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Differential Diagnoses of Groin Pain in Athletes and Physically Active Individuals

Adam C. Cady, MHS, ATC, CSCS, PA-C
Physician Assistant (Dr. Michael Banffy)
Kerlan Jobe Orthopaedic Clinic

Learning Outcomes

After this course, participants will be able to:

- Independently list at least three common groin related pathologies that share similar presentations.
- Identify at least three of the most sensitive/specific physical examination techniques in the current literature for groin related pathologies and/or the converse.
- Describe at least three ways to accurately identify athletes that will likely need a surgical referral if not improving with conservative care of common groin related pathologies.
- Describe at least three reasons athletes would require radiographic evaluation given presentation and evaluation of groin-related pathologies.
- Outline return to activity/timing after hip related surgical procedures.
Disclosures

- None

Differential of Groin pain

- Intra-articular (Hip related)
  - Labrum related
  - Chondral related
  - Osteoarthritis
  - Femoroacetabular Impingement (FAI)
  - Stress fractures
  - Osteonecrosis
- Extra-articular
  - Adductor related
  - Iliopsoas Syndrome
  - Core Muscle Injury (CMI)
  - Osteitis Pubis
  - Stress fractures
- Extra-articular Impingement
  - Sub-spine
  - Ischiofemoral
  - Greater trochanteric-Pelvic
- Referred Pain
  - Lumbar
  - SI joint
  - Nerve entrapment
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Epidemiology


de Sa D1, Hjortnaes D2, Phillips M3, Heaven S1, Simunovic N4, Philpott M4, Ayen G5.

- Methods
- Outcomes
Prevalence data by sport

- Soccer: 72%
- Hockey: 16%
- Australian Football: 4%
- Football: 4%
- Baseball: 2%

Prevalence data by etiology

- FAI: 32%
- Athletic Pubalgia (CMI): 24%
- Adductor: 12%
- Inguinal Hernias: 10%
- Labral: 5%
Unanimous agreement on classification of groin pain in athletes

Defined clinical entities for groin pain

Defined terms to avoid

Adductor-Related Groin Pain
Adductor longus strain

- Most frequent source of symptoms in athletes with adductor strain
- Mechanism
- Area

Presentation / Physical Exam

- A = Pain with palpation
- B = Pain with resisted adduction (Sensitivity 93%)
Imaging

- Acute Injuries will have increased signal intensity on MRI, signifying hemorrhagic area
- Correlation with physical exam....
- Adductor tests $\rightarrow$ 92-97% probability of + MRI finding
- Clinical implications....

78% of athletes returned symptom free to sport at median of 18.5 weeks
**Iliopsoas-Related Groin Pain**

Anatomy / Presentation of “Iliopsoas Syndrome”

- Largest bursa in the body
- Tendon rides over iliopectineal eminence → bursitis and / or tendonitis
- Complaints
  - Pain
  - Deep snapping/Clunk
Physical Exam

- Pain with palpation over the musculo-tendinous junction
- Pain with active and/or passive motion
- Reproducible snapping

Active iliopsoas snapping test

- Flexion →
- Abduction + ER →
- Extension
Imaging

- MRI Findings
  - Acute
    - Disruption of fibers
    - Increased fluid signal
  - Chronic
    - Thickened tendon
    - Bursitis
- Clinical implication...

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Invited Clinical Commentary
Rehabilitation of Soft Tissue Injuries of the Hip and Pelvis

- Flexibility
- Core stability
- Strengthen
  - Hip flexors
  - External Rotators

---

Treatment of Iliopsoas Syndrome with a Hip Rotation Strengthening Program: A Retrospective Case Series

Level IV evidence

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Level V Evidence
Treatment

- Corticosteroid injections???

**Outcomes after fluoroscopy-guided iliopsoas bursa injection for suspected iliopsoas tendinopathy**

- The risks and benefits of glucocorticoid treatment for tendinopathy: A systematic review of the effects of local glucocorticoid on tendon
  
  Benjamin John Hoyel, MRCSS; Emilie Luo, BSc; Thomas Oakley, BM, BSc; Joes Rombach, MSc; Mark E. Morrey, MD; Andrew J. Carr, FRAES

**Deterioration in mechanical properties of tendons**

Results of Labral-Level Arthroscopic Iliopsoas Tenotomies for the Treatment of Labral Impingement

