

# Shoulder Ultrasound: Anatomy and Scanning Techniques

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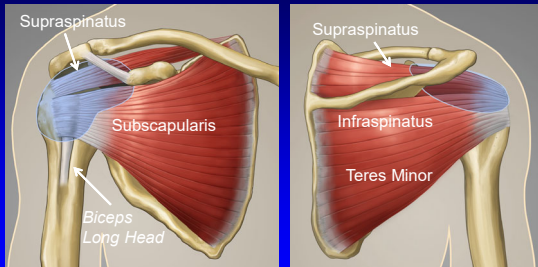
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## Rotator Cuff Anatomy:

- Supraspinatus
- Infraspinatus
- Teres Minor
- Subscapularis

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## Rotator Cuff

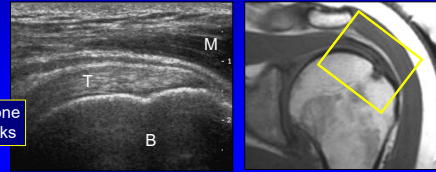


Note: Subacromial-subdeltoid Bursa (light blue)

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## Ultrasound Appearance:

- Tendon: *hyperechoic*, fibrillar
- Muscle: relatively *hypoechoic*
- Bone cortex: *hyperechoic*, shadowing

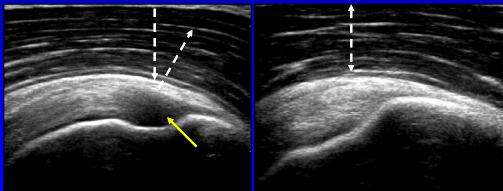


\*Note: Bone Landmarks

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## Anisotropic Effect

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



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## Shoulder Ultrasound Examination



Left Shoulder

Right Shoulder

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### 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

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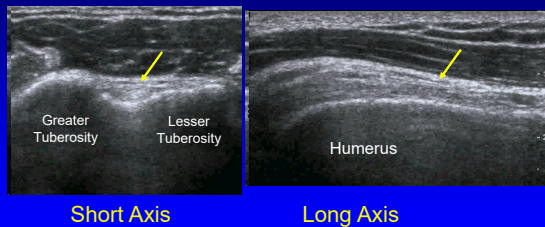
### Technique: position #1

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



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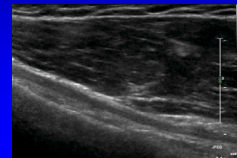
### Long Head of Biceps Brachii Tendon



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### Scanning: basics

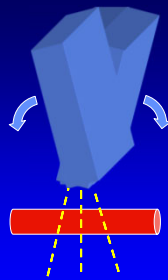
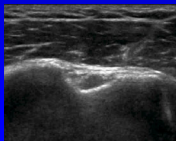
- Heel-toe maneuver
  - Evaluating long axis of tendon
  - Eliminate anisotropy



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### Scanning: basics

- Toggle
  - Evaluating short axis of tendon
  - Help identify tendon
  - Eliminate anisotropy



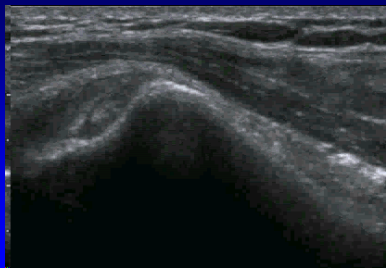
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### Technique: position #1

- To find biceps longitudinal
  - Use bone landmarks
  - Find lesser tuberosity: pyramid shape
  - Move lateral to bicipital groove

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### Long Head of Biceps Brachii Tendon



Long Axis

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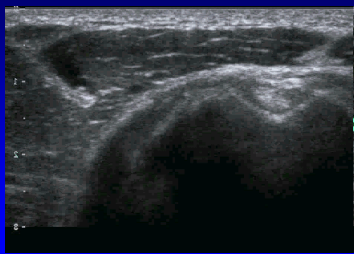
### Technique: position #2

- External Rotation
  - Anterior
  - 10-17 MHz linear
- Subscapularis tendon
  - Longitudinal, transverse
- Biceps dislocation



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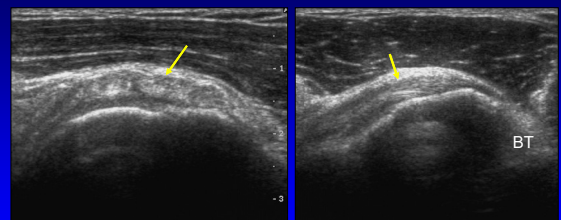
### External Shoulder Rotation



