Objectives

- Pathologies
  - Muscle strains and sprains
  - Bursitis
  - Mechanical Hip Pain
    - OA
    - Osteitis Pubis
    - Slipped Capital Femoral Epiphysis
    - Legg Calve Perthe’s Disease
    - CAM
    - FAI
    - Labral tears
  - Hip Fracture
Muscle Pathology

Muscle Strains

1. Hamstrings
   - The most common muscle strain in the hip/thigh
   - Primarily fast-twitch muscles - low repetitions and powerful movements
     - Age and previous injury major risk factors
     - Eccentric braking insufficient and muscle weakness and imbalance
   - S and Sx’s
     - Pain present primarily with elongation (eccentric control) rather than active shortening (low intensity)
     - Shortened stride length during gait
     - Pain often with ascending stairs and standing up from a chair
     - Often report a cramping sensation
   - Differential diagnosis with sciatica
     - Palpation not always definitive
     - SLR, slump, and flip not always conclusive

Muscle Pathology

Muscle Strains (Con’t)

1. Hamstrings (Con’t)
   - Hamstring syndrome
     - Adhesions from hamstring strain can scar down the sciatic nerve passing through the posterior thigh
   - Sign of the buttock
     - Present when pain produced in the buttock/proximal hamstrings during a SLR
     - At the point of symptoms during the SLR, maintain hip flexion, bend the knee and assess patient response:
       - If symptoms resolve then symptoms either from the lumbar or hamstrings
       - If symptoms persist, then symptoms from the hip joint or SIJ

Musculoskeletal Impairments III
Muscle Pathology
Muscle Strains

2. Gluteus medius
- Pain present superior to greater trochanter
- Differential diagnosis with piriformis syndrome, TFL strain, trochanteric bursitis and hip DJD
- S and Sx’s
  - Pain with hip ABD
  - Pain increases with shifting pelvis toward involved leg
  - Pain present during single leg stance on involved leg
  - Pain during throughout the gait cycle
    - During stance phase of the involved leg as well as during swing phase
    - May see trendelenburg

3. Tensor Fascia Lata
- S and Sx’s
  - Pain during swing phase of gait while stance phase not typically painful
  - Shortened stride from limited hip flexion and avoiding full hip extension
  - Pain with hip ABD
Muscle Pathology
Muscle Strains

4. Quadriceps
- Rectus femoris muscle
- Caution with deep thigh contusion and quadriceps tendon injuries
- Propensity for myositis ossificans with chronic thigh contusions and/or deep thigh contusion
- Differential diagnosis with femoral nerve entrapment and hip DJD

Musculoskeletal Impairments III

Muscle Pathology
Muscle Strains

5. Adductors
- Adductor muscle group is considered to have inversion where their action at the hip changes at certain points in the ROM
  - Main action is thigh AD in open chain and stabilize LE to perturbation in closed chain
- Adductor strains can occur during:
  - Flexion
  - Extension
- Adductor longus most common injured (lack of MA?)
- Differential diagnosis with:
  - Inguinal hernia
  - Hip joint OA
  - Piriformis syndrome

Musculoskeletal Impairments III
**Muscle Pathology**

**Muscle Strains**

5. **Adductors (Con't)**
   - **Examination:**
     - Pain on palpation of AD tendons or insertion on pubic bone
     - Groin pain during adduction against resistance
   - **Risk factors:**
     - Strength ratio of AD to AB (injury side 70% of uninjured side)
     - Previous injury of AD
     - Sports that require strong eccentric contraction
     - Hip abduction ROM deficits

6. **Iliopsoas**
   - Often has increased tension/muscle guarding from dysfunction in the lumbosacral region
   - Rarely a primary injury
   - Diagnosis with pain on active/resisted hip flexion, passive elongation and pain with palpation at Baer’s point
Muscle Pathology
Muscle Strains

7. Piriformis (syndrome)
- Strain of the piriformis produces entrapment of the sciatic nerve in the greater sciatic notch
- Symptoms mimic those of nerve root entrapment in the lumbar spine
- Differential diagnosis with lumbar disc prolapse, DDD, and SIJ dysfunction
- S and Sx’s
  - Increased pain locally in the buttock
  - Increased muscle guarding in the piriformis
  - Pain on palpation of the muscle &/or tendon in the posterior aspect of the greater trochanter
  - Limited hip IR and flexion which reproduces symptoms
  - SLR may be > greater than 60°
  - Sitting with increased weight bearing on the involved buttock
  - Often present with SIJ dysfunction

