The Athlete’s Hip: An Update on Athletic Groin Pain

John Snyder, PT, DPT, OCS, CSCS
Disclosures

• Financial
  – Teach a four-course series on MedBridge titled The Athlete’s Hip
  – Teach a two-day live course titled The Athlete’s Hip: Simplifying Evaluation, Treatment, and Return to Sport
  – Co-author of PT Ortho & Sports Questions Volume II: Pass the Test Without Breaking the Bank

• Nonfinancial
  – Manage and frequently contribute to JohnSnyderDPT.com
Learning Goals

• Recognize demographics and additional factors of individuals with groin pain in order to identify those at increased risk of developing groin pain
• Administer an efficient evaluation plan using recent research on special tests to assess athletic groin pain
• Analyze the literature related to conservative and surgical management of femoroacetabular impingement syndrome
• Administer evaluative techniques to determine the underlying pathology or structure involved in the athlete presenting with athletic pubalgia
• Apply the information learned during the webinar to clinical practice in order to more efficiently evaluate and treat this patient population
Chapter 1

What Is Athletic Groin Pain, and Who Is Affected?
What Diagnoses Are Most Common in Athletes With Groin Pain?

<table>
<thead>
<tr>
<th>Cause</th>
<th>Patients</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAIS</td>
<td>1510</td>
<td>59.2%</td>
</tr>
<tr>
<td>Athletic pubalgia</td>
<td>1122</td>
<td>98.0%</td>
</tr>
<tr>
<td>Adductor related</td>
<td>570</td>
<td>99.2%</td>
</tr>
<tr>
<td>Inguinal related</td>
<td>473</td>
<td>96.6%</td>
</tr>
<tr>
<td>Labral</td>
<td>220</td>
<td>54.3%</td>
</tr>
</tbody>
</table>

What Types of Sports Are Most Common?

<table>
<thead>
<tr>
<th>Sport</th>
<th>IR per 1000 AE (game)</th>
<th>IR per 1000 AE (practice)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men's soccer</td>
<td>0.75</td>
<td>0.25</td>
</tr>
<tr>
<td>Men's hockey</td>
<td>0.85</td>
<td>0.35</td>
</tr>
<tr>
<td>Men's football</td>
<td>0.65</td>
<td>0.20</td>
</tr>
<tr>
<td>Women's hockey</td>
<td>0.50</td>
<td>0.15</td>
</tr>
<tr>
<td>Men's lacrosse</td>
<td></td>
<td>1.80</td>
</tr>
</tbody>
</table>

Let’s Take a Closer Look

Rate Ratio

- Men's wrestling: 7
- Men's outdoor track: 6
- Men's football: 5
- Women's hockey: 2
- Men's hockey: 4
- Men's soccer: 3

What About Gender? Does Groin Pain Discriminate?

Ice Hockey Goaltenders: What Does the Evidence Show?

- **69%** of elite goaltenders experienced at least one episode of hip and groin problems
- **36%** experienced at least one episode of substantial problems affecting their performance
- **83.1%** were due to overuse, and 15.5% led to time loss

Players that reported symptoms during the previous season

- Players with longstanding symptoms (>6 weeks duration) presented with most severe impairments in self-reported hip and groin function at the beginning of the new season

How About Soccer (Football)?

- The average weekly prevalence of all groin problems was 11.7%
  - 1.3% with time loss and 10.4% without time loss
- The traditional time-loss measure only captured 10% of all groin problems
What Objective Factors Differentiate Between Those With and Without Groin Pain?

- Pain provocation tests
  - Adductor squeeze test (OR = 4.31)
  - Single adductor test (OR = 4.03)
  - Bilateral adductor test (OR = 24.76)
  - Impingement test (OR = 50.62)

- Range of motion (ROM)
  - Hip IR in prone or supine 90/90 position is less in athletes with hip and groin pain (SMD = 0.42, 0.58)
    - The difference between the groups equated to an average of 3.7°–3.8°
  - Bent-knee fallout
    - Reduced ROM in athletes with hip/groin pain
    - 3.6 cm difference (moderate effect size)

What range-of-motion deficits can be attributed to those with groin pain?

A. Flexion
B. Internal rotation
C. Extension
D. Total rotational range of motion
Closer Look at Range of Motion

• Strong evidence that total rotation of both hips **below 85°** measured at the preseason screening was a risk factor for groin pain development

• Strong evidence suggested that internal rotation, abduction, and extension alone were **not associated** with the risk/presence of groin pain

Bent-Knee Fallout

- Combined test of AROM hip flexion, abduction, and ER
- Strong evidence that a higher score on BKFO (reduced ROM) differentiates athletes with hip/groin pain from those without pain
- Reduced ROM in athletes with hip/groin pain (SMD = 0.7)
- 3.6 cm difference (moderate)

Does Cam Morphology Make a Difference?

Hips with a cam deformity showed higher **but nonsignificant** BKFO values than those without a cam deformity

- 17.1 cm vs. 14.2 cm
- 2.9 cm difference

What About Strength?

Strength

- **Strong evidence** that hip/groin pain was associated with less strength on adductor squeeze testing (SMD = 1.41)

- Limited evidence that when using an isokinetic dynamometer there are small strength differences

Copenhagen Five-Second Squeeze

• Place one arm between the ankles of the player
• Instruct the player to isometrically and continuously squeeze as hard as possible for five seconds and subsequently rate the pain experienced in the groin during this maneuver (0–10 NPRS)

667 Athletes (age: 24 ± 4)

Increased groin pain intensity correlated significantly with lower scores on HAGOS: sport, symptoms, pain, activities of daily living, physical activity, and quality-of-life subscales.
• Players differed significantly from each other regarding self-reported sporting function depending on category
  – Rho:–0.319; P < .01
• Negative correlations were found between the 5SST result and all strength measurements and the HAGOS Sport score
  – Rho:–0.157 to–0.305; P < .01
• Players in the yellow or red category during the 5SST were significantly weaker than players in the green category

How Do We Organize Our Evaluation?

Doha agreement on groin pain classification in athletes

Defined clinical entities

Adductor-related
Iliopsoas-related
Inguinal-related
Pubic-related
Hip-related
Other


Summary

- Groin pain presents primarily in male athletes who participate in multidirectional team sports
- Soccer and hockey players are among the most impacted
- Both the bent-knee fallout and Copenhagen five-second squeeze can be used to differentiate between those with and without groin pain
- Groin pain can be subdivided into several key categories per the Doha agreement
Chapter 2

Femoroacetabular Impingement Syndrome
Femoroacetabular Impingement Syndrome (FAIS)

Criteria needed for diagnosis

- Abnormal morphology of the femur and/or acetabulum
- Abnormal contact between these two structures
- Especially vigorous supraphysiologic motion that results in such abnormal contact and collision
- Repetitive motion resulting in the continuous insult
- Presence of soft-tissue damage


Morphology = Pathology?


