Differential diagnosis for the Lower extremity

Greg Bellisari MD

orthopedic ONE

Introduction

- Hip
- Knee
- Leg
- Ankle
- Foot
- Hope you had tons of coffee, only 128 more slides to go!!

Sports and hip injuries

- Hip and pelvis subjected to substantial forces.
  - Up to 8 x body weight
- Adult: 5 - 6% of athletic injuries.
- Pediatric: 10 - 24% of athletic injuries.
- High risk sports: Ballet, Running, Soccer, Contact sports.

Introduction
Hip & Groin Pain

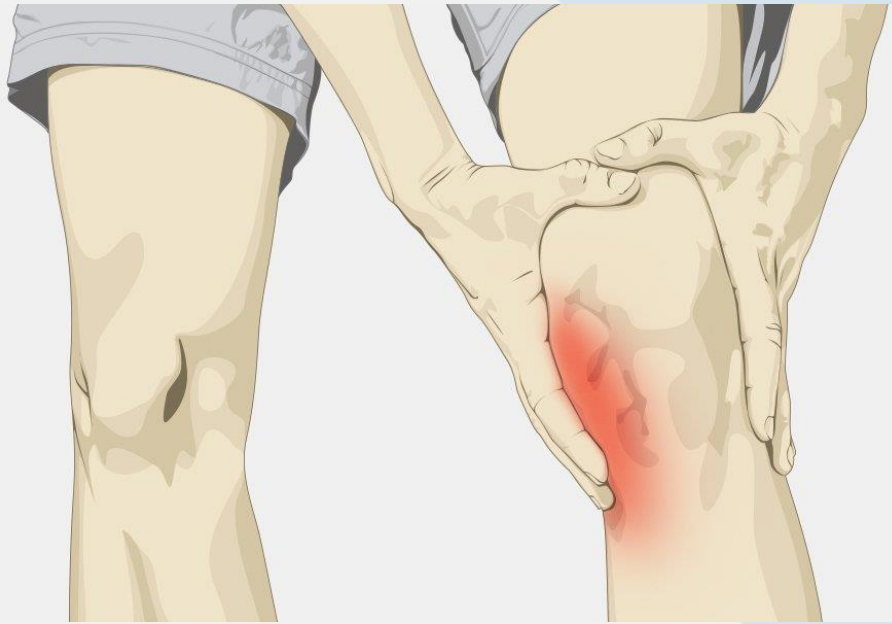
- One of the most difficult problems to diagnose and treat in sports.
- Symptoms are often indistinct, poorly localized.
- Early and accurate diagnosis is essential:
  - Rehab times prolonged
  - May result in chronic, disabling pain

“Hip” Pain

- Patients may present with chief complaint of “hip” pain, but it may not actually be coming from their hip
  - Intrarticular hip
  - Extrarticular hip
  - Lumbar spin
  - Sacroiliac joint
  - Other - Intra-abdominal, hernia, GI, GU

History

- Knee pain
  - Can be the initial complaint of hip pathology
  - Not uncommon for a patient with hip arthritis to present with knee pain
  - Differentiate with exam, X-rays, injections



orthopedic ONE

Initial evaluation

- Hip pain
  - *History*
    - Where, how long, trauma, always aware, mechanical, radicular, what aggravates
  - *Joint vs not joint*
    - Joint: FAI, dysplasia, OA, AVN
    - Not Joint: Gluteal, back, hernia, hamstring, butt

History

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

- Testicular pain does not come from the hip

Differential Diagnosis
Hip & Groin Pain

PEDIATRIC

- Avulsion fracture
- ASIS apophysitis
- SCFE
- Legg-Calve-Perthes
- Pathologic fracture
- CDH
- Toxic Synovitis
- Septic Hip

ADULT

- Stress fractures
- Osteitis pubis
- Sports hernia
- Athletic pubalgia
- Nerve compression
- Troch burisits
- Snapping hips
- Adductor strains
- Hip joint pathology

orthopedic ONE

*Medical causes

Medical Causes

- GI
  - Appendicitis, Crohn's Dz., Diverticulitis
- GU
  - Hernia, testicular torsion
  - UTI, kidney stones
- Spondyloarthropathies
- Female
  - Menstrual cramps, ovarian cyst, endometriosis, pregnacy, ectopic
- STD/PID

Intra-articular causes	Extra-articular causes
Labral tears	Extra-articular bony impingement
Chondral injury	Proximal hamstring
Ligamentum teres tears	Nerve compression syndromes
Femoroacetabular impingement (cam, pincer, or combined)	Snapping hip (internal vs external)
Synovitis	Capsular problems (loose or stiff)
Loose bodies—tumors (SOC, PVNS, OCD, DJD, and AVN)	Capsular laxity or atraumatic instability
	Piriformis syndrome
	Recalcitrant trochanteric bursitis
	Gluteus medius and minimus tears
	Osteitis pubis
	Athletic pubalgia/sports hernia/Gilmore's groin
	Avulsion injuries (ASIS, iliac crest, AIIS, pubis, ischial tuberosity, GT, and LT)
	SI joint pain
	Muscle/tendon tears (proximal HS, Adductor

Initial Evaluation

- Exam
  - ROM hip recreates pain, decreased FABER: *Hip*
  - Tender from femoral vessels medial, adductor pain, genital pain: *Hernia*
  - Tender over trochanter: *Glut med/joint/back*

Initial Evaluation

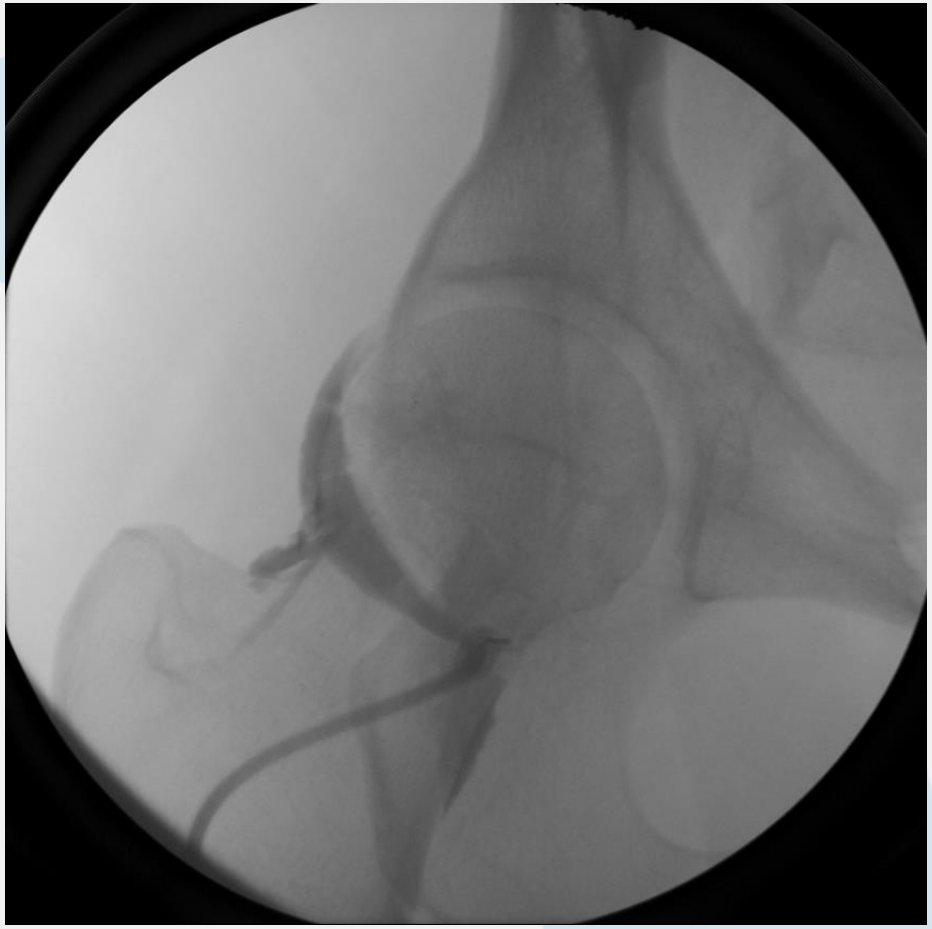
- Exam
  - Back pain: *Back/SI dysfunction/hip*
  - Butt Pain: *Back/piriformis/glut med*
  - Ischial tuberosity: *Hamstring*

Initial Evaluation

- *Imaging: X-rays are the workhorse*
- Direct focus after history and exam
    - Need to make sure history and exam match imaging
    - History and exam trump imaging

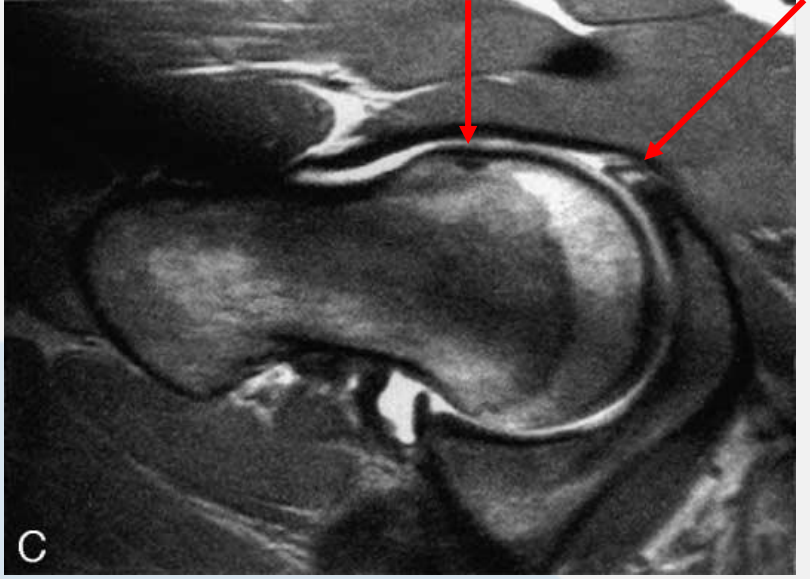
Diagnostic Injection

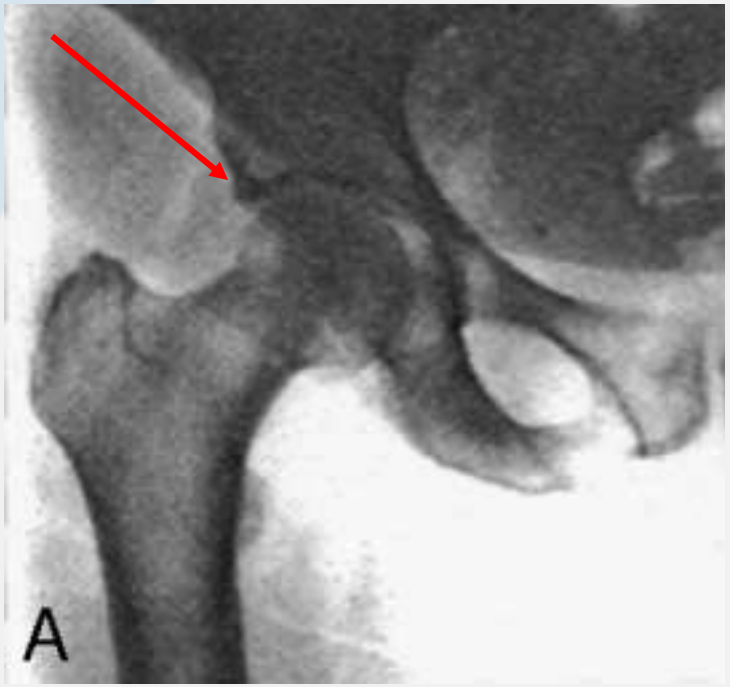
- Perform on many patients with suspected intraarticular/extraarticular pathology but with non-definitive history and exam
- Relief→Injected site is source of pain
- No relief→Pain is from somewhere else

