Shoulder Ultrasound

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Disclosure

- Non-Declaration Statement: I have no relevant relationships with ineligible companies to disclose within the past 24 months

Acknowledgement

- Patrick R Myers RMSK
- Jacobson, Jon. Fundamentals of Musculoskeletal Ultrasound. 3rd Ed. 2018
- Evan Peck, MD

Shoulder Checklist

- **Anterior**
  - Long Head Bicep Tend
  - Subscapularis
- **Superior**
  - AC Joint
- **Posterior Exam**
  - Infraspinatus
  - Spinoglenoid notch
  - Posterior labrum
  - Teres Minor
- **Anterolateral Exam**
  - Supraspinatus
  - Subacromial Bursa
  - Rotator Interval
- Long and Short Axis views
- Consider Dynamic scanning

Scanning Tips

- Get comfortable
  - Adjust height of scanning table
  - Undress and position patient for comparison scanning.
  - Implement split screen for comparison
- Use plenty of gel
  - Acoustic contact is difficult

Scanning Tips

- Long (LAX) and Short (SAX) axis of anatomy.
- Use anisotropy
  - identify tendon vs. vessel or fluid
- Adjust focal zone position at desired anatomy
- Select appropriate transducer for the job!

MRI

- Accepted as “gold” standard
- Currently the most lucrative
- Partial tears - Gadolinium (GD)
  - Fluoro charge
  - Charge for contrast
  - MRI technical charge
  - Professional charge
  - $2000.00 *charge*

US vs. MRI

- Difficult to detect partial tears with certain magnets
- MRI unable to accomplish “dynamic” scan
  - Dynamic scanning emphasizes pathology
- Portability

Normal Anatomy
Rotator Cuff

Shoulder (technique-anatomy)

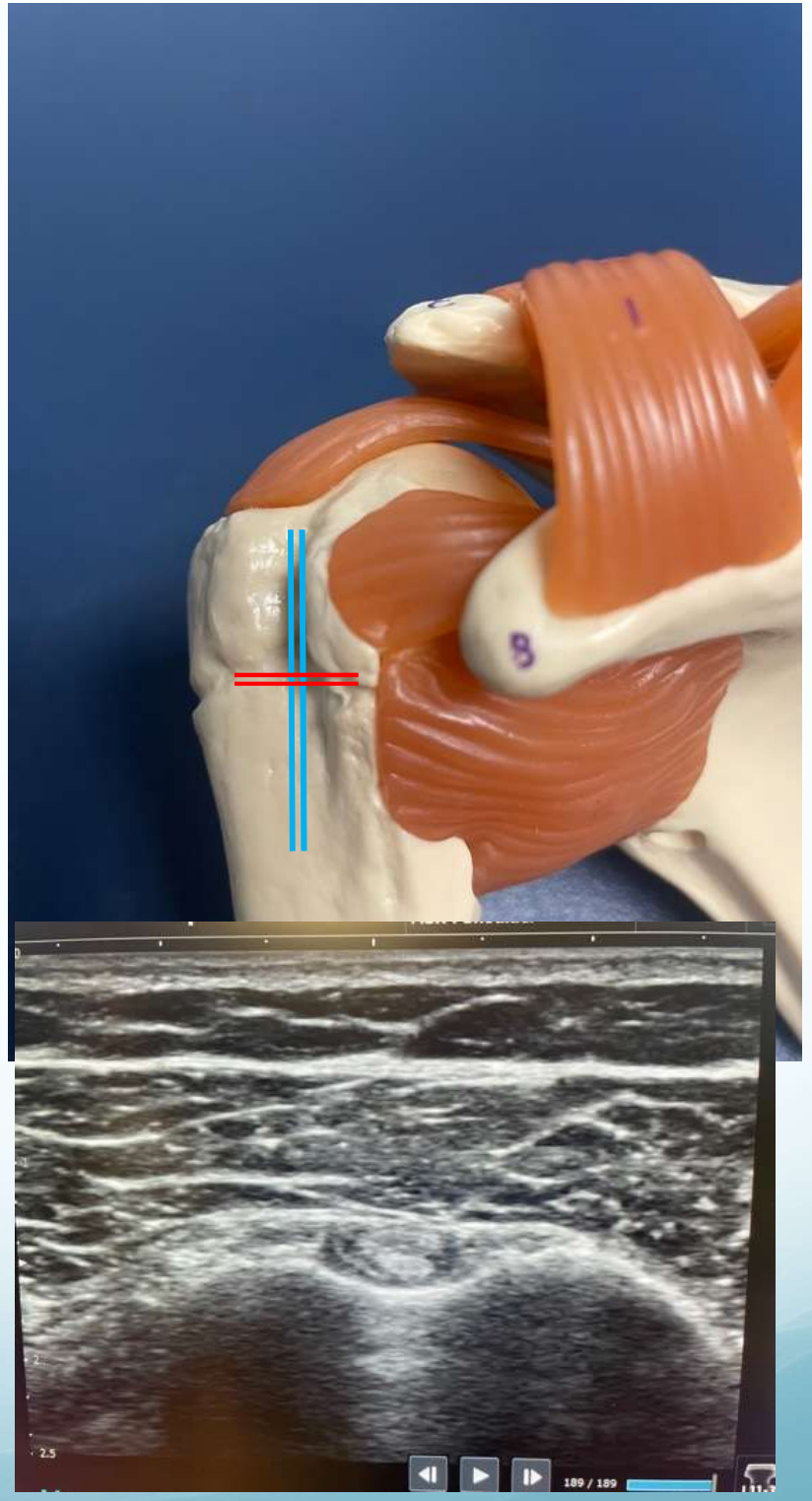
- BT - biceps tendon
- SCT - subscapularis tendon
- Sub-Deltoid, Sub-Acromion Bursa (SAB)
- SST- supraspinatus tendon
- IST - infraspinatus tendon
- Posterior glenoid labrum
- AC joint - fluid
- Glenoid notch

