Hip Ultrasound

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Fundamentals of Musculoskeletal Ultrasound are copyrighted
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Outline:
• Sonographic technique
• Normal anatomy
• Common pathology

Sonographic Technique: hip and thigh
• Anterior:
  – Hip joint
  – Anterior hip muscles, iliopsoas bursa
  – Consider: symphysis pubis, inguinal hernia
• Lateral: gluteal tendons, bursae
• Medial: adductors
• Posterior: hamstring

Sonographic Technique: Hip
• Anterior
  – Hip joint
  – Anterior musculature
  – Snapping iliopsoas
  – Iliopsoas bursa
  – Lateral femoral cutaneous nerve
• Transducers:
  – 10 – 12 MHz linear
  – <10 MHz curvilinear if needed

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

Radiology
1999; 210:499
Sonographic Technique: Hip

- **Lateral**
  - Greater trochanter
  - Gluteal tendons
  - Bursae
  - Snapping hip
- Transducers:
  - 10 – 12 MHz linear
  - <10 MHz curvilinear if needed
Greater Trochanter

FACETS: AF = anterior; LF = lateral; SPF = superoposterior; PF = posterior

Pfirrmann et al. Radiology 2001; 221:469

Greater Trochanter

Yellow arrow = gluteus medius
White arrow = gluteus minimus

Axial MRI

Greater Trochanter

Yellow arrow = gluteus medius
White arrow = gluteus minimus

Greater Trochanter

AF: anterior facet
LF: lateral facet
PF: posterior facet

Greater Trochanter

Gluteus Minimus and Medius: Long Axis

Gluteus Minimus: Long Axis
Iliotibial Tract

Gluteus Medius: Long Axis

Sonographic Technique: Thigh

- **Posterior:**
  - Semimembranosus
  - Semitendinosus
  - Biceps femoris
    - Long and short heads
  - Sciatic nerve
- **Transducers:**
  - 10 – 12 MHz linear
  - <10 MHz curvilinear if needed

Proximal Hamstring: gluteal fold

Note: Conjoined semitendinosus (ST) and biceps femoris long head (BF) tendon (yellow arrow), semimembranosus (SM blue arrow), and sciatic nerve in a triangle configuration.

"Toggle transducer to eliminate anistropy"
**Posterior Thigh: longitudinal**

- Sciatic Nerve
- Hamstring Origin

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

**Hip Effusion:**
- Separation of anterior and posterior layers\(^1\)
- Capsule distention at femoral neck > 7 mm or difference of 1 mm from opposite side\(^2\)
- Extension & abduction improves visualization\(^3\)
- Do not internally rotate hip: capsule thickens

\(^1\)Radiology 1999; 210:449
\(^2\)Scand J Rheumatology 1989; 18:113
\(^3\)Acta Radiologica 1997; 38:867

**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 Joint: aseptic effusion

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

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

* AJR 1998; 206:731

Pigmented Villonodular Synovitis

Juvenile Rheumatoid Arthritis

Hip Labrum
- Normal:
  - Hyperechoic, triangular
- Degeneration: hypoechoic
- Tear: anterior
  - Anechoic cleft
  - Sensitivity 82%, specificity 60%, accuracy 80%*

Labral Tear and Paralabral Cyst
• Associated with labral tear
  – Full-thickness or detachment
• Anechoic to hypoechoic
• Multilocular

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

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 change¹
• Suspect infection:
  – Pseudocapsule > 3.2 mm: suspect infection²
  – Extra-articular fluid collection
  – Not visualized with arthrography if non-communication

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

Teaching Point:
Always screen soft tissues about an arthroplasty prior to fluoroscopic joint aspiration
Metal-on-Metal Arthroplasty: pseudotumor

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

Trochanteric Pain Syndrome:
- Most commonly caused by gluteus minimus and medius tendon abnormalities\(^1\)
- Trochanteric bursitis: uncommon
  - 20% of symptomatic patients\(^2\)
  - Not actually inflamed\(^3\)
  - Not associated with pain\(^4\)

\(^1\)Kong A et al. Eur Rad 2007; 17:1772
\(^2\)Long SS et al. AJR 2013; 201:1053
\(^3\)Silva T et al. Clin Rheumatol 2008; 14:92
\(^4\)Blankenbaker DG et al. Skeletal Radiol 2008; 37:503

Trochanteric Bursitis: Septic

Note posterior location of bursa

Trochanteric Bursitis: Septic

Trochanteric Bursal Fluid + Glut Min Tear

Trochanteric Bursitis
Trochanteric Bursa: infection + gas

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

Radiology 1995; 197:853

Iliopsoas Bursal Fluid

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

Muscle and Tendon Injury
- Tear:
  - Anechoic or hypoechoic defect
  - Partial-thickness tear
  - Full-thickness tear: retraction
- Tendinosis:
  - Hypoechoic, enlarged
  - No inflammation (not tendinitis)
Tendinosis: Gluteus Medius

Tendinosis: Gluteus Minimus

Calcific Tendinosis: Gluteus Medius

Tear: Gluteus Medius after THA

Tear: Gluteus Minimus

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

Steinert et al. Radiology 2010; 257:754

Semimembranosus: tendinosis

Long Axis

Short Axis
Conjoined Biceps Femoris-Semitendinosus: tendinosis

Semimembranosus

Ischium

Short Axis

Conjoined BF-ST Tendon: partial tear

Semituberous Ligament

Conjoined BF-ST Tendon

Ischial Tuberosity

Semimembranosus

Long Axis

Conjoined BF-ST Tendon

Ischial Tuberosity

Semimembranosus

From: Berry et al. Radiology 2014; 271:112

Semimembranosus Tear

Tear

Normal

Hamstring: complete tear with retraction

Ischium

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 symphysis instability, FAI

Omar IM et al. Radiographics 2008; 28:1415
Garvey JW 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 Abdominis / Adductor Tendinosis: “Sports Hernia”

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

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

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

Snapping Hip: lateral

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

Snapping Gluteus Maximus / Iliotibial Band

Lymph Node: malignant

- Gray scale:
  - Absent echogenic hilum
  - Narrow hilum with thick cortex
  - Round shape (not oval)
- Power Doppler:
  - Dense vascularity
  - Spotted, mixed, or peripheral (not hilar)
  - High resistance

Lymph Node: Non-Hodgkin's lymphoma

Radiology 1992; 183:215
Recurrent Undifferentiated Pleomorphic Sarcoma

Transverse Longitudinal

Femur

Soft Tissue Metastasis: lung

Take-home points: hip

- Joint effusion: anterior hip recess
- Greater trochanteric pain syndrome:
  - Gluteal tendon abnormality, not bursitis
- Tendon tendinosis: know bone footprints
- Snapping hip syndrome: dynamic evaluation
  - Iliopsoas
  - Iliotibial tract / gluteus maximus

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