RhAPP

RHEUMATOLOGY ADVANCED PRACTICE PROVIDERS

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Shoulder Examination Anatomy and Pathology

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BORING!!!

The MVP of this Presentation

Shoulder Examination Anatomy and Pathology

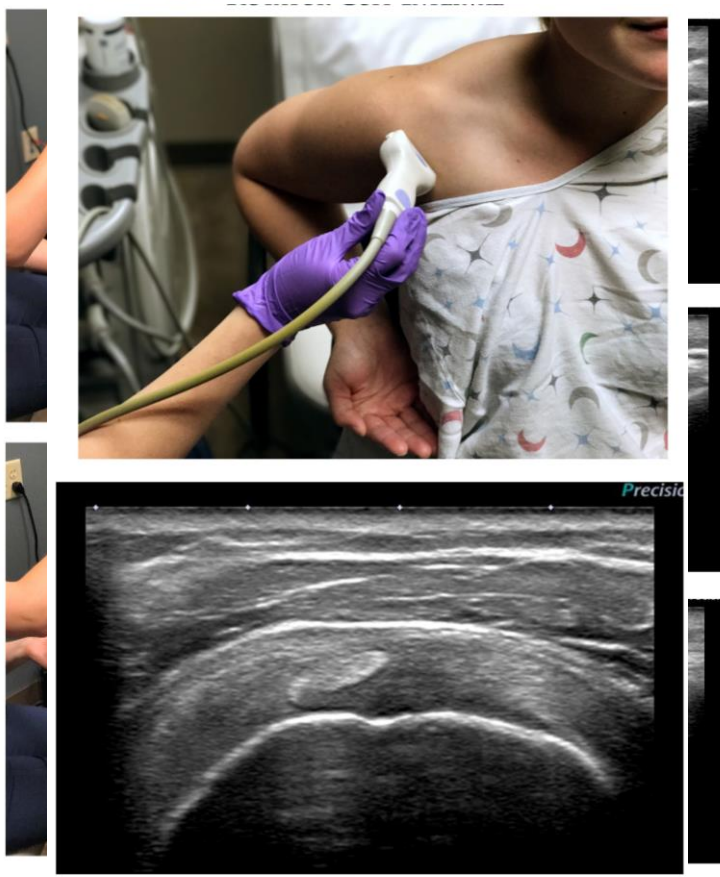
Why?

Why would we do a Shoulder Ultrasound?

- Limited ROM
- Suspected Acute Injury
- Chronic Pain
- Confirmation of X-Ray Findings

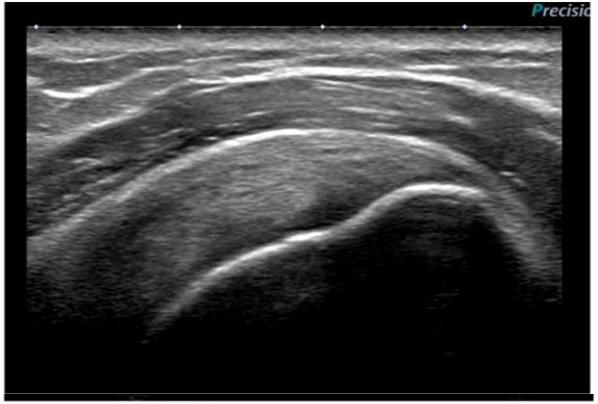
Shoulder Protocol

- Biceps Tendon (Long Head) Short Axis
- Biceps Tendon (Long Head) Long Axis
- Subscapularis Long Axis
  - Dynamic Imagery of External Rotation
- Subscapularis Short Axis
- Impingement Maneuver
- Rotator Cuff Interval



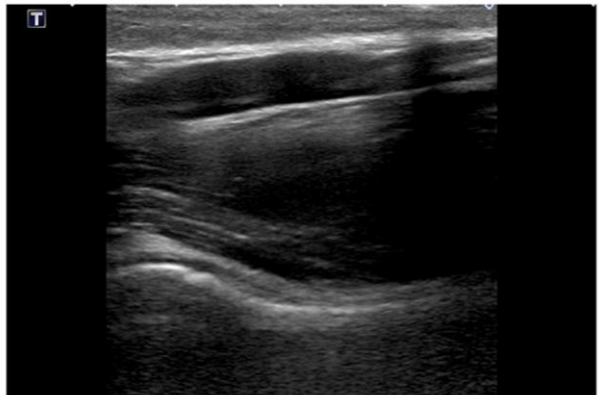
Shoulder Protocol

- Supraspinatus Short Axis
  - Superior
  - Mid
  - Inferior
- Supraspinatus Long Axis
  - Medial
  - Mid
  - Lateral



Shoulder Protocol

- Infraspinatus Long Axis
  - Dynamic Imagery of Internal/External Rotation
- Teres Minor Long Axis
  - Dynamic Imagery of Internal/External Rotation
- Glenohumeral Joint
  - Observe Glenoid Labrum
- AC Joint
- Axillary view