Technique

- Face patient
- 7.5 - 13 MHz probe
- LAX and SAX of all tendons and pathology
- Dynamic scanning
- Use bone landmarks
- Clinical history
- Bilateral only if indicated
- Compression - fluid

Biceps Tendon (BT)

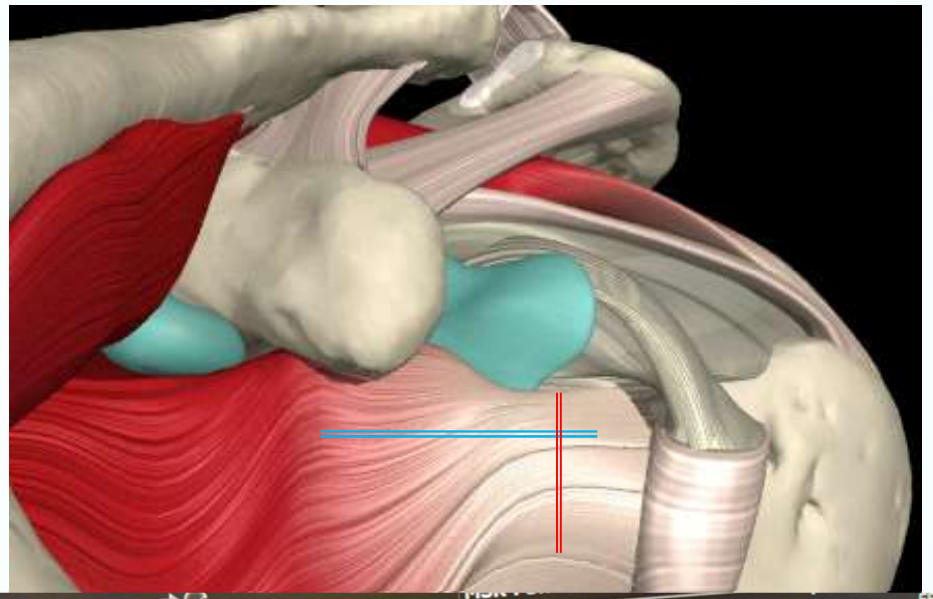
- Two heads
  - Long head passes through the bicipital groove.
  - Descends ventral shaft of the humerus to the biceps muscle.
- Separates the SCT from the SST
- Ventral boundary is the transverse humeral ligament



Bicep Tendon

Subscapularis Tendon

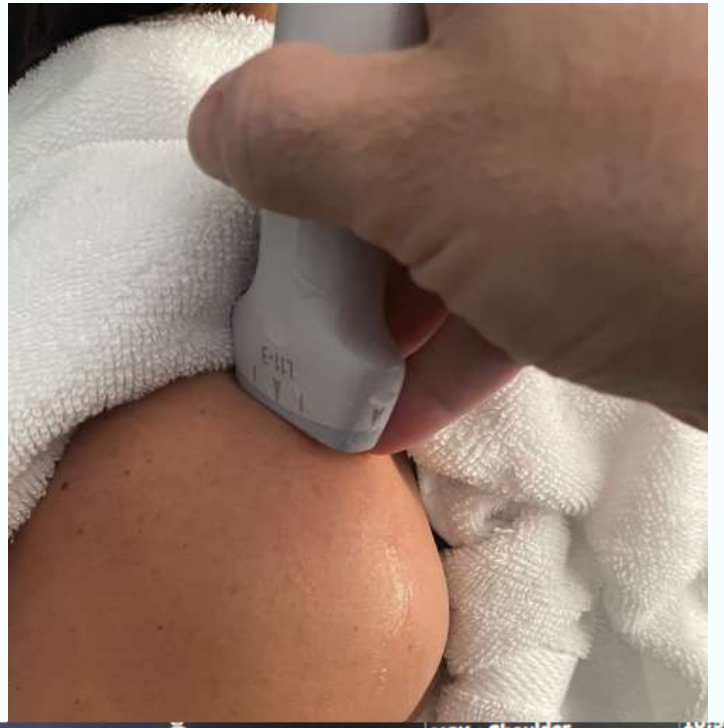
- Medial aspect of the rotator cuff
- Seldom involved in tears.
- Corocoid process of the scapula is the bone landmark superiorly.
- Multi-fascicle investment is unique.
  - source for false-positive diagnosis
- Long head of the BT separates the SST from the SCT.

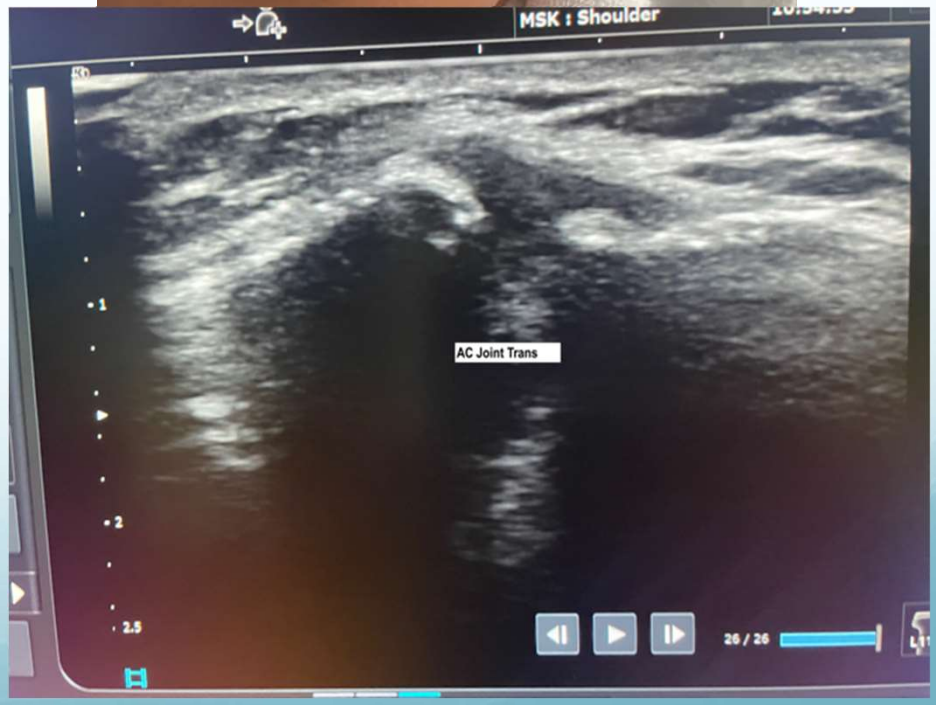



SUBSCAPULARIS
Asymptomatic
FULL THICKNESS TEAR
SUBSCAP LOCATION
Symptomatic
2
3
4

