

Diagnostic Ultrasound of the Shoulder

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Sports / Physical Medicine

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Set Up Basics

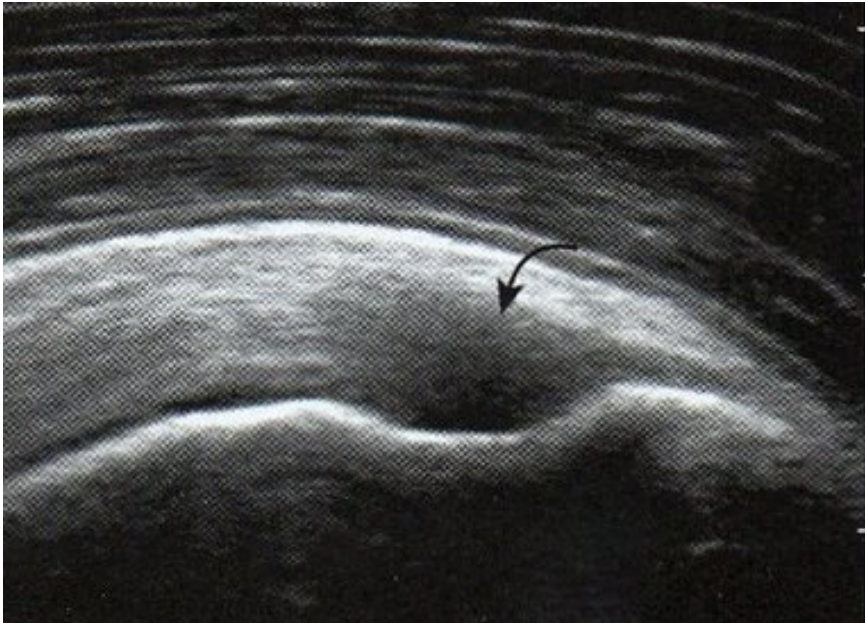
1. Positioning - Plan this right away and it will save you time
 - a) Patient – exposed? Position? Move bench?
 - b) Injections –ideally, keep everything in a line of sight (hands, probe, screen)
 - c) Dx studies – allow Pt to see, “Wow, I guess I don’t need an MRI”
 - d) Comfort / ergonomics
2. Please ask if you have questions about turning on a machine, choosing a probe and setting up study
3. Holding the probe
 - ✓ Gel is slippery – anchor
 - ✓ Notch is left, left is left (for vertical parts, by convention superior is left)
 - ✓ Do not drop it

Knob-ology

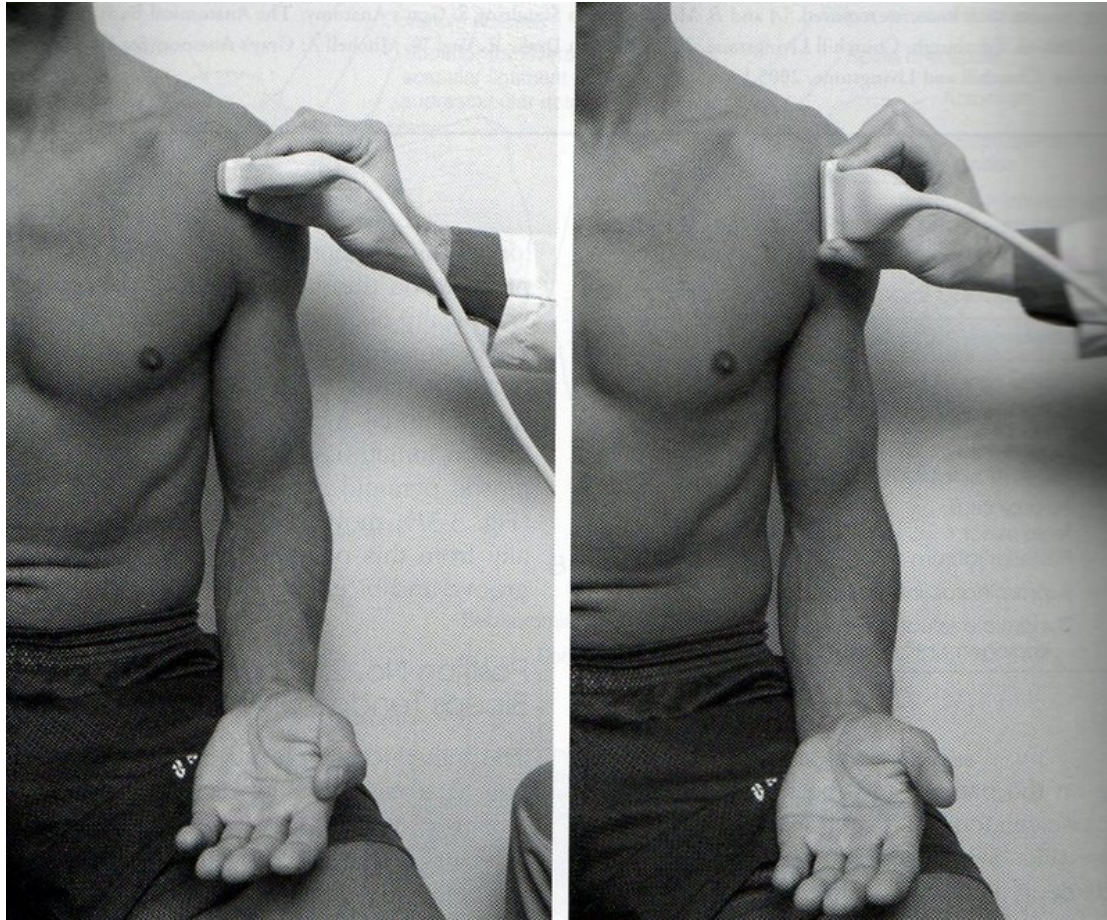
- Presets
- Frequency (higher freq, higher resolution at cost of penetration)
- Gain (brighter vs darker)
- Depth (up = zoom in, down = look deeper)
- When in doubt, optimize
- Taking pictures, taking movies

Terms

- Hyperechoic = whiter, brighter
- Hypoechoic = darker, light grey
- Anechoic = black
- Increased echogenicity = more hyperechoic
- Anisotropy

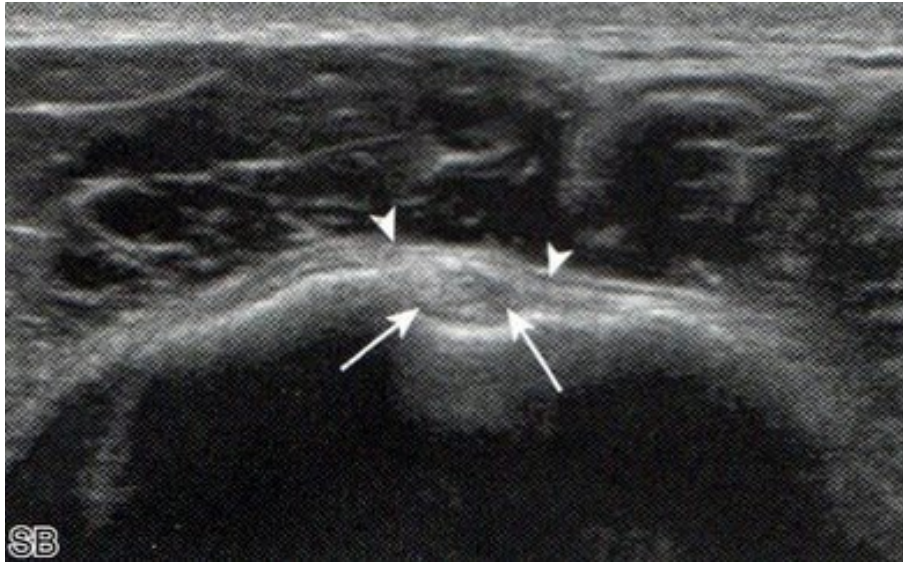


How to Look at Long Head Biceps

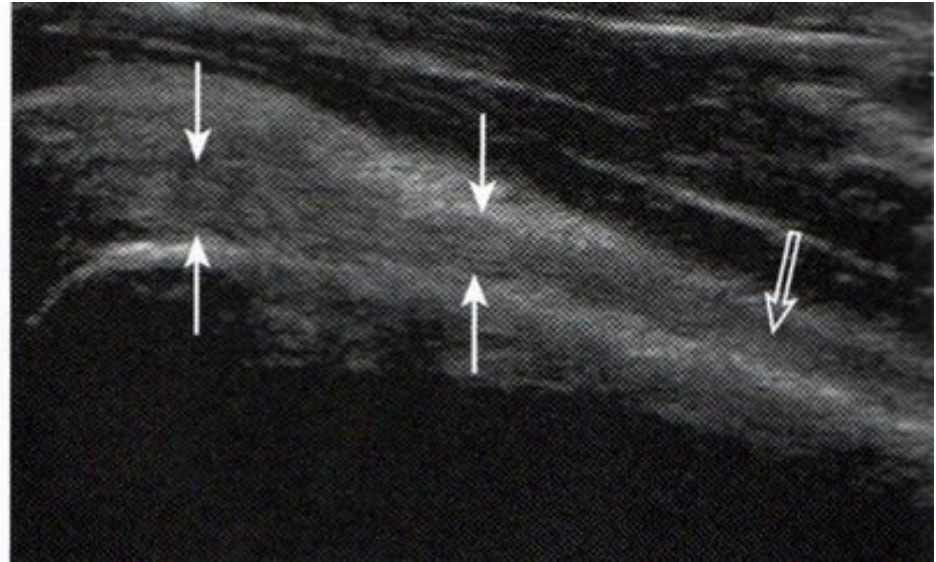


- Transverse (note supination)
- Longitudinal

Normal



Transverse view over bicipital groove, shows hyperechoic tendon, arrowheads: transverse humeral ligament