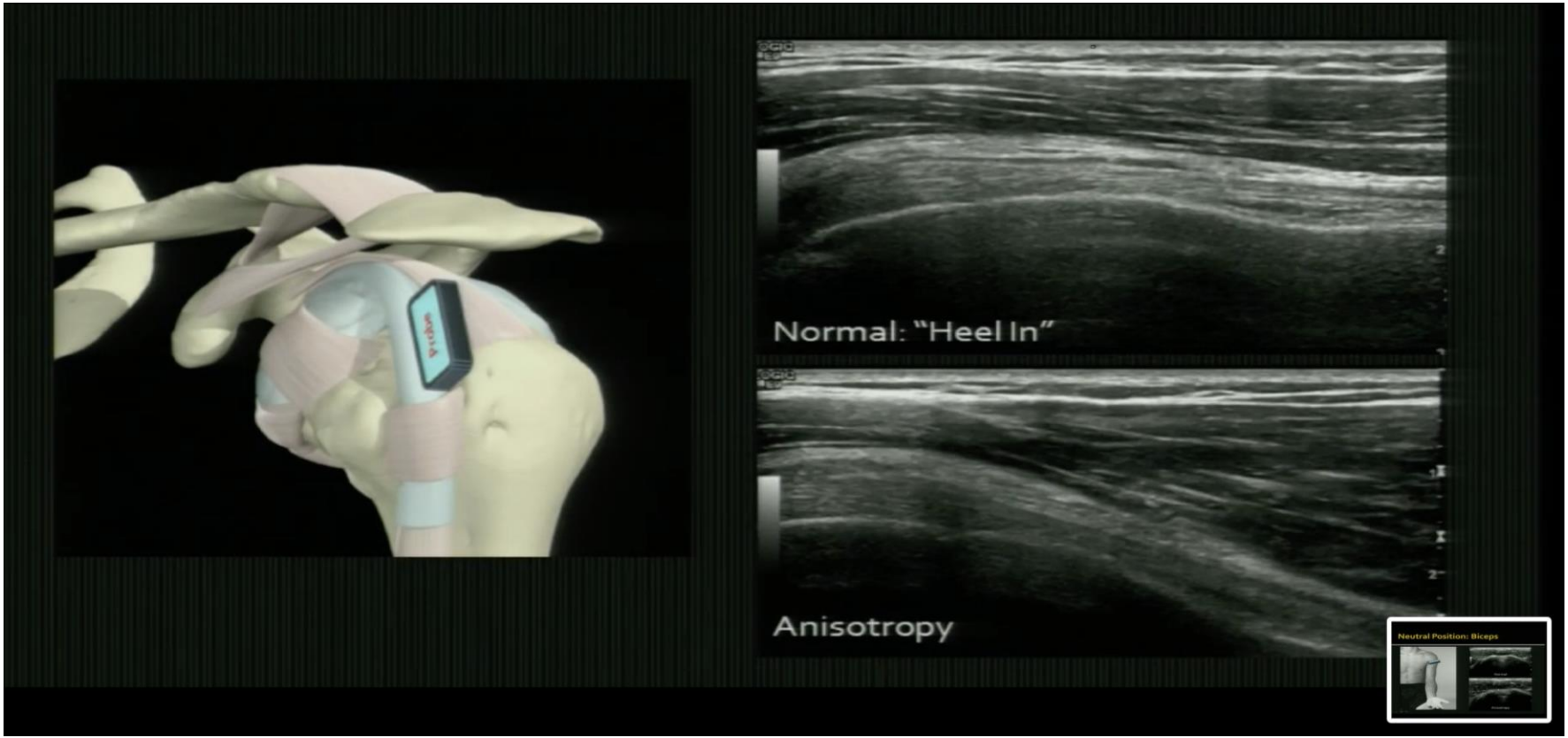


Positioning

Positioning

- Starting Position

Neutral Position: Biceps



Positioning

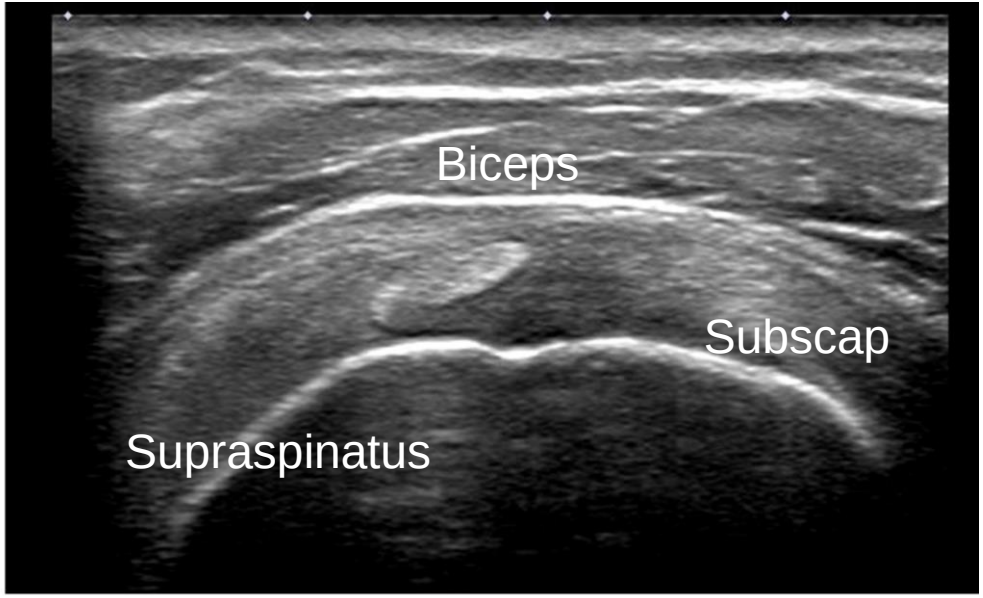
- External Rotation

Positioning

- Crass

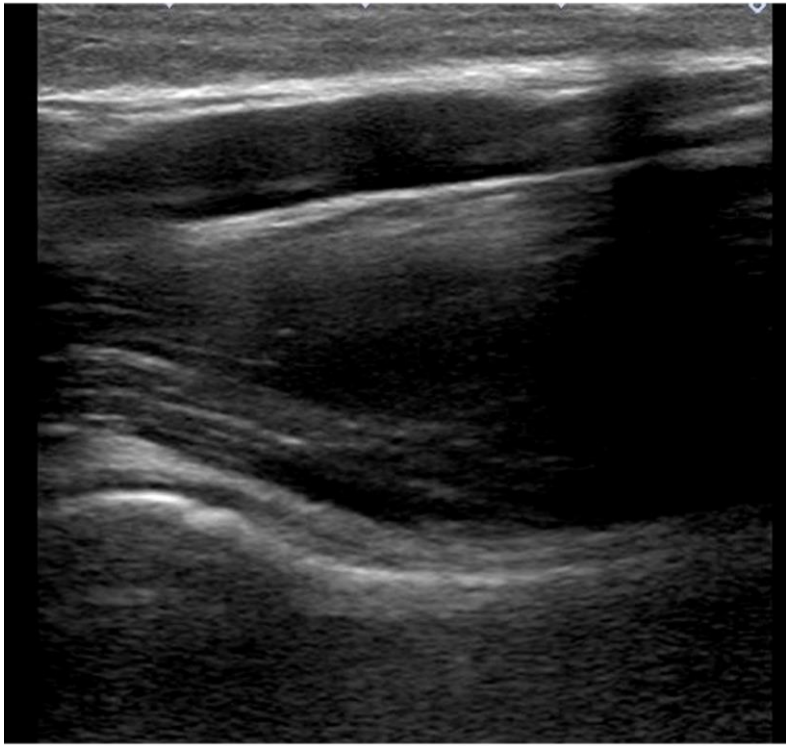
Positioning

- Modified Crass

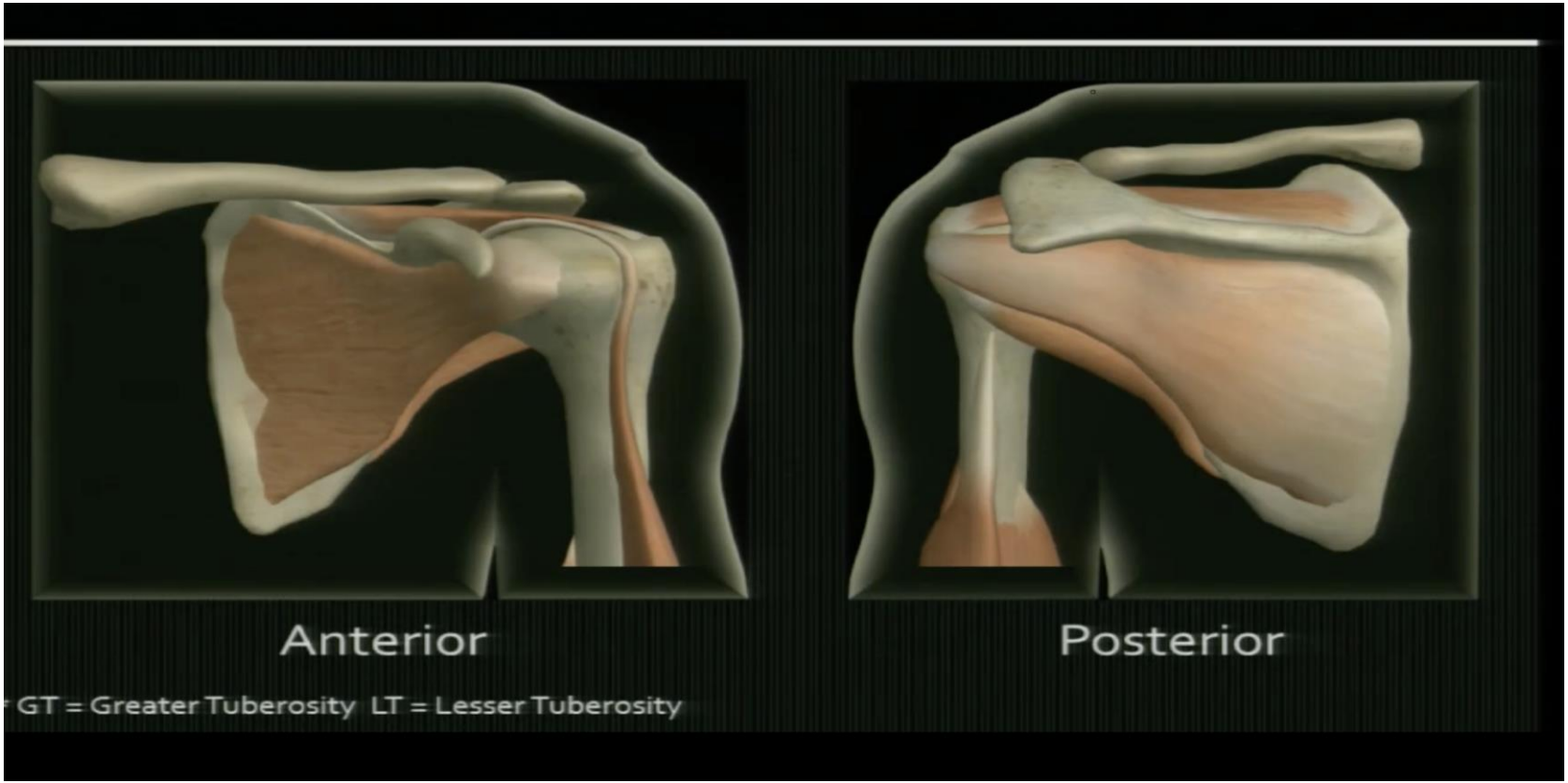


Positioning

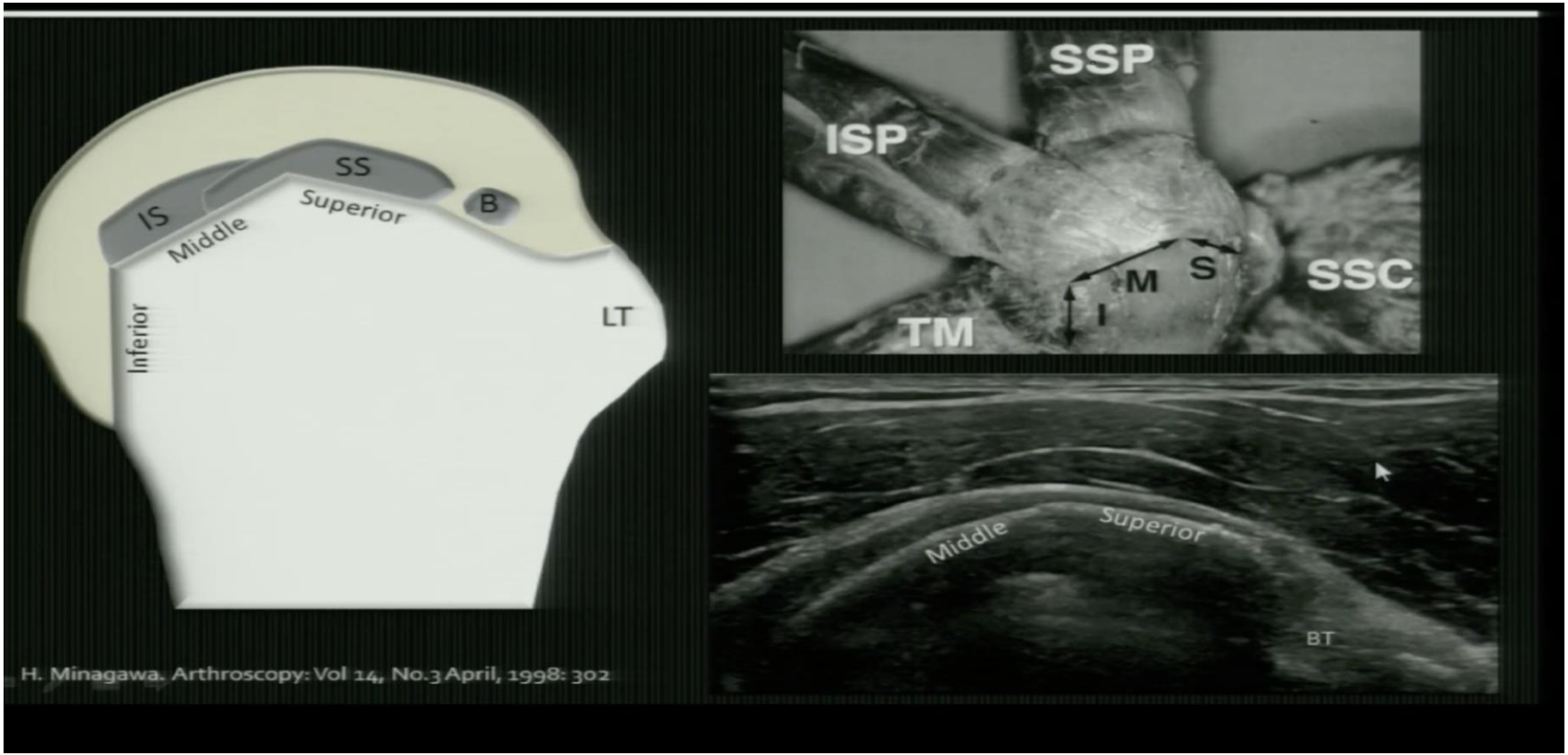
- Axillary



Anatomy (SITS)



Supraspinatus: Footprint



Pathology

The Hidden Ones

Rotator Cuff Tears: US

- Accuracy
  - Full thickness tear: 96%[1]
  - Partial thickness tear: 94% [2]
  - Equivalent to MRI
    - Accuracy [3]
    - Size
  - Patient Preference [4]

1. Teefey, JBJS 2000; 82:498
2. Middleton, AJR 2004; 183: 1449
3. Van Holsbeeck, Radiology 1995; 197:443
4. Nazarian, AJR 2008; 1621

Rotator Cuff Tears: US

- Meta-analysis: 65 articles[1]
- Full thickness tears
  - No difference in sensitivities MRA, MR, US (92-95%)
  - MRA more specific
- Partial thickness tears
  - MRA highest sensitivity and specificity
  - MRI and US fairly equivalent

