

# **Femoroacetabular Impingement - Evaluation and Treatment**

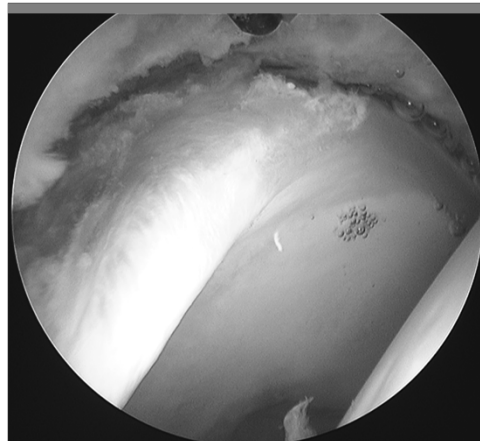
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**Division of Orthopaedics**  
**The Ohio State University Wexner Medical Center**

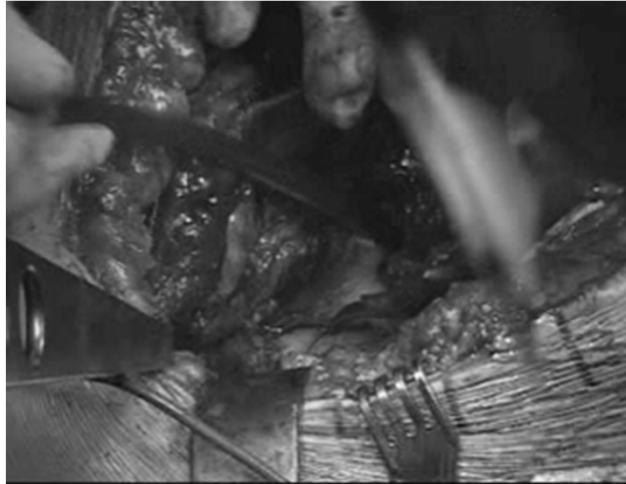
## **Anterior Hip Pain and Femoroacetabular Impingement - FAI**

## Differential for anterior hip pain

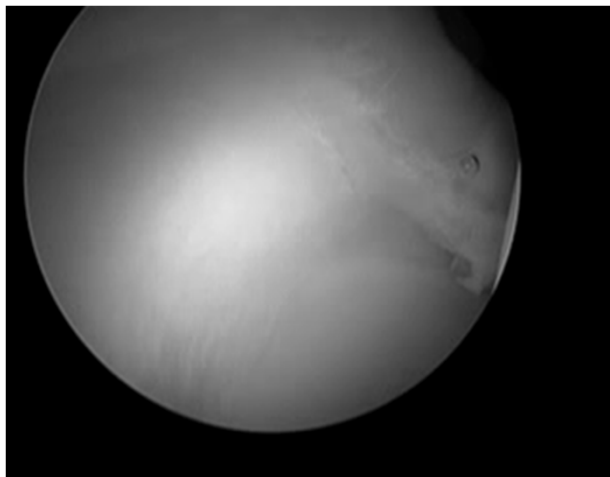
- “Groin pull”
  - Strain of hip flexor, adductor
- AVN
- Arthritis
  - Osteo vs rheumatologic
- Hernia
  - True groin (inguinal hernia) vs sports hernia
- Urologic / gynecologic pain
- Hip impingement

- 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

- 2<sup>nd</sup>-6<sup>th</sup> 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:

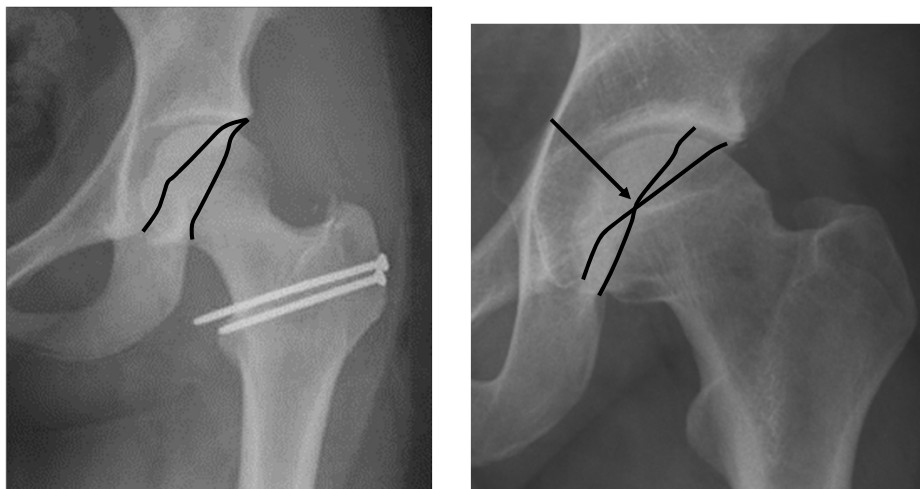
- Snapping external hip / IT band
- Troch Bursitis
- Gluteal cuff (minimus/medius) tendinopathy, tears (partial / full thickness)

- Posterior / Gluteal Region:

- Piriformis tendonitis / sciatica
- Ischio-femoral impingement / quadratus tendonitis
- SI joints / Low back
- Radicular pain

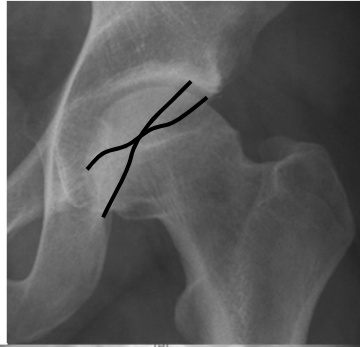
- Other lower extremity: pathology / limb mal-alignment

## Radiographic Assessment: Acetabular Version



## Acetabular Abnormalities

- Mild retroversion or anterior wall overcoverage
- Crossover sign



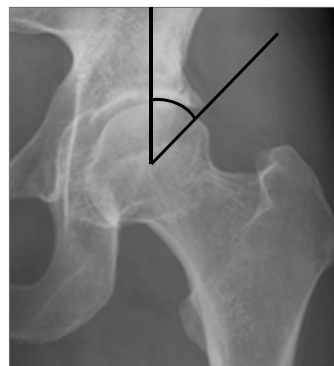
- Ischial spine sign



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

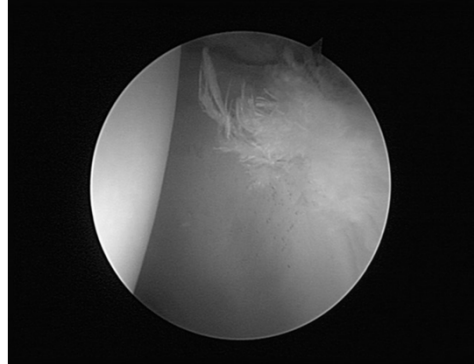
## Acetabular Abnormalities

- 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

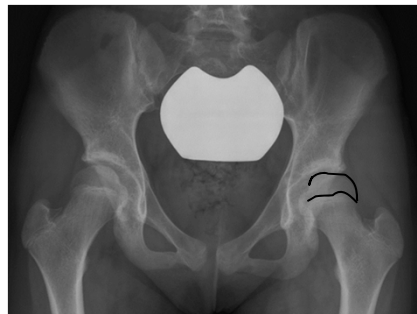


## Femoral Abnormalities

- Poor offset  
anterolateral head/neck  
Subclinical SCFE

High fovea with  
transverse physeal scar

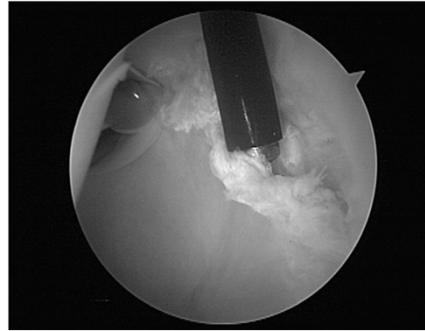
- Prominent  
anterolateral femoral  
head-neck junction



