EXTRA-ARTICULAR CAUSES OF GROIN PAIN IN THE ATHLETE

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No Disclosures
Overview

• Introduction

• Anatomy

• Differential Diagnosis
  • Sports hernia (Core Injury)
  • Osteitis pubis
  • Adductor dysfunction
    • Pathogenesis
    • History and physical exam
    • Imaging
    • Nonoperative treatment
    • Surgical technique
    • Outcomes

Introduction

- Groin pain is common in athletes that use musculature of proximal thigh and lower abdomen.
  - Soccer
  - Ice hockey
  - Skiing
  - Running/Hurdling

- Groin injuries account for 5-8% of all injuries in soccer players and **10-43% of all injuries in elite ice hockey players**.

- Sports hernia is a common diagnosis in athletes with chronic groin pain, occurring up to 50% of the time.

- Sports hernia, osteitis pubis, and adductor dysfunction are significantly more common in male athletes, but have been reported in females.

Anatomy

Superficial inguinal ring
Conjoint tendon
Inguinal ligament
Rectus abdominis

Superficial inguinal ring
Rectus abdominis

Pubic symphysis
Adductor longus
Inguinal ligament
Pubic symphysis
Adductor longus
Pubic tubercle

Anatomy

Rectus abdominis

Pubic tubercle

Pubic symphysis

Adductor longus

# Differential Diagnosis of Groin Pain

<table>
<thead>
<tr>
<th>Childhood disorders</th>
<th>Infectious conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Congenital dysplasia</td>
<td>- Septic arthritis</td>
</tr>
<tr>
<td>- Legg-Calve-Perthes disease</td>
<td>- Osteomyelitis</td>
</tr>
<tr>
<td>- Slipped capital femoral epiphysis (SCFE)</td>
<td>- Psoas abscess</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Traumatic conditions</th>
<th>Inflammatory conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Subluxation/Dislocation</td>
<td>- Rheumatoid arthritis</td>
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<td>- Fractures of the femoral head</td>
<td>- Juvenile arthritis</td>
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<td>- Stress fractures</td>
<td>- Ankylosing spondylitis</td>
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<td>- Loose bodies</td>
<td>- Bursitis</td>
</tr>
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<td>- Acetabular labral tears</td>
<td>- Tendonitis</td>
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<td>- Contusions</td>
<td>- Pelvic inflammatory disease</td>
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<td>- Femoral or inguinal hernia</td>
<td>- Prostatitis</td>
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<td>- Athletic pubalgia</td>
<td>- Crohn’s disease</td>
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<thead>
<tr>
<th>Degenerative joint disease</th>
<th>Neurologic conditions</th>
</tr>
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<tbody>
<tr>
<td>- Osteoarthritis</td>
<td>- Radiculopathy</td>
</tr>
<tr>
<td>- Osteolysis</td>
<td>- Local nerve entrapment (ilioinguinal, genitofemoral, or lateral femoral cutaneous)</td>
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<tr>
<th>Vascular conditions</th>
<th>Metabolic conditions</th>
</tr>
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<tbody>
<tr>
<td>- Osteonecrosis/avascular necrosis</td>
<td>- Gout</td>
</tr>
<tr>
<td></td>
<td>- Metabolic bone disease</td>
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</tbody>
</table>

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<tr>
<th>Neoplasms</th>
<th>Other causes</th>
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<tbody>
<tr>
<td></td>
<td>- Referred pain</td>
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<tr>
<td></td>
<td>- Corticosteroid use</td>
</tr>
<tr>
<td></td>
<td>- Alcoholism</td>
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<tr>
<td></td>
<td>- Psychosocial</td>
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<td>- Gynecologic</td>
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Musculoskeletal causes of groin pain

• EXTRA-ARTICULAR
  • Sports hernia
  • Adductor tendinopathy
  • Osteitis Pubis
  • Rectus abdominus injuries

• JUXTA-ARTICULAR
  • Psoas tendinopathy
  • Rectus fem. injury

• INTRA-ARTICULAR
  • Labral tears
  • Loose bodies
  • Femoroacetabular impingement
  • Instability/capsular laxity
  • Ligamentum teres tears
  • Chondral damage
  • Osteoarthritis

Extraarticular causes of chronic groin pain
Sports hernia

• Terms in the literature:
  • Sports hernia
  • Sportsman’s hernia
  • Athletic pubalgia
  • Gilmore’s groin
  • Groin disruption
  • Groin pain syndrome
  • Hockey groin syndrome
  • Hockey player’s syndrome
  • Slap-shot gut
  • Incipient hernia
  • Athletic hernia
  • **Core Injury**

