Hip Pathology Young to Old

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Amazing Hip

Pelvis

- Elbow
- Ilium
- Pubis
- Acetabulum
- Femur
- Sacrum
Femoroacetabular Joint

- "Ball and Socket"
- Femoral Head and Acetabulum
- Synovial Joint
- Supports weight of the body
  - Statically
  - Dynamically
- Forces across the hip joint
  - 2.5x body wt standing on one leg
  - 5x body wt running

Acetabulum

- Confluence of the Ilium, Ischium, and Pubis
- Oriented inferiorly, laterally and anteriorly
- Fused to hip by
- Cup shaped
- Articular cartilage: horseshoe shaped
- Covers approx. 40% of ball

Femur

- Femoral head/neck
- Oriented superiorly, medially and slightly anteriorly
- Greater trochanter: Abductor attachment
- Lesser trochanter: Iliopsoas attachment

Femoral Neck Angle

- Angle between the axes of the femoral neck and shaft
- Changes in FNA can change the stress patterns on the hip joint
  - Coxa Norma – Normal
    - 125 degrees
  - Coxa Vara – Small Angle
    - <120
    - Associated with genu valgum (knock-kneed)
  - Coxav – Large Angle
    - >135
    - Associated with genu varum (bow-legged)

Labrum and Capsule

- Labrum
  - Rigid fibrocartilage around the rim of the acetabulum
  - Deepens the hip socket
  - Acts as a suction seal – contributes to stability
  - Regulates fluid in and out of the joint
  - Triangular in shape
- Capsule – envelope
  - Thick fibrous structure (0.7mm – 4.2mm)
  - Longitudinal and circular fibers
  - Ligaments enclose the hip
  - Primary source of soft tissue static stability

Ligaments

- Make up the hip capsule
- Prevent excessive ROM
  - Extra-articular ligaments
    - Iliofemoral (Y ligament)
      - Strongest in the body
      - Prevents adduction and IL
      - Prevents posterior flexion
      - Prevents internal rotation
      - Relaxed during sitting
    - Pubofemoral
      - Prevents IL
      - Maintains the hip
      - Prevents abduction and IL
      - Serves as tensioner
      - Serves as tensioner
    - Iliobial tract
      - Collar around femoral neck
    - Intracapsular ligaments
      - Ligamentum teres
        - Attached to the acetabular notch to the fovea of the femoral head
        - Supplies blood to the femoral head in infants
      - Alar ligaments
        - Attached to the acetabular notch
        - Supplies blood to the femoral head in infants
Blood Supply

- Three main blood supplies:
  - Retinacular vessels from the lateral femoral circumflex artery and inferior metaphyseal artery
  - Blood supply to bone ends with ligamentum teres artery
  - Ligamentum teres artery

Innervation

- Femoral Nerve
  - Originates L2-L4
  - Innervates all muscles of anterior thigh
  - Skin of anterior thigh, anteromedial knee, medial leg, medial foot

- Obturator Nerve
  - Originates L2-L4
  - Innervates muscles of medial thigh (except adductor magnus/pectineus)
  - Innervates obturator externus
  - Skin medial upper thigh

- Sciatic Nerve
  - Originates L4-S3
  - Largest nerve in the body
  - Common fibular and tibial nerve branch
  - Innervates muscles in the posterior thigh
  - Adductor magnus
  - All muscles in leg/foot
  - Skin lateral/medial side and sole of foot

- Gluteal Nerves
  - Superior – L4-L5
    - Gluteus medius, minimus and TFL
  - Inferior L5-S2
    - Gluteus maximus

Muscle of the Hip

- 27 Muscles cross the hip joint
- Extensor Group – Extension and abduction
  - Gluteus maximus
  - Gluteus medius
  - Gluteus minimus
  - Tensor fasciae latae
- Adductor Group – Abduction and hip flexion
  - Adductor brevis
  - Adductor magnus
  - Pectineus
  - Gracilis
- Rotator Group – Hip Rotation
  - Gluteus medius
  - Tensor fasciae latae
- Medial Rotator Group – Internal rotation
  - Adductor magnus
  - Sartorius
- Other
  - Rectus femoris – Hip extension, knee flexion
  - Hamstring muscles
History

