Objectives

Role of Labrum

- Seal to maintain suction effect
  - Takechi et al. 1982, Terayama et al., 1980

- Tear
  - Loss of suction effect
  - Resulting in relative instability
Role of Labrum

• Reduce contact stress
  – Contact stress of the acetabular cartilage increased up to 92% in the absence of the labrum.
  • Ferguson et al. J. Biomech, 2000

Articular Cartilage Damage

• Can result from labral tears
• Focal changes were most common at the anterior superior location of the acetabulum

Impingement

Labrum
Head-Neck Off Set

Decreased Offset

Hip

“Center-edge” angle

35°
125°
Ligaments

Iliofemoral
If this ligament is tight or lax what would you expect to find on your clinical exam?

Ischiofemoral
If this ligament is tight or lax what would you expect to find on your clinical exam?

Pubofemoral

Ligamentum Teres
What is its role in stability and pain?

Blood supply
- The majority of the blood supply to the femoral head arises from the medial and lateral circumflex arteries at the base of the femoral neck.
- Ligamentum teres houses a small branch from the obturator artery.

How can femoral neck fractures and hip dislocations cause a catastrophic injury?

Bony geometry

- Frontal plane
  - Coxa valga
  - Coxa varus

How can changes in this angle affect growth plate stability in an active skeletally immature individual?

- Transverse plane
  - Anteversion
  - Retroversion

How can changes in this angle affect growth plate stability in an active skeletally immature individual?
• How do deformities in the transverse plane effect hip ROM?
• Gait?

When measuring end range hip motion, the clinician must be careful not to incorporate lower spine motion into the measurement.

Patients with tight hips will compensate by moving the spine prematurely thereby increasing the likelihood of injury risk.

As part of your lumbar spine examination, it is essential to examine hip range of motion to determine if the hip joint is contributing to the patient’s symptoms.

Rotator Cuff of the Hip

• The shoulder rotator cuff can be used to help understand the function of muscles around the hip.
• External rotation of the shoulder is performed by the infraspinatus, teres minor, and supraspinatus—compared to the piriformis, obturator externus and internus, superior and inferior gemelli, as well as the posterior gluteus medius at the hip.
• Internal rotation of the shoulder is performed by the subscapularis—compared to the anterior fibers of the gluteus medius and gluteus minimus.
• Abduction of the shoulder is performed by the supraspinatus and is compared to the gluteus medius of the hip.

Weakness Impacting Mechanics
Gluteus Medius
Potential Causes of Hip Pain

- Labral tear
- Articular cartilage lesions
- Trochanteric bursitis
- Psoas bursitis
- Tendinitis
- Muscle strains
- Myofascial pain
- Piriformis syndrome
- Local nerve entrapment
- Avulsion injury
- Avascular necrosis
- Femoral stress fracture

- Lumbar spine pathology
- Athletic pubalgia/Sports hernia
- Sacroiliac joint pathology
- Abdominal wall pathology
- Ingual hernia
- Femoral hernia

Systemic Causes of Hip Pain

- Rheumatic arthritis
- Crohn’s disease
- Psoriasis
- Reiter’s syndrome
- Systemic lupus erthematosus
- Genitourinary tract infection
- Endometriosis
- Neoplasm

Intra- vs Extra-Articular Pathology

- **Diagnosing Intra-articular pathology:**
  - Insidious onset of sharp or aching groin pain that limits activity.
- **Physical examination:**
  - Limited hip flexion, internal rotation, and abduction range of motion
  - Positive Flexion-Adduction-Internal Rotation Impingement test
  - Positive FABER test

- **Recommendation in FAI:**
  - B grade Evidence levels 2 and 3
    - Philippon MJ (2007) Traumatol Arthrosc

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Nerve Involvement

Nerve Involvement: Spine

- Entrapments in the posterior hip region:
  - Sciatic
  - Pudendal

- Entrapments in the anterior hip region:
  - Obturator
  - Femoral
  - Lateral femoral cutaneous
  - Iliinguinal-iliohypogastric
  - Genitofemoral
Anterior Nerve Entrapments
- Obturator
- Femoral
- Lateral femoral cutaneous
- Ilioinguinal-iliohypogastric
- Genitofemoral

Obturator Nerve
- Entrapment due to thick fascia overlying the short adductor muscle
- Symptoms of paresthesia, numbness, and/or pain located in the medial thigh
- Movements of abduction and extension increase the symptoms by stretching the obturator nerve.

