Rotator Cuff Tears
• Tears are hypoechoic / anechoic
• Indirect signs at ultrasound:
  – Cortical irregularity: supraspinatus footprint
    • If present on radiographs, 75% have tear
  – Volume loss
  – Cartilage interface sign
  – Joint and bursal fluid: 95% PPV

AJR 1998; 171:229
Radiology 2004; 230:234

Rotator Cuff: general pitfalls
• Incomplete evaluation of the supraspinatus
  – Use biceps long head tendon as landmark
• Inaccurate characterization of tear
  – Use greater tuberosity bone landmarks for orientation
• Anisotropy simulating pathology
  – Focus on tendon perpendicular to sound beam
  – Bone cortex should be bright and distinct

Full-thickness Tear: supraspinatus
Note: Cartilage Interface Sign (open arrow)
Anisotropy: supraspinatus

Rotator Cuff: specific pitfalls

- Partial-thickness articular tear:
  - Focal anisotropy simulating tear
- Partial-thickness bursal tear:
  - Thickened bursa simulating intact tendon
  - Use volume loss as key finding
- Retracted tear:
  - Hyperechoic deltoid simulating rotator cuff
- Repaired rotator cuff

Pitfall Alert!
Anisotropy

- Sound beam oblique to tendon fibers
- Artifactually hypoechoic
- Most common location for this error: rim rent area

Supraspinatus: long axis

Bursal Partial-thickness Tear: supraspinatus

Full-thickness Tear: supraspinatus

Repaired Cuff: ultrasound

- Post-op intact tendon:
  - Variable and heterogeneous echogenicity
  - Variable thickness
- Reimplantation trough
- Echogenic sutures & anchors

Outline

- Rotator cuff
- Biceps and triceps brachii
- Gamekeeper’s thumb
- Greater trochanter and post-operative hip
- Knee effusion and Baker cyst
- Achilles and Morton neuroma
- Ultrasound-guided techniques

Biceps Brachii: pitfalls

- Inadequate visualization:
  - Medial approach
- Partial versus full-thickness tear:
  - Lateral approach: dynamic imaging
- Partial-thickness tear:
  - Retracted superficial short head
  - Shadowing simulates tear of long head

Biceps Brachii Tendon: distal

1 = long head
2 = short head

Biceps Tendon

- Medial approach
- “Pronator window”
- Transducer:
  - Distal aspect over medial epicondyle
  - Parallel to humerus
  - Slide transducer anterior

Biceps Brachii Tendon: complete tear

Radial Head
Radial Tuberosity
Biceps Brachii Tendon: complete tear non-retracted

Kalume Brigido M. Eur Radiol 2009; 19:1817

Biceps Brachii Tendon: partial tear (short head)

Retracted superficial short head (yellow arrows)
Hypoechoic but intact deep long head (white arrows)

Biceps Tendon Tears: dynamic imaging

Partial Tear
Complete Tear

Triceps Brachii: pitfalls

- Partial-thickness tear
- Misinterpretation of avulsion bone fragment as remote injury
- Not identifying intact deeper medial head tendon
  - Overcalling full-thickness tear

Anatomy of the Distal Triceps Brachii

- Superficial (blue arrow): long + lateral heads
- Deep (black arrow): medial head
  - Primarily muscular insertion

*From Resnick, Skeletal Radiol 2009; 38:171

Triceps Tear: partial thickness tear

- Superficial layer torn
  - Long and lateral heads
- Intact deep layer (medial head)
- Associated enthesophyte bone fragment
  - 1 – 2 cm in size
  - 2.5 – 4 cm retraction
- No donor site

J Ultrasound Med 2011; 30:1351
Long Axis (Sagittal Plane)

Triceps Tendon: partial tear + avulsion

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Gamekeeper's Thumb: pitfalls
- Scanning technique:
  - Must be in coronal plane
  - Use bone landmarks for confirmation
- Adductor pollicis aponeurosis:
  - Interphalangeal joint flexion
- Stener lesion:
  - Hypoechoic rounded appearance at apex
  - Not always superficial to aponeurosis

Gamekeeper's Thumb
- Injury of the ulnar collateral ligament (UCL) of the thumb
  - Historically, chronic injury in Scottish gamekeepers
  - Frequently, due to acute MCP joint hyperabduction
  - Skier's thumb: up to 86% of thumb base injuries

Ulnar Collateral Ligament: thumb

Note: sliding of adductor aponeurosis with isolated interphalangeal joint flexion

Stener Lesion: variations
- Normal
- 1
- 2
- 3
- 4
- Displaced Full-thickness Tears
Stener Lesion: dynamic

White arrows = adductor aponeurosis
Yellow arrows = Stener lesion

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Hip: pitfalls

- Orientation: bone landmarks
  - Femoral neck: joint recess distention
  - Greater trochanter: gluteal tendons
- Post-operative hip replacement
  - Residual hypoechoic layer
  - Simulates small effusion

Hip: anterior recess

Greater Trochanter

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

- Metal components demonstrate posterior reverberation.
- Artifact occurs deep to prosthesis away from fluid collection (unlike MRI, CT).
- Ultrasound cannot differentiate small effusion from post-op change.

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Knee: pitfalls

- Knee joint effusion:
  - 3 locations
  - Slight flexion: suprapatellar recess
  - Full extension: medial and lateral recesses
- Baker cyst:
  - Must see extension between medial head of gastrocnemius and semimembranosus tendons for diagnosis.

Joint Effusion: sagittal plane

Sagittal T2w

Joint Effusion: knee extension

Quad Patella
Femur
Patella
Femur

**Baker Cyst**

- Transverse
- Parasagittal

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**Ankle and Foot: pitfalls**

- Achilles tendon:
  - Misdiagnosis of full-thickness tear as partial
  - Hematoma simulating intact tendon
  - Plantaris misinterpreted as Achilles tendon
- Morton neuroma:
  - Bursa versus neuroma
  - Sonographic Mulder sign:
    - Displaces neuroma in plantar direction
    - Palpable click producing symptoms

**Achilles Tendon: dynamic imaging**

- Long Axis

**Dynamic Evaluation**

- Compression
  - Between transducer and palpation
  - Bursae (dorsal) compress, neuromas (plantar) do not
- Sonographic Mulder Sign
  - Scan plantar: coronal plane
  - Neuroma displaces: plantar
  - Palpable click

Toriani M et al: AJR 2003; 180:1121
Zanetti M et al. Radiology 1997; 203:516

**Dynamic imaging: Mulder’s Maneuver**
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Ultrasound-guided Procedures: pitfalls

- Perform diagnostic imaging first!
- In-plane approach: most accurate
- Needle guidance:
  - Obliquity: needle anisotropy
  - Position needle perpendicular
  - Jiggle and rotate needle

Needle Anisotropy: 20-gauge

Oblique  Perpendicular

Needle Visualization

- Large needle
- Coated needle
- “Jiggle” the needle
- Rotate needle: bevel
- Needle perpendicular to sound beam

Syllabus on line and other educational material:
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