Joints of the Lower Limb I
Lecture Objectives

• Describe the sacroiliac joint.
• Describe the structure of the lesser and greater sciatic foramina.
• Describe the components of the hip joint.
• List the ligaments associated with the hip joint and their attachment.
• Describe the muscles acting on the hip joint according to the type and movement they perform.
• Describe the bursas in relation to the hip joint.
• Describe the stability of the hip joint.
• Describe the blood supply and nerve supply of the hip joint.
• Describe the major palpable bony prominences of the hip joint.
• Describe the joints of the foot.
Sacroiliac Joint

• Auricular surfaces of the sacrum and the iliac bone
• No movement; transmit body weight from vertebral column to pelvis
• In elderly people synovial cavity disappear and becomes fibrous joint
• Nerve supply: sacral spinal nerves
Sacroiliac Joint

• Associated ligaments
  • Posterior sacroiliac ligament
  • Interosseous sacroiliac ligament (between tuberosities of sacrum and iliac bone)
  • Anterior sacroiliac ligament
Sacroiliac Joint

- Accessory ligaments
  - Sacrotuberous ligament
    - Greater sciatic foramen
  - Sacrospinous ligament
    - Lesser sciatic foramen
  - Iliolumbar ligament
Hip Joint

• Head of the femur and the acetabulum

• Type
  • Ball and socket joint

• Movements
  • All movements
  • Most movable joint next to shoulder

• On standing transmits body weight through hip bone to head & neck of femur

• Nerve supply
  • femoral, obturator, and sciatic nerves and nerve to the quadratus femoris m.
Hip Joint: Components

- Head of femur
  - Fovea for lig. of femoral head
    - No articular cartilage
- Neck of femur
- Acetabulum
  - Lunate surface
    - Articular part
  - Acetabular fossa
    - No articular part
  - Acetabular rim
    - Acetabular notch
Hip Joint: Components

• Acetabular rim
  • Acetabular labrum
    • Transverse acetabular ligament

• Acetabular fossa
  • Fat pad
Hip Joint: Capsule

• Proximal attachment
  • Acetabular labrum
  • Transverse ligament

• Distal attachment
  • Anteriorly
    • Intertrochanteric line
  • Posteriorly
    • Free edge
Hip Joint: Ligaments

- **Intracapsular ligaments**
  - Transverse acetabular ligament
    - Bridge the notch
    - Entrance of BVs
  - Ligament of the head of the femur
    - Transverse lig. & edges of notch
    - Fovea capitis
Hip Joint: Ligaments

- Extracapsular ligaments

  - Iliofemoral ligament
    - The Strongest
    - inverted Y-shape
    - Attachments
      - AIIS
      - Intertrochanteric line (ITL)
    - Superior – anterior
    - Function
      - Prevent hyperextension during standing
Hip Joint: Ligaments

- Extracapsular ligaments

  - Pubofemoral ligament
    - Triangular shape
    - Attachments
      - Superior ramus of pubis
      - Inferior part of intertrochanteric line
    - Function
      - Limits extension and abduction
    - Anterior - inferior
Hip Joint: Ligaments

- Extracapsular ligaments

- Ischiofemoral ligament
  - The weakest
  - Spiral shape
  - Attachments
    - Ischial part of acetabular rim
    - Greater trochanter
  - Limits extension and medial rotation
Hip Joint: Ligaments

- Relative strength of ligaments compared to muscles
  - Anteriorly
    - Strong ligament and weak muscles
  - Posteriorly
    - Weak ligament and strong muscles
Hip Joint: Synovial Membrane

• Attached to articular surfaces
• Lines capsule
• Covers
  • Transverse lig.
  • Ligament of head of the femur
  • Pad of fat in acetabular fossa
  • Neck of femur
• Synovial fold (retinaculum)
  • At free edge of capsule
• Psoas bursa
  • Anterior continuation of synovial membrane

• Bursa for obturator externus
  • Posterior synovial protrusion
    • Through the free capsule edge

• Obturator internus bursa
Hip Joint: Movements
Hip Joint: Relations

- **Anteriorly**
  - Content of femoral triangle
- **Posteriorly**
  - Sciatic nerve
- **Superiorly**
- **Inferiorly**
Hip Joint: Stabilizing Factors

