Objectives

Discuss epidemiology of athletic groin injuries

Review diagnostic approach to athletic groin injuries highlighting the role of pelvic imaging

Emphasize differential diagnosis of groin pain

Discuss surgical treatment of athletic groin injuries
What Is Athletic Pubalgia?

The Surgical Approach to Sports Hernia: Myth or Reality

Groin Pain in the Athlete

• Misunderstood by many surgeons
• Difficult diagnostic issues
• Difficult treatment issues
• Many treatment options

Experience With “Sports Hernia” Spanning Two Decades

Groin Pain in the Athlete

- “Sports Hernia” is bad name
- Pelvis has 2 joints – think orthopedic
- The ball and socket hip joint
- The pubic bone joint
- Right and left groins act together as the center for a lot of symmetrical soft tissue structures

“The principal theme of athletic pubalgia is that the term “sports hernia” is a gross misnomer... very few of these patients have even incidental hernias. The injuries have nothing to do with true inguinal hernias, and instead involve what we describe as the pubic joint.”

adductor dysfunction
osteitis pubis
hip joint injury
“sports hernias”

The Surgical Approach to Sports Hernia: Myth or Reality

NFL Abdominal and Groin Injuries: Mean Days Lost

Courtesy of Michael Brunt, MD
Contusions and Muscle Strains: NFL 2000-2005

<table>
<thead>
<tr>
<th>Abdominal</th>
<th>N</th>
<th>Total Days</th>
<th>Mean # Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contusion</td>
<td>9</td>
<td>46</td>
<td>5.1</td>
</tr>
<tr>
<td>Oblique strain</td>
<td>55</td>
<td>495</td>
<td>9.0</td>
</tr>
<tr>
<td>Rectus strain</td>
<td>40</td>
<td>671</td>
<td>16.8</td>
</tr>
<tr>
<td>Herniation</td>
<td>11</td>
<td>96</td>
<td>36.0</td>
</tr>
<tr>
<td>Abd strain NOS</td>
<td>37</td>
<td>631</td>
<td>17.1</td>
</tr>
<tr>
<td>Groin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adductor strain</td>
<td>519</td>
<td>5387</td>
<td>10.4</td>
</tr>
<tr>
<td>Other groin</td>
<td>70</td>
<td>590</td>
<td>8.4</td>
</tr>
</tbody>
</table>

Courtesy of Michael Brunt, MD

NHL Injury Surveillance System (NHLISS) Study

Emery CA et al analyzed injury reports from 6 NHL seasons, 1991/92 – 1996/97
n=7,050 players
Subset analysis: 95/96 and 96/97 seasons
617 groin injuries reported
Injury rate 13-19.9 groin and abdominal injuries / 100 players


Distribution of Injuries by Player Position

The Surgical Approach to Sports Hernia: Myth or Reality

**Epidemiology**

- Collegiate 36%
- Professional 28%
- Regional 15%
- Recreational 10%
- Semi professional 6%
- High School 5%

**Risk Factors for Development of Athletic Pubalgia**

Imbalance in strength and flexibility between lower abdominal/trunk flexors and lower extremity hip flexors, extensors, and adductors

Risk factors for groin injury during training camp
- <18 sports-specific training sessions off-season (RR 3.4)
- History of previous groin or abdominal strain (RR 2.9)
- Veteran player status (veteran > rookie) (RR 5.7)

**TABLE 1: Top Six Sports (Total 9495 Athletes)**

<table>
<thead>
<tr>
<th>Source</th>
<th>% of Lower Body</th>
<th>% of Upper Body</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soccer</td>
<td>8.3</td>
<td>3.5</td>
</tr>
<tr>
<td>Football</td>
<td>8.1</td>
<td>3.1</td>
</tr>
<tr>
<td>Wrestling</td>
<td>6.3</td>
<td>1.2</td>
</tr>
<tr>
<td>Basketball</td>
<td>6.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Distance running</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>


*Courtesy of Michael Brunt, MD*
Anatomy and Pathophysiology of the Groin

Pathophysiology

Inguinal floor stressed by shear forces across symphysis pubis
- hip adduction, abduction, flexion-extension

Action of strong hip flexors tilting pelvis forward, stretching relatively weak abdominal muscles (imbalance)

Repetitive twisting / turning at speed results in stretching of internal oblique/transversalis that results in separation from inguinal ligament

