

Shoulder Ultrasound: Anatomy and Scanning Technique

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Disclosures

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

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

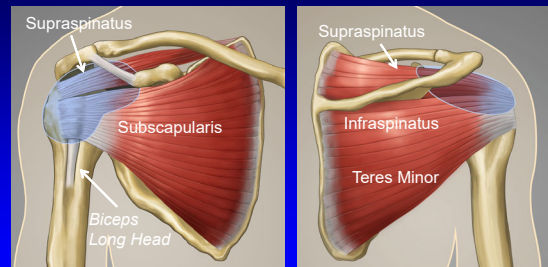
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Rotator Cuff Anatomy:

- Supraspinatus
- Infraspinatus
- Teres Minor
- Subscapularis

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Rotator Cuff

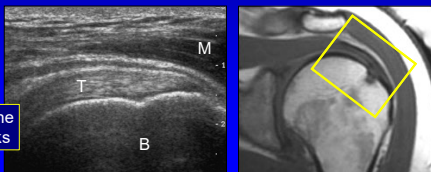


Note: Subacromial-subdeltoid Bursa (light blue)

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Ultrasound Appearance:

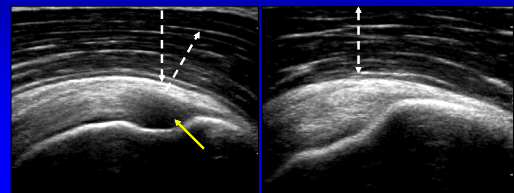
- Tendon: *hyperechoic*, fibrillar
- Muscle: relatively *hypoechoic*
- Bone cortex: *hyperechoic*, shadowing



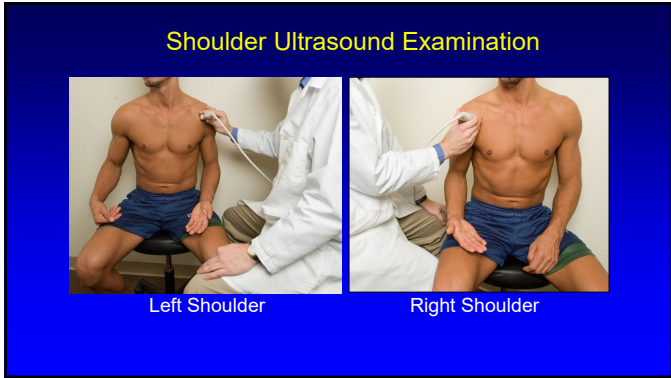
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Anisotropic Effect

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



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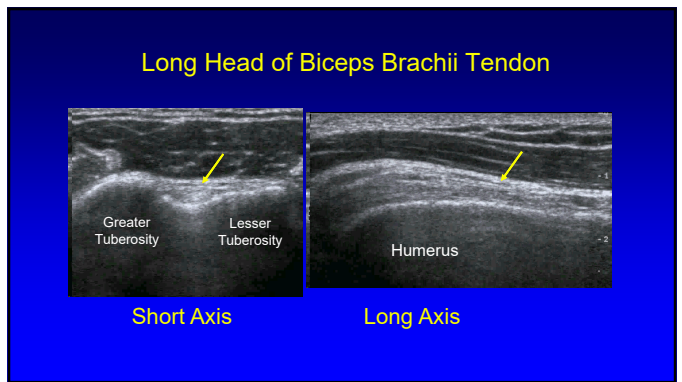
- ### Shoulder Ultrasound: 5 steps
1. Biceps Brachii: 2 images (short and long axis)
 2. Subscapularis: 2 images (long and short axis)
 3. Supraspinatus and infraspinatus: 6 images (long and short axis)
 4. AC joint and impingement: 2 images
 5. Posterior shoulder: 4 images
 - A. Joint recess and spinoglenoid 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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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

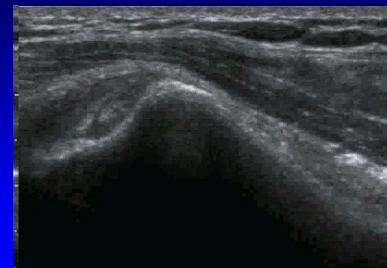
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Technique: position #1