- Timing of Symptoms
  - Acute (event)
  - Chronic/inflammatory

- Location
  - Groin - "C sign"
  - Deep
  - Gluteal or trochanteric
  - Deep vs. Superficial

- Quality
  - Sharp
  - Dull
  - Ache
  - Throb
  - Filigree

- Radiation
  - Anterior thigh
  - Buttocks
  - Lateral
  - Lumbar

Differential Diagnosis

- Lumbar pain
- Sciatica
- SI joint pain
- Piriformis syndrome
- Adductor tear
- GI issues
- GU issues
- Gynecologic problems

Radiographs

- AP
  - Sitting
  - Standing
Femoro-Acetabular Impingement (FAI)
- Described in literature for nearly 100 years
- More common in females
- Most common is mixed pattern
- Abnormal contact between the "ball and socket"
- During hip ROM (Flex, ADD, IR) non-spherical head and over covered socket hit or rub against each other
- Pinch the labrum
- Leading to degeneration or tearing of the labrum
- Can lead to labral tears and advancement of OA
- Three forms: Pincer, Cam and Combined

Pincer Lesion
- Prominent, non-covered socket, acetabular dysplasia or impingement
- More common in middle age females
- Anterosuperior – most common
- Acetabular retroversion
- Pincer all due to apophyseal traction injury and osteotomes
- Global over coverage – deepened acetabulum
Cam Lesion

- Non-spherical femoral head and neck
  - More common in females, athletes
  - Bimodal age
    - 20s
    - 40s
  - Higher incidence in high-impact sports
    - Basketball
    - Soccer
  - Etiology: possible due to stress at the lateral epiphysis of the femoral head during adolescence
  - Flexion - prominence of the head rotates into acetabulum, causing a shearing force on the acetabulum
  - Articular delamination, labral tearing, develop OA
  - Degree of pathology varies
    - Severity of pain
    - Intensity of equivocant

Combined Impingement

- Features of both Cam and Pincer
  - All patients with impingement
- Supraphysiologic motion with normal radiograph
  - Ballet
  - Gymnastics

Signs and Symptoms

- Acute Event or Insidious onset
- Groin Pain - dull or sharp
- "C sign" - pain deep between fingers and thumb
- Lateral Pain
- Catching, locking or clicking
- Giving way
- Worsening pain:
  - Prolonged sitting, standing, walking
  - Stair climbing
  - In and out of car or low chair
  - Putting on shoes/socks
  - Rotational activities

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Physical Exam
- Inspection
  - Leg length discrepancy
  - Pica
  - Erythema
  - Ulcers
- Stance/Gait
  - Antalgic gait
  - Trendelenburg gait
  - Single leg stance
- Palpation
  - L-spine
  - SI joints
  - Ischium
  - Iliac crest
  - Greater trochanter
  - Trochanteric bursa
  - Masses
  - Pulse palpation

Hip Physical Exam
- Range of motion
  - Flexion
  - Extension
  - Abduction
  - Adduction
  - Internal rotation: 20-35
  - External rotation: 45-65
- Neurovascular
  - Motor strength
  - Sensory L2-S1
  - DTRs
  - Vascular assessment

Objective/Physical Exam
- Reduced hip flexion, IR and adduction
- Weakness of gluteus medius, minimus and function
- Pain with palpation:
  - Iliopsoas
  - Gluteals
  - External rotators
  - Tensor fascia lata
- Special tests:
  - Anterior impingement test (FADDIR – flexion, adduction and internal rotation)
  - Complain of deep groin pain with decreased ROM
Lateral/Abduction Impingement Test

Posterior Impingement Test

FABER
- Graig - Bicipital strain/impingement
- Posterior - SI joint
- Lateral - greater trochanteric space syndrome

X-Rays
- Cam Impingement
  - Cam bump
  - Alpha angle
  - Contour of femoral head
    - >50-55 degrees

Pincer Impingement
- Crossover sign
- Focal over coverage (focal retroversion)
- Global over coverage (coxa profunda or protrusio)

