Shoulder Ultrasound: Beyond the Rotator Cuff

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Disclosures
- Consultant: Bioclinica
- Advisory Board: Philips
- Book Royalties: Elsevier
- Not relevant to this talk

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Miscellaneous Pathology:
- Biceps brachii tendon
- Subacromial-subdeltoid bursa
- Acromioclavicular joint
- Labrum
- Greater tuberosity
- Pectoralis major

Subacromial-subdeltoid Bursa:
- Normal:
  - Thin hypoechoic layer: fluid, synovium
  - Hyperechoic: bursal walls and peribursal fat
- Abnormal: >1 mm thick*
  - Fluid: anechoic
  - Synovial tissue: hypoechoic to hyperechoic

*Invest Radiol 1985;20:311

Subacromial-subdeltoid bursa (SASD) vs. subscapularis recess (SSR) vs. subcoracoid bursa (SCB)

Subacromial-subdeltoid Bursa: fluid

Coronal Coronal T2w
Subacromial-subdeltoid bursa: anterior

Subacromial-subdeltoid Bursa

Subacromial-subdeltoid Bursa and Biceps Tenosynovitis

Calcific Bursitis

Subcoracoid Bursa

- Located anterior to subscapularis under coracoid
- Unlike subscapularis recess
  - Does not communicate with joint
  - Does not change with internal-external rotation
  - Does not have an inverted "U-shape" over subscapularis

Subcoracoid versus Subscapularis Recess

*Invest Radiol 1985;20:311

From: Grainger A. et al. AJR 2000; 174:1377
Subcoracoid Bursa

Coracoid
Humerus

Axial
Sagittal

Impingement Syndrome

- Cuff impingement
- Subacromial enthesisophyte or acromioclavicular joint osteophyte
- Associated tendon degeneration and tear

Impingement Syndrome

Supraspinatus

Impingement: bursal fluid

- Abnormal pooling of subacromial-subdeltoid bursal fluid
- Lateral acromion: 
  - Coronal plane, active arm elevation
  - Not visible in neutral position, no cuff tear
- Thickened tendon or bursa
  - Possible snapping of thickened bursa
  - “Gathering” of bursa; may be asymptomatic

1Farin et al. Radiology 1990; 176:845
2Dagh A et al. Skeletal Radiol 2012; 41:1047

Impingement Test

Imaging criteria

Impingement: supraspinatus
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Acromioclavicular Joint:
• Osteoarthritis: common by age 40
  – Thick capsule > 2 mm
  – Narrow, irregular, osteophytes
• Trauma:
  – Wide, possible subluxation
  – Thick capsule > 2 mm
• Cyst versus geyser sign
  – Geyser: joint fluid tracking through ACJ via full-thickness rotator cuff tear

Acromioclavicular Joint
- Osteoarthrosis
- Prior Trauma

AC joint: subluxation

Post-traumatic Osteolysis of the Clavicle
Large Full-thickness Tear: geyser sign

Long Axis  Coronal T1w

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Glenoid Labrum:
- Hyperechoic
- Some areas difficult to visualize
- Hypoechoic cleft: tear
- Diffuse hypoechoic: degeneration
- Consider MRI to confirm

Labrum: normal

Paralabral Cysts:
- Periarticular shoulder cyst
- May cause pain simulating rotator cuff tear
- Associated with labral tears

Tung et al. AJR 2000; 174:1707
Labral Tear and Labral Cyst

Pitfall: suprascapular vein dilation

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Greater Tuberosity Fracture:
- Cortical step-off
- Point tenderness
- Differentiate from osteophyte
- Correlate with radiographs

Fracture: greater tuberosity

- Long Axis
- Coronal T1w

Patten et al. Radiology 1992; 182:201
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Pectoralis Major
- Clavicular head:
  - Forms anterior layer
- Sternal head:
  - Forms posterior layer and inferior aspect of anterior layer
  - Each layer: 2 mm thick
  - "U" shaped
  - Fuses 11 mm proximal to insertion

Chiavaras MM et al. Skeletal Radiol 2015; 44:157

Pectoralis Major
- Begin short axis over bicipital groove
- Identify biceps brachii long head
- Scan inferior to identify pectoralis major tendon superficial to biceps tendon

Curved arrow = anterior layer
Straight arrow = posterior layer
S = sternal head
C = clavicular head
B = biceps brachii long head
H = humerus
(Right side of image = lateral)

Pectoralis Major: ultrasound
- Distal tendon: short axis (sagittal)
- Fused anterior and posterior layers
- Identified over biceps brachii tendon

Arrowheads: fused anterior and posterior layers
B = biceps brachii long head
H = humerus
(Right side of image = inferior)
Case 1: full-thickness, full-width tear

- Longitudinal Axial T2w
- Curved arrow = torn and retracted pectoralis major
- * = short head biceps brachii + coracobrachialis
- Arrowhead = biceps brachii long head; D = deltoid

Case 3: partial-thickness, full-width sternal head tear (surgically created)

- Longitudinal Axial T2w
- Curved arrow = torn sternal head (S); Arrow = posterior layer
- * = short head biceps brachii + coracobrachialis
- M = pectoralis minor; D = deltoid

Case 3: partial-thickness, full-width sternal head tear (surgically created)

- Axial
- Sagittal
- Curved arrow = torn sternal head (S); Arrow = posterior layer
- Note: intact fused anterior and posterior layers (arrowheads) over biceps brachii long head tendon (B)
- * = short head biceps brachii + coracobrachialis
- D = deltoid; H = humerus

Soft Tissue Lipoma

- Subcutaneous or intramuscular
- Elongated or oval
- Echogenicity: variable
  - Hypoechoic: pure fat
  - Hyperechoic: fat + connective tissue

Inampudi, Radiology 2004; 233:763

Lipomas
Lipoma: subcutaneous
- Oval or oblong
- Homogeneous
- Isoechoic to adjacent fat
- Hyperechoic:
  - With increased fibrous tissue components
- No internal vascularity
- Compressible

Inampudi et al. Radiology 2004; 233:763

Lipoma: deep
- Variable echogenicity
- Often ill-defined
- Often difficult to assess
- Cannot reliably differentiate from low-grade liposarcoma!
- Need MRI

Paunipager et al. Insights Imaging 2010; 1:149

Liposarcoma: well-differentiated
- Hypoechoic
- Looks like a lipoma
- Need MRI with any suspected deep lipoma!

Soft Tissue Lipoma
- Sonography: to confirm suspected lipoma and exclude cyst
- History and physical exam
- If painful or enlarging: MRI
Take-home Points

• Subacromial-subdeltoid bursa:
  – Covers SST, IST, subscapularis, BT
• ACJ: cyst versus geyser
• Labrum: suprascapular vein pitfall
• Greater tuberosity: fracture
• Pectoralis: anatomy
• Lipoma: specific criteria

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other educational material

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