Sports hernia: pathogenesis

- Imbalance between strong adductor muscles of the thigh and relatively weak lower abdominal musculature

Zoga. Radiol Clin N Am. 2010
Sports hernia: pathogenesis

- Trunk hyperextension and thigh abduction lead to shear forces across pubic symphysis
Sports hernia: pathogenesis

• Shear forces on inguinal wall musculature leads to attenuation of local soft tissues:
  • Tearing of transversalis fascia or conjoined tendon
  • Abnormalities at insertion of rectus abdominis
  • Avulsion of internal oblique muscle fibers at pubic tubercle
  • Intrasubstance tear of internal oblique muscle
  • Attenuation of external oblique muscle and aponeurosis
Sports hernia: history

- Insidious onset/Occasional identifiable ‘event’
- Asymptomatic with rest, painful with activity
- Pain may radiate to adductor region, perineum, rectus muscles, inguinal ligament, and testicular area
  - Ilioinguinal nerve
  - Genitofemoral nerve
  - Obturator nerve
- Aggravated by sudden movements, coughing, sneezing, sit-ups, sprinting, and kicking
Sports hernia: physical examination

• No detectable inguinal hernia

• Four elements consistently found:
  1. Inguinal canal tenderness
  2. Dilated superficial inguinal ring
  3. Pubic tubercle tenderness
  4. Hip adductor origin tenderness

• *Location, Location, Location*

Sports hernia: physical examination

- Pain provocation tests
  1. Patient squeezes knees together while supine with 45deg hip flexion and 90deg knee flexion
  2. Patient squeezes feet together while supine with 30deg hip flexion and slight abduction-internal rotation
  3. Hip flexion-abduction-external rotation (FABER) or Quadrant tests
  4. Resisted SLR (Stinchfield)
  5. Resisted crunch or sit-up

Sports hernia: imaging

- Plain radiographs of hip, pelvis, and lumbar spine should be included in evaluation of athletes with groin pain, but are usually unremarkable in patients with sports hernia.

- MRI is nonspecific, useful to rule out other causes of groin pain.
  - Increased signal in pubic bone
  - Increased signal in one or more groin muscles
  - Attenuation or bulging of musculofascial layers of abdominal wall
  - **Lifting of the aponeurotic plate**

Albers. Skeletal Radiol. 2001
Sports hernia: imaging – aponeurotic plate
Sports hernia: nonoperative treatment

- 6 weeks
  - NSAIDs
  - Heat or ice
  - Massage
  - Modalities

- Progressive resistance hip adductor strengthening and stretching exercises

- Sports-specific functional tasks

- Gradual return to full activities when pain free

- *Success at long term pain relief* < 20%

Sports hernia: surgical technique

- Modified Bassini repair
  - Transversalis fascia is approximated to the iliopubic tract
- Floor of inguinal canal may be reinforced with mesh

Sports hernia: surgical technique

- Modified Shouldice repair
  - Transversalis fascia is plicated
  - Internal oblique and transversus abdominis muscles approximated to the iliopubic tract

Sports hernia: surgical technique

Rectus abdominis

Spermatic cord

Disruption in transversalis fascia

Repair augmented with mesh

Sports hernia: surgical technique

- Pathogenesis of sports hernia involves imbalance between strong adductor muscles of the thigh and relatively weak lower abdominal musculature

- Contracted or overdeveloped adductors should be addressed at time of sports hernia repair, with tenotomy of adductor longus

Zoga. Radiol Clin N Am. 2010 
Sports hernia: outcomes

• Meyers et al reported results on 157 athletes with chronic groin pain

  • Surgery consisted of broad surgical reattachment of inferolateral edge of rectus abdominis with fascial investment to pubis

  • 36 (23%) patients underwent concurrent adductor release

  • 152 patients (97%) returned to their preinjury activity levels

Sports hernia: outcomes

• Van Der Donckt et al prospectively reviewed 41 male athletes with chronic groin pain
  • Surgery consisted open Bassini hernia repair and percutaneous adductor longus tenotomy in all patients
  • All patients resumed sporting activity, at an average of 6.9 months
  • 37 patients (90%) reported to perform at same or improved levels, 4 patients (10%) reported to perform at lower levels
  • Recommended hernia repair and concomitant adductor longus tenotomy when conservative treatment unsuccessful

Van Der Donckt. Acta Orthop Belg. 2003
Sports hernia: outcomes

- Ingoldby retrospectively reviewed 30 hernia repairs in 28 patients
  - 14 patients (14 hernias) were repaired open and 14 patients (16 hernias) were repaired laproscopically
  - All patients returned to preinjury activity levels
  - Return to sporting activity <4 weeks occurred in 9/14 patients in open group and 13/14 in laproscopic group (p < 0.05)

