Groin Pain in Athletes

Chris Dolan, M.D.
Differential Diagnosis

**EXTRA ARTICULAR**
- Muscle strains
  - “Pulled Groin”
- Athletic Pubalgia / Sports Hernia
- Osteitis Pubis
- Snapping Hip
- Nerve entrapment syndromes
- Stress Fractures
- Avulsion and apophyseal injuries
- Piriformis syndrome
- Bursitis
  - Iliopsoas
  - Trochanteric
- Hip and thigh contusions

**INTRA ARTICULAR**
- Femoroacetabular impingement
- Labral tears
- Hip dysplasia
- Osteoarthritis
- Inflammatory arthritis
- Hip dislocations – AVN
- Osteonecrosis

**REFERRED / MEDICAL**
- Lumbar / Sacral pathology
- Gynecologic
- Urologic
- GI – Hernia, IBD
- Neoplasm
Groin Pain Epidemiology

- Feeley et al. AJSM preview July 2008
- NFL Injury Surveillance System 1997-2006
- All injuries that caused athlete to miss >2 days; all hip & groin injuries recorded
- 23,806 total injuries; 738 hip (3.1%)
- Avg 12.3 days lost
- Muscle strain most common
- “Sports hip triad” – labral tear, adductor strain, rectus abdominus strain
- Many players with labral tears demonstrated persistent adductor strains
Groin Pain in the Athlete

- Despite high prevalence the cause can be difficult to elucidate
  - Complex local anatomy with large soft tissue sleeve
  - Complex biomechanics
  - Wide differential diagnosis
  - Often diffuse, insidious symptoms with nonspecific presentation
  - Often multiple diagnoses
  - 19/21 athletes 2 or more diagnosed causes
  - Inguinal hernia, neuralgia, adductor strain, osteitis pubis, prostatitis
  - Difficult Dx, explanation for failed therapy
Patient History

- Onset – acute or insidious (most common athletic groin injuries are hip adductor and flexor strains which have an acute onset vs an athletic hernia which is usually chronic in nature)
- Location of pain
- Duration
- Severity
- Mechanical symptoms – Intraarticular - chondral flaps and labral tears
- Sporting activity
  - Recent increase in activity or vigorous new exercise
  - Long distance runners / Triathletes – stress fxs
  - Twisting type sports: Hockey, soccer, tennis, golf – adductor strains, sports hernia, labral tears
- Association with Trauma – history of hip dislocation; impact injury to greater trochanter
- History of ligamentous laxity
- Hip dysplasia as a child
- Previous hip problems – SCFE, Perthes

Patient History

- **Intra-articular Problems**
  - Pts often have pain that is described as deep in the joint and localized to anterior groin or inguinal region
  - May localize between a finger anteriorly in groin and one at posterior aspect of trochanter or buttock
  - Discrete episodes of sharp pain with weight bearing
  - Pain with sitting with the hip flexed and pain or catching on arising from a seated position
  - Catching, popping, locking

Patient History

- **Extra-articular Problems**
  - Pain felt in the buttocks/posterior trochanteric region, Lateral thigh
  - Low abdominal area
  - Pubic Symphysis and Adductors, Hip Flexors

- **Referred pain**
  - Spine
  - Abdominal / Intrapelvic / Retroperitoneal
  - Remember hip problems may present as knee pain

Physical Exam

- Palpation
  - Muscles origins such as sartorius, rectus femoris, gluteus medius and adductors
  - Iliac crest – hip pointers
  - Hernias
  - Pubic symphysis – osteitis pubis
  - Sciatic notch
    - With hip flexed 90deg palpate half way between GT and ischial tuberosity
    - Pts with sciatica, piriformis syndrome
  - Greater trochanter
    - Bursitis
    - Snapping ITB

Adductor Muscle Strains
Adductor Muscle Strains

- Most common injury about the groin
- Injury occurs during eccentric contraction – hip hyperabduction and hyperextension
- Adductor muscles = pectineus, adductor longus, brevis and magnus, gracilis and obturator externus
- Adductor longus is the most frequently injured
- More common in ice hockey and soccer, which require strong eccentric contraction of the adductor musculature
- Tyler et al. AJSM 2001 The association of hip strength and flexibility on the incidence of groin strains in professional ice hockey players.
  - The strength ratio of the adduction to abduction muscle groups (<80%) has been identified as a risk factor in pro hockey players and a program to increase adductor strength can be an effective method for preventing these injuries