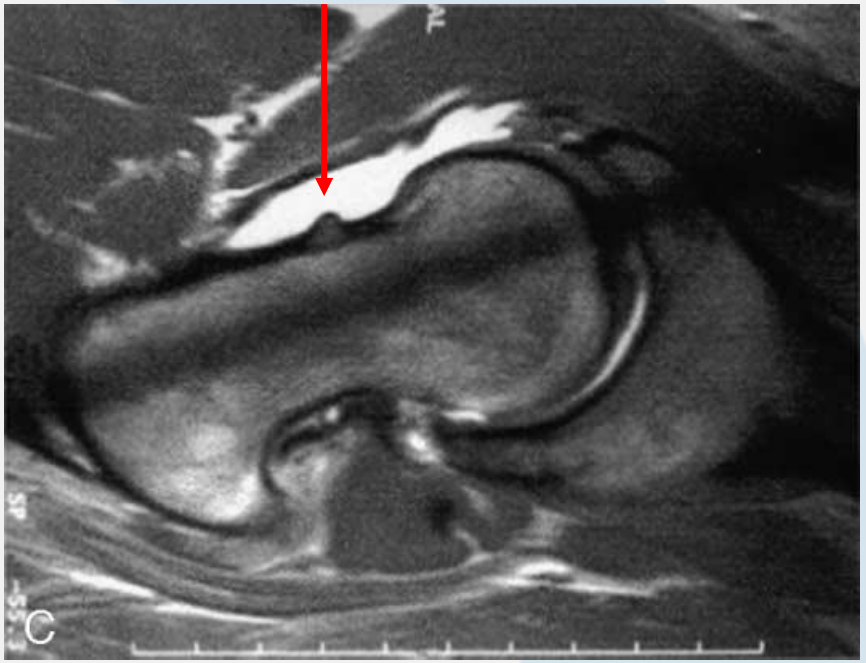


Femoroacetabular Impingement

orthopedic ONE





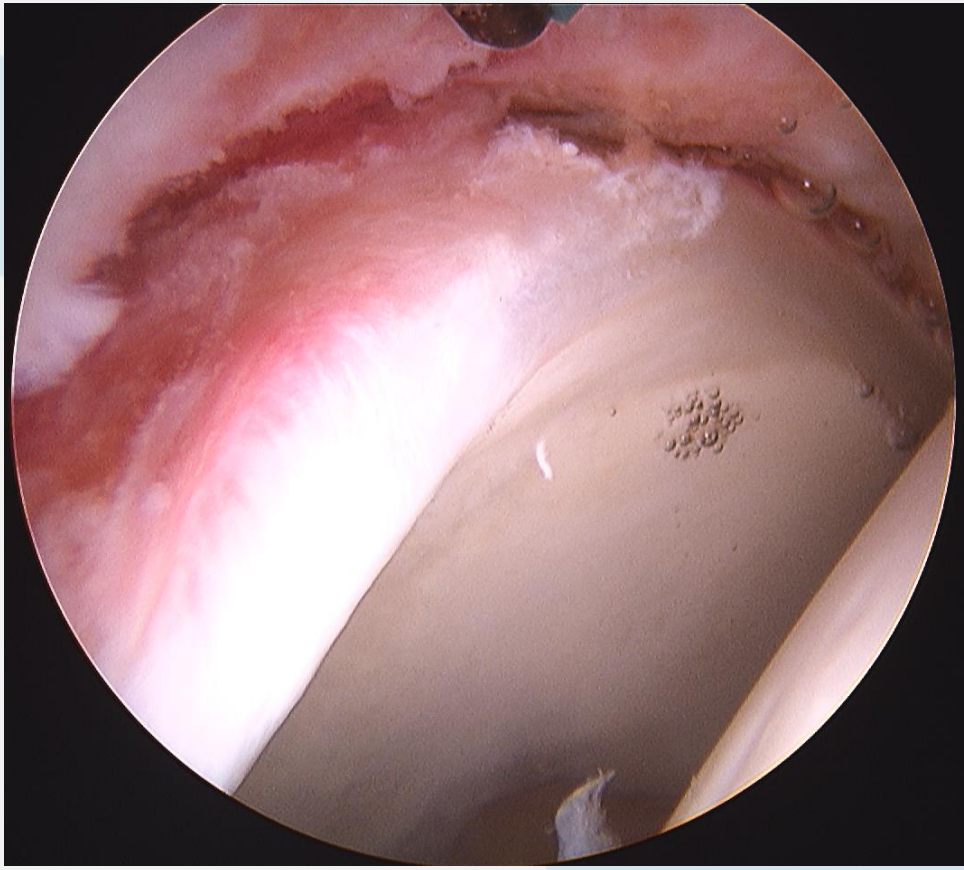


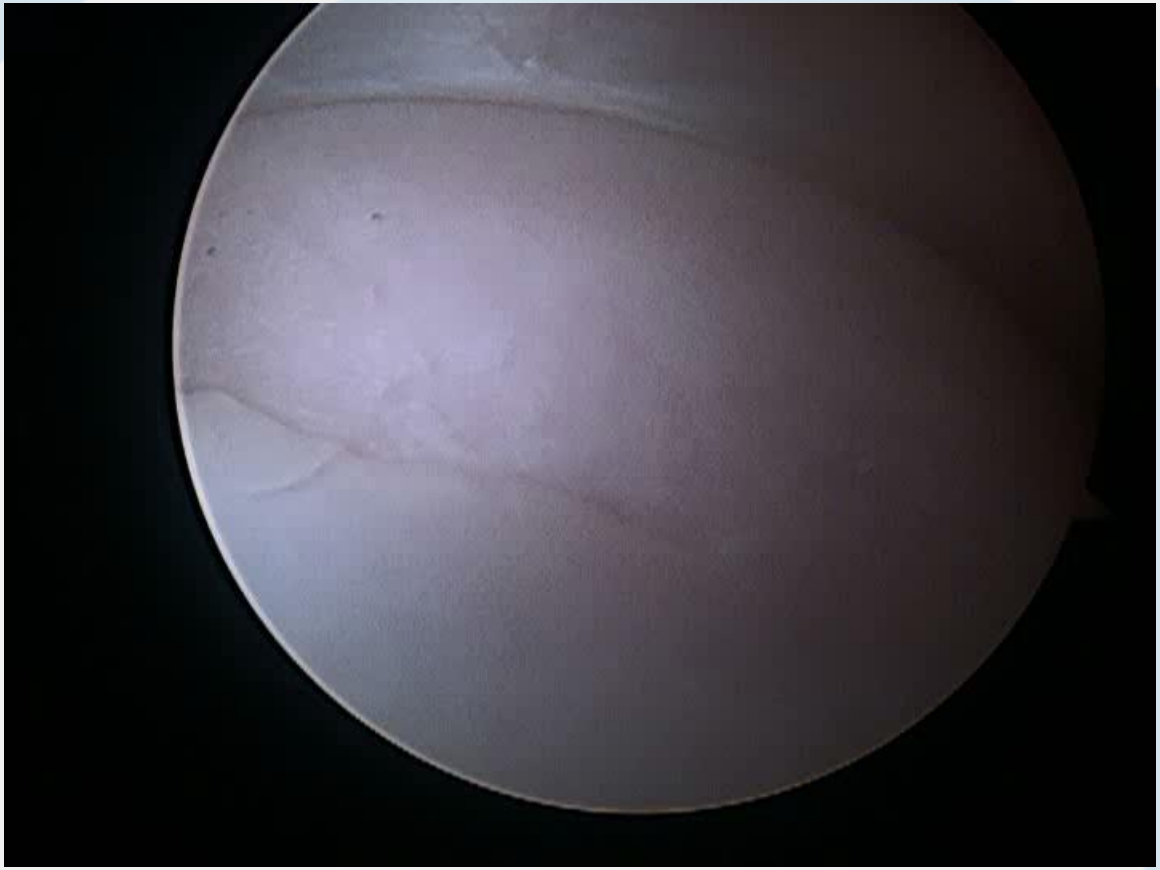
orthopedic ONE

Ganz et al, J Bone Joint Surg(Br) 2003;417:112-120

- This “impingement” damages the labrum and/or acetabular articular cartilage in the superior half of the acetabulum

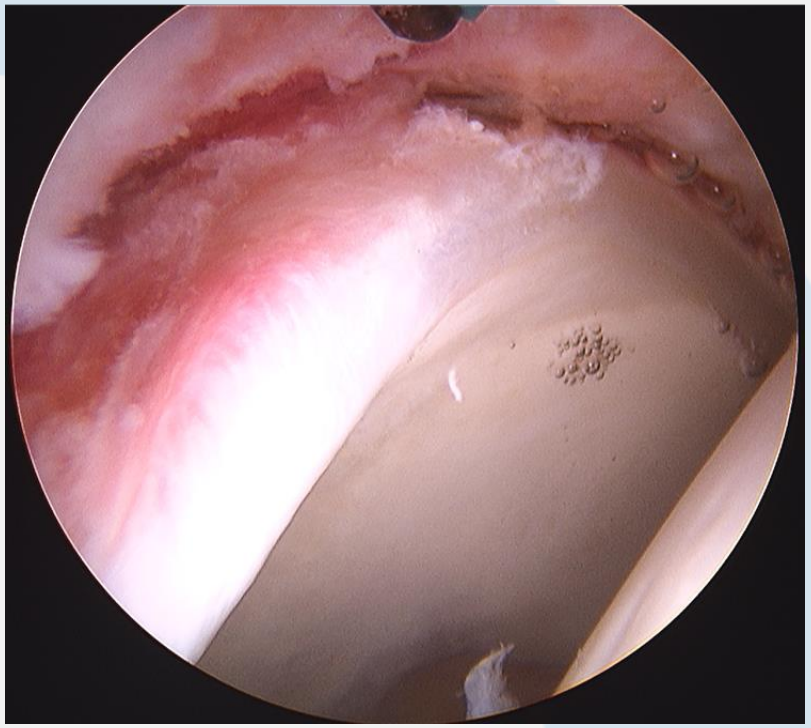
- Both structures involved since the acetabular labrum is confluent with the articular cartilage





Labral Function

- Increases volume joint
- Creates fluid seal
- Enhances stability
- Distributes forces articular surface



Patient History

- 2^{nd}-6^{th} decades
- Typically insidious onset
- "C" sign for location
- Constant hip ache
- Sharp, intermittent groin pain
- Pivoting/twisting painful

- Pain with activity (during or after)
- Better with rest
- "Ceiling effect"
- Intercourse painful
- Sitting painful