- 76% of patients reported good to excellent results

**Arthroscopic Iliopsoas Fractional Lengthening for Internal Snapping of the Hip**

Clinical Outcomes With a Minimum 2-Year Follow-up

- 95% of patients improved after 21 months
Inguinal-Related Groin Pain

Core Muscle Injury

- “Sports Hernia”
- “Athletic Pubalgia”
- “Sportsman Hernia”
- “Hockey Hernia”
Mechanism / Anatomy

- **Etiology**
  - *No* clinically detectable inguinal hernia
  - **Avulsion / strain of**
    - Transversalis fascia (deep to rectus)
    - Insertion of rectus abdominus
    - Insertion of internal oblique
    - Insertion of external oblique

Presentation / Physical Exam

- **Signs and symptoms**
  - Insidious onset
  - Pain at pubic tubercle radiating
  - Pain alleviated by rest

- **Physical exam**
  - TTP at pubic tubercle
  - Pain with resisted hip adduction (88%)
  - Pain with resisted sit up (common)
  - Pain worse with Valsalva/cough/sneeze (10%)
Imaging

- MRI findings
  - Small avulsions
  - Unexplained edema
  - Musculotendinous asymmetry
- MRI diagnostic utility

---

Proposed Algorithm for the Management of Athletes With Athletic Pubalgia (Sports Hernia): A Case Series

Level IV evidence

- 6 weeks of therapy
- 50% RTP rate (only 6 subjects)
- Interventions
Great outcomes

<table>
<thead>
<tr>
<th>Reference</th>
<th>Repair Type</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brannigan et al (2000)</td>
<td>Open/no mesh</td>
<td>95% return to sports</td>
</tr>
<tr>
<td>Gilmore (1991)</td>
<td>Open/no mesh</td>
<td>87% return to sports</td>
</tr>
<tr>
<td>Hackney (1993)</td>
<td>Open/no mesh</td>
<td>99% return to sports</td>
</tr>
<tr>
<td>Brown et al (2008)</td>
<td>Open/mesh</td>
<td>93% return to sports</td>
</tr>
<tr>
<td>Klin et al (2004)</td>
<td>Laparoscopic/mesh</td>
<td>100% return to sports</td>
</tr>
<tr>
<td>Gentisaris et al (2004)</td>
<td>Laparoscopic/mesh</td>
<td>84% return to sports</td>
</tr>
<tr>
<td>Muschawеке and Berger</td>
<td>Open/minimal repair</td>
<td>95% return to sports</td>
</tr>
<tr>
<td>Meyers et al (2000)</td>
<td>Open/broad pelvic floor</td>
<td>80% return to hockey</td>
</tr>
<tr>
<td>Jakoi et al (2013)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Pubic-Related Groin Pain
Osteitis pubis

- Presentation
  - Pubic symphysis pain
  - Often occurs concomitantly with adductor strain

Presentation / Physical exam

- Tenderness over pubic symphysis
- Occasional pain with movement
- Spring test
  - Move fingers 2cm lateral
  - Apply pressure to pubic rami
Imaging

- X-rays:
  - Widening
  - Lytic changes
  - Sclerosis

- MRI:
  - Marrow edema in the pubic bones

Treatment

- Outcome of Conservative Management of Athletic Chronic Groin Injury Diagnosed as Pubic Bone Stress Injury
  - Level IV evidence
  - 89% RTP rate within 20 to 24 weeks
  - 12 weeks without running or high impact

- Symphyseal Cleft Injection in the Diagnosis and Treatment of Osteitis Pubis in Athletes
  - Level I evidence
  - Accelerated return to play post steroid injection

- Non-surgical treatment of pubic crest and groin pain in non-contact athletic players: a prospective double-blind randomised controlled study
  - Reduced pain and faster return to play in athletes receiving shockwave therapy in conjunction with rehab
### Table 1

**Clinical Outcomes of Surgical Management of Osteitis Pubis**

<table>
<thead>
<tr>
<th>Study</th>
<th>Procedure</th>
<th>No. of Patients</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Williams et al³⁷</td>
<td>Fusion with compression plating</td>
<td>7</td>
<td>All patients able to RTP at approximately 6 mo. All patients were pain free at final follow-up (52 mo).</td>
</tr>
<tr>
<td>Radic and Annear³⁸</td>
<td>Curettage (no stabilization)</td>
<td>23</td>
<td>70% of patients able to RTP at 6 mo. 39% remained asymptomatic. 26% had one-time recurrence that improved with rest. 1 patient underwent late pubic symphysisseal fusion</td>
</tr>
<tr>
<td>Hechtman et al³⁹</td>
<td>Arthroscopically assisted curettage</td>
<td>4</td>
<td>Procedure preserved pubic ligament to reduce risk of instability. RTP at 3 months. Pain free at final follow-up (50 months)</td>
</tr>
<tr>
<td>Paajanen et al⁴⁰</td>
<td>Mesh reinforcement</td>
<td>8</td>
<td>RTP within 6 weeks for 7 of 8 patients. All patients pain free at final follow-up (2.7 years).</td>
</tr>
</tbody>
</table>

