

MED439  
KING SAUD UNIVERSITY

# Hip joint, Knee joint, Ankle joint

Musculoskeletal Block - Lecture 19

## Objective:

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

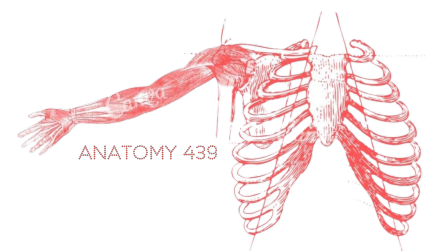
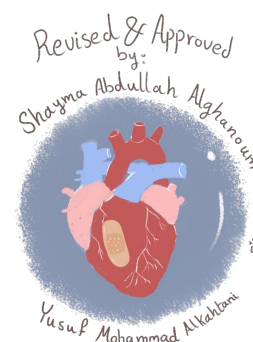
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**Important**

In male's slides only

In female's slides only

Extra information, explanation

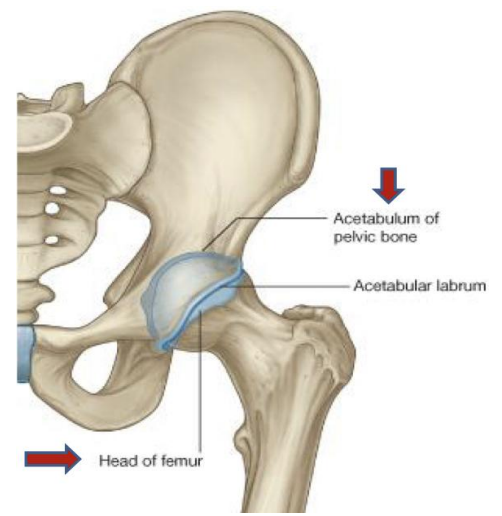


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# Hip Joint



**Type:** It is a synovial, ball & socket joint.

**ARTICULAR SURFACES:** -Acetabulum of hip(pelvic) bone.  
-Head of femur.

## Ligaments

### Extracapsular

#### 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

#### Acetabular labrum:

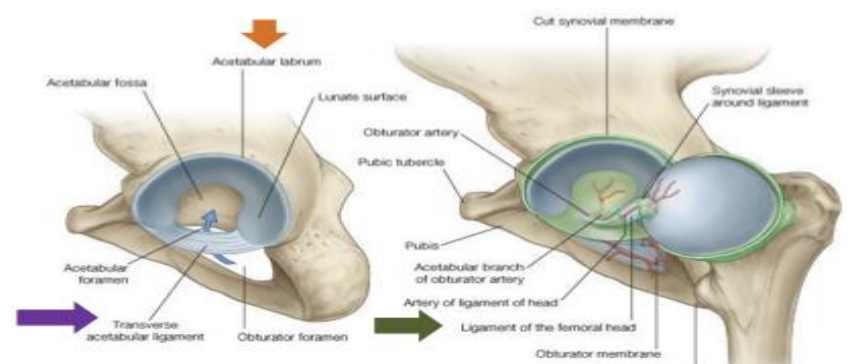
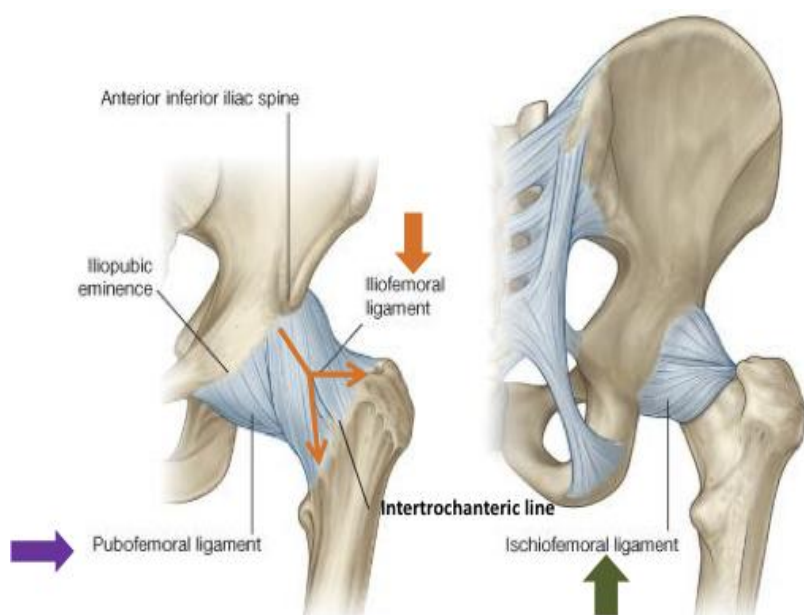
fibro-cartilaginous collar attached to margins of acetabulum to increase its depth for better retaining of head of femur (it is completed inferiorly by transverse ligament).

#### Transverse acetabular ligament:

converts acetabular notch into foramen (acetabular foramen) through which pass acetabular vessels.

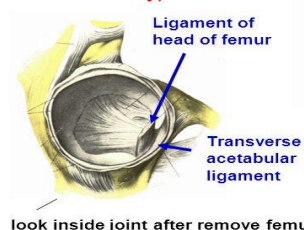
#### Ligament of femoral head:

carries vessels to head of femur (branch of obturator artery).

