Shoulder Ultrasound: Scanning Protocol

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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

Anisotropy: subscapularis tendon
US: normal appearance

- Cartilage
  - Hyaline: hypoechoic
  - Fibrocartilage: hyperechoic
- Joint fluid
  - Simple: anechoic
  - Complex: mixed echogenicity

Technique: general

- Follow imaging protocol steps
- For each step, identify key structure
  - Bone landmarks important
- Image structure in two planes
- Include video sweep back and forth beginning over structure

Shoulder Ultrasound: 5 steps

1. Biceps Brachii: 2 images (short and long axis)
2. Subscapularis: 2 images (long and short axis)
3. Supraspinatus and infraspinatus: 6 images (long and short axis)
4. AC joint and impingement: 2 images
5. Posterior shoulder: 4 images
   A. Joint recess and spinoglenoid notch
   B. Infraspinatus and teres minor muscles
   C. Supraspinatus muscle, suprascapular notch

Technique: position #1

- Neutral, supination
  - Hand on lap, palm up
  - Anterior (10-17 MHz)
  - Biceps tendon:
    - Transverse, longitudinal

Long Head of Biceps Brachii Tendon

- Greater Tuberosity
- Lesser Tuberosity
- Humerus

Short Axis

Long Axis
Scanning: basics
- Heel-toe maneuver
  - Evaluating long axis of tendon
  - Eliminate anisotropy

Scanning: basics
- Toggle
  - Evaluating short axis of tendon
  - Help identify tendon
  - Eliminate anisotropy

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

External Shoulder Rotation
Subscapularis

Technique: position #3
- Internal rotation, extension
  - Back of hand at other back pocket
  - Anterior (7-13 MHz linear)
- Supraspinatus
  - Start longitudinal
  - Infraspinatus
Neutral Position

Internal Rotation

Technique: position #3

- Modified Crass
  - Hand at closest hip pocket
  - Easier to tolerate
  - Long axis: aim toward ear
  - Improved biceps visualization
  - Overestimates size*

Ferri, AJR 2005; 184:160

Modified Crass Position

Supraspinatus Tendon: normal

- Hyperechoic and fibrillar echotexture
- Convex superior surface
- Uniform thickness: transverse

*Overestimates size
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

1Arend CF et al. J Ultrasound Med 2010; 29:1725
**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

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**Technique: position #4**

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

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**Subacromial-subdeltoid Bursa**

**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

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Infraspinatus Tendon & Posterior Labrum

Infraspinatus: Long Axis

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No Atrophy

Short Axis (extended field-of-view)

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Suprascapular Notch and Superior Labrum

Coronal Plane

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Take-home Points

- Must follow a protocol
- Beware: anisotropy
- Understand greater tuberosity footprints
- Dynamic: subacromial impingement

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Syllabus on line and other educational material:
www.jacobsonmskus.com

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