What About People With Hip/Groin Pain?

1,893 patients evaluated with hip/groin pain

Radiology: How Important Is It?

<table>
<thead>
<tr>
<th>Radiological findings</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>COS</td>
<td>0.300</td>
</tr>
<tr>
<td>ISS</td>
<td>0.413</td>
</tr>
<tr>
<td>PWS</td>
<td>0.180</td>
</tr>
<tr>
<td>PGD</td>
<td>0.626</td>
</tr>
<tr>
<td>CEA</td>
<td>0.639</td>
</tr>
<tr>
<td>AEA</td>
<td>0.333</td>
</tr>
</tbody>
</table>

Only predictors included a **positive FADIR test** and **younger age** at evaluation.

What is the most common important factor in persistent postoperative pain in those with FAIS?

A. Hip adductor to abductor strength ration
B. Hip flexion ROM
C. Psychosocial factors
D. Cam morphology size
What Matters?

• There was no statistically significant difference in alpha angle (P = .340) and LCEA (P = .412)

• Independent predictors for persistent postoperative pain include revision hip arthroscopy and mental health history positive for anxiety and depression

And Again…

64 patients undergoing arthroscopic surgery for labral pathology and/or cam morphology

- Symptom severity was **significantly more** related to **mental health status** than either the size of labral tear or FAI deformity

And Again...

- Female sex, lower education levels, smoking, **lower mental health scores**, and lower activity-level scores predicted HOOS pain preoperatively.
- Patient factors associated with worse baseline HOOS-PS include smoking, additional years of education, **lower mental health**, and activity scores.
- **No instance** where an arthroscopic variable or pathologic finding proved statistically significant.

And Again… A Systematic Review

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studies reporting ORs</td>
<td>3,727, 0.74</td>
</tr>
<tr>
<td>Studies reporting PROMs</td>
<td>1,909, -20.2 (WMD)</td>
</tr>
</tbody>
</table>
Femoroacetabular Impingement Syndrome

Previous definitions by Ganz et al. and Sankar et al. did not adequately present the need for positive symptoms, clinical signs, and imaging findings.

What is FAI syndrome?

FAI syndrome is a motion-related clinical disorder of the hip with a triad of symptoms, clinical signs, and imaging findings. It represents symptomatic premature contact between the proximal femur and the acetabulum.

Level of agreement: mean score 9.8 (95% CI 9.6 to 10)

## How Is It Developed?

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of hips</th>
<th>1 o’clock</th>
<th>2 o’clock</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All athletes</strong></td>
<td>77</td>
<td>54.1 ± 10.3</td>
<td>51.7 ± 9.9</td>
</tr>
<tr>
<td><strong>Growth plate</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open</td>
<td>34</td>
<td>49.1 ± 6.1</td>
<td>47.6 ± 6.9</td>
</tr>
<tr>
<td>Closed</td>
<td>43</td>
<td>58.2 ± 11.3</td>
<td>55.0 ± 10.8</td>
</tr>
<tr>
<td><strong>Symptomatic</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>15</td>
<td>62.0 ± 14.5</td>
<td>47.6 ± 6.9</td>
</tr>
<tr>
<td>No</td>
<td>62</td>
<td>52.2 ± 8.0</td>
<td>55.0 ± 10.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P &lt; .001&lt;sup&gt;b&lt;/sup&gt;</td>
<td>P &lt; .001&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
How Is It Developed? (cont.)

How Is It Developed? (cont.)

- Alpha angle and epiphyseal extension increased most rapidly between **ages 12 and 14 years**
- Compared with individuals who play no regular sport, alpha angles were 4.0 degrees higher
- **7.7 degrees higher in individuals competing at a national or international level**
“Cam Morphology in Young Male Football Players Mostly Develops Before Proximal Femoral Growth Plate Closure: A Prospective Study With 5-Year Follow-Up”

14 Years
Baseline
Normal
Growth plate open

16 Years
2.5-year follow-up
Flattening
Growth plate open

19 Years
5-year follow-up
Prominence
Growth plate closed

Early Sport Specialization

How much is too much?
Youth Sport Specialization Recommendations

• Delay specializing in a single sport for as long as possible
• One team at a time
• Less than eight months per year
• No more hours/week than the athlete’s age in years
• Two days of rest per week
• Rest and recovery time from organized sport participation
Does Early Sport Specialization Influence Injury Rates?

- 1,190 athletes between the ages of 7 and 18 years old
- Sports-specialized training was an independent risk factor for
  - Injury (OR = 1.27)
  - Serious overuse injury (OR = 1.36)
- Young athletes whose ratio of organized sports to free play time was 2:1 hours/week had increased odds of having a serious overuse injury (OR = 1.87)

Does Early Sport Specialization Influence Injury Rates? (cont.)

- Injury risk
  - High competition volume (> 60/yr): **2.08**
  - Moderate specialization: **2.38**
  - High specialization: **2.58**

- **1,544 high school athletes**

- **High specialization** defined as “year-round, intensive training in a single sport at the exclusion of other sports”

Does Early Sport Specialization Influence Injury Rates? (cont.)

• High specialization
  – Any injury: 1.59
  – Overuse injury: 1.45
  – UE overuse injury: 1.91
  – LE overuse injury: 1.27

• 2,011 athletes between the ages of 12 and 18 years old

What About the Hip and Sport Specialization?

- 205 collegiate hockey athletes between the ages of 18 and 30 years
- Women’s and men’s NCAA Division III ice hockey teams; American Collegiate Hockey Association Divisions I, II, and III

But… Little Timmy Wants to Play in College!
But… Little Timmy Wants to Play in College!

- Mean age of sports specialization was 14.3 years old
  - Professional (14.1 years old)
  - NCAA Division I (14.5 years old)
  - NCAA Division III (14.6 years old)
- Age at time of specialization
  - Before 14
    - Professional: 24%
    - NCAA Division I: 24%
    - NCAA Division III: 28%
  - Before 12
    - Professional: 5%
    - NCAA Division I: 12%
    - NCAA Division III: 12.5%
But... Little Timmy Wants to Play in College! (cont.)

- Elite athletes often specialized between the ages of 14 and 15
- Non-elite or semi-elite peers specialized prior to 13 years
- Six studies included, with 5,803 athletes
Tangent Over—Back to Hip Things
How Do We Accurately Diagnose FAIS?