Femoral Nerve
- Entrapment occurs:
  - Iliacus compartment
  - Inguinal ligament
- The main clinical feature of patients with femoral nerve entrapment is quadriceps muscle weakness.
- Pain, numbness, and paresthesia may also be noted in the anterior thigh and with saphenous nerve involvement noted in the anteromedial knee joint, medial leg, and foot.
- Symptoms are typically scanned with movements of hip extension and knee flexion—Modified Thomas test position.
- Patients with proximal nerve injury can present with iliopsoas muscle weakness.
- However, the psoas muscle is also directly innervated by the L2 and L3 nerve roots and can function adequately without femoral nerve innervation.
- Severe femoral nerve lesions produce quadriceps muscle atrophy and an absence of the patellar tendon reflex.

Lateral Femoral Cutaneous Nerve
- Entrapment can occur as it perforates the inguinal ligament
- Obesity and pregnancy are risk factors
- Symptoms of tingling, stinging, or burning sensation in the anterior lateral thigh with associated to numbness or hypersensitivity to touch.

Ilioinguinal-iliohypogastric Genitofemoral
- The Lumbosacral Plexus
- The nerve is compromised by the inguinal ligament.
- Affected area
Ilioinguinal-iliohypogastric

- Entrapment of the ilioinguinal and iliohypogastric need to be considered in those with pain in the abdominal wall, groin, thigh, and genital region.
  - Particularly after trauma to the abdomen region.
  - Abdominal surgeries, including hernia repairs, can cause entrapment of these nerves, and in particular the ilioinguinal nerve.
  - Stabbing pain in the distribution of the nerve that is aggravated by stretching movement is the most common complaint.
  - Tinel’s sign may be able to be elicited in the area of abdominal entrapment.
  - Madura et al. suggests an “arch and twist” maneuver to stretch the affected nerves and recreate symptoms.

Genitofemoral

- Entrapment of this nerve can occur after abdominal surgery or in rare cases blunt trauma to the groin.
  - Entrapment of the genital branch can cause symptoms in the genital region while entrapment of the femoral branch can cause symptoms in a small area in the proximal anterior thigh.
  - Typically movements into hip extension can aggravate symptoms.

Femoral Neck Stress Fractures

- **Etiology**
  - At the femoral neck, fractures may occur at the superior aspect due to tensile forces or on the inferior aspect secondary to the compressive forces.
  - Femoral neck stress fractures are the result of excessive stress without sufficient time for remodeling. In effect, the catabolic process (breakdown) bone exceeds the anabolic process (build up).
  - In the majority of cases, improper training is the most obvious cause of a stress fracture.

- **Risk factors:**
  - High body mass index (BMI)
  - decreased fitness
  - improper footwear
  - change of running surface
  - prior history of a stress fracture.

Femoral Neck Stress Fracture

- **Epidemiology**
  - **Incidence**
    - ~15% of runners will develop a stress fracture. Of these 15%, ~10% are classified as femoral neck stress fractures.
  - **Gender**
    - Females especially those with the female athlete triad (disordered eating, menstrual cycle dysfunction and osteoporosis) seem to be at greater risk.

- **Groin pain to anteromedial thigh**
- **Pain with weight bearing activity**
  - With progression night pain can occur
- **Physical examination**
  - Often negative
  - Pain at the extreme of internal and external rotation
- **Advanced imaging techniques are often necessary.**
Examination

- History

- 80% of the total useful information that you will collect!!!

History Taking

- Onset: Insidious vs Traumatic
- Symptoms change with Movement vs Constant?
- Increase /Decrease:
  - What direction?
  - What joint?
- Radicular vs Referred Symptoms vs Local
- SIJ vs Hip
- Hips
  - Previous Rx- MD, PT, Chiro- not effective, not thoroughly checked.

Evaluation: History

- Trauma:
  - Shear force (i.e. MVA) may cause dislocation, subluxation. Articular cartilage, capsular, and/or labral damage can occur.
  - Falls on the outside of the hip may cause trochanteric bursitis
Overuse injuries:
  - suspect biomechanical cause such as leg length discrepancy, or abnormality with bone geometry of the foot, tibia and/or femur.
  - NO SPECIFIC INJURY??

Evaluation: History

- Location of symptoms
  - Must consider pelvic involvement as well as referred pain from the lumbar spine.
- What increases and decreases the symptoms?
  - Muscle/tendon pathology is aggravated when the muscle is contracted and stretched.
- Timing of symptoms
  - OA, RA, AVN may cause stiffness in the morning.
  - Soft-tissue symptoms may increase with activity
  - NO SPECIFIC MOVEMENTS OR POSITIONS INCREASE OR DECREASE SYMPTOMS

Evaluation: History

- Twinges of pain
  - may indicate loose bodies or labral tears
- Snapping: ilipsoas tendon, iliotibial band, and labral tears.
  - External snapping
    - iliotibial band over the greater trochanter is most common cause.
    - ilipsoas tendon catching on the pelvic brim iliopsoas tendon over the greater trochanter and the femoral head. If the iliopsoas is tight it may accentuate the snapping and cause bursitis.
  - Internal snapping could be a result of a torn labrum