RTP = return to play

---

**Surgery for osteitis pubis**

Ramin Mehiri, MD; Robert Meek, MD; Peter O’Brien, MD; Plot Blachut, MD

- 5-10% athletes may fail conservative treatment

---

**Etiology behind most groin pain**

Femoroacetabular impingement (FAI)
Definition

- Cam = extra bone/cartilage at head-neck junction
- Pincer = over coverage of socket
- Mixed Type

90% of patients with labral pathology have associated bony abnormality

Cam Impingement
Pincer Impingement

Mixed Impingement

Acetabular side  Femoral side
Onfossa view  Frontal view  Oblique view

35°  69°  62°  62°
• Pain location
  ▪ Groin pain (83%)
  ▪ Other less common areas
    ▪ Lateral hip
    ▪ Anterior thigh
    ▪ Buttock
    ▪ Low Back / SI
• Aggravating factors
  ▪ Activity (71%)
  ▪ Sitting (65%)
  ▪ Standing (44%)
• Mechanical symptoms (65%)

Physical Exam
• Physical Exam
  ▪ IR of hip <30°
  ▪ Anterior impingement sign (FADIR)
    ▪ Highly sensitive (75-100%), but non-specific (10-100%)
  ▪ FABER
    ▪ Weak Sensitivity (44-100%) and specificity (57%-100%)
  ▪ Posterior impingement test (Extension + ER)
  ▪ Thomas test
    ▪ Low sensitivity (25%)

• C-Sign
Detection / Radiographs / CAM impingement

Do Plain Radiographs Correlate With CT for Imaging of Cam-type Femoroacetabular Impingement?
Jeffrey J. Nappi MD, John M. Mortel MD, Young-Ji Kim MD, Ira Zaltz MD, John C. CIchinsky MD, ANCHOR Study Group

- Sensitivity (71-80%)-Dunn view
- Specificity (91-100%)-Frog lateral view

Detection / Radiographs / Pincer impingement

Center Edge Angle

Cross over sign

Radiographic Diagnosis of Pincer-Type Femoroacetabular Impingement: A Systematic Review
Champa M. Khan, MD, Joa La Frances, MD, FMARS, J H. Thomas Page, MD, S Titles, MD, MS, FHMS, FMARS, and Jon Dpower, MD, MAOC, FMARS, De Piana Goa
**Diagnosis / MRI / Labral tears**

- MRI: with or without contrast?
  - Non-contrast
    - Sensitivity (60-80%)
  - Contrast
    - Sensitivity (60-100%)
      - Most ~90%

---

**Compensatory Injury Patterns / “Cam avoidance gait”**

- **Anterior**
  - Hip flexor strain
  - Psoas impingement
- **Medial**
  - CMI
  - Adductor Strains
  - Osteitis Pubis
- **Posterior**
  - Proximal HS strain
  - SI joint dysfunction
- **Lateral**
  - Abductor strain
  - ITBFS

---

*continued*
Evidence of association

- **Radiographic**
  - Weir, 2011
    - 94% of athletes with chronic adductor tendinopathy had FAI + x-rays
  - Economopoulos, 2014
    - 86% of athletes with CMI had FAI + x-rays  
    - Level IV evidence

- **Clinical / Surgical**
  - Larson, 2011
    - CMI surgery → 25% RTP
    - FAI surgery → 50% RTP
  - Hammoud, 2012
    - Surgery for both CMI / FAI → 85%-93% RTP  
    - Level IV evidence
  - Hammoud, 2012
    - >60% RTP with complete resolution of CMI injury symptoms with surgical management of FAI

- **Biomechanics**
  - Birmingham, 2012
    - Cadaver biomechanics: 35% more motion at the pubic symphysis with cam lesion

- **Risk of other sport injury**
  - Boutris, 2018
    - SR found significant associations between FAI and ACL tears  
    - Level IV evidence

Etiology of FAI (Genetics)