- Acetabular labrum & transverse lig.
  - Deepens the socket
- Intracapsular lig.
- Extracapsular ligaments
- Muscles traversing hip joint
- Orientation of acetabulum to head of femur
  - Superiorly located
<table>
<thead>
<tr>
<th>Movement</th>
<th>Limiting Structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexion</td>
<td>Soft tissue apposition</td>
</tr>
<tr>
<td></td>
<td>Tension of joint capsule posteriorly</td>
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<tr>
<td></td>
<td>Tension of gluteus maximus</td>
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<tr>
<td>Extension</td>
<td><em>Ligaments</em>: iliofemoral, ischiofemoral, and pubofemoral</td>
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<tr>
<td></td>
<td>Tension of iliopsoas</td>
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<tr>
<td>Abduction</td>
<td><em>Ligaments</em>: pubofemoral, ischiofemoral, and inferior band of iliofemoral</td>
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<tr>
<td></td>
<td>Tension of hip adductors</td>
</tr>
<tr>
<td>Adduction</td>
<td>Soft tissue apposition (thighs)</td>
</tr>
<tr>
<td></td>
<td>Tension of iliotibial band, superior joint capsule, superior band of iliofemoral ligament, and hip abductors (especially when contralateral hip joint is abducted or flexed)</td>
</tr>
<tr>
<td>Internal rotation</td>
<td><em>Ligaments</em>: ischiofemoral and posterior joint capsule</td>
</tr>
<tr>
<td></td>
<td>Tension of external rotators of hip joint</td>
</tr>
<tr>
<td>External rotation</td>
<td><em>Ligaments</em>: iliofemoral, pubofemoral, and anterior joint capsule</td>
</tr>
</tbody>
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Hip Joint: Blood Supply

- Medial & lateral circumflex
  - From profundal femoris
- Artery to the head of the femur
  - From obturator artery
- Retinacular arteries
  - Mainly from medial circumflex
  - Inter from free edge of capsule
Hip Joint: Arterial Anastomosis

• Trochanteric anastomosis
  • Superior gluteal a.
  • Inferior gluteal a.
  • Medial femoral circumflex a.
  • Lateral femoral circumflex a.

• Cruciate anastomosis
  • Inferior gluteal a.
  • Medial femoral circumflex a.
  • Lateral femoral circumflex a.
  • 1st perforating a. from profunda
Hip Joint: Fracture

- Fracture of femoral neck
  - Disruption of blood supply to the head
  - Avascular necrosis
    - Blood supply from artery to the head of the femur usually is not enough
- In elderly
- Female > Male
  - Osteoporosis
Surgical Hip Replacement

- In traumatic injuries or degenerative diseases
- Replace head and neck of femur
- Often acetabulum lined by metal or plastic socket
Dislocation of Hip Joint

- Congenital dislocation of hip joint
  - Common 1.5/1000
  - Female > Male
  - Affected limb looks shorter
    - Superior displacement
  - Positive Trendelenburg sign
    - Hip appear to drop to one side during walking
    - Inability to abduct hip
Dislocation of Hip Joint

• Acquired hip dislocation
  • Rare
  • Posterior dislocation more common
  • In car accidents
  • When femur is flexed, adducted, and medially rotated
  • Sciatic nerve injury
Joints of the Foot and Toes

- Subtalar joint
  - Medial and lateral talocalcaneal ligaments
  - Interosseous talocalcaneal ligament
- Talocalcaneonavicular joint
  - Planter calcaneonavicular ligament
- Calcaneocuboid joint
  - Bifurcated ligament
  - Long planter ligament
  - Short planter ligament

➢ Talocalcaneonavicular and Calcaneocuboid joints form the midtarsal or transverse tarsal joints
➢ Eversion and inversion movements happen at the midtarsal and subtalar joints
Joints of the Foot and Toes

- Cuneonavicular joint
  - Dorsal and planter ligaments
- Cuboideonavicular joint
  - Dorsal, planter and interosseous ligaments
- Intercuneiform and cuneocuboid joints
  - Dorsal, planter and interosseous ligaments
  - Same cavity with cuneonavicular joint
- Tarsometatarsal and intermetatarsal joints
  - Dorsal, planter and interosseous ligaments
  - For big toe there is separate cavity
- Metatarsophalangeal and interphalangeal joints
  - Deep transverse ligaments