Sports hernia: outcomes

- Jakoi et al reviewed 43 National Hockey League players who underwent sports hernia repair from 2001-2008

  - Compared statistics in 2 seasons prior to surgery with 2 seasons after recovery
    - 40 players (93%) were able to resume NHL career
    - Younger players had no difference in number of goals, assists, or time on ice.
    - Older players had a decrease in goals, assists, and games played

Sports hernia: outcomes

• Caudill et al. performed a metanalysis of 104 studies on sports hernia
  • Success rate of laproscopic (96%) repair was no different than open repair (93%)
  • Laproscopic repair offers advantage of faster rehabilitation and earlier return to unrestricted activity
  • Recurrence rate with laproscopic approach may be higher, since unable to visualize entire lesion during surgery
  • Surgical release of hip adductors may help restore balance between abdominal and hip adductor muscle forces at pubic bone

Sports hernia: Postoperative Rehabilitation

**Phase I-V (6 week)**
- I: walking, light stretching, wound care
- II: AROM hip, Backwards walking, bike, abdominal contraction
- III: Scar mob/ART, skating/stick handling
- IV: Advanced strengthening, core
- V: Weight room, conditioning, full practice

**Accelerated (3 week)**
- Week 1: Walk 1 mile/day
- Day 7-10: pool, gentle stretching, jogging, easy skate
- Day 11-21: Resistive exercises, sprinting, adv strengthening, skating++
- Day 18+: Full team participation as tolerated

L. Michael Brunt, MD – St. Louis Blues
Extraarticular causes of chronic groin pain
Rectus abdominus injuries

• Rectus muscle has tendinous origin on pubic symphysis and lateral pubic crest

• Primary functions are flexion of spine and compression of abdominal contents

• Dynamic motion with forced flexion against resistance can result in muscle strain or tear

Rectus abdominus injuries

• Most reliable sign on exam is reproduction of symptoms with flexion of rectus muscle (Carnette’s sign)
  • From supine position, have patient lift head and shoulders
  • Symptoms are increased with palpation
• Treatment involves rest, NSAIDs, and stretching
• Return to play averages 3-8 weeks

Extraarticular causes of chronic groin pain
Osteitis pubis

- Pubic symphysis is nonsynovial amphiarthroidal joint
- Acts as a compression strut, linking femur to posterior pelvic structures with centers of rotation being near the pubic symphysis
- Predominant motions are superior/inferior glide and separation/compression

Osteitis pubis

- Stress injury of the pubic symphysis and parasympyseal bone
- Common in soccer, ice hockey, rugby, football, and distance running
  - Incidence ranges from 0.5 to 7.0%
- History: gradually increasing pain in pubic area, groin, and lower rectus abdominis muscle
- Exam: tenderness at pubic symphysis and adjacent pubic bodies, pain with adductor stretch, pain with single leg hop

Osteitis pubis: imaging

- X-Rays
  - Bony sclerosis of symphysis
  - Erosions or widening of joint
  - Used to rule out other pathologies (FAI, DDH, AVN)

Osteitis pubis: imaging

- Flamingo view: AP pelvis with patient standing on one leg
  - Pubic symphysis instability:
    - > 2mm superior/inferior shift
    - > 7mm symphyseal widening

Osteitis pubis: imaging

• MRI

  • Articular surface irregularity
  • Marrow edema on each side of the symphysis
  • Subchondral cysts
  • Increased fluid intensity within the joint
  • Edema throughout the periarticular soft tissues.

Osteitis pubis: nonoperative treatment

- Rest, protected weight bearing
- NSAIDs
- Heat, ultrasound, electrical stimulation

- Progressive rehab focusing on hip ROM and core strengthening
- Considered self-limiting, but recovery can be lengthy
  - Usually 3-12 months
  - Average 9.6 months for men
  - Average 7 months for women

Osteitis pubis: nonoperative treatment

- Corticosteroid injections
  - Holt et al reviewed symphyseal injections in 8 college athletes:
    - 3/8 returned to play after one injection within 3 weeks
    - 4/8 required second injection
    - 1/8 unable to return to play

Osteitis pubis: surgical technique

• Many operative techniques described with limited published outcomes
  • Open curetage of symphysis
  • Arthroscopically assisted curetage of symphysis
  • Wedge resection
  • Placement of extraperitoneal retropubic mesh
  • Arthrodesis

Extraarticular causes of chronic groin pain
Adductor dysfunction

- Adductor group contains 6 muscles
  - Adductor longus
  - Adductor brevis
  - Adductor magnus
  - Gracilis
  - Pectineus
  - Obturator externus

