Shoulder Ultrasound: Anatomy and Scanning Techniques

Jon A. Jacobson, M.D.
Professor of Radiology
Director, Division of Musculoskeletal Radiology
University of Michigan

Rotator Cuff Anatomy:
- Supraspinatus
- Infraspinatus
- Teres Minor
- Subscapularis

Rotator Cuff

Ultrasound Appearance:
- Tendon: hyperechoic, fibrillar
- Muscle: relatively hyperechoic
- Bone cortex: hyperechoic, shadowing

Anisotropic Effect
- Tendon is artifactually hypoechoic
- Sound beam is not perpendicular to fibers
- Tendon, ligament > muscle

Shoulder Ultrasound Examination

Left Shoulder
Right Shoulder
Technique: position #1
• Neutral, supination
  – Hand on lap, palm up
  – Anterior (10-17 MHz)
  – Biceps tendon:
    • Transverse, longitudinal

Long Head of Biceps Brachii Tendon

Scanning: basics
• Heel-toe maneuver
  – Evaluating long axis of tendon
  – Eliminate anisotropy

Technique: position #2
• External Rotation
  – Anterior
  – 10-17 MHz linear
• Subscapularis tendon
  – Longitudinal, transverse
• Biceps dislocation

External Shoulder Rotation

Scanning: basics
• Toggle
  – Evaluating short axis of tendon
  – Help identify tendon
  – Eliminate anisotropy
**Subscapularis Tendon**

- **Short Axis**
- **Long Axis**

**Technique: position #3**
- Internal rotation, extension
  - Hand at back pocket
  - Anterior (7-13 MHz linear)
  - Supraspinatus
    - Start longitudinal
    - Infraspinatus

**Modified Crass Position**

**Long Axis**

**Supraspinatus Tendon: normal**
- Hyperechoic and fibrillar echotexture
- Convex superior surface
- Uniform thickness: transverse

**Technical Considerations**
- > 10 Mhz (prefer at least 12 Mhz)
- Supraspinatus: long axis most important plane
  - Less pitfalls, easy recognition of anatomy
  - >90% accuracy long axis alone
- Biceps tendon (intra-articular)
  - Important landmark: complete evaluation

---

Supraspinatus: normal
Long Axis

Supraspinatus Tendon: proximal
Long Axis
Short Axis (Intra-articular)

Supraspinatus Tendon: distal
Long Axis
Short Axis (Greater Tuberosity)

Supraspinatus and Infraspinatus Tendons
Short Axis (Greater Tuberosity)
Supraspinatus - Infraspinatus Junction

- Longitudinal:
  - Flattening of greater tuberosity
  - Tendon striations: anisotropy infraspinatus
- Transverse:
  - 1.3 – 2.3 cm posterior to biceps tendon
  - Infraspinatus overlaps supraspinatus
  - Slight volume loss

Supraspinatus – Infraspinatus Junction

- Middle Facet: Infraspinatus overlaps supraspinatus

Technique: position #4

- Neutral position
  - 10-17 MHz linear
  - Acromioclavicular joint
  - Subacromial-subdeltoid bursa
  - Dynamic: impingement

Subacromial-subdeltoid Bursa

- Superior facet
- Middle facet

Impingement Test

- Technique: position #5

- Neutral position: posterior (5 – 12 MHz)
  - A. Posterior glenohumeral joint
    - Joint recess, infraspinatus
    - Labrum, spinoglenoid notch
  - B. Muscle atrophy
  - C. Suprascapular notch
    - Superior labrum
Infraspinatus Tendon & Posterior Labrum

- Long Axis
- Short Axis

Suprascapular Notch and Superior Labrum

Coronal Plane

**Take-home Points**
- Must follow a protocol
- Important landmarks:
  - Greater tuberosity facet anatomy
  - Rotator interval
- Pitfalls:
  - Anisotropy
  - Incomplete evaluation of supraspinatus