Imaging Groin Pain in Athletes
What the Team Physician Needs to Know

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No conflicts of interest relevant to this topic
Imaging athletic groin pain

Background

- A very complex anatomic region
- Clinical and imaging findings often not able to diagnose a discrete entity
- Multiple groin pathologic conditions may coexist
- Variable nerve supply of the groin
- Referred pain with involvement of a nerve close to the pathologic area
Clinical entities defined for groin pain

Background

- Heterogeneous nomenclature for groin injuries in athletes
- Confusion (even the same term might have multiple interpretations)
- Consensus meeting in November 2014 (24 experts, 1 radiologist)
Clinical entities defined for groin pain
Doha Consensus

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• Heterogeneous nomenclature for groin injuries in athletes
• Confusion (even the same term might have multiple interpretations)
• Consensus meeting in November 2014 (24 experts, 1 radiologist)
• Preferred term: groin pain in athletes
• Outdated terms: osteitis pubis, sports groin, sports hernia, sportsman’s hernia, adductor and iliopsoas tendinitis/tendinopathy, athletic groin pain, athletic pubalgia, biomechanical groin overload, Gilmore’s groin, groin disruption, hockey-goalie syndrome, hockey groin
Clinical entities defined for groin pain
New classification

- Adductor-related groin pain
- Pubic-related groin pain
- Inguinal-related groin pain
- Iliopsoas-related groin pain

Based on history and clinical examination — NOT imaging findings

Weir A et al.  
Clinical entities defined for groin pain
New classification

- Adductor-related groin pain
- Pubic-related groin pain
- Inguinal-related groin pain
- Iliopsoas-related groin pain
- Hip-related groin pain
- Other causes of groin pain

Weir A et al.  
Br J Sports Med 2015
Imaging modalities for groin pain
Principal and adjunct

- Magnetic resonance (MR) imaging
- Plain radiographs
- Ultrasonography
Rectus abdominis-adductor aponeurosis

MR imaging

Robinson P et al.  
*Am J Roentgenol*  
2007
Muscles acting upon pubic symphysis

Chopra A and Robinson P.
Radiol Clin N Am
2016
Muscles acting upon pubic symphysis

Adductor-related groin pain

Key features

• In any sports that requires fast changes in direction and rapid leg movements against resistance
• Adductor longus is chiefly implicated
• Typically medial thigh pain
• Tenderness at the adductor enthesis
• Reproducible pain on passive adductor stretching and resisted adduction of the thigh
Adductor-related groin pain
MR imaging findings

• Diffuse high signal intensity at the adductor enthesis
• More focal fluid signal areas representing tears
• Contrast enhancement of the enthesis and anterior pubic region
• Secondary cleft sign
• Pubic bone marrow edema
• Degenerative changes of the pubic symphysis
Adductor-related groin pain

Imaging findings | Central cleft and secondary cleft

The articular disc often develops a central nonsynovialized ‘primary cleft’ by late teens reflecting increasing functional demands across the symphysis with increasing loads and greater transitional motion.

A tenoperiosteal avulsion that occurs at the tendon attachment to the inferior border of the symphyseal fibrocartilage that extends to involve the enthesis.
Adductor-related groin pain

25 yo M, basketball player
Adductor-related groin pain
25 yo M, basketball player
Adductor-related groin pain
25 yo M, basketball player

Adductor longus
Adductor-related groin pain

25 yo M, basketball player

Rectus abdominis
Adductor-related groin pain

35 yo M, football player

Right groin injury 5 months earlier; felt pain during game 2 days ago
Adductor-related groin pain
35 yo M, football player

Right groin injury 5 months earlier; felt pain during game 2 days ago
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Adductor-related groin pain
24 yo M, football player

Case courtesy of Zeynep Maraş Özdemir, MD
Malatya, Turkey
Adductor-related groin pain
24 yo M, football player

Case courtesy of Zeynep Maraş Özdemir, MD
Malatya, Turkey
Pubic-related groin pain

Key features

• In athletes where the pubic symphysis is repetitively subjected to high torsional and shear loads (soccer players)

