

Imaging the Painful Active Hip

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Outline

- Imaging techniques
- Review pathology in the "ACTIVE" hip
 - Osseous
 - Intra-articular: Labrum, LT, Chondral
 - FAI
 - Ischiofemoral impingement
 - Snapping hip
 - Bursitis
 - Muscle/tendon

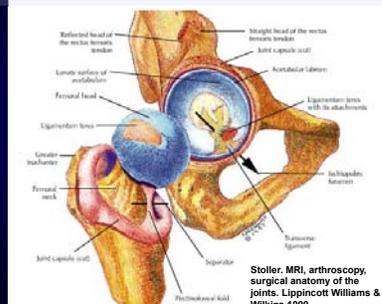


Bing.com



runandbecome.com

"Ball and Socket" Joint



Stoller. MRI, arthroscopy, surgical anatomy of the joints. Lippincott Williams & Wilkins 1999

Anteroposterior (AP) pelvis

- Comparison to contralateral hip
- Coccyx must be centered over the pubic symphysis (not more than 2 cm)



Frog-lateral



X-table lateral

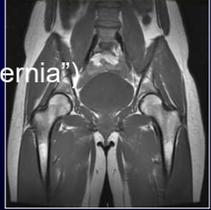


Dunn lateral



Indications for Routine Hip MRI

- Stress fracture (fatigue)
- Nonspecific hip pain
- Muscle/tendon injuries
- Pubalgia ("osteitis pubis/sports hernia")
- Osteonecrosis
- Tumor



Indications for MR Arthrography

- Assess the intra-articular structures
 - Labrum
 - Cartilage
 - Intra-articular bodies
 - Ligaments
 - Capsule



Indications for Sonography

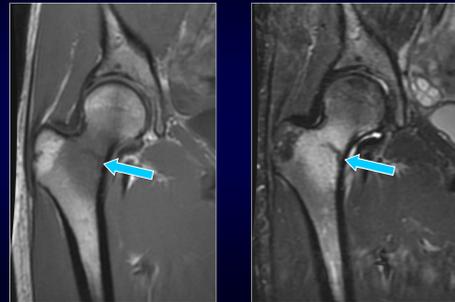
- Snapping hip
 - IPT
 - IT band
- Guidance for injection
 - Iliopsoas bursa
 - Greater trochanteric bursa



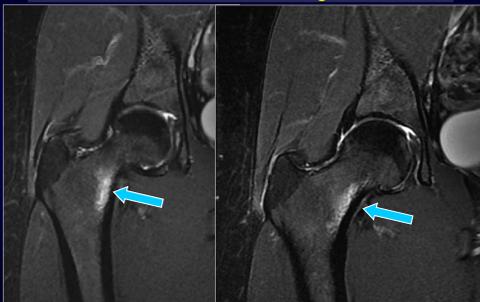
OSSEOUS ABNORMALITIES



Stress Fractures
Femoral Neck: Fatigue



Stress Fractures
Femoral Neck: Fatigue



Avulsion



AVULSION Typical Locations

Iliac crest: Obliques

ASIS: Sartorius

AIIS: Rectus

GT: Glutei

LT: Iliopsoas

Ischial tub: Hamstrings

LABRUM

www.sportsortho.co.uk/.../Labraltear.jpg

Labrum

- Composed of type I collagen fibers
- Vascularity
 - Small peripheral capsular vessels
 - Supplies peripheral 3rd of labrum
- Network of nerve endings
 - Tears are painful

jbjis.org
Kelly BT Arthroscopy 2005

Etiology: Labrum Tears

- Hip deformities
 - Cam or pincer impingement
 - Dysplasia
- Acute trauma
- Overuse injuries
- Degeneration
- Hypermobility/capsule laxity

