MR Imaging of the Hip
Soft Tissue Pathology

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Osseous Anatomy

Gluteus Minimus

Gluteus Medius
Main Tendon

Gluteus Medius
Lateral Component

Rotator Cuff Tear of the Hip

- First reported in the orthopaedic literature
- Initially felt to be asymptomatic lesions
- Involves gluteus medius or gluteus minimus tendons avulsion at insertion to greater trochanter
- Treatment can include reattachment of tendon

Rotator Cuff Tear of the Hip

- Atrophy of gluteus medius and minimus
- Irregularity at greater trochanter

Gluteus Minimus – Partial Tear

Gluteus Minimus - Avulsion

Gluteus Minimus - Avulsion

Gluteus Minimus Rupture with Atrophy

Rotator Cuff Tears in THR

- Soft tissue lesions important causes of hip pain s/p THR especially with transgluteal approach
- Patients present with hip pain and abductor weakness
- Of 39 symptomatic patients
  - 22 gluteus minimus defects
  - 24 gluteus medius defects
- Pathology included
  - Tears
  - Diameter change in tendons
  - Atrophy in muscles

Pfirrmann, et al., Radiology 2005 235: 969-976
Normal Appearance of Gluteal Attachment after THR

Gluteus Medius and Minimus Pathology in Total Hip Replacement
- Cause for “clinical” failure of THR

Rotator Cuff Tears of the Hip in Renal Transplant Patients
- Hip pain in renal transplant patients
- 24 renal transplant patients undergoing MR for hip pain
  - 13 with gluteal tendon abnormalities
  - 8 with AVN
  - 3 patients with both gluteal abnormality and AVN

Demant, et al., AJR 2007 188(2): 515-519

Joint Capsule

Iliopsoas Bursa
**Pseudo-IAB**

**Obturator Bursa**

**Inferior Retinaculum**

**Joint Capsule**
- Fibrous capsule invests synovial
- Areas of decompression
  - Iliopsoas bursa
  - Obturator externus

**Extrinsic Ligaments**
- Capsular thickenings which reinforce the joint, longitudinal orientation
  - Pubofemoral
  - Iliofemoral
  - Ischiofemoral
- Zona orbicularis
  - Deep layer of circularly oriented fibers encircling base of femoral neck

*Petersilge, Radiographics 20: S43-S51, 2000*
Iliofemoral Ligament

- Medial band

Iliofemoral Ligament

- Lateral band

Ischiofemoral Ligament

Pubofemoral Ligament

Iliofemoral Ligament Rupture in Hip

- Pathognomonic Triad:
  - Posterior Acetabular Lip Fracture
  - Hemarthrosis
  - Disruption of the iliofemoral ligament

Moorman, et al., JBJS 2003
Proximal Hamstring Attachment Complex
Facets of the Ischial Tuberosity

- Superolateral or oblique facet
- Semimembranosus
- Inferomedial or horizontal facet
- Semitendinosus
- Biceps femoris

Superolateral Facet of Ischial Tuberosity

Inferomedial Facet of Ischial Tuberosity

Adductor Magnus
Medial and Anterior to Biceps

Hamstring Avulsion

- Greater than 2 cm displacement in skeletally immature is unusual but indication for ORIF


Hamstring Avulsion

- Mechanism of injury
- Forceful flexion of hip joint with knee in full extension
- Treatment in adults
  - Surgical repair recommended with acute injury

Hamstring Injury

- Hamstring complex one of the most commonly injured muscles
- Mechanism = eccentric contraction during passive stretching
- Spectrum of injury:
  - Delayed onset muscle soreness → Strain → Avulsion
  - Strain = partial tear (treatment = conservative)
    - musculotendinous junction (MTJ)
    - microscopic tearing of myofibrils
    - increased T2 signal at MTJ
    - represents hemorrhage (<24 hrs), followed by inflammation
  - Avulsion = complete tear (treatment = surgery)
    - tendon origin (adult = complete tendon tear, children = apophyseal avulsion fx)
    - proximal >> distal
    - almost always involves conjoined tendon (complete tear)
    - most often also involves semimembranosus (partial vs complete)
  - role of MRI:
    1) confirm injury
    2) determine degree of retraction
    3) define anatomy for repair

Hamstring Pathology

- Patterns of pathology at PHAC at UCSD over past 5 years
- 82% of cases demonstrated pathology in all 3 tendon attachments
- 18% of cases with pathology in 1 or 2 of attachment sites

Hamstring Pathology

- Partial tear of the semitendinosus
  - Localized to the lateral aspect of the inferomedial facet of the ischial tuberosity

Hamstring Avulsion

- Quadratus Femoris
  - Origin: Superolateral Border of Ischial Tuberosity
  - Insertion: Linea Quadrata (Posterior Aspect of Intertrochanteric Crest)
  - Action: Laterally Rotates, Adducts Femur
  - Innervation: Nerve to Quadratus Femoris (L4-S1)

Quadratus Femoris Partial Tear

- Rare Cause of Groin or Gluteal Pain
- W>M, Young, R>L (Small Series)
- Can Be Confused with
  - Hamstring Injury
  - Obturator Externus Injury
  - Best Visualized on Sagittal Images Posterior to Lesser Trochanter (Comma Shape)
  - Difficult Assessment in Coronal Plane
  - Not always included on FOV
  - Muscle long axis parallel to Coronal Plane

Quadratus Femoris Partial Tear
55 year old woman with hip pain

Quadratus Femoris Partial Tear
84 year old man s/p fall

Quadratus Femoris Impingement
- Chronic Symptoms and Narrowing Between Ischial Tuberosity and Lesser Trochanter (<2cm)
- Cases of Edema not Centered at Musculotendinous Junction but rather in Muscle Belly, with Edema in Adjacent Fat
- Inability to Distinguish Low-Grade Muscle Strain from Impingement Induced Edema
- Need for Clinical Correlation in these Scenarios


Quadratus Femoris Impingement


Pubalgia
- Groin pain in athletes
- Broad spectrum of pathology
- Most common entity involves musculotendinous injury
  - Adductor group
  - Obturator group
- Other muscles involved
  - Rectus abdominus
  - Gracilis
  - Pectineus
  - Iliopsoas
  - Rectus femoris

Adductor Muscle Injury
Rectus Abdominus Injury


Rectus Femoris Lesion

Rectus Femoris Lesion

Rectus Femoris Lesion