- *Pain worse over time*

orthopedic ONE

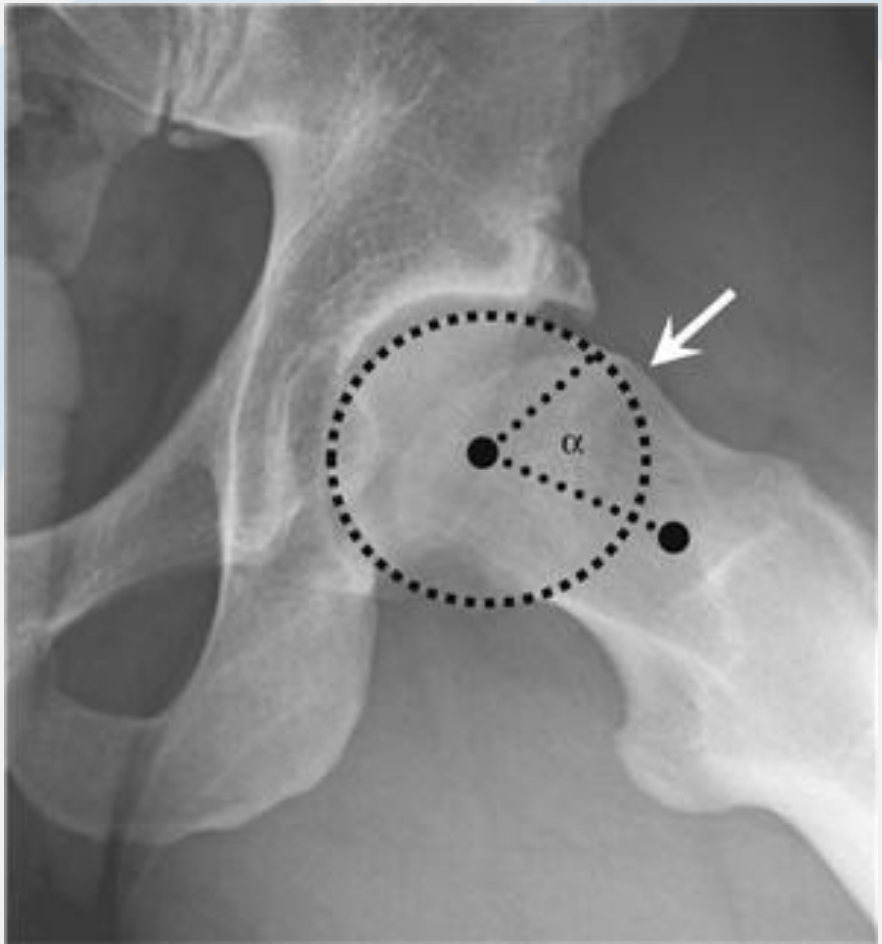
Physical Exam

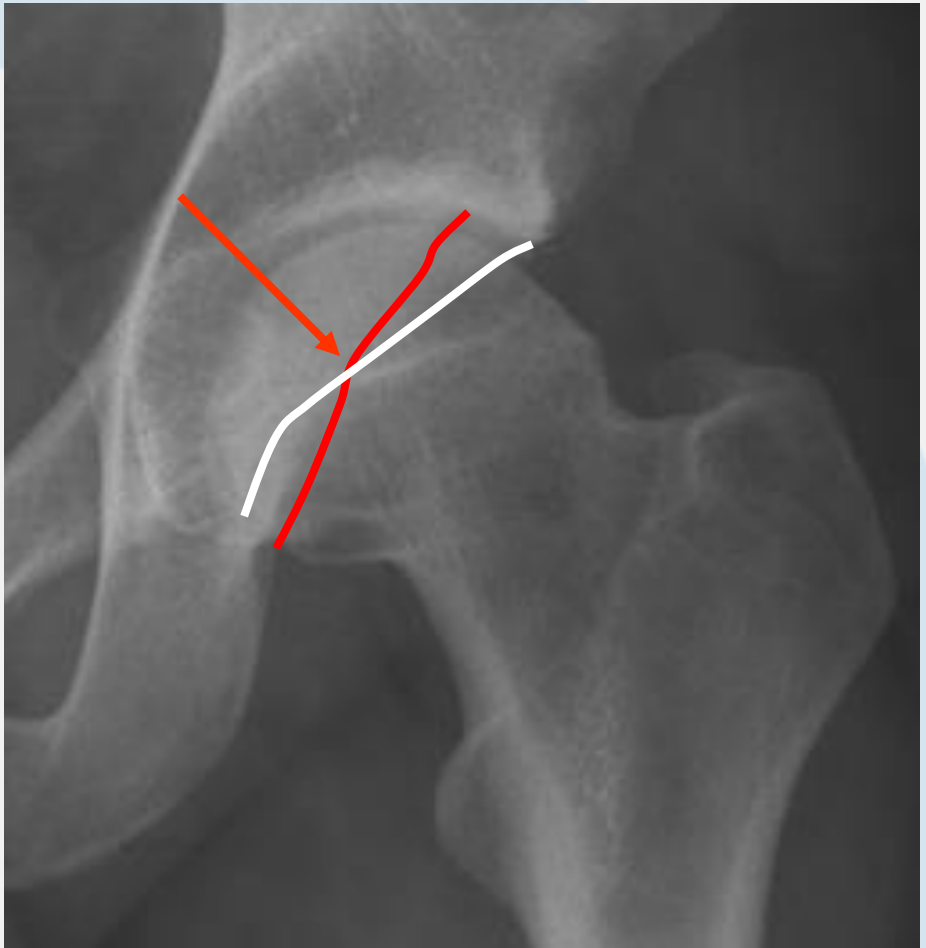
- Gait
- ROM
  - Decreased FABER
- Impingement test
- Circumduction hip

- *Motion typically restricted*

- *Motion recreates location of pain*

Radiographic Assessment:

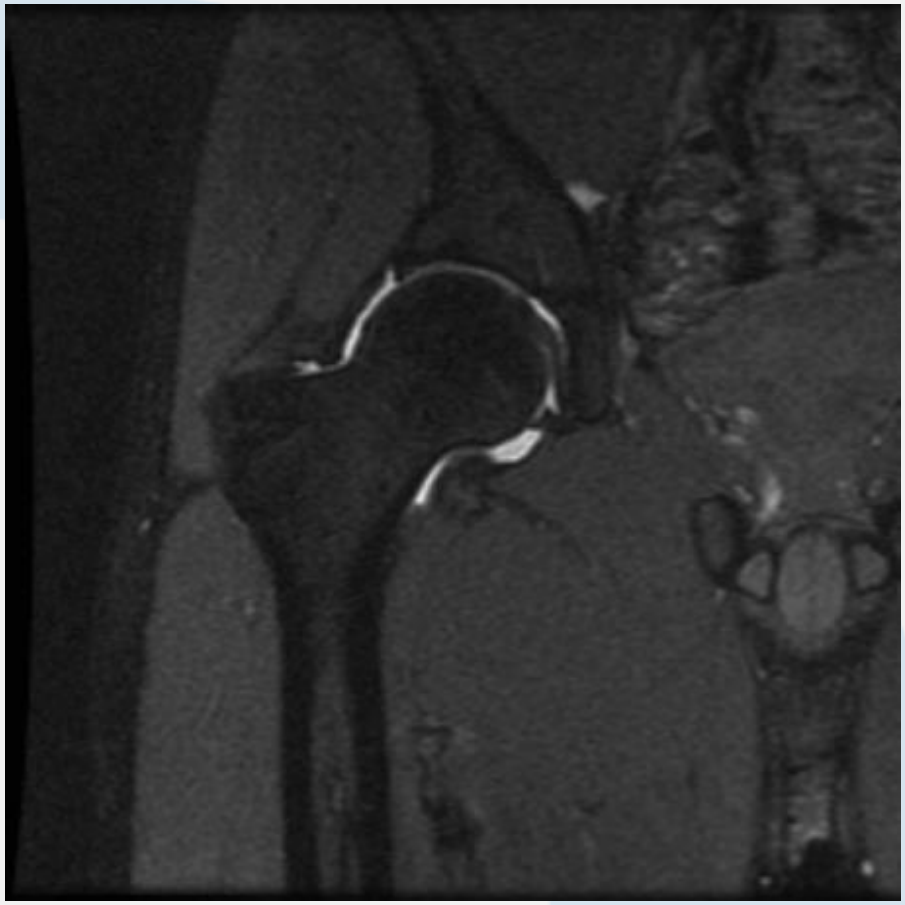




MR/MR Arthrogram

- Dedicated hip MR
  - Labral pathology +/-
  - Subchondral cysts
  - Other pathology

- Minimal indication for an MR with IV contrast or MR pelvis



Non Op Treatment

- PT
  - Core and glut
  - Avoid squats, lunges, flexion beyond 90
- Standing desk
- NSAIDS
- Occasional steroid injection

Surgical Plan: FAI

- Labrum: Repair/reconstruct/rare debride
- Articular injury: Debride if unstable/?microfracture
- Pincer deformity: Recess anterior wall
- CAM deformity: Osteoplasty of femoral neck (acromioplasty)

Relative Contraindications to Arthroscopy

- Arthritis with joint space narrowing
- Inflammatory arthropathy
- Age >60

Lateral Hip Pain

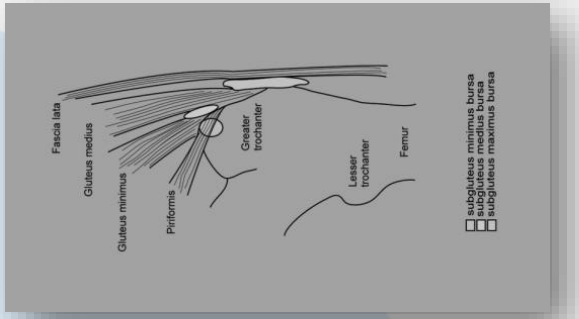
- Historically
  - Diagnosed as trochanteric Bursitis
  - Initially symptoms thought to be from inflammation of trochanteric bursa

- Now
  - Bursa may not be the pain generator
  - Acute inflammatory process not typically present
  - Steroid injections may have limited effect

orthopedic ONE

Bursitis vs Tendinopathy

- MRIs performed on 24 females with GT pain
  - 2 patients had distention of GT bursa (8.3%)
  - 15 patients had tendinitis/tendinopathy of G. Med (62.5%)
  - 11 patients had glute med tears
    (6 Tear + tendonitits)
  - "Trochanteric bursal distention (true bursitis) was uncommon and did not occur in the absence of tendon pathology"



Bird PA, Oakley P, Shnier R, et al. Prospective evaluation of magnetic resonance imaging and physical examination findings in patients with greater trochanteric pain syndrome. Arthritis Rheumatism. 2001;44:2138-2145

orthopedic ONE

Bursitis vs Tendinoopathy

- 877 patients with Dx of Greater Trochanteric pain syndrome
- 602 women, 275 men

- Dx made with US:
  - 20.2% trochanteric bursitis
  - 50.4% gluteal tendonosis/tear
  - 28.5% thickened IT band

- Trochanteric bursitis 'overdiagnosed'

- Gluteal pathology underdiagnosed

orthopedic ONE

Long S, Surrey D, Nazarian L. Sonography of greater trochanteric pain syndrome and the rarity of primary bursitis. American Journal or Roentgenology. 2013; 201: 1083-1086.

Mechanism of Injury

- NOT tight Iliotibial band
- IT band normal or excessive lateral soft tissue length
- Compression of IT band against trochanter irritates/injures gluteal tendons
- Weakness of glut med and functional adduction have role in injury and delayed recovery

Grimaldi, A. Lateral Hip Pain. http://dralisongrimaldi.com. 2013

Exam

- Tender to palpation over trochanter
- Flexion/IR and figure four may be painful
  - Confuse with joint pain
- Poor balance with single leg stance
  - Identify loss of contralateral pelvic height
- If not sure of pain source, inject trochanter with 10cc 1% lidocaine and see if pain goes away

Imaging

- Ultrasound
- MR
- High percentage of asymptomatic population with glut med tears

Treatment

- Focus on gluteus medius strength
- Positional avoidance
- Walking in pool
- *CANE*

- Should see improvement in 6 weeks

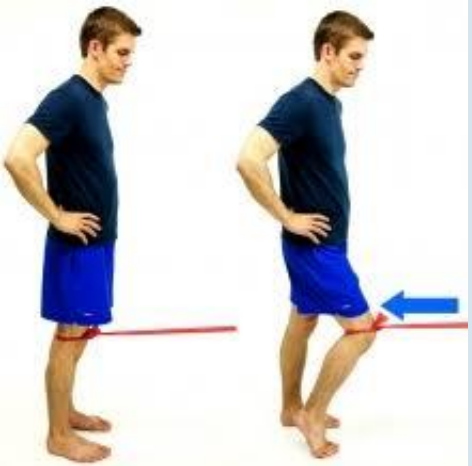
Treatment: Pt. Education

Activities to Avoid	
Avoid crossing legs while sitting	
Avoid sitting in "figure 4" position	
Avoid "hanging" on either hip while standing	
Avoid flexibility and stretching exercises targeting IT Band/piriformis	
Avoid sleeping on painful hip	If you must sleep on painful hip, use an egg crate to soften surface

