# Femoroacetabular Impingement - Evaluation and Treatment

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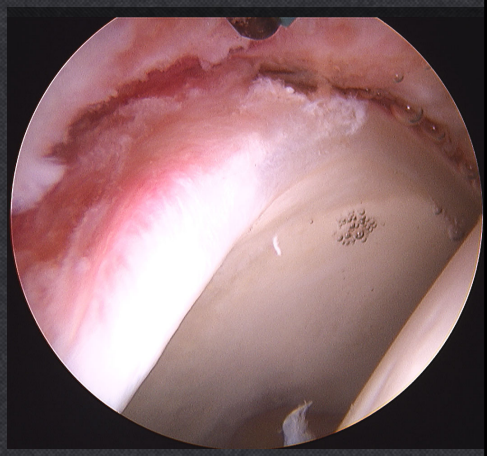
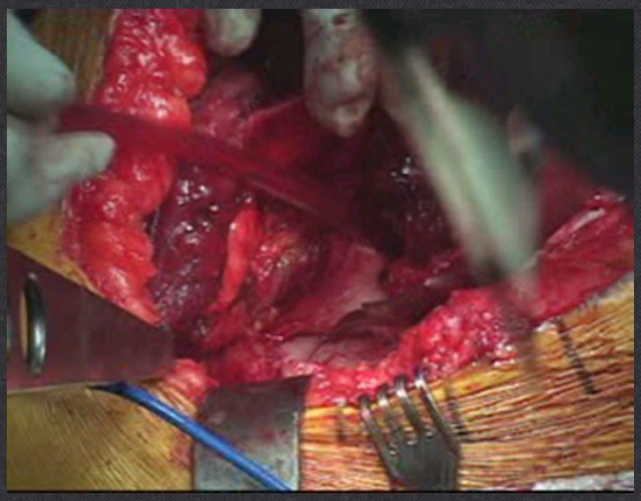
# Anterior Hip Pain and Femoroacetabular Impingement - FAI

## Differential for anterior hip pain

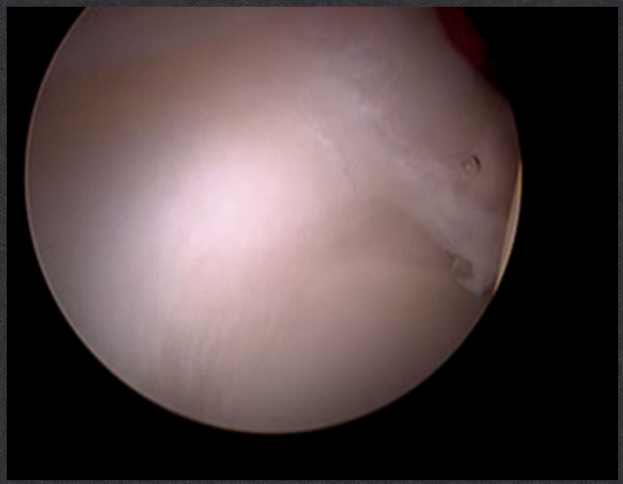
- "Groin pull"
  - Strain of hip flexor, adductor
- AVN
- Arthitis
  - Osteo vs rheumatologic
- Hernia
- True groin (inguinal hernia) vs sports hernia
- Urologic / gynelogic pain
- Hip impingement

- Bony "impingement" causes damage to the labrum and/or acetabular articular cartilage in the anterior / superior half of the acetabulum
- Both structures involved since the acetabular labrum is confluent with the articular cartilage





## Arthroscopic View



# Patient History

- 2nd-6th decades
- Typically insidious onset
  - Most do not recall specific trauma
- "C" sign for location
- Constant low level ache with sharp, intermittent groin pain
- Pivoting/twisting painful
- Pain with activity (sometimes during or often after)
- Better with rest
- "Ceiling effect" – can't get all the way back
- Intercourse painful
- Sitting painful
  - long car rides, sitting in class or work – need to get up and move about
- *Pain waxes/wanes, generally gets worse over time – true FAI generally does not resolve spontaneously*

# History

- ***Absence of groin pain does not preclude an intraarticular hip injury***

# Physical Exam

- Thorough PE will result in accurate diagnosis in most patients
- Gait
  - Possible - Antalgic shortened stance phase, weak abductors (single leg stand), chronic condition, overlap with glute med
  - Be wary of pronounced antalgic gait (chronic pain, BWC etc)
- ROM (side to side comparison)

