Sports Pubalgia
Pelvic Tendons

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Disclosures

- IICME Speaker
- Lippincott
Objectives

- Review normal anatomy of rectus abdominis/adductor aponeurosis and pelvic tendons
- Review common causes for sports pubalgia
- Review sports-related pelvic tendon pathologies
  - Tendinopathy and tendon tears
  - Avulsive injuries at tendinous attachments
  - Snapping hip syndrome
Athletic Pubalgia

- Clinical syndrome
  - Groin pain that *cannot* be attributed to intrinsic hip lesion
  - During or after specific activities or ranges of motion
  - Can occur at any age
    - 2nd – 4th decades
    - M > F
Athletic Pubalgia

- High-level competitors and recreational athletes
- Pain localized to pubic symphysis
- As distant as anterior superior iliac spine and adductor compartment
- Soft tissue, bones or both
- Often difficult to localize lesions and differentiate from hip labral tears or cartilage injuries

Athletic Pubalgia

- Activities that involve twisting at the waist while running, sudden and acute directional change, and sideways movement
  - American and Australian rules football
  - Soccer
  - Baseball
  - Ice hockey
  - Lacrosse
  - Long distance runners
## MRI Sports Pubalgia Protocol

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Normal Anatomy

- **Pubic symphysis**
  - Midline amphiarthrodial joint with articular disk
  - Medial pubic body is ovoid and covered by a hyaline cartilage
  - Transversely oriented subchondral ridges and grooves
  - Disc protects joint - dissipates shear forces between innominate bones
Normal Anatomy

- **Pubic Tubercle**
  - Osseous excrescence – attachment site for inguinal ligament and inferior aspect of rectus abdominis
Normal Anatomy

- Pubic Tubercle
  - Osseous excrescence – attachment site for inguinal ligament and inferior aspect of rectus abdominis

Pubic Symphysis

- 4 ligaments, articular disk, and tendinous attachments contribute to supporting bony symphysis
- **Rectus abdominis/adductor aponeurosis**
  - Distal rectus abdominis and proximal adductor longus blend - elongated osseous attachment
  - Spans pubic tubercle and anteroinferior pubic body
  - Thick and rigid
Rectus Abdominis/Adductor Aponeurosis

- Rectus abdominis
- Adductor longus
- Pectineus
- Arcuate ligament
- Pubic periosteum
Rectus Abdominis

- **Distal attachment** –
  - Anterior/anteroinferior pubic symphysis near joint capsule
  - Near pectineus, adductor longus and brevis origins – blend with distal rectus abdominis attachment

- **Lateral attachment** –
  - Close to external inguinal ring - association with inguinal hernia symptoms
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Adductor Aponeurosis

- **Lateral edge** - just deep to posteromedial wall of superficial inguinal ring - adds to integrity
- **Medially** - anatomic variability
  - Distinct left and right rectus abdominis/adductor aponeuroses with midline cleft
  - Left and right aponeuroses merge
  - Thick, platelike structure superficial to pubic symphysis

Rectus Abdominis/Adductor Aponeurosis

- Large midline aponeurotic plate
  - Rectus abdominis
  - Adductor fibers
  - Pubic symphysis capsule
  - Arcuate ligament
  - Anterior pubic periosteum

MRI - Athletic Pubalgia

- Sensitive
- Concomitant and bilateral lesions - frequently encountered
- Osseous and osteochondral structures at pubic symphysis should be assessed as a joint
- Secondary signs – identify any tendinous attachment pathology around symphysis at pubic tubercles
MRI - Athletic Pubalgia

- Evaluate inguinal canal for hernia, varicocele, and symmetry
- Large field of view sequences
  - More-remote myotendinous hip flexor or adductor compartment injuries, apophysites, soft tissue masses, sacroiliac pathology and internal derangements of hips
Pubic Symphyseal Clefts

- **Primary cleft**
  - Developmental
  - 10% of adults
  - Posterosuperior central portion of disc
  - T2 hyperintense vertical signal

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Pubic Symphyseal Clefts

- **Secondary cleft**
  - Fluoroscopy-guided pubic symphysis arthrography
  - Injected contrast injected into primary cleft extends unilaterally inferolateral to pubic symphysis
  - MRI - T2 hyperintense signal extends inferolateral from symphysis

Secondary Cleft

- **Ipsilateral** rectus abdominis/adductor detachment
- **Bilateral** secondary clefts - midline rectus abdominis/adductor aponeurotic plate disruption
Secondary Cleft

- Patients with athletic pubalgia
  - Arthrographic or MR secondary cleft correlates strongly with site of pain
  - Sometimes secondary cleft extends between rectus abdominis or adductor tendon attachments and bone
  - Sometimes has subchondral or subapophyseal element
  - Not diagnostic of any single injury, indicates regional injury
Secondary Cleft

