Structure and Function of the Hip
Objectives

• Identify the supporting structures of the hip joint
• Discuss the actions of the hip musculature through understanding of the origin and insertion
• Identify the force couples involved with an anterior and posterior pelvic tilt
• Explain the function of the hip abductor muscles while walking
• Identify the one joint and two joint muscles of the hip joint
Ligaments in the Pelvis

- Iliofemoral (Y) ligament
- Ischiofemoral ligament
- Pubofemoral ligament
Relevance of Anterior Hip Ligaments

• Where was the plumb line to describe optimal posture? Ant or post to hip joint.
The Ilioinguinal Ligament

- No function at hip joint; Separates abd wall and thigh. One border of the femoral triangle
The Iliotibial Band (ITB)

• A very long, tendinous portion of the tensor fascia latae muscle

• Both the gluteus maximus and tensor fascia latae attach to it
The Hip Joint

• Three degrees of Freedom
  – Flexion/Extension (Sagittal plane)
    • Medial/Lateral axis
      – Anterior to axis will _____ the hip
      – Posterior to axis will _____ the hip
  – Abduction/Adduction (Frontal plane)
    • Anterior/Posterior axis
      – Medial to axis will ______ the hip
      – Lateral to axis will ______ the hip
  – Internal/External Rotation (Transverse plane)
    • Vertical axis
      – Anterior and/or medial will _____ the hip
      – Posterior and/or lateral will _____ the hip
Which line of pull will flex/ext, and which will int/ext rotate?
Innervation of Hip

- Femoral nerve innervates most of the hip flexors
- Obturator nerve innervates primarily the hip adductors
- Sciatic nerve (tibial portion): hamstrings and extensor head of adductor magnus
- Gluteal nerve (superior and inferior) will innervate the rest
Iliopsoas

- **Origin:**
  - Iliacus:
    - Iliac fossa
  - Psoas Major:
    - transverse processes of T12-L5
- **Insertion:**
  - Lesser trochanter
- **Action:**
  - Hip flexion
  - Trunk flexion
  - Anterior pelvic tilt
- **Innervation:** femoral nerve
Rectus Femoris

- **Origin:**
  - Anterior inferior iliac spine

- **Insertion:**
  - Tibial tuberosity via the quadriceps tendon

- **Action:**
  - Hip flexion
  - Knee extension

- **Innervation:** femoral nerve
Sartorius

• Origin:
  – Anterior Superior Iliac Spine
• Insertion:
  – Proximal/Medial tibia (pes anserine)
• Action:
  – (Slide your heel up your opposite shin)
    • Hip flexion
    • Hip Ext Rotation
    • Hip external rotation
    • Knee flexion
• Innervation: femoral nerve
Tensor Fascia Latae

- **Origin:**
  - Outer surface of the iliac crest posterior to the ASIS
- **Insertion:**
  - Proximal 1/3 of the ITB
- **Action:**
  - Hip flexion
  - Hip ABDuction
  - Hip Internal rotation
- **Innervation:** Superior gluteal n.
Primary Hip Flexors

- Iliopsoas
- Rectus Femoris
- Sartorius
- Tensor Fascia Latae
Biceps Femoris
(Part of the hamstrings)

• Origin:
  – Ischial Tuberosity
• Insertion:
  – Head of the fibula
• Action:
  – Hip extension
  – Knee flexion
• Innervation: sciatic nerve (tibial portion)
Semimembranosus
(Part of the hamstrings)

- **Origin:**
  - Ischial tuberosity
- **Insertion:**
  - Medial condyle of the tibia (posterior)
- **Action:**
  - Hip extension
  - Knee flexion
- **Innervation:** sciatic nerve (tibial portion)
Semitendinosus
(Part of the hamstrings)

- **Origin:**
  - Ischial tuberosity
- **Insertion:**
  - Prox/medial surface of the tibia (pes anserine)
- **Action:**
  - Hip extension
  - Knee flexion
- **Innervation:** sciatic nerve (tibial portion)
Gluteus Maximus