Longitudinal view, some anisotropy distally

Effusions

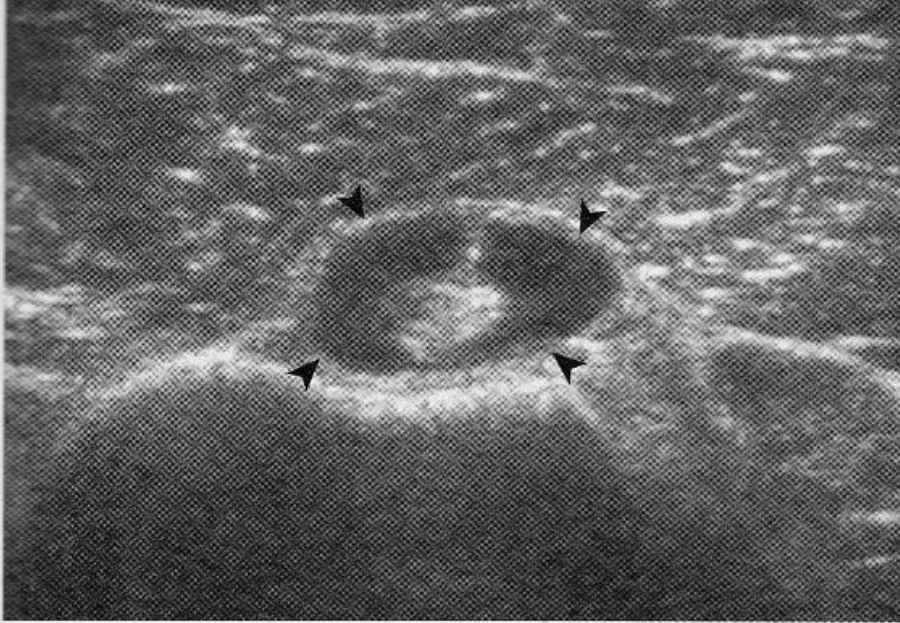
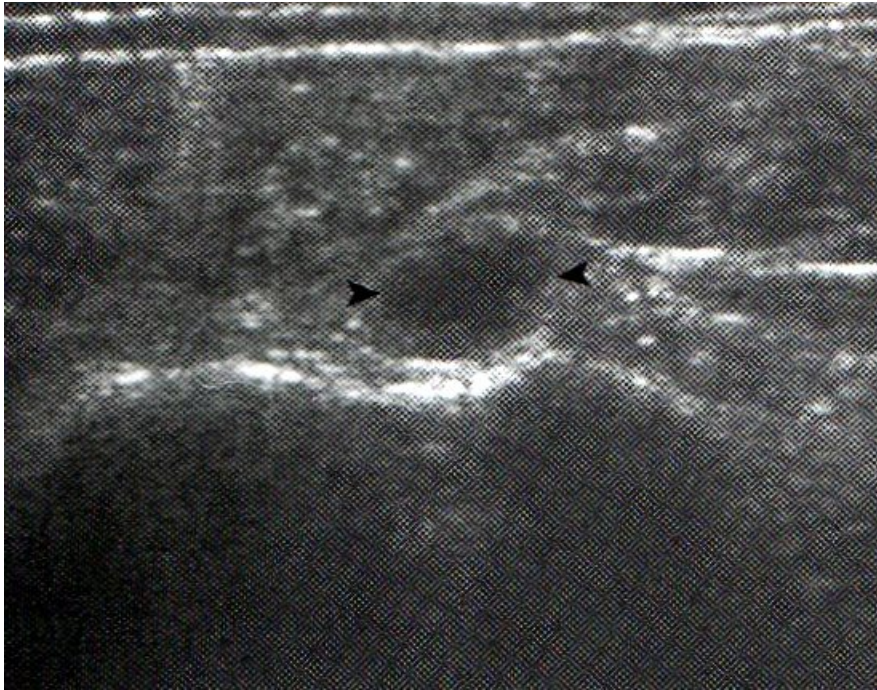


FIGURE 3-27 Joint effusion: biceps tendon sheath communication. Ultrasound image transverse over the distal bicipital groove shows anechoic joint fluid (*arrowheads*), which

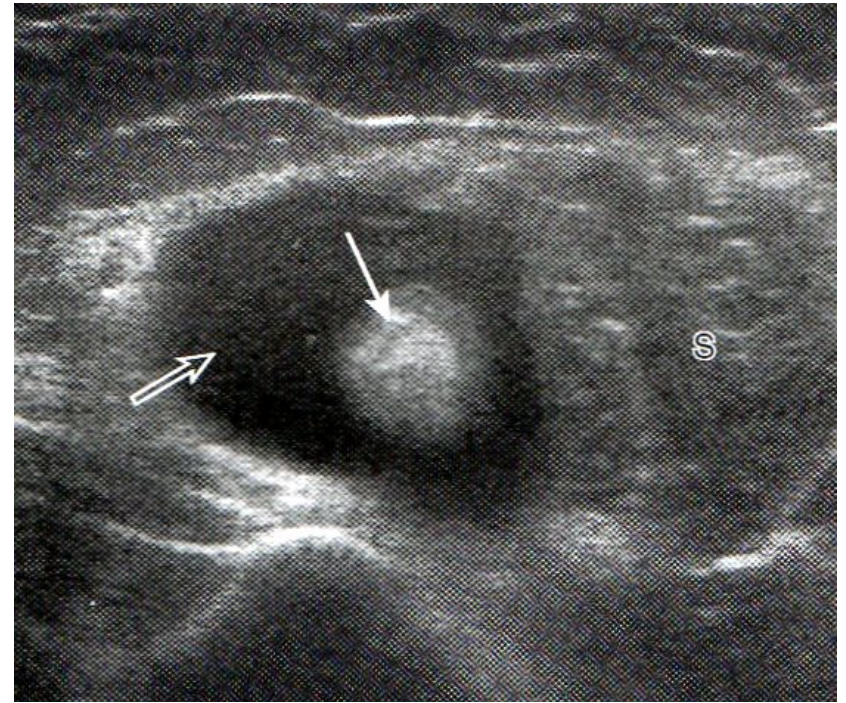
- Halo sign
- Anechoic fluid
- Note “starry sky” appearance normal deltoid

Biceps not necessarily primary problem, the tendon sheath communicates with joint (tender to probe pressure? Tendon pathology?)

Biceps Complete Tear, Transverse view

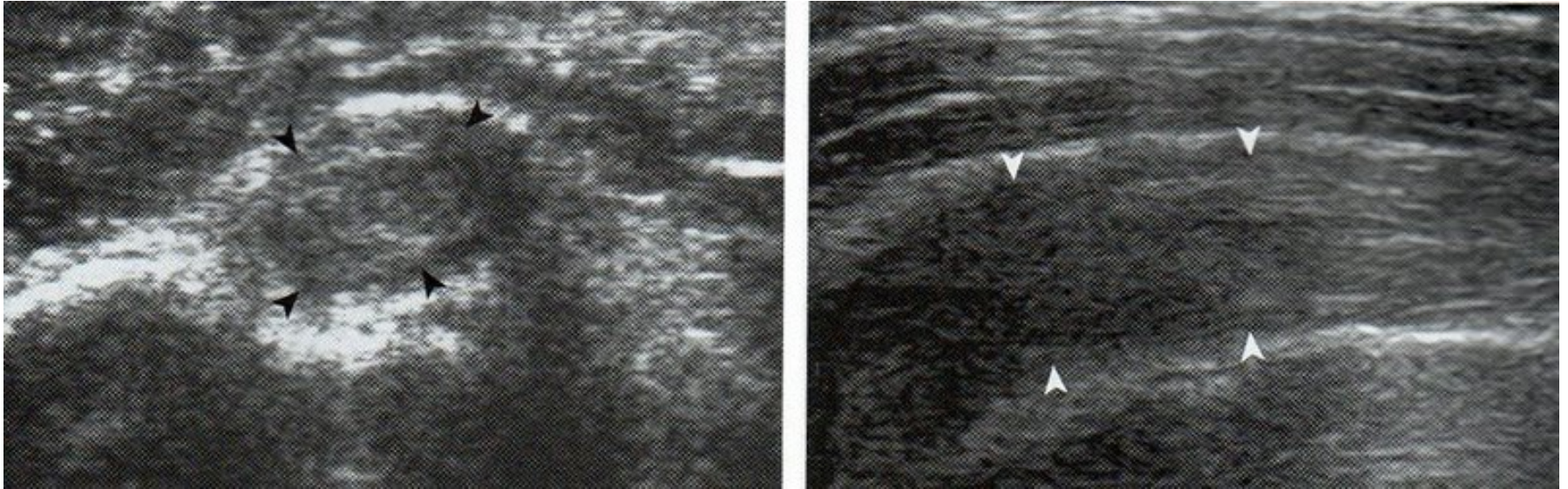


- Right side is medial
- Absence of tendon, just hemorrhage / effusion



- Slide down, there's the retracted tendon

Biceps Tendinosis



- Transverse on left, longitudinal on right
- Hypoechoic thickening, but no disruption of fibers
- May need to compare to other side