Patients with athletic pubalgia

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Avulsion Adductors - Pubalgia
Avulsion Adductors - Pubalgia
Athletic Pubalgia - MRI

- **Most frequent patterns**
  - Injury of rectus abdominis + adductor longus origin + pubic tubercle periosteum or pubic symphysis capsule
  - Confluent interstitial tearing/detachment of 1 or both rectus abdominis muscles at level of symphysis and adductor longus tendons
Rectus Abdominis/Adductor Aponeurosis Injury

- Chronic source of debilitating groin pain
- Acute and often extreme trauma
  - Breech between 2 structures
  - Detachment and subsequent retraction of 1 or both
- Centered at the level of the pubic tubercle
Rectus Abdominis/Adductor Aponeurosis Injury

- MRI - subenthesial or periosteal bone marrow edema at rectus abdominis attachment onto pubic tubercle
- Enlargement or interstitial tearing of adductor longus origin
- Unilateral secondary cleft and offset-midline injury can be unilateral or bilateral, with or without osteitis pubis
- Treated surgically
Rectus Abdominis/Adductor Aponeurosis Injury

- **Midline Lesions** = Rectus abdominis/adductor aponeurotic plate disruption
  - Rectus abdominis/adductor aponeurosis injuries appear are centered at pubic symphysis, extending into the medial edge of bilateral aponeuroses
  - Rarely - distraction between rectus abdominis and adductor tendons
  - Lifting or delamination of entire apparatus from the pubic symphysis region
  - Osteitis pubis - common with these lesions

Midline Lesions = Rectus abdominis/adductor aponeurotic plate disruption

- MRI - Adductor tendinopathy is often asymmetric
- Rectus abdominis injury - symmetric or asymmetric, may or may not extend to the lateral edges of the aponeuroses
- Detachment spanning the midline pubic symphysis
- Athletes rarely return to preinjury level without surgical repair

Osteitis Pubis

- Pubic symphysis
  - Painful inflammatory osteochondral changes
  - Microinstability
  - Central disc can degenerate and articular surfaces are subject to trauma
Osteitis Pubis

- Altered biomechanics related to instability of joint or gait aberrancy
- Can destabilize anterior pelvis
  - Lead to lesions observed in athletic pubalgia
  - Initial tear at one of tendinous attachments can lead to abnormal biomechanics that subsequently damage symphysis
Osteitis Pubis

- Bony injury at symphysis
- Subchondral bone marrow edema (~OA)
  - Bilateral
  - Often asymmetric to side of pain
  - Should span subchondral region of symphysis from anterior to posterior
Osteitis Pubis

- Bony injury at symphysis
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Osteitis Pubis

- Chronic osteitis pubis - productive changes of osteoarthritis
  - Hyperintense subchondral cysts
  - Hypointense sclerosis
  - Subchondral bony resorption
Osteitis Pubis

- Pelvic fractures or shear-force trauma across symphysis
  - Primary stabilizers can be injured
  - Destabilization and osteitis pubis
- Skeletally immature patient
  - Unfused apophyses at pubic symphysis can be injured
  - Lead to developmental osteitis pubis

Adductor Syndromes

- Adductor origin lesions - common source of debilitating groin pain in athletes
- Acute or chronic
- Avulsions or degenerative distal myotendinous junction strains
Adductor Longus

Origin – anterior pubis

Attach – linear aspera
Adductor Brevis

Origin – inferior pubic ramus

Attach – linear aspera
Adductor Brevis
Adductor Magnus

Origin – ischial tuberosity/ramus, pubis

Attach – linear aspera, supracondylar femur, adductor tubercle
Adductor Magnus
Adductor Insertion Avulsion Syndrome

Adductor Insertion Avulsion Syndrome

Adductor Insertion Avulsion Syndrome

Inguinal Hernias

- True hernias are rare in the setting of athletic pubalgia
- Reinforcing inguinal wall with mesh
  - Transient symptom relief with an aponeurosis injury,
  - Symptoms almost inevitably return as athletic activity is resumed
- Small percentage of patients with athletic pubalgia will have a true inguinal or femoral hernia

Athletic Pubalgia in Women

- Midline rectus abdominis/adductor aponeurotic plate disruption is more common than ipsilateral lesions

Athletic Pubalgia in Women

- **Pregnancy**
  - Changes biomechanical forces
    - Vectors throughout pelvis stress pubic symphysis and SI joints
    - Leads to osteitis pubis and sacroiliitis
- **Postpartum osteitis pubis**
  - Ligamentous injuries sustained during delivery