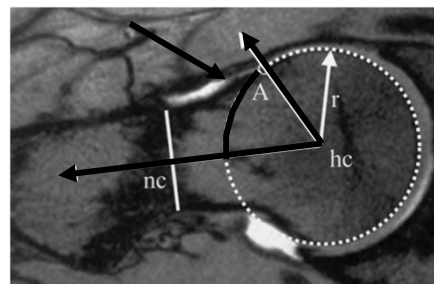
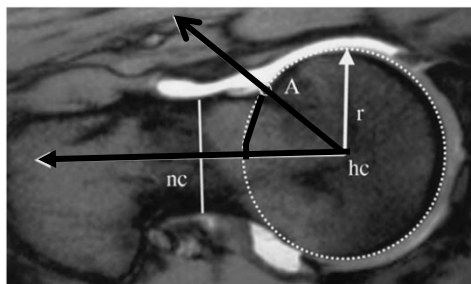


# CAM Impingement

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

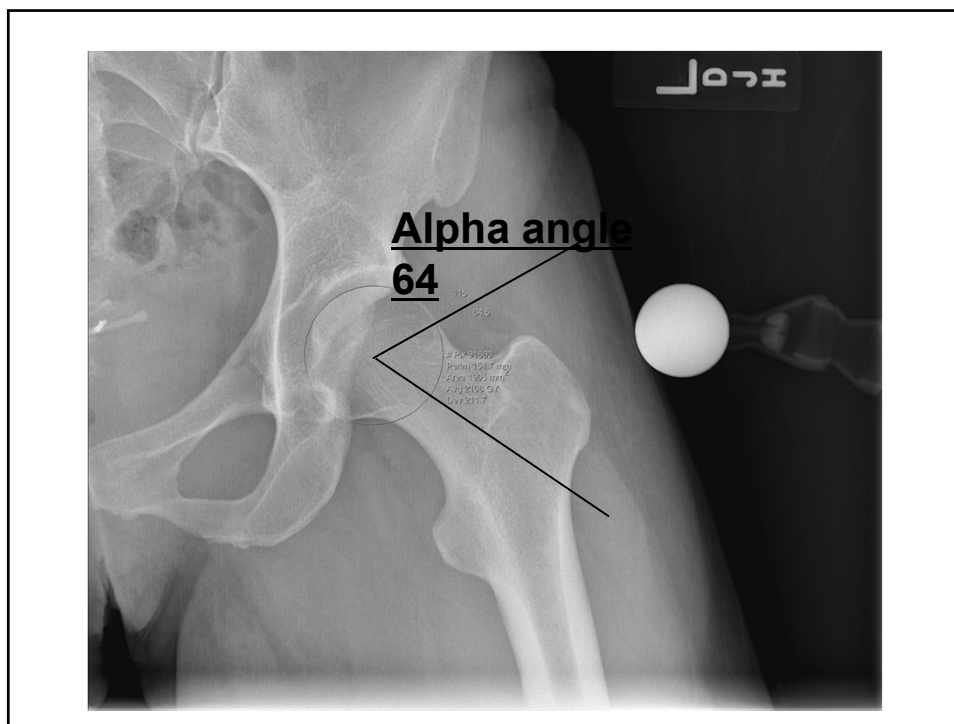


## Offset measurement



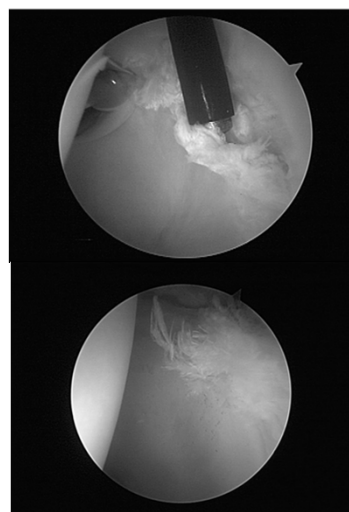
- Alpha angle
- "Normal" < 50
- > 50 greater chance of CAM Impingement
- Axial oblique MRI
- Dunn lateral view
- 3d CT