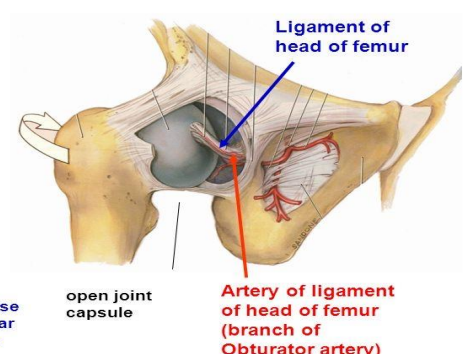


### HIP JOINT - LIGAMENTS

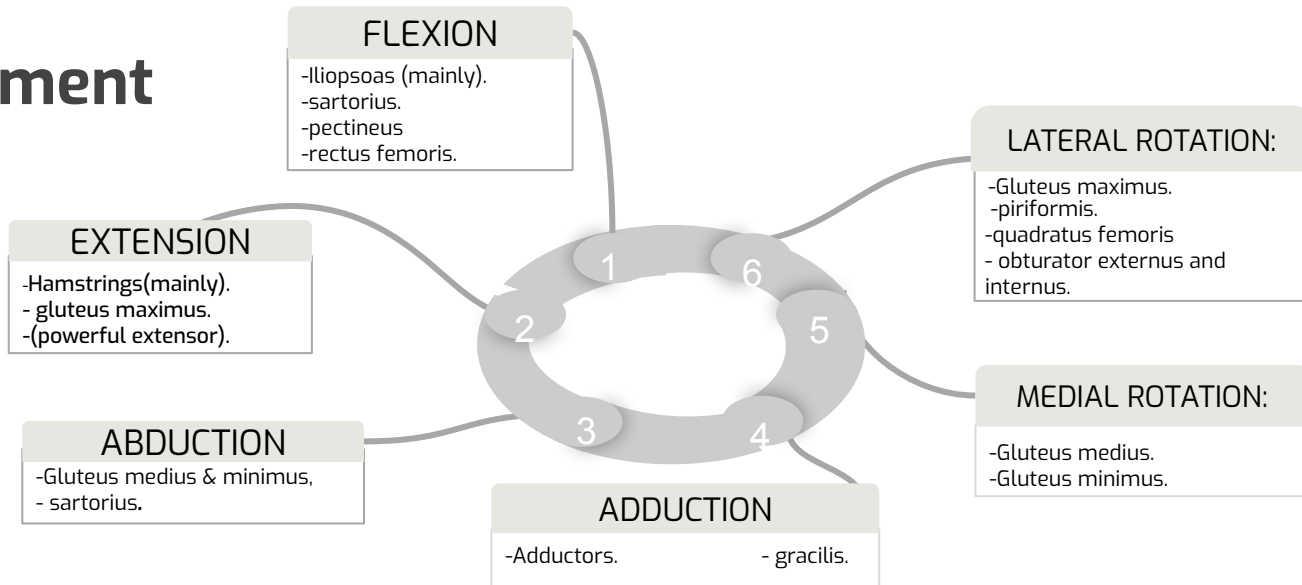
C. **Ligament of head of femur** - inside joint capsule; attached to head of femur at fovea capitis and to transverse acetabular ligament; transmits **Artery of ligament of head of femur (branch of Obturator artery)**.



look inside joint after remove femur



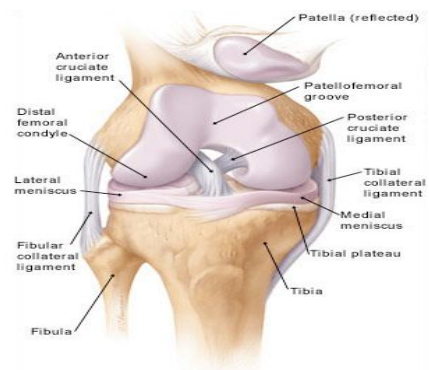
# Movement



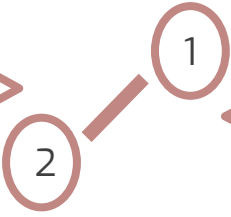
# Knee Joint

is formed of:

- Three bones.
- Three articulations:



**Femoro-patellar articulations:**  
between posterior surface of patella & patellar surface of femur (Type: synovial, plane).



**Femorotibial articulations:**  
between the 2 femoral condyles & upper surfaces of the 2 tibial condyles (Type: synovial, modified hinge).

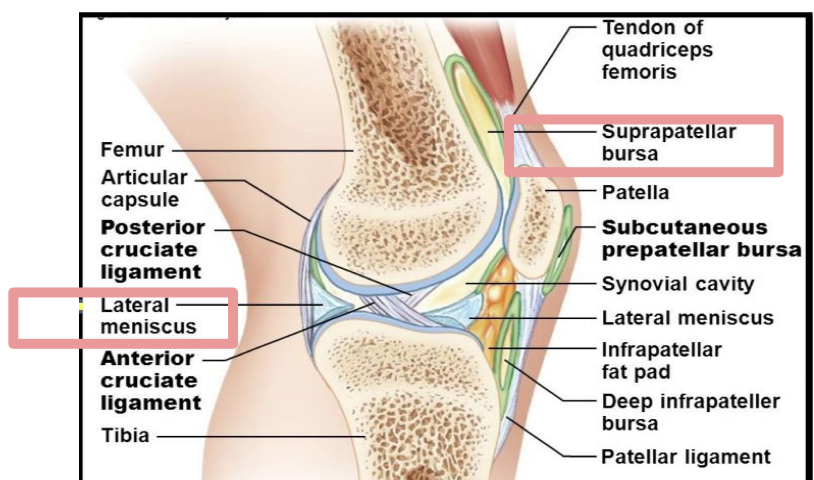
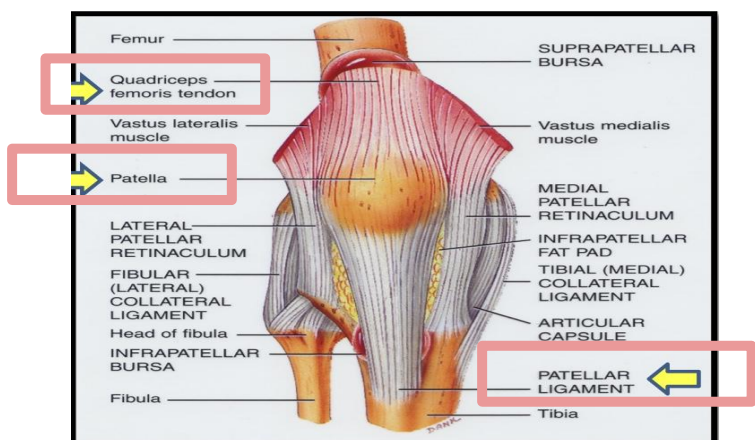
# Capsule