1. De Jesus, 2009; 192:1701

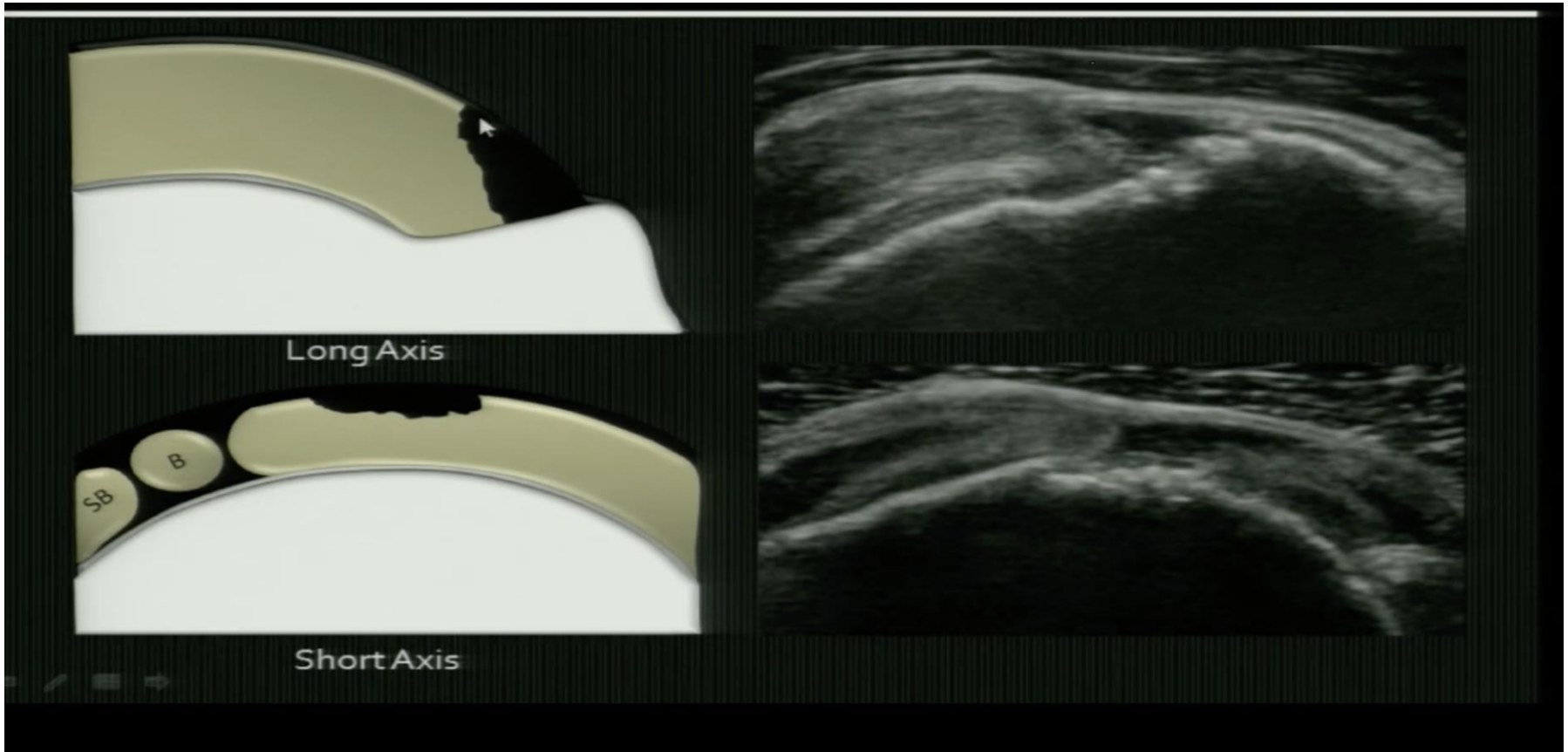
Rotator Cuff Tear: US Appearance

- Tears typically anechoic or hypoechoic
- Thinning of tendon – Loss of volume
  - Large tear: flat or concave surface
  - Massive tear: difficult dx due to non-visualization
- Secondary Signs
  - Cortical Irregularity of Greater Tuberosity
  - Deltoid Dip
  - Cartilage Interface Sign
  - Joint & Bursal Effusions

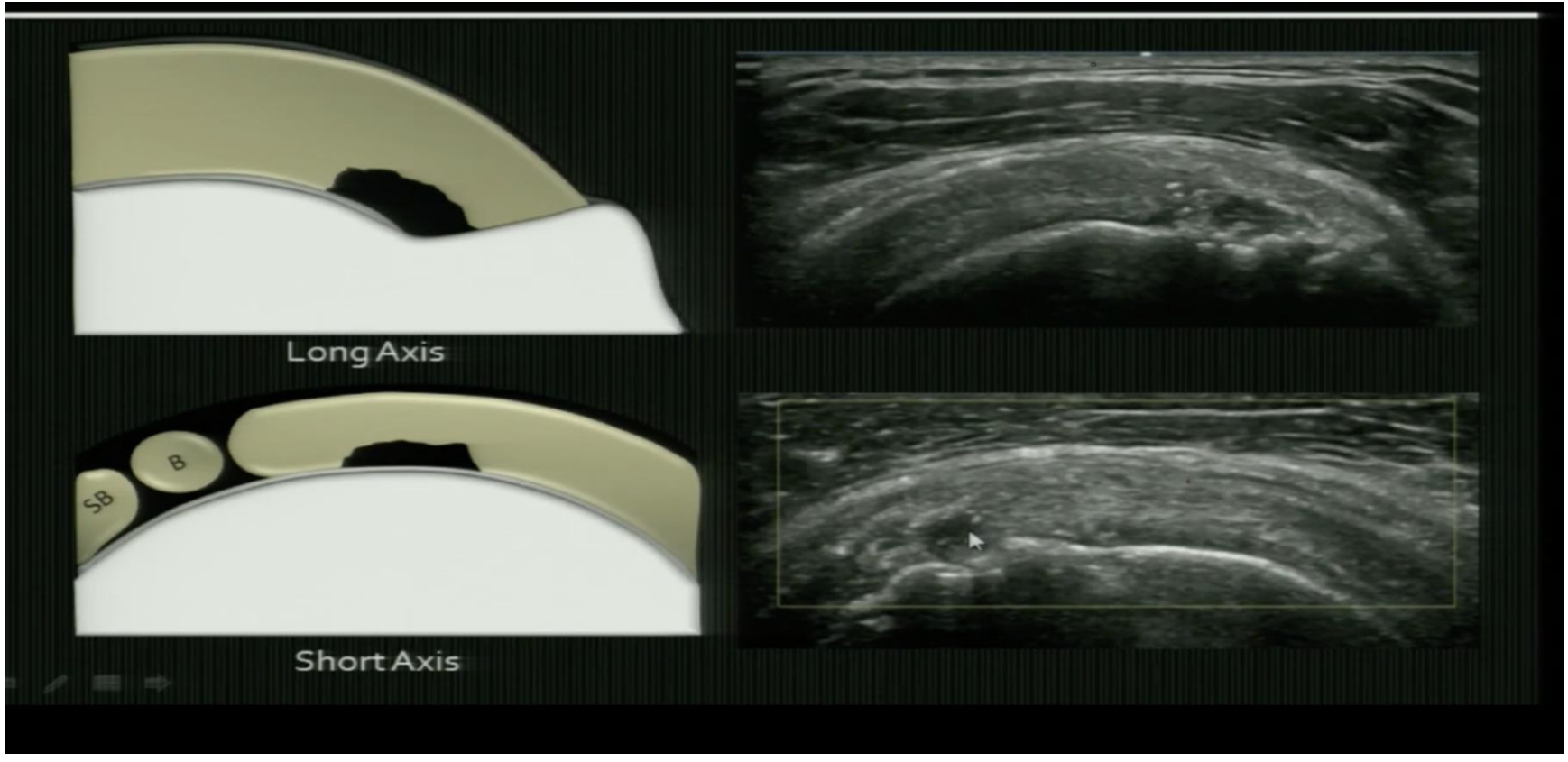
Rotator Cuff Tear: Classification

- Partial Thickness
  - Large tear: flat or concave surface
  - Massive tear: difficult dx due to non-visualization
- Secondary Signs
  - Cortical Irregularity of Greater Tuberosity
  - Articular Sided
  - Interstitial/Intrasubstance
- Full Thickness
- Complete (Bald Humerus)
- Can be Acute or Chronic in nature