Activities to Change	
Use towel roll between knees to avoid knees coming together	
Raise seat height so that hips are at an angle greater than 90°	
When sleeping on your non-painful side, put two pillows between our knees	

orthopedic ONE

Early Phase: Therapeutic Exercise



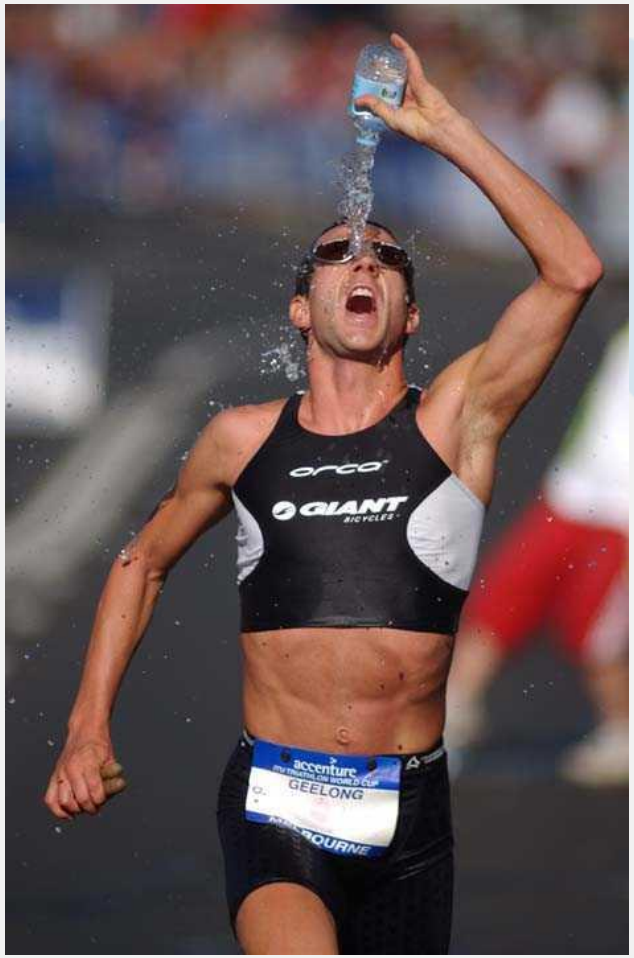
orthopedic ONE

Surgical Indications

- Patients who fail non op treatment
- Functionally limited
- Long recovery (6-12 months)

- Improving surgical outcomes

Stress Fractures



orthopedic ONE

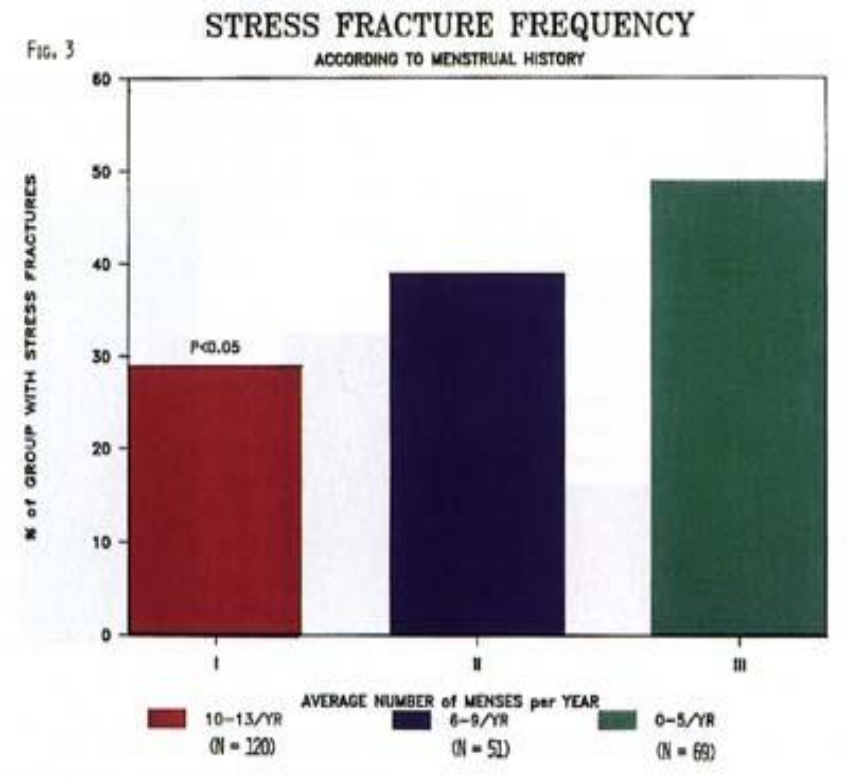
Stress Fractures

- Definition: Fracture of normal bone caused by abnormal forces.
- Etiology - repetitive cyclic overload by submaximal forces.
- Femur 4% Pelvis < 4%
  - Long distance runners and military recruits

Distribution of stress fractures[a]	
Tibia (63%)	
Proximal	25%
Mid	28%
Distal	48%
Metatarsals (21%)	
Second	52%
Third	24%
Fourth	14%
First	10%
Fibula (9%)	
Distal	100%
Femur (4%)	
Calcaneous	
Pelvis	<4%
Tarsal	

Stress Fractures

- Prevalence in females 4 – 10 x higher than males.
- Female triad: Anorexia, Amenorrhea & Osteoporsis.
- *Barrow et al AJSM, 1988*
  - stress fx occurred in 49% of college female distance runners with <5 menses / yr
- Important to obtain menstrual and dietary history in females.



Stress Fractures - Treatment

- Conservative - rest 4 - 6 weeks
- Gradual return to activities when pain free.
- Address dietary / hormonal issues.

Stress Fracture - Femoral Neck

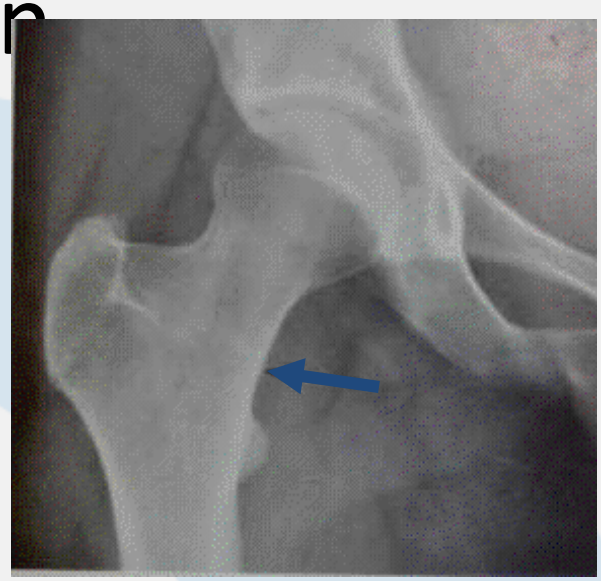
- Early diagnosis and treatment essential
- Displacement can result in severe and extremely disabling complications.
  - Osteonecrosis
  - Nonunion
  - Varus malunion

- Johansson et al, AJSM, 1990
  - The consequences of delay in diagnosis.
  - 23 pts.
  - Diagnosis avg. 14 weeks after symptoms.
  - 7/23 (30%) with major complications (5 displaced).
  - 3 developed AVN – 2 had THA, 1 arthrodesis.
  - 4 required osteotomy.

orthopedic ONE

Stress Fracture - Femoral Neck Classification

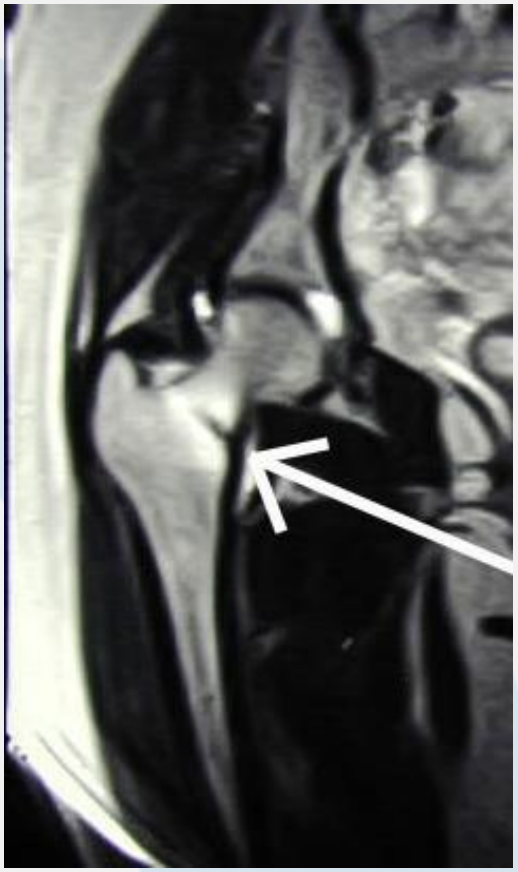
- Crucial to identify type of fracture.
- <u>Compression Side</u>
  - Inherent stability
- <u>Tension side</u>
  - Unfavorable biomechanical forces
  - More likely to displace



orthopedic ONE

Stress Fracture - Femoral Neck Treatment

Compression side



- Typically non-operative.
- Consider MRI
  - Fracture line < 50% width of neck.
    - NWB until healed
  - Fracture line > 50% width of neck.
    - Screw fixation
- ORIF for delayed / nonunion

orthopedic ONE

Stress Fracture - Femoral Neck Treatment

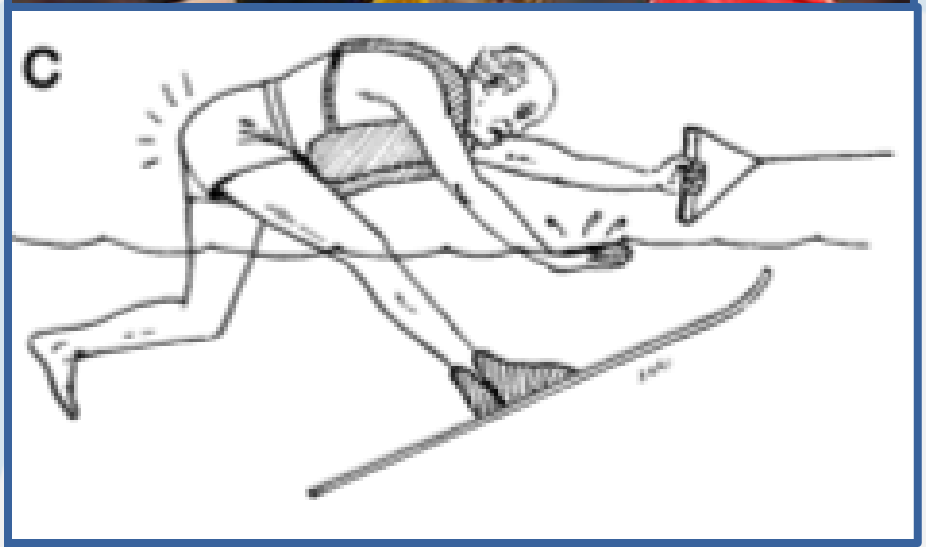
Tension Side

- Urgent percutaneous screw fixation.

Want to avoid this.

