Lower Extremity Ultrasound with MRI Correlation

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Outline
• Hip
  – Effusion
  – Trochanteric pain syndrome
  – Iliopsoas snapping
• Knee
  – Joint effusion and extensor mechanism
  – Baker cyst
• Ankle and Foot
  – Achilles and peroneal tendons
  – Ligaments

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\(^1\)
• 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; 210:499
\(^2\)Scand J Rheumatol 1989; 18:113
\(^3\)Acta Radiologica 1997; 38:637
**Hip Joint: septic effusion**

**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**

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**Trochanteric Pain Syndrome:**
- Most commonly caused by gluteus minimus and medius tendon abnormalities¹
- Trochanteric bursitis: uncommon
  - 20% of symptomatic patients²
  - Not actually inflamed³
  - Not associated with pain⁴

¹Eur Rad 2007; 17:1772
²Long SS et al. AJR 2011; 201:1083
³Cln Rheumatol 2006; 14:62
⁴Skeletal Radiol 2008; 37:203

**Greater Trochanter**

Pfirrmann et al. Radiology 2001; 221:469
Greater Trochanter

Trochanteric Bursitis

Transverse  Coronal

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% (x-ray) *

*Steinert et al. Radiology 2010; 257:754

Tear: Gluteus Medius

Calcific Tendinosis: Gluteus Medius

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

Steinert et al. Radiology 2010; 257:754
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Snapping Hip Syndrome

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

Iliopsoas Complex


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

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

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Joint Effusion
- Suprapatellar recess
  - Superior
    - Prefemoral & quadriceps fat pad separation
    - Distends with partial knee flexion
  - Medial and lateral to patella
    - Distends with knee extension
    - Transducer pressure displaces joint effusion

Suprapatellar Recess and Gutters

Joint Effusion: sagittal plane

Suprapatellar Recess and Gutters


Joint Effusion: transverse plane
Joint Effusion: knee extension

Quadiceps Tendon: tendinosis

Quadiceps Tendon: Partial Tears

Quadiceps Tendon: full-thickness tear

Patellar Tendinosis:
- Jumper’s knee
- Hypoechoic swelling
- Mucoid degeneration, possible interstitial tearing
- Hyperemia: neovascularity
- No inflammatory cells

Radiology 1996; 200:821
Patellar Tendon: tendinosis

Patellar Tendon: full-thickness tear

Gout: patellar tendon

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Baker Cyst:
- Semimembranosus-medial gastrocnemius bursa
- 50% over age of 50 have communication with knee joint
- Cyst communication to posterior knee between SM-MG tendons required

AJR 2001; 176:373

Anatomy: posterior

From: Netter’s Atlas of Human Anatomy
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Achilles Tendon:
- 2 – 6 cm proximal to insertion
  - Tendinosis
  - Full-thickness tear
- Calcaneal attachment
  - Tendinosis, tear
  - Haglund Syndrome
Tendinosis: Achilles

Achilles Tendon: partial-thickness tear

Achilles Tendon: full-thickness tear

Achilles FTT + Intact Plantaris

Achilles Tendon: dynamic imaging

Achilles Tendon: healing tear

Courtesy of Jon Halperin, San Diego
Longitudinal split: peroneus brevis

Transverse: proximal
Transverse: distal

Peroneal Tendon Subluxation:
- Abnormal movement may only occur dynamically
- Predisposes to peroneal tendon tears
  - Longitudinal split of peroneus brevis
- US: examine with dorsiflexion / eversion
  - 100% accurate diagnosis with US

Neustadter et al. AJR 2004; 183:985

Peroneal Retinaculum

Rosenberg et al. AJR 2003; 181:1551

Dislocation: peroneus brevis & longus

Short axis
Intrasheath Subluxation

- Abnormal snapping of peroneal tendons
- No lateral displacement, intact retinaculum
- Associations:
  - Convex posterior fibula in 92%
  - Tendon tear in 86%
  - Low lying peroneus brevis muscle in 71%

J Bone Joint Surg Am 2008; 90:992
J Foot Ankle Surg 2009; 48:323

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Technique: lateral

- Anterior talofibular
- Calcaneofibular
- Posterior talofibular
- Anterior tibiofibular
- Posterior tibiofibular

Anterior Talofibular Ligament

Calcaneofibular Ligament
Ligament Tear:

- Anterior inferior tibiofibular ligament:
  - Look for interosseous membrane tear if absent lower fibular fracture
  - Maisonneuve fracture
Take Home Points

- Hip: bursitis is very uncommon
- Knee effusion:
  - Suprapatellar and medial/lateral recesses
- Extensor mechanism: dynamic evaluation
- Baker cyst: must see neck to diagnose
- Achilles: dynamic imaging
- Peroneal: dynamic, subluxation

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