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

- Quadriceps femoris tendon.
- Patella.
- Ligamentum patella.

It possesses two openings:

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



# Ligaments of the knee

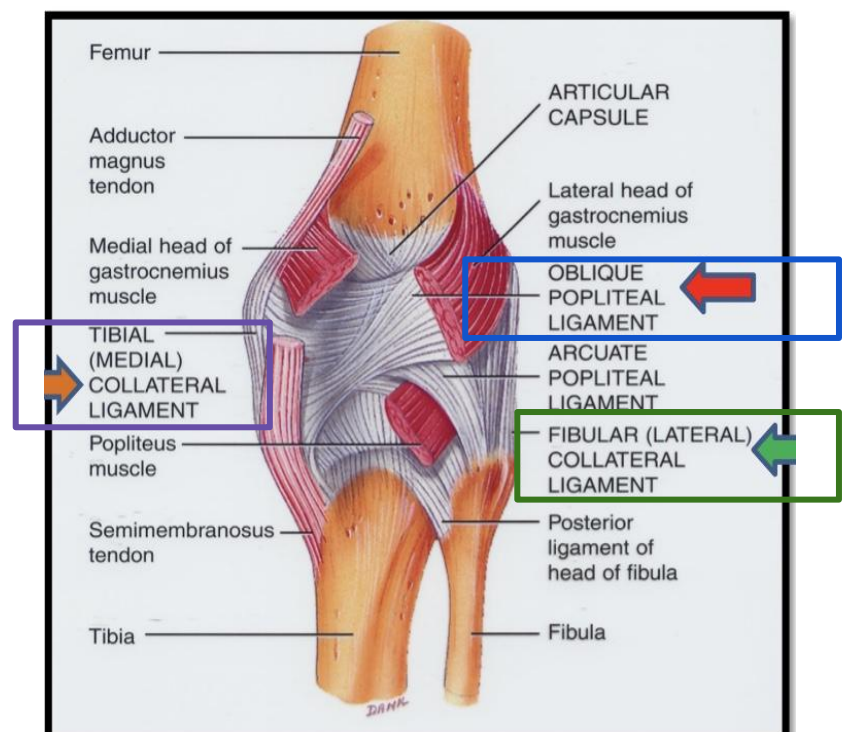
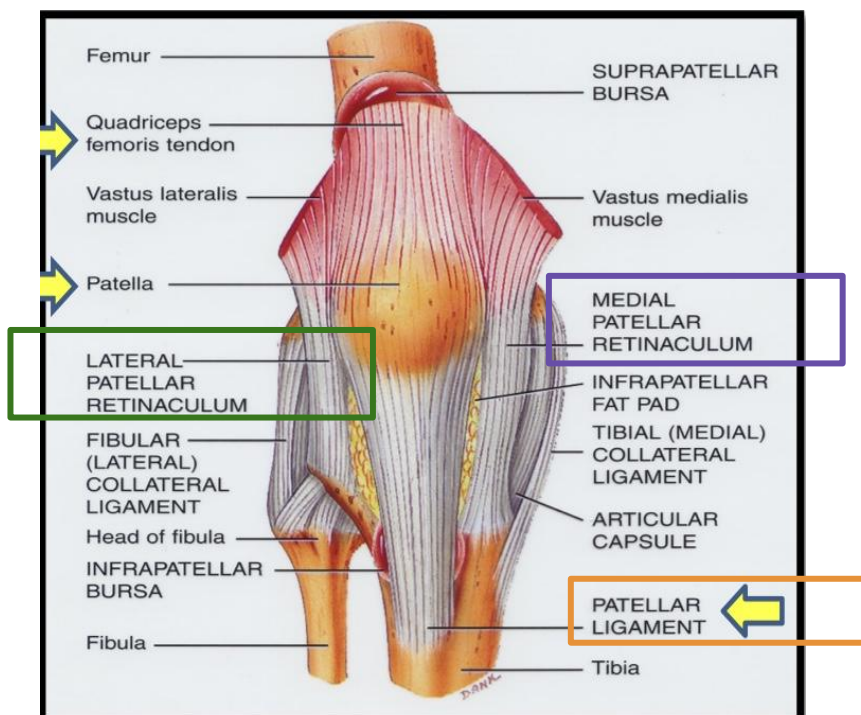
## Extracapsular

**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"

**Lateral (fibular) collateral ligament:** from **lateral epicondyle of femur** to head of fibula (separated from lateral meniscus by **popliteus tendon**).