- **Origin:**
  - Posterior Ilium
  - Sacrum and Coccyx
- **Insertion:**
  - ITB
  - Gluteal Tuberosity of the femur
- **Action:**
  - Hip extension
  - Hip external rotation
- **Innervation:** Superior gluteal nerve
Primary Hip Extensors

- Gluteus Maximus
- Hamstrings
  - Semitendinosus
  - Semimembranosus
  - Biceps Femoris
- Adductor Magnus (extensor head)
Gluteus Medius

- **Origin:**
  - Outer surface of the ilium
- **Insertion:**
  - Greater trochanter of the femur
- **Action:**
  - Hip ABDuction
- **Innervation:**
  - Superior gluteal nerve
Gluteus Minimus

- **Origin:**
  - Outer surface of the ilium, inferior to the gluteus medius
- **Insertion:**
  - Greater trochanter
- **Action:**
  - Hip ABDuction
  - Hip Int rotation
- **Innervation:** Superior gluteal nerve
Trendelenburg Sign

- During single leg stance of walking, the hip abductor muscles need to work to keep pelvis level;
  - If weak, you see the pelvis tilt inferiorly on the non-affected side.

http://www.youtube.com/watch?v=IhsPOYhDUu8
Primary Hip Abductors

- Gluteus Medius
- Gluteus Minimus
- TFL
Pectiníus

• **Origin:**
  - pectineal line on the superior pubic ramus

• **Insertion:**
  - pectineal line on the posterior femur

• **Action:**
  - Hip ADDuct
  - Hip flexion

• **Innervation:** Obturator nerve
Adductor Magnus

- **Extensor Head**
  - Origin:
    - Ischial tuberosity
  - Insertion:
    - Adductor tubercle (distal femur)
  - Action:
    - Hip ADDuct, hip extension
  - Innervation: sciatic n. (tibial portion)

- **Adductor Head**
  - Origin:
    - Ischial ramus
  - Insertion:
    - Entire linea aspera of femur
  - Action:
    - Hip ADDuct, hip flexion
  - Innervation: Obturator n.
Adductor Longus

• Origin:
  – *Anterior surface of the body of the pubis*

• Insertion:
  – *Middle 1/3 of the linea aspera of the femur*

• Action:
  – Hip Adduct
  – Hip flexion

• Innervation: Obturator n.
Adductor Brevis

- **Origin:**
  - Inferior pubic ramus

- **Insertion:**
  - Prox 1/3 of linea aspera

- **Action:**
  - Hip ADDuct
  - Hip flexion

- **Innervation:** Obturator n.
Gracilis

- **Origin:**
  - Inferior ramus and body of pubis

- **Insertion:**
  - Proximal/medial aspect of tibia (pes anserine)

- **Action:**
  - Hip ADDuct
  - Hip flexion
  - Knee flexion

- **Innervation:** Obturator n.
Primary Hip Adductors

- Pectinius
- Adductor Magnus - both
- Adductor Longus
- Adductor Brevis
- Gracilis
Primary Hip External Rotators

• Intrinsic Hip ER: \(6 \text{ muscles}\)
  - Piriformis
  - Obturator Internus
  - Obturator Exterunus
  - Gemelus Superior
  - Gemelus Inferior
  - Quadratus Femoris

• Piriformis Syndrome:
  - The sciatic nerve passes deep to the piriformis in most cases (approximately 85% of people) but can in fact pierce the piriformis itself, predisposing to piriformis syndrome and subsequent sciatica.
Sciatic Nerve Distribution & the Piriformis Syndrome
Primary Hip Internal Rotators

- Gluteus Medius
- Gluteus Minimus
- Tensor Fasica Latae
Pelvic Tilting – Force Couple

Muscles for Anterior Tilt

Muscles for Posterior Tilt
Optional Project
Up to 5 points on next exam

• One page paper about why you should hold and use a cane in the opposite hand of the injured or weak leg