Decreased IR, especially with large cam lesion

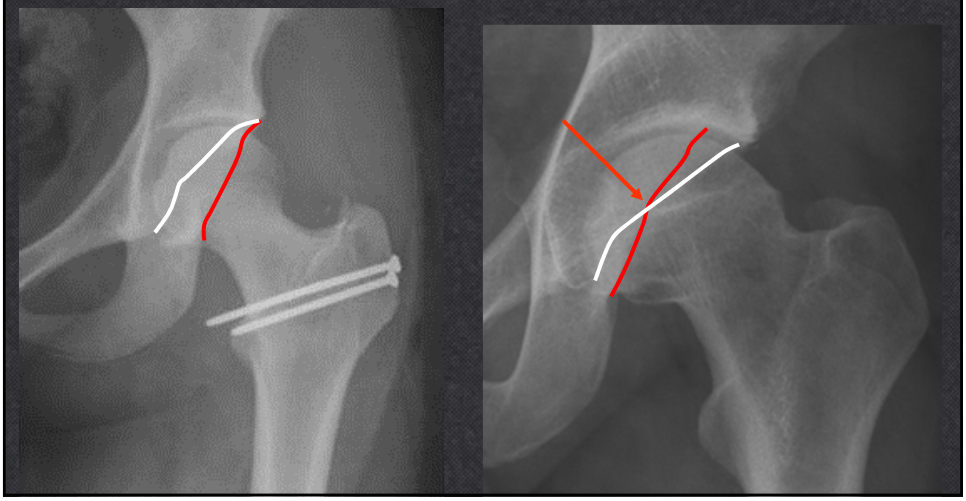
# Physical Exam

- Pain
  - Flexion (often not painful, subspine impingement)
  - Flexion-Adduction-IR: *Impingement Test*
  - Circumduction (*McMurrays of the hip*)
  - FABER (lateral posterior hip pathology, large cam lesion)
  - Abduction (restricted with large cam)
- *For true positive test – The motion must recreate the location of the pain "Is this your pain?"*

## Other Diagnosis to Rule Out:

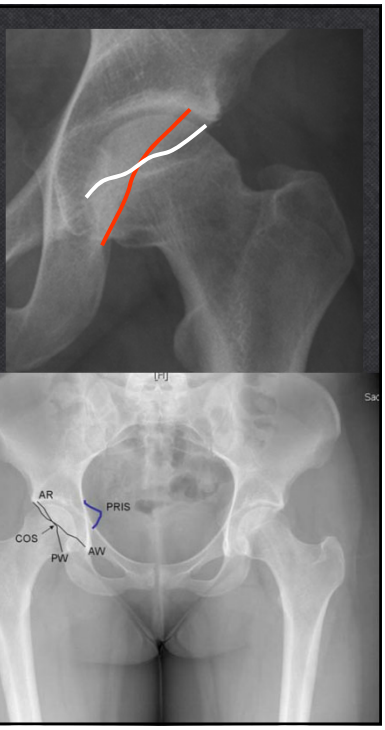
- **Anterior / Groin Region:**
  - Inguinal hernia / Sports hernia
  - Adductor strain
  - Osteitis Pubis
  - Psoas tendonitis (rubs over labral tear) / snapping internal hip
- **Trochanteric Region:**
  - Snapping external hip / IT band
  - Troch Bursitis
  - Gluteal cuff (miniumus/medius) tendinopathy, tears (partial / full thickness)
- **Posterior / Gluteal Region:**
  - Piriformis tendonitis / sciatica
  - Ischio-femoral impingment / quadratus tendonitis
  - SI joints / Low back
  - Radicular pain
- **Other lower extremity:** pathology / limb mal-alignment

## Radiographic Assessment: Acetabular Version



# Acetabular Abnormalities

- Mild retroversion or anterior wall overcoverage
  - Crossover sign
  - Ischial spine sign




Kalberer et al, Clin Orthop Relat Res 2008;466:677-83.

# Acetabular Abnormalities

- Center Edge Angle = 30 (25-35)
- >35-40: Pincer Deformity
- 20-25 Borderline dysplasia
- < 20 dysplasia

# Pincer Impingement

- Linear impact of the acetabular rim against the head-neck junction in a local (*anterior wall overcoverage*) or global (*protrusio*) overcoverage of the acetabulum