Runnersworld.com, orthopaedics360.com, spineone.com

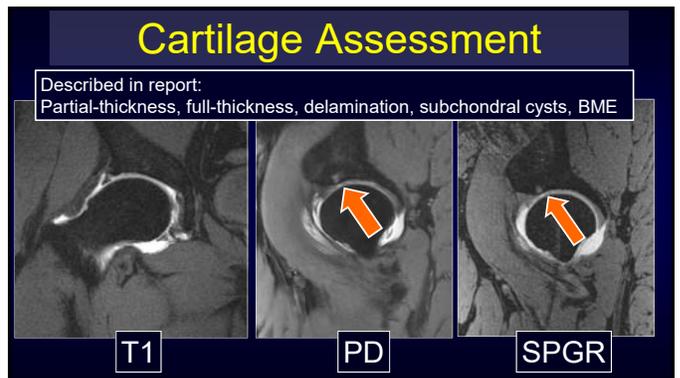
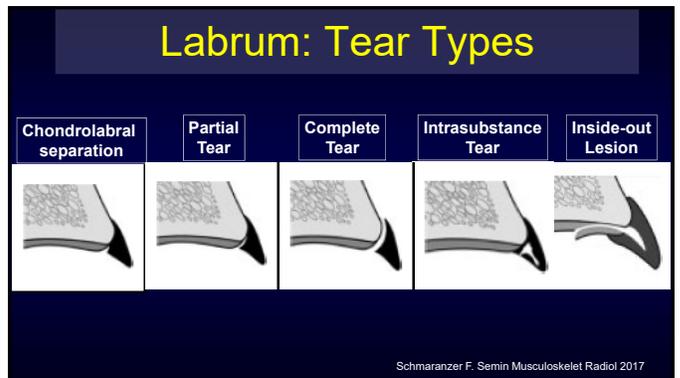
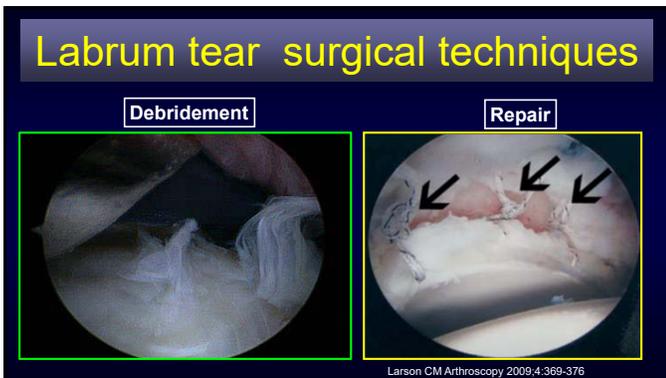
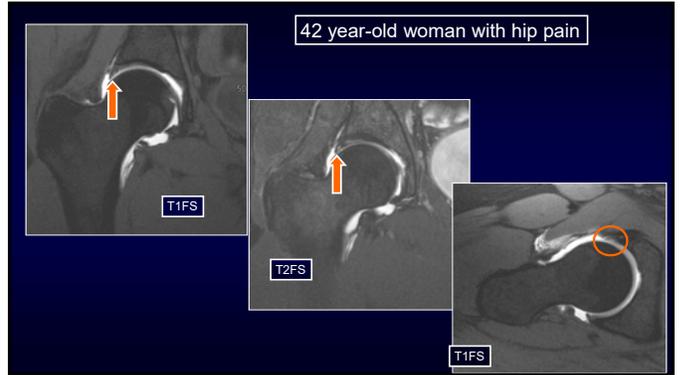
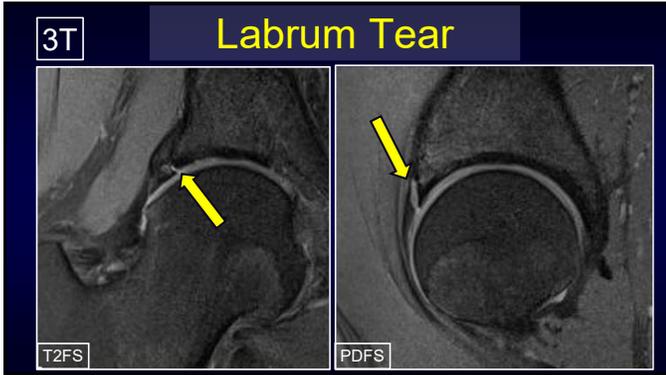
MR: Labrum