**Oblique popliteal ligament:** extension of semimembranosus tendon



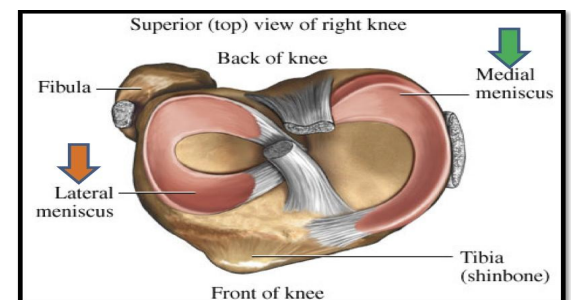
# Ligaments of the knee

## Intracapsular

### Menisci

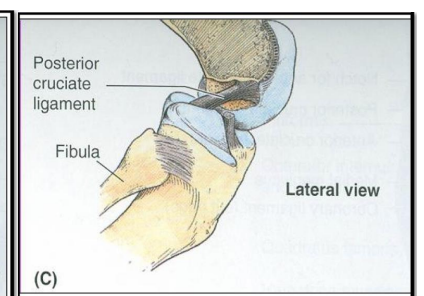
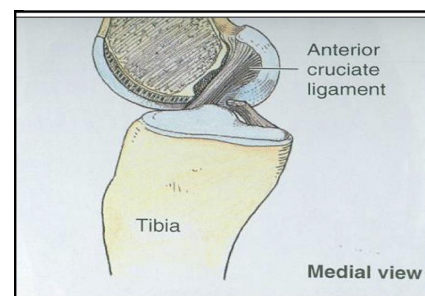
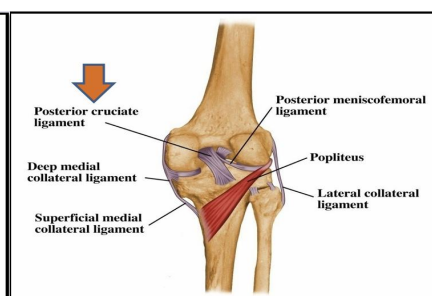
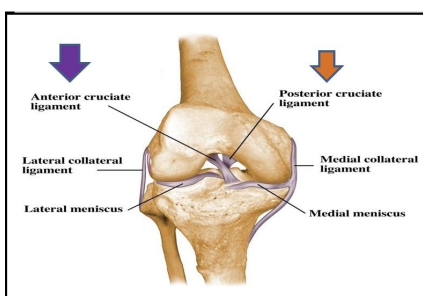
Attachments	Functions
<p>1- Each meniscus is attached by anterior &amp; posterior horns into the <b>upper surface of tibia</b>. "Thus, each meniscus participates in the stability +makes the movement easier".</p> <p>2- The outer surface of <b>medial meniscus</b> is also attached to capsule &amp; medial collateral ligament. <b>So; medial meniscus is less mobile &amp; more liable to be injured.</b></p>	<ul style="list-style-type: none"> <li>• They deepen articular surfaces of tibial condyles.</li> <li>• They serve as cushions between tibia &amp; femur.</li> </ul>

- They are 2 C shaped plates of fibro-cartilage
- The **medial** meniscus is large & **oval**. "Cause it lies on the medial condyle of the femur "which is larger than the lateral"
- The **lateral** meniscus is small & **circular**.

