

Ultrasound Basics and the 13 Point Shoulder Exam

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R3 Medical Training

Overview

Ultrasound Basics (7 slides)
Shoulder Orientation
13 Point Shoulder Exam

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What Are Ultrasound Advantages?

- Images muscle, soft tissue, and bone surfaces
- Provides dynamic, “live” images
- No known long term side effects
- Portable, relatively inexpensive
- High spatial resolution (1mm) with high frequency transducers
- Effective visualization of the postsurgical rotator cuff - not degraded by implants like MRI

What Are Ultrasound Disadvantages?

- Can't see “thru” bone or gas
- Relatively limited depth of penetration
- Operator dependent imaging modality
- Hardware dependent imaging modality
- No scout image as with CT or MRI

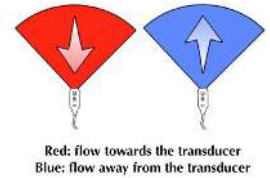
Basic US Concept

- Higher frequency transducers
 - Better resolution, less penetration
- Lower frequency transducers
 - Worse resolution, better penetration

How Does Ultrasound Work?

- The US wave is partially reflected when it hits a density change in the body
- The amount of the reflection depends on the density difference (impedance difference)
 - Large density difference - large reflection, “bright echo”
 - Small density difference - small reflection, “grayer”

Ultrasound Modes



- A-Mode
single transducer, scans one line
- B-Mode (musculoskeletal scanning)
linear phased array transducer, scans a body plane
- M-Mode (cardiac scanning)
rapid sequence B mode scans (motion mode)
- Doppler Mode (color doppler-directional, power doppler-nondirectional)
determines motion towards or away from transducer

How Does Ultrasound Work?

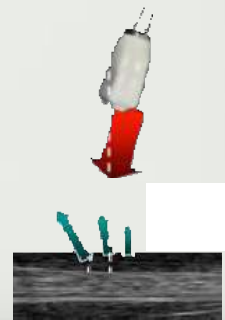
Anisotropy

An artifact found on sonograms of tendons

If the probe is not held with the surface parallel to the tendon, US reflection is not back towards the probe and the tendon appears falsely hypoechoic.



This hypoechoic appearance is eliminated with proper transducer orientation (realignment)



Ultrasound Knobs

Main Study Controls

- Depth (2cm -6cm)
- Gain (near, far)
- Freeze Image
- Video Clip
- Save Image
- Needle Guidance



Basic Ultrasound Vocabulary

Hyperechoic - “whiter signal”

Hypoechoic – “darker signal”

Anechoic – “no signal”, black



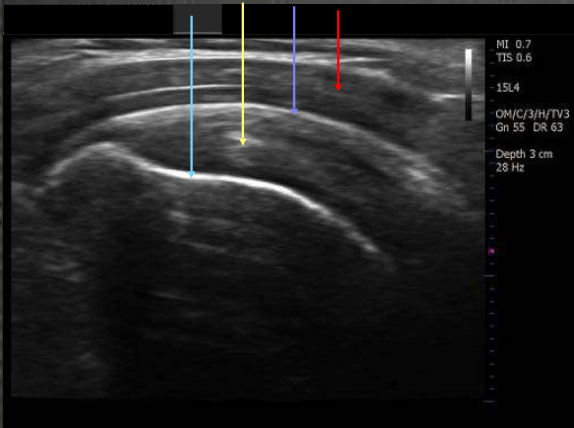
Anisotropy

Structures appear more hypoechoic if the transducer is not perpendicular to the structure being examined

Orientation

Right Supraspinatus Tendon

Ultrasound



MRI

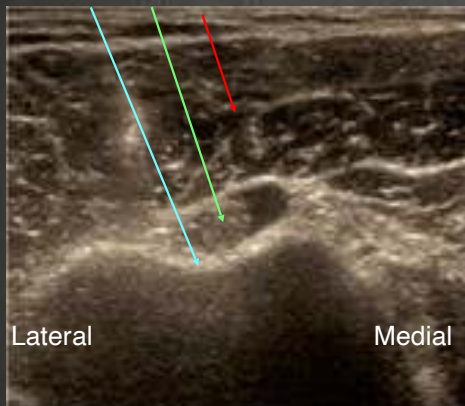


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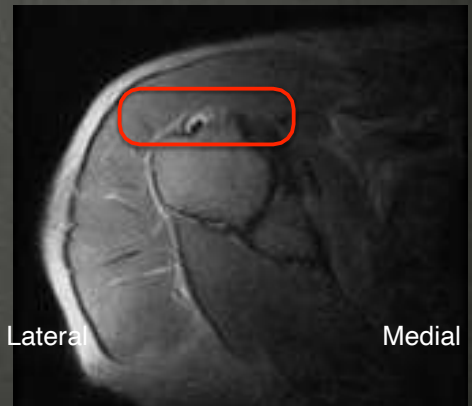
Orientation