Combined Impingement
- Lateral center edge angle: Degree of acetabular coverage over the femoral head
  - Normal: 25-40
  - Borderline: 20-25
  - Dysplasia: <20
  - Over covered: >40

**MRI Findings**

- Most accurate modality: MRI Arthrogram
- Obtain if concerned of a labral tear
- +/- Labral tear
- +/- Cartilage injury
- +/- Stress fracture
- Predicts outcomes of arthroscopy based on state of cartilage

**Treatment**

- NSAIDs
- Activity modification
- Physical therapy
  - Minimum 6-12 weeks
  - 2-3 x/wk with HEP
- Diagnostic intra-articular injection
  - 1% lidocaine
- Arthroscopic surgery
  - 3-4 month recovery
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  - 1% lidocaine
- Arthroscopic surgery
  - 3-4 month recovery
Intra-articular Injection

- 1% Lidocaine
- Lidocaine + Corticosteroid
- Hyaluronic Acid

Physical Therapy

- Proprioceptive/balance training
- Functional training
- Manual therapy
- Flexibility training
- Strength training
- Aerobic/endurance training
- Return to sport training
  Focus on the back, core and dynamic hip-stabilizing muscles
Labral Tear

- Tear of the ring of cartilage around the acetabulum
- Disruption of the hip's suction seal
- Decreased stability
- Decreased lubrication
- Acute or chronic
- May progress to degenerative changes of the acetabulum/femoral head

Signs and Symptoms

- Deep, sharp groin pain
- May radiate down thigh/leg
- Clicking
- Catching
- Locking
- Sense of instability
- Weakness
- Decreased athletic performance
Radiographic Findings

- Similar to FAI
- Cam, Pincer, Combined
- Calcified Labrum

MRI

Treatment

- Extensive conservative treatment (3 months)
- NSAIDs
- Activity modification
- Physical therapy
- Arthroscopic surgery
  - 4-6+ month recovery
Dysplasia

- Congenital condition
- Acetabulum is shallow
  - Under coverage of femoral head
- Weight-bearing surface of hip is overloaded
- May progress to:
  - Instability
  - Labral damage
  - Early-onset Osteoarthritis (OA) – Total Hip Arthroplasty (THA)

Developmental causes:
- Injury in utero or early childhood
- Infection in utero/early childhood
- Position in the uterus

Risk Factors:
- Females
- First born
- Larger birth weight
- Breech position
- Family history

Sign and Symptoms
- Constant, aching pain
- Groin pain
- Buttock pain
- Increased catching or locking
- Difficulty walking
- Instability
- Extreme flexibility
Physical Exam
- Antalgic gait
- Difficult standing on one leg
- Leg length discrepancy
- Pain with ROM
- Diminished ROM

Imaging
- X-rays: assess bony abnormality
- MRI: assess cartilage damage and injury to the joint

Treatment
- May depend on the severity
- Conservative:
  - NSAIDs
  - Activity modification
  - Physical Therapy
- Arthroscopic Surgery: Mild to Moderate
  - LSOA 20-25
  - Debridement lesions
  - Tightening superior ligaments
  - Bony pathology left untreated
  - Good short-term outcomes
- Periacetabular Osteotomy (PAO): Moderate to Severe
  - Open without arthroscopy
  - Focusing on mechanical alignment without reconfiguring the native structures

http://www.americanhipinstitute.org/peri-acetabular-osteotomy.html
PAO

- Minimal to no articular damage
- Labral tears may be treated during the PAO or with hip arthroscopy
- MRI can be used to determine the articular damage for surgical planning
- Increased articular damage have a higher rate of failure
  - Arthroscopy
  - THA

Snapping Hip – Coxa Saltans

- Iliopsoas complex
- Iliacus – Originates from iliac crest
- Psoas – Originates T12-L5 vertebral bodies
  - Major
  - Minor
- Combined insertion on the lesser trochanter
- Primary Function
  - Hip Flexion
- Secondary Function
  - Femoral ER
  - Lateral bending
  - Flexion
  - Balance of the trunk
- Common in dance, football, hockey and soccer
- More common in girls/women

