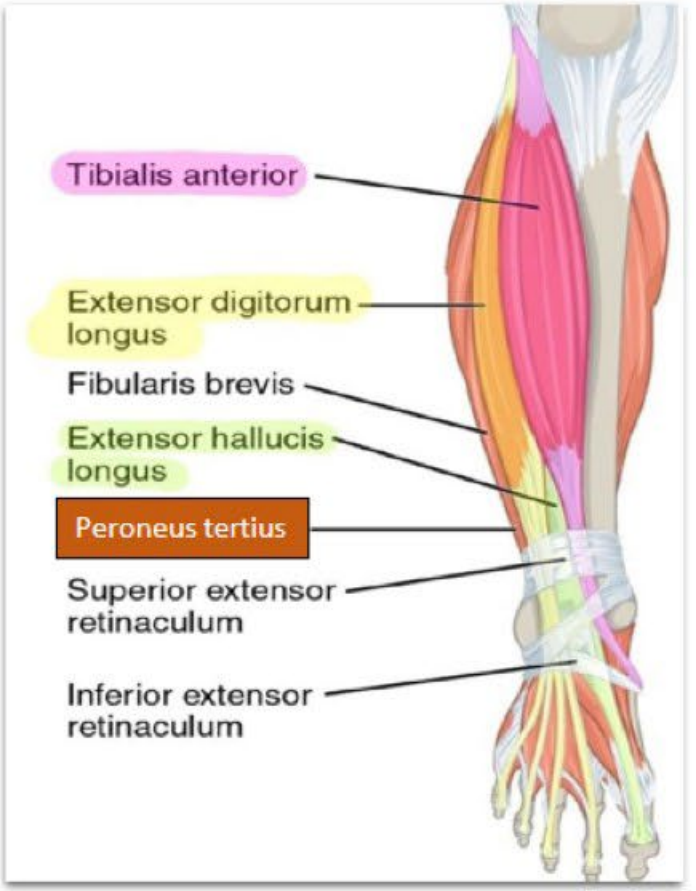




Movements of the Ankle Joint

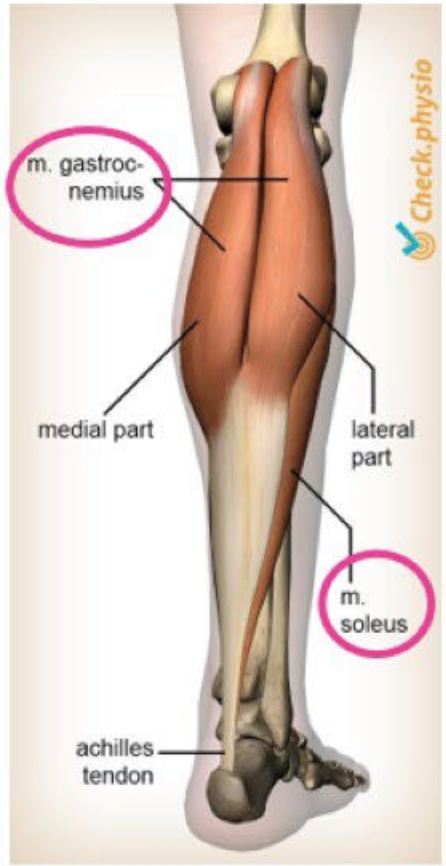
Movement	Dorsiflexion	Plantarflexion
	1. Tibialis anterior 2. Extensor hallucis longus 3. Extensor digitorum longus 4. Peroneus tertius	1) Gastrocnemius 2) Soleus 3) Tibialis posterior 4) Flexor digitorum longus 5) Flexor hallucis longus