Right Supraspinatus Tendon

Ultrasound



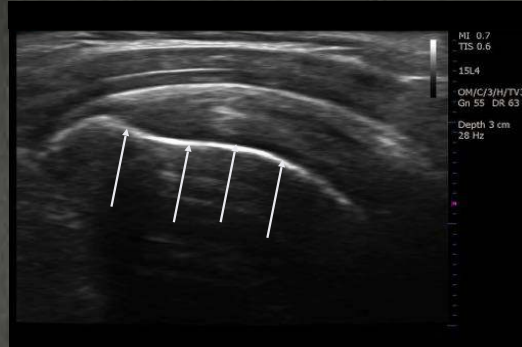
MRI



Axial/Short Axis View

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Ultrasound Scanning Tips



Expose shoulder(s)

Positioning - sit/stand behind the patient facing monitor

Darken the room

“Focus” the image by finding the bony cortex first

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The 13 Point Shoulder Ultrasound Examination©

By Don Buford, MD and Ben DuBois, MD
www.orthosono.com

<p>Point 1 Primary Structure - Interscapular long head biceps tendon</p>	<p>Point 2 Primary Structure - Longitudinal long head biceps tendon</p>
<p>Point 3 Primary Structure - Longitudinal acromioclavicular tendon</p>	<p>Point 4 Primary Structure - Interscapular acromioclavicular tendon</p>
<p>Point 5 Primary Structure - Interscapular subscapularis tendon</p>	<p>Point 6 Primary Structure - Longitudinal anterior subscapularis tendon</p>
<p>Point 7 Primary Structure - Interscapular acromioclavicular tendon</p>	<p>Point 8 Primary Structure - Interscapular anterior subscapularis tendon</p>
<p>Point 9 Primary Structure - Interscapular posterior subscapularis tendon</p>	<p>Point 10 Primary Structure - Longitudinal infraspinatus tendon</p>
<p>Point 11 Primary Structure - Interscapular infraspinatus tendon</p>	<p>Point 12 Primary Structure - posterior 2-3 cm distal, longitudinal infraspinatus tendon</p>
<p>Point 13 Primary Structure - Acromioclavicular Joint</p>	

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The 13 Point Exam

Point 1: Transverse biceps tendon in the bicipital groove (axial)

Point 2: Longitudinal biceps tendon (sagittal)

Point 3: Longitudinal subscapularis tendon (axial)

Point 4: Transverse subscapularis (sagittal)

Point 5: Longitudinal coracoid and subscapularis (axial)

Point 6: Longitudinal anterior supraspinatus (coronal)

Point 7: Longitudinal posterior supraspinatus (coronal)

Point 8: Transverse anterior supraspinatus (sagittal)

Point 9: Transverse posterior supraspinatus (sagittal)

Point 10: Longitudinal infraspinatus (axial)

Point 11: Transverse infraspinatus (sagittal)

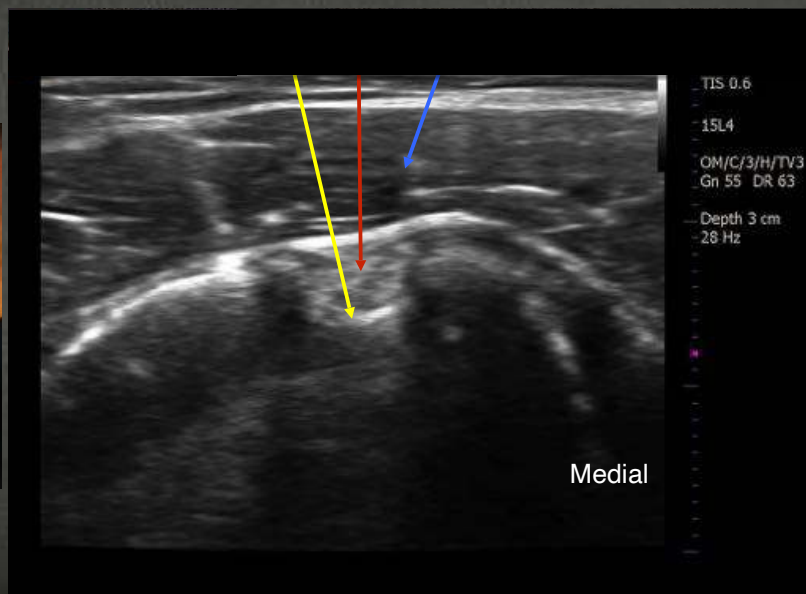
Point 12: Posterior glenohumeral joint and labrum (axial)

Point 13: Acromioclavicular joint (coronal)