FAIS: Patient Presentation

- Onset of symptoms
  - Insidious (65%)
  - Trauma (21%)
  - Acute (14%)

- Characteristic of pain
  - Sharp (73%)
  - Ache (73%)
  - Constant (46%)

- Mechanical symptoms
  - Pop (46%)
  - Snap (44%)

- Aggravating factors
  - Activity-related (71%)
  - Running (69%)
  - Sitting (65%)
  - Pivoting (63%)

FAIS: Pain Distribution

- Groin: 88% (46 patients)
- Anterior Thigh: 35% (18 patients)
- Knee: 27% (14 patients)
- Low Back: 23% (12 patients)
- Buttock: 29% (15 patients)
- Posterior Thigh: 12% (6 patients)
- Lateral Hip: 67% (37 patients)
- Lateral Thigh: 19% (10 patients)

“Physical Impairments in Symptomatic Femoroacetabular Impingement: A Systematic Review of Evidence”

- SR included 22 studies and 819 patients
  - Case series and case-controlled studies; no RCTs
- Main findings
  - No significant limitation in ROM or difference between pre-/postsurgical ROM
    - One low-quality case series showed significant improvement in ROM following PT
  - Significant hip strength deficits in all planes (excluding extension and flexion in a few studies)

“Standardized Measurement of Physical Capacity in Young and Middle-Aged Active Adults With Hip-Related Pain”

- Evaluate hip adduction, abduction, flexion, internal rotation, and external rotation
  - Measuring strength using objective methods is recommended (e.g., HHD)
- Evaluate ability to perform functional tasks
- Understand patient’s expectations for treatment and recovery

**FAI: Special Testing**

**Flexion adduction internal rotation test (FADIR)**

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>Specificity</th>
<th>+LR</th>
<th>−LR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.91-0.99</td>
<td>0.05-0.09</td>
<td>1.02-1.04</td>
<td>0.14-0.45</td>
</tr>
</tbody>
</table>

**Flexion internal rotation test**

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>Specificity</th>
<th>+LR</th>
<th>−LR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.96</td>
<td>0.25</td>
<td>1.28</td>
<td>0.15</td>
</tr>
</tbody>
</table>


FADIR: What Is the Evidence?

Compared to the asymptomatic cohort, FAIS patients had

- **Decreased adduction and internal rotation during the impingement exam**

- During the rotational profile, only the FAIS patient with the most severe deformities demonstrated considerable rotation deficits

FADIR: What Is the Evidence? (cont.)

• Seventy-four ice hockey players

• Presence of cam and pincer morphology was evaluated using the FADIR test and magnetic resonance imaging (MRI)

• Very low sensitivity
  – 0.41 to 0.60

• Positive and negative LRs hovering around 1.00
  – $-LR: 0.78$ to $1.24$
  – $+LR: 0.78$ to $1.24$

• Out of 74 athletes “screened,” there were $30/31$ false positives

Beyond FADIR

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>FABER distance test (&gt;3.7 cm difference between hips) for radiographic large alpha angle (≥78°)</td>
<td>0.85</td>
<td>0.38</td>
<td>35%</td>
<td>86%</td>
</tr>
</tbody>
</table>

Beyond FADIR (cont.)

Deep Squat Test

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>Specificity</th>
<th>+LR</th>
<th>−LR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.75</td>
<td>0.41</td>
<td>1.3</td>
<td>0.6</td>
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</table>

How can we improve the applicability of this test?

Acetabular Labral Pathology

• Most commonly present via nontraumatic mechanism (74%)
  – Repetitive motions into the position of FAI may cause the acetabular labrum to undergo excessive shear and compressive forces

• Traumatic mechanisms described involve rapid twisting, pivoting, or falling motions
  – Forceful rotation with the hip in a hyperextended position

Pathology or “Normal” Structural Changes?

“What Is the Prevalence of Hip Intra-Articular Pathologies and Osteoarthritis in Active Athletes With Hip and Groin Pain Compared With Those Without? A Systematic Review and Meta-analysis”¹

Labral tears per person

- 54.1 out of 100 asymptomatic people
- 45.9 out of 100 asymptomatic people


Labral tears per person

- 62 out of 100 symptomatic people
- 38 out of 100 symptomatic people
Pathology or "Normal" Structural Changes? (cont.)


66.6 out of 100 asymptomatic people

20 out of 100 symptomatic people

**Pathology or ”Normal” Structural Changes? (cont.)**

- **Labral tears per person (cutting sports)**
  - 33.1 out of 100 asymptomatic people
  - 66.9%

- **Labral tears per person (impingement sports)**
  - 33.4 out of 100 asymptomatic people
  - 66.6%

- **Labral tears per person (asymmetric sports)**
  - 32.9 out of 100 asymptomatic people
  - 67.1%
Do Asymptomatic Findings Progress to Symptomatic Over Time?

- 21 NHL/AHL players without hip/groin pain
  - Only four players (19%) had no pathology identified on MRI
- 90% remained actively playing at four-year follow-up
  - Fourteen players (67%) remained at the same level of play
  - Four (19%) advanced to a higher level of play
  - Only one (5%) was demoted
- Hip and/or pelvis symptoms only developed in three players (14%)
  - Neither missed any games related to hip/groin symptoms

Are There Structural Changes That DO Matter?

- **Increasing BMI** was correlated with a more severe acetabular cartilage grade.
- **Increasing femoral cartilage damage** in the anterosuperior femoral head region correlated with worse scores on the HOOS activities of daily, symptoms, and pain subscales.
- **No correlation between PRO scores and acetabular cartilage damage or labral tearing found on quantitative MRI or during arthroscopic surgery.**

**Cartilage: The Structural Factor That DOES Matter**

“What Is the Prevalence of Hip Intra-Articular Pathologies and Osteoarthritis in Active Athletes With Hip and Groin Pain Compared With Those Without? A Systematic Review and Meta-analysis”¹

“What is the Prevalence of Imaging-Defined Intra-articular Hip Pathologies in People With and Without Pain? A Systematic Review and Meta-analysis”²

9.6 out of 100 **asymptomatic** people

64 out of 100 **symptomatic** people

Heerey et al., 2019; Heerey et al., 2018
Who Is at Risk?