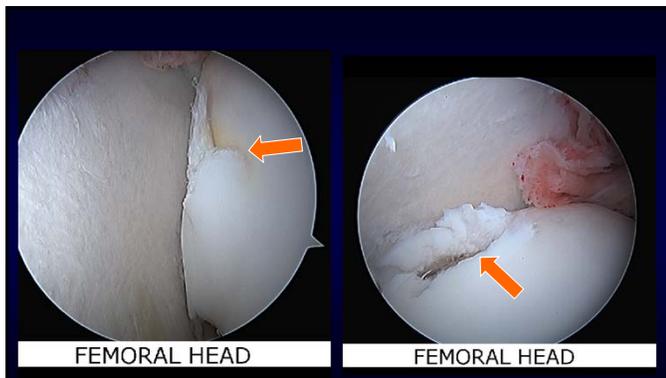
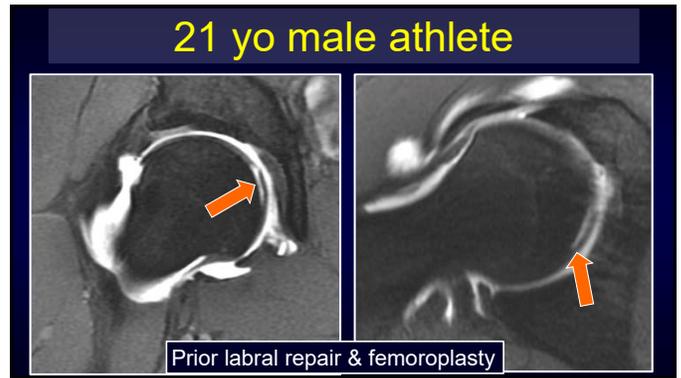
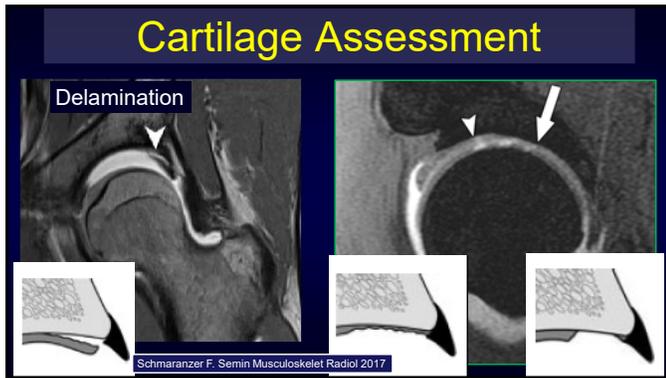
• Triangular shape: 96% 10-19 y/o; 62% > 50 y/o

Labrum Tear

T1FS

Location: Anterosuperior tears most common





Ligamentum Teres (LT)

Ligamentum Teres

- LT originates from the transverse ligament and surrounding structures
- Inserts on the fovea capitis
- May provide stability, proprioception info
- When partially or completely torn, causes deep anterior groin pain, usually mechanical symptoms

Cerezal L. RG 2010; 30:1637-1651

Byrd JWT. Arthrosc 2004; 20:385-391.

Ligamentum Teres

- LT tears are common
 - 51% of 558 scopes in one study
- LT tears respond well to debridement and shrinkage
- No clinical test
- Preoperative diagnosis rare

Baradakos NV. JBJS-Br 2009; 91-B:8-15
 Haviv B. KSSTA 2011; 19:1510-1513
 Boster IB. AJSM 2011; 39:117S-125S
 Byrd JWT. Arthrosc 2004; 20:385-391.

Ligamentum Teres: Imaging

Pearl: Use all imaging planes

T1 T2 T1

43♀ hurt while stretching
LT tear confirmed at surgery

Ligamentum Teres: Complete Tear

No discrete fibers

T1 T2

FAI

www.orthoinfo

Femoroacetabular Impingement (FAI)

- Controversial...
 - ...but everybody's doing it
- Morphologic abnormalities of the proximal femur and/or acetabulum
- FAI can cause:
 - Labrum tears
 - Cartilage lesions
 - Premature OA

Beall *Skeletal Radiol* 2005; 34:691-701.
Ganz *Clin Orthop* 2003; 417:112-120.

