Ultrasound of Common Hip Pathology

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

Disclosures:

• Consultant: Bioclinica
• Book Royalties: Elsevier
• I follow Hashtag the Panda on Twitter

Note: all images from the textbook Fundamentals of Musculoskeletal Ultrasound are copyrighted by Elsevier Inc.

Outline:

• Hip joint
• Bursae
• Tendon abnormalities
• Snapping hip syndrome

Hip: anterior recess

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

Radiology 1999; 210:499

Hip: anterior recess

Anterior
Posterior

Femur

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; 38:867
Hip Joint: septic effusion

Pitfall: capsule thickening
- Internal rotation of hip:
  - Anterior hip capsule
  - Thicker, convex anterior

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

* AJR 1998; 206:731

Joint injection
- Anterior recess
- In plane
- Transducer:
  - Parallel to femoral neck
  - Consider curvilinear
- Needle: distal to proximal
- 97% accuracy1


Pitfall: synovitis
- Anterior and posterior layers of anterior capsule should not be misinterpreted as synovitis
- Transient synovitis:
  - Joint effusion
  - Synovial thickening too small to see

Radiology 1999; 210:499
Pigmented Villonodular Synovitis

Head Erosion

Hip Labrum
- Normal: hyperechoic, triangular
- Degeneration: hypoechoic
- Tear:
  - Anechoic cleft
  - Most common anterior
  - Possible paralabral cyst
  - Sensitivity 44%, specificity 75%

Femoral Head Acetab Labral Tear

Sagittal-oblique
*Acta Radiologica 2007; 9:1004

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

Courtesy of M. van Holsbeeck, Detroit, MI

Femoroacetabular Impingement

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

Hip Arthroplasty:
- Ultrasound cannot differentiate small effusion from post-op change.
- Suspect infection:
  - Pseudocapsule > 3.2 mm: suspect infection.
  - Extra-articular fluid collection.
  - Not visualized with arthrography if non-communication.

Hip Arthroplasty: infection
- Superior
- Inferior
- Sagittal

Teaching Point:
Always screen soft tissues about an arthroplasty prior to fluoroscopic joint aspiration.

Metal-on-Metal Arthroplasty: pseudotumor
- Anterior
- Lateral

Outline:
- Hip joint
- Bursae
- Tendon abnormalities
- Snapping hip syndrome
**Trochanteric Pain Syndrome:**

- Most commonly caused by gluteus minimus and medius tendon abnormalities
- Trochanteric bursitis: uncommon
  - 20% of symptomatic patients
  - Not actually inflamed
  - Not associated with pain

1Eur Rad 2007; 17:1772
2Long SS et al. AJR 2013; 201:1083
3Clin Rheumatol 2008; 14:82
4Skeletal Radiol 2008; 37:303

**Greater Trochanter**

![Axial MRI](image)

Yellow arrow = gluteus medius
White arrow = gluteus minimus

**Greater Trochanter**

![Posterior view](image)

Yellow arrow = gluteus medius
White arrow = gluteus minimus

**Gluteus Minimus and Medius: Long Axis**

![Long Axis](image)
Trochanteric Bursitis

Transverse
Coronal

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

Outline:
- Hip joint
- Bursae
- Tendon abnormalities
- Snapping hip syndrome

Acute Muscle and Tendon Injury
- Direct impact: contusion, muscle belly
- Indirect (strain):
  - Musculotendinous junction
  - Especially muscles than span 2 joints
  - Hamstrings, gastrocnemius
  - Osseous avulsion
Tendon Injury

- Tendinosis
- Hypoechoic, increased thickness
- Progression to partial and full-thickness tendon tear
  - Hypoechoic or anechoic tendon defect
  - Retraction: full-thickness tear

Tendinosis: Gluteus Minimus

Tendinosis: Gluteus Medius

Tear: Gluteus Medius

Calcific Tendinosis: Gluteus Medius

Calcific Tendinosis: rectus femoris

>2 mm cortical irregularity depth (x-ray) = 90% positive predictive value for gluteus tendon tear

Steinert et al. Radiology 2010; 257:754
Semimembranosus: tendinosis

Conjoint Tendon: tendinosis

Ischium
Conjoint Tendon

Semimembranosus

Conjoint Tendon

Long Axis

SM

Long Axis

Sports Hernia?
- A non-anatomic, non-diagnostic term attributed to many cause of groin pain
  - Tears or attenuation of inguinal structures
  - Bulge posterior wall of inguinal canal
  - Obturator nerve entrapment
  - Common aponeurosis abnormality:
    - Rectus abdominis and adductors tendons
    - Associated: pubic symphyseal instability, FAI

Notes:
- From: Radiographics 2008; 28:1415
- Garvey JF W et al. Hernia 2010; 14:17
- Hopkins JN et al. JBJS Reviews 2017; 5:1

Author: Joe Lemire, Hemisphere Magazine, Feb. 2015

Rectus Abdominis + Adductor: “Sports Hernia”

Note: common aponeurosis

From: Radiographics 2008; 28:1415
Rectus Abdominus / Adductor Tendinosis: "Sports Hernia"

Outline:
- Hip joint
- Bursae
- Tendon abnormalities
- Snapping hip syndrome

Snapping Hip Syndrome
- Painful snap with hip motion
- Intraarticular
- Extraarticular:
  - Medial: 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

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

- Transverse over greater trochanter
- Hip external rotation / flexion
- Abrupt motion of iliobial tract over greater trochanter

Snapping Hip: iliobial tract

- Transverse over greater trochanter
- Hip external rotation / flexion
- Abrupt motion of iliobial tract over greater trochanter

Snapping Hip: lateral

- Transverse over greater trochanter
- Hip external rotation / flexion
- Abrupt motion of iliobial tract or gluteus maximus over greater trochanter

Snapping Gluteus Maximus / Iliobial Band

Take-home points: hip

- Joint effusion: anterior recess
  - Pitfalls: large patients, post-arthroplasty
- Bursae and gluteal tendons:
  - Use facets of greater trochanter for orientation
- Sports hernia:
  - Common aponeurosis
- Snapping hip:
  - Dynamic evaluation

Syllabus on line and other educational material:
www.jacobsonmskus.com
Twitter handle: @jjacobsn