Rectus abdominus tears leading to increased adductor tension/pressure

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Groin Pain in the Athlete

• Unclear etiology; hyperextension of abdominal muscles and hyperabduction of the adductors of the thigh
• Possible causes of groin pain are vast
• Deep, chronic, dull pain
• In groin, pubic, adductor area
• Can radiate to inner thigh, perineum or across the midline
• Can be acute but 90% give insidious onset
• Associated with activity, relieved with rest
Physical Exam

- Pubic point tenderness without inguinal hernia
- Increased pain with adduction against resistance
- Tenderness at adductor insertion
- Increased pain on resisted sit-up
- Weak floor, tenderness on palpation
- Dilated superficial ring

Inguinal Anatomy

Inguinal Anatomy: Preperitoneal View
Measured hip flexibility, abductor and adductor strength in 81 players over 2 seasons

Preseason hip adduction strength 18% lower in players who sustained an adductor strain


Adductor: Abductor strength ratio greatly decreased on side of injury

Players with adductor strength < 80% of abductor strength were 17x more likely to sustain an adductor strain

No differences in preseason adductor flexibility between uninjured and injured players


Pathophysiology

Weakness of the posterior wall of the inguinal canal results in both nerve irritation (neuritis) and insertional tendon pain on bone (pubalgia)

Transversalis fascia dilates at its weakest point and widens the inguinal triangle (bordered by the rectus abdominus muscle, the inguinal canal, and the inferior epigastric vessels)

Rectus abdominus muscle retracts cranially and medially and produces increased tension on the pubis

Localized bulging can compress the nearby genital branch of the genitofemoral nerve, especially during the stresses and straining of physical exertion

Nerve irritation produces a dull or burning pain that radiates into the inner thigh or scrotum

The Surgical Approach to Sports Hernia: Myth or Reality
Entrapment of ilioinguinal or iliohypogastric nerve branches in hypertrophied or torn muscle fibers or scar tissue

Irshad K et al. Surgery 2001;130:759-766

Operative Findings

- Torn rectus
- Torn conjoined tendon
- Deficient posterior inguinal wall
- Entrapped ilioinguinal or genito-fem nerve
- Tear in TF
- IO torn from pubic tubercle
- Torn EO

"Aponeurotic Plate"

Rectus abdominis ( )
Adductor ( )

The Surgical Approach to Sports Hernia: Myth or Reality
The Surgical Approach to Sports Hernia: Myth or Reality

**Imaging**

**Ultrasound**

Ultrasound image depicting protrusion of transversalis fascia during a Valsalva maneuver.


**MRI**

MRI appearance of adductor tendon.


The Surgical Approach to Sports Hernia: Myth or Reality

**MRI**

MRI image showing adductor hernia.

*Am J Radiol 2007;188, March*

**Right adductor muscle atrophy** (arrow) consistent with chronic strain.


The Surgical Approach to Sports Hernia: Myth or Reality

**Table 4**

Anatomical Defects identified in 100 Consecutive MRI of Athletic Pelvis Patients in 2005.

<table>
<thead>
<tr>
<th>Anatomical Defect</th>
<th>Incidence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pubic symphysis</td>
<td>43</td>
</tr>
<tr>
<td>Adductor longus</td>
<td>44</td>
</tr>
<tr>
<td>Femoral neck</td>
<td>36</td>
</tr>
<tr>
<td>Adductor magnus</td>
<td>28</td>
</tr>
<tr>
<td>Iliopsoas</td>
<td>6</td>
</tr>
<tr>
<td>Rectus abdominis</td>
<td>2</td>
</tr>
<tr>
<td>Sartorius</td>
<td>2</td>
</tr>
<tr>
<td>Tensor fasciae iliaca</td>
<td>1</td>
</tr>
<tr>
<td>Pubic symphysis</td>
<td>1</td>
</tr>
<tr>
<td>Obturator externus</td>
<td>1</td>
</tr>
<tr>
<td>Gracilis</td>
<td>1</td>
</tr>
<tr>
<td>Pectineus</td>
<td>1</td>
</tr>
<tr>
<td>Adductor magnus</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: the more that one defect was common the incidence adds up to greater than 100%.


The Surgical Approach to Sports Hernia: Myth or Reality
Overall, 30 of 39 (77%) asymptomatic hockey players demonstrated MRI findings of hip or groin pathologic abnormalities.