Associated with moderate to severe cartilage injury

- Increased **cam severity** (OR = 4.82)
- **Male sex** (OR = 4.42)
- Higher age (OR = 1.70)
- Borderline dysplasia (OR = 3.19)

Labral Pathology: Clinical Presentation

- **Onset of symptoms**
  - Insidious (61%)
  - Acute (30%)
  - Trauma (6%)

- **Characteristic of pain**
  - Sharp (86%)
  - Dull (80%)
  - Night pain (71%)

- **Mechanical symptoms**
  - Painful locking (89%)
  - Locking (77%)
  - Snap/pop/lock (53%)

- **Aggravating factors**
  - Activity-related (91%)
  - Walking (70%)
  - Pivoting (70%)
  - Impact activities (62%)

Labral Pathology: Pain Distribution

- **Groin**: 91% (61 patients)
- **Anterior Thigh/Knee**: 52% (34 patients)
- **Buttock**: 38% (25 patients)
- **Lateral Hip**: 59% (39 patients)

# Anterosuperior Labrum: Special Testing

## Fitzgerald test (anterior labrum)

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>Specificity</th>
<th>+LR</th>
<th>−LR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.72–0.98</td>
<td>0.00–0.33</td>
<td>1.08</td>
<td>0.83</td>
</tr>
</tbody>
</table>

## Thomas test

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>Specificity</th>
<th>+LR</th>
<th>−LR</th>
<th>PPV</th>
<th>NPV</th>
</tr>
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<tbody>
<tr>
<td>0.11–0.89</td>
<td>0.67–0.92</td>
<td>0.33–11.1</td>
<td>1.34–0.12</td>
<td>94%</td>
<td>86%</td>
</tr>
</tbody>
</table>

“The Modified Thomas Test Is Not a Valid Measure of Hip Extension Unless Pelvic Tilt Is Controlled”

- Designed to evaluate the “tightness” of the anterolateral hip/thigh structures
  - Sn = 0.32, Sp = 0.57
- Accounting for pelvic tilt may improve test
- Yes for ruling in a labral tear, no for assessing soft-tissue restrictions

Ligamentum Teres Pathology

- Significant role in maintaining rotational stability of hip
  - Especially evident when hip is in 90° or 120° of flexion
- **Mechanism of injury**
  - Ligament is taut with flexion, adduction, and external rotation
    - Could reflect a mechanism of twisting injury
  - Hyperabduction also identified as potential MOI
  - Common pathology following traumatic dislocation of hip

Byrd et al., 2004; Philippon et al., 2009; Martin et al., 2014; Martin et al., 2018; Martin et al., 2019
Ligamentum Teres: Patient Presentation

- Older age
  - 1.51 higher for individuals older than 30 years of age
- Gender
  - Women three times more likely to have LT tear
- BMI
  - Those with a low BMI more likely to have LT tear
- Clinical presentation
  - Theoretical limitations in hip flexion, excessive IR
    - Literature shows only small differences in comparison to those without LT pathology
  - Deep anterior groin pain
    - 23/23 (100%)
  - Mechanical symptoms (catching, popping, locking, giving away)
    - 19/23 (83%)
  - Complaint of hip instability

Chahla et al., 2016; Byrd et al., 2004; Martin et al., 2019
Ligamentum Teres: Special Testing

Ligamentum teres test

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.90</td>
<td>0.85</td>
<td>84%</td>
<td>91%</td>
</tr>
</tbody>
</table>

*Those with a positive LT tear were 7.5x more likely to have a (+) FADIR Test

O’Donnell et al., 2014; Chahla et al., 2016
FAIS: To Cut or Not to Cut?

The Athlete’s Hip: Simplifying the Evaluation of Hip Pathology
“Femoroacetabular Impingement Surgery Is on the Rise: But What Is the Next Step?”

- **18-fold increase** in FAI surgery between 1999 and 2009
- Only **25%** of surgeons were willing to consider a trial randomizing patients with FAI for operative versus nonoperative treatment
- **21%** of patients were not willing to try conservative therapy for six months

“Prevalence and Consistency in Surgical Outcome Reporting for Femoroacetabular Impingement Syndrome: A Scoping Review”

Number of studies per year and level of evidence

“A Shift in Hip Arthroscopy Use by Patient Age and Surgeon Volume: A New York State–Based Population Analysis 2004 to 2016”

There was a 495% increase in hip arthroscopies from 2004 to 2016

Surgical Criteria for FAIS

Surgical Criteria for FAIS (cont.)

Surgical Criteria for FAIS (cont.)

• 44% of studies described failed conservative treatment
  – 18% described failed physical therapy

• Only 56% of included studies utilized the combination of symptoms, clinical signs, and diagnostic imaging for diagnosis of FAIS

Nonsurgical treatment was reported in **25% of patients** (1,264/5,125 patients)

- **7.36%**: physical therapy
- **11.00%**: activity modification
- **10.4%**: NSAIDs
- **1.99%**: intra-articular injection
“Nonoperative Management Prior to Hip Arthroscopy for Femoroacetabular Impingement Syndrome: An Investigation Into the Utilization and Content of Physical Therapy”

- 1,870 participants
- 1,106 did not see a PT prior to surgery
- Of those who did see a PT
  - Average number of visits: two
What Do Patients Care About?

FAIS and Osteoarthritis

• The effect of surgery on the natural history of FAI or the capacity to prevent/delay OA has **not been established**

• In middle-aged patients, moderate (α-angle >60°) and severe (>83°) cam morphology was associated with development of end-stage OA at five years
  – Adjusted ORs 3.67 and 9.66

• Pincer-type morphology **was not** associated with the development of OA
  – OR = 0.34


“Cam Deformities and Limited Hip Range of Motion Are Associated With Early Osteoarthritic Changes in Adolescent Athletes”

OA progression: decreased hip internal rotation, positive anterior impingement sign, decreased hip flexion, increased alpha angle, and presence of a cam lesion

Of the 1,870 participants in this young cohort, 21.9% had a postoperative clinical diagnosis of hip osteoarthritis within two years

- Mean age 32.2 years at follow-up

Variables indicative of progression to OA

- Increased age (OR = 1.037)
- Male sex (OR = 1.305)
- Additional hip surgery (OR = 2.330)
“Radiographic Hip Osteoarthritis Is Prevalent, and Is Related to Cam Deformity 12–24 Months Post Hip Arthroscopy”

Of the 70 participants in this young cohort, 37.0% had a postoperative clinical diagnosis of hip osteoarthritis within 12–24 months

- Mean age 36.7 years at follow-up

“An Examination of the Association Between Different Morphotypes of Femoroacetabular Impingement in Asymptomatic Subjects and the Development of Osteoarthritis of the Hip”

Of the 192 participants (96 symptomatic, 96 asymptomatic), **82.3% remained free of a clinical diagnosis of hip osteoarthritis at 18.5-year follow-up**

- Mean age 49.3 years at follow-up

If We Are Not Changing the Likelihood of OA, Are We At Least Improving Function?