(.....) = corresponding MRI orientation

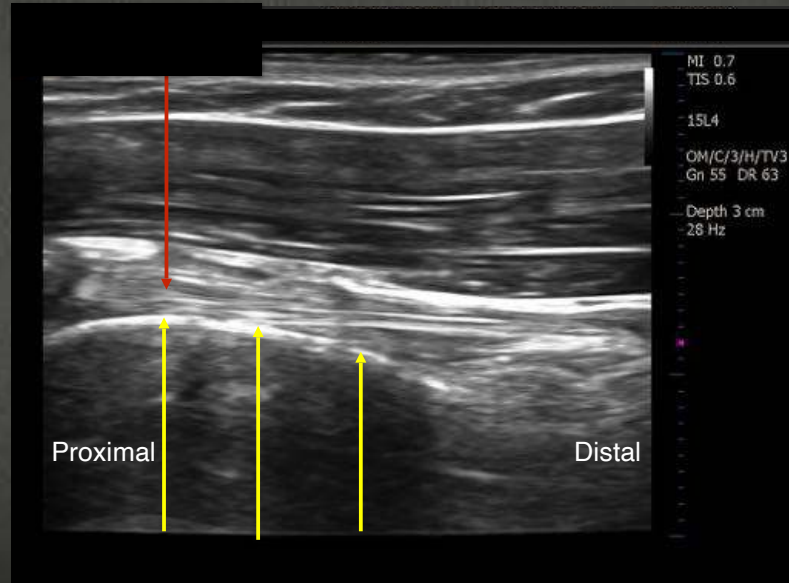
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Point 1 - Long head biceps tendon (axial/short axis view)

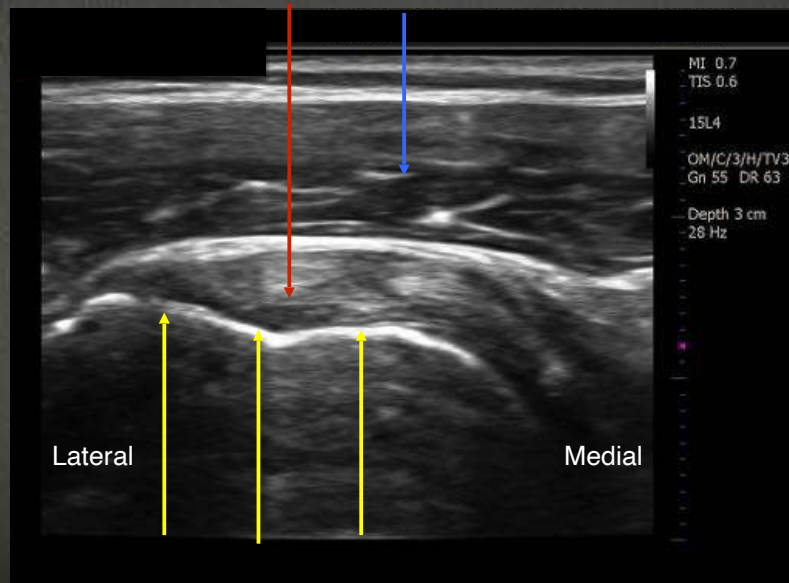


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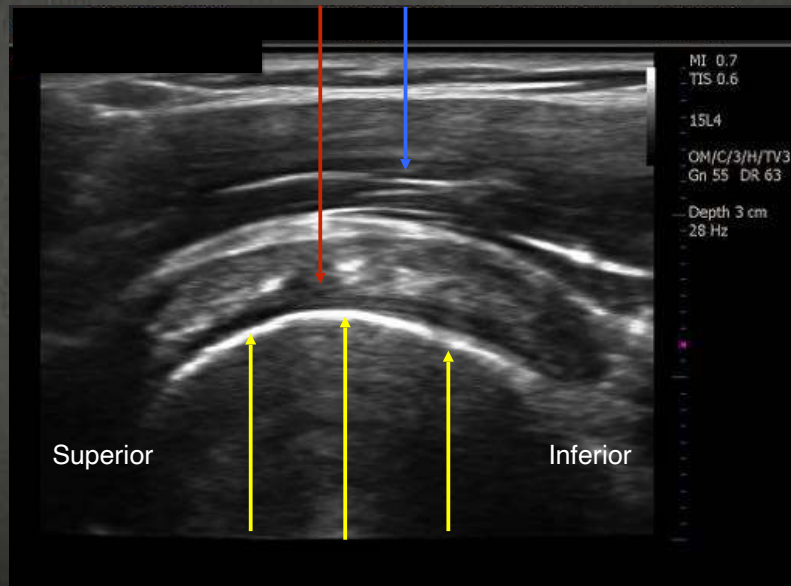
Point 2 - Long head biceps tendon (sagittal/long axis view)