AC Joint

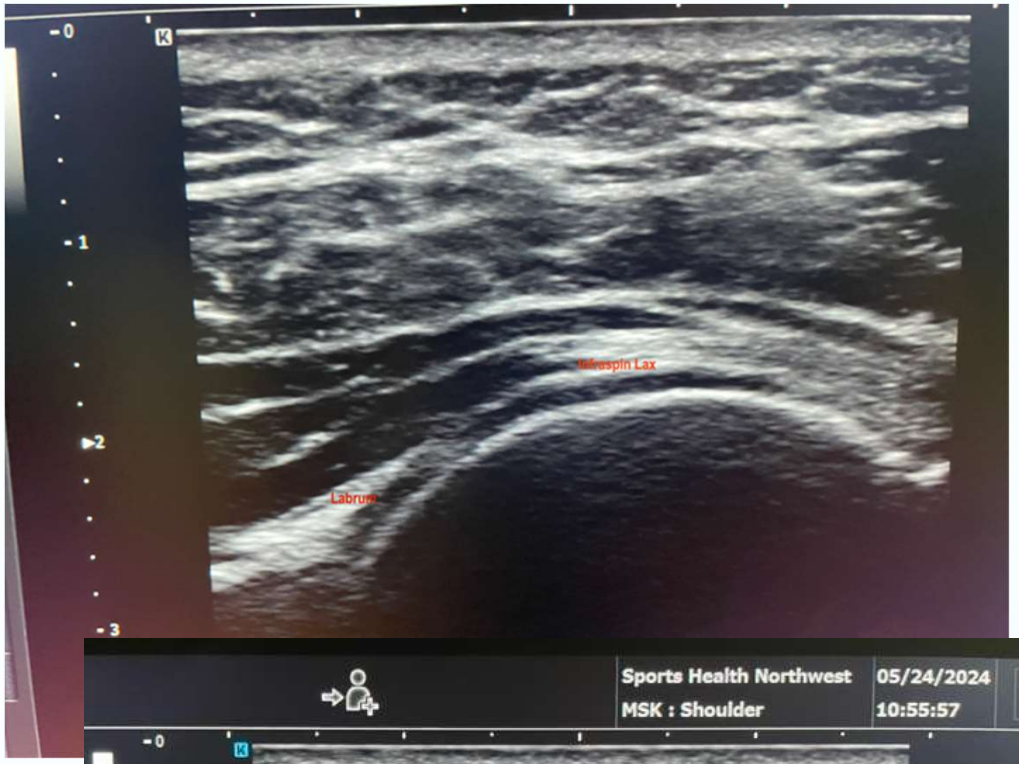
- Acromioclavicular joint is imaged for fluid
- May provide a small window for imaging the distal SST.
- Acromion is the superior bone landmark for SST.





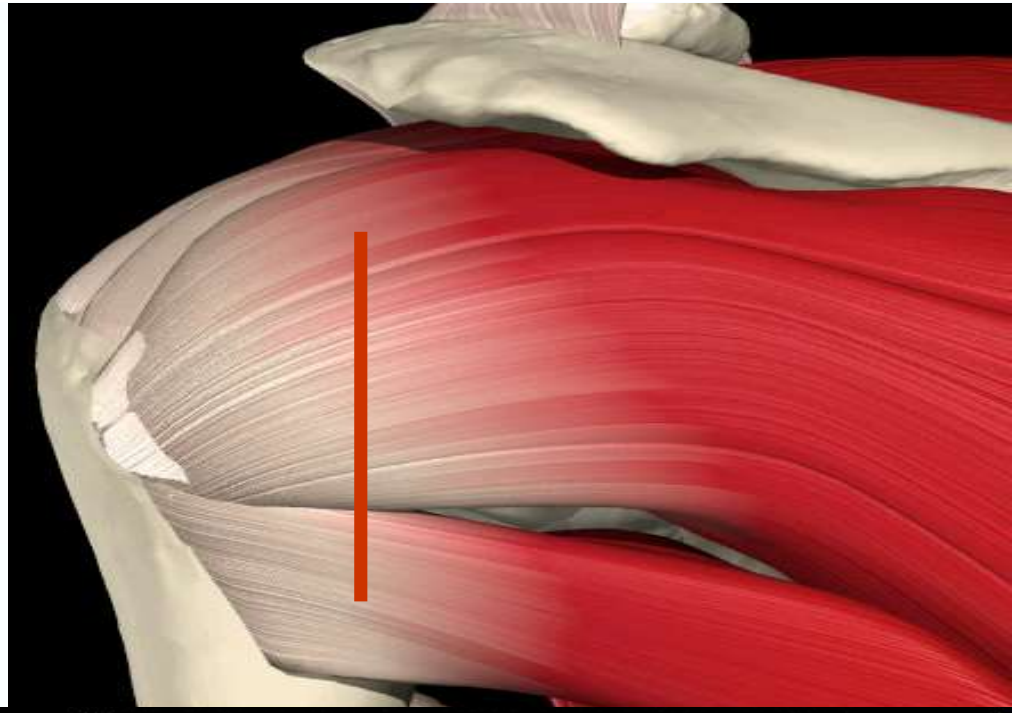
Infraspinatus & Teres Minor

- Lateral and posterior support of the shoulder inserts on the lateral aspect of the greater tubercle.
- Infrequently involved in injury
- Teres minor lies inferior to the IST