Cam FAI

- Aspherical femoral head
 - Anterior superior
- Shearing forces & outside-in-abrasion of acetabular cartilage
 - Delamination of acetabular cartilage

Cam

Pfarrmann CW. *Radiology* 2006

Courtesy of Dr. Michael Recht

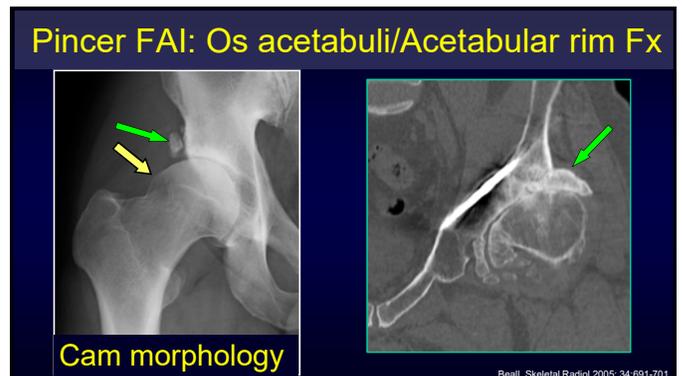
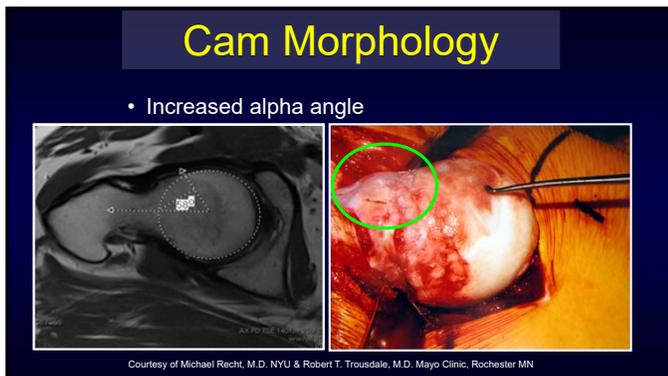
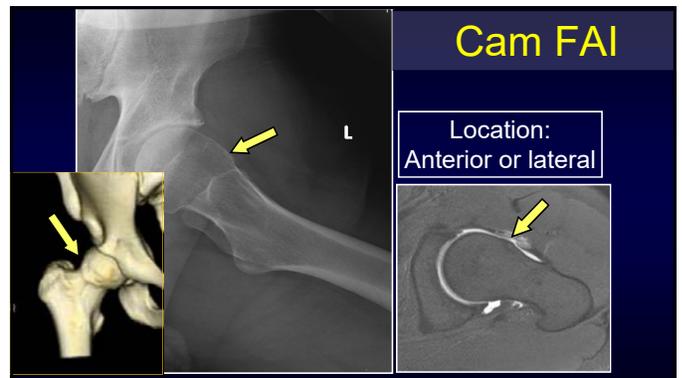
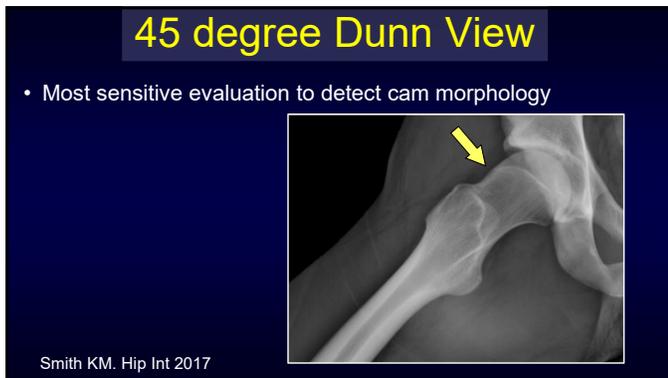
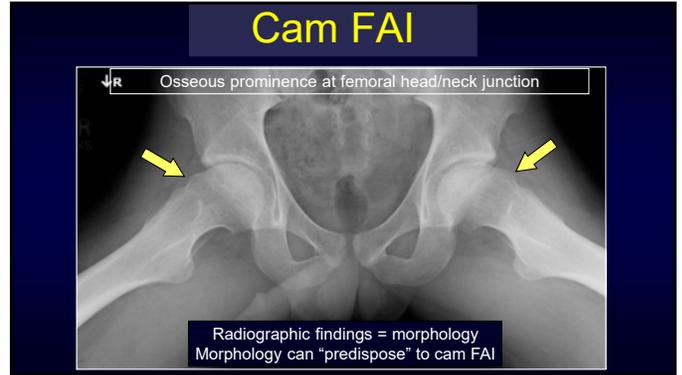
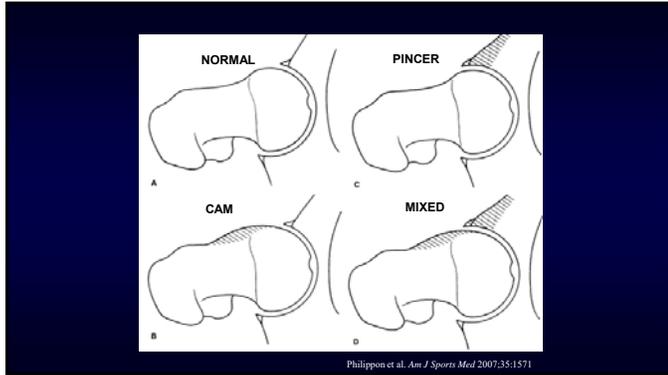
Pincer FAI