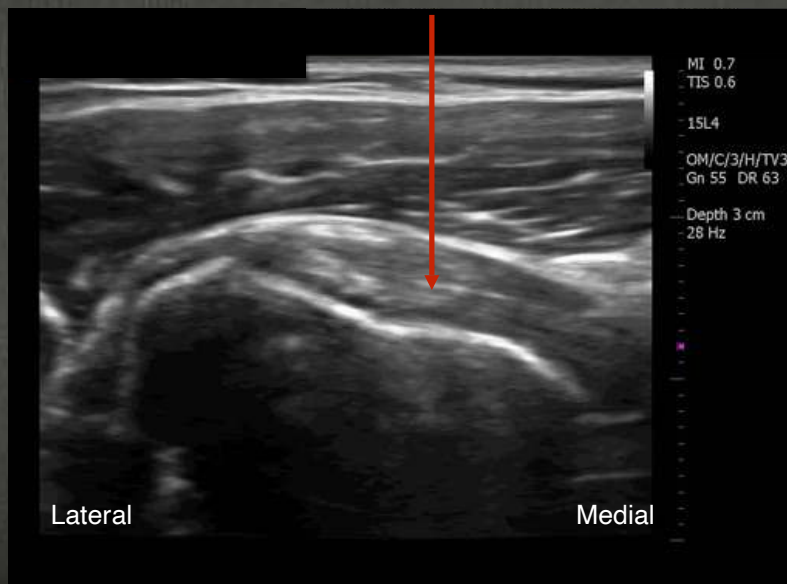
Point 3 - Subscapularis tendon (axial/long axis view)



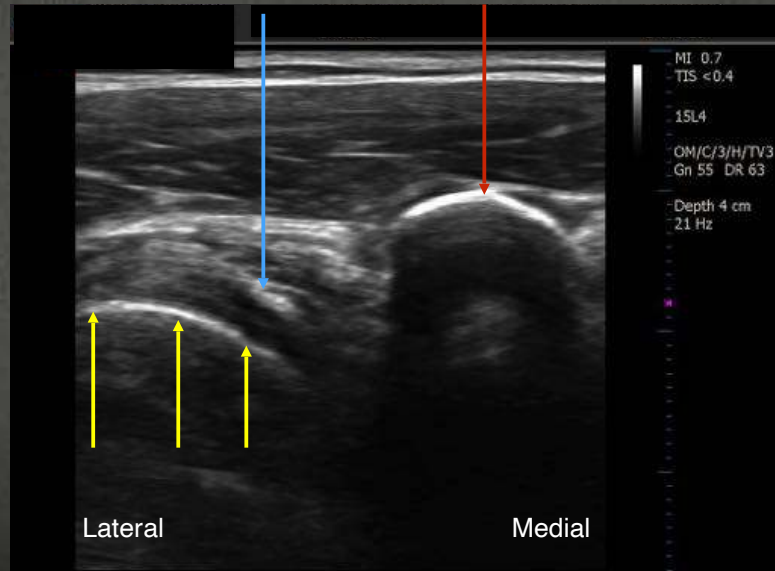
Point 4 - Subscapularis tendon (sagittal/short axis view)



Point 3 - Live Subscapularis tendon (axial/long axis view)

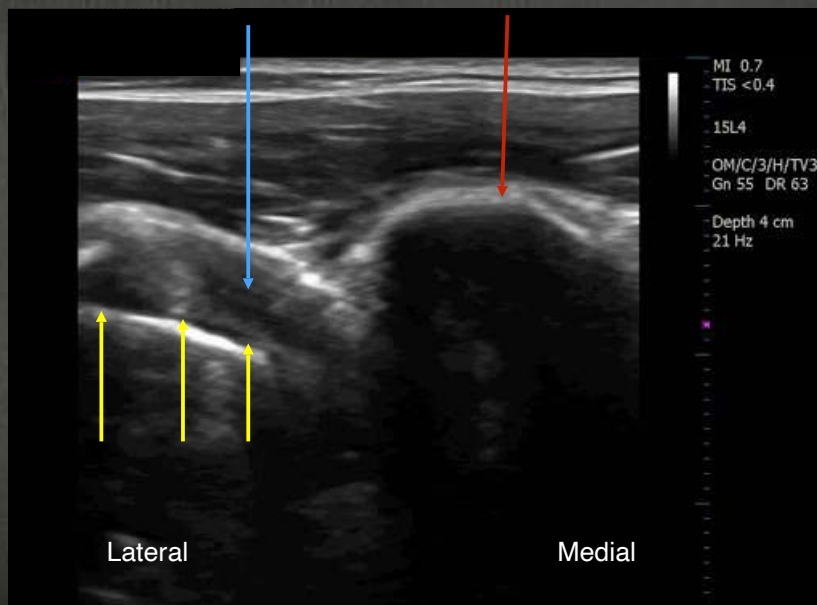


Point 5 - Subscapularis tendon & coracoid (axial/longitudinal view)



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Live Point 5 - Subscapularis tendon & Coracoid (axial/longitudinal view)



The 13 Point Shoulder Exam

The next 4 points cover the lateral shoulder

Point 6: Longitudinal anterior *supraspinatus* (**coronal**)