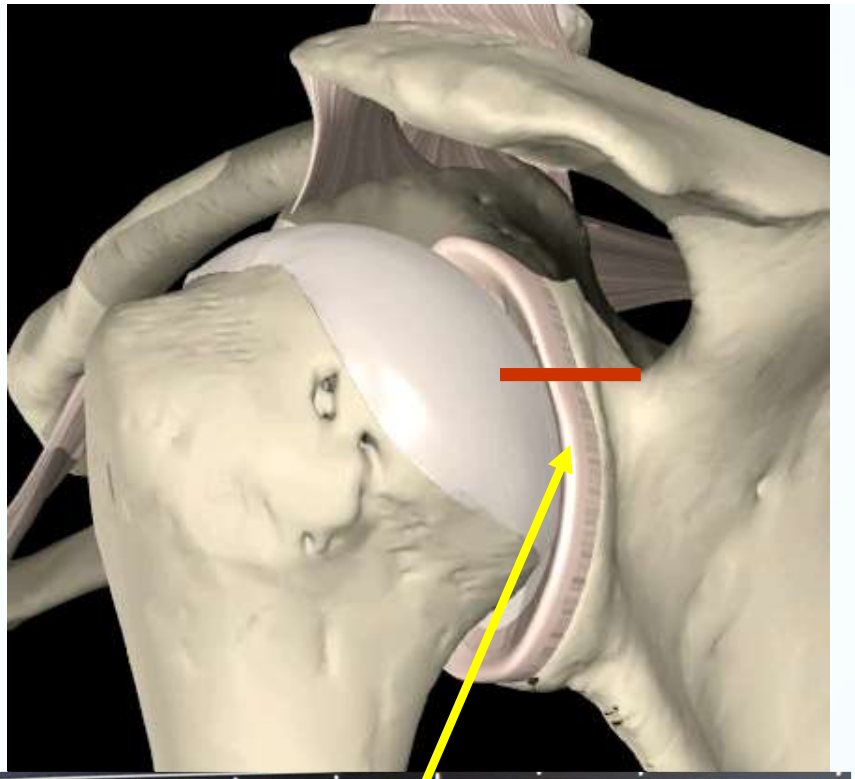


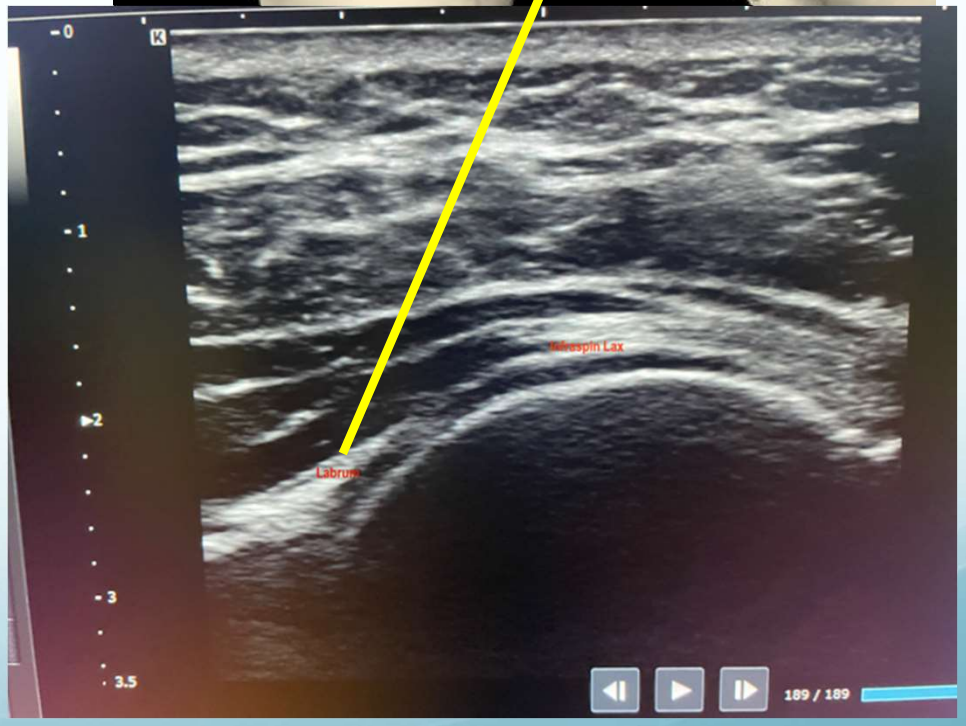
Infraspinatus Tendon/ Teres Minor

- Lateral and posterior support of the shoulder inserts on the lateral aspect of the greater tubercle.
- Infrequently involved in injury.
- Teres minor lies inferior to the IST.
  - has a bright band running through it.