- Overcoverage of femoral head
 - Deep socket
 - Focal anterior overcoverage
- Linear impact injury
 - Labrum tears (painful)
 - Chronic injury: ossification of the acetabular rim & osteophytic ridging

Pincer

Ganz R. *J Bone Joint Surg Br* 2001
Kim YT. *Clin Orthop Relat Res* 1995

Courtesy of Dr. Michael Recht



3 Signs Pincer FAI: Retroversion

1

Anterior wall

Posterior wall

2

Crossover sign

Retroversion

Ant. Post.

Ischial spine is visible on AP radiograph

<https://clinical.gate.com>

3rd Pincer FAI: Retroversion

- Deficient posterior wall
 - Posterior acetabular rim medial to the femoral head center

Posterior wall sign

Reynolds D. J Bone Joint Surg Br 1999

Sutter R. Radiology 2012

Other Pincer Contributors

Coxa Profunda:
Teardrop medial to ilioischial line

Protrusio Acetabuli:
Fem head medial to ilioischial line

Treatment of FAI

- Goals:
 - Prevent or stop progression of OA
 - Alleviate pain
- Surgical
 - Address morphologic problems
 - Acetabular osteoplasty
 - Femoral osteoplasty
 - Address soft tissue defects (as necessary)
 - Labral repair

Ischiofemoral Impingement

www.nsmoc.com

Ischiofemoral impingement

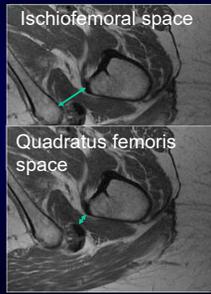
- Manifests clinically as hip, gluteal, or atypical groin pain
- Decreased distance between the lesser trochanter and ischial tuberosity
 - F>M
- Compression of the quadratus femoris (QF) muscle

Taneja AK. MRI Clinics 2013

Tosun O. Skeletal Radiology 2012

Ischiofemoral impingement

- How do we define IFI?
 - Edema and/or atrophy in the quadratus femoris
 - Ischiofemoral space (IFS) narrowing
 - 13 mm +/- 5 (23 mm +/- 8)
 - Quadratus femoris space (QFS) narrowing
 - 7 mm +/- 3 (12 mm +/- 4)



Torriani. AJR 2009

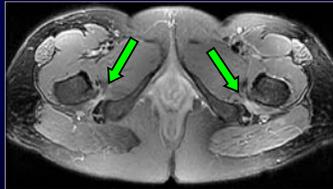
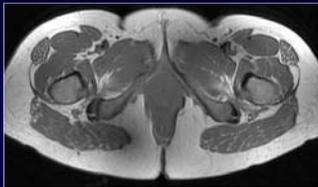
Radiographs for detection of IFI