Point 7: Longitudinal posterior *supraspinatus* (**coronal**)

Point 8: Transverse anterior *supraspinatus* (**sagittal**)

Point 9: Transverse posterior *supraspinatus* (**sagittal**)

Main Structure: supraspinatus tendon

(.....) = corresponding MRI orientation

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Point 6 & 7 - Supraspinatus tendon (coronal/long axis view)



Patient positioning

Hand as posterior as possible on hip,
pointing straight ahead

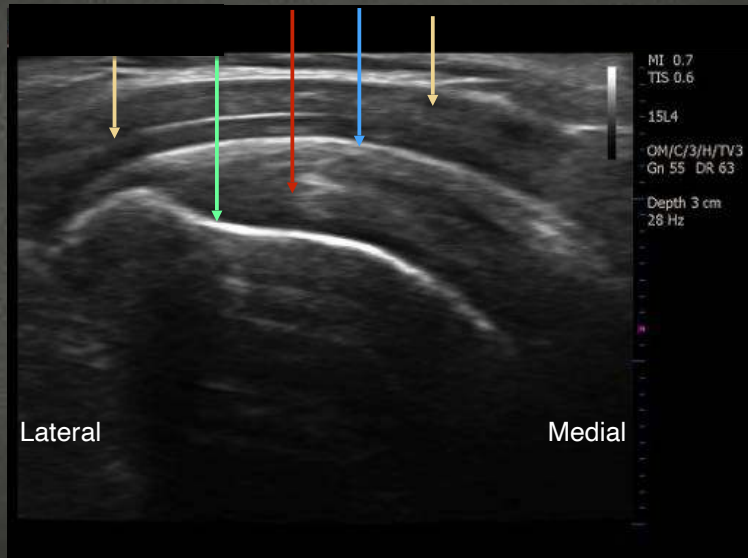
Elbow as adducted as comfortable

Transducer position

Transducer aligned parallel to line connecting
contralateral shoulder to ipsilateral hip
(red line on image)

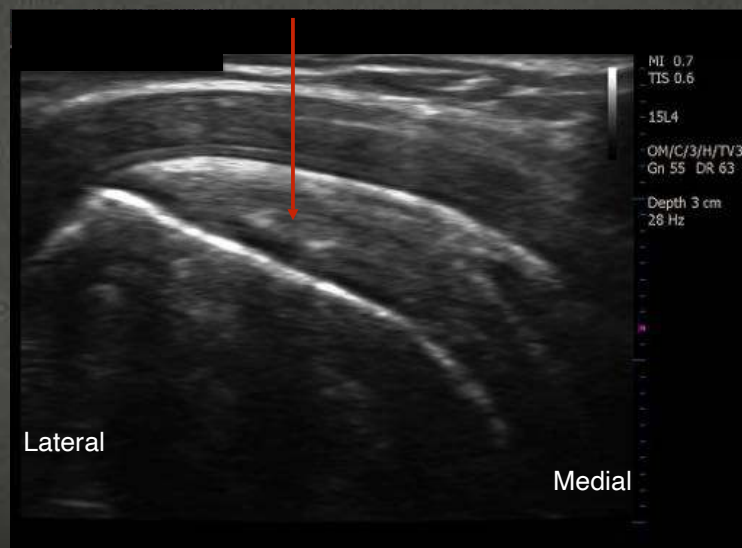
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Point 6 - Anterior Supraspinatus tendon (coronal/long axis view)



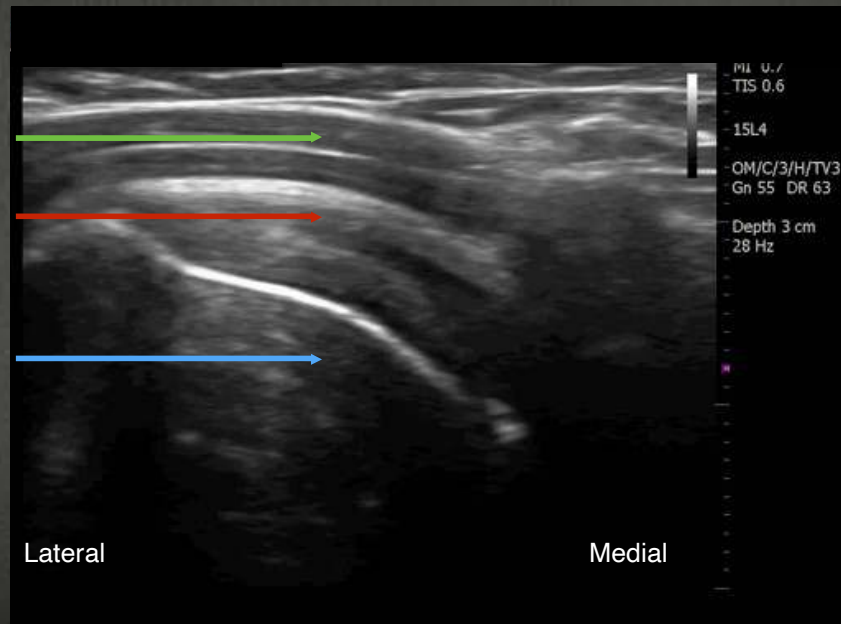
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Point 7 - Posterior Supraspinatus tendon (coronal/long axis view)