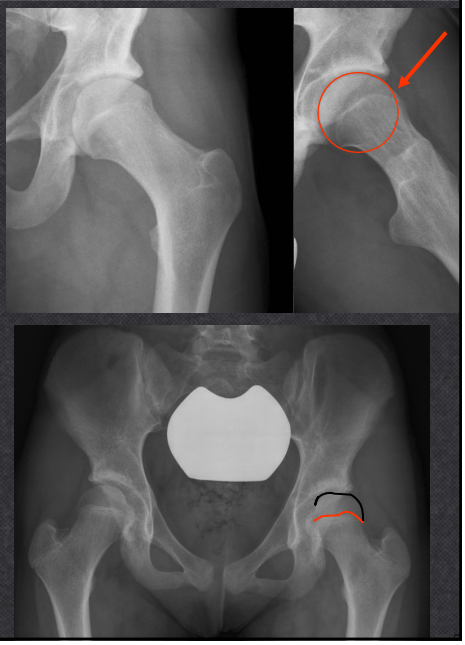
# Femoral Abnormalities

- Poor offset anterolateral head/neck

Subclinical SCFE

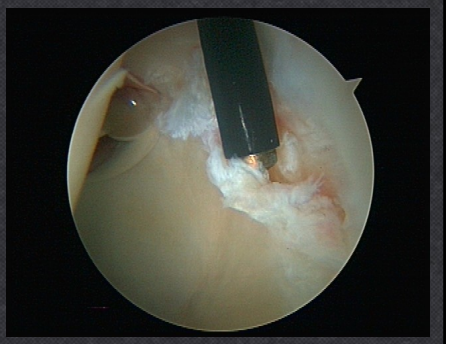
High fovea with transverse physeal scar

- Prominent anterolateral femoral head-neck junction

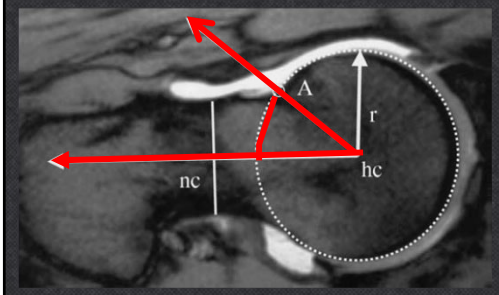


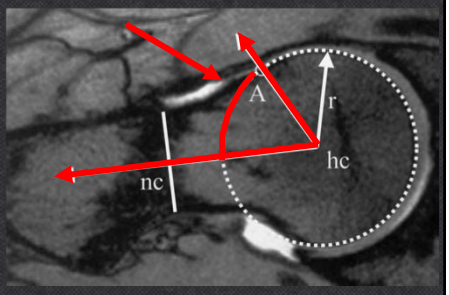
# CAM Impingement

- Jamming of a nonspherical extension of the femoral head into the acetabular cavity
- Creates extensive chondrolabral delamination
- Associated with progressive early onset osteoarthritis



# Offset measurement

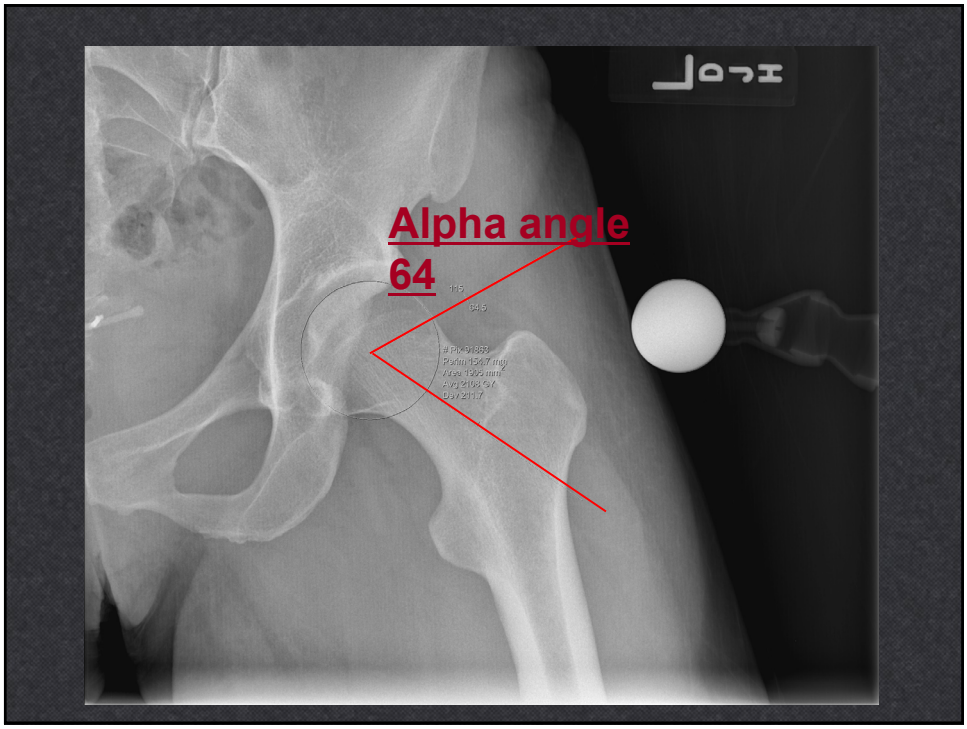



- Alpha angle
- "Normal" < 50
- > 50 greater chance of CAM Impingement

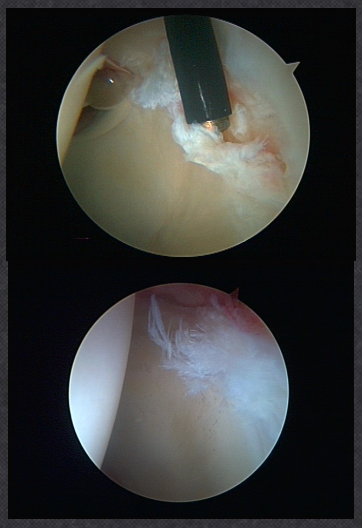
- Axial oblique MRI
- Dunn lateral view
- 3d CT

Notzli et al, J Bone Joint Surg(Br) 2002
Clohissy et al, Clin Orthop Relat Res 2007




# Impingement Damage Patterns

- CAM
  - Acetabular articular injury
    - Softening → Delamination
    - "wave sign"
- PINCER
  - Labral pathology: "crush"
- *>70% combined deformity*



Beck et al, J Bone Joint Surg(Br) 2005;87:1012-18

# Diagnostic Injections

Perform when suspected intraarticular pathology but with non-definitive history and exam, (Patient pain diary, EUA often helpful)

Relief → Evident of an intraarticular problem

No relief → Look for an Extraarticular component to pain (think tendinopathy, neuropathic, GI / GU etc)