Dynamic exam - Biceps Dislocation

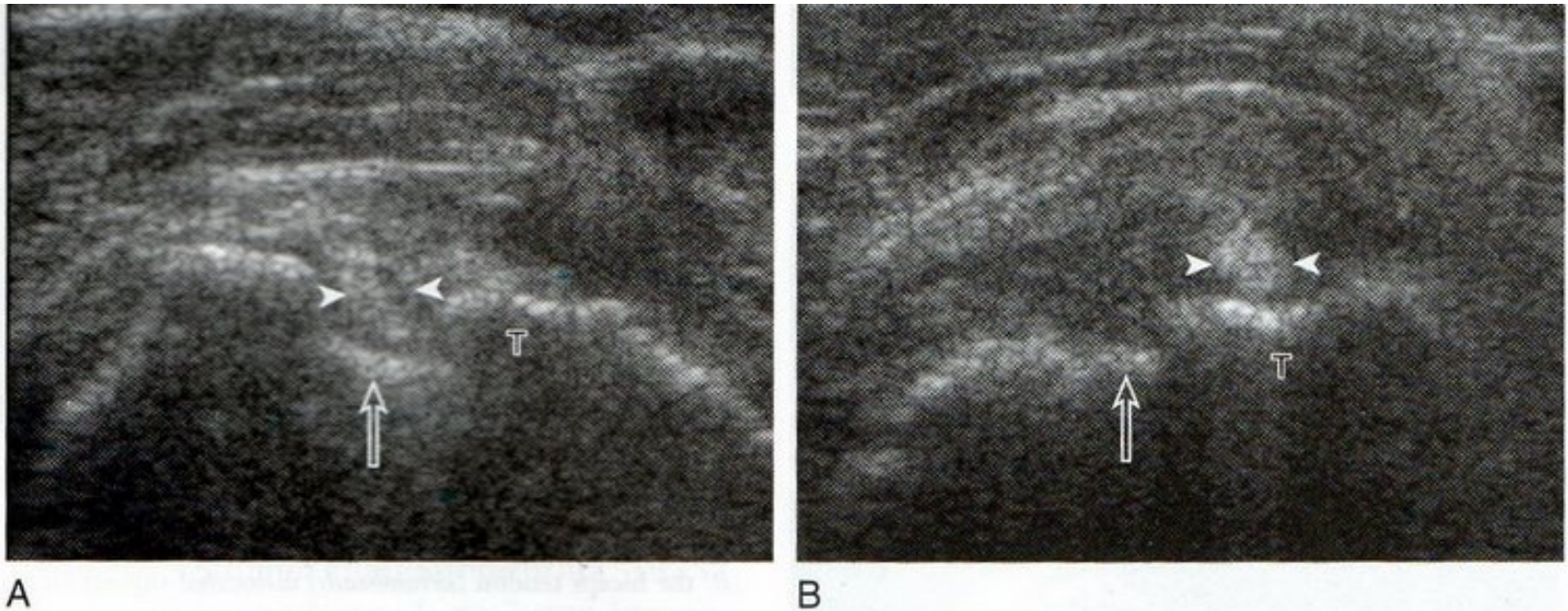
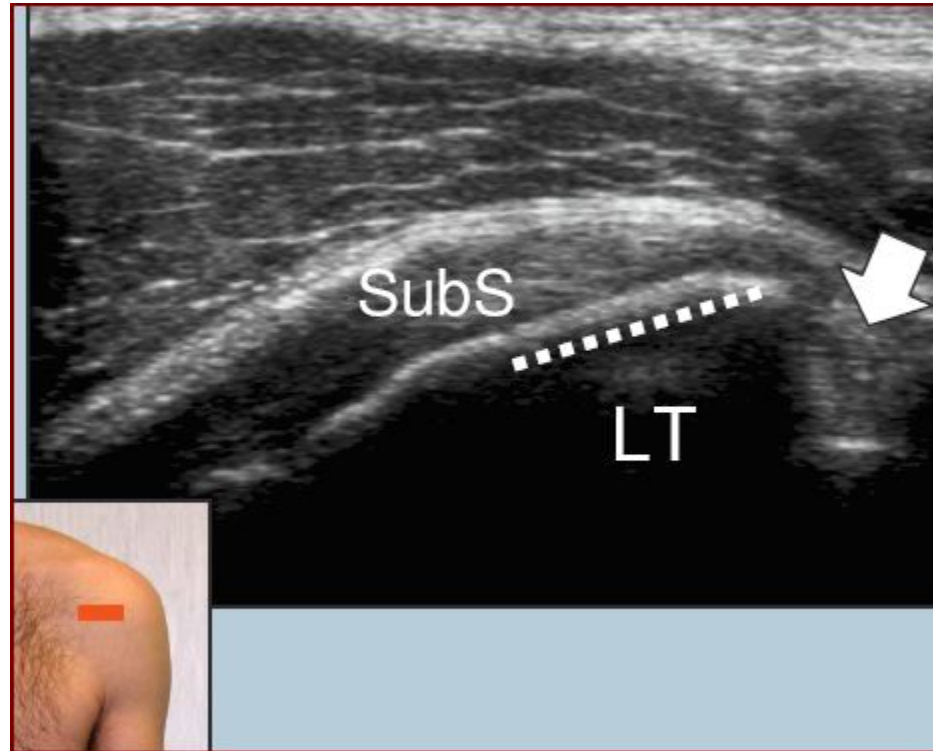


FIGURE 3-66 Transient biceps brachii tendon dislocation. Ultrasound images transverse to the biceps brachii long head tendon in neutral (*A*) and external rotation (*B*) show medial dislocation of the biceps tendon (*arrowheads*) in *B* (*open arrow*, bicipital groove, *T*, lesser tuberosity; *right side* of images is medial).

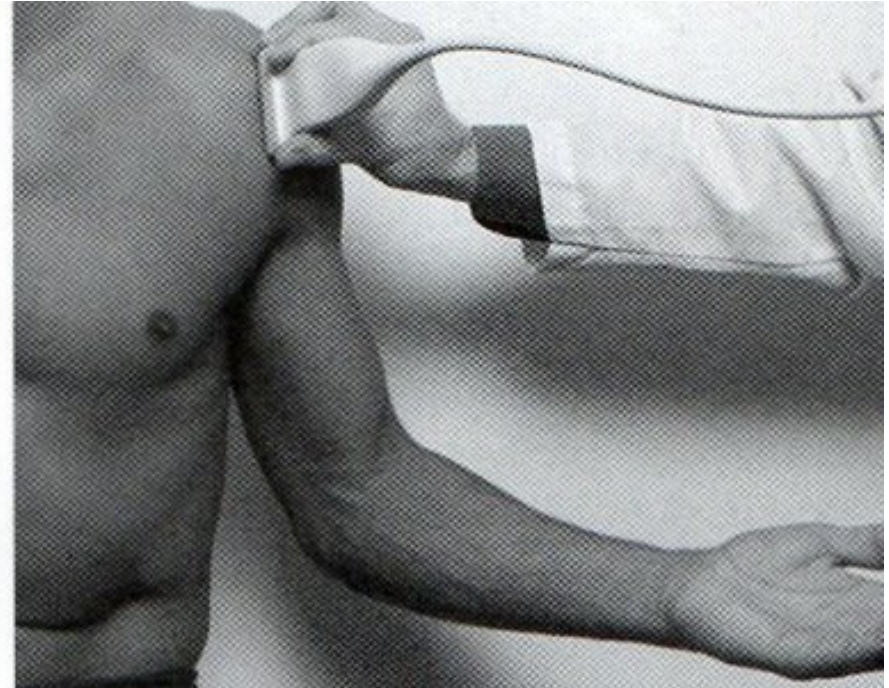
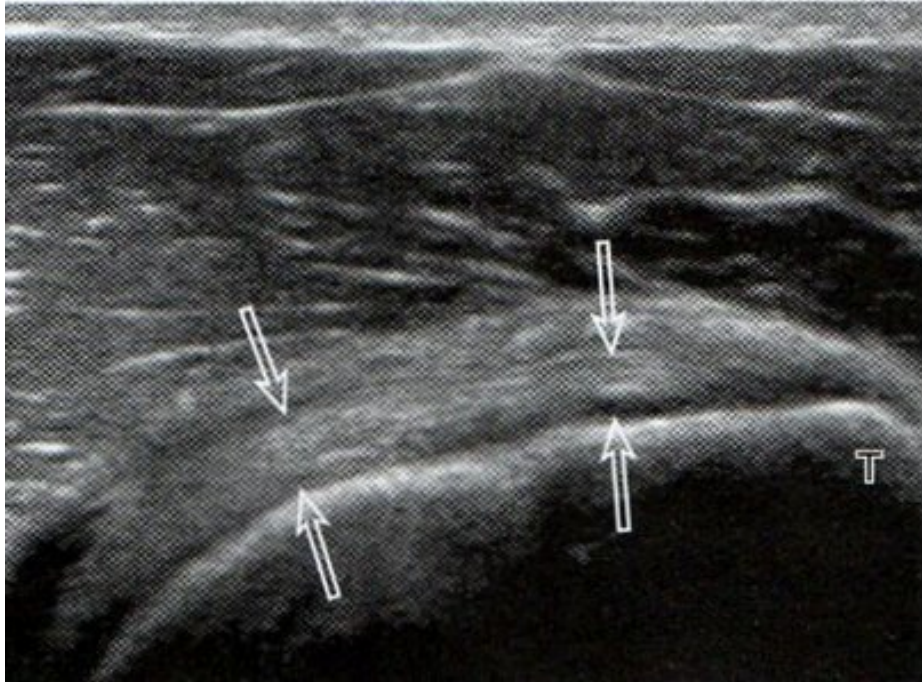
- Before and after external rotation (dislocated medially-right side of image)
- Arrowheads – biceps tendon, open arrow – bicipital groove

Externally rotate to see subscapularis



- Lateral is to the right
- Dotted line – insertion of subscap tendon on lesser tuberosity
- Arrow – biceps in transverse

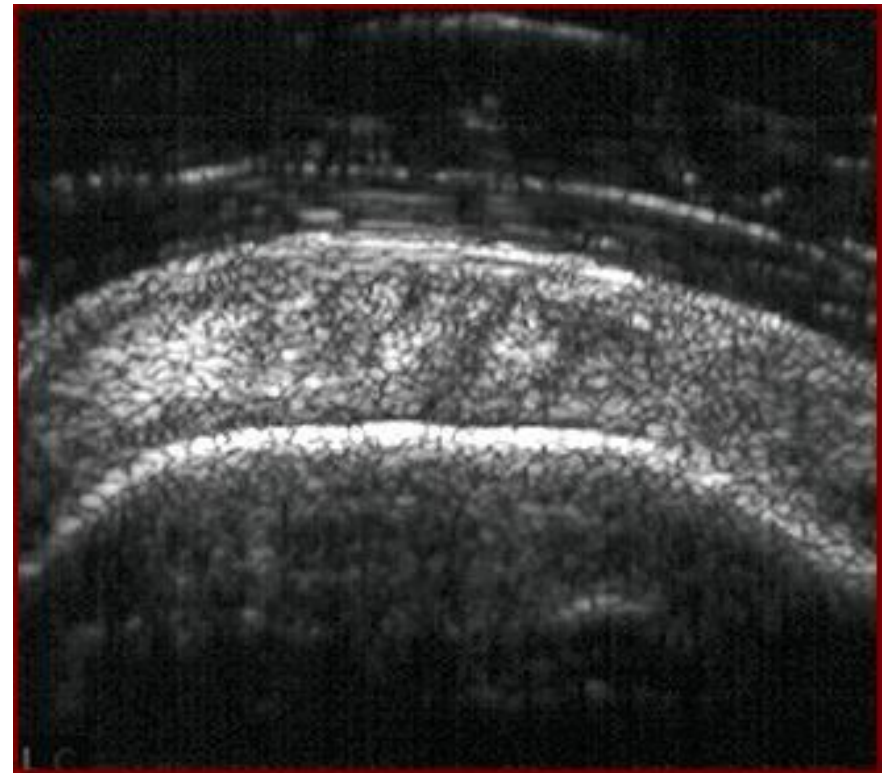
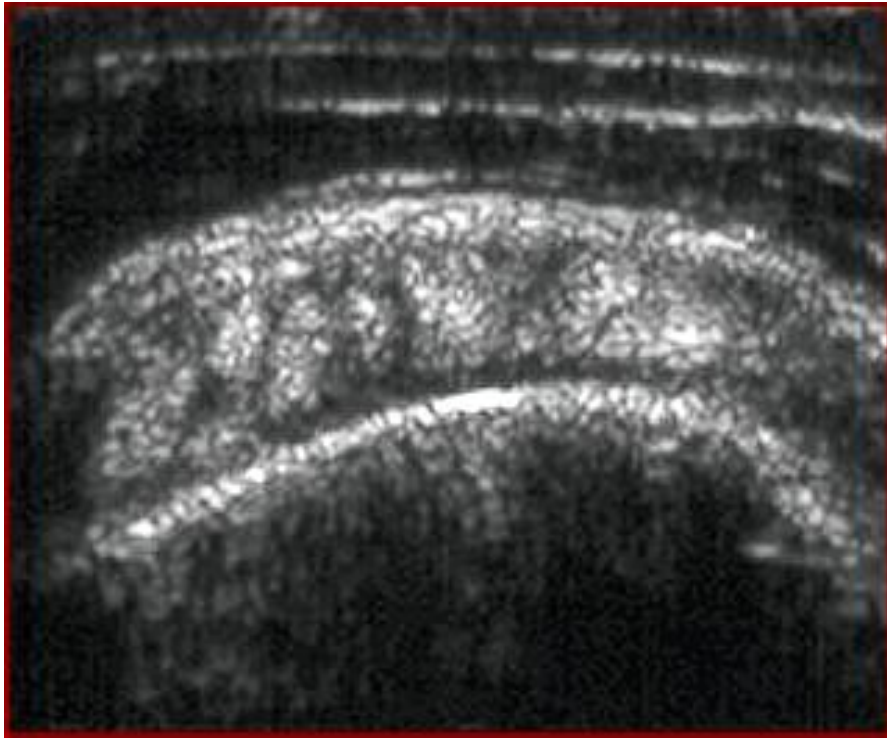
Turn 90 degrees for transverse view