Glenoid Labrum Posterior



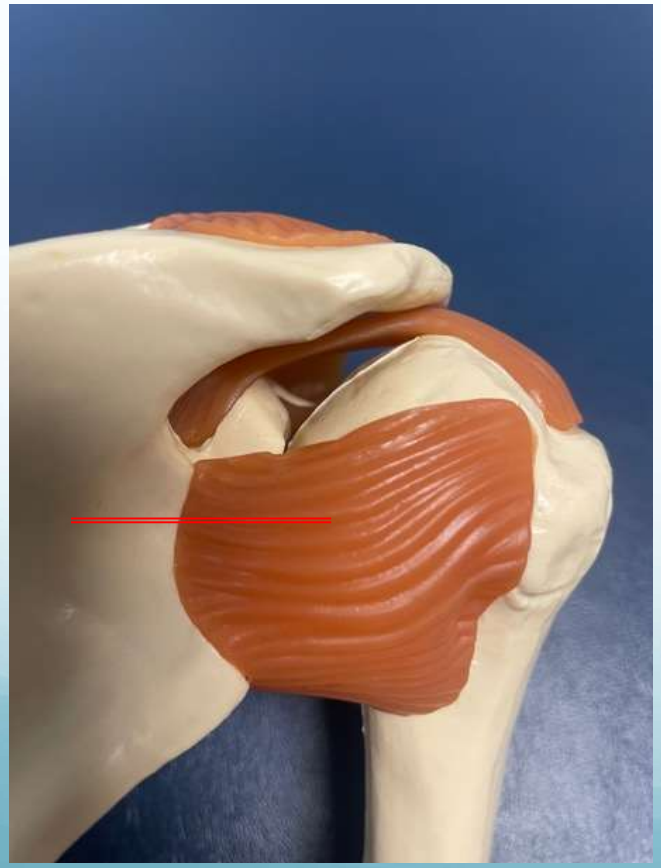


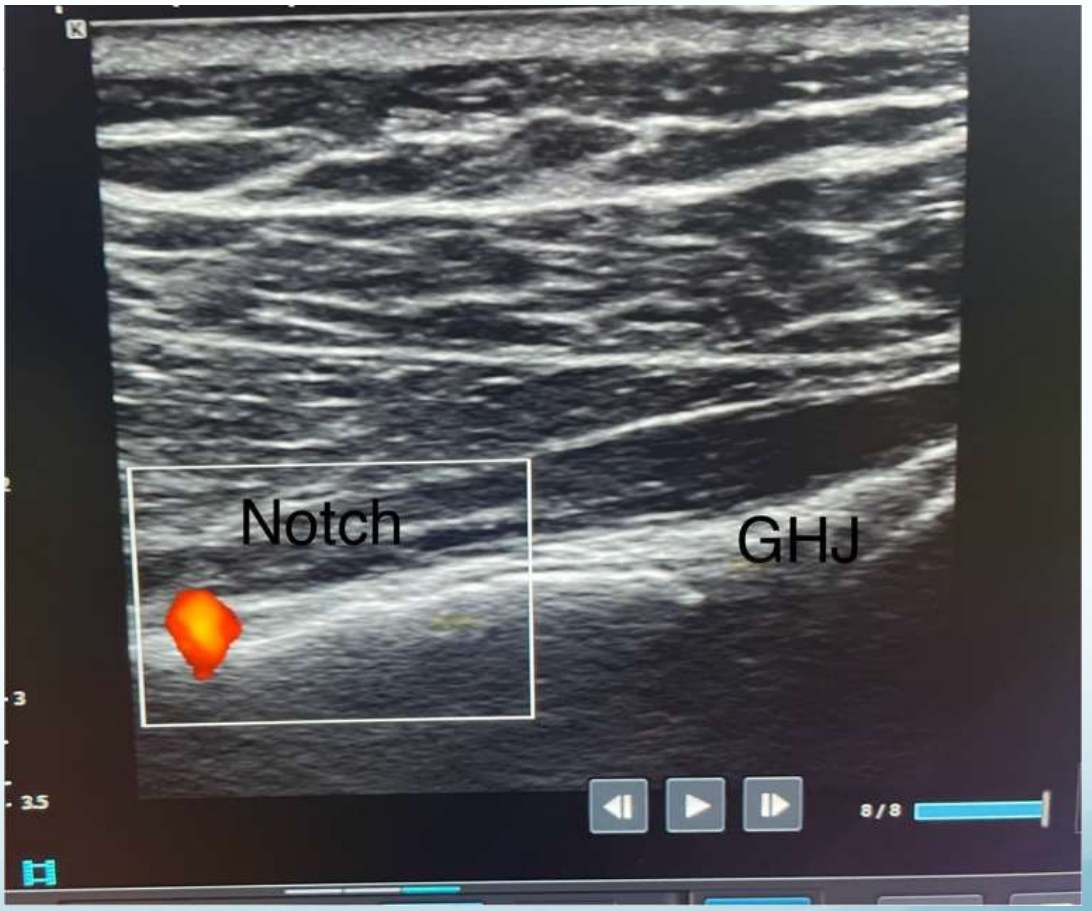
Glenoid Labrum Posterior

- Posterior and anterior labrum
- Cartilage extension of the boney labrum
- Medium echo
- In injury may contain fluid
- Posterior labrum is best seen

Scapular Notch

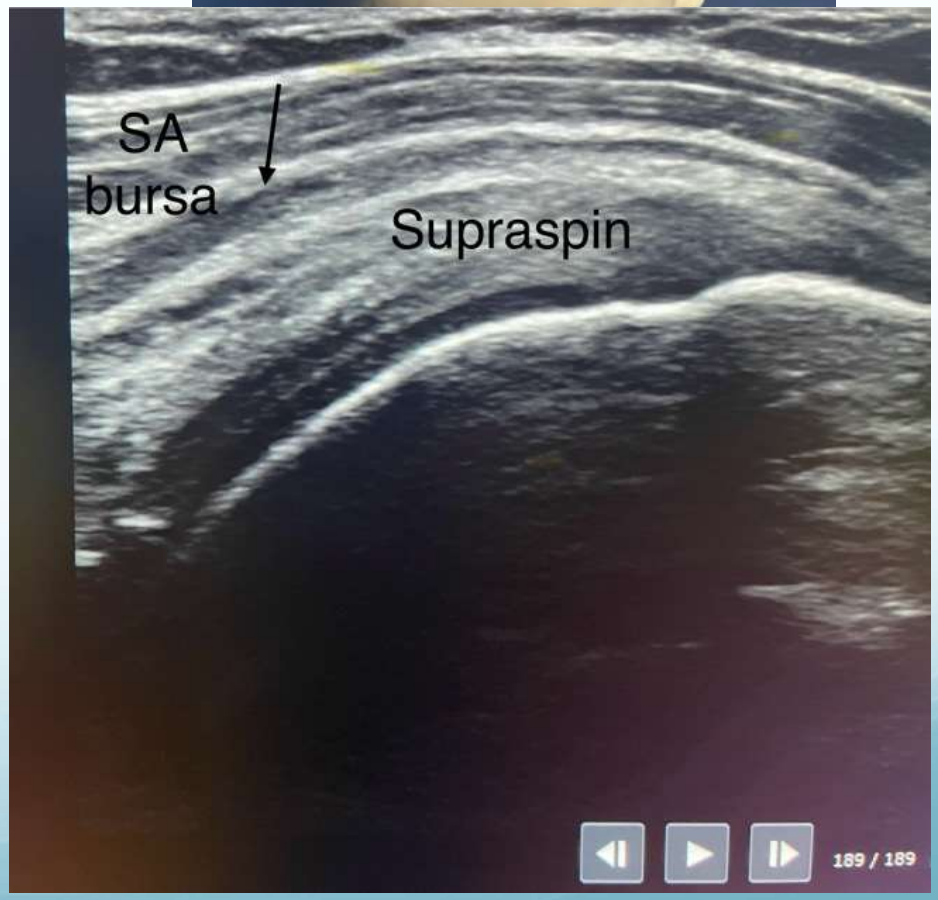
- Area of neurovascular bundle
- Location of cyst ganglions that c
  cause pain