orthopedic ONE

Proximal Hamstring Ruptures

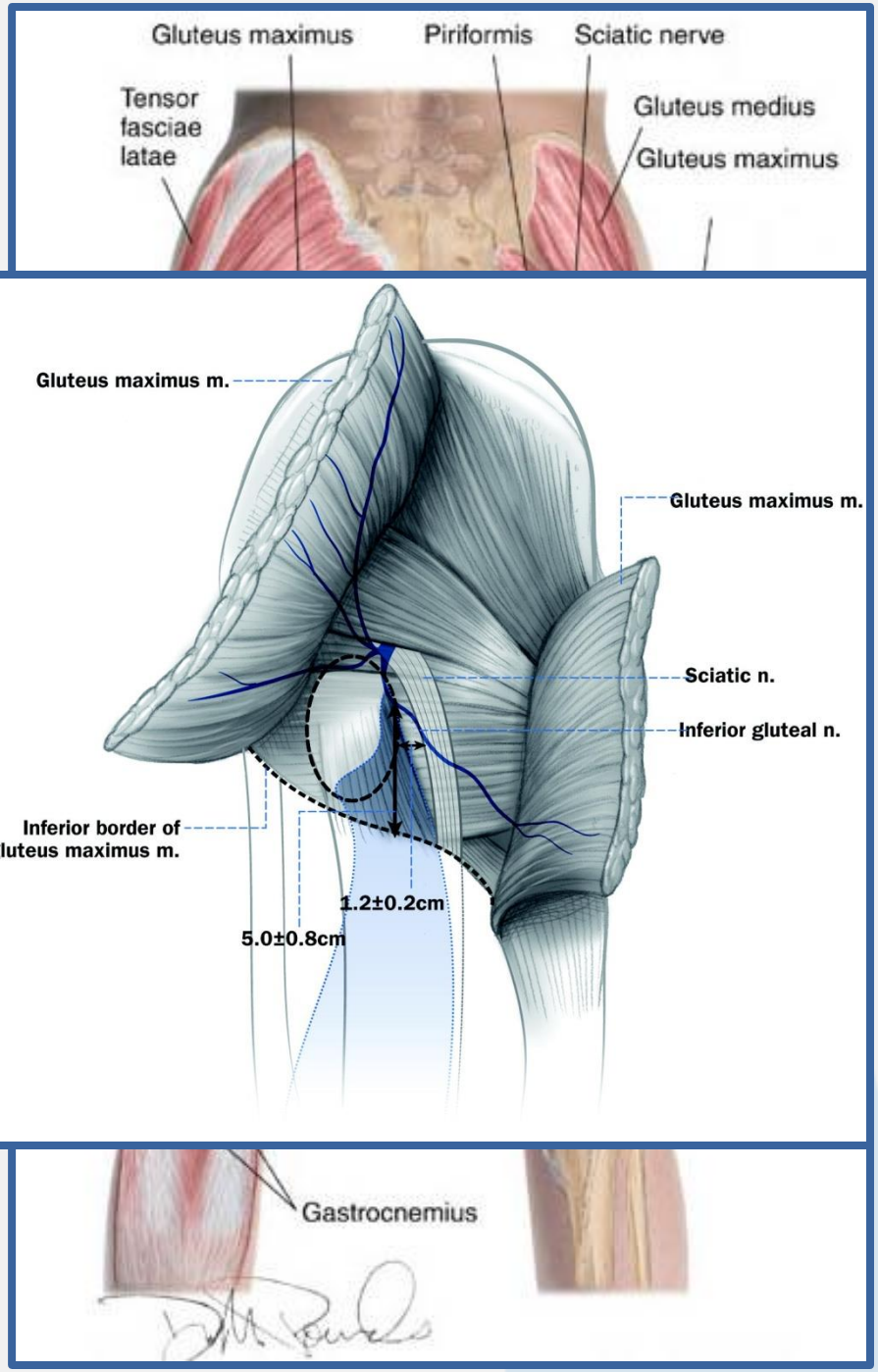


- Relatively Uncommon
  - 9% of all HS injuries (Koulouris et al, Skel Rad 2003)
- Different mechanism
  - Knee extension and forced hip flexion
  - Water Skiing injury (22%)
- Poor outcomes with complete ruptures treated conservatively (Sallay et al, AJSM 1996)

orthopedic ONE

Anatomy

- Three muscles: Biceps femoris, Semitendinosis & Semimembranosis
- Cross two joints
- Origin: Ischial tuberosity
  - Exception: Short head of the biceps
  - ST & BF together medially, SM more lateral
- Innervation: Tibial portion of sciatic
  - Exception: Short head of the biceps (peroneal)
  - Sciatic n avg 1.2cm from ischium (Miller et al, JBJS 2008)



orthopedic ONE

Physical Exam

- Palpate entire length from origin to insertion
- Tenderness, Induration, Ecchymosis, Defect
- Check eversion strength (peroneal n) or for foot drop
- Record passive extension and HS tension with hip flexed to 90°

orthopedic ONE

Imaging

- Plain radiographs helpful for avulsion fractures and the skeletally immature
- MRI has become modality of choice
  - complete versus partial rupture
  - number of tendons ruptured
  - amount of retraction

Treatment

- Only small case series, limited high level data!!

- Non-operative management
  - Proximal Hamstring Strain
  - Any Single tendon tear
  - 2 tendon tears with less than 2cm of retraction (Cohen et al, JAAOS 2007)
  - Median time to return to sport was 31 wks (Askling et al, AJSM 2008)

Operative Indications??

"Clear Cut"

- Displaced Avulsion fractures
- 3 tendon tears retracted > 5 cm

"Gray Zone"

- 2 tendon tears with > 2cm of retraction
- Proximal hamstring syndrome
- Painful fibrous union

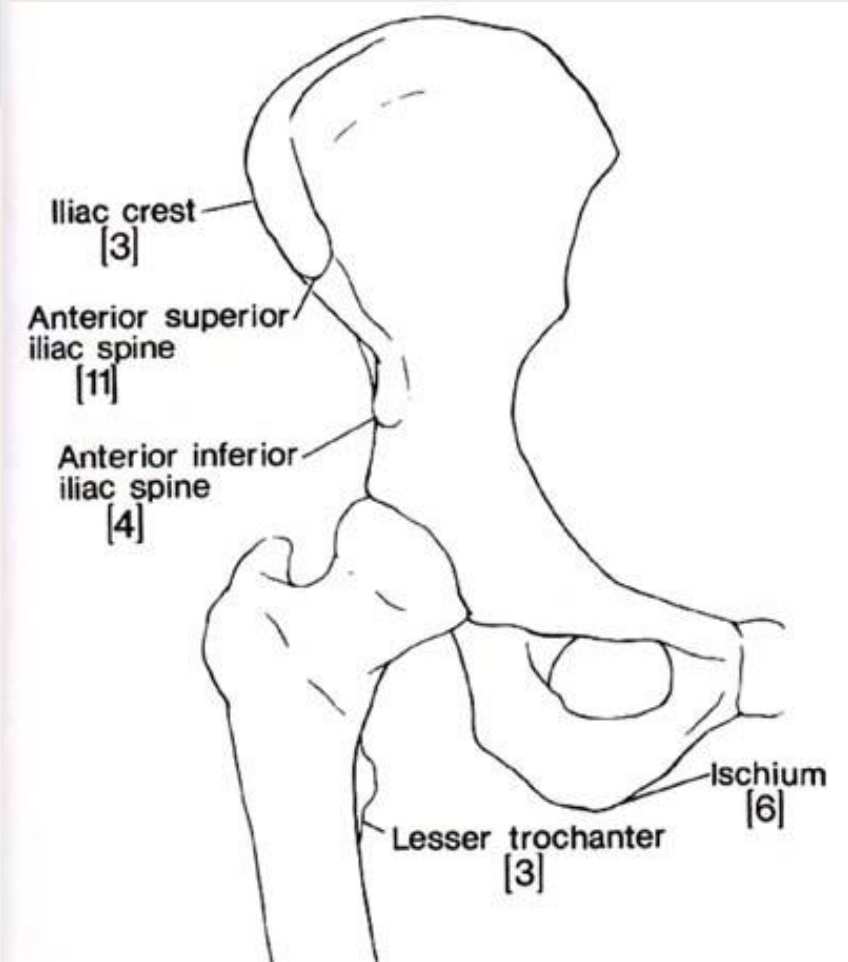
Avulsion Fractures

Avulsion Fractures

- 90% occur in adolescents.
  - Unfused apophysis.
- Usually acute episode.
- Result of violent eccentric muscle contraction.
- Physical Exam:
  - Tenderness, swelling, ecchymosis.
  - Pain: resisted contraction or stretch.
- X-ray:
  - May need comparison views.

Avulsion Fractures

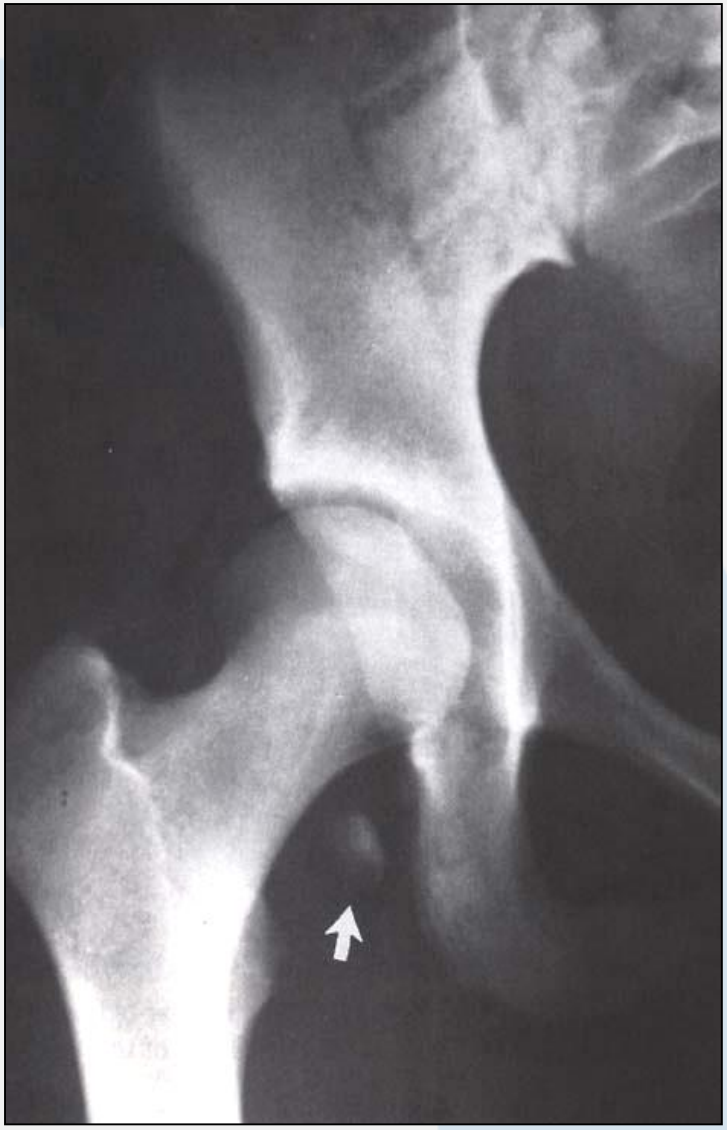
- Iliac Crest: external oblique/gluteus medius
- ASIS: Sartorius
  - Jumping
- Ischial tuberosity: Hamstrings
  - Running / hurdling
- AIIS: Rectus femoris
  - Kicking
- Lesser trochanter: Iliopsoas
  - Kicking



orthopedic ONE

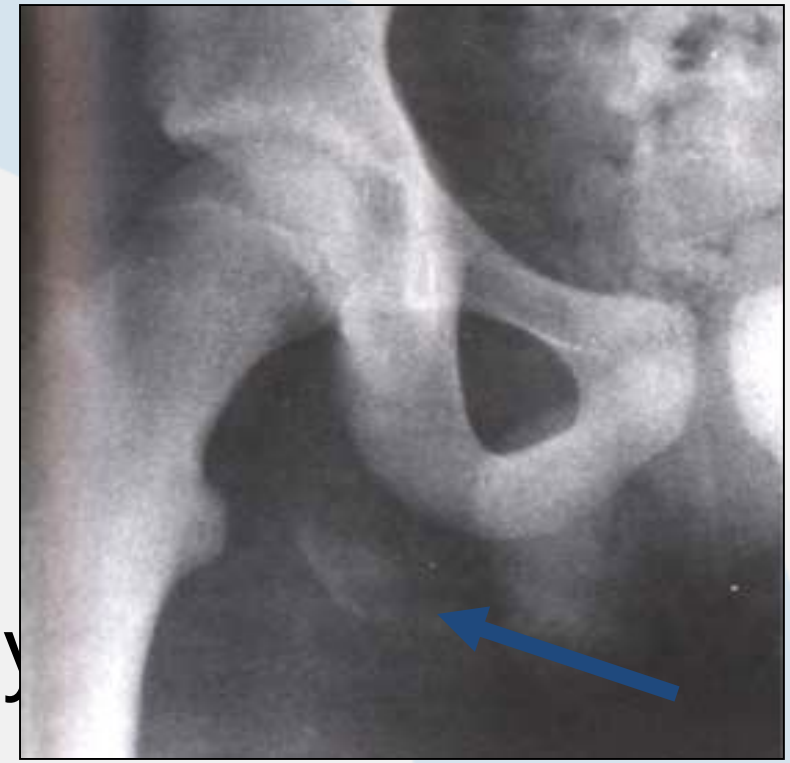
Avulsion Fractures
Treatment

- Vast majority can be treated non-operatively.
  - Rest with gradual return to activity.