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**



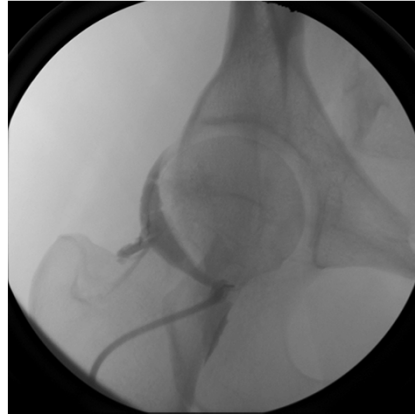
Beck et al, J Bone Joint Surg(Br) 2005;87:1012-18

# 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)



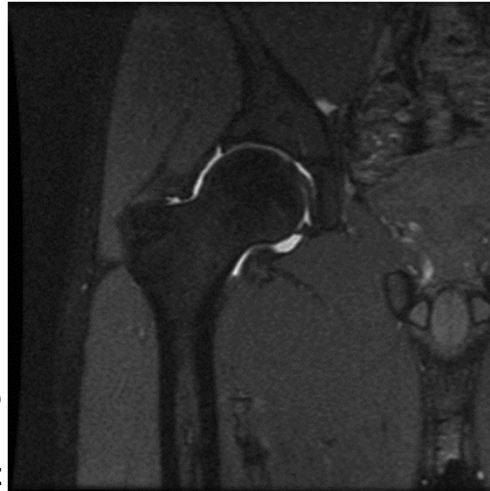
## 3D CT

- 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

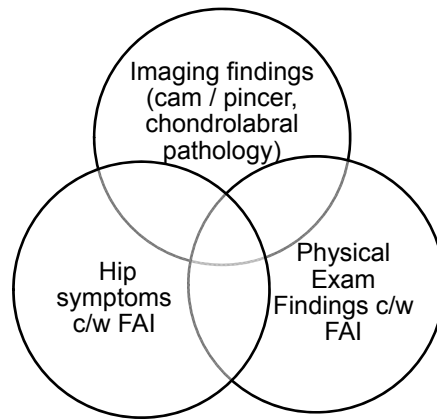
- **Labrum:** suture anchor repair vs debridement, reconstruction
- **Articular injury:** chondroplasty, if unstable/ possible microfracture
- **Pincer deformity:** Recess anterior wall, Supspine (AIIIS) decompression, os acetabuli excision
- **CAM deformity:** Osteoplasty of femoral neck

## 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**

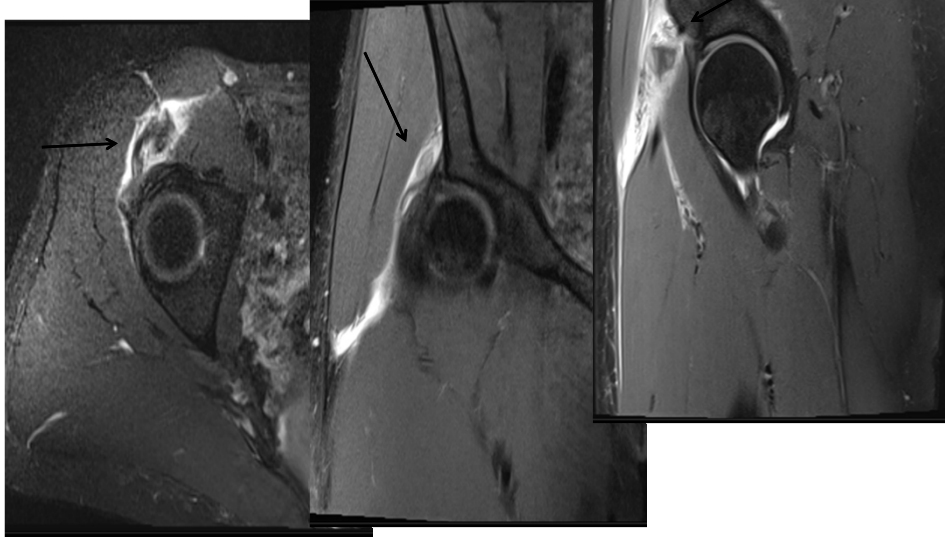
- **Hip Flexor and Adductor Injuries**
  - Typically Acute Event
  - Gymnastics or Martial Arts on occasion
  - Soccer Athletes
  - Typically treated conservatively
  - Rare need to fix large displaced rectus avulsion