Supraspinatus Tendon (SST)

- Attaches to the greater tubercle of the humerus
- Neck of the humerus is the bone landmark.
- Traverses beneath the AC joint. Attaches to the scapula.
- Responsible for 95% of pathology to the rotator cuff.
- 1-2 cm distal from tubercle attachment - critical zone - is where the vast majority of injury occurs.



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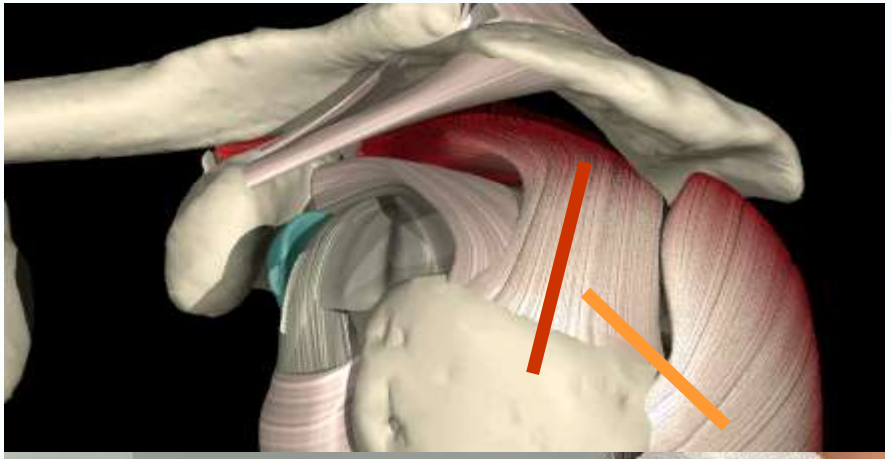
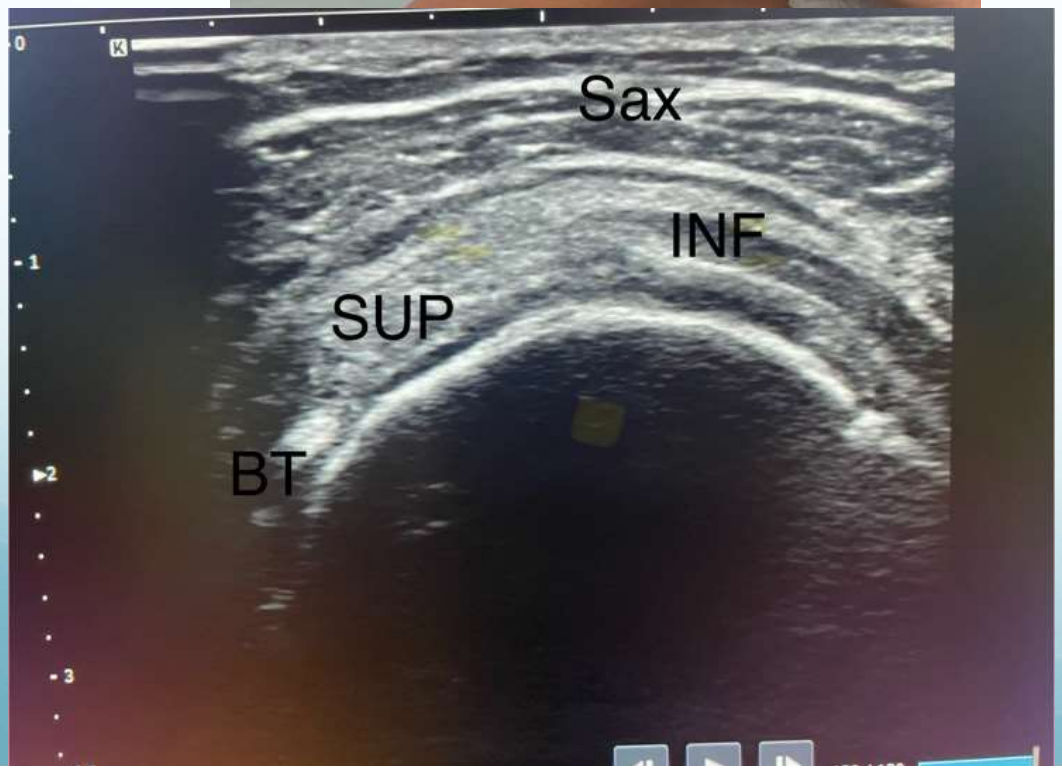




Pathology of the Rotator Cuff

Clinical Hx/ Pathology

- 70% of shoulders with tears have bone irregularities along greater tuberosity- autopsy proven
- Pain is the deciding clinical criteria
  - does the pain wake the patient at night
  - is the pain debilitating
- No normal RC past 50