Partial Thickness: Bursal Sided



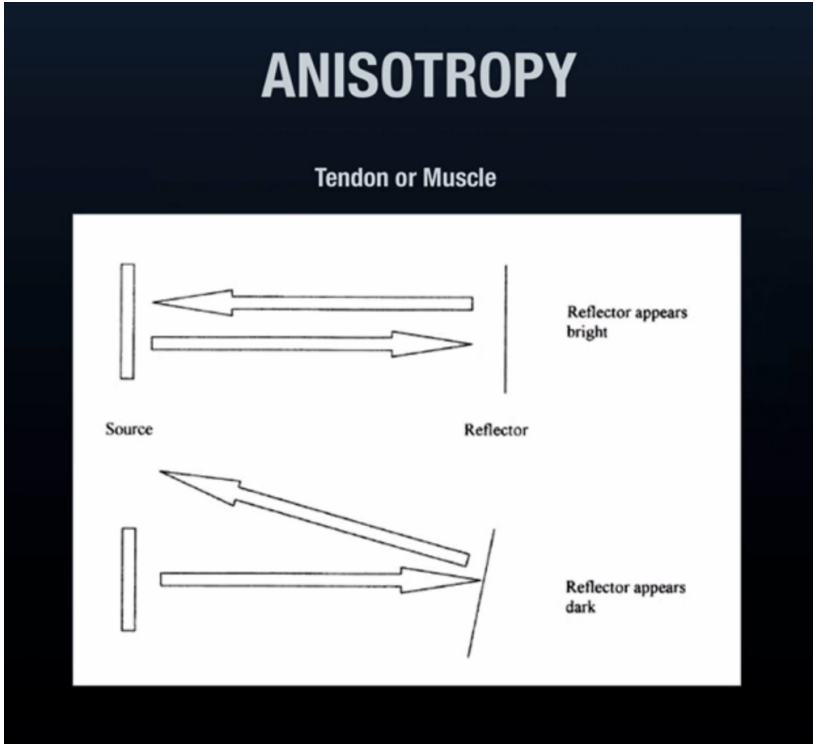
Partial Thickness: Articular Sided

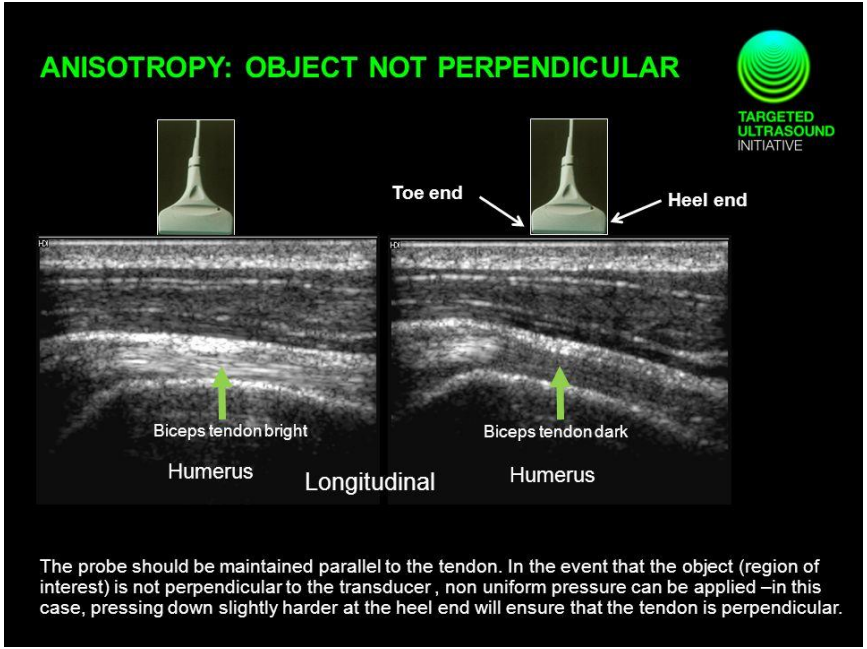


Pitfall: Anisotropy

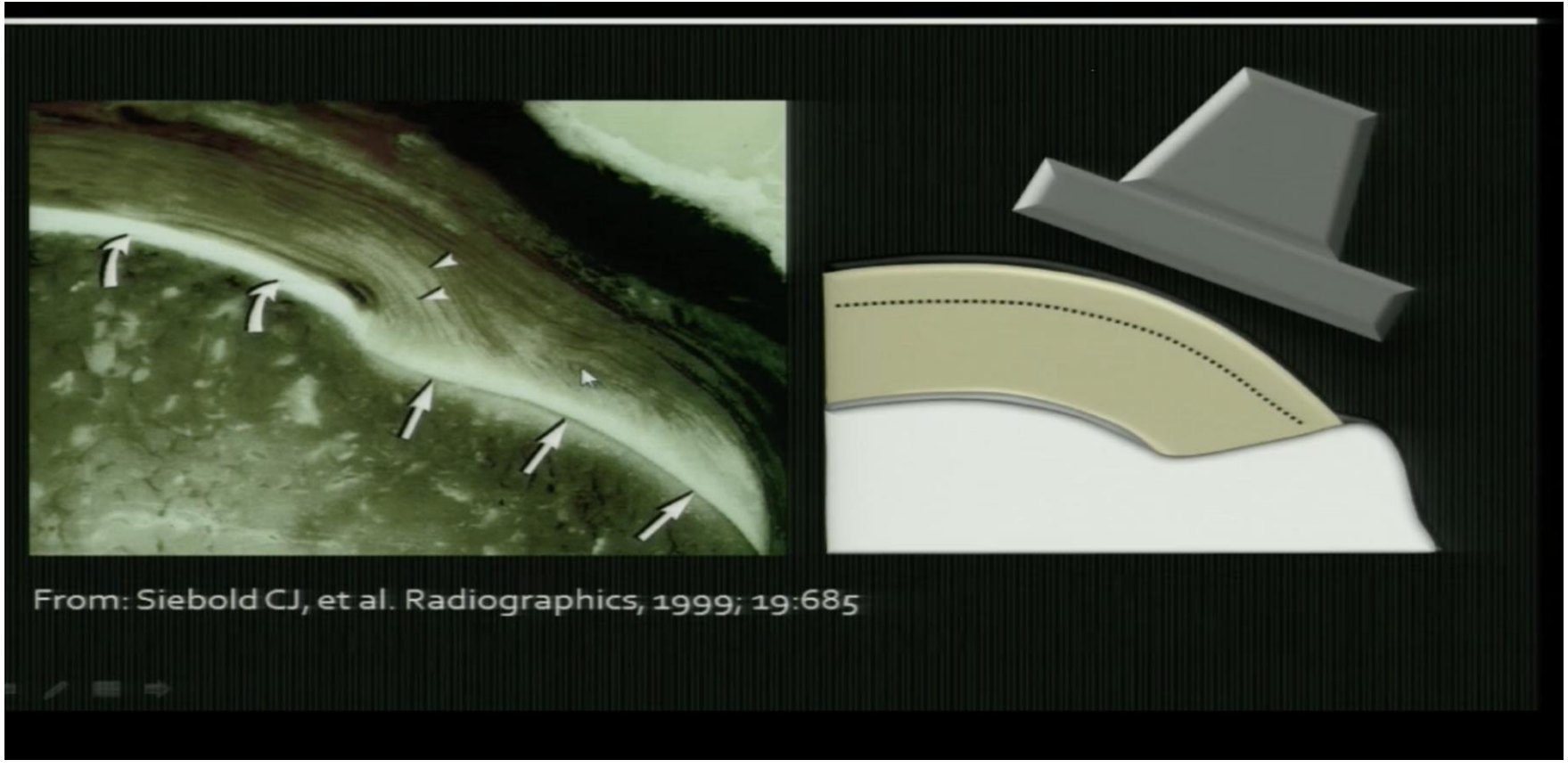
Image Reflection

Anisotropy

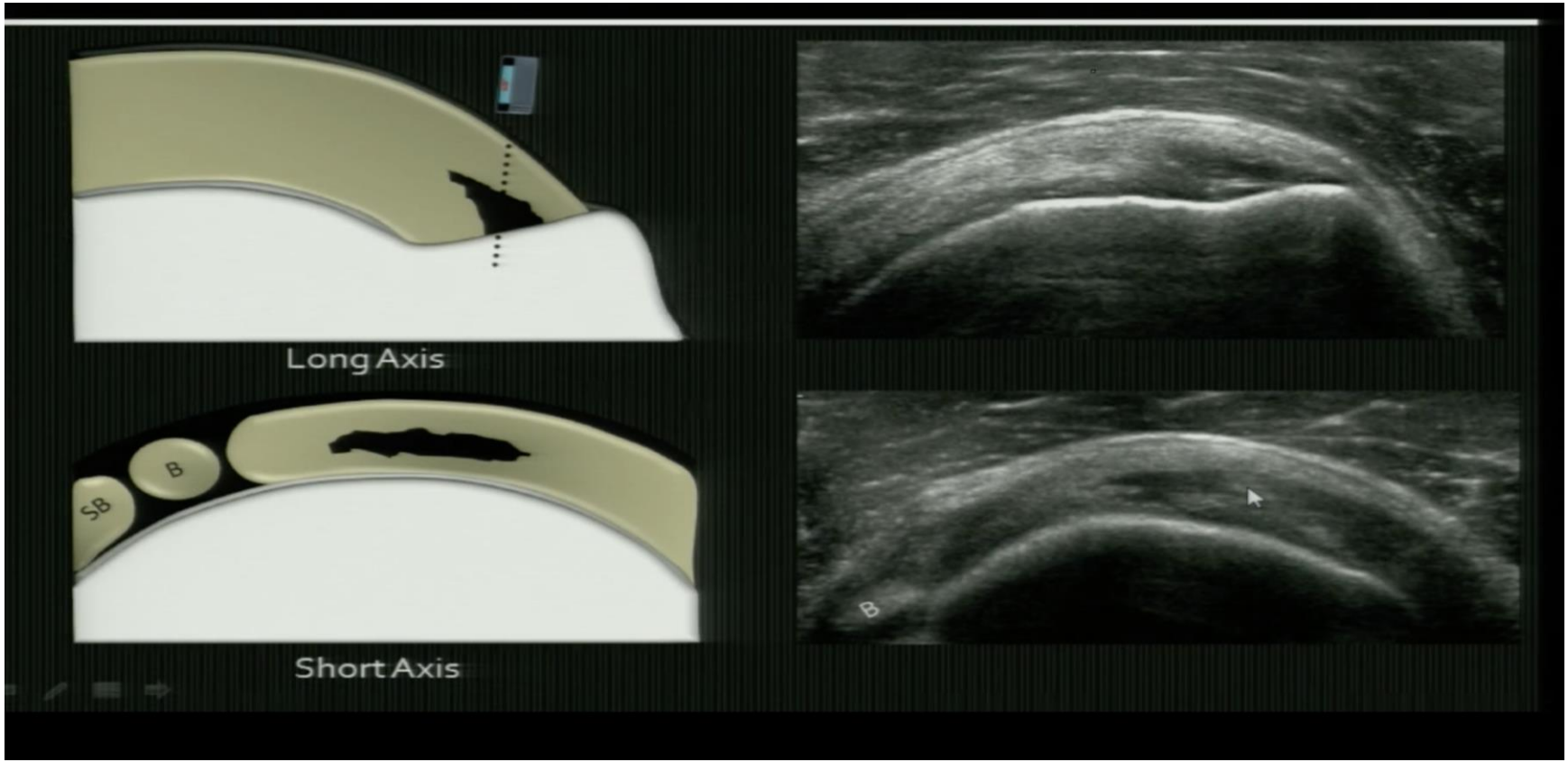

ANISOTROPY
Tendon or Muscle
Reflector appears bright
Source
Reflector
Reflector appears dark


ANISOTROPY: OBJECT NOT PERPENDICULAR
TARGETED ULTRASOUND INITIATIVE
Toe end
Heel end
Biceps tendon bright
Biceps tendon dark
Humerus
Longitudinal
Humerus
The probe should be maintained parallel to the tendon. In the event that the object (region of interest) is not perpendicular to the transducer , non uniform pressure can be applied –in this case, pressing down slightly harder at the heel end will ensure that the tendon is perpendicular.