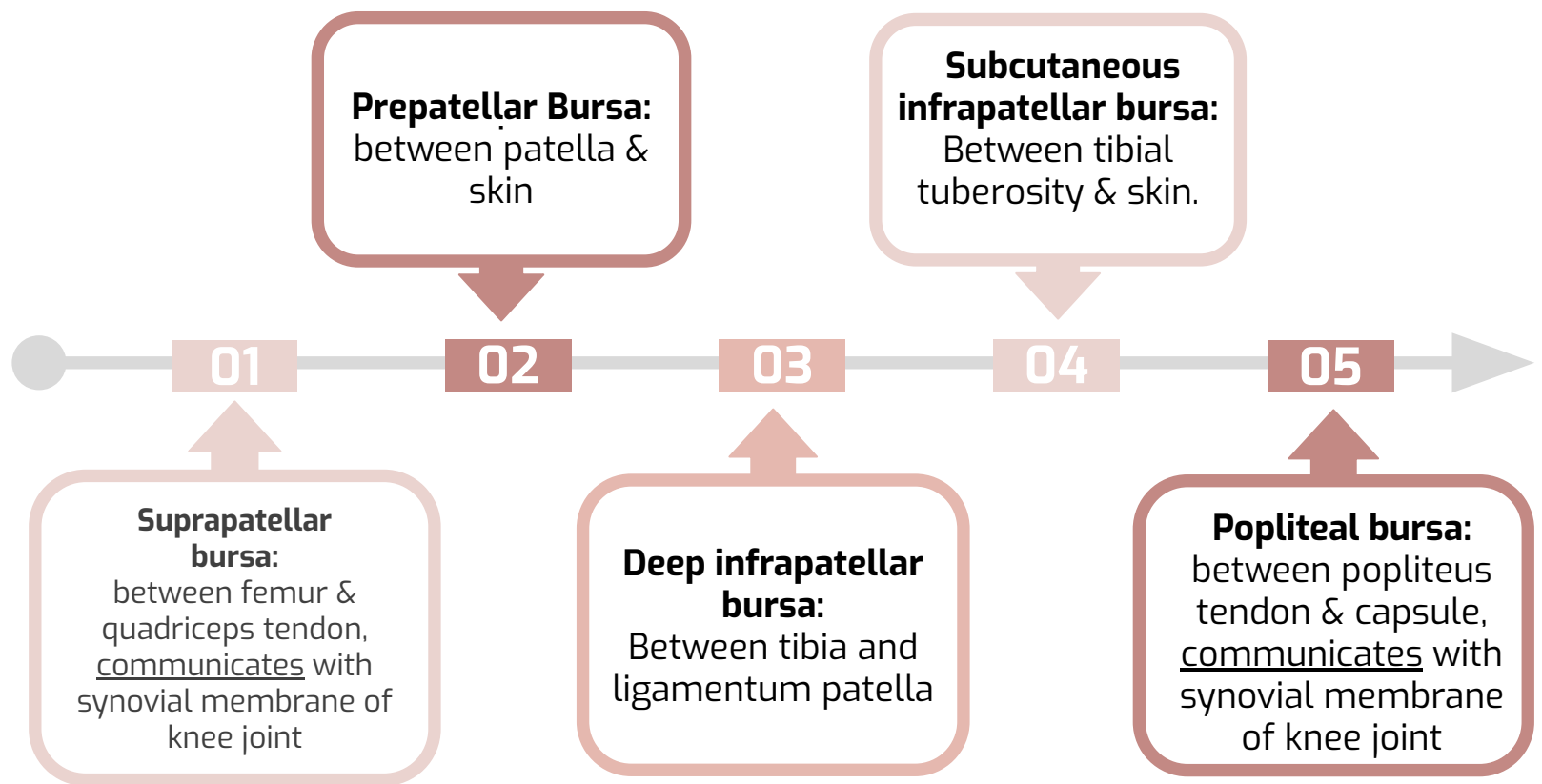


### Anterior & posterior cruciate ligaments

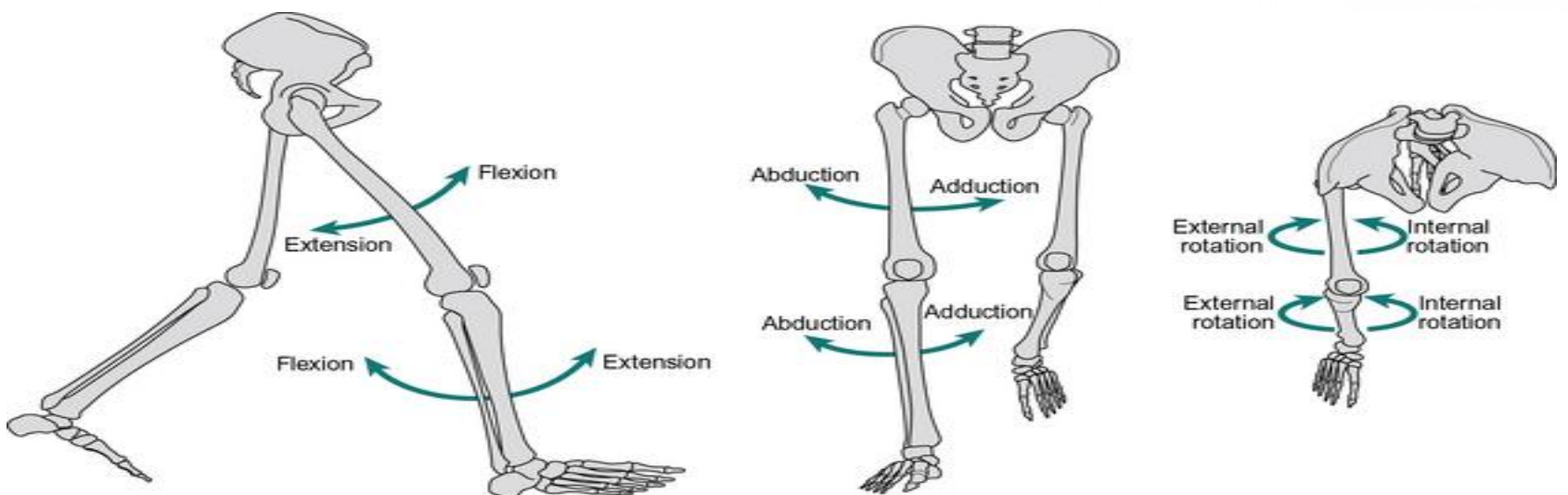
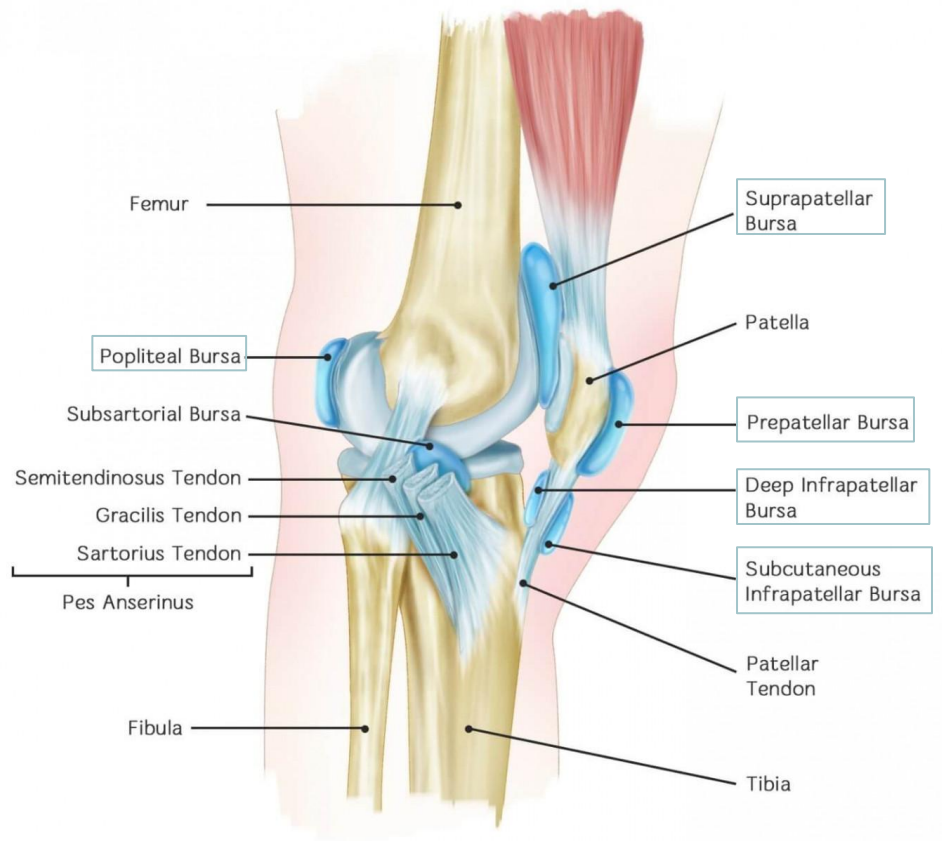
Attachments	Functions
<p><b>Anterior cruciate:</b> from <b>anterior part</b> of the intercondylar area of tibia <b>to posterior part of lateral condyle</b> of the femur.</p>	<p>Prevents the <b>posterior</b> displacement of femur on tibia.</p>
<p><b>Posterior cruciate:</b> from <b>posterior part</b> of the intercondylar area of tibia <b>to anterior part of medial condyle</b> of the femur.</p>	<p>Prevents the <b>anterior</b> displacement of femur on tibia.</p>