## **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

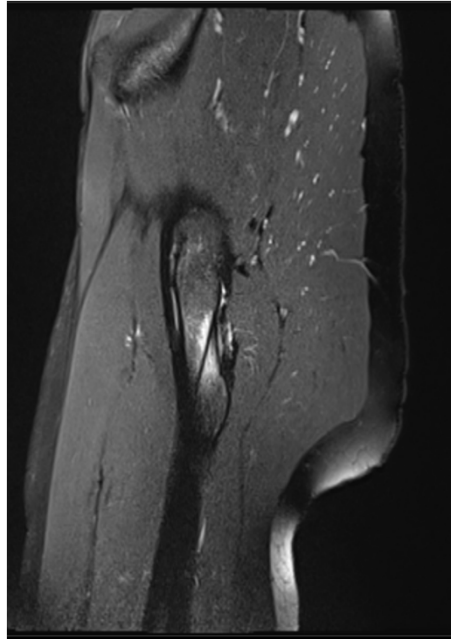
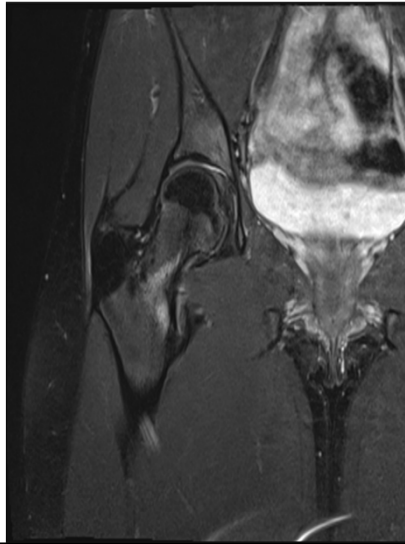
## Stress Fractures