Musculoskeletal Impairments III

Muscle Tightness/Pathology
Special Tests

- Hip Flexors
  - Thomas Test
- Rectus Femoris
  - Ely’s Test
- IT Band
  - Ober’s test
- Adduction contracture test
- Hamstrings
  - 90-90 SLR test
  - Hamstring contracture test
  - Tripod sign
- Piriformis
  - Piriformis test
- Trendelenberg Sign

Musculoskeletal Impairments III
1. Trochanteric bursitis

- Patient presentation:
  - Pain:
    - Localized to the hip joint directly over the greater trochanter
    - Warmth over greater trochanter region
    - May radiate into lateral thigh
    - Complaints after standing asymmetrically for long periods with affected hip elevated and adducted
    - Increased with ambulation and stair negotiation and lying on affected side (difficulty with sleeping)
  - Examination
    - Pain with hip AB
    - Pain with hip AD (passive)
    - Palpable tenderness at lateral hip

Musculoskeletal Impairments III
Muscle Pathology

Bursitis

1. Trochanteric bursitis (con’t)
   - May be present concurrently with ITB friction syndrome
   - May develop during pregnancy from sudden weight gain and widening of pelvis
   - People prone to this injury include those with femoral anteversion with increased genu valgum
   - May be found in patients with increased Q-angle or runners, bikers, etc.
   - Onset primarily due to either direct blow or repetitive overuse in presence of poor flexibility in the TFL

Musculoskeletal Impairments III

2. iliopectineal bursitis
   - Pain in the inguinal region and radiating into the femoral triangle
   - Patient’s often have poor flexibility in iliopsoas leading to increased compression on the bursa during hip extension
   - Palpable tenderness present by placing hip in flexion and ER
   - May also relieve symptoms
Muscle Pathology

Bursitis

3. Snapping hip syndrome
   - Can arise from two different sources:
     - Intra articular
     - Extra articular
   - Extra articular:
     - ITB over greater trochanter during hip F/E
     - Iliopsoas tendon as it passes in front of hip joint with hip flexion
       - Can catch on pelvic brim (iliopectineal eminence)
   - Common in ballet dancers
   - Mainly complaint is sensation of snapping with 1/3 reporting pain
     - Audible snap or click anterior deep in groin or lateral; may or may not be painful

Musculoskeletal Impairments III

Conditions of Hypomobility
Conditions of Hypomobility

1. Degenerative Joint Disease (OA)
2. Osteitis Pubis
3. Slipped Capital Femoral Epiphysis
4. Legg Calve Perthe’s Disease
5. Mechanical Hip Pain
6. Labral Tears

Conditions of Hypomobility
Degenerative Joint Disease (OA)

- Affects the entire joint structure including:
  - Joint capsular changes (shortening and lengthening)
  - Thinning and splitting of the articular cartilage
  - Sclerosis of subchondral bone
  - Cyst formation
  - Ostearthtes formation

- Risk factors:
  - *Age - most common pre-disposing factor
  - *Developmental disorders (Legg-Calve-Perthes dz; slipped capital femoral epiphysis; congenital hip dislocation)
  - Race - caucasian with european ancestry
  - Gender - pattern in men vs. women
  - Genetics
  - Occupation
  - Sports Exposure
  - *Previous Injury
  - BMI
  - Leg Length disparity
Conditions of Hypomobility
Degenerative Joint Disease (OA)

- Patients classified as having hip OA if they a) report experiencing hip pain and b) present with either one of the following clusters:
  - Hip IR < 15°
  - Hip F ≤ 115°
  - Age > 50 y.o.
  - OR
  - Hip IR ≤ 15°
  - Pain with hip IR
  - Duration of morning stiffness of the hip less than or equal to 60 minutes
  - Age > 50 y.o.