# IMPORTANT BURSAE RELATED TO KNEE



(Clinical importance?)  
commonly inflamed bursa leads to bursitis.



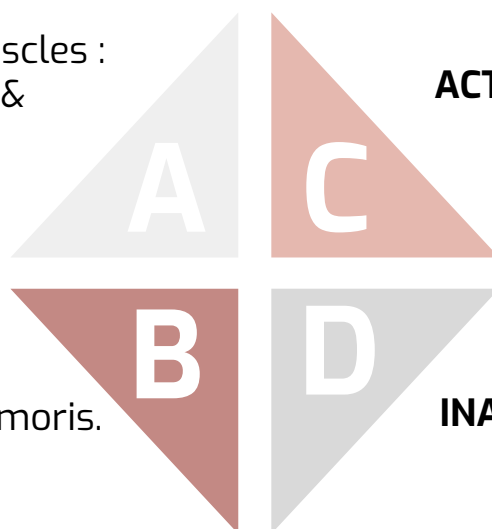
**Movements about the hip joint (above) and knee joint (below).**

# MOVEMENTS

**Flexion:** Mainly by hamstring muscles : biceps femoris , semitendinosus & semimembranosus.

**Assisted by:** sartorius , gracilis & popliteus.

**EXTENSION:** Quadriceps femoris.



**ACTIVE ROTATION (PERFORMED WHEN KNEE IS FLEXED)**

**INACTIVE (DEPENDANT) ROTATION**



**MEDIAL ROTATION:** Mainly by semitendinosus & semimembranosus. Assisted by sartorius & gracilis.

**LATERAL ROTATION:** Biceps femoris.

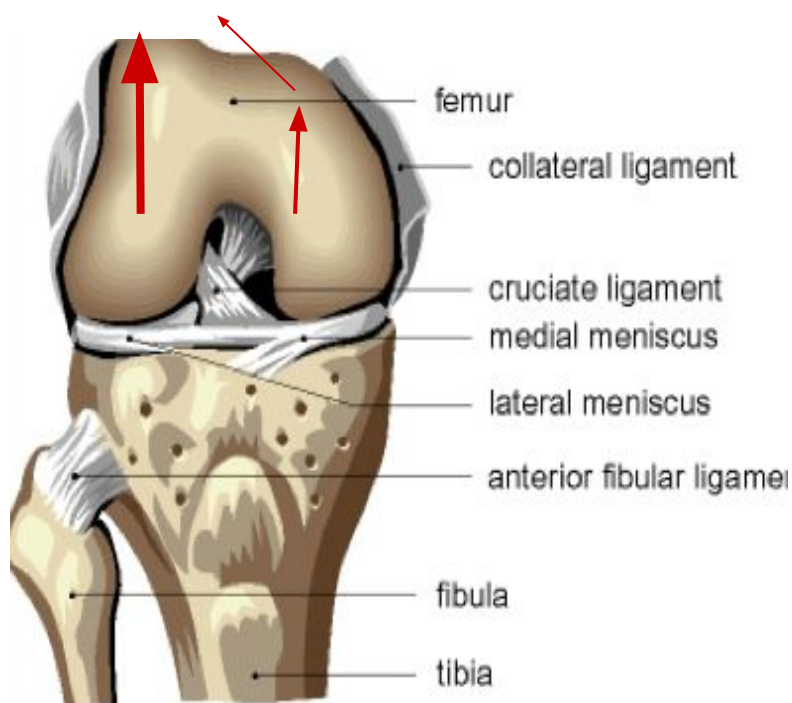


**LOCKING OF KNEE:**

- Slight Lateral rotation of tibia (or medial rotation of femur) (due to the shape of condyles), at the end of extension
- results mainly by tension of anterior cruciate ligament
- In locked knee, all ligaments become tight.

