JOINTS OF THE LOWER LIMB

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HIP JOINT
1-Type:

**Synovial multi-axial ball-and-socket joint.**

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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.

Distally, it is attached along the intertrochanteric line, the bases of the greater and lesser trochanters.
posteriorly, to the femoral neck about 0.5 in (12mm) from the intertrochanteric crest.
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).

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

5- Blood supply of the head of the femur

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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)
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.
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.
Flexion is performed by the iliopsoas, rectus femoris, and sartorius and the hamstring muscles.

Extension is performed by the gluteus maximus and sartorius.

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 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.

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ANKLE JOINT
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

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.

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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**
KNEE JOINT
**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**

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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.
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.

**MEDIAL AND LATERAL ROTATION**
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 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 flextion

 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.
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.

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10- blood supply

Branch of the femoral artery in the adductor canal

From the popliteal artery

Self-study

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