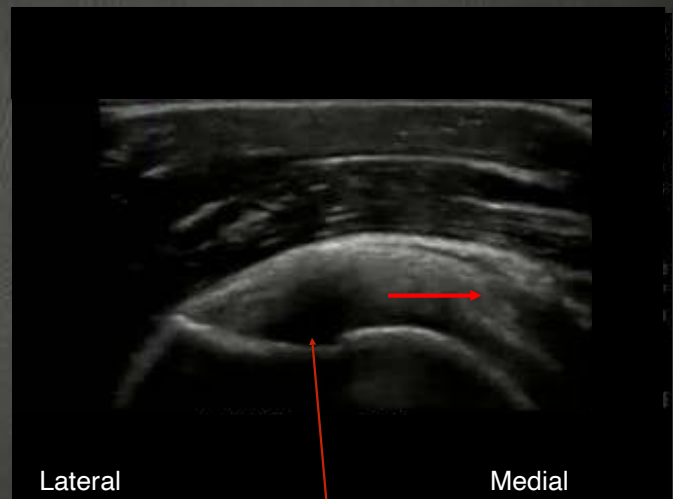
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Live Point 6 - Anterior Supraspinatus tendon (coronal/longitudinal view)



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Point 6 - Anterior Supraspinatus tendon - stress test (coronal/long axis view)



* Helpful for diagnosis of partial thickness Supraspinatus tears

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Point 6 - Anterior Supraspinatus tendon (coronal/longitudinal view)



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Point 8 & 9 - Supraspinatus tendon (sagittal/short axis view)



Patient positioning

Hand as posterior as possible on hip,
pointing straight ahead

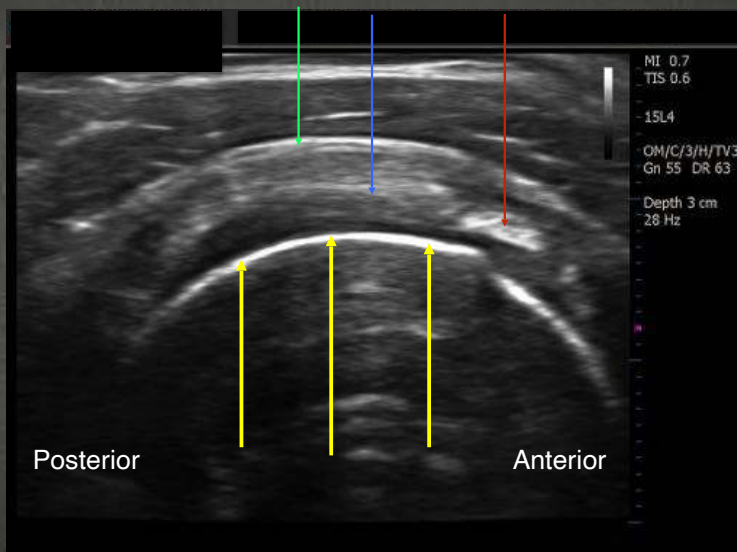
Elbow as adducted as comfortable

Transducer position

Transducer aligned parallel to line
connecting ipsilateral shoulder to
contralateral hip (red line on image)

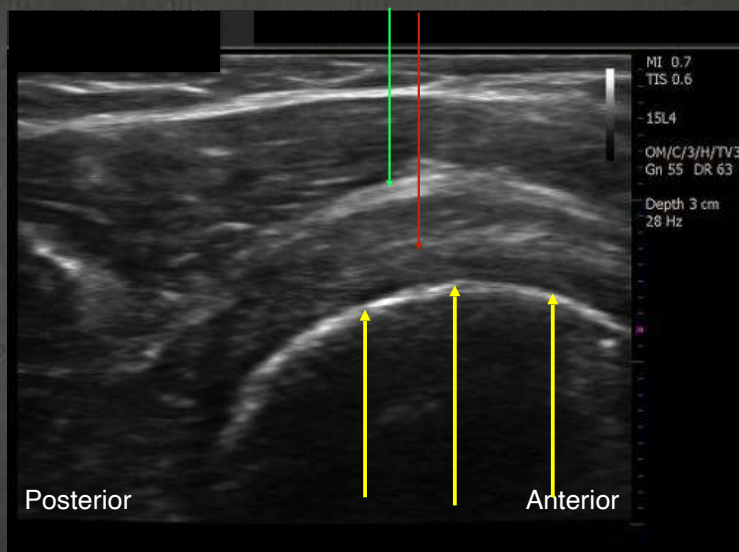
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Point 8 - Anterior Supraspinatus tendon (sagittal/short axis view)