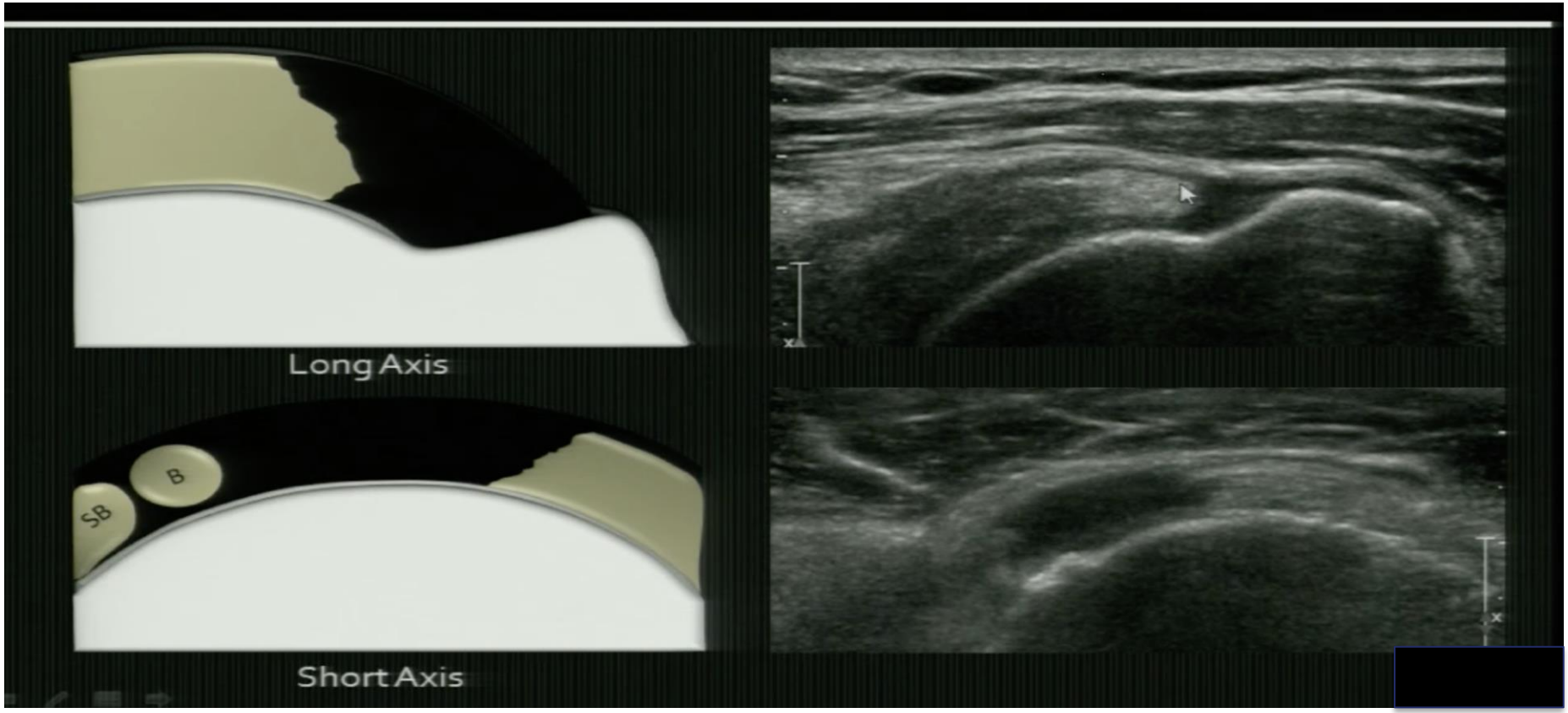
Anisotropic Effect: Supraspinatus



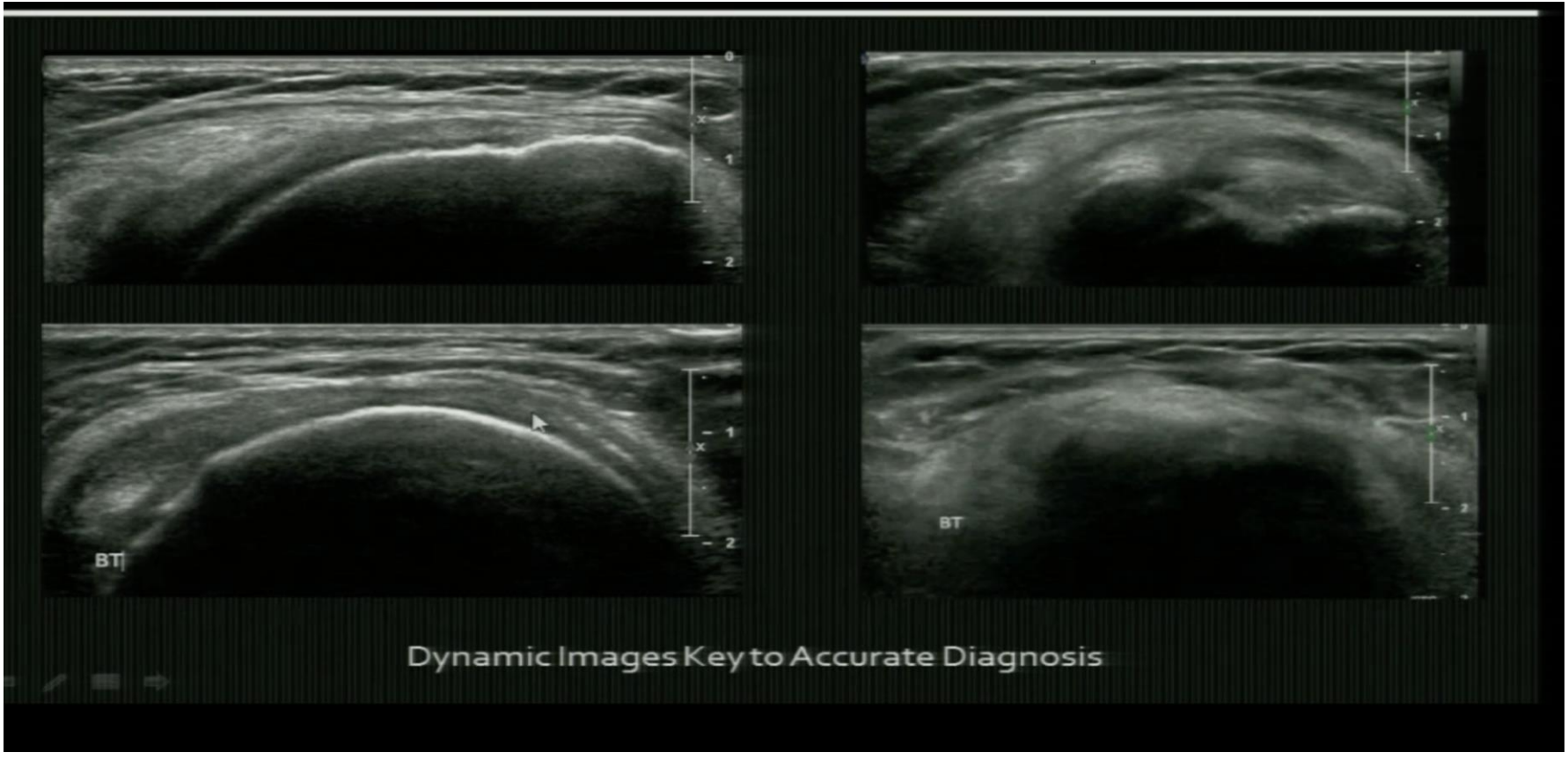
Partial Thickness Tear: Interstitial/Intrasubstance



Full Thickness Tear

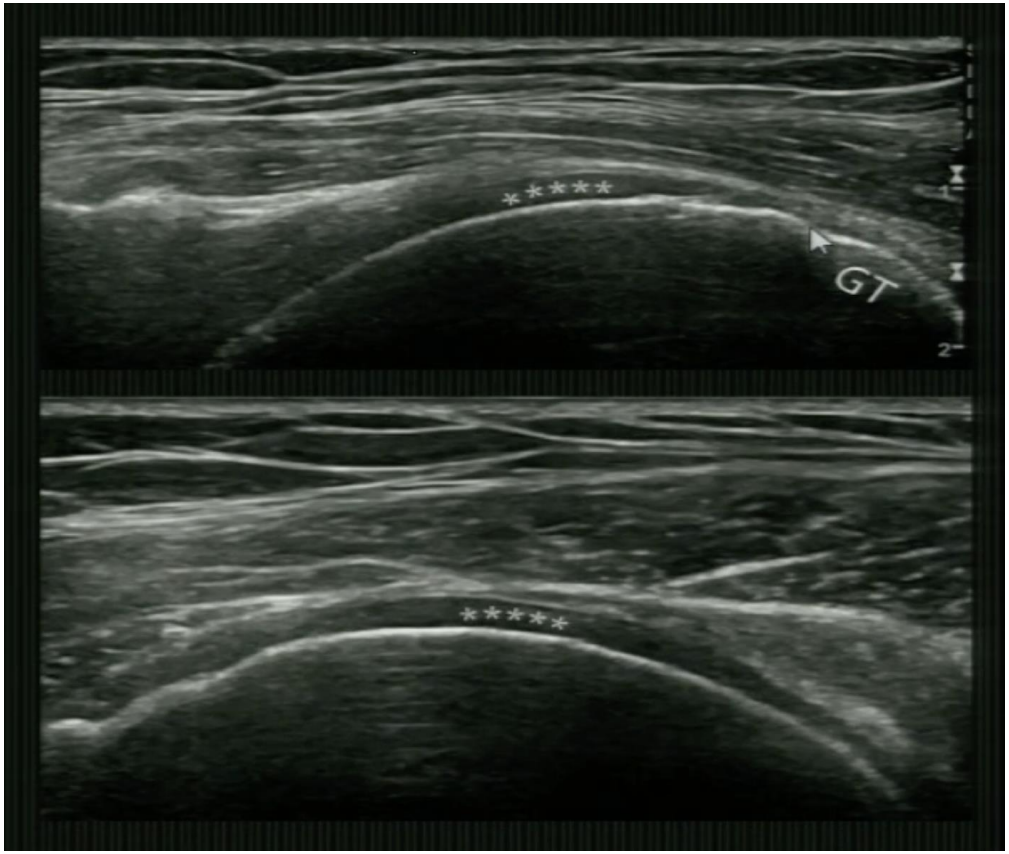


Full Thickness Tear: Massive



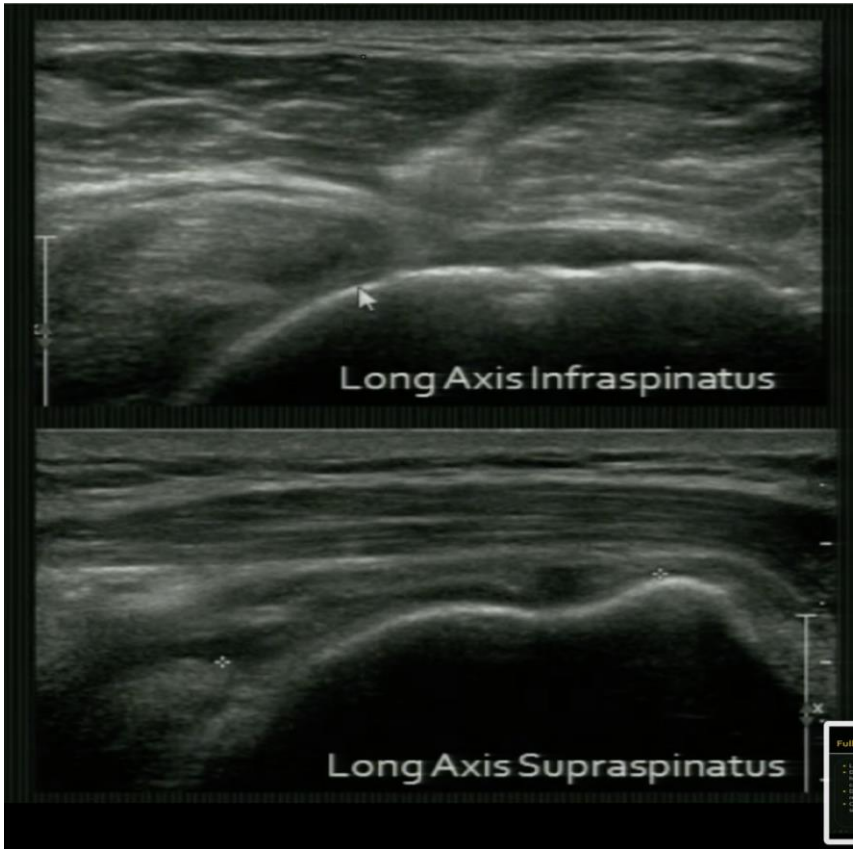
Full Thickness: Bald Head

- Large FT Tears
- Deltoid overlies humeral head cartilage
- Do not mistake for residual fibers
- Cartilage interface sign