# 3D CT

- Defines anatomy – correct pelvic tilt, assess femoral torsion, acetabular version, AIIS prominence / subspine impingement
- Very helpful for revision or large deformity cases

# MRI

- **Define**

  chondral / labral injury (arthrogram most definitive)
- **Rule out**

  bone lesion, avn, stress fracture, pelvic mass, high grade tendinopathy
- **Stage**

  chondral damage (Helpful to rule in / out for surgery), assess for subchondral cyst / bone marrow lesion

# Treatment: Non-Operative

- Core strengthening program – paraspinals / abdominals / gluteals to improve posture / decrease pelvic tilt
- Positional avoidance / activity mod

  (standing desks at work)
- NSAIDs
- Injections – joint/bursal/psoas
- Low impact -- Elliptical / bike / pool

Fair success

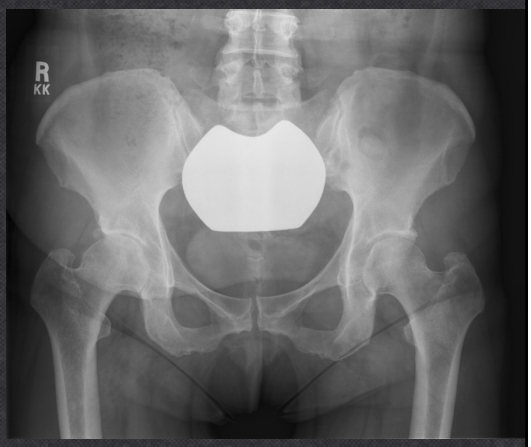
- Ceiling effect often seen – unable to get fully back

# Surgical Options for FAI

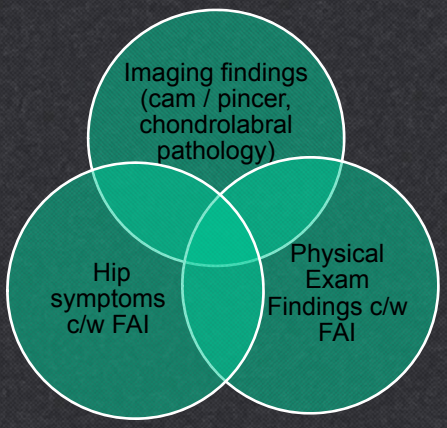
- Labrum: suture anchor repair vs debridement, reconstruction
- Articular injury: chondroplasty, if unstable/ possible microfracture
- Pincer deformity: Recess anterior wall, Supspine (AIIS) decompression, os acetabuli excision
- CAM deformity: Osteoplasty of femoral neck

# Contraindications to Arthroscopy

- Arthritis with joint space narrowing, Tonnis 2 or greater
- Age > 60
- Inflammatory arthropathies
- Complex pain pattern, not clearly intra-articular, chronic disability / deconditioning – unable to adequately perform postop rehab



## Femoral Acetabular Impingement as Clinical Syndrome




# Extra-Articular Hip Injuries

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# Disclosures

- No relevant financial disclosures.

# Hip Girdle Pain Differential

- Intra-Articular Pain- Not focus of this talk
  - FAI
  - Dysplasia
  - Labral tear
  - Articular cartilage injury
  - Arthritis
  - Insufficiency fracture
  - Bone Marrow lesion

# Hip Girdle Pain Differential

- Anterior
  - Adductor injury
  - Athletic Pubalgia/Sports Hernia
  - Osteitis Pubis
  - Internal Snapping Hip
  - Stress Fracture
  - Hip Flexor/rectus tears
  - Sartorius avulsion

# Extra Articular Hip Injuries

- Lateral
  - Greater Trochanteric Pain Syndrome
    - IT Band
    - Trochanteric Bursitis
    - Gluteal tendinopathy
  - Piriformis

# Extra Articular Hip Injuries

- Posterior
  - Intra-Artic “C-sign”
  - Proximal Hamstring
  - Gluteal muscles
  - Piriformis
  - Sciatic/radicular pain
  - SI joint
  - Lateral Fatigue Pain

# Extra Articular Hip Injuries

- Other non-MSK causes of “hip” pain
  - Ob/Gyn
  - Urology
  - Hernia
  - Gastrointestinal
  - Lumbar Radiculopathy