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Point 9 - Posterior Supraspinatus tendon (sagittal/short axis view)



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The 13 Point Shoulder Exam

The next 3 points cover the posterior shoulder

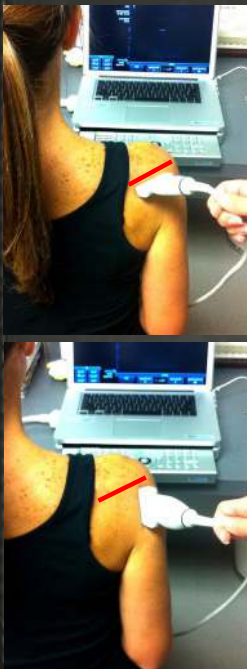
Point 10: Axial, long axis infraspinatus (**axial**)
Point 11: Sagittal short axis infraspinatus (**sagittal**)
Point 12: Posterior glenohumeral joint (**axial**)

Main Structures: infraspinatus tendon, glenohumeral joint

(.....) = corresponding MRI orientation

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Point 10 -12 Infraspinatus tendon



Patient positioning

Hand resting on inner thigh
Elbow flexed 90 degrees

Transducer position

Point 10 & 12

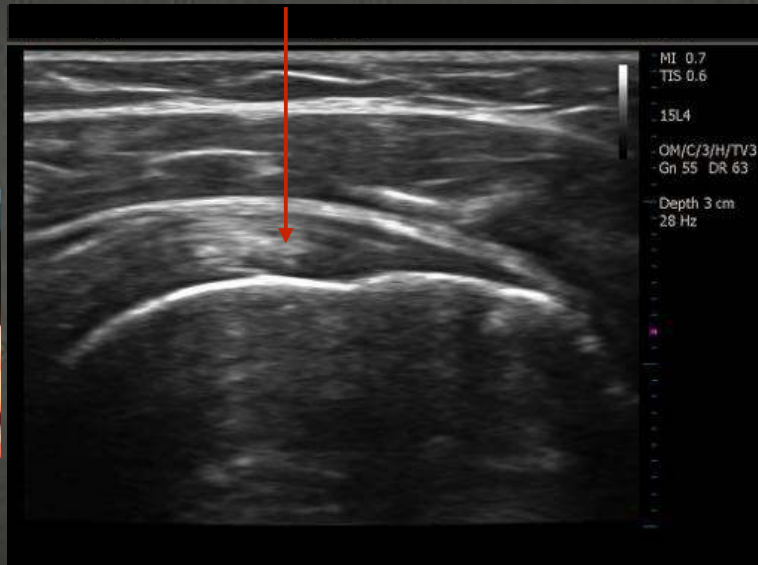
Transducer aligned parallel and inferior to scapular spine

Point 11

Transducer aligned vertically inferior to scapular spine

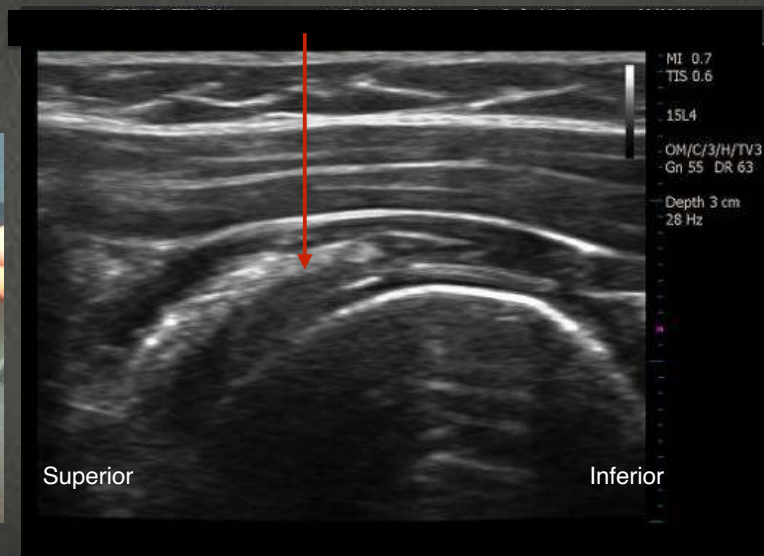
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Point 10 - Infraspinatus tendon (axial/long axis view)