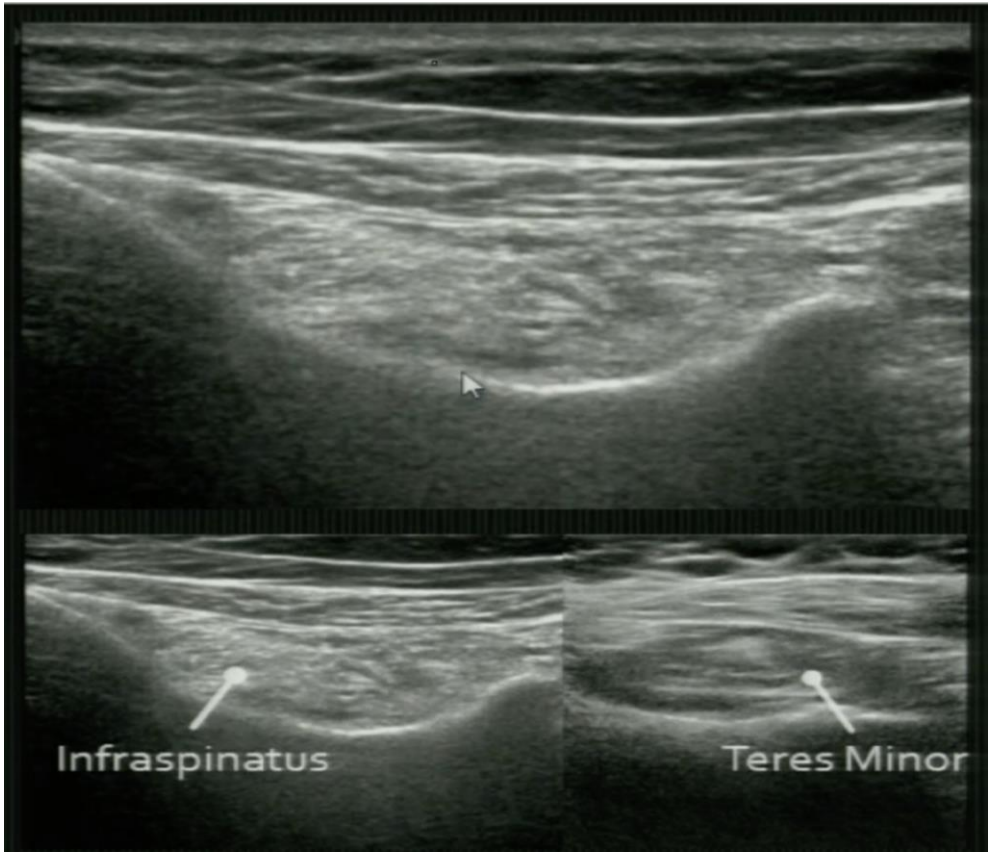
Full Thickness: Infraspinatus

- Rarely tears in isolation
- Component of massive rotator cuff tear
- Tear extends over the middle facet
  - >1.3 cm from RI on transverse image

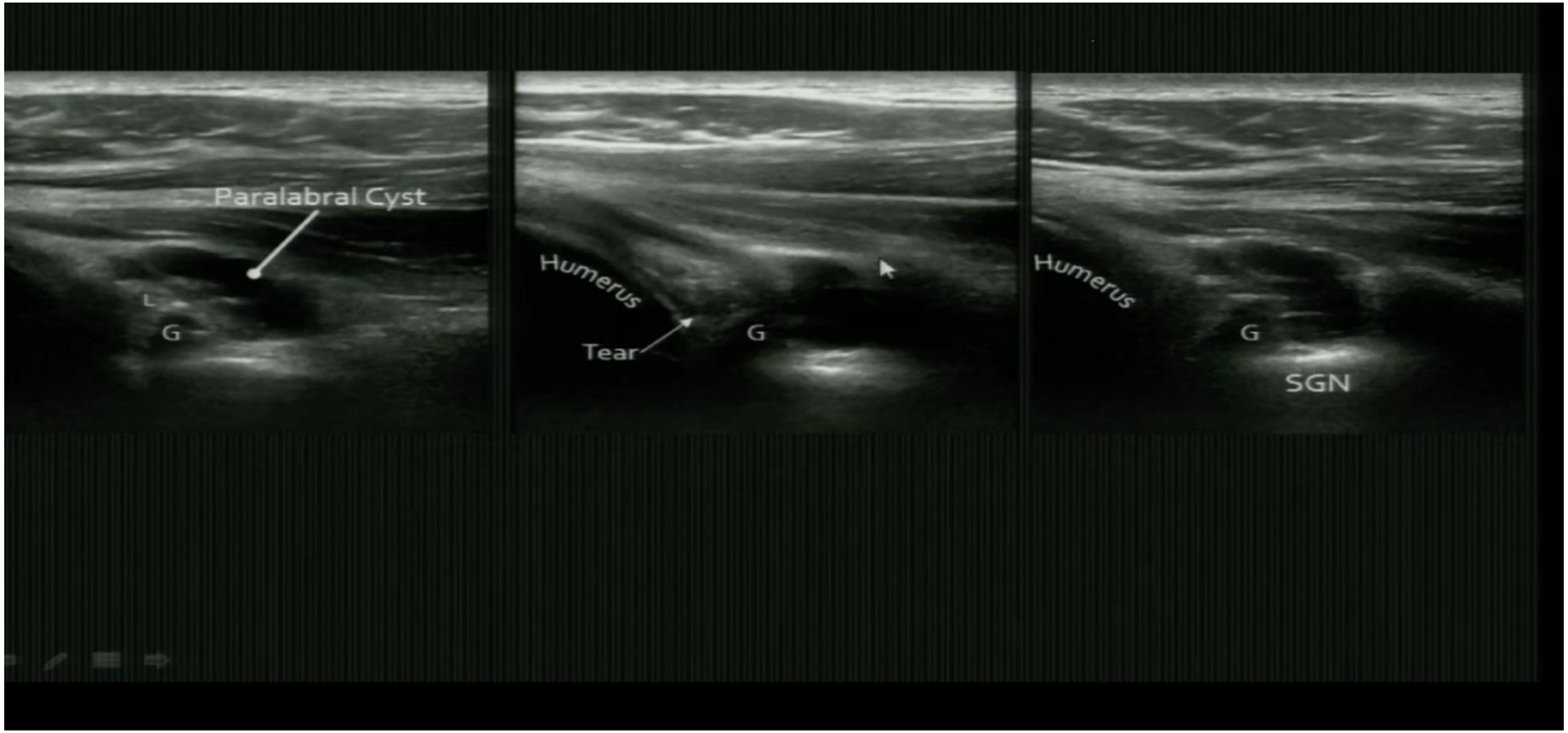


Muscle Atrophy & Fatty Infiltration

- Increased echogenicity
  - Contralateral Side
  - Teres Minor
- Myotendinous Junction
  - Indistinct muscle-tendon
- Decreased Muscle Bulk
  - Contralateral Side
  - Teres Minor
- Identify Scapular Ridge



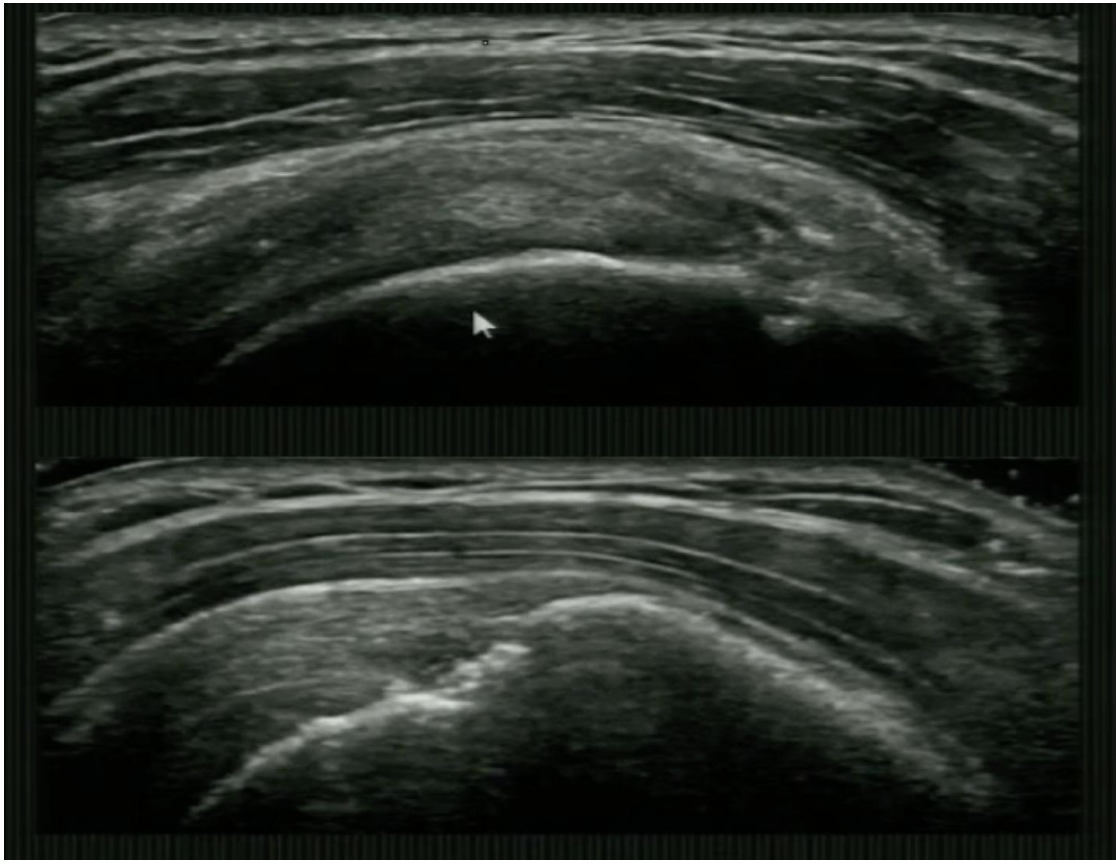
Atrophy: Notch Cyst



Secondary Signs

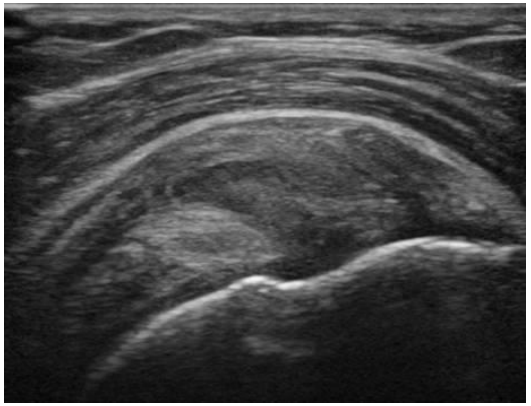
Cortical Irregularity

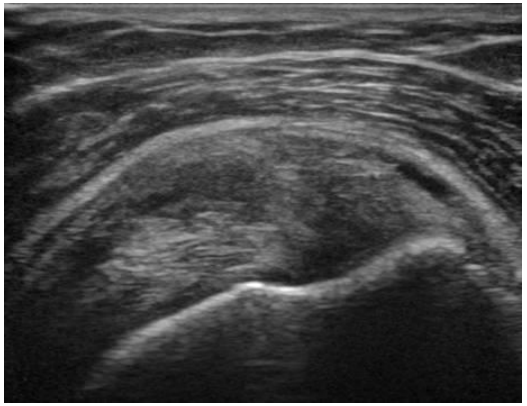
- Greater Tuberosity
  - Supraspinatus Insertion
- Patients over 40 YO
  - 75% have RC tear
- Absent
  - 96% normal RC on US
- Not a finding seen with tendinosis

