Hip and Thigh Ultrasound with MRI Correlation

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

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

Radiology 1999; 210:499

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 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 Joint: aseptic effusion

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

* AJR 1998; 206:731

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

External Rotation
Internal Rotation
Pigmented Villonodular Synovitis

Juvenile Idiopathic Arthritis

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

Femoral Head Acetab Labral Tear

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

Chondrocalcinosis Labral Tear and Paralabral Cyst

CAM Impingement


Radiology 2005; 236:588

Note: labral tear (yellow arrow) and osseous bump (white arrow)

Courtesy of D. Fassell, Ann Arbor, MI

Courtesy of M. van Holsbeeck, Detroit, MI
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\textsuperscript{1}
- Suspect infection:
  - Pseudocapsule $>3.2$ mm: suspect infection\textsuperscript{2}
  - Extra-articular fluid collection
  - Not visualized with arthrography if non-communication

\textsuperscript{1}Weybright PN et al. AJR 2003; 181:215
\textsuperscript{2}AJR 1994; 163:381

Hip Arthroplasty: infection

Sagittal

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

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**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

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

**Trochanteric Bursal Fluid:**
- Bursal fluid not normally seen
- Fluid distention:
  - simple fluid: anechoic
  - complicated fluid: mixed echogenicity

**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

**Axial MRI**

- Note: ITB is formed by fascia from gluteus maximus and tensor fascia latae
Gluteus Minimus and Medius: Long Axis

- Gmed

Gluteus Medius: Long Axis

- Iliotibial Tract
- Lateral Facet

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
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**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*
Tendinosis: Gluteus Minimus

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

Post-operative: Gluteus Medius

Calcific Tendinosis: Gluteus Medius

Semimembranosus: tendinosis

Conjoined Tendons: tendinosis
Semimembranosus Tear

- Normal
- Tear

Rectus Femoris: anatomy

- Aponeurosis Tear (Indirect Head): Rectus Femoris
  - Short Axis
  - Long Axis

Rectus Femoris Tear: full-thickness tear

- Abnormal
- Normal

Calcific Tendinosis: rectus femoris

- Long Axis

Courtesy of Y. Morag, Ann Arbor, MI
Calcific Tendinosis
- Ultrasound-guided lavage and aspiration
- 20 gauge spinal needle

Rectus Femoris Tear: full tear, pseudomass

Hematoma: adductors

Seroma

Thigh Splints:
- Adductor insertion avulsion syndrome
- Proximal - mid femur
- Sports-related injuries
- Stress fracture, edema

AJR 2001; 177:673
Adductor Insertion Avulsion

Coronal Plane

Femur

Adductor Insertion Avulsion

Transverse

Femur

Morel-Lavallée Lesion:
- Thigh and hip region
- Fluid collection:
  - Between subcutaneous fat and fascia
  - Closed de-gloving injury
- Trauma

Mellado, AJR 2004; 182:1289

Morel-Lavallée Lesion

Muscle

Muscle

Sub-Q Fat

Coronal

Transverse

Normal

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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

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

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**Inflammatory Myositis**

- Acute: variable echogenicity, swollen
- Late:
  - Hyperechoic: fatty infiltration
  - Decreased size
- Possible hyperemia
- Infection, dermatomyositis, polymyositis

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**Transection Neuroma:**

- Neuroma formation:
  - Disorganized and tangled nerve end
  - Normal response to nerve transection
  - US important to determine if symptomatic

*J Clin Ultrasound 1997; 25:85*

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**Lymph Node:**

- Normal: echogenic hilum
  - Interfaces with fluid-filled sinuses
  - Not due to fat
- Abnormal: enlarged, short axis >1.5 cm

*Radiology 1992; 183:215*

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**Polymyositis: sartorius**

- Normal
- Abnormal

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**Transection Neuroma:**

- Sciatic

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**Lymph Node: malignant**

- Gray scale:
  - Absent echogenic hilum
  - Narrow hilum with thick cortex
  - Round shape (not oval)

*Radiology 1992; 183:215*
Lymph Node: malignant

- Power Doppler:
  - Dense vascularity
  - Spotted, mixed, or peripheral (not hilar)
  - High resistance

AJR 1998; 171:503

Lymph Node: reactive

Lymph Node: angiosarcoma metastasis

Pseudohypertrophy

- Thigh: tensor fascia lata
- Denervation: spine, chronic
- Pseudomass appearance:
  - Enlarged muscle
  - Fat infiltration

Petersilge, J Comput Assist Tomogr 1995; 19:596

Tensor Fascia Lata: pseudohypertrophy

Transverse  Longitudinal
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