- 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



External Shoulder Rotation

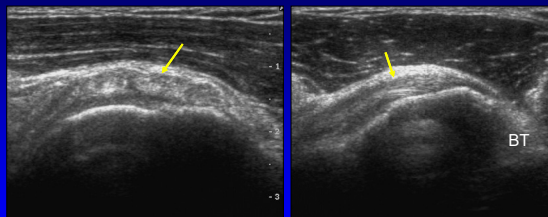


Subscapularis

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Subscapularis Tendon



Short Axis

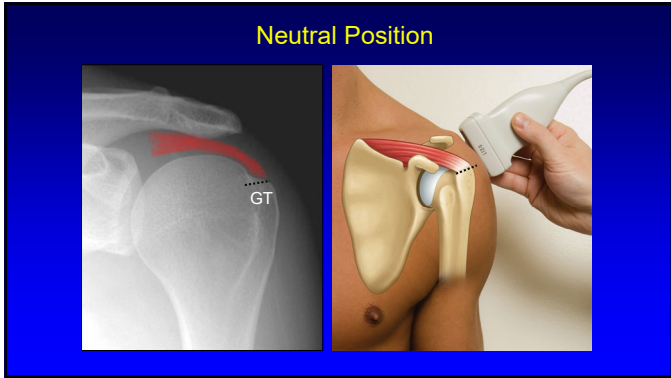
Long Axis

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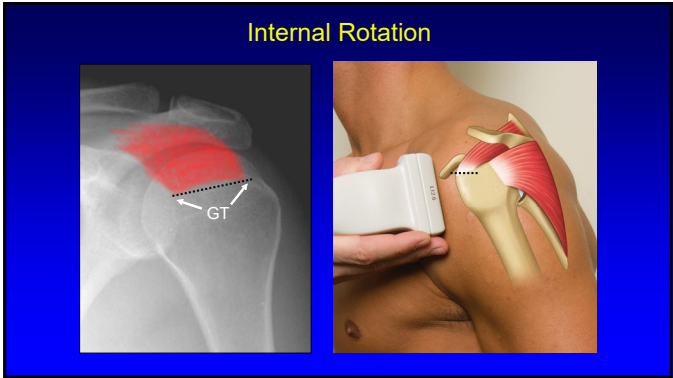
Technique: position #3

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

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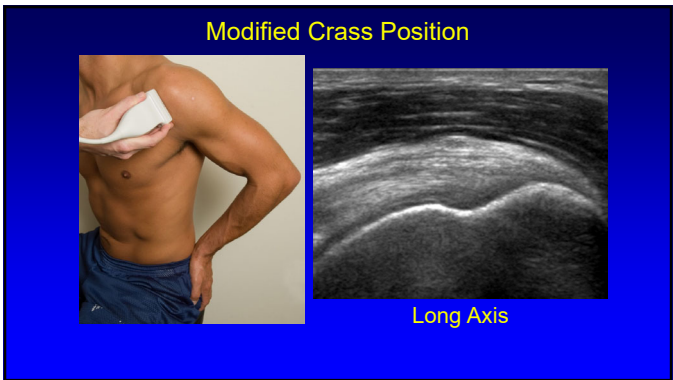
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Technique: position #3

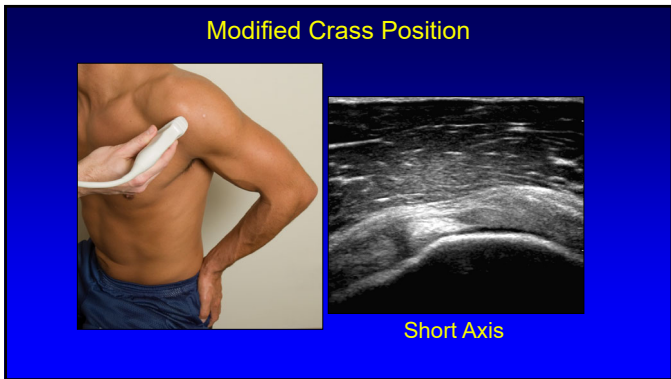
- Modified Crass (or Middleton)
 - Hand at closest hip pocket
 - Easier to tolerate
 - Long axis: aim toward ear
 - Improved biceps visualization
 - Overestimates size*

Ferri, AJR 2005; 184:180

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Supraspinatus Tendon: normal

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

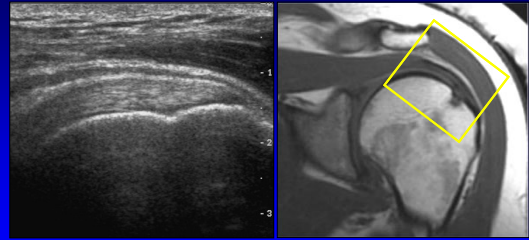
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Technical Considerations

- > 10 Mhz (prefer at least 12 Mhz)
- Supraspinatus: long axis most important plane
 - Less pitfalls, easy recognition of anatomy
 - >90% accuracy long axis alone¹
- Biceps tendon (intra-articular)
 - Important landmark: complete evaluation

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

Supraspinatus: normal

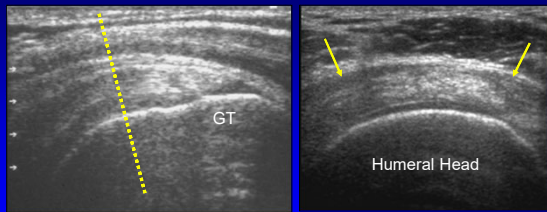


Long Axis

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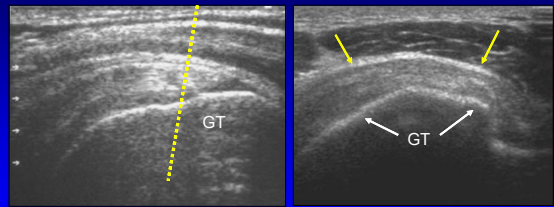
Supraspinatus Tendon: proximal