Subscapularis

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### Subscapularis Tendon



Short Axis

Long Axis

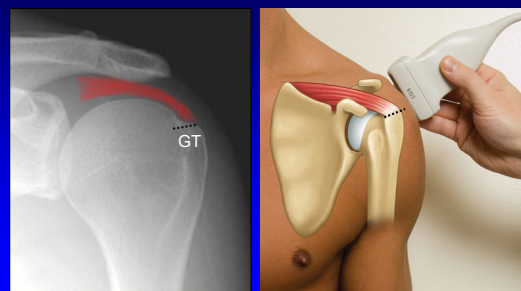
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### Technique: position #3

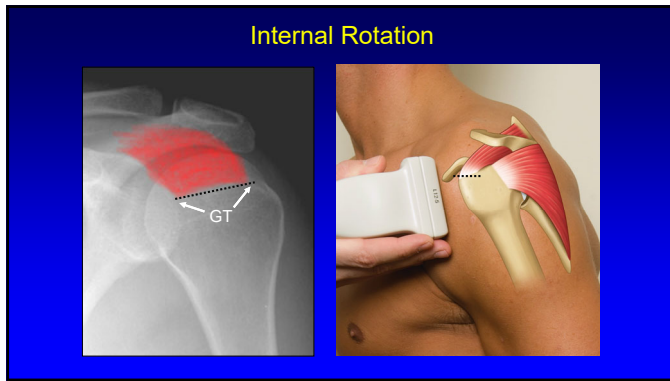
- Internal rotation, extension
  - Hand at back pocket
  - Anterior (7-13 MHz linear)
- Supraspinatus
  - Start longitudinal
- Infraspinatus

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### Neutral Position



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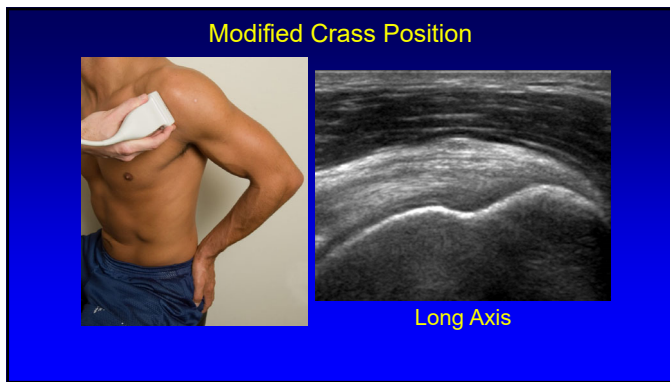
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### Technique: position #3

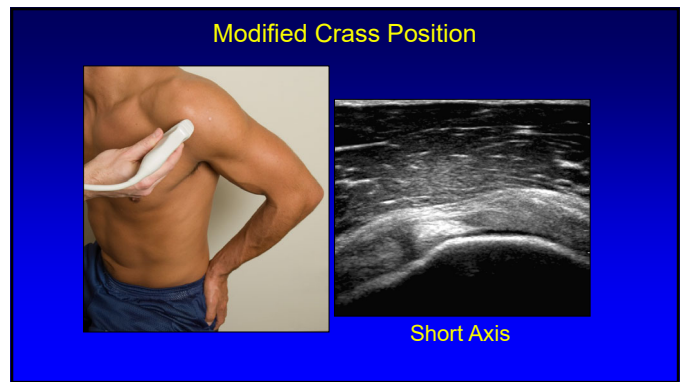
- Modified Crass (or Middleton)
  - Hand at closest hip pocket
  - Easier to tolerate
  - Long axis: aim toward ear
  - Improved biceps visualization
  - Overestimates size\*

Ferri, AJR 2005; 184:180

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### Supraspinatus Tendon: normal

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

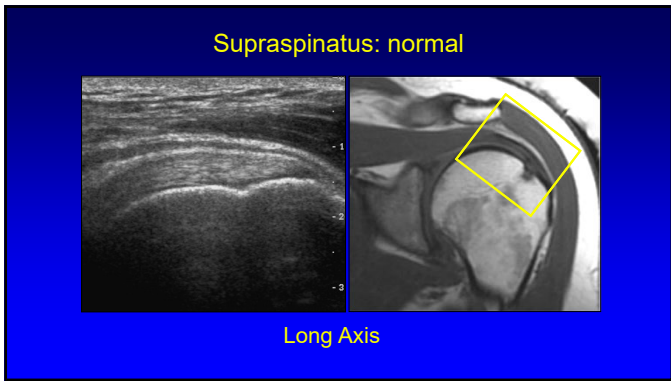
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### Technical Considerations