Anderson. AJSM 2001
Adductor Muscle Strains

- **CLINICAL PRESENTATION / PHYSICAL EXAM**
  - Usually sudden onset pain in groin region; insidious
  - Pts have pain on palpation of adductor tendons or insertion on the pubic bone
  - Pain with resisted adduction or passive abduction

- **Grade**
  - First degree – pain, but minimal loss of strength and minimal restriction of motion
  - Second degree – decreased strength
  - Third degree – complete disruption of muscle tendon unit
Adductor Muscle Strains

- **Imaging**
  - Plain films to rule out avulsions, fractures, pathology
  - Bone scan to rule out osteitis pubis
  - MRI muscle enhancement, ant pubic bone

Robinson. Skeletal Rad 2004
Adductor Muscle Strains

- There is high incidence of recurrent strains
  - Likely due to incomplete rehab
- Rehab program needs to emphasize eccentric resistive exercise
- Tyler et al showed that an 8-12wk active strengthening program, consisting of progressive resistive adduction and abduction exercises, balance training, abdominal strengthening and skating movements on a slide board, proved effective in treating chronic groin strains and preventing new in season injuries
Table II. Groin strain post-injury programme

<table>
<thead>
<tr>
<th>Phase</th>
<th>Treatment</th>
<th>Clinical milestone</th>
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</thead>
<tbody>
<tr>
<td>Phase I (acute)</td>
<td>RICE for first ~48 hours after injury</td>
<td>Concentric adduction (against gravity without pain)</td>
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<td>NSAIDs</td>
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<td>Massage</td>
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<td>TENS</td>
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<td></td>
<td>Ultrasound</td>
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<td>Submaximal (25-50%) isometric adduction with knees bent then with knees</td>
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<td>straight progressing to maximal isometric adduction, pain free</td>
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<td>Hip PROM in pain-free range</td>
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<td>Nonweight-bearing ambulation/PEF except abduction of involved lower extremity</td>
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<td>Pain-free, left and right upper body</td>
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<td></td>
<td>Contralateral adduction</td>
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<td>Flexibility and balance</td>
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<td></td>
<td>Bilateral balance</td>
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<tr>
<td>Phase II (subacute)</td>
<td>Bicycling/squatting, sumo squatting, single-limb standing,</td>
<td>Involved lower extremity PROM equal to that of the uninvolved side, and involved adductor strength at least 75% that of the ipsilateral abductors</td>
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<td>standing and concentric standing and seated adduction</td>
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<td>Bilateral adduction contralateral board moving in frontal plane (ie.</td>
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<td>adduction simultaneously)</td>
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<td>Unilateral lunges (sagittal) with reciprocal arm movements</td>
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<td>Multiplane trunk tilting</td>
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<td>Balance-board squats with throwbacks</td>
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<tr>
<td>Phase III (sports-specific training)</td>
<td>Phase II exercises with increase in load, intensity, speed and volume</td>
<td>Adduction strength at least 90-100% of the abduction strength, and involved muscle strength equal to that of the contralateral side</td>
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<tr>
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<td>Standing: resisted stride lengths on cable column to simulate skating</td>
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<td>Slide board</td>
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<td>On ice: kneeling adductor pull togethera</td>
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<td></td>
<td>Correct or modify ice-skating technique</td>
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</tbody>
</table>

a. Use of tradenames is for product identification only and does not imply endorsement.

NSAIDs = non-steroidal anti-inflammatory drugs; PReS = progressive resistance exercises; PROM = passive range of motion; RICE = rest, ice, compression and elevation; TENS = transcutaneous electrical nerve stimulation.
Adductor Muscle Strains

**TREATMENT**

- Rest, ice, NSAIDs, compressive shorts *(skins)*
- 68 athletes >10 mos adductor related groin pain
- 8-12 weeks active vs passive therapy
- Found that functional training with active exercise was far superior to passive therapy with massage and modalities.
- **After RTP** – only 40% athletes **WITHOUT** symptoms at end of following season
Adductor Muscle Strains