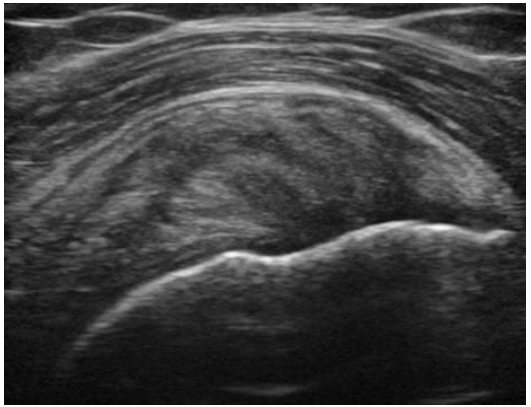


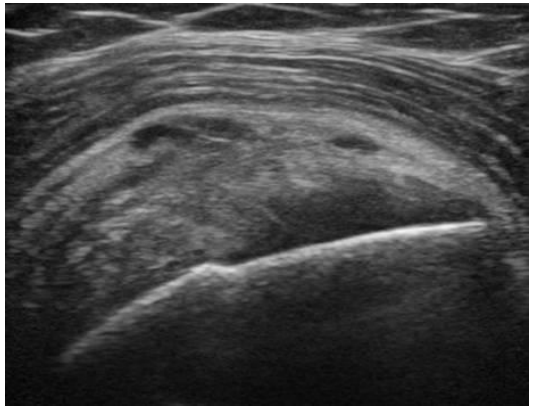
Tendinosis

- Not inflammatory
  - Mucoid degeneration
  - Chondroid metaplasia
- Hypoechoic
- +/- Enlargement
- No Cortical irregularity



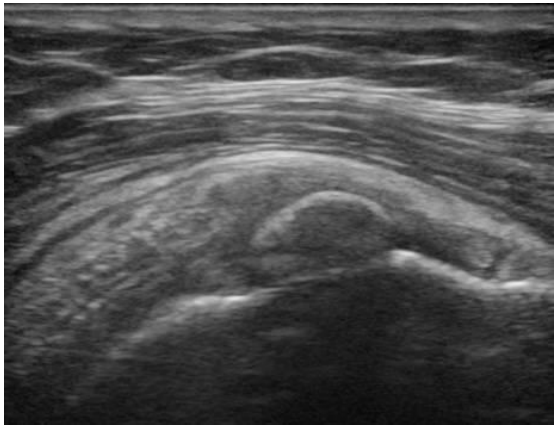


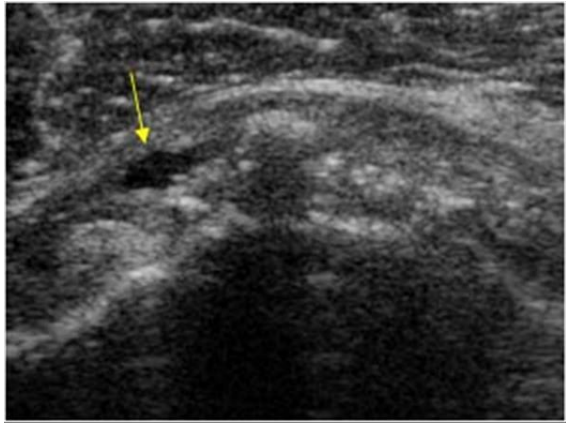


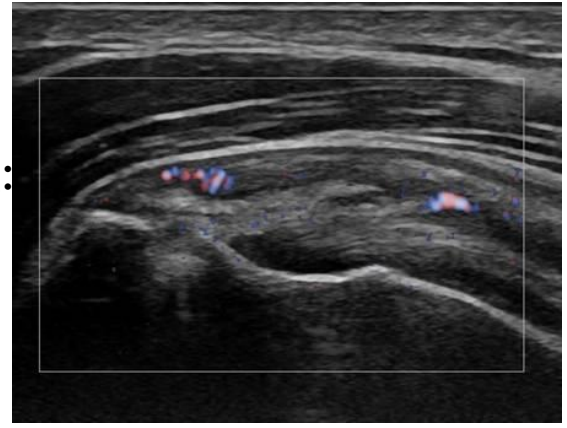


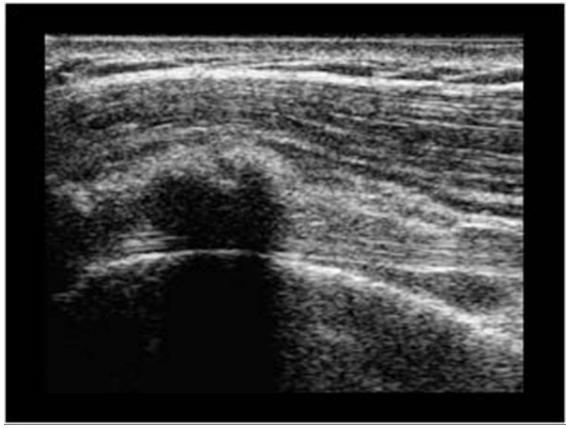
Calcific Tendinosis

- Hydroxyapatite Deposition
- Supraspinatus tendon most common
- Bilaterally 50% of the time
- US Appearance
  - Hyperechoic and Shadowing: 79%
  - No Shadow: 7%
- Utilize Anisotropy



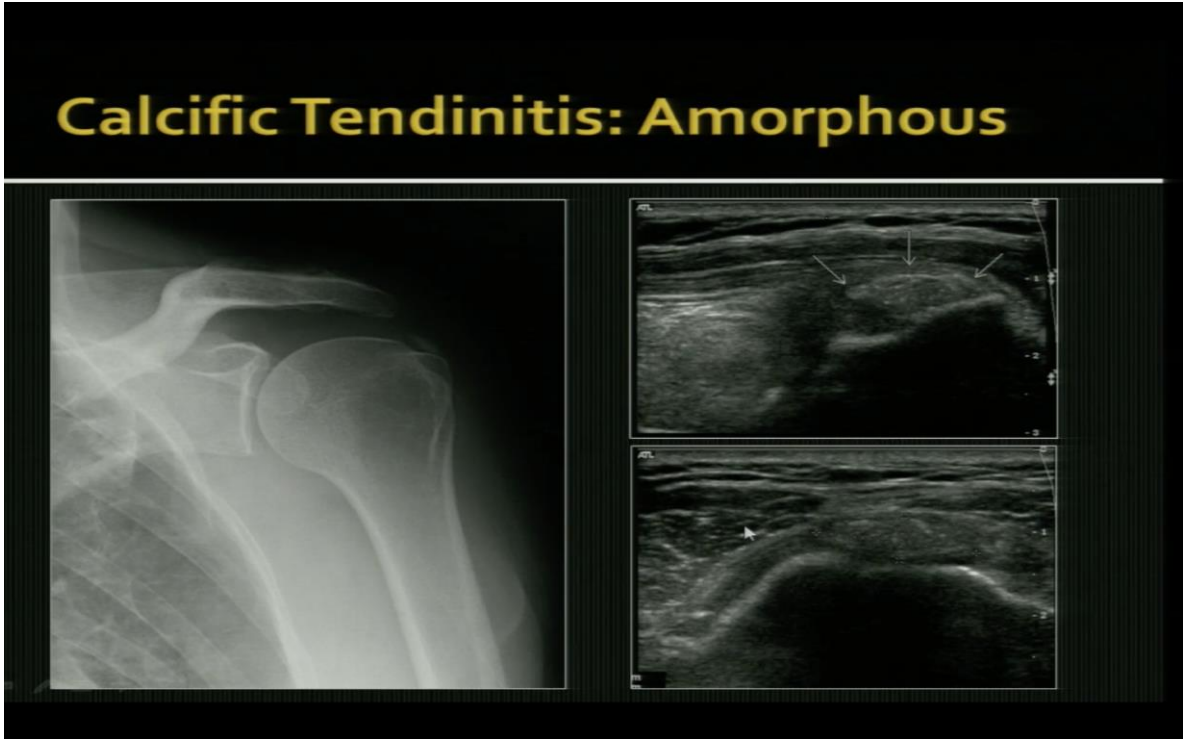






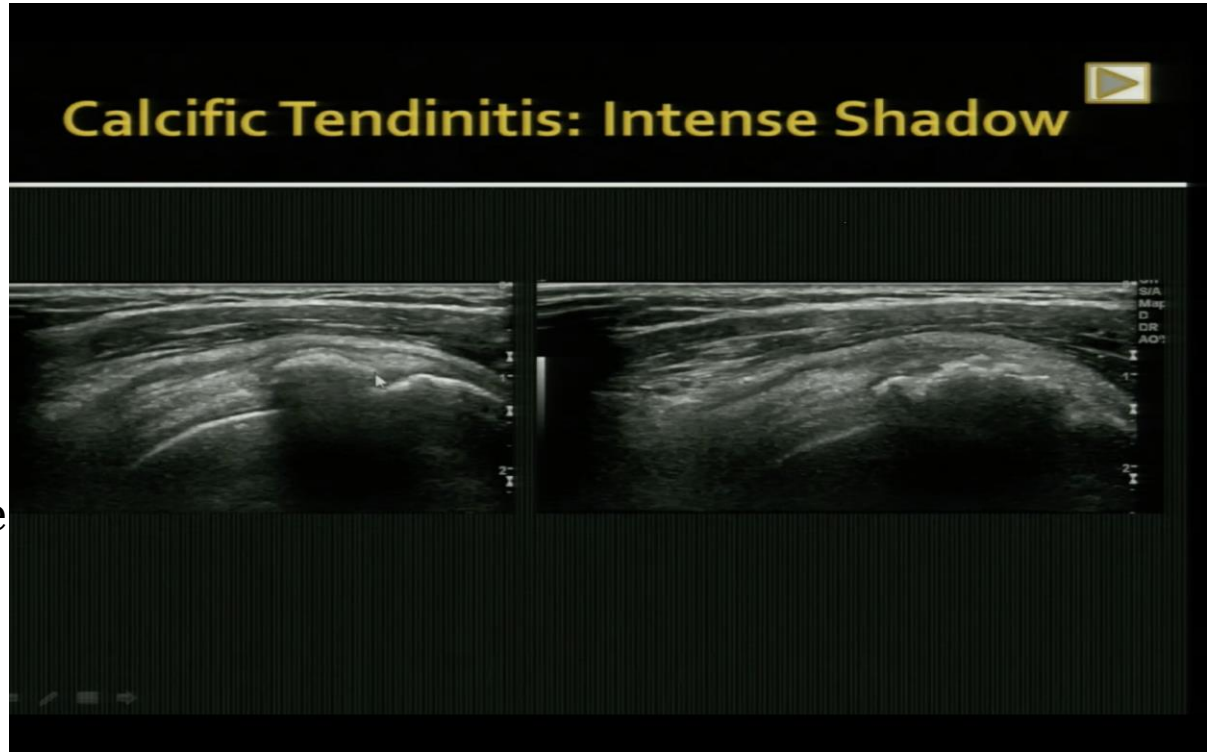
Calcific Tendinosis

- Thin linear deposit
  - Likely degenerative
- Globular, amorphous
  - Soft, successful lavage
  - Resorptive phase