21yF Collegiate distance runner/XC



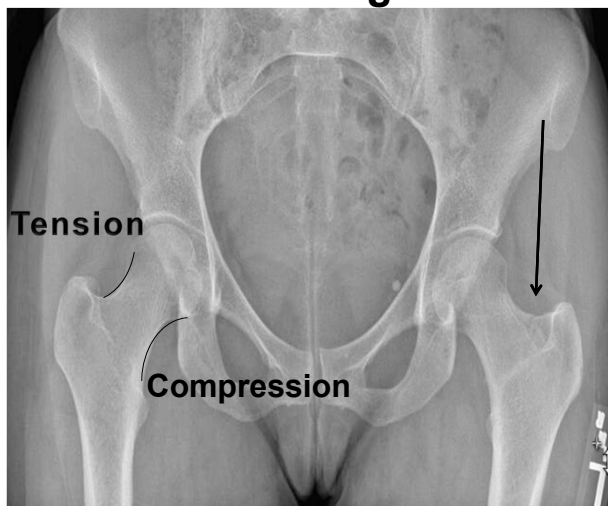
## Stress Fractures

21yF Collegiate distance  
runner/XC



## Stress Fractures

31yF Boston Marathon  
Training



## Stress Fractures



## Lateral Pain

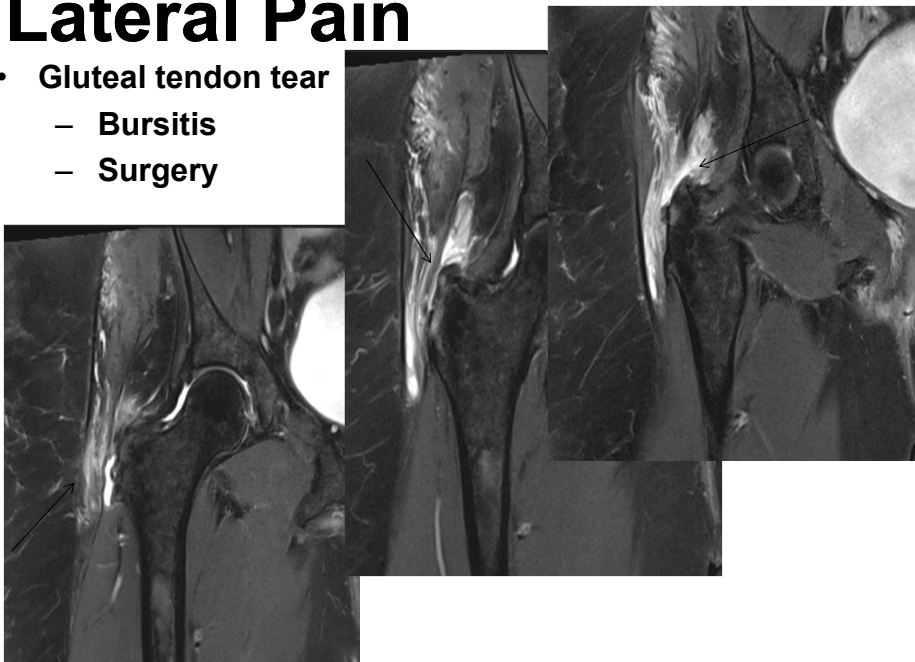
- **Greater Trochanteric Pain Syndrome**
  - Troch bursitis, gluteal tendinopathy/tear, IT band pain
  - Can be related to IA pain- “Lateral fatigue pain”
  - **Diagnosis: Based on history and physical exam**
    - Lateral sided complaints, lay on side at night
    - Pain with lateral palpation
    - 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

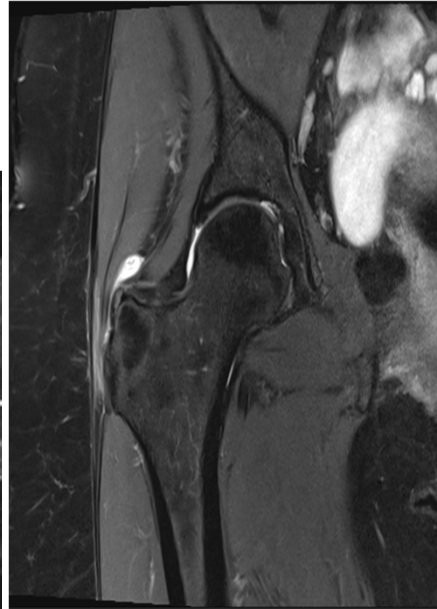
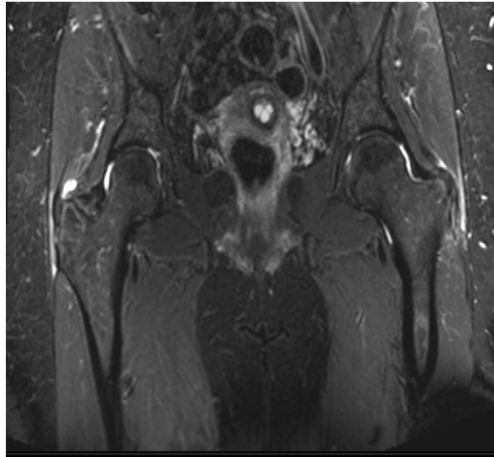
- **Gluteal tendon tear**
  - Bursitis
  - Surgery