- Surgical treatment = Adductor tenotomy

  - Akermark and Johansson. AJSM 1992
    - 16 athletes, all improved or were free of symptoms
    - All but one returned to the same sports at a mean of 6.6wks
    - 10/16 (63%) were able to return to their previous sports activities
    - 5/16 returned but at a reduced level
    - All pts had decreased strength
Sports Hernia
Sports Hernia

- Athletic pubalgia, sportsman’s hernia, Gilmore’s groin, hockey groin, slap shot gut, Ashby’s inguinal ligament enthesopathy
- **Occult hernia caused by weakness or deficiency of the posterior inguinal wall without a clinically recognizable hernia, leads to chronic groin pain**
- Almost always in men, most commonly in sports such as hockey, soccer, Australian rules football, and tennis
- Often prolonged course before diagnosis
- Cause of chronic groin pain in athletes
Sports Hernia

- Pathoanatomy  Farber et al. JAAOS Aug 2007
  - Often from trunk hyperextension and thigh hyperabduction, leads to shear across the pubic symphysis and stress on inguinal musculature
  - **Shearing forces more prominent in athletes with an imbalance between the strong adductors and relatively weak lower abdominal musculature**
  - Places stress on inguinal wall musculature leading to attenuation of the soft tissues
Pathologic findings have included attenuation or tearing of the transversalis fascia, conjoined tendon, the rectus abdominis muscle insertion, or of the Int O / Ext O muscles or aponeuroses.
Sports Hernia

- “Syndrome of Muscle Imbalance of the Groin”
- Additional stress on hemipelvis leads to weakening or tearing of the transversalis fascia and surrounding tissue
- Results in tendonitis of adductor and/or abdominal muscles

Sports Hernia

- Hallmark = asymptomatic with inactivity and pain returns with activity
- Usually an insidious onset of unilateral, deep groin pain that often radiates to the perineum and inner thigh or across the midline
- Aggravated by sudden movements, valsala, performing sit-ups, sprinting and kicking
- On exam findings may include local tenderness over the conjoined tendon, pubic tubercle and midinguinal region; **tender, dilated superficial inguinal ring (up to 94%)** and tenderness of the post. wall of the inguinal canal; pain with resisted hip adduction and resisted sit-up as well as valsalva or coughing

Farber et al. JAAOS Aug 2007
Sports Hernia

- Imaging
  - Generally used to r/o other diagnoses
  - Plain films of hips, pelvis and LS spine
  - Bone scan may reveal increased uptake at superior pubis, pubic symphysis or adductor origin but is nonspecific
  - Dynamic ultrasound – operator dependent
  - MRI – may show increased signal within the pubic bones or within one or more groin muscles (rectus abdominus, pectineus, adductors) but is also nonspecific
Sports Hernia

- **Conservative**
  - NSAIDs
  - Deep massage
  - Prolonged rest
  - PT with emphasis on core strengthening and resolving the imbalance of the hip and pelvic muscle stabilizers
  - **Pts with chronic groin pain do not get better with conservative measures**

Farber et al. JAAOS Aug 2007
Sports Hernia

- **Surgical treatment**
  - Consider after 8-12 weeks of failed non-op Tx
  - Surgical repair of the weak posterior inguinal wall with open or laparoscopic techniques leads to success rates of 80-97%
  - Some also recommend adductor tenotomy in pts who have symptomatic adductor abnormality that is not corrected preoperatively
Muschaweck argues if pain not improved in 4-6 weeks athlete at high risk of chronic pain if not aggressively treated.

Tension free repair of the transversalis fascia.
Sports Hernia

- Varied Surgical treatment

    
    - 157 athletes, reattached the inferolateral edge of the rectus abdominis to pubic bone and inguinal ligament: tightens attachment around pubis and stabilizes pelvis
    
    - +/- adductor longus tenotomy;
    