S & S

- Snapping of iliopsoas tendon over the Superior aspect of the pubis or joint
- Pulsatile, audible or palpable snapping in groin
- Groin pain with radiation
Active iliopsoas snapping test
- Palpate groin for snapping
  - May occur at 30-45 degrees of flexion
- Strength testing
  - Resisted hip flexion in sitting position

Radiographic Findings
- X-rays
  - No specific findings
- MRI
  - Associated chondral/lateral injury
  - Present in 67-100% of symptomatic iliopsoas snapping
  - Inflammation associated with iliopsoas tendinitis

Treatment
- Conservative
  - NSAIDs
  - Activity modification
  - Physical therapy
- Arthroscopic surgery
  - Iliopsoas lengthening
**Arthroscopic surgery**

- Arthroscopic lengthening of the iliopsoas tendon
- 3 Levels:
  - Central - 40% tendon/60% muscle belly
  - Peripheral - 53% tendon/47% muscle belly
  - Lesser trochanter - 60% tendon/40% muscle belly

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**Trochanteric Bursitis**

- Inflammation of the bursa overlying the greater trochanter
- Pain near lateral aspect of the hip
- May be early sign of gluteus medius tear
- Earlyaign to energy
- More common in women
- Acute
  - Trauma
- Chronic
  - Repetitive micro injuries of the soft tissue/bursa
  - Iliotibial band friction

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S & S

- Chronic aching of lateral hip
- Localized tenderness
- Increased with hip abduction or external rotation
- Worsened with prolonged weight bearing or deep flexion (car or chair)
- Pain with sleeping on affected hip
- Occasional radiation pain

PE

- Palpation: lateral decubitus
  - Localized to greater trochanter
  -Posteroinferior aspect of gluteus medius insertion
- Gait
  - Global limp
- Patrick/FABER (flexion, abduction, external rotation and internal rotation)

Radiographic Findings

- X-ray
- MRI
  - Fluid
  - Abductor tendon tear present in 50% of patients with recalcitrant trochanteric bursitis
Treatment

- Conservative
- Medications
- Activity modification
- Physical therapy
- Cortisone injection
- Arthroscopic surgery

Abductor Tear

- Gross findings:
  - Abduction at the greater trochanter
  - Superomedial facet
  - Subscapularis
  - Greater trochanteric bursitis
  - "risk off the leg"
  - Greater incidence in elderly women

S&S

- Similar symptoms to trochanteric bursitis
- Labral tear pain
- Weakness with abduction
- Trendelenburg gait
PE
- Ober Test
- Extension – TFL contracture
- Neutral – gluteus medius contracture
- Flexion – gluteus medius contracture
- Resisted Abduction strength testing
- Trendelenburg’s test
- Resisted internal rotation test
  - Gluteus minimus is the only internal rotator of the hip

MRI

Treatment
- Conservative
  - PT
  - Activity modification
  - NSAIDs
- Corticosteroid injection trochanteric bursa
- Endoscopic vs open surgery
Osteoarthritis

- Loss of articular cartilage
- Primary
  - Idiopathic
- Secondary
  - Injury during childhood
  - Unrepaired dysplasia or FAI
  - Trauma
  - Osteonecrosis
  - Previous joint infection
  - Other

S&S

- Gradual onset of pain
  - Anterior thigh
  - Groin
- Referral pain
  - Direct thigh
  - Knee
- Pain with activity progresses to pain with rest, night
- Progressive decrease ROM
- Antalgic gait

PE

- Loss of ROM
  - IR-Earliest
  - AB
- Flexion contracture
- Antalgic gait
- Abductor lurch
  - Swaying trunk over affected hip
PE

- Straight Leg Test
- Logroll Test

Radiographic Findings

- X-Ray
  - Joint space narrowing
  - Osteophytes
  - Subchondral cyst
  - Subchondral sclerosis

- Tonnis Classification
  - Grade 0: None
    - No signs of OA
  - Grade 1: Mild
    - Increased sclerosis
    - Slight joint narrowing
    - No to slight loss of head shape
  - Grade 2: Moderate
    - Small cysts
    - Moderate narrowing
    - Moderate loss of head shape
  - Grade 3: Severe
    - Large cysts
    - Severe narrowing/obliteration
    - Severe deformity of head