Avulsion Fractures Treatment

- Ischial tuberosity:
  - –ORIF for displaced fractures.
  - –Risk of long-term disability if not addressed surgically



Osteitis Pubis

Osteitis Pubis

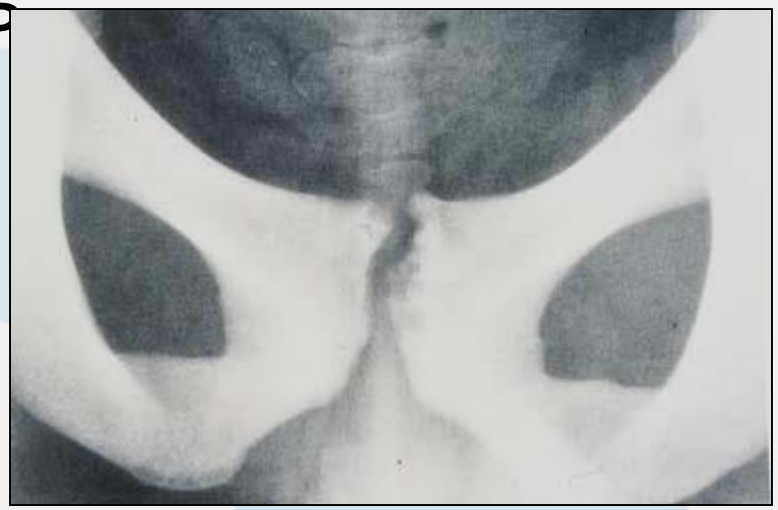
- Poorly understood disorder.
  - First described in fencers in 1932.
- Repetitive trauma.
  - Distance running, soccer, hockey.
- Tension from adductors & rectus abdominus implicated.
- 6% of overuse injuries of hip / pelvis.

Osteitis Pubis
History & Physical Exam

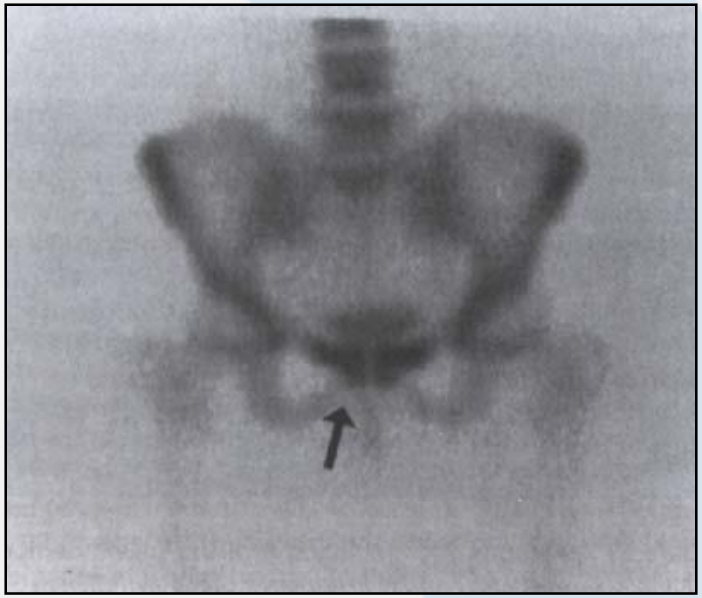
- Insidious onset of suprapubic or groin pain.
- Pain increases with kicking, running, jumping or pivoting.
- History of chronic, unresponsive adductor strain.
- Physical Exam:
  - Tenderness to palpation at pubis.
  - Adductor tightness.
- Differential Diagnosis:
  - Infection.

Osteitis Pubis Imaging

- Radiographs:
  - Early: Resorption or cystic changes.
  - Late: Sclerosis.



- Bone Scan: Can be helpful if x-rays are equivocal.



Osteitis Pubis
Treatment

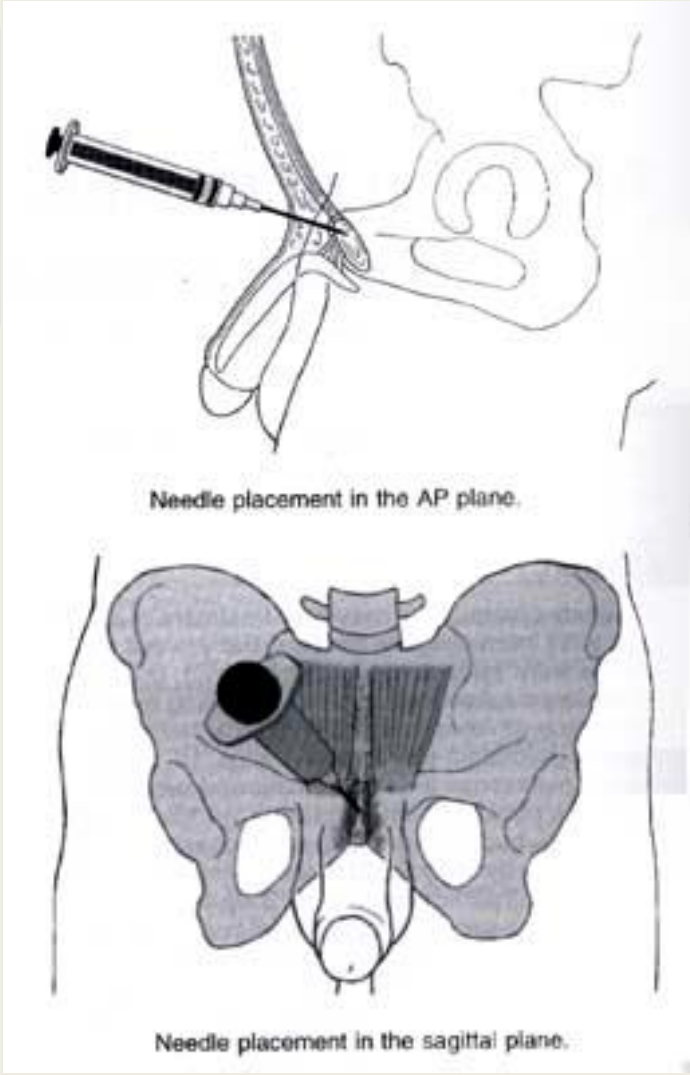
- Activity modification:
  - Rest.
  - Good shoe wear.
  - Pelvic flexibility program
    - (hip internal rotation)
- NSAIDs
- Corticosteroid injection

orthopedic ONE

Injection of Pubic Symphysis

Holt, et. al., AJSM, 1995

- 11 intercollegiate athletes.
- Dexamethasone injected into pubic symphysis.
- Results
- Chronic
- 3 returned <3 wks after injection.
- 4 returned after second injection.
- 1 unable to return to sports.
- Acute
- All 3 returned to sports within 2 weeks
- No complications
- Recommend injection if no relief > 7-10 days after beginning of symptoms.



Needle placement in the AP plane.

Needle placement in the sagittal plane.

orthopedic ONE

Osteitis Pubis
Surgical Treatment

Arthrodesis of the pubic symphysis.

Williams et al, AJSM, 2000

- 7 professional rugby players.
- All failed 13 months non-operative treatment.
  - PT, NSAIDs, Injections
- Open arthrodesis with ICBG and DC plate.
- Mean follow-up 64 months.
- Results
- All patients asymptomatic
- Return to sports at 6 months

orthopedic ONE

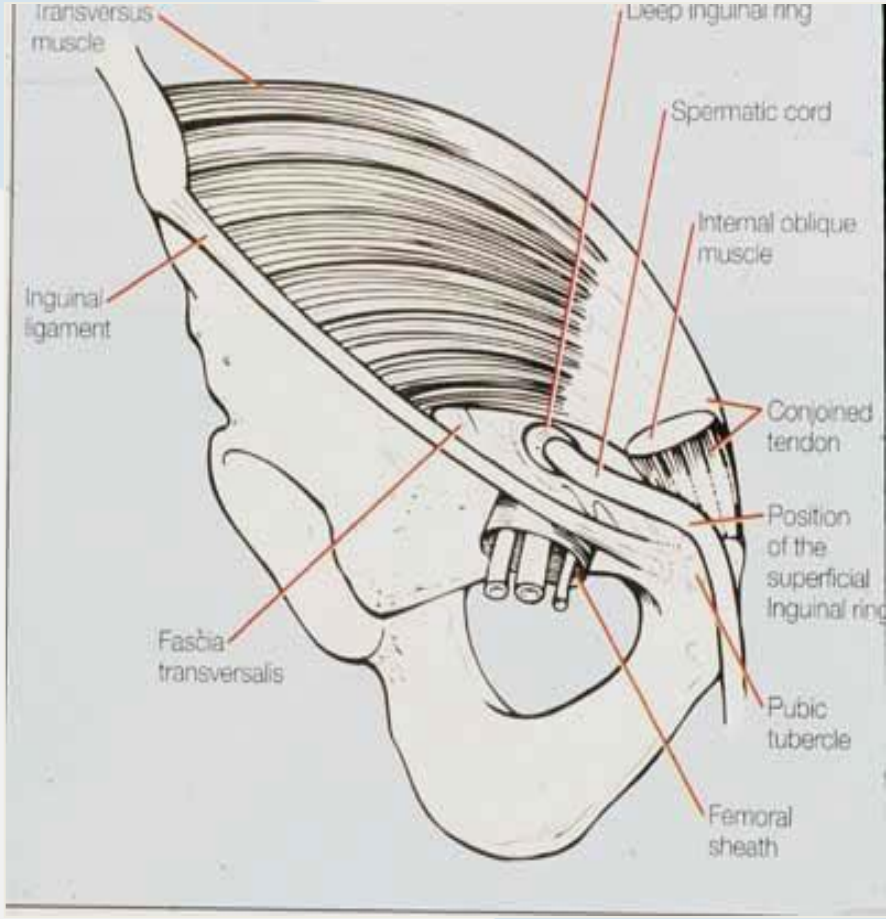
Sports Hernia

- "Hockey Hernia" or "Gilmore's Hernia"
- Repetitive twisting and turning: hockey, soccer, tennis, football.
- Chronic groin pain, insidious onset.
  - Inguinal canal and conjoined tendon.
  - Radiation to adductor area or testicle (30%).
  - Maximal pain after exercise.
- Exacerbated by valsava.
- Caused by weakness of the posterior inguinal wall without a clinically palpable hernia.
  - Repetitive hip hyperextension and truncal rotational movements.

Sports Hernia Diagnosis

Exam

- Superficial inguinal ring dilated and tender.
- Prominent cough response
- No evidence of inguinal hernia.
- Normal gait
- Normal ROM of hip without pain.

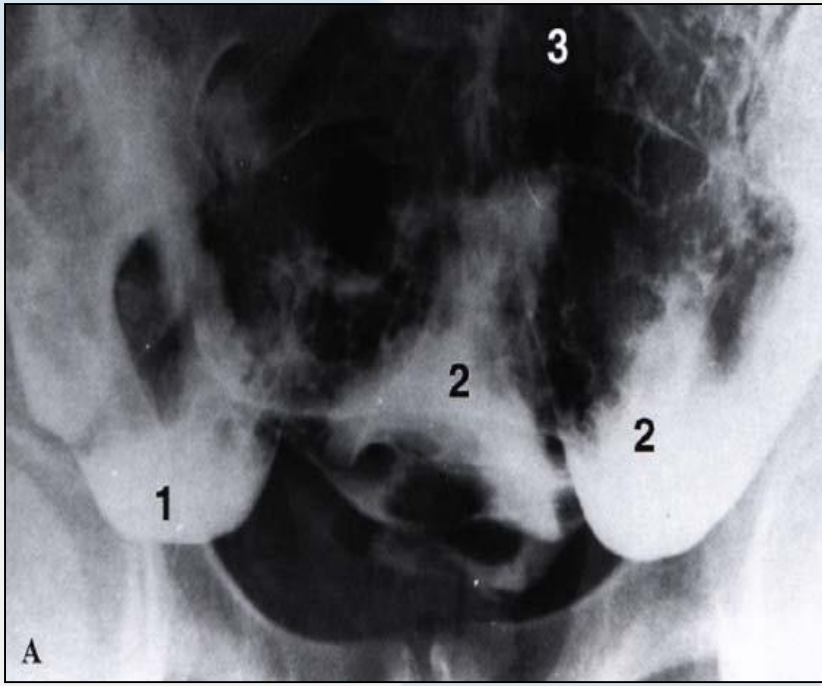


orthopedic ONE

Sports Hernia Diagnosis

Imaging

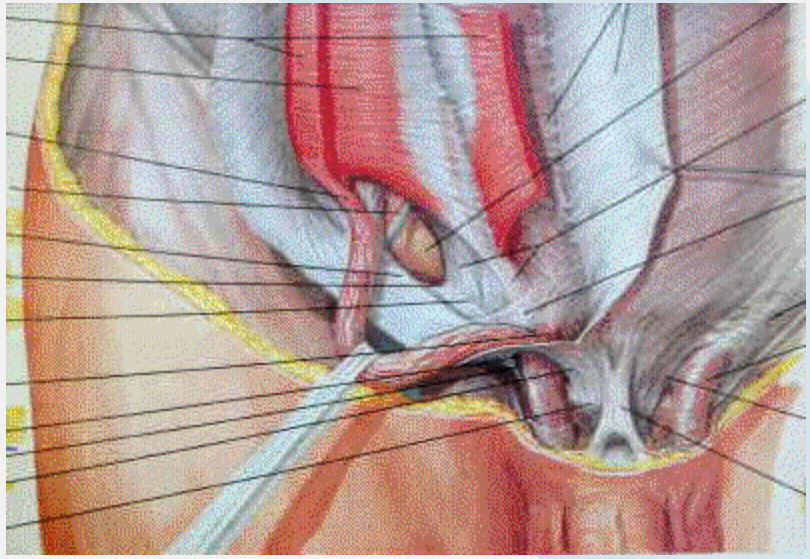
- X-rays: Rule out osteitis pubis.
- Bone Scan: Rule out osteitis pubis.
- Herniography: Distention of the peritoneal folds indicating a stretching of normal fascial layers; Rare.



orthopedic ONE

Sports Hernia Treatment

- Nonoperative Treatment - rarely successful.
  - Rest relieves pain initially, but typically recurs.
- Surgical treatment:
  - Pelvic floor repair.