A total of 1,911 patients and 1,981 hips were assessed in 29 clinical studies.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Weighted change</th>
</tr>
</thead>
<tbody>
<tr>
<td>mHHS</td>
<td>24.4</td>
</tr>
<tr>
<td>HOS-ADL</td>
<td>23.7</td>
</tr>
<tr>
<td>HOS-Sport</td>
<td>41.7</td>
</tr>
<tr>
<td>NAHS</td>
<td>22.0</td>
</tr>
<tr>
<td>WOMAC</td>
<td>12.9</td>
</tr>
<tr>
<td>VAS-Pain</td>
<td>-4.5</td>
</tr>
</tbody>
</table>

What About Return to Sport?

- A total of 1,296 patients and 1,442 hips were assessed for return to play/sports in 22 clinical studies
- **Return-to-sport rate:** 84.6%
  - 95% CI, 80.4%–88.8%; P = .008
- Sim et al., 2015
  - Only 6.8% of studies reported RTS data

“The Difference Between Getting Better and Getting Back to Normal”

- Statistically and clinically relevant improvements in HAGOS and mHHS results after hip arthroscopy and rehabilitation can be seen at three months and up to one year.
A Matter of Definition?

1. Not returned to any sport or exercise
2. Returned to participation in a different sport or exercise than prior to hip symptoms
3. Returned to participation in the same sport or exercise but on a lower performance level
4. Returned to participation in the same sport or exercise on same or higher performance level than prior to hip symptoms

89% had returned to sport when reporting RTS in traditional fashion (yes/no)

Only 28% participated in the same sport as prior to hip symptoms, but at lower performance levels

Only 21% participated in the same sport at the same or higher performance levels

46% reported satisfaction with current RTS level over six months following arthroscopy
“Femoroacetabular Impingement Surgery Allows 74% of Athletes to Return to the Same Competitive Level of Sports Participation but Their Level of Performance Remains Unreported”

- 35 studies (1,634 athletes/1,828 hips) included
- Mean time from surgery to RTS was 7.0 ± 2.6 months
- Only 37% of studies reported pre-injury level of competition
- Only 14% of studies reported on pre-surgery and post-surgery athletic performance

"Return to Sport and Performance After Hip Arthroscopy for Femoroacetabular Impingement in 18- to 30-Year-Old Athletes"

17% returned to optimal sports performance

“Return to Sport and Performance After Hip Arthroscopy for Femoroacetabular Impingement in 18- to 30-Year-Old Athletes” (cont.)

Of those that failed to return to preinjury sport at preinjury level...

- 18.5% Same sport, lower level due to hip/groin pain
- 32.1% Another sport due to hip/groin pain
- 43.2% Not engaged in any sport due to hip/groin pain
- 6.2% Unrelated to hip/groin pain

Of the athletes engaged in their preinjury sport at preinjury level at follow-up...

- Optimal sports performance, including full sports participation (46.3%)
- Impaired sports performance, but full participation (29.6%)
- Impaired sports participation, including restricted participation (24.1%)

89.5% reported impaired performance due to persistent hip and/or groin pain

153/184 athletes (83.2%) were classified with impaired sport performance.

No differences between sports were observed in the proportion of athletes with moderate-to-extreme difficulties in specific sport activities.

HAGOS sport subscale items:
- SP8 (“stretched into an outer hip position”)
- SP5 (“running as fast as you can”)
- SP7 (“explosive movements”)
- SP2 (“running”)
- SP6 (“kicking, skating, etc.”)
“Prognosis Following Hip Arthroscopy Varies in Professional Athletes Based on Sport”

Returned to sport: **88.7%**

**Change in Games Played**

- **NHL**
  - 1 season before surgery vs average of seasons 2 and 3 after
  - 1 season before surgery vs 1 season after

- **MLB**
  - 1 season before surgery vs average of seasons 2 and 3 after
  - 1 season before surgery vs 1 season after

- **NBA**
  - 1 season before surgery vs average of seasons 2 and 3 after
  - 1 season before surgery vs 1 season after

- **NFL**
  - 1 season before surgery vs average of seasons 2 and 3 after
  - 1 season before surgery vs 1 season after

“Prognosis Following Hip Arthroscopy Varies in Professional Athletes Based on Sport” (cont.)

Returned to sport: 88.7%

Change in Performance

- NHL: -37
- MLB: -13
- NBA: -5
- NFL: -9

1 season before surgery vs average of seasons 2 and 3 after
1 season before surgery vs 1 season after

“Most Military Service Members Return to Activity Duty With Limitations After Surgery for Femoroacetabular Impingement Syndrome”

<table>
<thead>
<tr>
<th>Studies</th>
<th>Subjects</th>
<th>Returned to duty</th>
<th>RTD without limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>871</td>
<td>75%</td>
<td>47%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Expectation</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved sport performance</td>
<td>92%</td>
</tr>
<tr>
<td>Improved ability to attain athletic potential</td>
<td>88%</td>
</tr>
<tr>
<td>Improved ability to exercise</td>
<td>100%</td>
</tr>
<tr>
<td>Relieve persistent pain</td>
<td>98%</td>
</tr>
<tr>
<td>Relieve pain with sitting</td>
<td>94%</td>
</tr>
<tr>
<td>Relieve stress and anxiety caused by hip</td>
<td>93%</td>
</tr>
<tr>
<td>Remove my hip from the forefront of my thoughts</td>
<td>96%</td>
</tr>
<tr>
<td>Relieve worry that hip damage is getting worse</td>
<td>96%</td>
</tr>
<tr>
<td>Resume the lifestyle I had before this problem started</td>
<td>99%</td>
</tr>
</tbody>
</table>
## Additional Postoperative Implications

<table>
<thead>
<tr>
<th>Condition</th>
<th>Total before</th>
<th>Total after</th>
<th>Total new</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental health disorder</td>
<td>372</td>
<td>685</td>
<td>391</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Chronic pain</td>
<td>174</td>
<td>463</td>
<td>374</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Substance abuse</td>
<td>288</td>
<td>453</td>
<td>248</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Cardiovascular disease</td>
<td>198</td>
<td>339</td>
<td>195</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Metabolic syndrome</td>
<td>297</td>
<td>552</td>
<td>341</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Systemic arthropathy</td>
<td>34</td>
<td>79</td>
<td>60</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Sleep disorder</td>
<td>256</td>
<td>541</td>
<td>370</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td><strong>Any comorbidity</strong></td>
<td><strong>973</strong></td>
<td><strong>1,347</strong></td>
<td><strong>480</strong></td>
<td><strong>&lt; 0.001</strong></td>
</tr>
</tbody>
</table>

## What Influences Opioid Use?

<table>
<thead>
<tr>
<th></th>
<th>Opioid use (&lt; 180 days pre-op)</th>
<th>Opioid use (&gt; 90 days post-op)</th>
<th>Total health care costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depressive Sx</td>
<td>36.2%</td>
<td>29.5%</td>
<td>$14,062</td>
</tr>
<tr>
<td>No depressive Sx</td>
<td>25.6%</td>
<td>23.4%</td>
<td>$9,582</td>
</tr>
</tbody>
</table>