- Seen laterally, mainly hyperechoic tendon here

Now you slide medially...

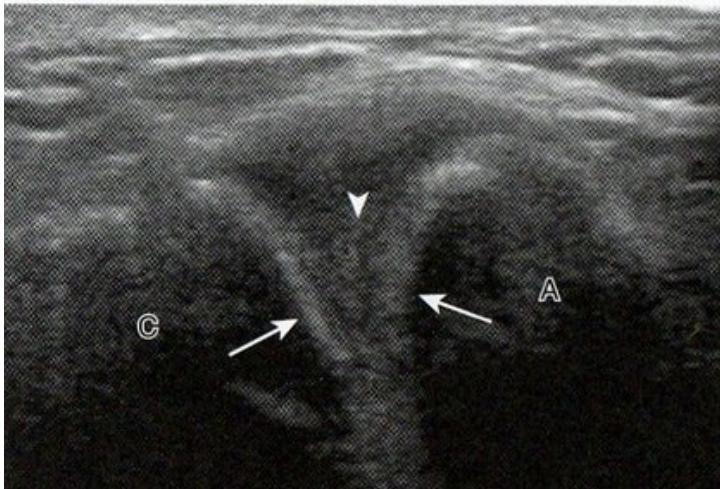
- Normal appearances of musculotendinous junctions. Not a tear!



US of the AC Joint

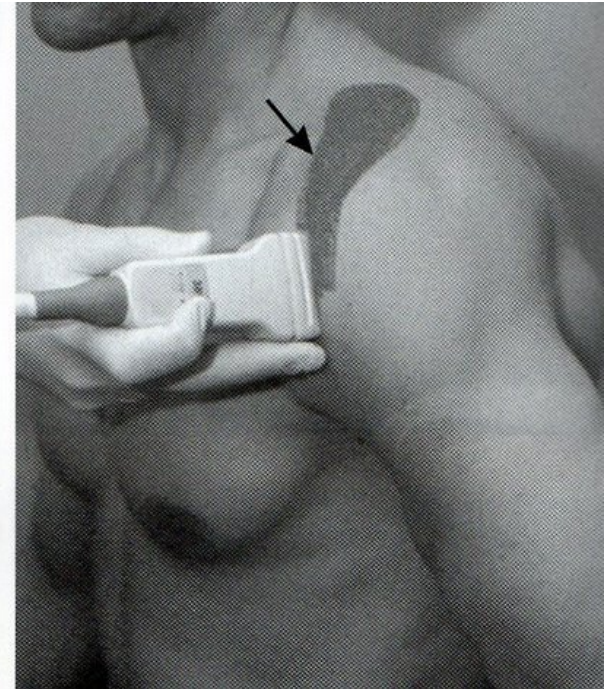
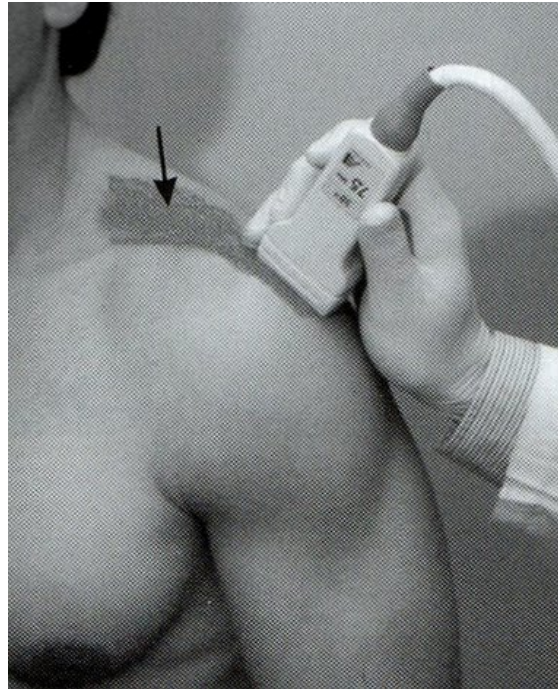


A



- Use visualization / palpation for probe placement
- View in coronal plane, medial to the left
- Arrowhead: hyperechoic fibrocartilage disc
- Up to 3mm hypoechoic distension is normal

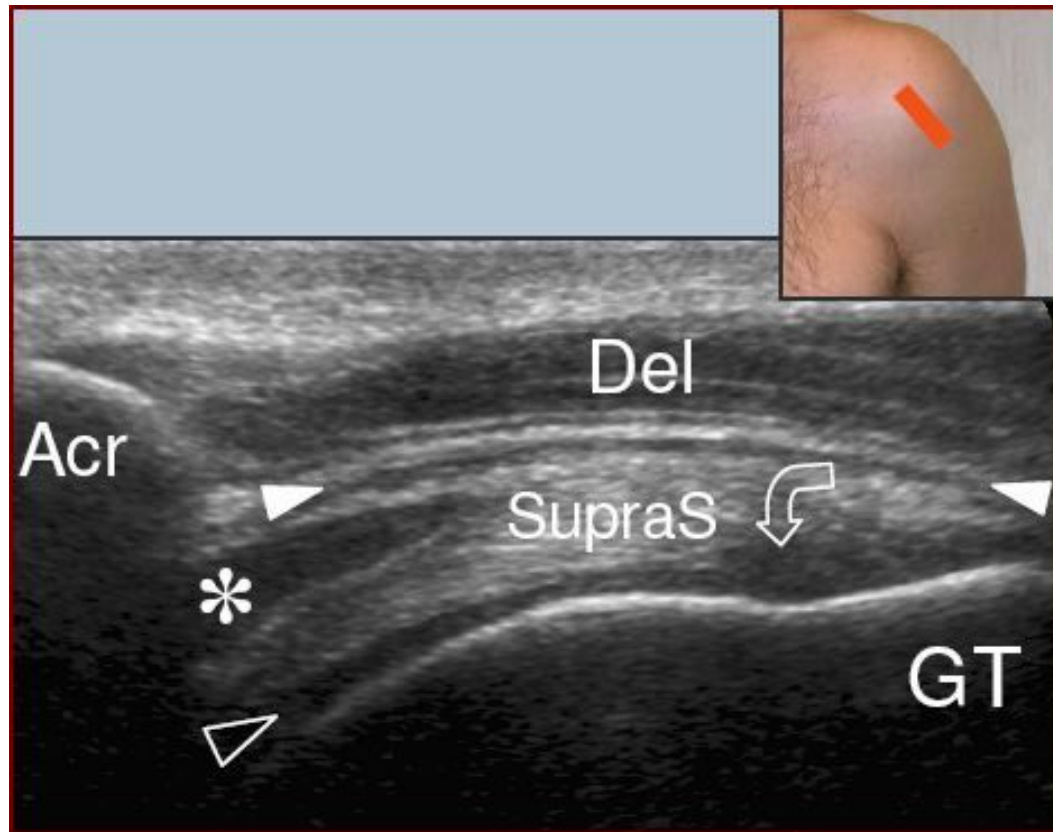
Technique for Supraspinatus



Crass position: ask Pt to put back of hand over contralateral wallet pocket. This tilts GT anteriorly, out from under acromion, exposing supraspinatus

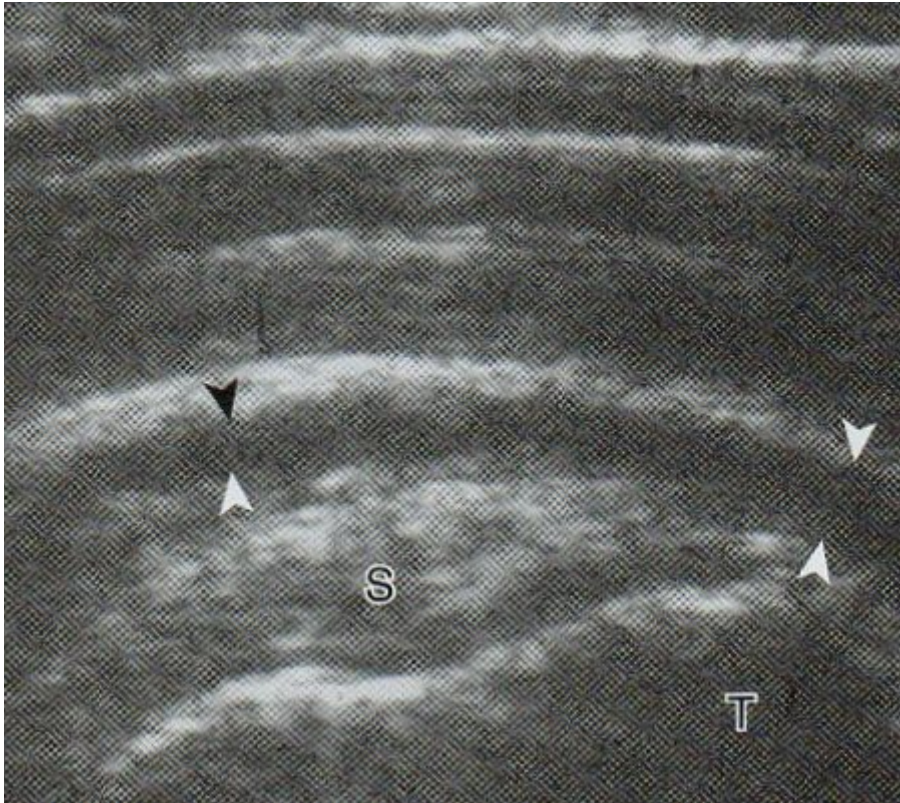
Modified Crass: palm over ipsilateral back pocket, elbow pointed posteriorly