Sports Hernia
Treatment

Brannigan et al, J Orthop Sports Phys Ther, 2000

- 85 athletes with 100 groin injuries.
- Mean age 24
- Repair: transversalis fascia, conjoint tendon and external oblique aponeurosis.
- Surgical findings: external oblique aponeurosis frayed, conjoint tendon separated from inguinal ligament or absent, transversalis fascia weakened.
- Results:
- 96% success rate.
- 3 failures.
- 82 returned to sports by 15 weeks post-op.

Sports Hernia Treatment

Hackney, Br J Sports Med, 1993

- 15 athletes.
- Age range: 18-38.
- Follow-up: 18 months – 5 years.
- Surgical repair of posterior inguinal wall.
- Results:
- 87% return to sports.
- Remaining 13% improved.

Athletic Pubalgia

Meyers et al, Am J Sports Med, 2000

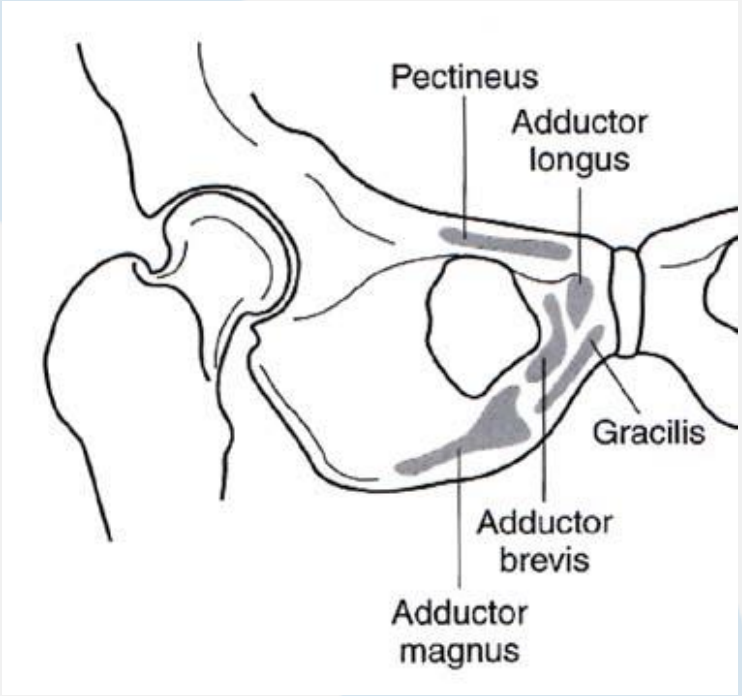
- 157 athletes underwent surgical repair.
- Soccer and hockey most common sports.
- Mean follow-up: 78 months.
- Results:
- 97% return to previous level after 6 mos.
- Important to rule out other causes of pain.

Adductor Strains

orthopedic ONE

Adductor Strains

- Strains: most common injuries about the hip and groin.
- Anatomy: Adductors, Pectineus, Gracilis.
- 62% involve adductor longus *(Renstrom, 1980)*
- Most are incomplete tears near musculotendinous junction.
- Often occur during eccentric contraction.
- Ice hockey, Soccer, Football, Sprinters.
  - 10% of all injuries in elite Swedish hockey players (Sim et al, 1987)



orthopedic ONE

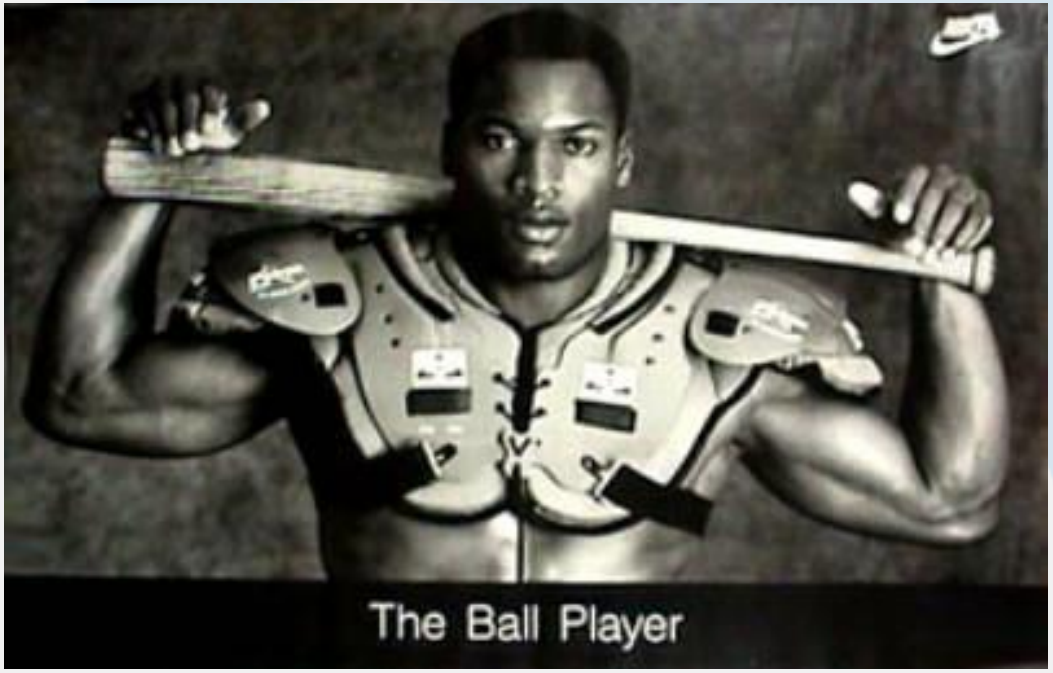
Adductor Strain Diagnosis

- Groin or medial thigh pain.
- Pain with resisted adduction.
- Localized tenderness and swelling.
  - Recovery: Proximal vs Distal
- Grading:
  - 1: No loss of function
  - 2: Partial loss of function
  - 3: Complete loss of function
    - Defect may be palpable.
- X-rays: Avulsion fractures and osteitis pubis.
- ? Ultrasound, MRI

Adductor Strain
Treatment

- Most respond to conservative treatment:
  - RICE.
  - Stretching.
  - Progressive rehab.
- Consider Surgery:
  - Complete tears - rare.
  - Complete tears treated in NFL and soccer athletes with good success
  - Avulsions sometimes need surgery

Traumatic Hip Subluxation



Traumatic Hip Subluxation

- Often misdiagnosed as hip "sprain"
  - Potentially disastrous
- Axial load onto flexed, adducted hip
  - American football
- Posterior acetabular lip fracture
  - Capsular tears iliofemoral ligament

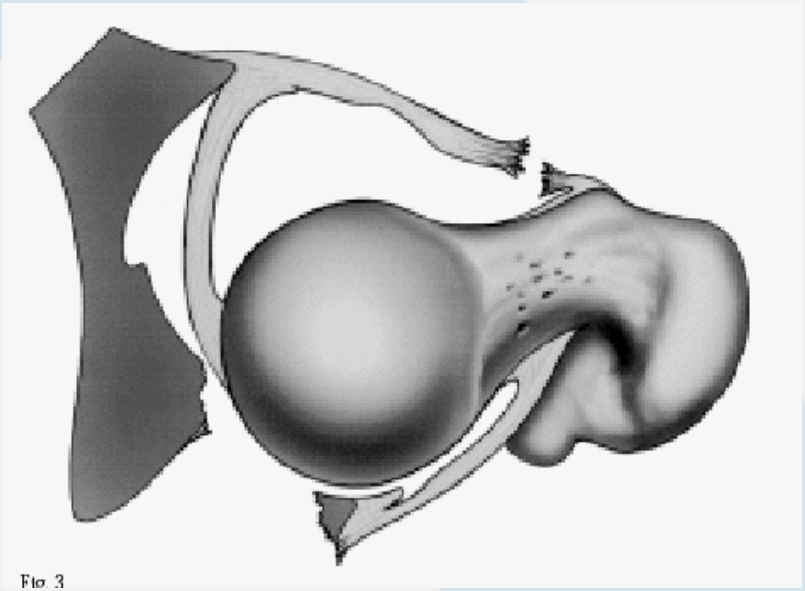


Fig. 3

orthopedic ONE

Traumatic Hip Subluxation

- Moorman et al. *JBJS 2003*
  - 8 posterior subluxations in football players
  - 2 developed AVN
    - NFL running back 3 more years
    - THA in both
  - Recommend:
    - Aspirate hemarthrosis if “large”
    - Crutches, TTWB for 6 weeks
    - MRI @ 6 weeks to evaluate AVN
    - Average return to play 13 weeks

Snapping Hip Syndromes

orthopedic ONE

Snapping Hip Syndromes

- Characterized by an audible snap.
- Usually occurs with hip flexion/extension
- Can be painful.
- Causes:
  - Internal type: Iliopsoas tendon snapping over the femoral head or iliopectineal eminence.
    - dance and martial arts
  - External type: Iliotibial band snapping over the greater trochanter
    - cyclists and runners (hills)
  - Intra-articular type: Labrum tears, loose bodies

Snapping Hip Syndromes
Internal Type

<u>Pathophysiology:</u>

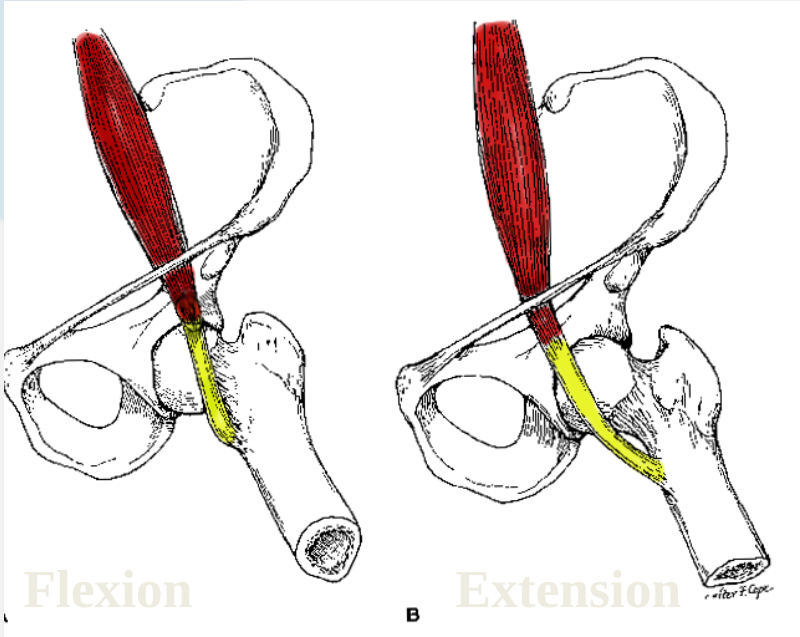
- Snapping over femoral head - common
- Prominent iliopectineal ridge or exostosis
- Iliopsoas bursa
  - Largest synovial bursa

<u>Diagnosis:</u>

- Pt. points to front of hip.
- Will often reproduce voluntarily.
- Exam: Snaps when goes from flexion/abduction to extension/adduction.
- Imaging: Iliopsaoas bursography – definitive

<u>Treatment :</u>

- Rest, NSAIDs, Stretching.
- Lengthening or release for recalcitrant cases.



orthopedic ONE

Snapping Hip Syndromes
External Type

Pathophysiology:

- IT band snapping over the greater trochanter.
- Thickening posteriorly can enhance snapping.
- Snaps as hip goes from extension to flexion.

