UNIT 7

JOINTS

Knee and Ankle Joints

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RHPT Lecture 7
Knee Joint

It is the most complex joint in the human body.

**Type of the joint:** Synovial "modified hinge" joint.

**Articulations:** 3 in number

1. Two articulations between the 2 conyles of femur with the 2 condyles of tibia.
2. One articulation between patella and pattelar (anterior) surface of codyles of femur. It is a plane articulation, allowing gliding movement.

**Movements:**

Flexion, extension and slight lateral and medial rotation.

**Muscles producing movements:**

1. **Flexion:** by
   - Hamstring group of muscles; biceps femoris, semitendinosus and semimembranosus.
   - Gastrocnemius
   - Sartorius
   - Gracilis.
2. **Extension:** by quadriceps femoris; rectus femoris, vastus medialis, vastus lateralis and vastus intermedius
3. **Lateral rotation:** by biceps femoris
4. **Medial rotation:** by popliteus, semitendinosus and semimembranosus.

N.B.: Popliteus muscle unlocks the extended knee joint at the beginning of flexion. It is a small triangular muscle on the back of knee. It originates from the lateral surface of lateral condyle of femur and comes out from the joint capsule to be inserted into the upper part of the back of tibia.

N.B.: Rotation of knee joint occurs only in flexed joint. This occurs because the 2 collateral ligaments are lax at flexion, while they become taut at extension.
Capsule:

It is attached to the articular margins and lined by a synovial membrane.

Intra-capsular structures: include

1. **Menisci (medial and lateral meniscus):**
   - **Shape:** Each meniscus is a C-shaped (semilunar) cartilage.
   - **Site:** They lie on the upper articular surface of tibia.
   - **Function:** They deepen the upper articular surface of tibia, to increase its congruity with the convex condyles of femur.

2. **Cruciate ligaments (anterior and posterior cruciate ligament):**
   They are two ligments, crossing each other. They are named anterior or posterior according to their attachment to the tibia.
   - **Anterior cruciate ligament:** passes from the anterior intercondylar area of tibia and extends upwards, posteriorly, and laterally to reach the inner aspect of lateral condyle of femur. It is taught in hyperextension, so it prevents anterior displacement of tibia.
   - **Posterior cruciate ligament:** passes from the posterior intercondylar area of tibia and extends upwards, anteriorly, and medially to reach the inner aspect of medial condyle of femur. It is taught in hypereflexion, so it prevents posterior displacement of tibia.

   N.B.: Simultaneous forced abduction of the knee and anterior displacement of tibia as that occurs in footplayers may result in a triad of injury i.e. injury of anterior cruciate ligament, injury of medial meniscus and medial collateral ligament

3. **Transverse ligament:** It is a slender fibrous ligament connecting the anterior edges of the 2 menisci.

4. **Tendon of popliteus muscle.**
**Extra-capsular ligaments:**

They strengthen the capsule. They include:

1. Lateral (fibular) collateral ligament ---- laterally.
2. Medial (tibial) collateral ligament ---- medially. This ligament is a strong flat band and is firmly attached to the medial meniscus.
3. Patellar ligament and medial and lateral patellar retinacula---- anteriorly.
4. Oblique popliteal ligament----posteriorly.

N.B.: - Patellar (medial and lateral) retinacula are fibrous extensions from the 2 vasti (medial and lateral vastus respectively), attached to the edges of patella.

N.B.: - Oblique popliteal ligament is a reflected fibrous extension from the semimembranosus tendon.

**Stability of the joint:**

Shape of bones plays little or no role in stability of the joint. However, it is stabilized by strong ligaments including
intracapsular ligaments called **cruciate ligaments**, crossing each other within the joint & strong extracapsular ligaments that limit the movement of the joint. In addition to that, there are 2 menisci; **medial** and **lateral meniscus** (semi-lunar 'or C-shaped' cartilage) deepen the upper surface of the tibia).
Ankle Joint

**Type of the joint:** Synovial "hinge" joint.

**Articulations:**

1. Two malleoli; medial and lateral malleolus and lower surface of tibia.
2. Body of talus.

**Movements:**

Flexion and extension.

**Muscles producing movements:**

1. Flexion (Plantar flexion): by
   - Gastrocnemius and soleus
   - Tibialis posterior.
   - Flexor hallucis longus
   - Flexor digitorum longus.
2. Extension (Dorsiflexion): by
   - Tibialis anterior.
   - Extensor hallucis longus
   - Extensor digitorum longus

**Capsule:**

- It is attached to the articular margins and lined by a synovial membrane.
- It is strengthened by 2 main collateral ligaments, like any other hinge joint.