Longitudinal View – “Bird’s beak”



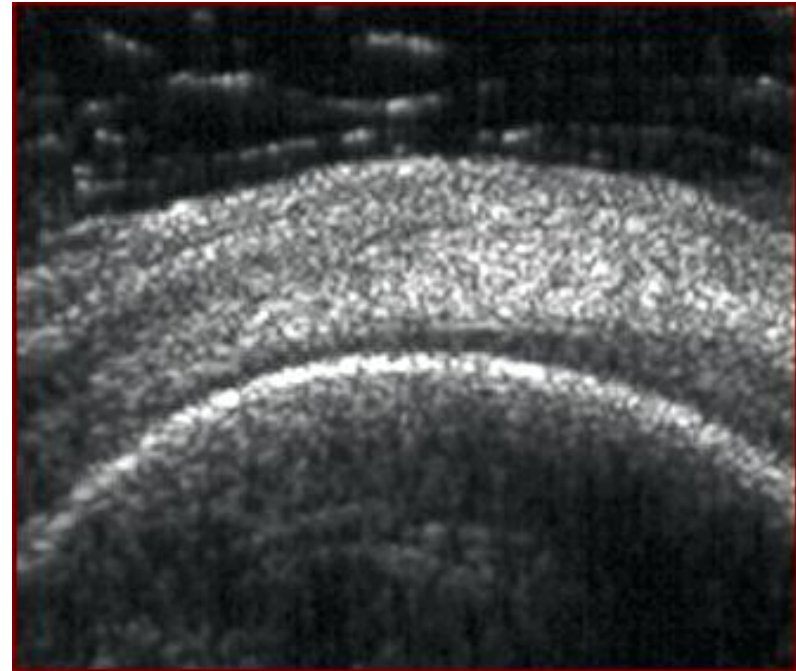
- Point from anterolateral tip of shoulder up at ear
- The more abducted arm is, the less tendon you see
- White arrowhead: subacromial subdeltoid bursa, Open arrowhead: hypoechoic hyaline cartilage, asterisk: myotendinous junction, curved arrow: anisotropy

“I have bursitis”



- >1 mm is abnormal
- Reflection of acuity of injury
- Injection target

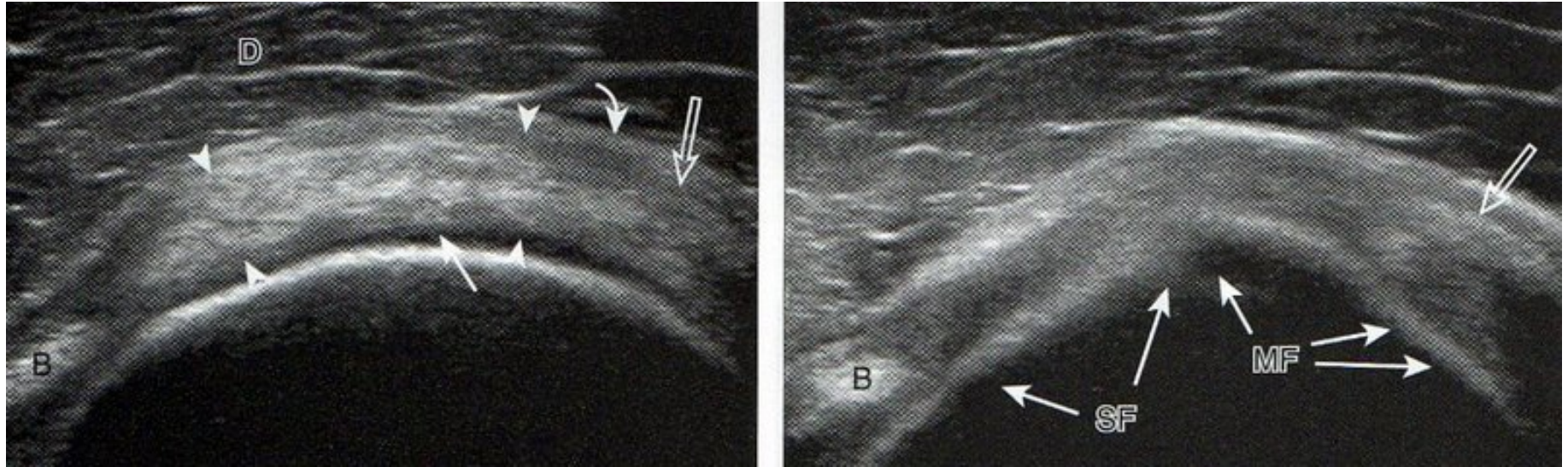
Turn probe and look transverse..



Same Pt position, but turn probe 90°

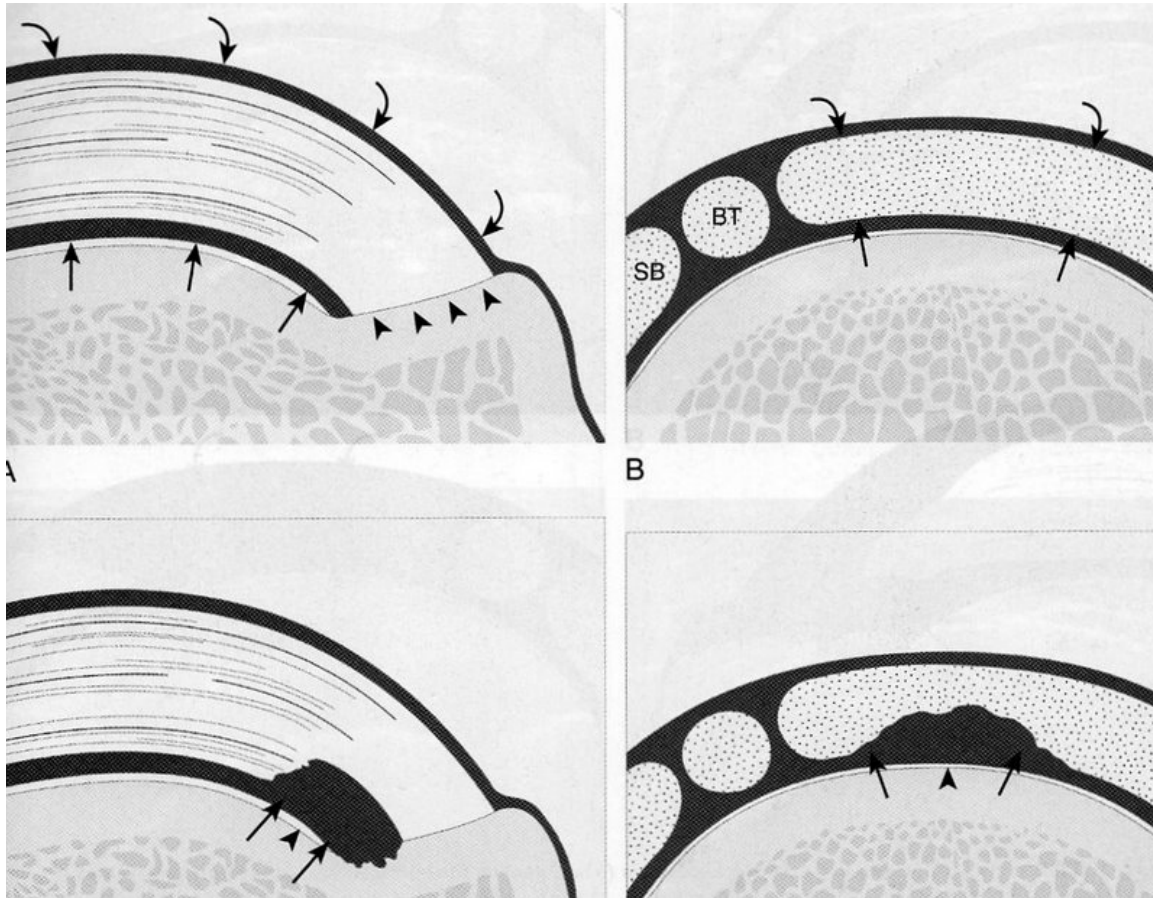
Has a wide footprint 2-2.25 cm, should sweep around to see whole tendon. Intra-articular biceps tendon will be at anterior edge. Linear probe 6 cm long

Sweep proximal to distal..