**UNLOCKING OF KNEE:**

- Medial rotation of tibia (lateral rotation of femur), at the beginning of flexion.
- Results mainly by tension of ligament.
- Performed by Popliteus to relax ligaments & allow easy flexion.



**POPLITEUS UNLOCKS KNEE WHEN FLEX KNEE**

## Nerve supply:

Remember Hilton's Law: "The joint is supplied by branches from nerves supplying muscles acting on it"

# Ankle Joint

**Type:** It is a synovial, hinge joint.

**Articular surfaces:**

**UPPER:** A socket formed by: the lower end of tibia, medial malleolus & lateral malleolus.

**LOWER:** Body of talus.

## Ligaments

### Medial (Deltoid)

**A strong triangular ligament**

**Apex:** attached to medial malleolus

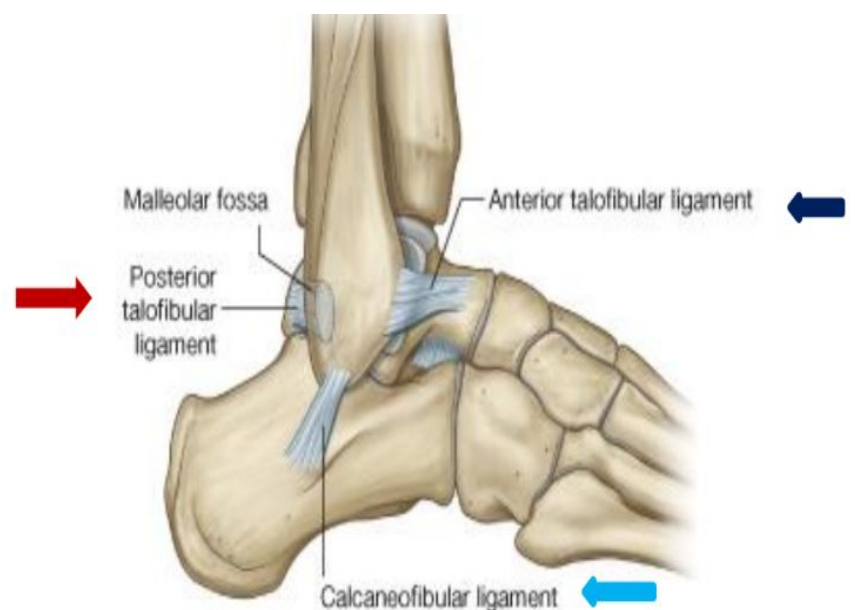
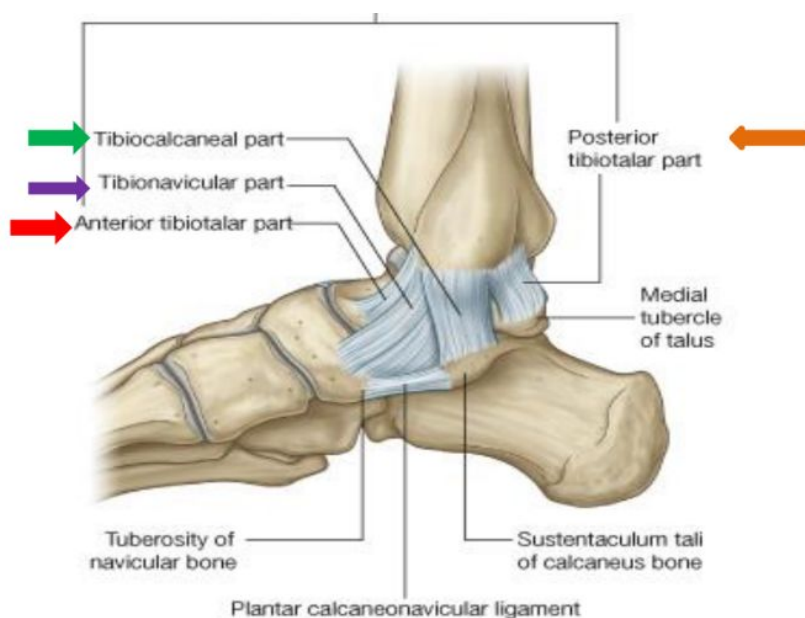
**Base:** subdivided into 4 parts:

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

### Lateral

**Composed of 3 separated ligament:**

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





# MOVEMENTS OF ANKLE JOINT

## Plantar flexion:

- Initiated by soleus.
- Maintained by gastrocnemius.
- Assisted by muscles in **posterior** compartment of leg:
  1. tibialis posterior.
  2. flexor digitorum longus.
  3. flexor hallucis longus.

Assisted by muscles in **lateral** compartment of leg:

1. peroneus longus.
2. peroneus brevis.

## Dorsiflexion:

- Performed by muscles of anterior compartment of leg:
  1. tibialis anterior.
  2. extensor hallucis longus.
  3. extensor digitorum longus.
  4. peroneus tertius.