Surgery Versus Conservative Management
“Arthroscopic Surgery or Physical Therapy for Patients With Femoroacetabular Impingement Syndrome”

- 80 patients
  - 40 in surgery group, 40 in PT group
- **Supervised PT program**: twice a week for 12 sessions
- **Surgery**: acetabuloplasty, labral repair/debridement, and/or femoroplasty as indicated by the surgeon’s clinical judgment

“Hip Arthroscopy Versus Best Conservative Care for the Treatment of Femoroacetabular Impingement Syndrome”

- 348 patients
  - 171 in surgery group, 177 in PT group
- At initial assessment, participants received a personalized hip therapy information packet
- They then had between six and ten face-to-face contacts with the physiotherapist over 12–24 weeks
- Some contacts were allowed by either telephone or email

188 patients (At conclusion of data collection)
  - 100 in surgery group, 88 in PT group

Maximum of **eight sessions** over five months
  - Emphasis on muscle strengthening to improve core stability and movement control
  - Encouraged to perform exercises at home
  - Participants encouraged to avoid impingement positions

Acetabuloplasty, labral repair/debridement, chondral microfracture, and/or femoroplasty as indicated by the surgeon’s clinical judgment

## And the Verdict Is…

<table>
<thead>
<tr>
<th>Study</th>
<th>Follow-up</th>
<th>iHOT-33 Difference</th>
<th>HOS-ADL Difference</th>
<th>HOS-Sports Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mansell et al., 2018</td>
<td>24 months</td>
<td>6.3 (-6.1 to 18.7)</td>
<td>3.8 (-6 to 13.6)</td>
<td>1.8 (-11.2 to 14.7)</td>
</tr>
<tr>
<td>Griffin et al., 2018</td>
<td>8 months</td>
<td><em><em>6.8</em> (1.7 to 12.0)</em>*</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Palmer et al., 2019</td>
<td>12 months</td>
<td><em><em>2.0</em> (1.3 to 2.8)</em>*</td>
<td><em><em>10.0</em> (6.4 to 13.6)</em>*</td>
<td><em><em>11.7</em> (5.8 to 17.6)</em>*</td>
</tr>
</tbody>
</table>

The pooled crossover rate from nonoperative to operative care was 14%

# Does This Tell the Full Story?

<table>
<thead>
<tr>
<th>Study</th>
<th>Scale</th>
<th>Population</th>
<th>90% MDC</th>
<th>95% MDC</th>
<th>MCID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mohtadi et al., 2012</td>
<td>iHOT-33</td>
<td>Symptomatic Hip Conditions</td>
<td>7.0</td>
<td>-</td>
<td>6.1</td>
</tr>
<tr>
<td>Hinman et al., 2013</td>
<td>iHOT-33</td>
<td>FAIS</td>
<td>13.2</td>
<td>15.6</td>
<td>-</td>
</tr>
<tr>
<td>Kemp et al., 2013</td>
<td>iHOT-33</td>
<td>Hip Arthroscopy</td>
<td>13.9</td>
<td>16.6</td>
<td>10</td>
</tr>
<tr>
<td>Jonasson et al., 2014</td>
<td>iHOT-12</td>
<td>FAIS</td>
<td>14.4</td>
<td>-</td>
<td>9</td>
</tr>
<tr>
<td>Nwachukwu et al., 2017</td>
<td>iHOT-33</td>
<td>Hip Arthroscopy</td>
<td>-</td>
<td>-</td>
<td>12.1</td>
</tr>
</tbody>
</table>

- **Griffin and Palmer** utilized a MDIC of 6.1
- **Mansell** utilized a MDIC of 12.1
### Does This Tell the Full Story? (cont.)

<table>
<thead>
<tr>
<th>Study</th>
<th>Scale</th>
<th>Population</th>
<th>90% MDC</th>
<th>95% MDC</th>
<th>MCID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Martin et al., 2008</td>
<td>HOS-ADL</td>
<td>Hip Arthroscopy</td>
<td>3</td>
<td>-</td>
<td>9</td>
</tr>
<tr>
<td>Hinman et al., 2013</td>
<td>HOS-ADL</td>
<td>FAIS</td>
<td>15.0</td>
<td>17.8</td>
<td>-</td>
</tr>
<tr>
<td>Kemp et al., 2013</td>
<td>HOS-ADL</td>
<td>Hip Arthroscopy</td>
<td>9</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Nwachukwu et al., 2017</td>
<td>HOS-ADL</td>
<td>Hip Arthroscopy</td>
<td>-</td>
<td>-</td>
<td>8.3</td>
</tr>
</tbody>
</table>

- **Palmer** utilized a MDIC of nine
- **Mansell** utilized a MDIC of between six and eight points
Are These Fair Comparisons Between “Physical Therapy” and Surgery?

- **Mansell et al.**
  - Delivered over six weeks
  - Mostly mobility and “therapeutic motor control” exercises

- **Griffin et al.**
  - Average of five sessions over 12–24 weeks
  - 66% of participants attended over eight sessions
  - Primarily non-functional, low-load exercises

- **Palmer et al.**
  - Average of six sessions over five months
  - No specifics on program used

Maybe These Studies ARE Representative of What WE Are Doing

- 220 (11.8%) had over six visits utilizing exercise
- Exercise was coded in 52.3% of the total visits in each individual course of care

There Is Hope

- Individuals in both groups attended eight sessions over a 12-week period, and 12 weekly supervised gym visits
  - Participants were also asked to complete two additional unsupervised exercise sessions per week
- Program consisted of *progressive loading* program
  - Squats
  - Lunges
  - *Progressive loading*

### Outcome Baseline Follow-up (six months) Difference Effect size

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Baseline</th>
<th>Follow-up (six months)</th>
<th>Difference</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>iHOT-33</td>
<td>60</td>
<td>87</td>
<td>27</td>
<td>1.34</td>
</tr>
<tr>
<td>HOOS QOL</td>
<td>54</td>
<td>76</td>
<td>22</td>
<td>1.26</td>
</tr>
<tr>
<td>HOOS Pain</td>
<td>63</td>
<td>83</td>
<td>20</td>
<td>1.77</td>
</tr>
</tbody>
</table>

**Other less intensive RCTs**

- Palmer et al.: **1.7 (HOS-ADL)**
- Mansell et al.: 15.5 (iHOT-33), 8.5 (HOS-ADL), **3.9 (HOS-Sports)**
- Griffin et al.: 14.1 (iHOT-33)
How long do you try?