    - f/u avg 3.9yrs, 95% success rate with 88% playing at or above pre-injury level at 3mo and 96% at 6mo
<table>
<thead>
<tr>
<th>Authors</th>
<th>Number of Patients</th>
<th>Most Common Sport Involved</th>
<th>Surgical Approach; Operative Findings</th>
<th>Percentage Athletes and Time to Return to Play</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polglase et al</td>
<td>64</td>
<td>Football</td>
<td>Open repair; transversalis defect</td>
<td>89%, timeframe not documented</td>
</tr>
<tr>
<td>Malycha and Lovell</td>
<td>50</td>
<td>Soccer</td>
<td>Open repair; bulge posterior wall</td>
<td>93%, 6–8 weeks</td>
</tr>
<tr>
<td>Hackney</td>
<td>15</td>
<td>Soccer</td>
<td>Open repair; transversalis defect</td>
<td>80%, 6 weeks</td>
</tr>
<tr>
<td>Simonet et al</td>
<td>10</td>
<td>Ice hockey</td>
<td>Open repair; internal oblique muscle tear</td>
<td>100%, timeframe not documented</td>
</tr>
<tr>
<td>Ingoldby</td>
<td>28</td>
<td>Rugby</td>
<td>Open vs. laparoscopic OR findings not reported</td>
<td>Open: 64% at 4 wks Lap; 93% at 4 wks; 97%, 6 weeks</td>
</tr>
<tr>
<td>Gilmore</td>
<td>&gt; 1200</td>
<td>Soccer</td>
<td>Open repair; torn external oblique aponeurosis (EOA) and conjoined tendon, dehiscence of conjoined tendon off inguinal ligament</td>
<td>89%, return to play timeframe not documented</td>
</tr>
<tr>
<td>Meyers et al</td>
<td>157</td>
<td>Soccer</td>
<td>Open repair; 30% received adductor release; inguinal floor defect, EOA tear, rectus tear</td>
<td>89%, return to play timeframe not documented</td>
</tr>
<tr>
<td>Ekstrand and Ringborg</td>
<td>66</td>
<td>Soccer</td>
<td>Open repair; incipient hernia Neurotomy of ilioinguinal, iliohypogastric nerves</td>
<td>Unclear, but superior to nonoperative. Return to play at 6–8 weeks</td>
</tr>
<tr>
<td>Irshad et al</td>
<td>22</td>
<td>Ice hockey</td>
<td>Open repair; EOA tear, entrapped ilioinguinal nerve ablation</td>
<td>100%, timeframe not documented</td>
</tr>
<tr>
<td>Kumar et al</td>
<td>35</td>
<td>Soccer</td>
<td>Open repair; EOA tear, posterior wall bulge</td>
<td>93%, 14 weeks</td>
</tr>
<tr>
<td>Genitsaris et al</td>
<td>131</td>
<td>Soccer</td>
<td>Laparoscopic repair; posterior wall deficiency</td>
<td>100%, 2–3 weeks</td>
</tr>
<tr>
<td>Klun et al</td>
<td>14</td>
<td>Soccer and triathletes</td>
<td>Laparoscopic repair; lateral/medial/femoral hernia</td>
<td>93%, timeframe unclear</td>
</tr>
<tr>
<td>Paajanen et al</td>
<td>41</td>
<td>Soccer</td>
<td>Laparoscopic repair; disrupted conjoined tendon (10%)</td>
<td>90%, 4 weeks</td>
</tr>
<tr>
<td>Steele et al</td>
<td>47</td>
<td>Soccer/Rugby</td>
<td>Open repair; posterior wall deficiency</td>
<td>77%, 4 months</td>
</tr>
<tr>
<td>Susmallian et al</td>
<td>35</td>
<td>Soccer</td>
<td>Laparoscopic repair; posterior wall deficiency</td>
<td>97%, ≥ 10 days</td>
</tr>
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</table>
Sports Hernia

- Only one prospective, randomized study

  - 66pts, four groups: surgery, individual training, NSAIDS and PT and controls; only the surgical group showed substantial and statistically significant improvement in symptoms and ability to return to sport

  - “Sports hernia anatomy, surgical procedures and rehabilitation strategies are poorly described”
  - Majority Level IV
  - Call for better studies
Sports Hernia

- Should involve a multidisciplinary approach
- Pts often have more than one diagnosis
  - Ortho surg, Gen. surg, Urologist evaluated 21pts
  - 90% of pts had two or more positive findings, some >4 diagnoses
  - Most common diagnoses were osteitis pubis, inguinal hernia and prostatitis (48%)
Osteitis Pubis
Osteitis Pubis

- Painful, inflammatory, non-infectious condition of pubic symphysis and surrounding structures
- Etiology considered to be associated with muscle imbalance, pelvis instability and chronic overuse injury
- Abdominal and adductor muscle imbalance (antagonists), prevalent in kicking sports
- Abnormal vertical motion of the pubic symphysis (>2mm) is a contributing factor
Osteitis Pubis