Pathology - progression

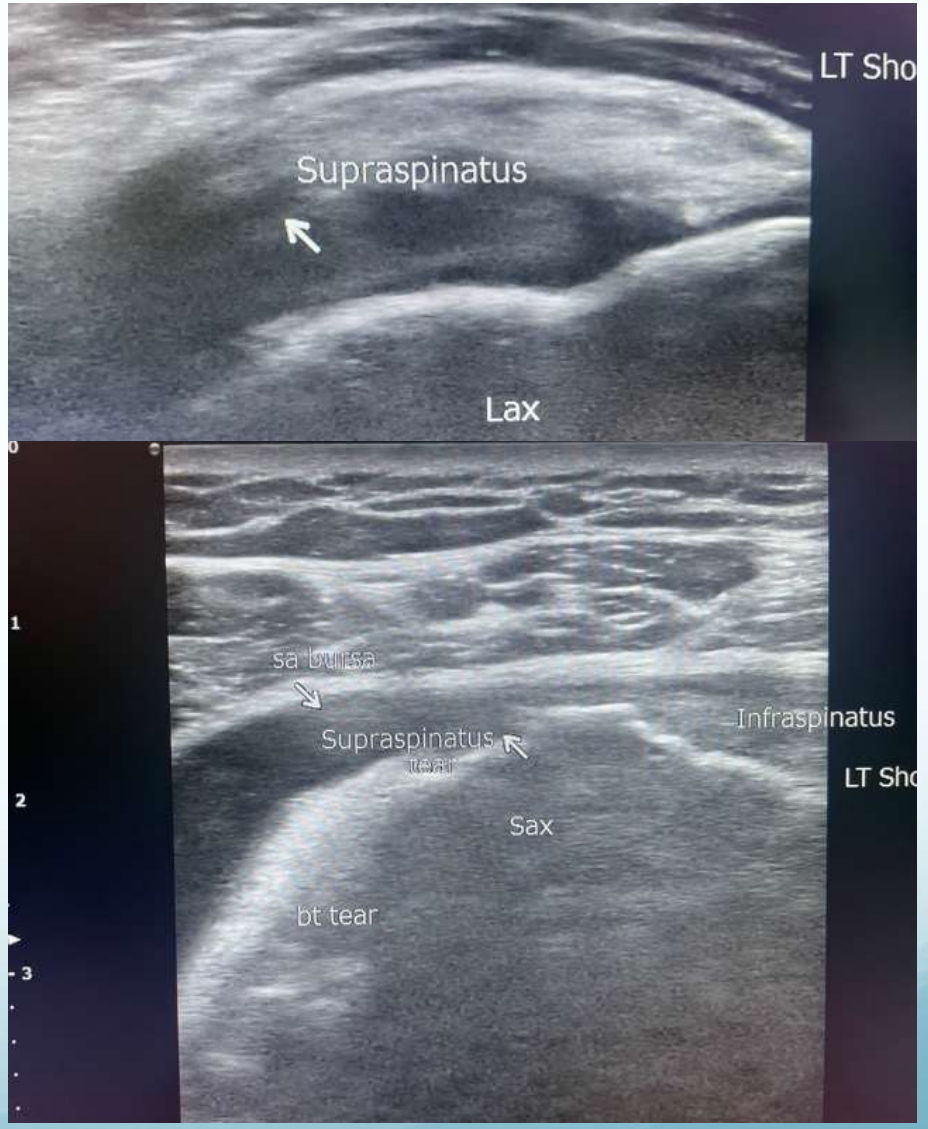
- Subdeltoid subacromion bursitis
- Tendonitis
- Intrasubstance tear
- Partial thickness tear
- Deep partial thickness tear
- Full thickness tear
- Massive full thickness tear

Inflammation (impingement syndrome)

- Acute - tendon swells/hypoechoic
  - tendon may become vascular rich
  - tendon may be weakened
- Chronic - tendon atrophies
- Bursitis - compressible fluid not communicating with the joint
- Biceps tendonitis - isolated fluid in biceps tendon sheath with swelling of the tendon

Diagnostic and Suggestive Signs of RC tear

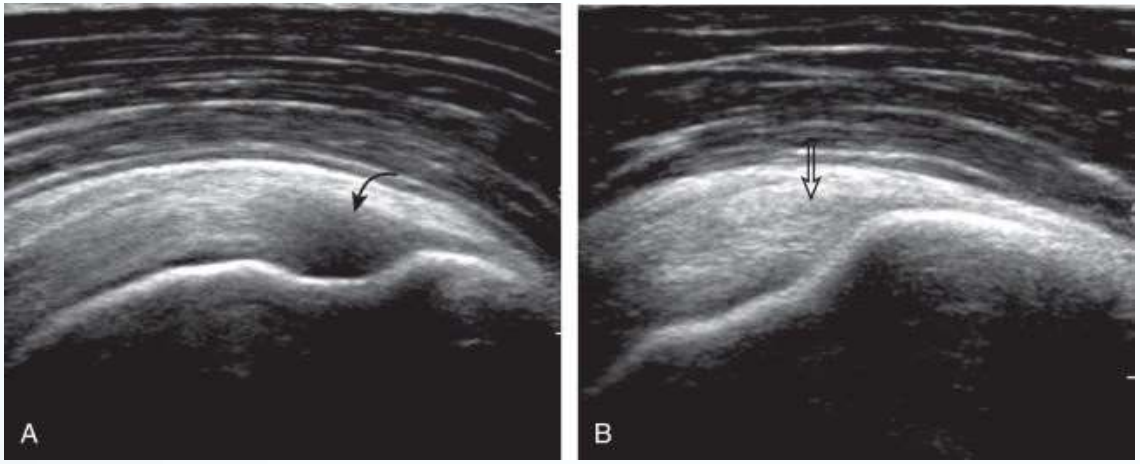
- Diagnostic
  - Complete absence of the tendon
  - Focal atrophy of the tendon
  - Hypoechoic cleft in tendon
  - Distended subdeltoid bursa with joint communication



