Other Shoulder Pathology and Intervention

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Disclosures

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

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Fundamentals of Musculoskeletal Ultrasound are copyrighted by Elsevier Inc.

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

Zubler et al. Eur Radiol 2011; 21:1858

Biceps Tendon Sheath

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

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

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**Biceps Brachii: sheath injection**
- Ultrasound-guided: highest accuracy¹
  - Statistically significant difference in pain relief compared with blind injection at 33 weeks²
- In plane, lateral to medial:
  - Deep to tendon: avoid SA-SD bursa
  - Avoid anterior circumflex humeral artery
- Glenohumeral joint extension: if 5 ml or more³

¹Hashiuchi et al. J Sho Elb Surg 2011; 20:1069
²Zhang et al. Ultrasound Med Bio 2011; 37:729
³Nwawka et al. AJR 2016; 206; 737.

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**Biceps Tendon:**
- Partial-thickness tear:
  - Hypoechoic / anechoic cleft
  - Tenosynovitis
  - Sensitivity: 27%
  - Accuracy: 88%
  - Subluxation / spur
  - Important secondary signs

Skendzel J. et al. AJR 2011; 197:942
Aponeurotic Expansion of Supraspinatus Tendon
- Up to 49% of shoulders
- Cleft: coronal plane
- Origin: supraspinatus
- Distal: pectoralis or bicipital groove

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

Moser et al. Skeletal Rad 2015; 44:223
Skendzel J, et al. AJR 2000; 197:942

Biceps Tendon: full-thickness tear

Pitfall Alert!
Pseudo Biceps Tendon
- Biceps brachii long head
- Complete retracted tear
- Visible "fibers" in groove
  - Collapsed tendon sheath
  - Aponeurotic expansion of supraspinatus
- Look for distal retracted tendon and absent tendon in rotator interval

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

Shoulder: biceps tendon
- Subluxation and dislocation
  - Medial from bicipital groove*
  - May only occur dynamically in external rotation and not identified with MRI
  - Possibly located within subscapularis or glenohumeral joint

Farin et al. Radiology 1995; 195:845

Biceps Tendon
- Subluxation
- Dislocation
**Biceps Tendon Subluxation**

**Biceps Tendon Dislocation**

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**Biceps Brachii: anatomy**
- Origin: supraglenoid tubercle of scapula and labrum
- Reflection pulley: stability
  - Coracohumeral ligament
  - Superior glenohumeral ligament
  - Superior aspect of subscapularis

From: Ding et al. JBJS 2015; 96:E176

Yellow Arrow = coracohumeral ligament

**Rotator Interval Tear**
- Abnormal hypoechoogenicity, non-visualization
- Abnormal supraspinatus, superior glenohumeral ligament, subscapularis
- Biceps instability
  - “Chondral Print Sign”
  - Intracapsular instability

Case #3: remote tear
Case #2: instability

*Zappa M et al. Skeletal Radiol 2016: 45:35

**Biceps Tendon: Dislocation into subscapularis tendon**

**Biceps Tendon:**
- Tenotomy: surgical transection of intra-articular aspect of long head biceps brachii tendon
- Tenodesis: surgical transection + fixation of proximal stump to intertubercular groove
Biceps Tendon: tenodesis

Biceps Tendon: failed tenodesis

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

Joint Effusion: posterior glenohumeral joint recess

Glenohumeral Joint
- Posterior joint recess
  - In plane
  - Transducer: axial
  - Lateral to medial
  - Most reliable site*

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

**Subscapularis Recess**
- *Note redistribution of joint fluid with internal and external shoulder rotation*

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

*Invest Radiol 1985;20:311

Subcoracoid versus Subscapularis Recess
- From: Grainger A. et al. AJR 2000; 174:1377

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 Bursitis:

- Etiologies:
  - Idiopathic
  - Rotator cuff tear, impingement
  - Rheumatoid arthritis, hemorrhage, infection, gout

*Invest Radiol 1985;20:311
Calcific Bursitis

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

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

Impingement Test

Notation:
1Farin et al. Radiology 1990; 176:845
2Daghir A et al. Skeletal Radiol 2012; 41:1047
Subacromial Impingement

- Thickened tendon or bursa
  - Possible snapping of thickened bursa
  - “Gathering” of bursa: may be asymptomatic
- Superior movement of humeral head
  - Possible contact between humerus and acromion

1Daghir A et al. Skeletal Radiol 2012; 41:1047
2Bureau N et al. AJR 2006; 187:216

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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:

- Large Full-thickness Tear: geyser sign

Long Axis Coronal T1w

Clavicle Acromion

Acromioclavicular Joint:

- Dynamic evaluation: clinical sign “cross-arm”
  - Ipsilateral hand to opposite shoulder: pain
- Normal:
  - Maneuver: ACJ narrows, < 1 mm, no pain
  - Rest: widens back to normal (up to 5 mm)
- Abnormal:
  - Maneuver: ACJ narrows, > 1 mm, extruded capsule and disc: osteoarthritis
  - Rest: ACJ widens > 5 mm: trauma

AC joint: subluxation

Post-traumatic Osteolysis of the Clavicle

Cross-arm maneuver

Clavicle
Sternoclavicular Joint: dislocation

Contralateral Side
Anterior Dislocation
Posterior Dislocation
Clavicle
Sternum

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Glenoid Labrum
- Many areas difficult to visualize
  - Normal: hyperechoic
  - Diffuse hypoechoic: degeneration
  - Well-defined hypoechoic cleft: tear
- Labrum tear versus degeneration/normal:
  - 67% sensitivity, 99% specificity
  - 99% negative predictive value, 99% accuracy
- MRI gold standard

Labrum: normal

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

Taljanovic M et al. AJR 2010; 174:1717
Tung et al. AJR 2000; 174:1707
Posterior Labral Tear and Cyst

Axial Axial T1w post-gado

Glenoid Humerus

Labral Tear and Labral Cyst

Long Axis: infraspinatus Short Axis: infraspinatus

*Note: non-compressible

Pitfall: suprascapular vein dilation

Paralabral cyst

- Usually with labral tear
- Aspiration
  - Axial plane
  - Lateral to medial

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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: 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**

- 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)**

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

**Case 3: partial-thickness, full-width sternal head tear (arrows)**

- Curved arrow = torn sternal head (S);
- Arrow = posterior layer
- * = short head biceps brachii + coracobrachialis
- D = deltoïd; H = humerus

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

- Curved arrow = torn sternal head (S);
- Arrow = posterior layer
- Coracobrachialis + short head biceps brachii
- Note: intact fused anterior and posterior layers (open arrows)
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!

Take-home Points
- Biceps:
  - Don’t overcall tenosynovitis
  - Aponeurotic expansion of supraspinatus
  - Pseudofibers with full thickness tear
- Bursa:
  - Anatomy
  - Subcoracoid bursitis is rare

Syllabus on line and other educational material:
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