- Adductor longus has least mechanical advantage on adduction of hip

Delee and Drez. Orthopaedic Sports Medicine Principles and Practice. 2010
Adductor dysfunction

- Injury mechanism includes quick acceleration and deceleration, changes of direction, and kicking
- Most frequent in soccer, skiing, hurdling, hockey, and rugby
- Ranges from enthesopathy at adductor longus insertion to avulsion of tendon origin

Adductor dysfunction: history and physical exam

- History:
  - Groin pain worse with activity, may be acute or chronic
  - Occasional acute “pop”

- Exam:
  - Tenderness at adductor longus insertion
  - Pain on passive stretching
  - Pain with resisted adduction

Adductor dysfunction: imaging

- X-Rays
  - Enthesophyte formation in chronic tendinopathy
  - Bony avulsion in acute injury
  - Assess concomitant pathology in groin and hip

Adductor dysfunction: imaging

• MRI
  • Increased signal in adductor longus enthesis
  • Complete tear of tendinous insertion

Adductor enthesopathy: nonoperative treatment

- Rest, WBAT
  - Ice
  - NSAIDS

- Progressive rehab consisting of adductor stretching, adductor strengthening, and sports-specific exercises

- Enthesal cleft injections
  - Schilders et al reviewed corticosteroid injections to adductor longus insertion in 28 recreational athletes and 24 competitive athletes
    - 21/28 recreational athletes had pain relief at one year after 1-2 injections
    - 24/24 competitive athletes had short term pain relief, with pain recurring only in those with MRI findings of enthesopathy

- PRP???
Adductor enthesopathy: nonoperative treatment-PRP

- PRP
  - Case Reports/No high level data
  - ??Shorten injury time
  - ??Quicker return to play
Rectus fem tear: nonoperative treatment-PRP
Rectus fem tear: nonoperative treatment-PRP
Adductor enthesopathy: surgical technique

• Maffulli et al reviewed adductor tenotomy for chronic adductor longus tendinopathy in 29 athletes

• Technique:
  • Patient supine with hip flexed and maximally abducted
  • 2cm transverse incision 1cm distal to adductor longus origin
  • Complete tenotomy of adductor longus

Adductor enthesopathy: outcomes

- Maffulli et al reviewed adductor tenotomy for chronic adductor longus tendinopathy in 29 athletes

  - Outcomes:
    - 22/29 patients returned to preinjury or higher level of sport
    - Average time to return to sports was 18 weeks
    - 3/29 superficial infections managed with oral antibiotics
    - 2/29 developed adductor weakness that improved with continued therapy

Adductor enthesopathy: outcomes

- Akermark et al reviewed 18 adductor tenotomies in 16 patients for chronic adductor longus tendinopathy
  - All 16 patients symptom free at average 36 month follow-up
  - 15/16 returned to sports at average 14 weeks
  - 10/16 reported ability to return to full athletic activity, 5/16 with performed at reduced level
  - Decrease in adductor strength in operative v. nonoperative adductors observed at final follow-up

Adductor tendon ruptures
Adductor rupture: imaging

Adductor tendon ruptures: nonoperative treatment

- Schlegel et al reviewed 19 National Football League players with adductor longus tendon ruptures
  - 14/19 players were managed nonoperatively
  - All 14 players returned to the NFL at an average of 6.1 weeks post-injury

- Treatment program:
  - Week 1: NSAIDs, heat, ice, electrical stimulation
  - Week 2: Nonresistance exercise bicycle, pool walking, light stretching
  - Weeks 3-4: Core strengthening, light plyometrics, light treadmill running
  - Weeks 5-6: heavier running, light strengthening, gradual participation in practice drills, and return to sports

Adductor tendon ruptures: surgical technique

• Less than 10 cases have been reported in the literature

• Technique
  • 5cm bikini incision
  • Torn tendon identified and debrided to healthy tissue
  • Insertion site on symphysis is burred until bleeding surface
  • Two 3.5 bioabsorbable suture anchors placed into pubis
  • Sutures passed through tendon edge and secured

Combined injuries

• Larson et al reviewed 37 patients diagnosed with both sports hernia and intra-articular hip joint pathology
  
  • 16 patients had sports hernia surgery as index procedure
    • 4/16 returned to sports without limitation
    • 11/16 required hip arthroscopy

  • 8 patients had hip arthroscopy as index procedure
    • 4/8 returned to sports without limitation
    • 3/8 required sports hernia surgery

• Outcomes suboptimal when surgery only addressed one component of combined injury

Conclusion

• Understanding groin anatomy is key to making the correct diagnosis and instituting the appropriate treatment plan