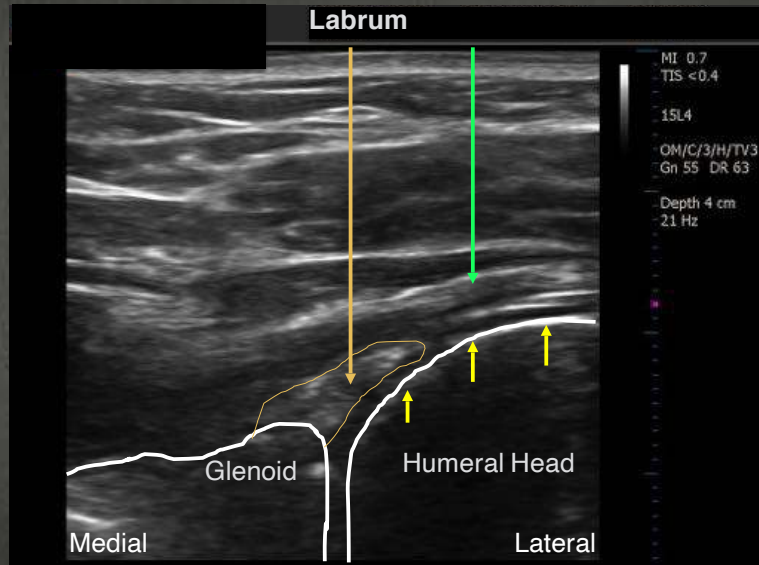
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Point 11 - Infraspinatus tendon (axial/long axis view)



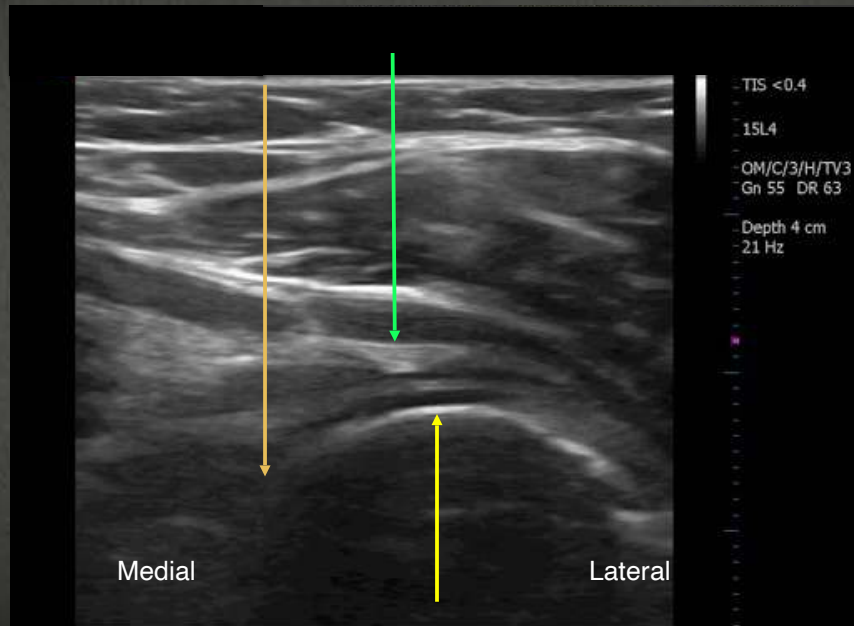
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Point 12 - Posterior Glenohumeral Joint (axial joint view)



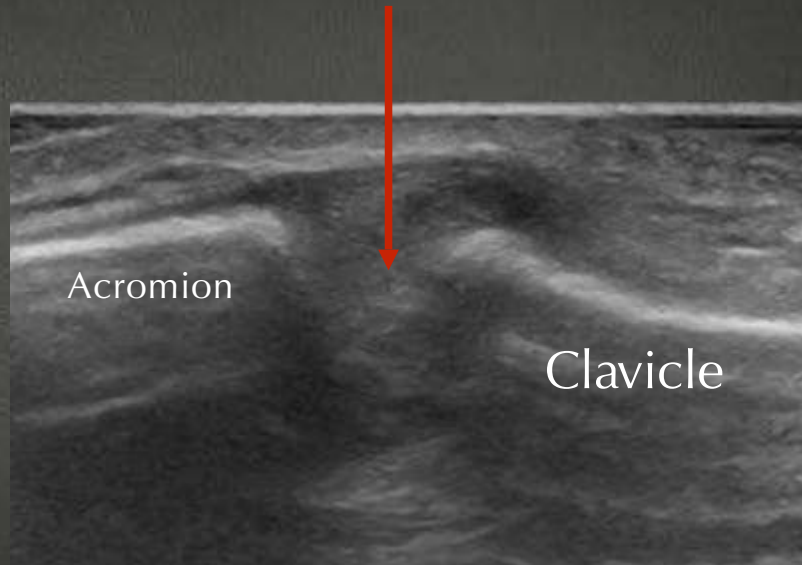
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Live Infraspinatus/ Posterior Glenohumeral Joint



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Point 13 - AC Joint (coronal view)



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Summary

Have a routine exam protocol

Standardizes scanning

Simplifies documentation

Improves diagnostic sensitivity

Improves image guidance

Time for the 13 Point Exam: 5-15 minutes

Practice!

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