# Extra Articular Hip Injuries

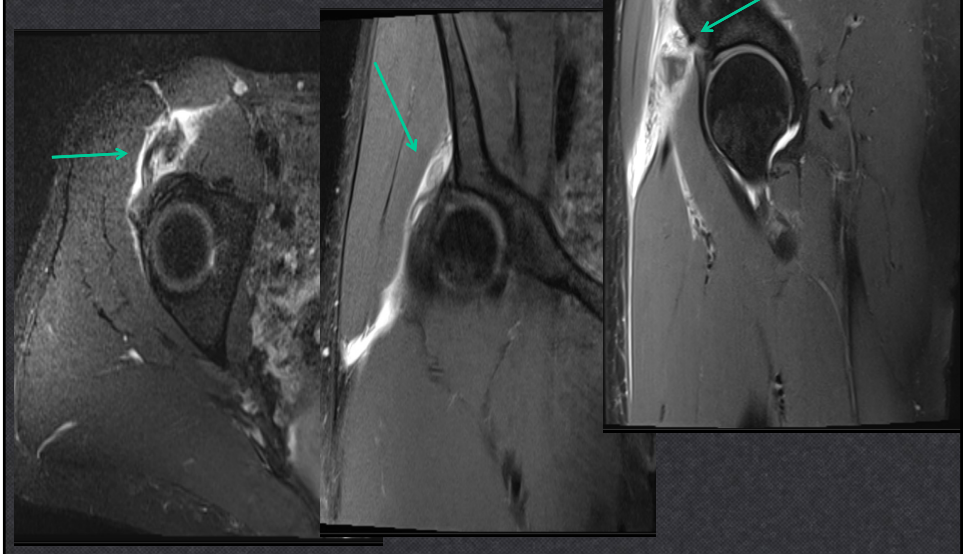
- Hip Flexor and Adductor Injuries
  - Typically Acute Event
  - Gymnastics or Martial Arts on occasion
  - Soccer Athletes
  - Typically treated conservatively
  - Rare need to fix large displaced rectus avulsion

# Hip Flexors and Adductors

- Acute injuries typically resolve with appropriate non-surgical care
  - Rest, Therapy, Rehab, slow RTP program
- Occasional indications for surgical repair
  - Large acute retracted rectus avulsion
  - Recalcitrant adductor injuries

## Rectus Femoris Avulsion

- 37yF CrossFit athlete



## Sports Hernia/Athletic Pubalgia

- Typical presentation is more ache, less sharp pain
  - Similar location to IA pain (may co-exist as well)
  - Tender superficially along inguinal area
  - Pain with resisted sit-up one of most sensitive tests
  - Imaging can be challenging
    - Dynamic Problem
    - Ultrasound
    - MRI
  - May need eval by Gen Surg for hernia or muscle repair
  - May overlap with FAI or adductor injuries and require combo treatment

# Osteitis Pubis

- Inflammation of pubic symphysis and adjacent bone/tendon insert- see on XR and MRI
- Soccer, football, hockey, runners
- Repetitive microtrauma
  - ✓ Kick, Abduct, Adduct
- Vague ill-defined pain
- Tender to palpation at ramus and symphysis
- Vast majority resolve with non-op care

# Stress Fractures

- Commonly people ramping up activity
  - Military recruits
  - Long-distance running/Couch to 5k
  - Athletes changing sports/beginning of season
- XR good first step- can show cortical thickening or beak
- MRI- edema pattern and fx line evident
- Tension sided more concerning than compression sided

# Stress Fractures

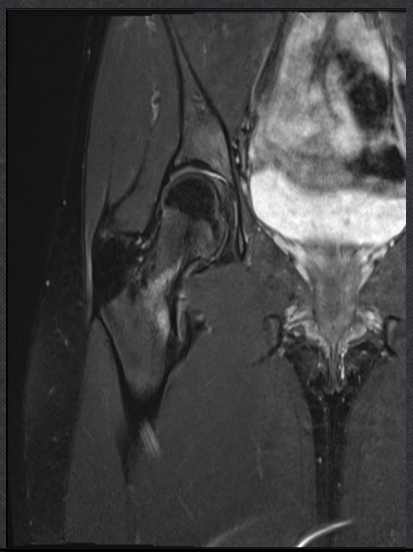
- Typically treated with protected WB and shut-down
- Ensure appropriate nutrition and hormonal status
  - Endocrinology/Dietician/Dexa Scan may be indicated
  - "Female Athlete Triad"
- Surgery indications
  - Stress fracture or stress reaction fail conservative tx
  - Compression side >50% fracture line or progression
  - Tension sided with fracture line on XR or MRI
    - High risk for displacement- worse surgery/outcomes