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Level of evidence</th>
<th>Median (0–10)</th>
<th>Number of votes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise-based treatments are recommended for people with hip-related pain</td>
<td>Moderate</td>
<td>9</td>
<td>37</td>
</tr>
<tr>
<td>Exercise-based treatment should be at least three months in duration</td>
<td>Limited</td>
<td>7</td>
<td>37</td>
</tr>
<tr>
<td>Clinicians should discuss patient expectations, use shared decision making and provide education</td>
<td>Insignificant</td>
<td>9</td>
<td>37</td>
</tr>
</tbody>
</table>
“Improving Function in People With Hip-related Pain: A Systematic Review And Meta-analysis of Physiotherapist-led Interventions for Hip-related Pain”

• Duration of interventions ranged from 3 weeks to 5 months

• Interventions of 3 months’ duration that included targeted strengthening showed moderate pooled effects for function
  – SMD (95% CI): 0.66 (0.09 to 1.23)

• Interventions of shorter duration (6–8 weeks) showed no significant differences between groups

Summary

• Asymptomatic morphological abnormalities are very common
• Utilize the criteria set forth by the Warwick Agreement
• Surgery versus conservative management, no clear answer
Chapter 3

Athletic Pubalgia
Defined Clinical Entities

- Athletic pubalgia = sports hernia = osteitis pubis = hockey groin = Gilmore’s groin = chronic adductor-related groin pain
- **Catch-all term for soft-tissue pathology localized to groin/pelvic region**
- **Pathology broken down by region**
  - Adductor-related
  - Hip flexor-related
  - Inguinal-related
  - Pubic-related

AP: Structures Involved

• Adductor pathology most prevalent on clinical, MRI, and US evaluation (63%–66%)
  – Adductor longus (93%)

• Negative imaging found in fourth of cases

• Significant discrepancy between clinical and radiological findings

Multiple causes for groin pain were found in **44% of the athletes**

**Distribution**
- Adductor-related: 61 (37.4%)
- Inguinal-related: 40 (24.5%)
- Hip flexor-related: 31 (19.0%)
- Hip-related: 7 (4.3%)
- Pubic-related: 4 (2.5%)
- Other: 20 (12.3%)
AP: Risk Factors

- Level 1 evidence
  - Previous groin injury
  - Higher level of play
- Level 2 evidence
  - Decreased hip abductor and adductor strength
  - Lower levels of sport-specific training
- Other potential risk factors
  - Male gender
  - Common sports
    - Ice hockey
    - Soccer
    - Rugby
    - Football

Athletic Pubalgia and FAI

- Bisciotti et al., 2017
  - Association between cam morphology and inguinal pathologies in 88.6% cases
- Naal et al., 2015
  - Evidence of AP was found in 34 hips with FAI (41%)
    - Tendinopathy of the proximal adductor insertion was detected in 19 cases (23%; 11 female, 8 male)
    - There were no significant differences for any of the radiographic or clinical parameters between patients with or without tendinopathy
- Economopoulos et al., 2014
  - Radiographic evidence of FAI was identified in at least one hip in 37 of 43 patients (86%) diagnosed with AP
    - Cam lesions were identified in 83.7% of subjects
    - Pincer lesions were present in 28% of hips
Inguinal-Related: Patient Presentation

- Pain localized to the inguinal canal region
- Tenderness reproduced in the inguinal canal
- Pain aggravated with resistance testing of the abdominal muscles or Valsalva/cough/sneeze

Serner et al., 2016; Weir et al., 2015
Inguinal-Related: Special Testing

• Unable to determine statistical properties due to low prevalence

• Palpation (rectus abdominis, superficial inguinal ring, inguinal canal)

• Resistance
  – Oblique sit-up, straight sit-up, Thomas test + hip flexion

• Stretch
  – Thomas test + passive hip extension

Serner et al., 2016; Weir et al., 2015
Pubic-Related: Patient Presentation

• Unable to determine statistical properties due to low prevalence
• Localized tenderness of the pubic symphysis and adjacent pubic bone
• No specific resistive test identified for this population

Serner et al., 2016; Weir et al., 2015
Hip Flexor-Related: Patient Presentation

• Tenderness isolated to iliopsoas and/or rectus femoris
• Pain on resisted hip flexion and/or pain on passive stretch of hip flexor musculature
• A proximal pain referral to the lower abdominal region in 7% of patients

Drew et al., 2017; Serner et al., 2016; Weir et al., 2015

Risk factors

- No association between age and injury
- Previous injury (hamstring and quadriceps)
- Dominant leg (60%)
Iliopsoas Disorder in Athletes with Groin Pain: Prevalence in 638 Consecutive Patients Assessed With MRI and Clinical Results in 134 Patients With Signal Intensity Changes in the Iliopsoas

- Iliopsoas pathology in 134/638 athletes (21.0%)
- Soccer is most common sport (88/134; 65.7%)
- No clear history of trauma (68.2%)

### Hip Flexor-Related: Special Testing

#### Resisted hip flexion (0˚)

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>Specificity</th>
<th>+LR</th>
<th>−LR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.72</td>
<td>0.60</td>
<td>1.82</td>
<td>0.46</td>
</tr>
</tbody>
</table>

#### Resisted hip flexion (90˚)

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>Specificity</th>
<th>+LR</th>
<th>−LR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.67</td>
<td>0.79</td>
<td>3.23</td>
<td>0.42</td>
</tr>
</tbody>
</table>

### Hip Flexor-Related Special Testing: Thomas Test Variations

<table>
<thead>
<tr>
<th></th>
<th>Resisted hip flexion</th>
<th>Passive hip extension</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sn</td>
<td>Sp</td>
</tr>
<tr>
<td>Resisted hip flexion</td>
<td>0.72</td>
<td>0.67</td>
</tr>
<tr>
<td>Passive hip extension</td>
<td>0.61</td>
<td>0.75</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Resisted knee extension</th>
<th>Passive knee flexion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sn</td>
<td>Sp</td>
</tr>
<tr>
<td>Resisted knee extension</td>
<td>0.67</td>
<td>0.82</td>
</tr>
<tr>
<td>Passive knee flexion</td>
<td>0.56</td>
<td>0.89</td>
</tr>
</tbody>
</table>

“Can Standardized Clinical Examination of Athletes With Acute Groin Injuries Predict the Presence and Location of MRI Findings?”