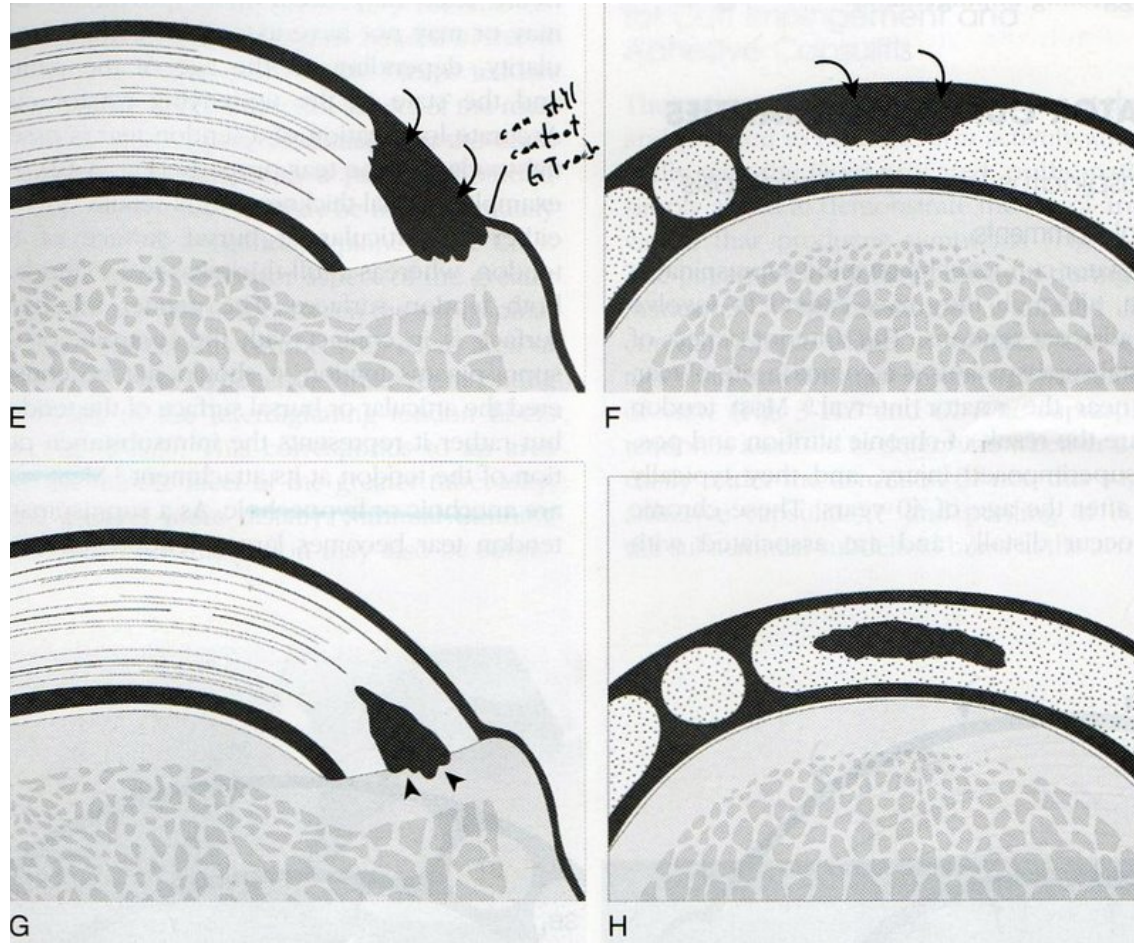
Note intra-articular portion of biceps tendon in rotator interval, note uniform thickness of tendon and facet insertions, open arrow – supra/infraspinatus junction, curved arrow – where bursa would be

Let's Diagram Different Types of Supraspinatus Tears



- Top: normal. Curved arrow – bursal surface, straight arrow – articular surface
- Bottom: articular-side partial thickness tear (rim-rent)

More Partial Tears



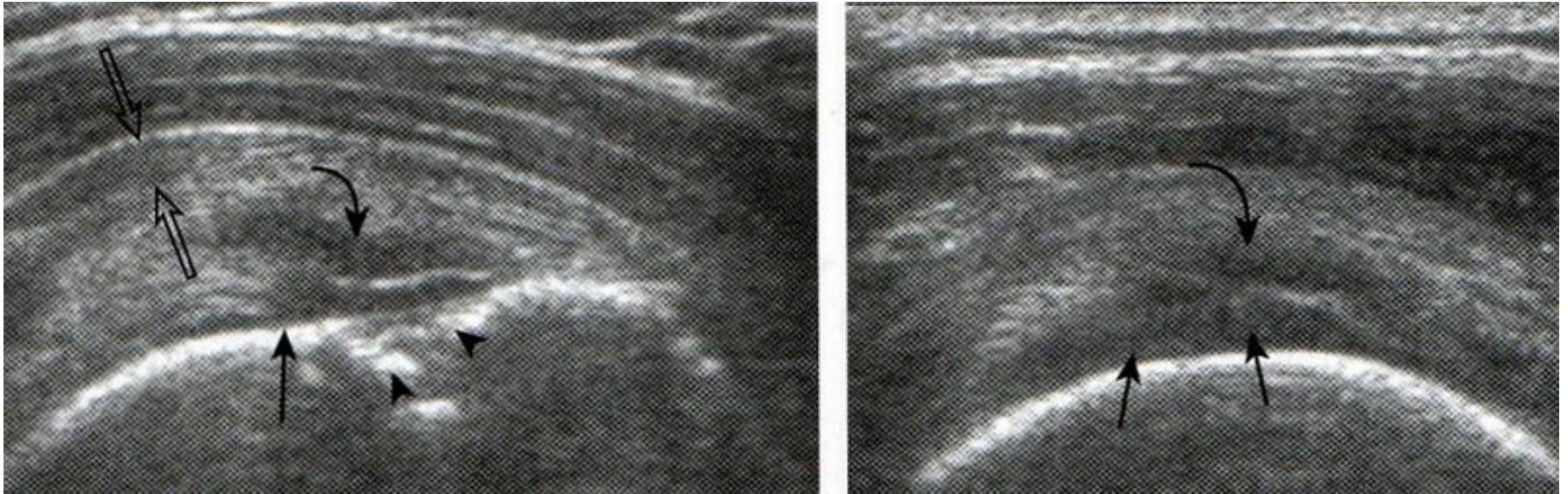
- Top: bursal-side partial thickness tears
- Bottom: intrasubstance tear

Full-thickness Tears



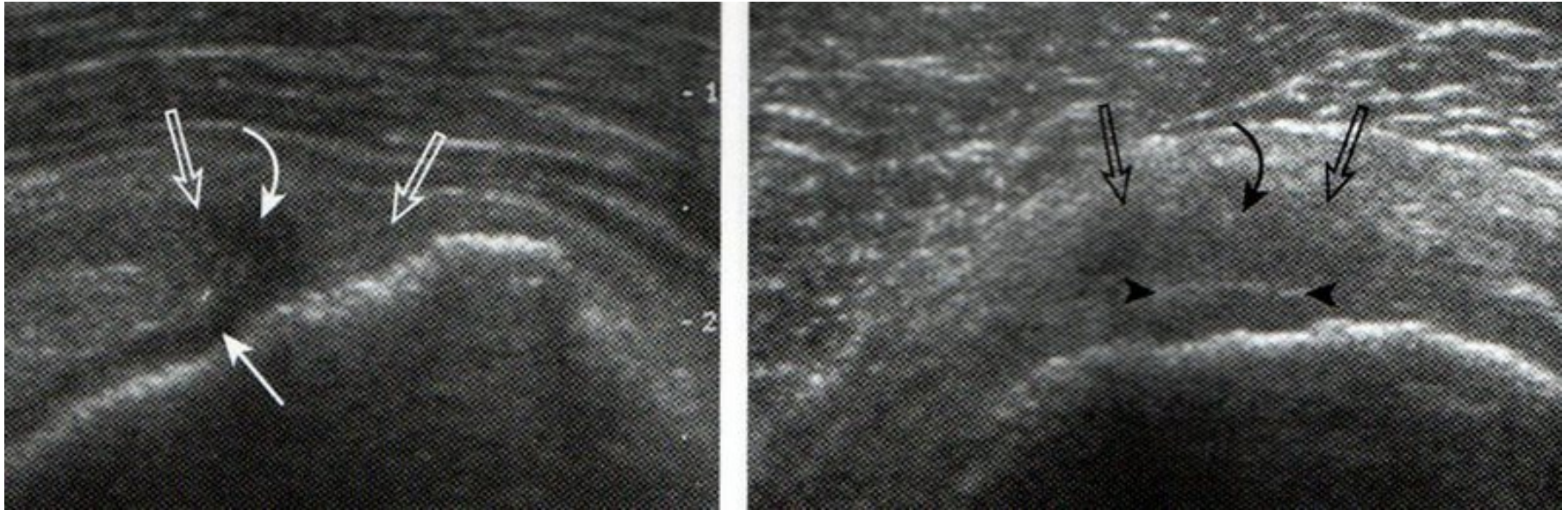
- Full-thickness (FT) tear
- Full-thickness tears that encompass whole width of tendon is a complete FT tear

Cortical Irregularity



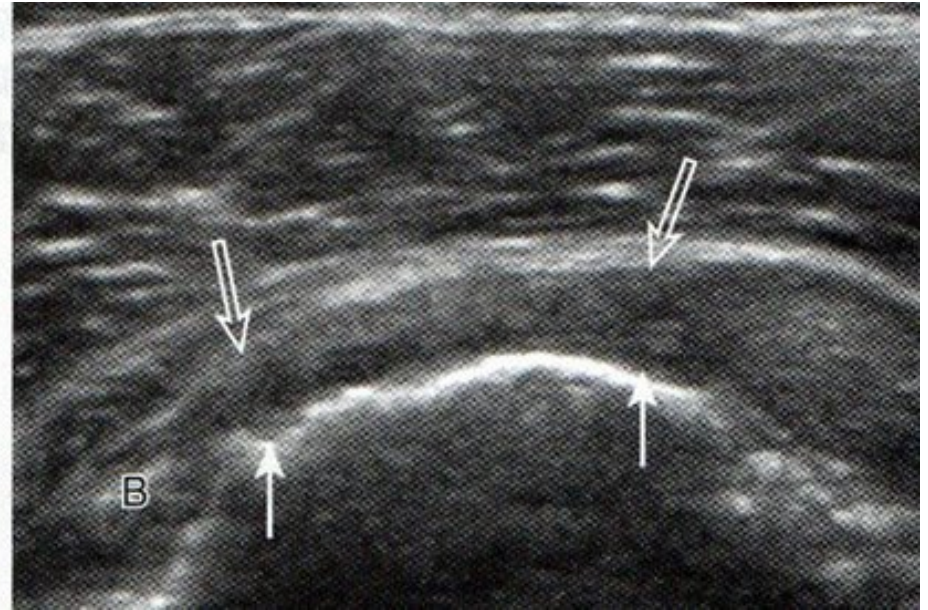
- Jacobsen: best indicator of tear >> tendinosis
- Especially seen in those with chronic / degenerative tears
- Curved arrow shows distal partial-thickness articular-side tear (rim-vent tear), arrowheads – cortical irregularity, open arrows – mild bursa thickening

Cartilage interface sign on a full-tear



- Curved arrow – hypoechoic full-thickness tear, extends from bursal surface (open arrow) to articular surface (white arrow)
- Arrowheads: Cartilage interface sign– when there is hypoechoic / anechoic signal near cartilage interface, this become even more hyperechoic and noticeable

The shape is funny..