Treatment

- Activity modification
- NSAIDs
- Pain medication
- PT
- Nonweight-bearing exercise
- Extra-articular injections
  - Corticosteroid
  - Hyaluronic acid
Treatment

- Advantages
  - 4-6" incision
  - Less damage to major muscles
  - Less postoperative pain
  - Quicker postoperative recovery
  - Decreased risk of hip dislocation
  - Improved ROM

- Disadvantages
  - Injury to lateral femoral cutaneous nerve

Anterior THA

Case Study #1

- HPI:
  - 20 year old female college soccer player. 3 years of right hip pain with sudden onset. Described as a burning, rarely a sharp, did not hurt while playing soccer. In the last 6-9 months pain with going up stairs.

  - Described the pain in the groin area. Pain increased with walking and running, but did not radiate. Denies pain with anterior thigh. Does not experience pain with sitting, standing, or lifting.

  - Has pushed through the pain and continued playing soccer. Has not missed any games. Denied not missing practices.

  - Discussed pain with athletic trainer. Trainer began stretching, strengthening modalities. Minimal improvement.
Physical Exam

- Normal gait
- Range of motion:
  - Internal rotation: 20 degrees
  - External rotation: 65 degrees
  - Flexion: 120 degrees
  - Extension: 10 degrees with tightness
- Palpation:
  - Mild pain in the posterior facet of her trochanter
  - Mild tenderness to palpation around her ischial tuberosity

Special Tests:
- Positive FADIR test
- Positive FABER test
- Snapping and pain with iliopsoas snapping maneuver
- Mild pain with abduction
- Positive Ober test
- Tight hamstrings
- Strength:
  - Mild weakness with resisted abduction
  - Otherwise WNL
- Neurologic/Vascular:
  - Otherwise WNL

Radiographs

- LCJ angle: 31 degrees
- Alpha angle: 60 degrees
- Tonnus grade 0

MRI

- Anterior superior labral tear
- Intact cartilage
Assessment

- Femoroacetabular impingement
- Labral tear
- Hip flexor snapping
- Secondary iliopsoas bursitis, IT band and hamstring tightness

Plan

- Motrin 7.5mg QD x 6 weeks
- Shut down from soccer x 1 month
- Physical therapy on campus 6 days/week x 3 months
  - Stretching
  - Strengthening
  - Core stabilization
  - Modalities
- Progress soccer related activities as tolerated
- Follow up in 3 months

3 Month Visit

- Minimal improvement in pain
- Was able to progress to all soccer drills with 少数 participation
- Improvement in strength/feasibility
- Continued doing physical therapy for impingement, labral tear and hip flexor tightness
- Proceeded with arthroscopic surgery
Capsular Plication

Other Surgical findings: Chondral Defects/Delamination

Pincer Lesion
Case Study #2

- 66 year old female complaining of right hip pain for 15 months. Very active walking 6-7 miles/day, yoga 6 days/week, swimming 3 days/week and light weight training 4 days/week.
- Saw PCP 8 months ago. Activity modification. Physical therapy 4 months ago. Activity with knee progression. Abduction pain 4 months ago. NSAID PRN.

Physical Exam

- Antalgic gait with cane
- Range of motion:
  - Diminished compared to the contralateral side
  - Internal rotation - 5 degrees
  - External rotation - 10 degrees
  - Flexion - 90 degrees
  - Extension - 0 degrees
- Palpation:
  - Slight pain greater tuberosity
- Special Tests:
  - Positive log roll test
  - Positive Stinchfield test
- Strength:
  - Weakness with resisted abduction
  - Otherwise WNL
- Neurologic/Vascular WNL

Radiographs
Assessment/Plan

- Assessment: Right hip OA (Tonnis grade III)
  - Too much OA to consider arthroscopy
  - Less than 2mm of joint space predicts conversion rate of %0% to THA within 2 years

- Plan: THA vs Corticosteroid/hyaluronic acid injection, PT
- Proceed with total hip arthroplasty anterior approach