# 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**

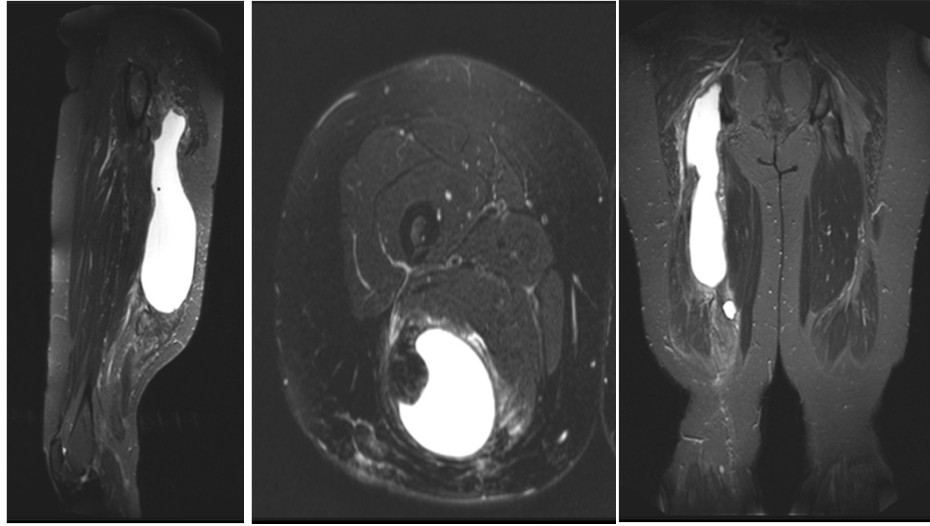
- **Chronic – complete, retracted**
- **Surgical treatment**
  - **More technically challenging**
  - **Less optimal functional and symptomatic results**
  - **More complications**
  - **Must discuss risk / benefit ratio**

## **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**

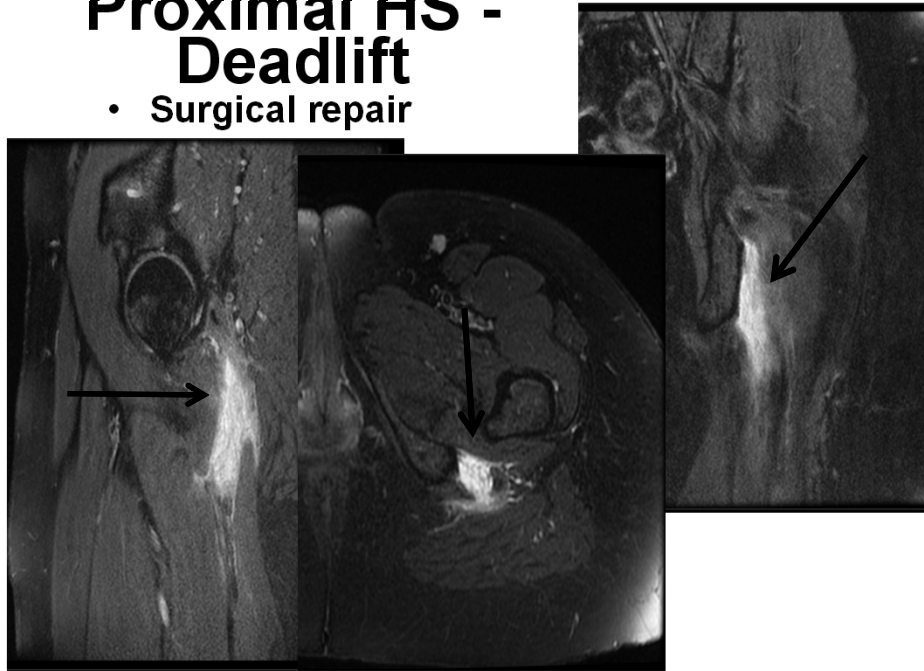
## Proximal HS - Slip and fall on ice

- Surgical repair and hematoma evacuation



## Proximal HS - Deadlift

- Surgical repair





## Proximal HS - recreational runner

- Treated with PT, rest, PRP and fenestration