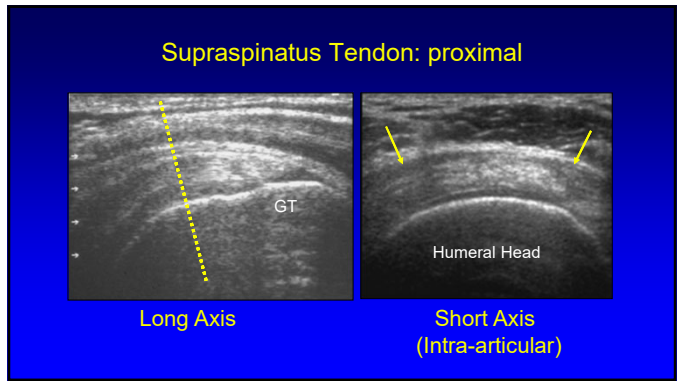
- > 10 Mhz (prefer at least 12 Mhz)
- Supraspinatus: long axis most important plane
  - Less pitfalls, easy recognition of anatomy
  - >90% accuracy long axis alone<sup>1</sup>
- Biceps tendon (intra-articular)
  - Important landmark: complete evaluation

<sup>1</sup>Arend CF et al. J Ultrasound Med 2010; 29:1725

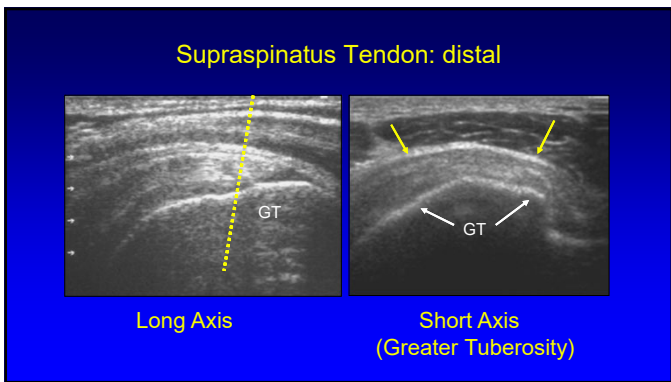
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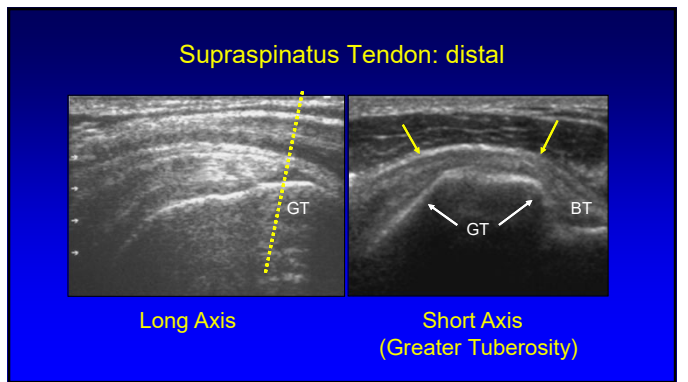
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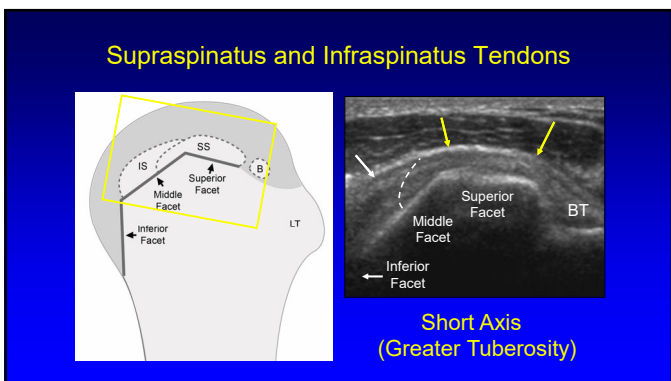
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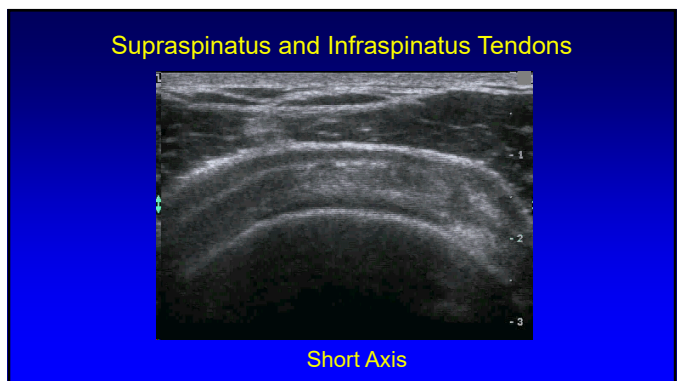
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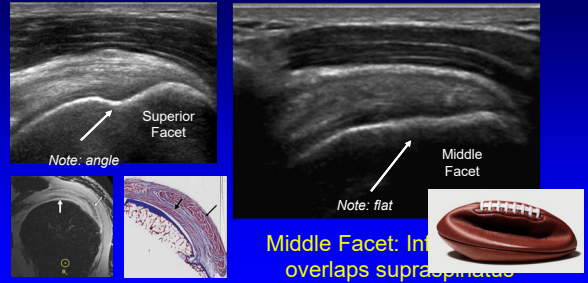
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### Supraspinatus - Infraspinatus Junction