- Sn: 86%; Sp: 75%

Conditions of Hypomobility
Degenerative Joint Disease (OA)

- Typical clinical presentation in patients with confirmed OA
  - Reports of moderate pain in the lateral or anterior hip with WB. This pain may progress to anterior thigh or knee region
  - Adults greater than age 50
  - Limited passive hip joint ROM in at least 2 of its 6 directions
  - Morning stiffness which improves in less than 1 hour

- Differential diagnosis:
  - Bursitis/tendonitis
  - Intra-articular injury (chondral damage, labral tears)
  - Piriformis syndrome
  - SI joint dysfunction
  - Referred pain from L2-3 radiculopathy
  - Femoral neck stress fracture

Musculoskeletal Impairments III
Evidence Based Practice

CPR - examination

- Assess diagnostic accuracy and establish preliminary CPR for hip OA

- 29% of subjects (N=72) had radiographic evidence of hip OA

- Examination tests: ROM, end-feel testing, and 3 provocative measures:
  - Patrick’s test
  - Scour test
  - Squat test

- 5 factors:
  - Self-reported squatting as aggravating condition
  - Active hip flexion causing lateral hip pain
  - Scour test with adduction causing lateral or groin pain
  - Active hip extension causing pain
  - Passive IR ≤ 25°

- 3 out of 5: +LR=5.2; pre-test probability 29% → 68%
- 4 out of 5: +LR=24.3; pre-test probability 29% → 91%

Musculoskeletal Impairments III  Sutlive et al., JOSPT, Sept. 2008

Conditions of Hypomobility

Degenerative Joint Disease (OA)

- Clinical outcome tools:
  - Lower Extremity Functional Scale (LEFS)
  - Harris hip score
  - Western Ontario and McMaster Universities Osteoarthritis index (WOMAC)

- Activity limitation and participation restriction measures:
  - 6 minutes walk test
  - Self-paced walk test
  - Stair measure
  - Timed up and Go

Musculoskeletal Impairments III
Conditions of Hypomobility
Mild and Advanced Hip DJD

Musculoskeletal Impairments III

Conditions of Hypomobility
Osteitis Pubis

- Defined as chronic inflammation of the symphysis pubis
- May develop following surgery to the prostate or bladder
- Common mechanism of injury:
  - repetitive stress of the adductor muscle group (i.e. during sporting events)
  - repetitive tension stress from excessive ABD
- Patient presentation:
  - Localized pain to the pubic region and proximal medial thigh
  - Pain with ambulation (esp. on stairs)
  - Pain with hip ABD and ADD
Conditions of Hypomobility
Slipped Capital Femoral Epiphysis

- Vertical slipping of the femoral head from the femoral neck
- Typically seen in obese children but may also be seen in tall, thin children
- The exact underlying cause is unknown but may result from increased stress to the femoral head/neck during rapid growth spurts or trauma
Conditions of Hypomobility

Slipped Capital Femoral Epiphysis

- There are 3 grades of SCFE:
  - Mild
  - Moderate
  - Severe
  - Determined by apposition and slip angle
- The affected limb gradually becomes shorter and smaller
  - decreased hip ROM also present especially with internal rotation
- Diagnosis:
  - Greater trochanter heights asymmetrical in both standing and sitting
  - Scouring (quadrant) test will be painful
  - Antalgic gait
  - Pain may be referred to the distal thigh or knee

Legg-Calve-Perthes Disease

- An idiopathic form of osteonecrosis of the femoral head occurring in children
- Occurs in children ages 3-12 years old
- Found more frequently in boys (80%)
- The cause is unknown but damage to the blood supply to the femoral head is frequently seen
- As the necrotic bone of the femoral head is resorbed, it is replaced with new living bone
  - The new bone is soft and the increased pressure from weight bearing results in a flattening of the femoral head
- Clinical manifestation
  - Child ambulates with an antalgic limp
  - Muscle spasm in the hip and thigh with pain referred to the groin/medial thigh
  - ROM limited most notably in IR and ABD
Conditions of Hypomobility
Legg-Calve-Perthes Disease

Legg-Calve-Perthes Disease
Right Hip of 8 y.o. Boy
Legg-Calve-Perthes Disease
9 Months after Detection

Legg-Calve-Perthes Disease
5 years after onset
Conditions of Hypomobility
Mechanical Hip Pain