Referred Groin Pain

- Mimic athletic pubalgia
- Need larger field of view survey
- Internal derangements of the hip
  - Synovitis, femoral acetabular impingement and labral tears
- Snapping iliopsoas tendon
- Osseous stress fracture
Iliopsoas

Iliacus origin – iliac fossa, crest, anterior SI/LS/IL ligaments

Psoas origin – transverse processes and lumbar vertebrae
**Iliopsoas**

- **Iliacus origin** – iliac fossa, crest, anterior SI/LS/IL ligaments

- **Psoas origin** – transverse processes and lumbar vertebrae
Snapping hip

- Sudden, painful, audible snap
- Young, athletic (ballet dancers)

Causes

- **External** – most common
  - iliobial band catching on greater trochanter

- **Internal** –
  - * iliopsoas tendon* - catching on iliopectineal eminence, paralabral cyst, muscle trapped beneath tendon, bifid tendon
  - iliofemoral ligaments

- **Intraarticular** – labral tear, loose body, cartilage flap
Snapping hip - Historically

- Iliopsoas tendon snapping against iliopsectineal eminence or lesser trochanter
Snapping Iliopsoas Tendon

- Iliopectineal prominence
- Lesser trochanter

45°

SNAP!
Snapping Iliopsoas Tendon


- Transverse oblique plane
- Above hip joint
- Parallel pubis
- Frog leg to Neutral

Resting
Snapping Iliopsoas Tendon

- Transverse oblique plane
- Above hip joint
- Parallel pubis
- Frog leg to Neutral

Resting
Snapping Iliopsoas Tendon

- Resting
- Brought to neutral – part of muscle is trapped b/w tendon and superior pubic ramus
Snapping Iliopsoas Tendon

Brought to neutral – part of muscle is trapped b/w tendon and superior pubic ramus
Snapping Iliopsoas Tendon

Muscle is suddenly released – audible snap
Iliopsoas Bursa Injection

Iliopsoas Bursa Injection
Paralabral Cyst

Paralabral Cyst
Paralabral Cyst
Muscle Strains

- Some distance from pubic symphysis
- Common sources of groin pain
- Easily identified on fluid sensitive sequences
- Concomitant pubic symphysis lesion can also be present
Iliopsoas Muscle Strain
Adductor Strain
Pectineus Strain

Axial FSE T2 FS

Coronal FSE T2 FS
Pectineus Strain

Axial FSE T2 FS

Coronal FSE T2 FS
Apophysitis

- Skeletally immature
  - Anterior inferior iliac spine
  - Anterior superior iliac spine
  - Ischial tuberosities
- T1- apophyseal fragmentation
- T2 - osseous, chondral and tendinous hyperintensities
Sartorius

Origin - ASIS

Attachment - proximal medial tibia
Sartorius Avulsion at ASIS

- Extended hip, flexed knee
- Sprinters, hurdlers, running
Ischial Apophysitis
Ischial Apophysitis
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Ischial Apophysitis
Ischial Apophysitis
Partial Rupture Hamstring Origin
Ischial Avulsion Fracture
Ischial Avulsion Fracture
Apophysitis

- Anterior inferior iliac spine (AIIS) apophysitis
  - Rectus femoris origin
  - Common cause of groin pain in dominant extremity of young kicking athlete
Apophysitis

- Anterior inferior iliac spine (AIIS) apophysitis
  - Rectus femoris origin
  - Common cause of groin pain in dominant extremity of young kicking athlete
AIIS Apophysitis

- Hyperextended hip and flexed knee
- Sprinting, soccer, football
AIIS Apophysitis

AIIS Apophysitis

Axial FSE T2 FS
Sagittal FSE T2 FS

AIIS Apophysitis

AIIS Apophysitis

Visceral Pathology

- Ovarian cysts or follicles
- Endometriosis
- Adenomyosis
- Uterine fibroids
- Nerve entrapment syndromes
- Soft tissue tumors
- Lumbar spine and sacroiliac joints
Conclusion

- MRI is an essential diagnostic tool in the workup and treatment planning of patients with athletic pubalgia

- Osteitis pubis can reflect joint instability, and ligamentous and tendinous attachment pathology about the pubic symphysis should be evaluated
Conclusion

- Osteitis pubis reflects joint instability and should prompt assessment of ligamentous and tendinous attachments about the pubic symphysis.

- Rectus abdominis/adductor aponeurosis injuries should be identified and characterized as either ipsilateral or midline plate lesions.
Conclusion

- Imaging can detect the presence and extent of tendinopathy, partial and full-thickness tendon tears, avulsive injuries at tendinous attachments, and snapping hip syndrome.

- When no lesion is found in the pubic symphysis region, attention should be turned to the regional muscles, tendons, bursae, the visceral pelvis, and, ultimately, the hips.