Differential Diagnosis

- Identify “RED FLAGS”
  - Systems Review
    - CV/pulmonary
    - Integumentary
    - Neuromuscular
    - Musculoskeletal
    - Communication
      - (i.e.- OX3, emotional-behavior response)
Non-Musculoskeletal Source of hip pain

Symptom Presentation
- No specific injury mechanism
- Bilateral hip pain
- Poorly localized
  - Unable to point to a specific spot
- No specific movements aggravate symptoms
- All movements increase symptoms with empty end-feels
- Aggravated by activities that increase intra-abdominal pressure
  - e.g., Coughing, bowel movements

Pain Locations

Key Questions
- Changes in bowel or bladder function
  - Unusual stool or urine color
- Changes in menstruation
  - Can symptoms correlate with menstrual cycle?
- Painful menstruation
- Possibility of being pregnant
- Painful intercourse
- Sexual difficulty
- Discharge from penis or vagina
- Fever, chills, nausea, vomiting
- Recent infections or illness
  - "Just cannot get rid of a cold"
  - "The cold keeps coming back"
- Unusual changes in skin including rashes
- Unusual fatigue, irritability, or difficulty sleeping
- Loss appetite
- Unexplained weight loss

Non-Musculoskeletal Source of hip pain

- Cancer - Bone Tumors
  - Hodgkin's lymphoma
    - Enlarged and tender lymph glands
  - Best predictor for CA is previous history of CA

- Vascular - Arterial Insufficiency
  - AVN
    - Long term use of corticosteroids, immunosuppressants
  - Abdominal aortic aneurysm
    - Rapid onset of sharp severe groin pain
    - Pulsating abdominal pain
    - Can be associated with back pain
Non-Musculoskeletal Source of hip pain

- Urogenital
  - Changes in bladder function
  - Genital symptoms
- Testicular Cancer
  - Testicular irregularities
- Endometriosis
- Pelvic inflammatory conditions
- Prostate impairment
- Kidney
  - Fevers chills

Non-Musculoskeletal Source of hip pain

- Psas Abscess
  - Abdominal pain and tenderness in femoral triangle
  - Psas spasm
  - Fever and sweats
- Crohn’s Disease
  - A type of inflammatory bowel disease
  - Skin rash associated with the onset of hip pain
- Reiter’s Syndrome
  - Also called reactive arthritis,
  - Occurs as a reaction to certain infections of the reproductive system and digestive system.
- Tuberculosis

Non-Musculoskeletal Source of hip pain

- Pagets’ Disease
  - Caused by the excessive breakdown and formation of bone, followed by disorganized bone remodeling.
  - This causes affected bone to weaken, resulting in pain, misshapen bones, fractures and arthritis in the joints near the affected bones
- Other metabolic Diseases
  - Gaucher’s disease
  - Ochronosis
  - Hemochromatosis

“Red Flags”

- Symptoms
  - Acute hip pain with fever
  - Malaise
  - Night sweats
  - Weight loss
  - Night pain
  - Intravenous drug abuse
  - History of cancer
  - Compromised immune system
- Consider
  - Tumor
  - Infection
  - Septic arthritis
  - Osteomyelitis
  - Inflammatory condition

“Red Flags”

- A history of corticosteroid exposure or alcohol abuse
  - Risk for avascular necrosis.
- Others

Diagnostic Test | Potential Uses
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Magnetic Resonance Imaging | Labral tear
Magnetic resonance Arthrography | Labral tear
Plain Radiographs | Bone abnormalities including dysplasia and femoral acetabular impingement, osteophytes, joint space narrowing, articular cartilage degeneration and fractures
Bone Scan | Fractures, arthritis, neoplasm, infections and vascular abnormalities.
Computed Tomography (CT) Scan | Bone abnormalities
Ultrasound | Soft tissue and intraarticular effusion.
Intraarticular Injection | Confirm an intraarticular pathology
**Diagnostic Testing**

- **Plain Radiographs**
  - Bony abnormalities
    - Dysplasia
    - FAI
    - Osteophytes
    - Joint Space Narrowing
    - Articular Cartilage Degeneration
    - Fractures

**EXAMINATION**

**Test and measures**

- **Observation**
  - Examine general alignment of spine, pelvis and lower extremity including lumbar lordosis, iliac crest height, patellar position, varus/valgus at the hip or knee joints, heel position, and foot position.

  - Gait

**Functional Assessment**

- **Single Leg Stance**
- **Single Leg Squat**
- **Medial Hop**

Single Leg Stance Test

FAIL

No evidence of pelvic tilt, drop, or trunk compensation

Single Leg Squat

Symmetrical single leg squat

Medial Hop Test

Conclusion