Long Axis

Short Axis
(Intra-articular)

Supraspinatus Tendon: distal



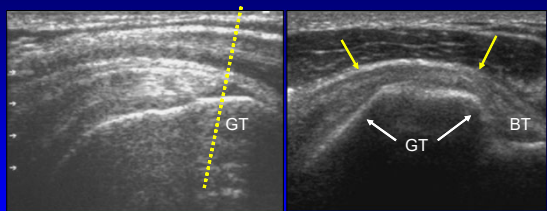
Long Axis

Short Axis
(Greater Tuberosity)

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Supraspinatus Tendon: distal

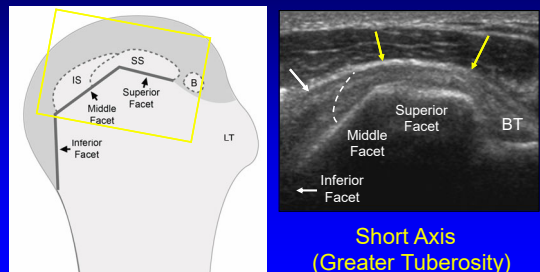


Long Axis

Short Axis
(Greater Tuberosity)

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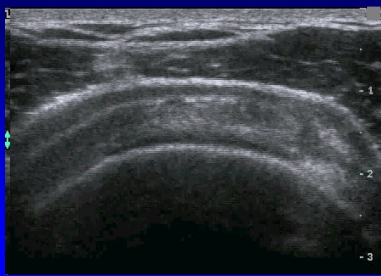
Supraspinatus and Infrapinatus Tendons



Short Axis
(Greater Tuberosity)

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Supraspinatus and Infraspinatus Tendons



Short Axis

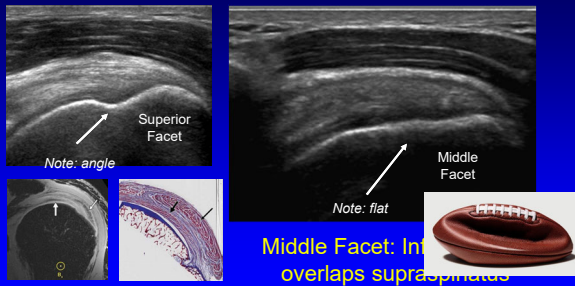
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Supraspinatus - Infraspinatus Junction

- 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

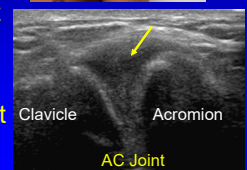


From: Chang EY et al. AJR
2014; 202:w376

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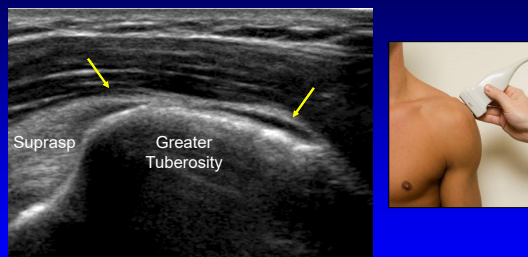
Technique: position #4

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



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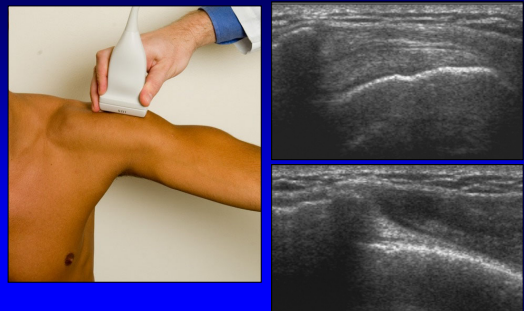
Subacromial-subdeltoid Bursa



Coronal

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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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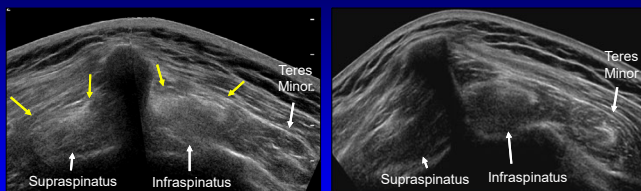
A. Infraspinatus Tendon & Posterior Labrum



Infraspinatus: Long Axis

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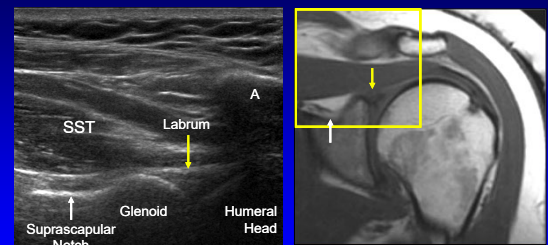
B. Atrophy: supraspinatus and infraspinatus



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
- Important landmarks:
 - Greater tuberosity facet anatomy
 - Rotator interval
- Pitfalls:
 - Anisotropy
 - Incomplete evaluation of supraspinatus

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Thank you!

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

Twitter handle: @jjacobsn

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