- Screening tool
- Supine: <2cm
- Standing: <1.9cm



Park S. et al. AJR 2016

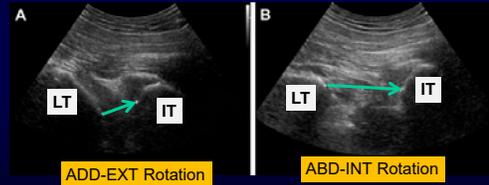
Ischiofemoral impingement



34 ♀ with right hip pain

Ischiofemoral space variability

- Finnoff JT. Am Acad Phys Med & Rehab 2015



Treatment of IFI

- Conservative
 - Oral anti-inflammatory
 - Activity modification
 - Physical therapy
- Corticosteroid injection
 - Potential diagnostic and therapeutic role
- Surgical decompression
 - Osteotomy of lesser trochanter or IP tendon release
 - Quadratus decompression



Byrd T. Extra-articular arthroscopy. ISHA Meeting 2011
Backer MW. AJR 2014;589

Snapping Hip



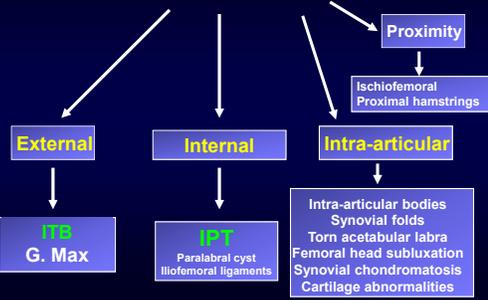
Snapping hip syndrome

- Clinical diagnosis
 - Based on dynamic maneuvers
 - Sudden, painful, audible snap
 - Typically athletic
 - Ballet dancers

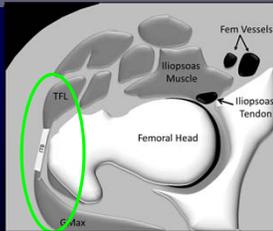


<http://zoomlocal.com/wilmington-star-news/3juf6v17vKTLB0?article=389211>

Causes: Painful snapping hip



External snapping hip



Snapping Hip Syndrome: iliotibial band



Snapping Hip: iliopsoas

Most common internal cause:

- ▶ Iliopsoas tendon rolling over the medial part of the iliacus muscle onto the superior pubic ramus



Deslandes et al. AJR 2008;190:576-581

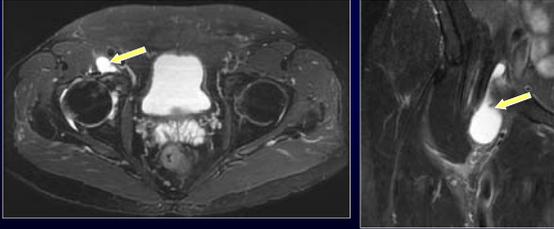
Snapping Iliopsoas tendon



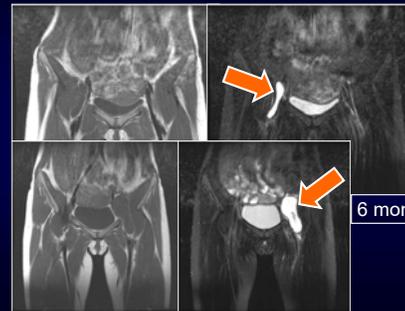
- ❖ Extension of flexed, abducted and externally rotated hip (FABER)
- ✓ abrupt motion of iliopsoas tendon

Bursitis: iliopsoas

- ✓ Sport-related: overzealous hip flexion & extension
- ✓ Rowing, running uphill, competitive track/field, strength training



Bursitis: Iliopsoas



17-year-old female with hip pain

6 months later...

MUSCLE/TENDON INJURY

Hip Abductors

“Rotator cuff of the hip”



www.wellhipclinic

Greater Trochanter Anatomy

- Main attachment site for strong abductor tendons
- 4 Facets



Anterior

Lateral

Posterior

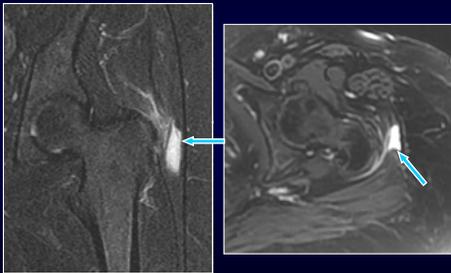
Pfirschmann C. Radiology. 2001; 221: 469-477.