- Usually presents with pubic symphysis or adductor pain
- Aggravated by activities requiring sudden hip flexion or rotation
- Provocative maneuvers
  - Rocking cross-leg test – pt sits with one knee crossed over the other, push down on knee and hold down opposite iliac crest
  - Lateral pelvic compression test
Physical Exam

- Lateral compression to evaluate osteitis pubis
  - Lateral decubitus position with downward force applied to iliac crest
  - Symptoms at the pubis
- Gapping and approximation/compression test
  - Supine (Transverse anterior stress test)
    - Downward and outward pressure on ASIS
  - Supine (Transverse posterior stress test)
    - Pressure from iliac crests towards midline
Osteitis Pubis

- **Xrays findings** – marginal irregularity, symmetrical bone reabsorption, widening of symphysis, reactive sclerosis

- **Flamingo views** – single leg standing AP view of PS, vertical motion >2mm is abnormal

- **MRI** – increased signal in the PS because of bone marrow edema

*Figure 2. Vertical symphyseal instability demonstrated by AP flamingo view radiographs. A, patient standing on left leg. B, patient standing on right leg.*

Radic et al. AJSM Jan 2008
Paajanen et al. AJSM Jan 2008  Comparison of MRI findings for athletes with osteitis pubis and asymptomatic athletes during heavy training

-65% of asymptomatic athletes demonstrated presence of bone marrow edema
-Decreases the value of MRI for surgical decision making
Osteitis Pubis

- Nonoperative management
  - Rest from physical activity – average time to full recovery was 9.6mo (Fricker et al. Sports Med 1991), most studies indicate need for 3-6mo of rest
  - NSAIDS
  - Shock absorbing footwear
  - PT – Hip and adductor muscle stretching/strengthening, core stability and strengthening and muscle force balancing
  - Corticosteriod injection – some studies suggest a quicker return to athletic activities if done early
    - Holt et al. AJSM 1995 – 8 athletes, after one injection 3/8 returned to sport within 3wks, four required a second injection
Osteitis Pubis

- **Surgical Management**
  - **Wedge Resection**
    - Concern with late pelvic instability (Grace et al. JBJS 1989)
  - **Compression Plate arthrodesis with bone graft**
    - Williams et al. AJSM 2000 – 7 rugby players failed 13mo non-op tx, at mean 52.4mo f/u all were free of sxs and all returned to sport
  - **Currettage for resistant osteitis pubis in athletes**
    - Radic et al AJSM Jan 2008 – 23 athletes; 21 return to pain free running at 3 mos
Osteitis Pubis

  - 25 articles (case series / reports) = all Level IV
  - No randomized controlled trials
  - 195 athletes Dx with osteitis pubis
  - No comparisons of treatments, difficult to draw accurate conclusions
  - Call for better studies
Snapping Hip
Snapping Hip / Coxa Saltans

- Internal Type – Iliopsoas
- External Type – TFL
- Snapping of the hip is a normal occurrence
- Many people experience benign, asymptomatic snapping on an infrequent basis
- It is the rare individual who experiences symptomatic snapping

- Allen. JAAOS 1995
Snapping Hip / Coxa Saltans

- Internal type – Iliopsoas tendon
- Can mimic a mechanical intra-articular process
- Is an asymptomatic incidental observation in 5% to 10% of the population
- Commonly seen in ballet dancers
- Occurs as the iliopsoas tendon subluxates from lateral to medial while the hip is brought from a FABER position into extension and IR
  - Debated whether the snapping is the tendon going back and forth across the femoral head or across the pectineal eminence

Allen, JAAOS 1995
Snapping Hip

Fig. 1  A, With flexion of the hip, the iliopsoas tendon shifts laterally in relation to the center of the femoral head. B, With extension of the hip, the iliopsoas tendon shifts medially in relation to the center of the femoral head.
Snapping Hip

FIG. 3. Examination maneuver for snapping of the iliopsoas tendon. (A) The hip is initially placed in abduction, flexion, and external rotation. (B) The hip is then brought into extension with internal rotation, producing the snap of the iliopsoas tendon.