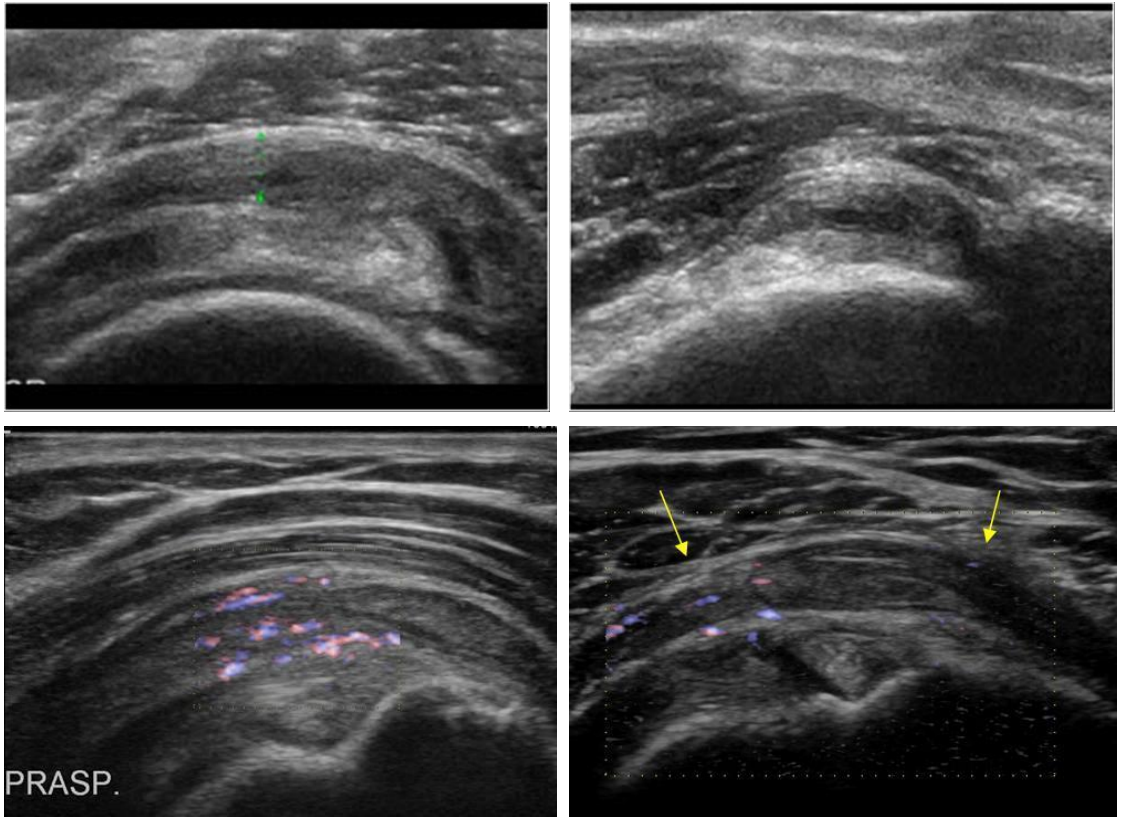
Calcific Tendinosis

- Thin linear deposit
  - Likely degenerative
- Globular, amorphous
  - Soft, successful lavage
  - Resorptive phase
- Well-defined, intense Shadow
  - Hard, difficult to lavage
  - Consider fenestrating
  - Formative Stage



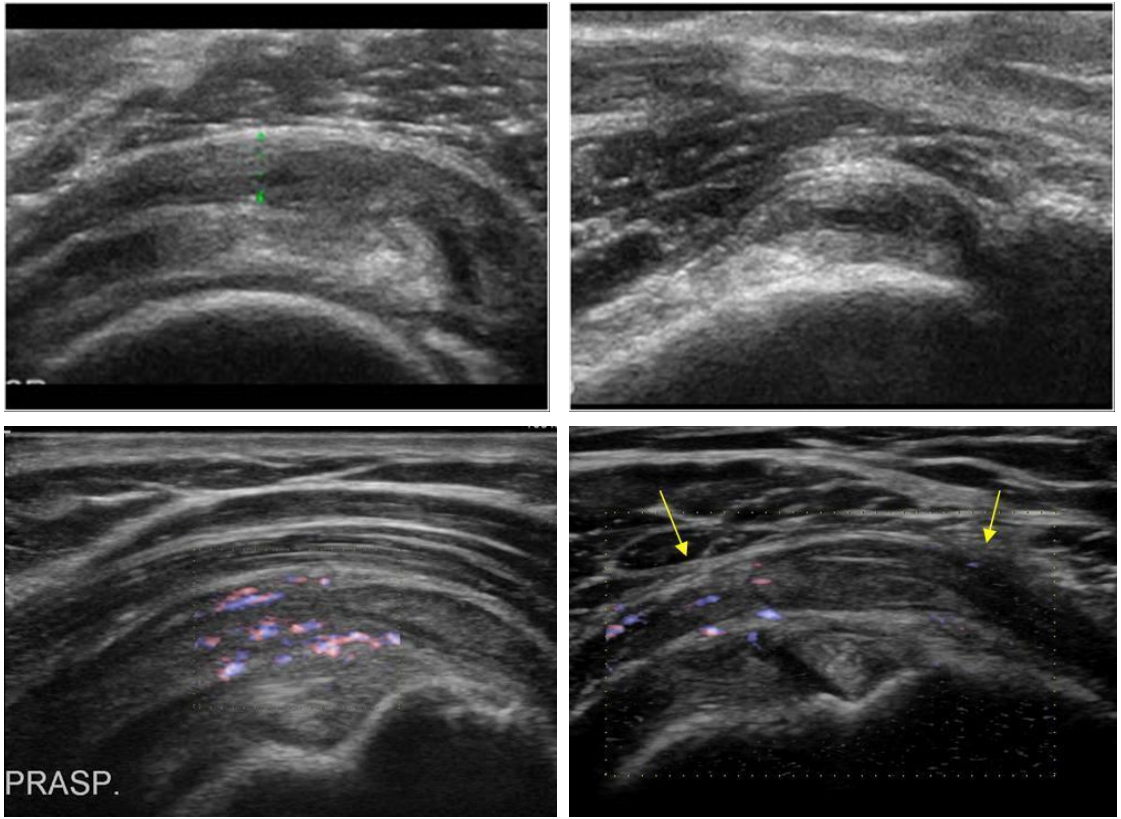
Subacromial Bursitis: Chronic

- Common Appearances
  - Bursal thickening
  - Bursal effusion
  - Active Doppler Signal



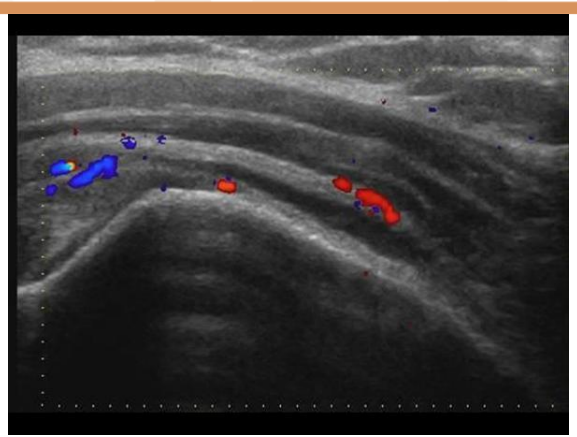
Subacromial Bursitis: Chronic

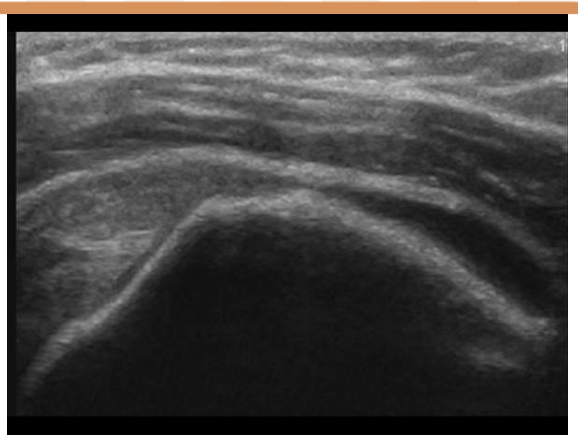
- Bursal impingement
  - Commonly found in abduction
  - Can also be found in external rotation

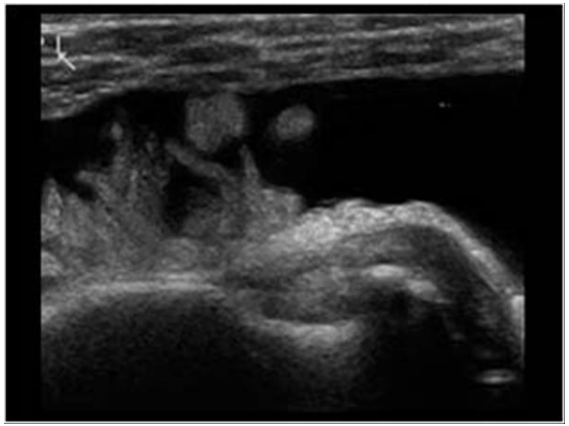


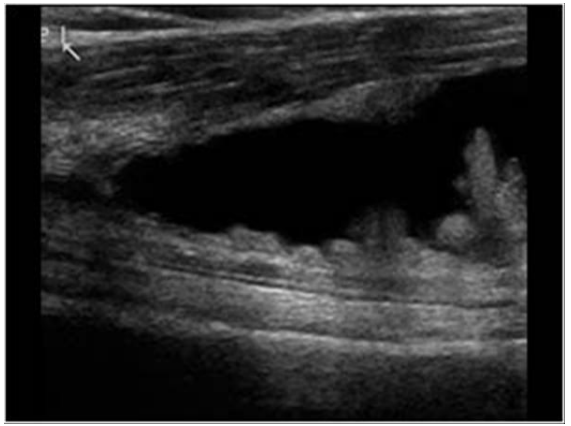
Subacromial Bursitis: Acute

- Bursitis
  - Active Doppler Signal
  - Mild thickening of peribursal fat stripe
  - Hypoechoic fluid accumulation
  - Frequently accompanies acute rupture









Subacromial Bursal Impingement

- Bursal impingement
  - Commonly found in abduction
  - Can also be found in external rotation

Take Home Points

- Use a standard protocol
- Beware of anisotropy
- Cortical irregularity along the insertion of the supraspinatus is a great secondary sign of an underlying tear
- Have FUN with it (Don’t be afraid of it)

References

- Shoulder Ultrasound Pathology & Therapeutics – Humberto Rosas, MD; Andrews Research & Education Foundation in partnership with AIUM, 2017
- https://www.ultrasoundcases.info/calcifications-penetrating-the-cortex-6294/
- https://www.ultrasoundcases.info/supraspinatus-tendinosis-6253/
- https://www.ultrasoundcases.info/acute-bursitis-4870/

Extra Gravy