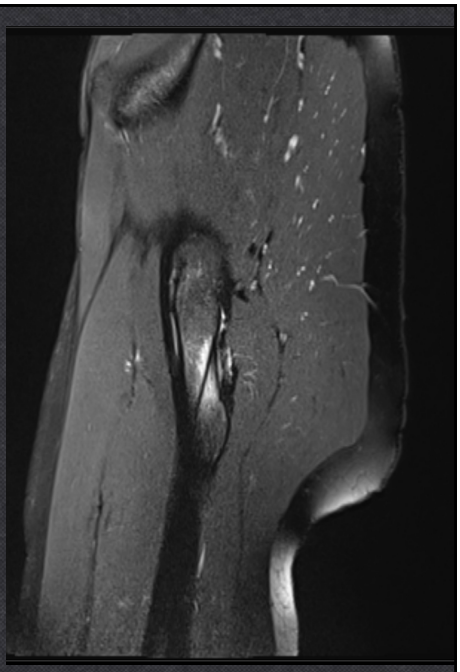
# Stress Fractures

21yF Collegiate distance runner/XC

# Stress Fractures

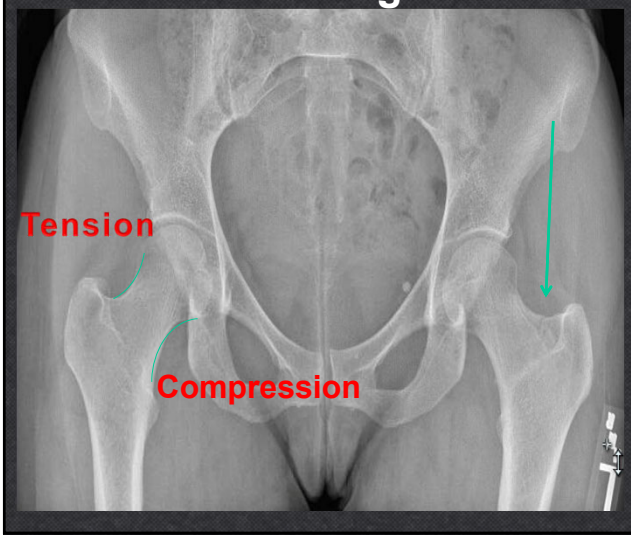
21yF Collegiate distance runner/XC



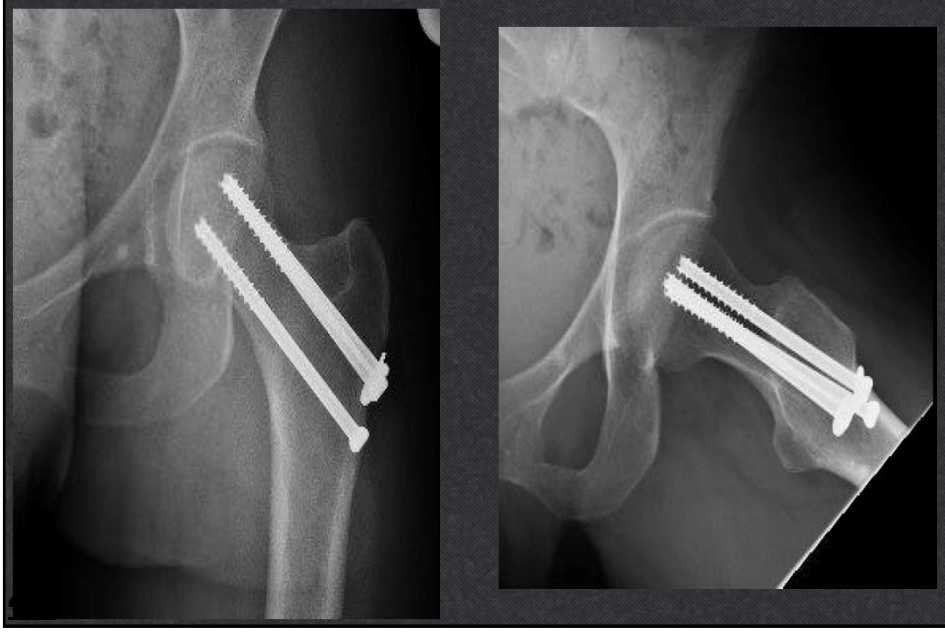


# Stress Fractures

31yF Boston Marathon Training




# Stress Fractures



# Lateral Pain

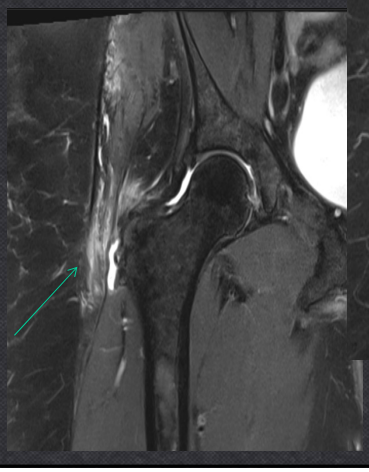
- Greater Trochanteric Pain Syndrome
  - Troch bursitis, gluteal tendinopathy/tear, IT band pain
  - Can be related to IA pain- “Lateral fatigue pain”
  - Diagnosis: Based on history and physical exam
    - Lateral sided complaints, lay on side at night
    - Pain with lateral palpation
    - Weakness or pain with resisted abduction
    - Pain/weakness with single leg stance (stork)
      - Inability to maintain pelvis level
    - Imaging secondary

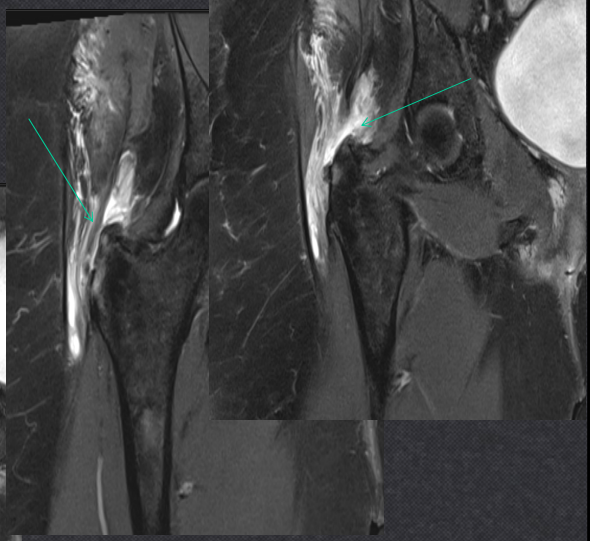
# Lateral Pain

- GTPS
  - Non-Op Treatment
    - PT/HEP, tendon loading modification, posture
    - Inject with CS vs PRP (increasing evidence)
    - Tenex
  - Surgery
    - Mini open vs scope
    - IT band window +/-
    - Bursectomy