## Inversion:

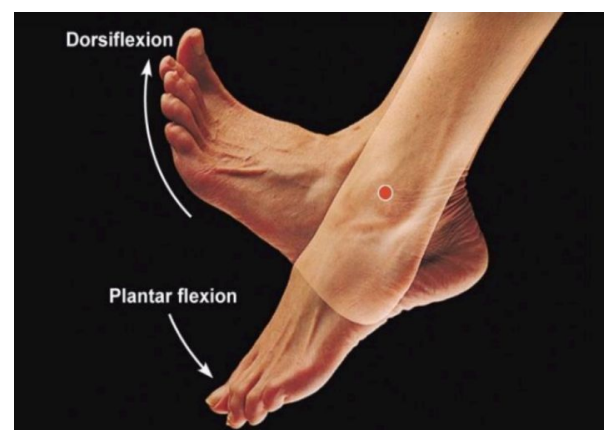
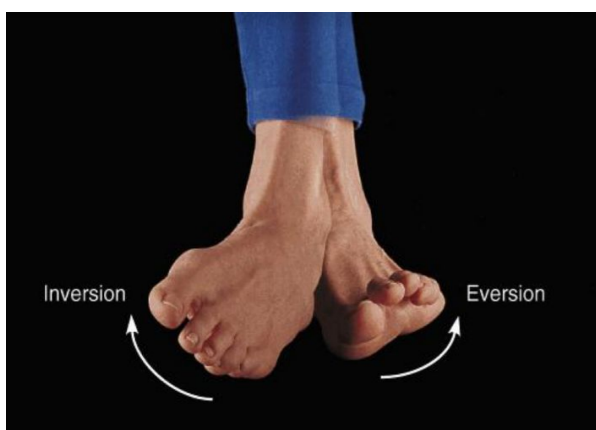
- Performed by:
  1. Tibialis anterior.
  2. Tibialis posterior.
- Inversion and Eversion occurs at the **talo-calcaneo-navicular joint**.

## Eversion:

- Performed by:
  1. Peroneus longus.
  2. Peroneus brevis.
  3. **Peroneus tertius**. (This muscle can be absent)

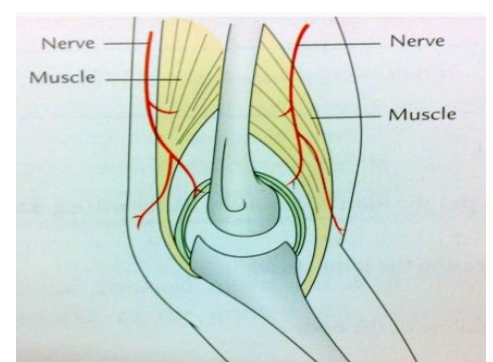
- Inversion and Eversion is NOT considered ankle joint movements.

## MOVEMENTS



## Nerve supply:

Remember Hilton's Law: "The joint is supplied by branches from nerves supplying muscles acting on it"



# MCOs

Q1: Which of the following is Extracapsular ligament?

- A. Acetabular labrum
- B. Transverse acetabular ligament
- C. Pubofemoral ligament
- D. Ligament of femoral head

Q2: Knee joint is formed of:

- A. Three bones, Three articulations.
- B. Two bones, Three articulations.
- C. Three bones, Two articulations.
- D. Four bones, Three articulations.

Q3: Which one of the following is a knee ligament that is attached to the capsule?

- A. oblique ligament
- B. posterior cruciate
- C. medial ligament
- D. medial meniscus

Q4: The lateral ligament is separated from the lateral meniscus by which of the following?

- A. medial meniscus
- B. oblique ligament
- C. capsule
- D. popliteus tendon

Q5: Which type of joint represent the ankle joint?

- A. Ball and socket
- B. Hinge
- C. Pivot
- D. Saddle

Q6: Which one of these ankle parts belong to medial ligament?

- A. Anterior tibiotalar.
- B. Anterior talofibular.
- C. Calcaneofibular.
- D. Posterior talofibular.

Q7: Inversion and Eversion occurs at the:

- A. ankle joint
- B. knee joint
- C. hip joint
- D. talo-calcaneo-navicular joint.

Q8: Medial rotation of the knee mainly by :

- A. semimembranosus
- B. sartorius
- C. semitendinosus
- D. both A&C

Q9: .....less mobile & more liable to be injured.

- A. medial meniscus
- B. posterior cruciate ligament
- C. lateral collateral ligament
- D. medial collateral ligament

Q10: Extension of knee done by :

- A. hamstring
- B. biceps femoris
- C. Quadriceps femoris.
- D. gracilis

Q11: .....between patella & skin:

- A. infrapatellar bursa
- B. prepatellar bursa
- C. deep infrapatellar bursa
- D. none

Q12: In locked knee, all ligaments become :

- A. tight
- B. relaxed
- C. allow easy flexion.
- D. locked

12)A  
11)B  
10)C  
9)A  
8)D  
7)D

6)A  
5)B  
4)D  
3)D  
2)A  
1)C

# SAOs

Q1: What are the ARTICULAR SURFACES in hip joint?




Q2: List the extracapsular ligaments of the knee.

Q3: What is the muscle that maintains plantar flexion?

Q4: List the parts of medial ligament of the ankle.

- 1) -Acetabulum of hip(pelvic) bone.  
-Head of femur.
- 2)
  - patellar ligament.
  - medial collateral ligament.
  - lateral collateral ligament.
  - oblique popliteal ligament.
- 3)gastrocnemius
- 4)
  - Anterior tibiotalar part.
  - Posterior tibiotalar part.
  - Tibionavicular part.
  - Tibiocalcaneal part.

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