Abductor tendon pathology

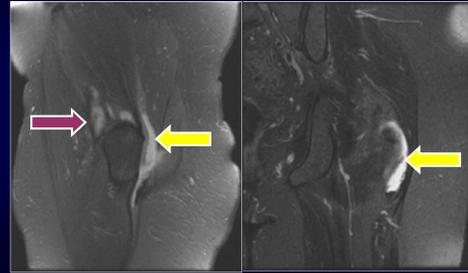
- Tendinopathy of the abductor tendons is a common finding
 - Buttock, lateral hip, or groin pain
 - Frequent cause of greater trochanteric pain syndrome
 - May mimic other causes of hip pain

Cvitanic et al. AJR 2004; 182: 137-143.

Bursitis: Trochanteric



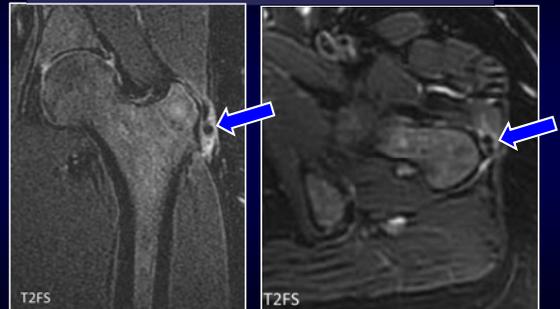
Gluteus minimus partial tear



Hydroxyapatite Deposition Disease



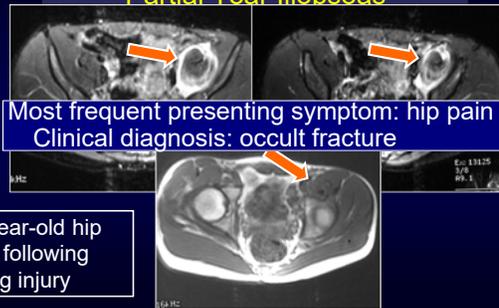
HADD



Treatment: Calcific tendinosis lavage



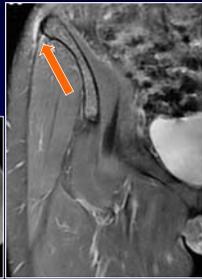
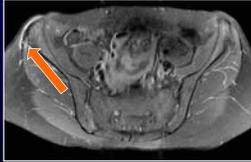
Muscle/Tendon Injury: Partial Tear Iliopsoas



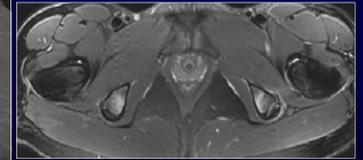
Tendinopathy/Partial tear tensor fascia lata

46 y/o woman with hip pain

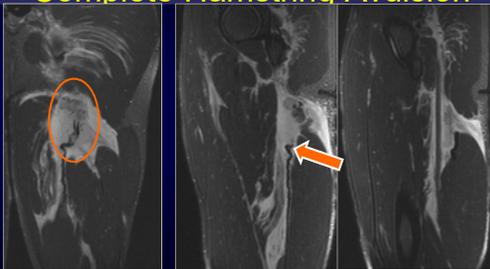
- Anterior groin pain
- Esp. athletes who run >10 miles/week
- TFL provides tension in ilio-tibial tract
 - Helps maintain the knee in position when extended



Muscle/Tendon Injury Partial Tear Hamstring Origin



Muscle/Tendon Injury Complete Hamstring Avulsion



Clinical: proximal hamstring avulsion injuries

- Swelling, ecchymosis in the posterior thigh
- Palpable proximal defect is common
- Complete rupture can lead to significant pain and disability
- Functional testing of peroneal branch of sciatic nv



parkclinic.com.au

Take-Home Points

- MRI useful in assessment for stress fractures & other hip pathology
- FAI is a clinical diagnosis
 - Leads to labrum & cartilage injury
- Ligamentum teres
 - May be important, generates pain
- Ischiofemoral impingement: narrowing & muscle edema
- Snapping hip: multiple causes
- Bursitis & muscles injuries