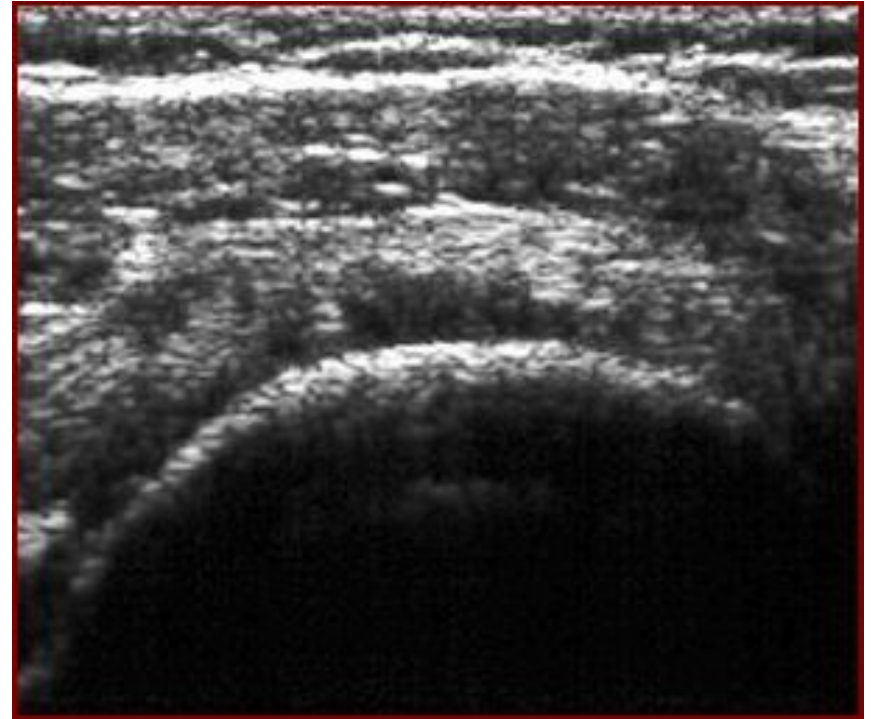
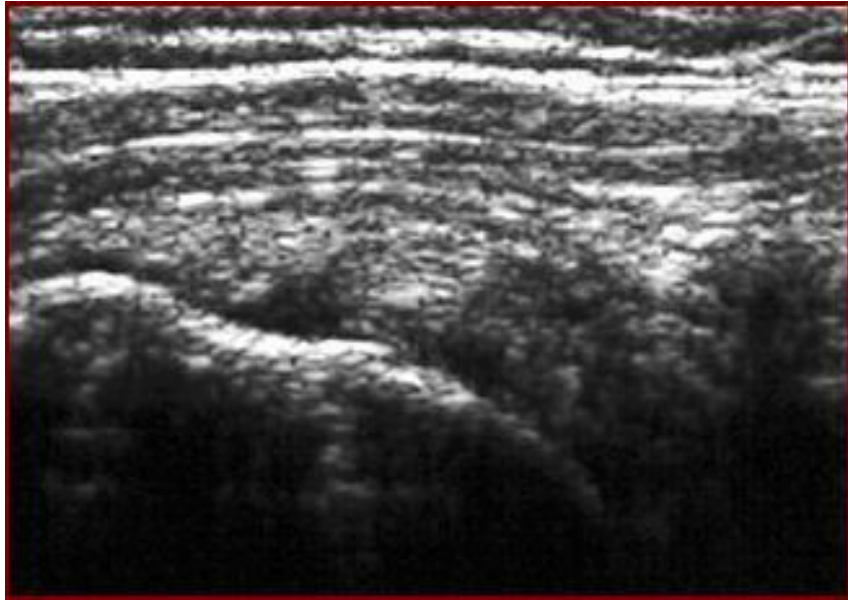
Full-thickness tears often have a loss of convexity and volume loss as seen above

* - retracted tendon, curved arrow – isoechoic synovitis, other arrows show articular and bursal surfaces

Summary on Cuff Tears

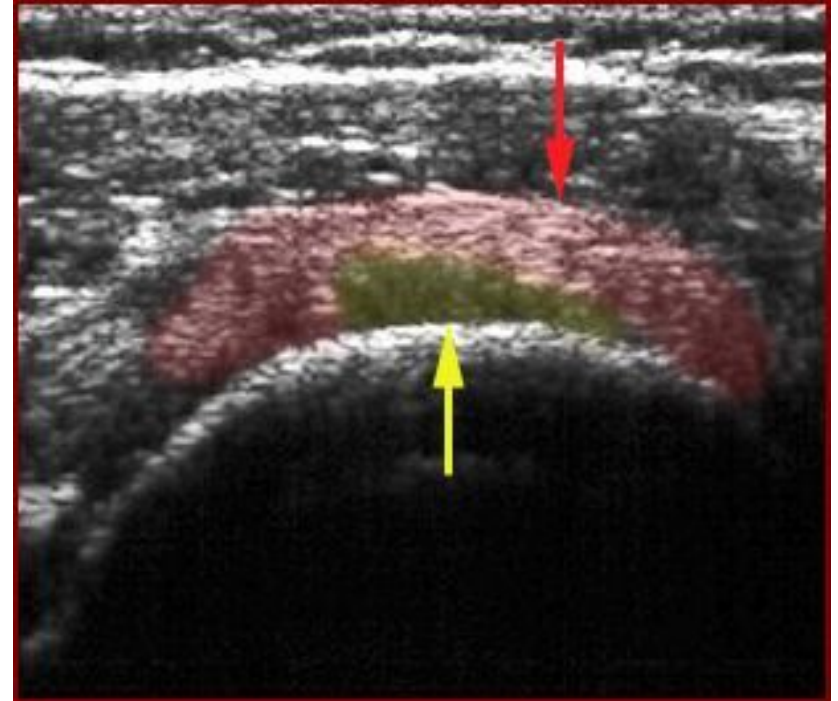
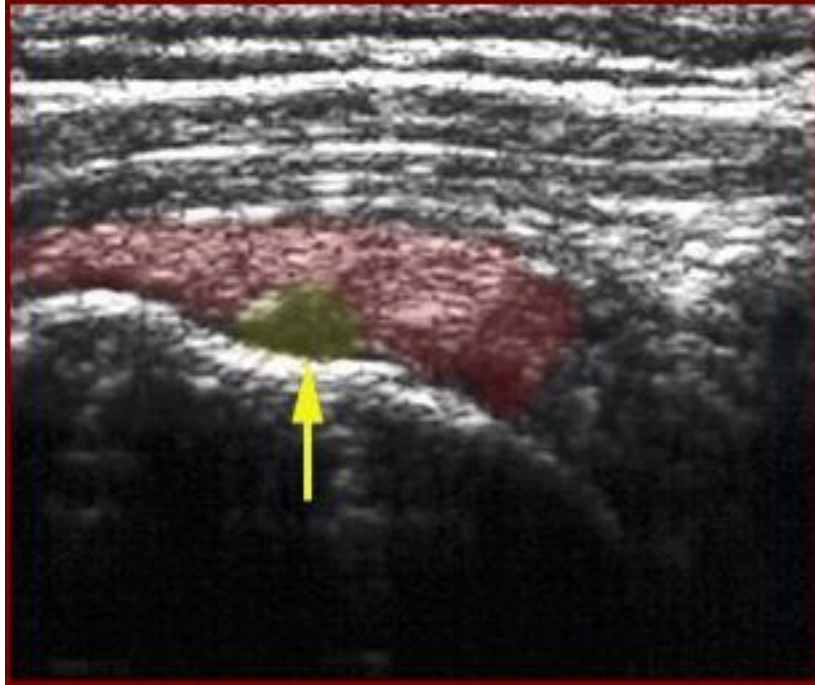
- Partial , articular-side and full-thickness tears:
 - Cartilage interface sign
- Partial, bursal-side and full-thickness tears:
 - Loss of contour / volume
- Full – thickness tears:
 - Joint / biceps effusion (effusion + bursitis = 95% there is tear)
 - Anechoic defect spanning from articular to bursal side
 - Visible stump, moves on dynamic exam
- Any tear:
 - Cortical irregularity

Is there a tear and what type?



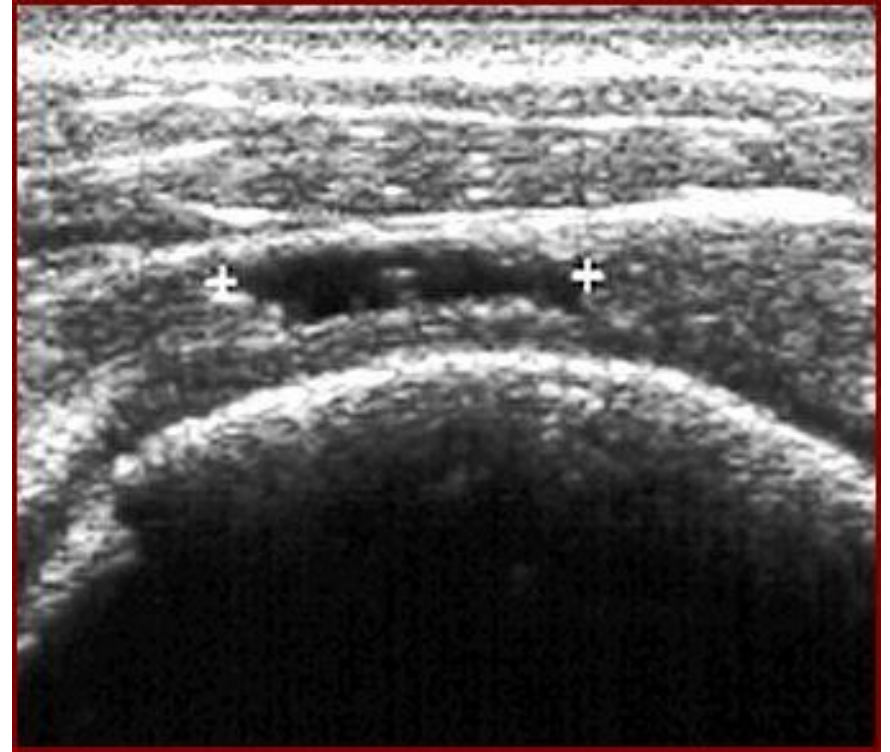
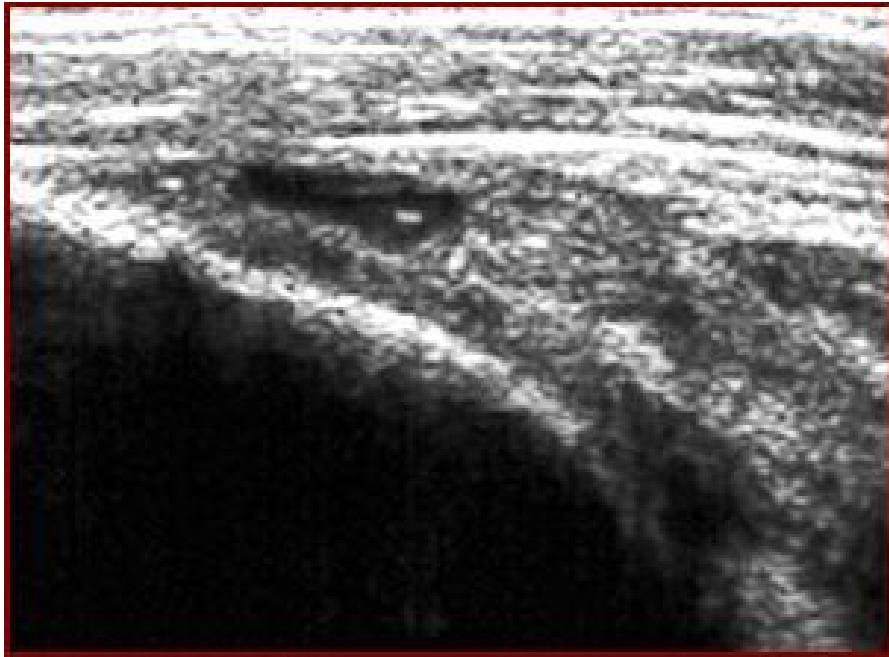
- Longitudinal on left and transverse on right