# Lateral Pain

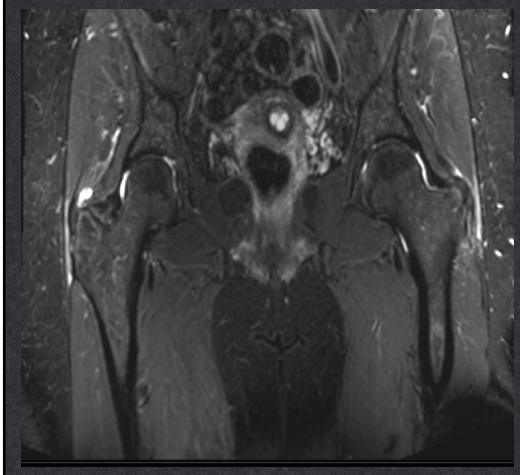
- Gluteal tendon tear
  - Bursitis
  - Surgery

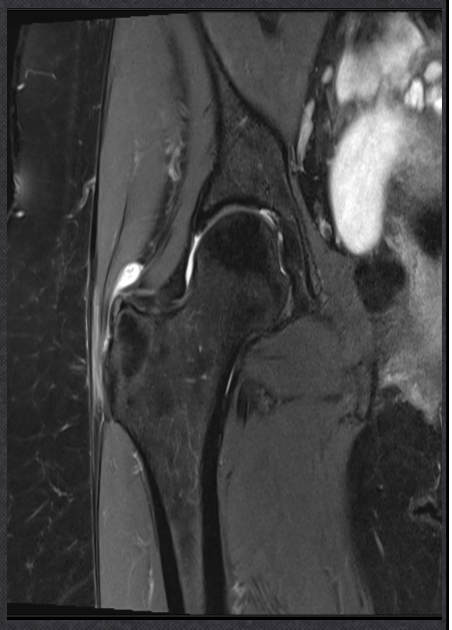




# Lateral Pain

- Bilateral lateral pain
  - Tendinopathy/Bursitis- Tenex





# Extra Articular Hip Injuries

- Posterior Pain
  - Can be intra-articular – "C sign"
  - Spine/radicular- overlap with hip pain common
    - "Hip-Back Syndrome"
  - SI joint
  - Piriformis pain- difficult to dx and to tx
  - Gluteal pain
  - Proximal hamstring
  - Pelvic floor

# Extra Articular Hip Injuries

- Proximal Hamstring Tears
  - Increasingly recognized
  - Increasingly treated surgically
    - Acute vs Chronic
    - Partial vs Full
    - Retracted vs non-retracted
    - Patient activity level

# Typical presentation/history

- Acute injuries
  - Most athletes recall audible or palpable “pop”
  - Position of hip flexion and knee extension
  - Pain felt in the posterior aspect of thigh
- Few athletes complain of progressive tightness
  - Chronic proximal injuries may complain of sitting pain
- Loss of flexibility and difficulty with walking smoothly also common

## Mechanism of Injury

- Function
  - Extends Hip
  - Flexes Knee
  - Decelerates tibia when hip is rapidly flexed
- Acute injury
  - Eccentric contraction
  - Knee extended
  - Hip flexed

## Physical Exam

- Posterior thigh ecchymosis in acute injuries
- Stiff-legged gait common
- Palpation may demonstrate tenderness or defect
- ROM
- Strength- resisted knee flexion and hip extension

# Imaging

- Plain radiographs often negative
  - Exception is ischial tuberosity avulsion injury pattern
- Dynamic Ultrasound
  - Can be performed immediately, in-office
  - Can directly correlate with PE findings
- MRI
  - Most common
  - Precisely identify severity, location, number of tendons involved, chronicity, retraction, bone injury

# Treatment

- Non-op Vs. Surgical treatment decision
  - Acute Injuries
    - Surgical treatment indicated with 2 tendon tears >2cm retraction or 3 tendon complete tears
    - Non-Op treatment indicated for single-tendon injuries or those with <2cm of retraction
    - Patient factors such as age, non-compliance, activity level may affect decision process
    - Early recognition and treatment ideal

# Treatment

- Non-Op/Therapy
  - May be best for less active patients, obese, non-compliant with postop restrictions
  - Activity modification, NSAIDs, PT
  - Modalities: Ultrasound, shockwave, e-stim, edema control
  - Begin core, hip, quad program as symptoms allow
  - At least 6 weeks for initial healing
  - Pain, knee flexion and hip extension weakness can persist for months despite rehab

# Treatment

- Non-Op/Therapy
  - Full return to sport when pain free and strength within 1 grade of contralateral side
  - Long-term complication include sitting pain and “hamstring syndrome”

•Scarring of proximal hamstrings to sciatic nerve

•Cause of chronic pain in posterior buttock with activity, sitting, and hamstring stretching