- 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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### Supraspinatus – Infraspinatus Junction

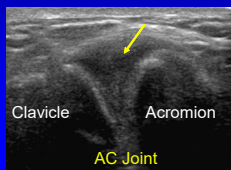


From: Chang EY et al. AJR 2014; 202:w376

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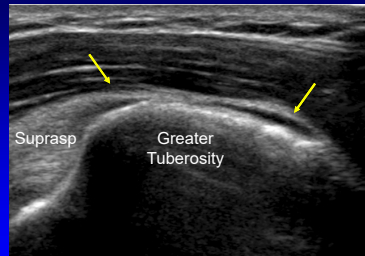
### Technique: position #4

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



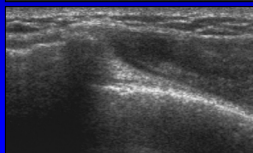
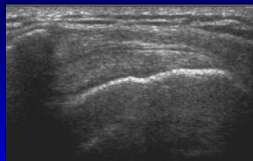
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### Subacromial-subdeltoid Bursa



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### Impingement Test

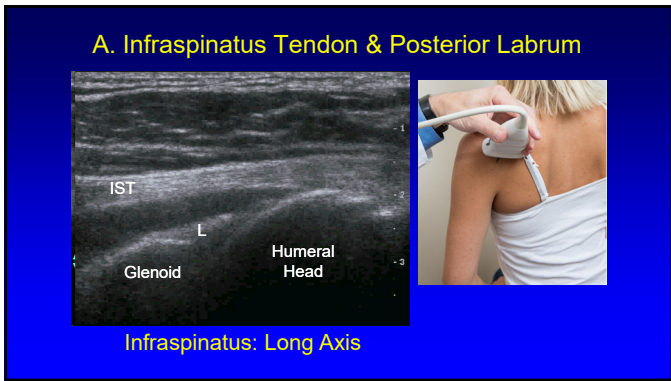


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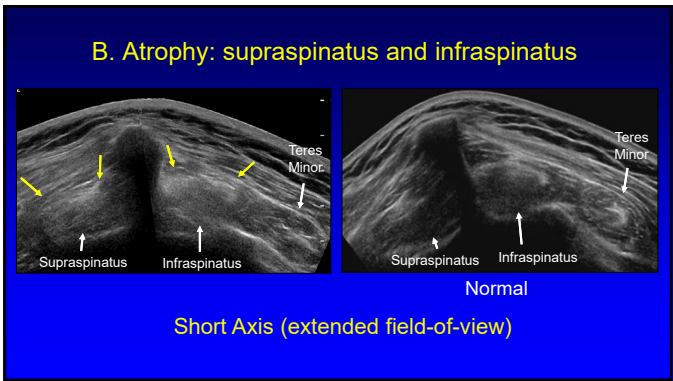
### Technique: position #5

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

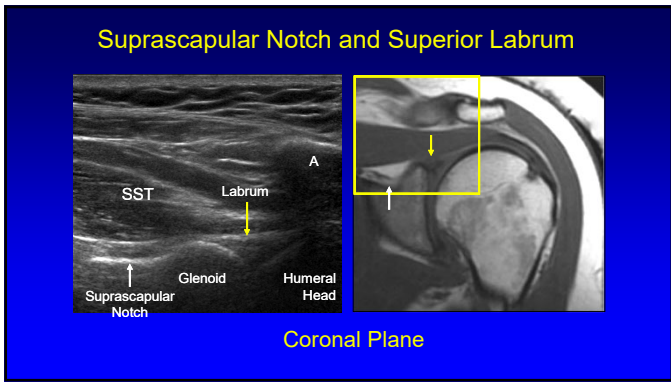
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- ### Take-home Points
- Must follow a protocol
  - Important landmarks:
    - Greater tuberosity facet anatomy
    - Rotator interval
  - Pitfalls:
    - Anisotropy
    - Incomplete evaluation of supraspinatus

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Syllabus on line and other educational material:  
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 Twitter handle: @jjacobsn

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