Diagnosis:

- Pt. points to lateral hip.
- Exam: Have patient lay on side and actively flex and extend hip.
- Pressure on greater trochanter stops the snapping.

Treatment :

- Rest, NSAIDs, Stretching
- Excision of bursa and Z-lengthening for recalcitrant cases.

Snapping Hip Syndromes
Intra-articular Type

<u>Pathophysiology:</u>
- Intra-articular pathology

<u>Differential Diagnosis:</u>
- SCFE or Perthes in adolescent
- Labral tears
- Loose bodies
- AVN
- OCD
- Arthritis

<u>Diagnosis</u>
- Xrays
- MRI arthrogram
  - Marcaine can assist diagnosis

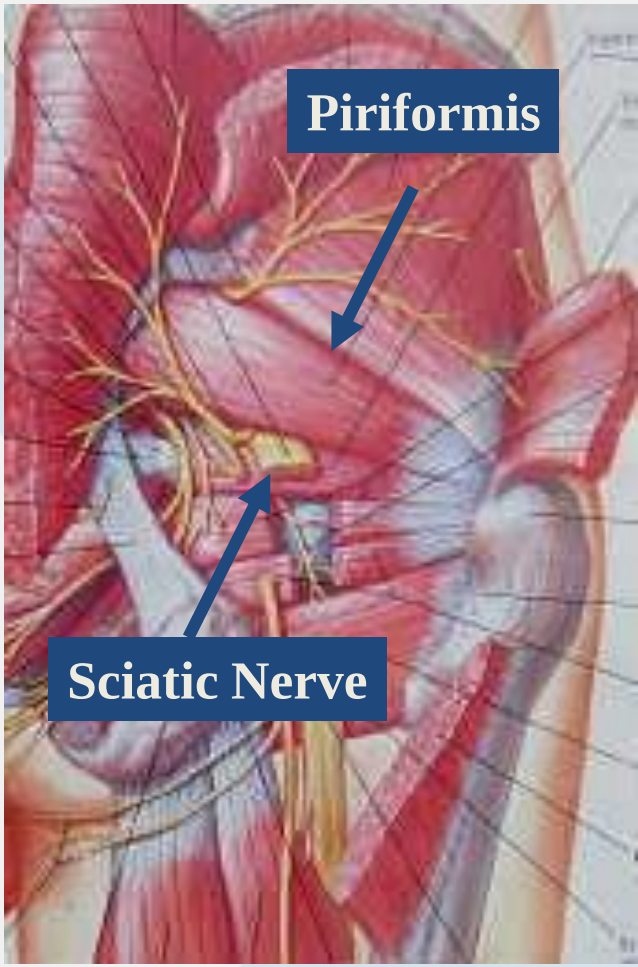
orthopedic ONE

Piriformis Syndrome

orthopedic ONE

Piriformis Syndrome

- Compression of the sciatic nerve under the piriformis muscle.
  - Bifid muscle.
  - Fibrous bands.
  - Hypertrophied muscle.
- Buttock pain +/- radiation
- Exacerbated with hip adduction and internal rotation and prolonged sitting.
- Often triggered by acute trauma to buttock.
- Hockey, Cross-country skiing and tennis.



Piriformis Syndrome

- Physical Exam:
  - Tenderness over piriformis.
    - May feel spindle shaped mass.
  - Pain with forced IR of extended thigh (Freiberg sign).
  - Weakness of abduction and ER (Pace sign).
  - Positive straight leg raise.
  - Neurologic exam usually normal.

Piriformis Syndrome

Diagnostic Tests:

- MRI – Rule out other conditions
  - May see hypertrophy or atrophy.
- EMG
  - Can detect myopathic and neuropathic changes.
  - Dynamic test: Delay in the H-reflex with leg adducted, IR and flexed position.
- Diagnostic injection

Piriformis Syndrome Treatment

Non-Operative:

- NSAIDs
- Muscle relaxants
- PT
  - Stretching, US, transrectal massage.
- Corticosteroid injections.

Operative:

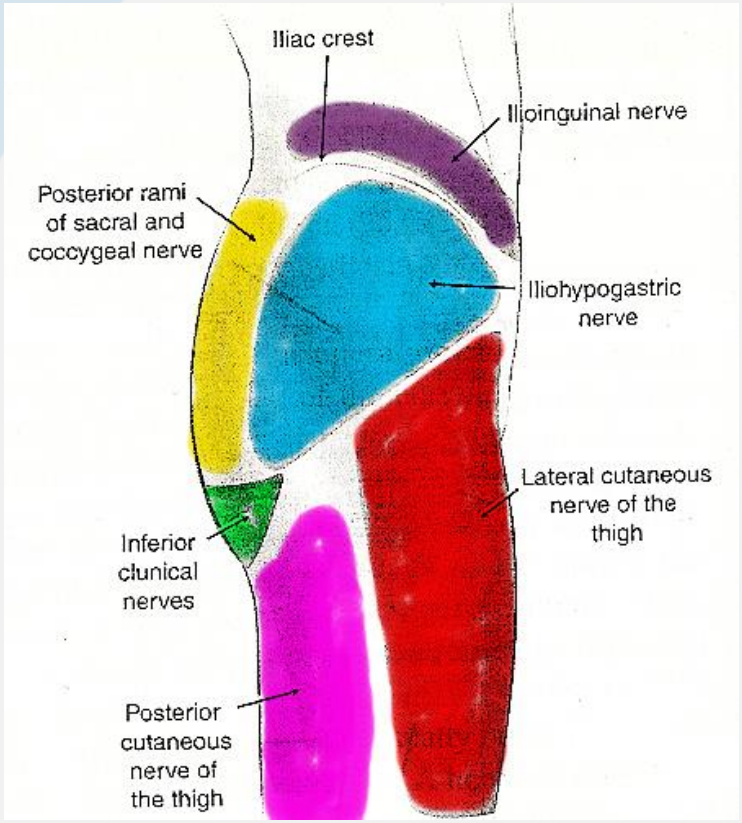
- Release of piriformis and neurolysis.

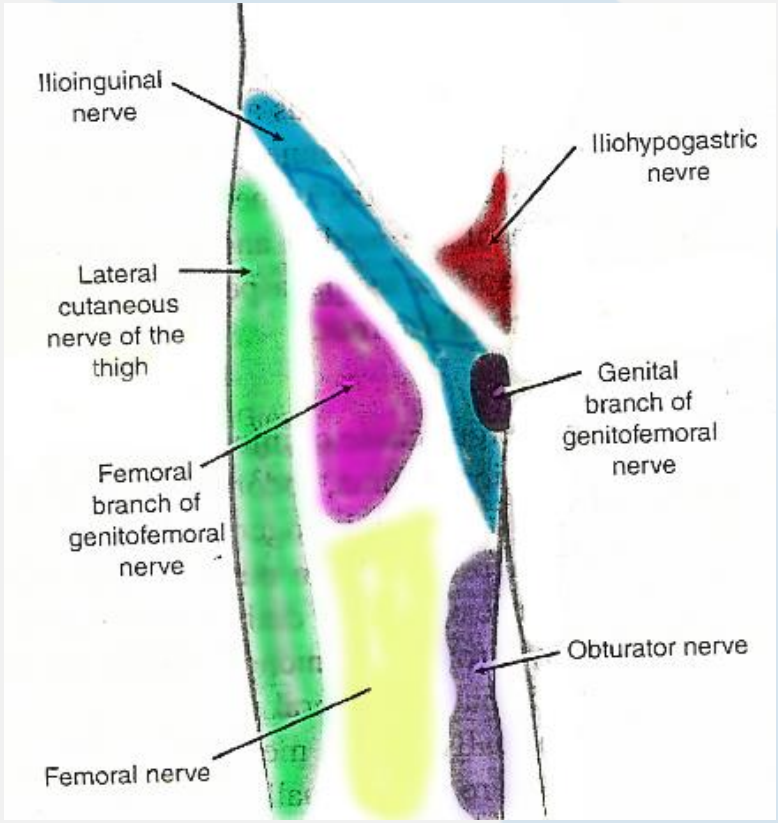
Nerve Entrapment Syndromes

orthopedic ONE

Nerve Entrapment Syndromes

- Relatively rare in sports.
- Etiology –
  - Trauma: Local edema, hematoma or scar.
  - Clothing or equipment.





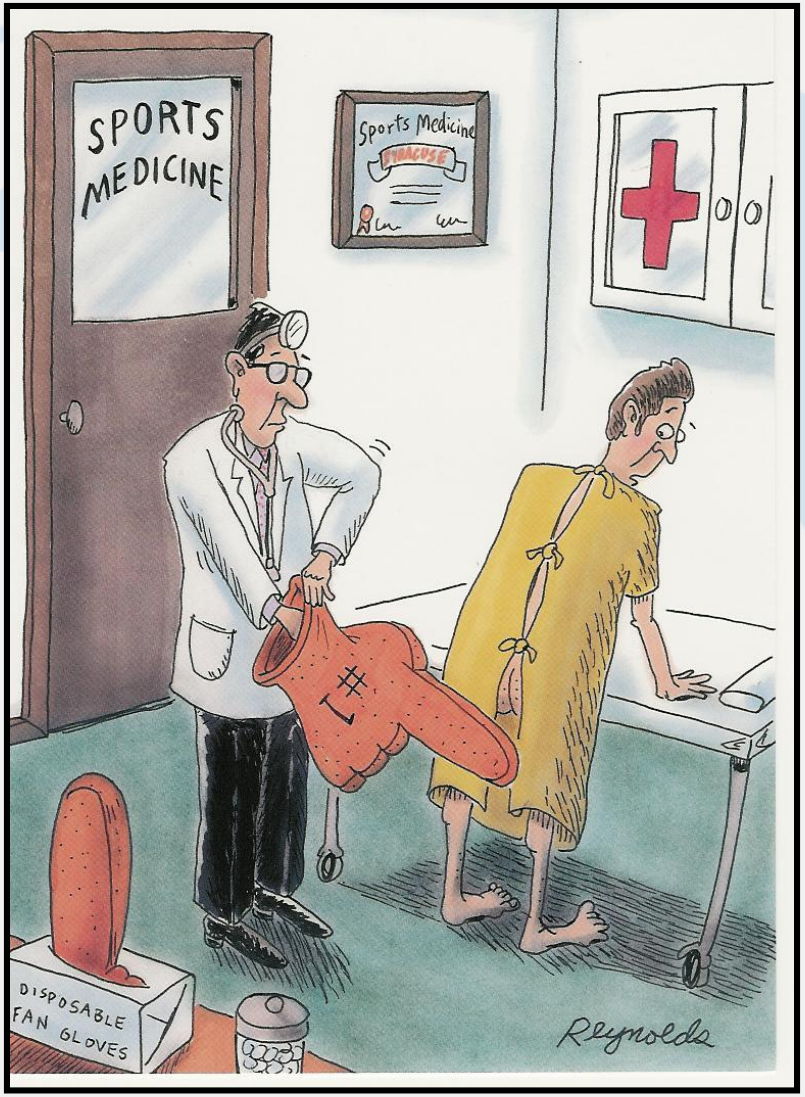
Nerve Entrapment Syndromes

- Femoral Nerve: Anterior thigh
  - Iliopsoas strain with hematoma (gymnasts)
- Pudendal Nerve: Perianal, genital
  - Cyclists
- Lateral Femoral Cutaneous: Lateral thigh
  - "meralgia paresthetica"
  - Gymnasts (uneven bars), SCUBA
- Posterior Femoral Cutaneous: Post thigh
  - Cyclists

Nerve Entrapment Syndromes

- Physical Exam
  - Sensory/ motor exam
  - Tinnels
  - Have patient reproduce activity that causes symptoms
- Diagnostics
  - Local injection
  - EMG
- Treatment – Most resolve
  - Clothing or equipment change
  - NSAIDs
  - Injections
  - Surgical neurolysis

Thank You!



orthopedic ONE