Shoulder Ultrasound: Beyond the Rotator Cuff

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

Biceps Brachii: pathology
- Tendinosis
- Tear: partial and full-thickness
- Subluxation and dislocation
- Association with:
  - SLAP and anterior rotator cuff tears
- Causes: acute injury, repetitive injury, degeneration

Biceps Tendon:
- Glenohumeral joint effusion:
  - Collects around biceps tendon
  - Tendon sheath communication
  - Seen in 97% with joint effusion
  - Abnormal: > 1 mm

Short Axis
Color Doppler
Zubler et al. Eur Radiol 2011; 21:1858

Shoulder Joint Recesses
- Long head biceps tendon sheath
- Posterior recess:
  - Image with shoulder in external rotation
- Axillary recess
- Subscapularis recess

Biceps Tendon Sheath
- Intra-articular body
  - Echogenic
  - Possible shadowing
  - Single or multiple
  - Associated with glenohumeral joint osteoarthritis

Short Axis
Long Axis
Biceps Tendon:

- Tenosynovitis
  - Unlike joint effusion:
    - Focal distention
    - Hyperemia with color Doppler
    - Pain with transducer pressure
    - No effusion in posterior recess

Biceps Tendon:

- Tendinosis:
  - Hypoechoic
  - Swollen
  - No inflammatory cells (not tendinitis)
  - Possible tenosynovitis

Biceps Tendon:

- Partial-thickness tear:
  - Hypoechoic / anechoic cleft
  - Tenosynovitis
  - Sensitivity: 27%
  - Accuracy: 88%
  - Subluxation / spur
  - Important secondary signs
    - Split + tenosynovitis
    - Split + Subluxation

Skendzel J, et al. AJR 2000; 197:942

Aponeurotic Expansion of Supraspinatus Tendon

- Up to 49% of shoulders
- Cleft: coronal plane
- Origin: supraspinatus
- Distal: pectoralis or bicipital groove

Moser et al. Skeletal Rad 2015; 44:223

Biceps Tendon:

- Full-thickness tear:
  - Non-visualization proximally
  - Bicipital groove filled with fluid / granulation tissue
  - Distal retracted tendon stump
  - Ultrasound: 88% sensitivity, 97% accuracy

Skendzel J, et al. AJR 2000; 197:942
Biceps Tendon: full-thickness tear

Biceps Tendon (long head): full-thickness tear

Biceps Tendon Subluxation

Biceps Tendon Dislocation into subscapularis tendon
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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 and Biceps Tenosynovitis

- Transverse
- Coronal

Calcific Bursitis

Impingement Syndrome

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

Impingement Syndrome

- 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

Impingement Test

- Farin et al. Radiology 1990; 176:845
- Daghir A et al. Skeletal Radiol 2012; 41:1047
**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

**AC joint: subluxation**

**Osteoarthrosis**

**Prior Trauma**
Post-traumatic Osteolysis of the Clavicle

Large Full-thickness Tear: geyser sign

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

Labrum: normal

Posterior Labral Tear
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

Patten et al. Radiology 1992; 182:201

Fracture: greater tuberosity

Long Axis

Coronal T1w
Fracture: greater tuberosity

Long Axis  Short Axis

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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
- S = sternal head; C = clavicular head
- D = deltoid; B = bicep brachii

Pectoralis Major: ultrasound
- Begin short axis over bicipital groove
- Identify bicep 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: short axis (sagittal plane)
- S = sternal and C = clavicular heads
- Arrowheads: sternal head tendons
Curved arrow = anterior layer
Straight arrow = posterior layer
Pectoralis Major: ultrasound

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

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 = deltid

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

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

Case 5: partial-thickness, full-width sternal head tear (arrow)

- Curved arrow = torn sternal head (S); Arrow = posterior layer
- Note: intact fused anterior and posterior layers (open arrows)

Take-home Points

- Biceps brachii:
  - Don’t overcall tenosynovitis
  - Dynamic evaluation
- Subacromial-subdeltoid bursa:
  - Covers SST, IST, subscapularis, BT
- ACJ: cyst versus geyser
- Labrum: suprascapular vein pitfall
- Greater tuberosity: fracture
- Pectoralis: anatomy