From FABER to extension
Snapping Hip

- **Conservative Treatment**
  - Modify offending activities
  - Stretching and flexibility
  - Core stabilization program
  - NSAIDS
  - Corticosteroid injection in the iliopsoas bursa
    - Only a few case series reported
    - Vaccaro et al. Radiol 1995 – 8pts, 7 had between 2-8mo relief however 4 went onto surgery
    - Wahl et al. AJSM 2004 – 2 pro football players, U/S guided inj into bursa, both returned to sport in 4 weeks with f/u 26mo and no return of snapping
Snapping Hip

- Surgical Treatment
  - Relaxation of the iliopsoas to eliminate the snapping
  - Different open approaches have been described depending on the location of the snapping
    - Allen et al. AJSM 1990 – 20 hips, anterior approach, release of posteromedial tendinous portion; 70% complete resolution, 25% partial
    - Gruen et al. AJSM 2002 – 11pts, ilioinguinal approach with fractional lengthening of the iliopsoas tendon within the psoas muscle; 100% resolution of snapping and 83% pt satisfaction
    - Taylor et al. JBJS 1995 – 16hips, medial approach, tendinous portion released from the lesser troch; all pts subjectively improved
  - Complications – reported to occur in 43-50% of patients; loss of hip flexion strength, sensory disturbances, incisional complications – hip arthroscopy results differ
Snapping Hip

- Arthroscopic release of tendinous portion of iliopsoas at the lesser troch
- Also allows you to address any intra-articular problems
- Avoids complications due to incisions
Snapping Hip

- Flanum et al. AJSM 2007 – 6pts, 5/6 also had intra-articular pathology, none had recurrence of snapping at 12mo
- Ilizalitturi et al. Arthroscopy 2004 – 6pts, 4/6 had intra-articular pathology, no recurrence of snapping at 10-27mo f/u
- Hip flexor strength returned by 8-12weeks
Snapping Hip

- External type – Iliotibial Band
- Can often be seen from across the room
- Pts describe a sense that the hip is subluxating or dislocating
- Classically described in the downside leg of runners training on a sloped surface
- With pt in lateral decubitus position flex and extend the hip, snap palpated over greater troch which can be blocked by applying pressure over GT
- Often a dynamic process better demonstrated by the pt then on passive exam
- Ober test to evaluate for IT tightness
Physical Exam

- Ober Test
  - For hip abductor tightness or IT band contracture
  - Patient in the lateral decub position, with lower hip and knee flexed
  - Flex hip to 90deg and fully abduct then extend past neutral with knee in 90deg flexion. Now allow hip and knee to adduct with hip neutral
  - Hip should adduct such that the knee is at or below the midline
Snapping Hip

- Snapping occurs from the IT band flipping back and forth across the greater trochanter.
- Often attributed to a thickening of the posterior part of the IT tract or anterior border of the gluteus maximus.
- Thickened portion lies posterior to the trochanter in extension, then flips forward over the trochanter as the hip begins to flex.
Snapping Hip

- Xrays to r/o other pathology – coxa vara may predispose
- MRI may show evidence of trochanteric bursitis and thickening of the tendon
- Ultrasound

Treatment
- Avoid offending activities
- NSAIDS
- PT – stretching program for the ITband
- Corticosteroid injections into trochanteric bursa
Snapping Hip

- **Surgical treatment**
  - Goal is to eliminate the snapping by a relaxing procedure of the IT band
  - Most use a Z-plasty technique with excision of the underlying bursa (excision of an ellipsoid-shaped segment as well as a cruciate incision of the IT band have also been described)
    - Proventure AJSM 2004 – 9 hips, all had complete resolution of snapping and all but one returned to unrestricted activities
Snapping Hip

- Arthroscopic releases have also been described
- Ilizaliturri et al. Arthroscopy 2006 – 11 pts, 2yr f/u 1 pt with non-painful snapping, rest had no sx and returned to previous activity
Stress fractures

- Generally felt to occur from a repetitive cycle overload by submaximal forces – bone resorption > bone formation
- Muscle fatigue may lead to transmission of forces to the underlying bone
- Muscles may also contribute by concentrating forces across a localized area of bone
- Stress fxs of the pubic rami are particularly common among long distance runners
- Appears to be an association with anorexia and amenorrhoea in female athletes (female athlete triad – eating disorder, amenorrhoea, osteoporosis)
  - Saha et al. AJSM 1988 – stress fxs occurred in 49% of collegiate female distance runners that had less than 5 menses/yr
Stress fractures