RTC Large Retracted Tear

SS Tendonitis

Normal



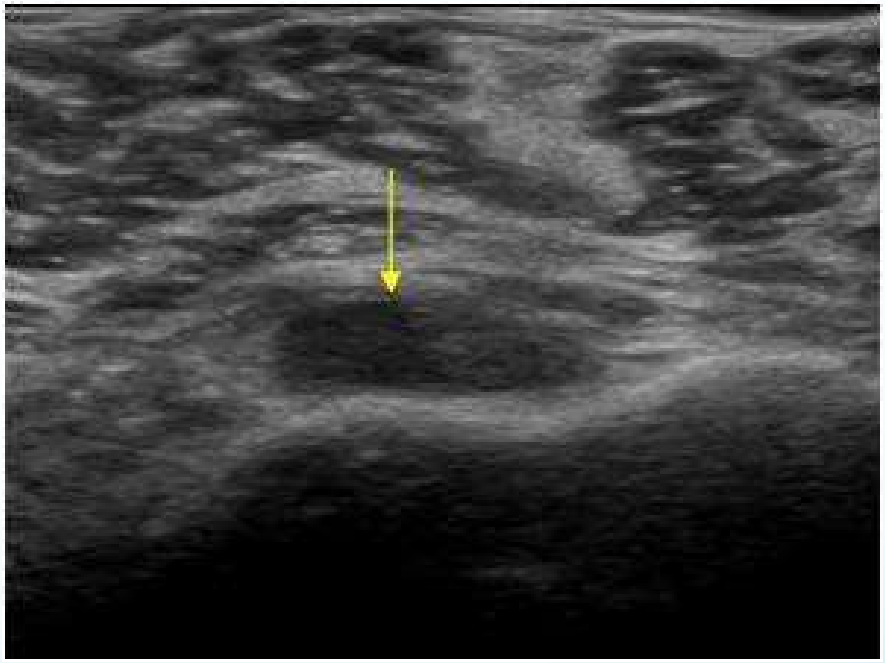
Tendonitis

BT cont....

- 5 mm hypoechoic region on either side is normal.
  - not to mistaken for a RC tear
- Inflammation
  - Swelling
  - Fluid in the tendon sheath
  - Tendon may become vascular rich.
- BT may dislocate medial
  - mistaken for tear

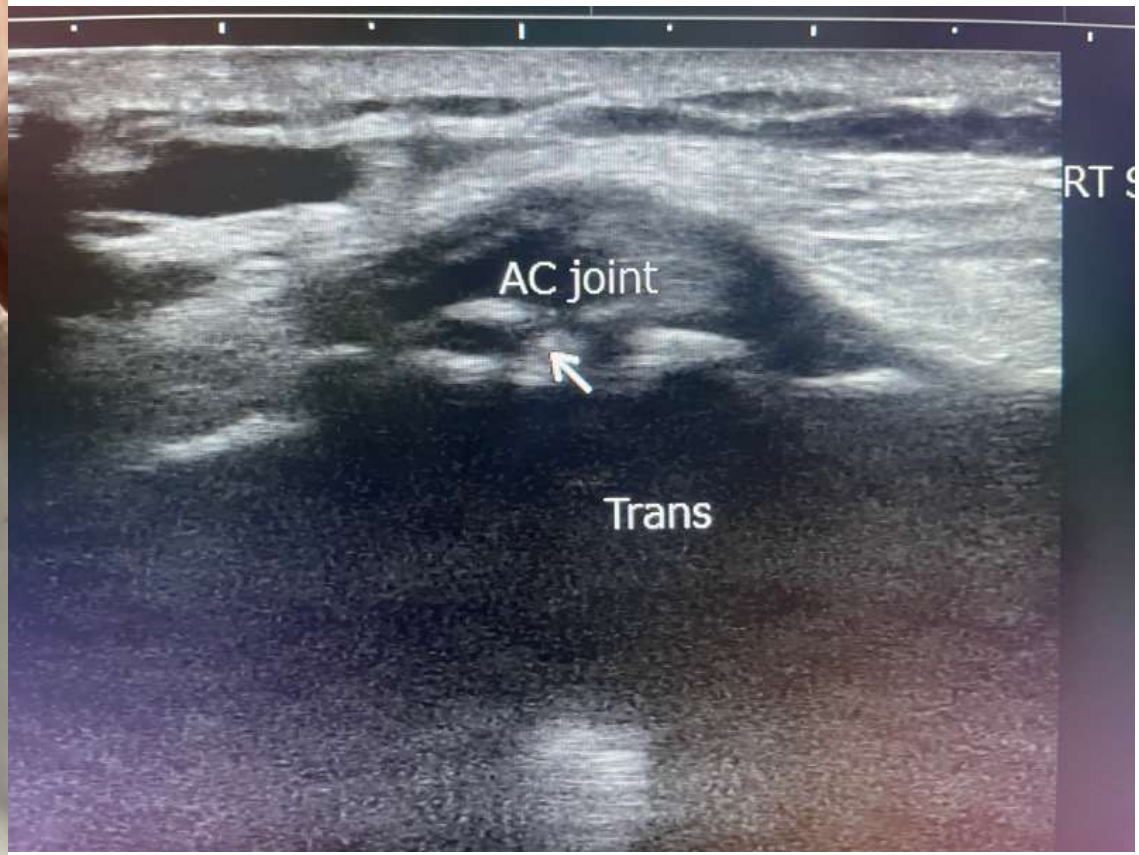
LHB Tear

Retracted stump longitudinal



Empty bicipital groove transverse

AC Joint



Tendon

Normal

- Fibrillar pattern
- Echogenic
- Bright, echogenic peritendon sheath
- High resistance flow

Pathology

- Fibrillar pattern disrupted
  - Most SST tears are humeral head side
- Inflammation - hypoechoic
- Fluid may accentuate the tendon sheath
- Low resistance flow in inflammation

Pitfalls

- Scan low and anteriorly on greater tubercle to image small tears
- Perpendicular beam to eliminate anisotropic artifact
  - anisotropic substances provide different measurements depending on the direction of measurement.
- Anatomy - shoulder sonography is a complex exam
- Practice, practice, practice