The Hip Region: Normal and Abnormal Features with MRI and Ultrasound Correlation

Jon A. Jacobson, M.D.
Professor of Radiology
Director, Division of Musculoskeletal Radiology
University of Michigan

Disclosures:
• Consultant: Bioclinica
• Advisory Board: GE, Philips
• Book Royalties: Elsevier
• Not relevant to this talk

Pathology:
• Joint abnormalities
• Bursal pathology
• Muscle and tendon injury
• Snapping hip syndrome

Hip: anterior recess
• Anterior and posterior layers
  – Fibrous tissue + minute layer of synovium
  – Hyperechoic
  – Each 2 - 4 mm thick

Hip Effusion:
• Separation of anterior and posterior layers
• Capsule distention at femoral neck > 7 mm or difference of 1 mm from opposite side
• Extension & abduction improves visualization
• Do not internally rotate hip: capsule thickens

1Radiology 1999; 210:449
2Scand J Rheumatology 1989; 18:113
3Acta Radiologica 1997; 38:887
Hip Joint: septic effusion

Hip Joint: aseptic effusion

Hip Effusion: misconception
- It is incorrect to assume that joint fluid may not be seen anterior due to gravity
- Native hip: joint fluid distributes around femoral neck
- In no cases was fluid only seen posterior
- Exception: after hip surgery

Moss et al. Radiology 1998; 208:43

Hip Effusion: misconception

Hip Effusion: aseptic effusion

Hip Effusion:
- Cannot predict infection by ultrasound
- Negative power color Doppler does not exclude infection*
- Guided aspiration

Pigmented Villonodular Synovitis

* AJR 1998; 206:731
Juvenile Idiopathic Arthritis

Hip Labrum

- Normal: Hyperechoic, triangular
- Degeneration: hypoechoic
- Tear:
  - Anechoic cleft
  - Most common anterior
  - Possible paralabral cyst
  - Sensitivity 82%, specificity 60%


Labral Tear and Paralabral Cyst

Femoroacetabular Impingement:

- Pincer-type: deep acetabulum
- Cam-type
  - Broad irregular femoral neck
  - Possible cortical irregularity at US
- Associated with anterior labrum tear
- Consider dynamic evaluation

Radiology 2005; 236:588

CAM Impingement

Total Hip Arthroplasty:

- Metal components demonstrate posterior reverberation
- Artifact occurs deep to prosthesis away from fluid collection (unlike MRI, CT)
Hip Arthroplasty: infection

- Pseudocapsule > 3.2 mm: suspect infection\(^1\)
- Extra-articular fluid collection
- Not visualized with arthrography if non-communication

\(^1\)Weybright PN et al. AJR 2003; 181:215
\(^2\)AJR 1994; 163:381

Pathology:
- Joint abnormalities
- Bursal pathology
- Muscle and tendon injury
- Snapping hip syndrome

\(^1\)Kong A et al. Eur Rad 2007; 17:1772
\(^2\)Long SS et al. AJR 2013; 201:1083
\(^3\)Sylva F et al. Clin Rheumatol 2008; 14:82
\(^4\)Blankenbaker DG et al. Skeletal Radiol 2008; 37:903
Greater Trochanter

FACETS: AF = anterior; LF = lateral; SPF = superoposterior; PF = posterior
Pfirrmann et al. Radiology 2001; 221:469

Yellow arrow = gluteus medius
White arrow = gluteus minimus

Trochanteric Bursal Fluid + Glut Min Tear

Note: ITB is formed by fascia from gluteus maximus and tensor fascia latae

Trochanteric Bursitis: Septic

Note posterior location of bursa

Iliopsoas Bursa:
- Hip joint communication in 10%
  - Increased with hip joint pathology
- May extend cephalad into abdomen
- May be mistaken for abscess:
  - Look for hip joint communication

Radiology 1995; 197:853
Iliopsoas Bursal Fluid

Axial T1w post-gadolinium

Ischial or ischiogluteal Bursa
- Uncommon
- “Weaver’s Bottom”
- Between ischial tuberosity and gluteus maximus

Pathology:
- Joint abnormalities
- Bursal pathology
- Muscle and tendon injury
- Snapping hip syndrome
- Miscellaneous pathology

Gluteal Tendon Pathology:
- Tendinosis: hypoechoic, no defects
- Partial tear: anechoic clefts
- Complete tear: discontinuous tendon
- >2 mm cortical irregularity is associated with tendon tear
  - Positive predictive value = 90% (xray)*

*Steinert et al. Radiology 2010; 257:754

Gluteus Medius

Tendinosis: Gluteus Minimus

Gluteus Minimus

Short Axis

Long Axis
>2 mm cortical irregularity depth (x-ray) = 90% positive predictive value for gluteus tendon tear
Steinert et al. Radiology 2010; 257:754

Calcific Tendinosis: Gluteus Medius

Semimembranosus: tendinosis

Conjoined Tendons: tendinosis

Conjoined BF-ST Tendon: partial tear

Snapping Conjoined Long Head Biceps Femoris, Semitendinosus + Sacrotuberous Ligament

From: Bierry G et al. Radiology 2014; 271:162
**Pathology:**
- Joint abnormalities
- Bursal pathology
- Muscle and tendon injury
- Snapping hip syndrome
- Miscellaneous pathology

**Snapping Hip Syndrome**
- Painful snap with hip motion
- Intraarticular
- Extraarticular:
  - Anterior: iliopsoas tendon
  - Lateral: iliotibial tract or gluteus maximus

**Snapping Hip Syndrome: iliopsoas**
- Image long axis to inguinal ligament superior to femoral head
- Extension of flexed abducted and externally rotated hip
- Abrupt movement of iliopsoas as iliacus muscle interposed between tendon and bone moves


*From: Deslandes et al. AJR 2008; 190:576*
Snapping Hip Syndrome: iliopsoas

Snapping Hip: lateral
- Transverse over greater trochanter
- Hip external rotation / flexion
- Abrupt motion of iliotibial tract or gluteus maximus over greater trochanter

Snapping Gluteus Maximus / Iliotibial Band

Take-home points: hip
- Effusion: anterior hip
- Greater trochanteric pain syndrome:
  - Not bursitis, usually tendinosis
- Trochanter anatomy: facets
- Snapping hip syndrome
  - Iliopsoas, iliotibial band / gluteus maximus

Syllabus on line and other educational material:
www.jacobsonmsk.us
Twitter handle: @jacobsn