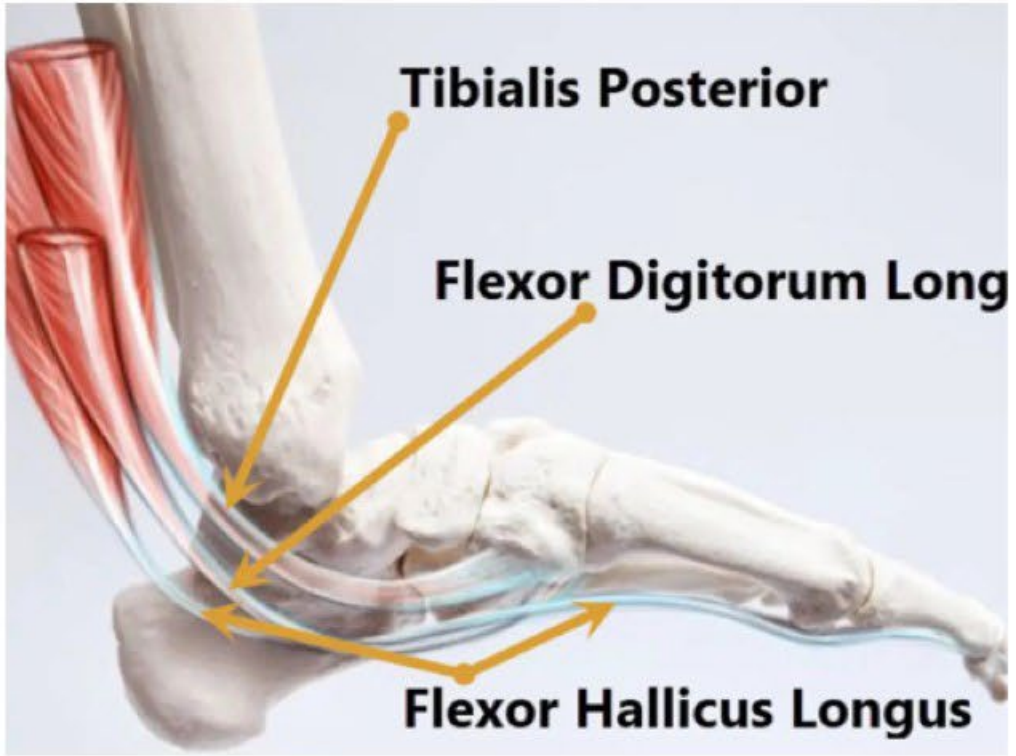
Dorsiflexion



Movements of the Ankle Joint

Plantarflexion





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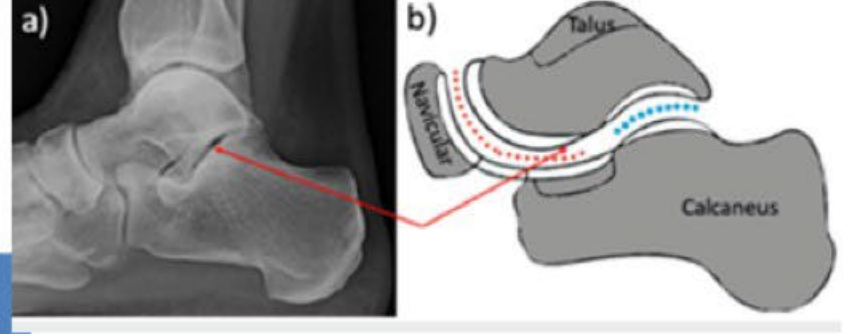
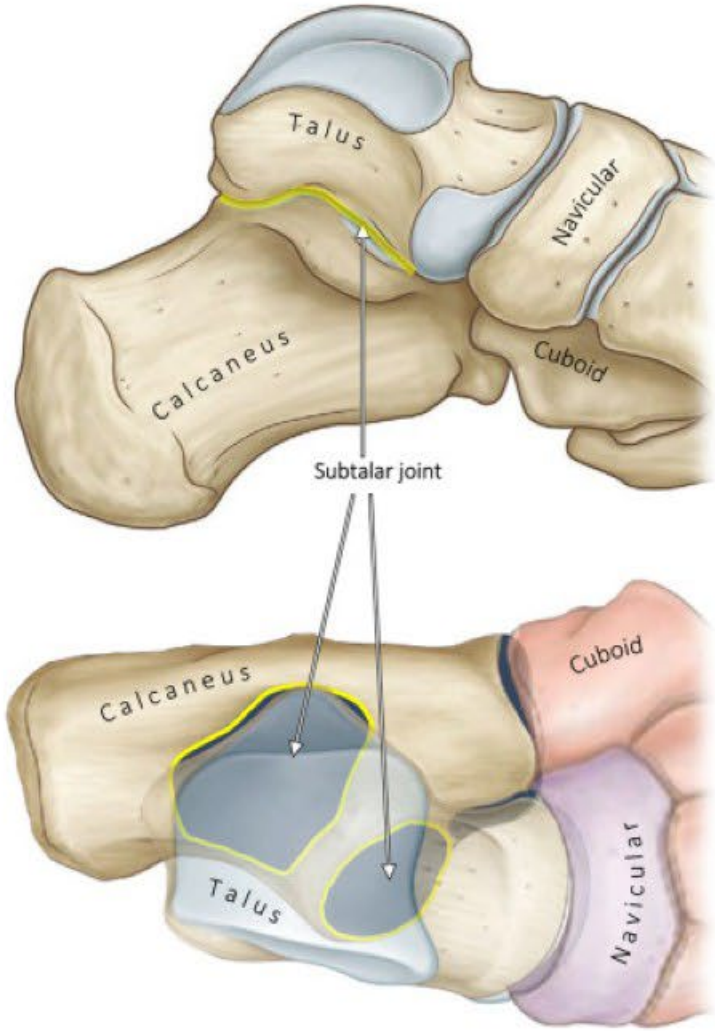
➢ Movements at Subtalar (talo-calcaneo-navicular & talocalcanean) Joint:

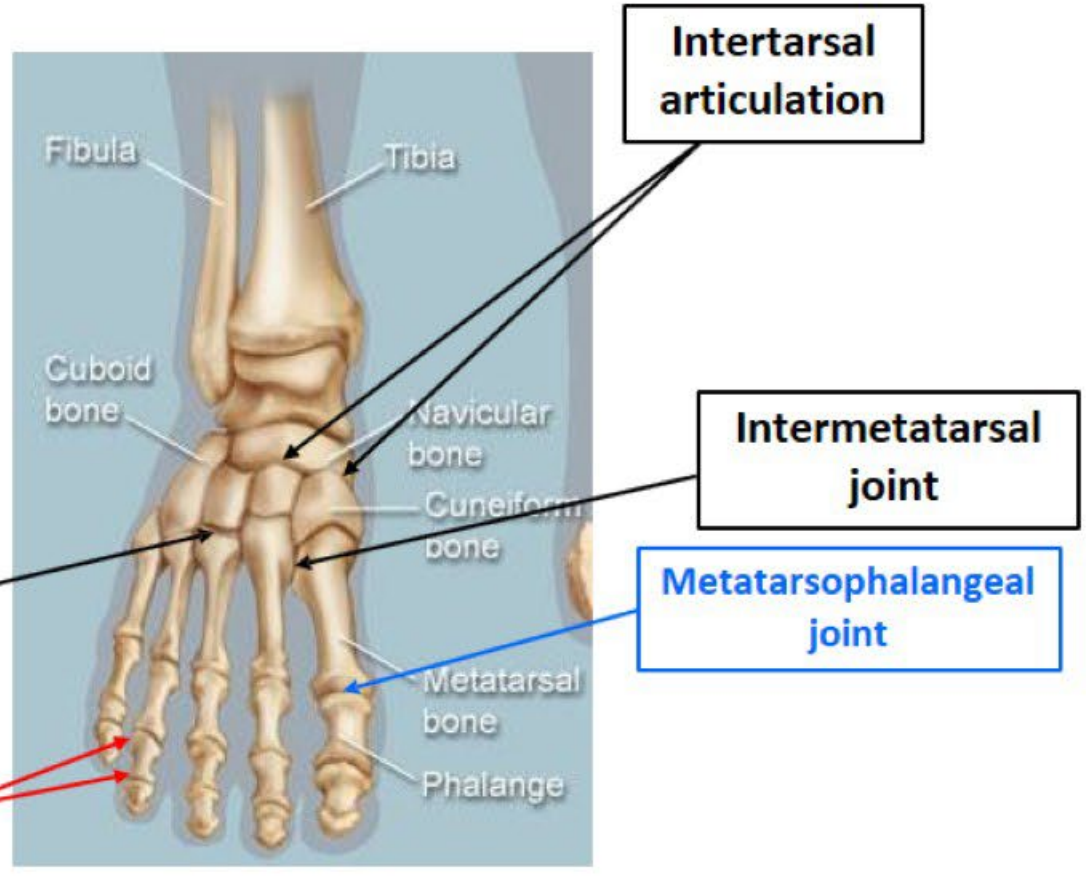


Movements	Eversion	Inversion
Definition	The movement in which sole of the foot looks laterally and the lateral border of the foot is raised. This movement is accompanied by slight dorsiflexion.	The movement in which sole of the foot looks medially and the medial border of the foot is raised. It is accompanied by slight plantar flexion.
Produced by	1. Peroneus longus, 2. peroneus brevis 3. peroneus tertius.	1. Tibialis anterior and posterior. 2. Extensor and flexor hallucis longus. 3. Extensor and flexor digitorum longus.



Joints of the foot

Name of joint	Type
4. Intertarsal articulation	Synovial plane.
5. Tarsometatarsal joints	
6.Intermetatarsal joints	
7. Metatarsophalangeal joints	Synovial Condyloid.
8.Interphalangeal joints	Synovial hinge.




Thank
You!