- Present with insidious onset of lower pelvic and groin pain, worse after running and improves with rest
- Often will have pain with axial loading or with standing or hopping on the involved leg
- Often the result of training errors
- Imaging of choice is MRI or bone scan
- Treatment of stress fxs about the pelvis
  - period of 4-6wks of rest and when pain free a graduated program of return to activities
  - Address any dietary or hormonal issues
Stress fractures

- Femoral neck
  - Distance runners
  - F>M
  - Activity related anterior groin pain, have limitations of end range of motion, active SLR and logrolling may cause pain
  - Xrays – may not show changes, if suspicious need to get MRI or bone scan
Stress fractures

- **Femoral neck**
  - Compression side = inferior femoral neck
    - Good potential to heal
    - Treatment is generally nonop. Crutches and non-weight bearing until asymptomatic. Weekly xrays to ensure fx is not progressing. Gradual return to pain free activities.
  - If fatigue line on MR is >50% consider pinning
Stress fractures

- Tension side = superior femoral neck
  - Unstable
  - High rate of complications if it progresses to a displaced fracture
  - Should be treated with surgical fixation
Nerve Entrapments

- Obturator nerve entrapment in skaters secondary to adductor muscle development
- Meralgia paraesthetica
  - LFCN
- Pudendal nerve cyclists

- Treatment = removal of the offending compression
  - Compression traumatic, anatomic, nonanatomic
- Ilioinguinal neuralgia – nerve ablation

Sartorius and iliac fascia
Apophyseal Avulsion Injuries

Operative fixation considered for larger fragments and displacement > 2cm
Thank You
Piriformis syndrome
**Piriformis syndrome**

- **Piriformis muscle**
  - Origin from ant 2-4\textsuperscript{th} sacral vertebrae, sup margin of sciatic notch, exits notch and inserts on superior aspect of greater troch.
  - In Extension it ER the hip and in flexion it becomes an abductor.
  - Sciatic nerve lies anterior to the muscle and most commonly passes underneath the muscle.
  - Gluteal nerves and vessels, pudendal n., PFCN also exit the notch.
Piriformis syndrome

- Compression of the sciatic nerve by the piriformis muscle due to:
  - Overuse – muscle is under strain during entire gait cycle and may be prone to hypertrophy
  - Acute trauma – blunt blow to buttocks with subsequent hematoma and scarring
  - Anomalous anatomic relationships
Piriformis syndrome

**Evaluation**

- Cardinal characteristic of the syndrome is sitting intolerance
- Patients often will describe post. hip pain and variable pattern of radicular sxs
- Piriformis syndrome is a diagnosis of exclusion. Need to evaluate for lumbar spine disease and SI joint as cause of pain
- Imaging studies such as plain films and MRI and EMG/NCV studies are used to r/o other causes
  - In pts with piriformis syndrome EMG may show involvement of the peroneal division of the sciatic nerve or inferior gluteal nerve; NCV may show delayed F wave and H reflex (which can be further delayed with flexion adduction internal rotation)
Piriformis syndrome

**Exam**

- Gait – look for ER of involved limb with walking
- Tenderness in the sciatic notch
- Freiberg sign – with hip extended, passive IR causes pain
- Resisted ER of the leg also reproduces pain around the area of the piriformis
Piriformis syndrome

- **Exam**
  - **Pace sign** – in flexion the piriformis is an abductor, so resisted ABD of the flexed hip is a provocative maneuver
  - **Piriformis test** – pt is in lateral decub position with hip flexed to 60deg apply downward force to knee
  - **FAIR** – flexion, adduction and internal rotation
Piriformis syndrome

- **Treatment**
  - PT – specific stretching of the piriformis, core strengthening
  - NSAIDS
  - Activity modification
  - Corticosteroid injection/Botox injection
  - Surgical release of the piriformis – tendon is released at greater troch and followed back to the notch, in largest series a sciatic neurolysis was also performed, good results in carefully selected pts
    - Benson et al. JBJS 1999 – 15pts with h/o blunt trauma to buttocks, all had immediate and long-lasting relief
    - Fishman et al. Arch Phys Med Rehab 2002 – 28/43(70%) showed 50% or greater improvement
CAUTION:
Vehicle may be Transporting
Political Promises!