- Genetic influences in the etiology of femoroacetabular impingement: a sibling study
- Elevated risk in siblings of surgical FAI patients
  - Deformity (Cam: 2.8 relative risk / Pincer: 2.0 relative risk)
  - Bilateral deformity: 2.6 relative risk
  - Clinical symptoms: 2.5 relative risk

- Statistically significant differences in radiographic measure of FAI
Etiology (Correlation with Athletics)

High Level male athletes
- 1.9-8.0 times more likely to develop cam type deformity
- Hockey and basketball players

At least 10 more studies showing increased prevalence in sport
- Hockey
- Basketball
- Football
- Soccer
- Water Polo
- Baseball
- Martial Arts
- Australian Football

Etiology (Correlation: Age and Sport Demand)

Alpha angle of 55° versus 49° in closed versus open physes
Nonoperative Treatment for Femoroacetabular Impingement: A Systematic Review of the Literature

Peter H. Wolf, MBChB (Hons), MRCS (Edin), Miguel Fernandez, PhD, MBBS, MRCS, Darnion R. Griffin, MA (Cantab), MPhil (Oxon), FRC (TrkOrth), Nadine E. Foster, DPhil, BSc (Hons)

- 5 articles on effectiveness of nonoperative treatment for FAI
  - 4 case series
  - 1 descriptive epidemiologic study
- Outcomes poorly defined
- Some rehab designs not supported by evidence and/or were not reproducible
- Inclusion criteria / Diagnosis of FAI not consistent

PT versus Surgical management

- 44% satisfied with non-operative care at 1 year
- 56% chose surgery following “Pre-hab”
- Surgery group had higher baseline activity levels
Methods
- 80 military members mean age of 30
- Outcome measures = no difference
  - Hip Outcome score daily living
  - Hip Outcome score sport
  - Patient improvement perception
- 28/40 (70%) in PT group → surgery
  - PT group loss to follow up → 11 patients remaining
- Final comparison for data
  - PT group: 11
  - Surgery: 65

With paucity of evidence for conservative care why expedite surgical management?

Conservative care
- Rest / Activity modification
- Acupuncture
- ART
- Injections
  - Cortisone
  - Biologics
  - Hyaluronic acid
- Physical Therapy
  - Optimize Core strength
  - Limit hip flexion to 45°
  - Avoid impingement

AVOID IMPINGEMENT TYPE STRECHES WHILE TRYING TO OBTAIN GREATER ROM
Arthroscopy

Goals of Surgical management

- Restore Anatomy
- Reduce Pain
- Return to sport
- Prevent degeneration of the hip
Prospective Level 3 study

- 303 patients
- Mean age of 32
- Groups that did not have improved outcomes...

1911 patients

- Arthroscopy for FAI and/or Labral tears
- 87.7% return to sport
- ALL PROs improved post op
- Risk of clinical complications 1.7%
Factors associated with outcomes

Positive +
- Females
- Pro/College athletes
  - 93% return to play
- Overhead athletes
  - 97% return to play
- > Pre op joint space

Negative -
- Males
- Females
- Lower level athletes
- Increased age
- Increased OA

FAI → Cartilage Damage → Arthritis

- Alpha angle of 65° or greater
  - Odds ratio of 4.00 of having Grade 3 + damage
- Higher alpha angle associated with cartilage defects
FAI → Cartilage Damage → Arthritis (cont)

- Risk of developing OA
  - Pincer: Odds ratio 2.4
  - Cam: Odds ratio 2.2

- Risk of developing end stage OA
  - Alpha angle > 60º: Odds ratio 3.67
  - Alpha angle > 83º: Odds ratio 9.66

Conclusions

- Groin pathology is prevalent in active individuals
  - Increased prevalence of FAI in athletes

- Differential Diagnosis of extra-articular and intra-articular pathology is vast.

- Femoroacetabular Impingement predisposes individuals to further injury
  - Soft tissues (Adductor / CMI / Labral tears)
  - Hip arthritis
  - ACL injuries
Presentation

- 3 years to diagnosis
- 4 providers
- 13% underwent unsuccessful surgery

Thank You
Questions?
RTP post hip arthroscopy

- Weight bearing restriction: median of 3 weeks
- Running progression: median of 12 weeks
- Return to sport: median of 15.5 weeks

References
- Available in PDF
Most concerning diagnosis to mimic groin pain?

- Femoral neck stress fractures

Fig. 1: Types of FNSF.