# Treatment

- Conditioned Serum/PRP
  - Has shown good efficacy
  - Used for injection of chronic proximal tears with excellent success return to sport
  - Has also been shown to work well in partial injuries undergoing rehab and decrease the time to return to play
  - Needle fenestration may also be employed

# Treatment- Surgical Indications

- Surgical
  - Acute 2 or 3 tendon tears
    - Retraction >2cm
  - Chronic injuries/Partial tears
    - Occassional if fail non-op care, persistent symptoms
    - Complete, no retraction
    - Partial/incomplete
    - Overuse

# Treatment- Surgical Indications

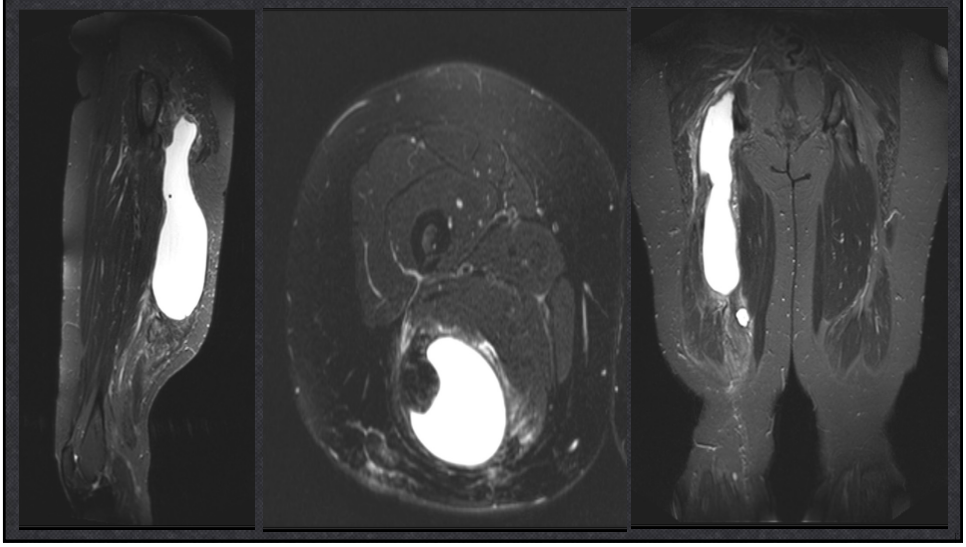
- Chronic – complete, retracted
- Surgical treatment
  - More technically challenging
  - Less optimal functional and symptomatic results
  - More complications
  - Must discuss risk / benefit ratio

# Treatment

- Post surgical rehab- Essential
- Protected Weight bearing
- Brace for restricted ROM??
  - Only if high-tension repair
- Slow advance of PROM
- Gradually increase WB/AROM
- Sport-specific train- 3mos
- Full return to play
  - 6-10 months

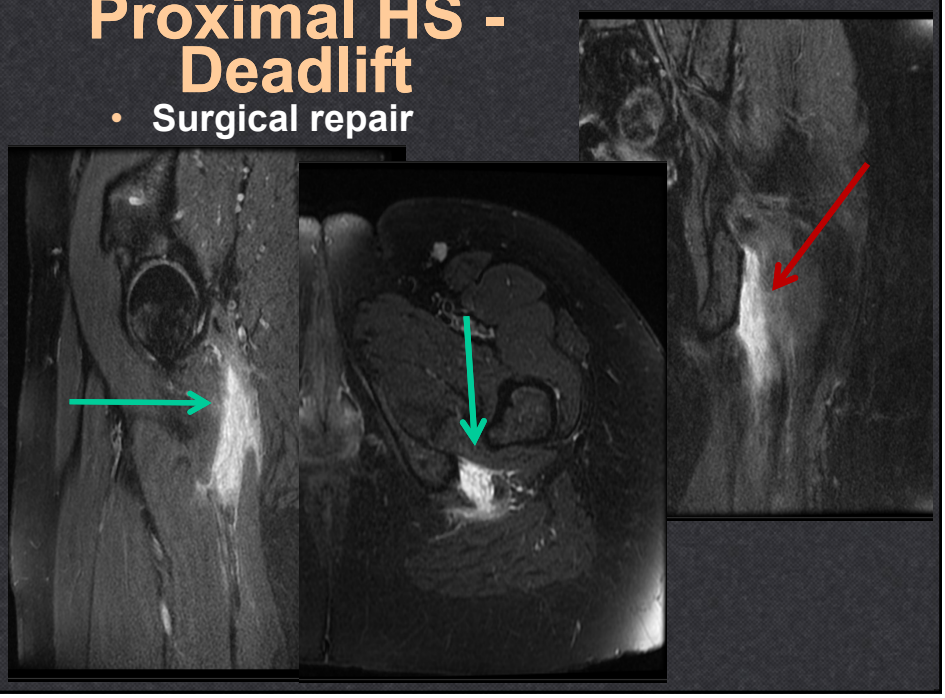
# Proximal HS - Slip and fall on ice

- Surgical repair and hematoma evacuation



# Proximal HS - Deadlift

- Surgical repair



# Proximal HS - recreational runner

- Treated with PT, rest, PRP and fenestration