Only two cases where all hip flexor tests were negative, and a positive hip flexor lesion was reported on MRI.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>+LR</th>
<th>−LR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three positive</td>
<td>0.78</td>
<td>0.79</td>
<td>3.69</td>
<td>0.28</td>
</tr>
<tr>
<td>All positive</td>
<td>0.33</td>
<td>0.98</td>
<td>19.00</td>
<td>0.68</td>
</tr>
<tr>
<td>All negative</td>
<td>0.11</td>
<td>0.53</td>
<td>0.23</td>
<td>1.69</td>
</tr>
</tbody>
</table>

Adductor-Related: Physical Examination

- Pubic tubercle pain (75%) and ramus pain (85%) common upon palpation
- General adductor tenderness
  - Sn: 0.96, −LR: 0.08
- Valsalva maneuver can occasionally reproduce symptoms
- A proximal pain referral to the lower abdominal region found in 33% of patients

Meyers et al., 2000; Verrall et al., 2005; Slavotinek et al., 2005; Falvey et al., 2015; Hegedus et al., 2013; Serner et al., 2016; Drew et al., 2017

- Most injuries occurred in noncontact situations
  - 71%
- Following a quick defensive reaction to a change in play
  - 53%
- No contact
  - Less than two meters away: 47%
  - More than two meters away: 24%

“Mechanisms of Acute Adductor Longus Injuries in Male Football Players: A Systematic Visual Video Analysis” (cont.)

Adductor-Related: Special Testing

Resisted outer-range adduction

<table>
<thead>
<tr>
<th>Sn</th>
<th>Sp</th>
<th>+LR</th>
<th>−LR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.85</td>
<td>0.89</td>
<td>7.63</td>
<td>0.17</td>
</tr>
</tbody>
</table>
“Can Standardized Clinical Examination of Athletes With Acute Groin Injuries Predict the Presence and Location of MRI Findings?”

- Positive individual adductor tests provide about 80% probability of a positive MRI in the adductors.
- High accuracy (92%–97% probability) of confirming that the injury is located in the adductors on MRI.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>+LR</th>
<th>−LR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three positive</td>
<td>0.85</td>
<td>0.66</td>
<td>2.47</td>
<td>0.23</td>
</tr>
<tr>
<td>All positive</td>
<td>0.33</td>
<td>0.91</td>
<td>3.80</td>
<td>0.74</td>
</tr>
<tr>
<td>All negative</td>
<td>0.00</td>
<td>0.54</td>
<td>0.00</td>
<td>1.84</td>
</tr>
</tbody>
</table>

To Cut or Not to Cut?
Three prospective RCTs evaluating exercise interventions for the treatment of long-standing groin pain in athletes compared with passive therapy reported favorable outcomes in terms of

- Improved symptoms
- Reduced pain on return to sport
- Improved hip muscle strength

Exercise programs consist of

- Hip strengthening (Iso, Con, Ecc)
- Abdominal strengthening
- Proprioceptive training
- Return to running program


“The Effect of Therapeutic Exercise on Long-Standing Adductor-Related Groin Pain in Athletes: Modified Holmich Protocol”

“Return to Sport After Criteria-Based Rehabilitation of Acute Adductor Injuries in Male Athletes: A Prospective Cohort Study”

- Program was supervised by a sports PT with face-to-face sessions offered five times per week
- Therapeutic ultrasound, lasers, dry needling, and other similar treatments were prohibited
  - No fluff
- Program consisted of progressive loading program
  - Adductor loading
  - Sprinting/running/agility training
  - Sport-specific training

As many repetitions as possible (volitional failure) within a pain score of 2/10

Athletes were encouraged to increase loading to perform exercises with minor pain
• One-year reinjury rate was 8%

• Athletes who achieved RTS milestone 1 had a statistically significantly lower reinjury rate
  – 5% vs. 21%

• Athletes who achieved RTS milestone 2 had a non-statistically significantly lower reinjury rate
  – 6% vs. 13%
73% of patients returned to play pain-free at a mean of 9.9 weeks (±3.5)

Fifty-six papers (3,332 athletes) were included in the review

“Athletic Groin Pain: A Systematic Review and Meta-analysis of Surgical Versus Physical Therapy Rehabilitation Outcomes” (cont.)

Prevention?

- Two prospective RCTs (Soccer and hockey players)
- Adductor-related athletic pubalgia

- **Holmich et al., 2010**
  - Low risk of bias
  - Non-significant trend towards a favorable effect (hazard risk reduction)

- **Tyler et al., 2002**
  - Reduction in the incidence of strains compared with pre-intervention seasons was reported
  - Significant improvements in hip strength ratios in a sub-set of athletes who underwent strength reassessment in the subsequent season

Copenhagen Adduction

- The intervention group demonstrated a 35.7% increase in eccentric adduction (P < .001)
- 20.3% increase in eccentric abduction (P = .003)
- 12.3% increase in EHAD/EHAB ratio (P = .019)
- Peak normalized EMG
  - Adductor longus: 108% (dominant), 69% (nondominant)
  - Gluteus medius: 20% (dominant), 48% (nondominant)

What is the most beneficial intervention in the prevention of groin pain in athletes?

A. Hip mobility training
B. Adductor eccentric training
C. Gluteus medius strengthening
D. Soft-tissue mobilization
Significantly greater increase in **eccentric hip adduction strength** of 0.29 Nm/kg (8.9%; P = .01)

No within-group change was noted in the group that used the standard FIFA 11+ program.
“The Adductor Strengthening Programme Prevents Groin Problems Among Male Football Players: A Cluster-Randomized Controlled Trial”

- **Easiest (1A/B):** sidelying hip adduction
- **Moderate (2A/B):** the CA as previously described, but with a shorter lever arm
- **Hardest (3A/B):** the CA as previously described

### Week	Weekly sessions	Sets (per side)	Reps (per side)
---
**Preseason: week 1**
1 2 1 3–5
2 3 1 3–5
3–4 3 1 7–10
5–6 3 1 12–15
7–8 2 1 12–15
**In season**
1 1 12–15

• Weekly prevalence of all groin problems
  – Intervention group: 13.5%
  – Control group: 21.3%
  – **41% reduction in control group (statistically significant)**

• Weekly prevalence of ‘substantial’ groin problems
  – Intervention group: 5.7%
  – Control group: 8.0%
  – **18% reduction in control group (non-significant)**

Reverse Nordic Hamstring

- **Significant increase** in the RF muscle fascicle length, muscle thickness, pennation angle, and cross-sectional area
- After the detraining period FL, MT, PA and CSA showed a **significant decrease**
Summary

• Break your evaluation into the defined clinical entities
• Progressive loading and return to sport programs are effective
• Utilizing the Copenhagen adduction exercise can significantly decrease the likelihood of adductor related pain
Bibliography

MedBridge

The Athlete’s Hip: An Update on Athletic Groin Pain
John Snyder, PT, DPT, OCS, CSCS