Classic Open Operative ("sports hernia") Repair
- Torn external oblique aponeurosis
- Torn conjoint tendon
- Disrupted posterior inguinal floor
- Conjoined tendon torn from pubic tubercle

Courtesy of Michael Brunt, MD

The Surgical Approach to Sports Hernia: Myth or Reality

Figure 1. Illustration (a) and intraoperative photograph (b) showing localized bulge of the posterior wall causing compression of the genital branch of the genitofemoral nerve. (102 U. Washhornsom)


The Surgical Approach to Sports Hernia: Myth or Reality
The Surgical Approach to Sports Hernia: Myth or Reality

Tension-Free Hernia Repair: Lichtenstein

The Tension-Free Hernioplasty

American Journal of Surgery, 1987
Local anesthesia, “dynamic observation”
Indirect sac opened, inverted
Marlex mesh, 5 x 10 cm
Suturing:
Continuous 3-0 monofilament
Single suture approximates tails
Laparoscopic Groin Anatomy: TEP

Myopectineal Orifice

Internal View

Mesh Fixation Options

Inferior Epigastrics

Right groin
Laparoscopic Repair

• TAPP and TEP
• 5-10 reports with 30-130 patients
• Describe tear in posterior wall, a weakness or bulge, true hernia or lipoma
• All used mesh
• 95-100% return to full activity quickly
Laparoscopic surgery for chronic groin pain in athletes is more effective than nonoperative treatment: A randomized clinical trial with magnetic resonance imaging of 60 patients with sportsman’s hernia (athletic pubalgia).

<table>
<thead>
<tr>
<th>Title III: Outcome of the patients after 3, 6, and 12 months.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hernia</strong></td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>Time</td>
</tr>
<tr>
<td>3 mo. (&lt; 1)</td>
</tr>
<tr>
<td>6 mo. (&lt; 1)</td>
</tr>
<tr>
<td>12 mo. (&lt; 1)</td>
</tr>
<tr>
<td>Full return to play</td>
</tr>
<tr>
<td>Improved activity</td>
</tr>
<tr>
<td>Improved activity</td>
</tr>
<tr>
<td>No return to play</td>
</tr>
<tr>
<td>3 mo. (≥ 1)</td>
</tr>
<tr>
<td>6 mo. (≥ 1)</td>
</tr>
<tr>
<td>12 mo. (≥ 1)</td>
</tr>
</tbody>
</table>

The Surgical Approach to Sports Hernia: Myth or Reality

**Sports Hernia in National Hockey League Players**

**Does Surgery Affect Performance?**

Players were divided into 3 groups:

(1) group A - all players

(2) group B - players with 6 or fewer seasons of play

(3) group C - players with 7 or more seasons of play

(4) control group - to compare player deterioration or improvement over a career; each player selected for the study had a corresponding control player with the same tenure in his career and position during the same years.

Players who undergo sports hernia surgeries return to play and often perform similar to their pre-surgery level. Players with over 7 full seasons return but with significant decreases in their overall performance levels. Less veteran players were able to return to play without any statistical decrease in performance and are likely the best candidates for repair once incurring injury.
Akermark

• First to describe tenotomy of adductor longus for chronic groin pain in athletes
• 16 patients, all competitive athletes; had to stop athletic activity; mean duration of pain 18 months
• Pain at adductor refractory to conservative therapy
• Soccer, hockey and runners
• Tenotomy one cm. from muscle origin at pubic bone
• At 35 month mean f/u all but one returned to sport within a mean of 6 weeks

Prospective, randomized trial in soccer players with chronic groin pain of more than 3 months’ duration

Players were randomized into 4 groups
 Controls with no treatment
 2 different physical therapy groups
 Surgery: inguinal floor repair, inguinal/iliohypogastric neurectomy

Only the surgically treated group showed substantial and statistically significant improvement over the 6 months of the study


The Surgical Approach to Sports Hernia: Myth or Reality
Post-Operative Rehabilitation Guidelines:
Sports Hernia Repair and Adductor Release

I. Immediate Post-Operative Phase (0-2 weeks)
II. Intermediate Post-Operative Phase (Weeks 2-4)
III. Strength Phase (Weeks 4-8)
IV. Advanced Strength/Agility (Weeks 8-10)
V. Sports Specific Training Program (Weeks 10-12)

Summary

Groin injuries are a significant problem in athletes

Multi-disciplinary team approach critical to evaluation and management (athletic trainer, orthopedist, physical therapist, general surgeon)

Surgery may be indicated for sports hernia/athletic pubalgia after failure of conservative treatment (6 weeks - 6 months)
  - Rest, NSAIDS, local injection, PT, Rehab

Rehabilitation is important to a successful outcome after surgical repair

The Surgical Approach to Sports Hernia: Myth or Reality