• Local tenderness of the pubic symphysis and the immediately adjacent bone

• Previously called “osteitis pubis”
Pubic-related groin pain
MR imaging findings

• Pubic bone edema, more extensive in symptomatic athletes
• Degree of edema increased in more symptomatic athletes
• If the history of pain <6 months: >6 months:
  Subchondral pubic marrow edema Subchondral sclerosis
  Fluid within the pubic symphysis Subchondral resorption
  Periarticular edema Public osteophytes
Pubic-related groin pain
19 yo M, professional football player
Osteitis pubis during MR arthrography of the hip
19 yo M
Osteitis pubis during MR arthrography of the hip

19 yo M
Osteitis pubis with active sacroiliitis

33 yo M
Osteitis pubis with active sacroiliitis

33 yo M
Parasympyseal osteochondroma

19 yo M
Parasympphyseal osteochondroma
19 yo M
Parasympyseal osteochondroma
19 yo M
Parasympyseal osteochondroma
19 yo M
Inguinal-related groin pain

Key features

• Groin pain and tenderness in the inguinal canal region in the absence of a palpable hernia

• More likely if the pain is aggravated with resistance testing of the abdominal muscles or on Valsalva/cough/sneeze

• Patients do not have a true inguinal hernia, but instead an acquired inguinal wall deficiency/dysfunction through overuse
Inguinal-related groin pain

Imaging

• Ultrasonography
• Magnetic resonance (MR) imaging
Inguinal-related groin pain

Imaging

- Best assessed initially with ultrasonography (US) to exclude true inguinal or femoral hernia

- US allows dynamic assessment of the posterior inguinal wall for incompetence and disruption
Inguinal-related groin pain

Ultrasonography


* pre-peritoneal fat
► margins of the inguinal canal
→ peritoneum

Valsalva
Inguinal-related groin pain

Imaging

• Best assessed initially with ultrasonography (US) to exclude true inguinal or femoral hernia

• US allows dynamic assessment of the posterior inguinal wall for incompetence and disruption

• Main role of MR imaging in this group is to exclude an alternative diagnosis such as inguinal canal masses

• MR imaging can also show occasional injury to the aponeurotic structures
Iliopsoas-related groin pain

Key features

- Acute injuries in athletes typically involve an eccentric contraction or direct trauma
- Overuse injuries occur in activities involving rapid hip flexion or external rotation of the thigh (running, soccer, and gymnastics)
- More likely if there is pain on resisted hip flexion and/or pain on stretching of the hip flexors
**Iliopsoas-related groin pain**

**Imaging findings**

- Iliopsoas bursitis, caused by overuse and friction as the iliopsoas tendon rides over the iliopectineal eminence of the pubis, is best assessed with MR imaging.

- MR imaging also shows iliopsoas tears and iliopsoas impingement.
Iliopsoas-related groin pain
47 yo M
Iliopsoas bursitis
Iliopsoas-related groin pain
11 yo F
Iliopsoas-related groin pain

Imaging findings

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• Ultrasonography can be used to assess snapping iliopsoas tendon syndrome
Iliopsoas-related groin pain
Iliopsoas impingement

• First described in 2007

• In patients with close proximity of the iliopsoas tendon to the acetabular labrum

• Isolated anterior tear (at 9 o’clock)

Labral tear/injury does not characteristically extend to an anterosuperior location (which is usually the site of injury with femoroacetabular impingement)

Heyworth BE et al. Arthroscopy 2007
Iliopsoas impingement

15 yo M, football player
Iliopsoas impingement

15 yo M, football player
Iliopsoas impingement
29 yo M
Iliopsoas impingement

29 yo M
Iliopsoas impingement

29 yo M
Iliopsoas impingement background

17 yo M, kickboxer
Iliopsoas impingement background

17 yo M, kickboxer

[Image showing medical scans with 42° annotation]
Imaging groin pain in athletes

Conclusion

• MR imaging is the principal imaging modality

• Plain films and ultrasonography can be useful adjuncts in specific circumstances (especially if an alternative pathological condition needs to be excluded)
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International Olympic Committee
Advanced Team Physician Course
Antalya, Turkey • 29 November 2017