• Causes:
  • Intra-articular
    • Labral tear
    • Femoral acetabular impingement (FAI)
  • Instability
  • Chondral injury
  • OA
• Extra-articular
  • Muscle imbalance/overuse inflammation
  • Tendonitis
  • Bursitis

Labral Tear

• Occur from trauma to the hip
• Patient reports pain and clicking in the hip with AROM
• Evaluation with either anterior or posterior labral tear tests
• Differential diagnosis with snapping hip syndrome, bursitis and DJD
Conditions of Hypomobility
FAI

- Impingement of anterior head-neck junction of femur against anterosuperior labrum
- Caused by insufficient femoral head-neck offset
- 2 types:
  - “CAM” FAI
  - “Pincer” FAI

Musculoskeletal Impairments III

Conditions of Hypomobility
FAI

- “CAM”
  - Morphological changes in femoral head (pistol grip deformity)
  - Increased incidence in young, active males
  - Associated with:
    - Slipped capital femoral epiphysis
    - Legg-Calve-Perthes disease
    - Malunion femoral neck fractures
    - Principle damage to cartilage
    - Labral injury tends to be detached

Musculoskeletal Impairments III
Conditions of Hypomobility

FAI

• “Pincer”
  • Involves acetabular rim, resulting from increased coverage of anterosuperior portion of femoral head
  • Increased incidence in middle aged women and older patients
  • Associated with:
    • Acetabular retroversion
    • Coxa vara
  • Principle damage to labrum and tends to be tear

Musculoskeletal Impairments III

Conditions of Hypomobility

Mechanical Hip Pain

• Patient history of clicking
• Anterior Labral Tear Test
• Posterior labral test
• Hip Scour test
• Hip Quadrant Test
• Resisted SLR
• Patrick’s Test/FABER’s
• Log-Roll test
• Long-axis distraction

Musculoskeletal Impairments III
Hip Fractures

Hip Fracture

- Incidence:
  - More than 70% occur in individuals 70+ years old
  - Women > men
  - Multiple factors:
    - OP
    - Sudden twisting motion or impact from fall results in pathological fracture
    - 90% associated with fall (which comes 1st?)
- Physical changes:
  - Balance, proprioceptive reactions, and muscle power
  - Walking speed
  - Greatly influences independence and disability
  - 15-20% of women who sustain hip fracture lose ability to live independently in 1st year
- Post-operative mortality rates → 20%
Hip Fracture

• Acute signs and symptoms:
  • Leg shortened and ER
  • Pain in groin or hip region
  • Pain with A or PROM
  • Pain with LE WB

• Classification:
  • Intracapsular
  • Extracapsular

Hip Fracture

• Fracture-dislocation
  • Occurs in young, active individual
  • Often the hip dislocation will result in fracture of the acetabulum
  • Can lead to femoral avascular necrosis and damage to joint cartilage
  • May lead to prosthetic replacement

Musculoskeletal Impairments III
Femoral Neck Stress Fracture

Subcapital Fracture Femoral Neck
Subtrochanteric Fracture

Musculoskeletal Impairments III

Mid-femur fracture

Musculoskeletal Impairments III
Leg Length Discrepancy

- Causes:
  - True anatomical leg length discrepancies
    - Congenital
    - Fracture
    - Asymmetrical femoral torsion
  - Functional leg length discrepancies
    - Pelvic dysfunctions
  - Injuries to LE that result in an acquired postural shift

Musculoskeletal Impairments III
Leg Length Discrepancy

**Consequences of leg length discrepancy:**

- Increased compression and tensile stress to the joints of the LE
- Functional (pathological) scoliosis
- Decreased efficiency of work around the joints of the LE

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Musculoskeletal Impairments III

Leg Length Discrepancy

- **Short Leg**
  - Lumbar: convexity to the short side
  - Pelvis: post. rotated
  - Knee: genu valgum & flexion
  - Ankle: everted
  - Foot: pronated

- **Long Leg**
  - Lumbar: SB toward the long side
  - Pelvis: ant rotated
  - Knee: genu varum & extension
  - Ankle: inverted
  - Foot: supinated

Musculoskeletal Impairments III
Leg Length Assessment

- True leg length assessment
- Weber-barstow maneuver
- Functional standing leg length