Partial thickness, articular-sided



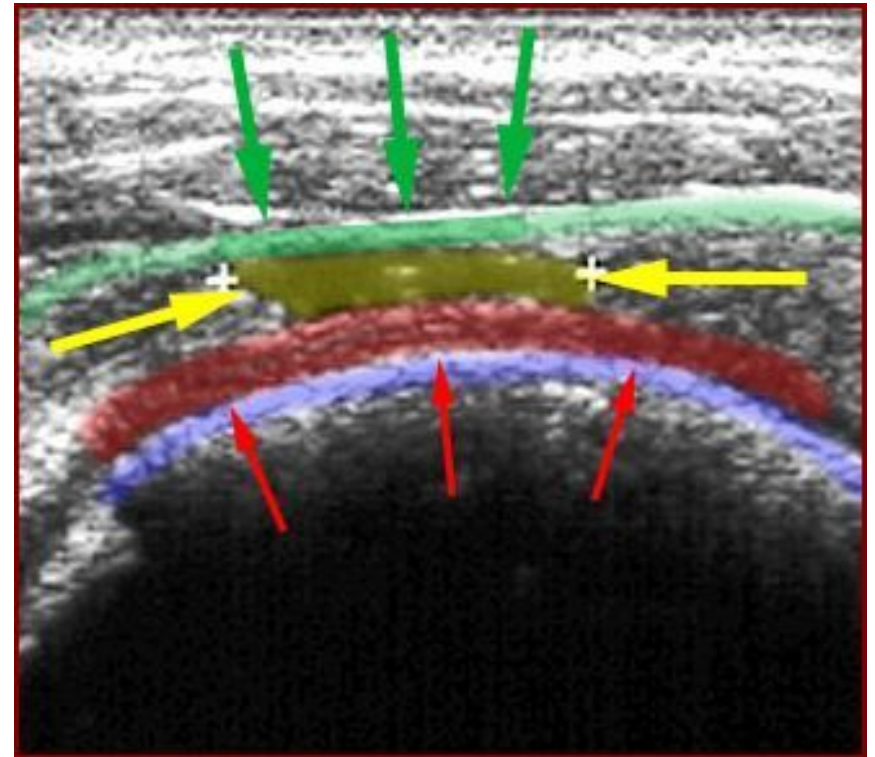
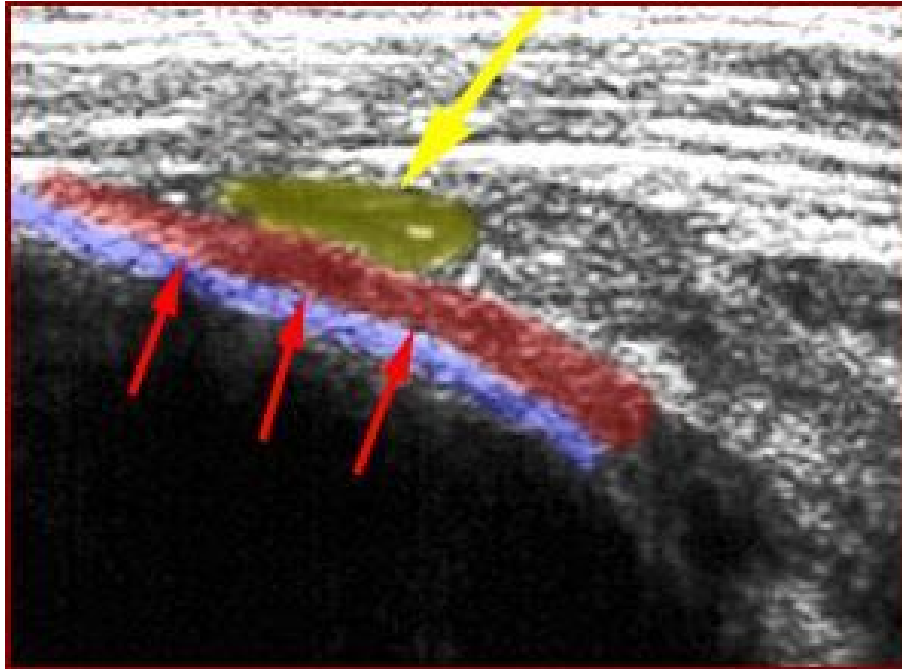
Yellow – anechoic defect representing articular-sided partial thickness tear. Red – remainder of tendon. Note: no volume loss

What type of tear is this?



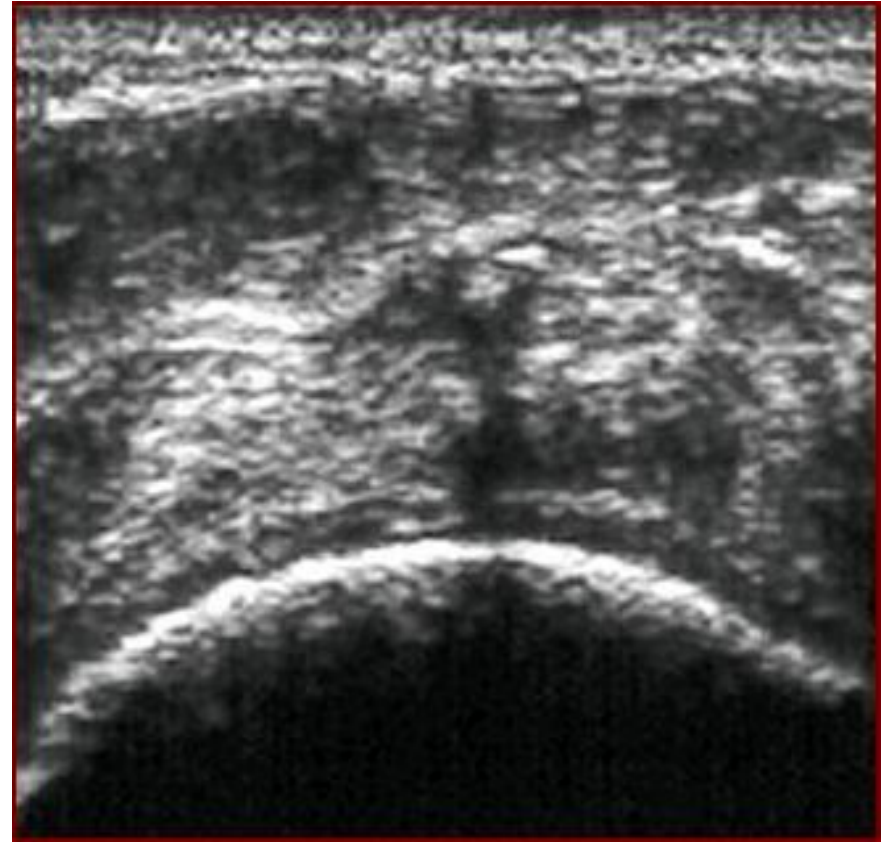
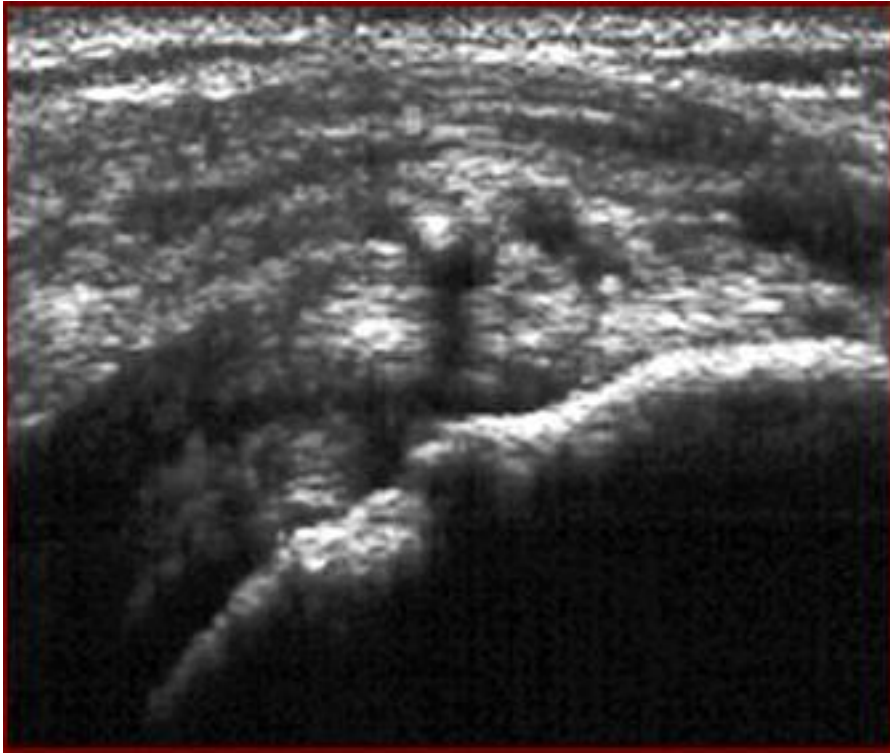
- Longitudinal on left and transverse on right

Partial-thickness, bursal-sided tear



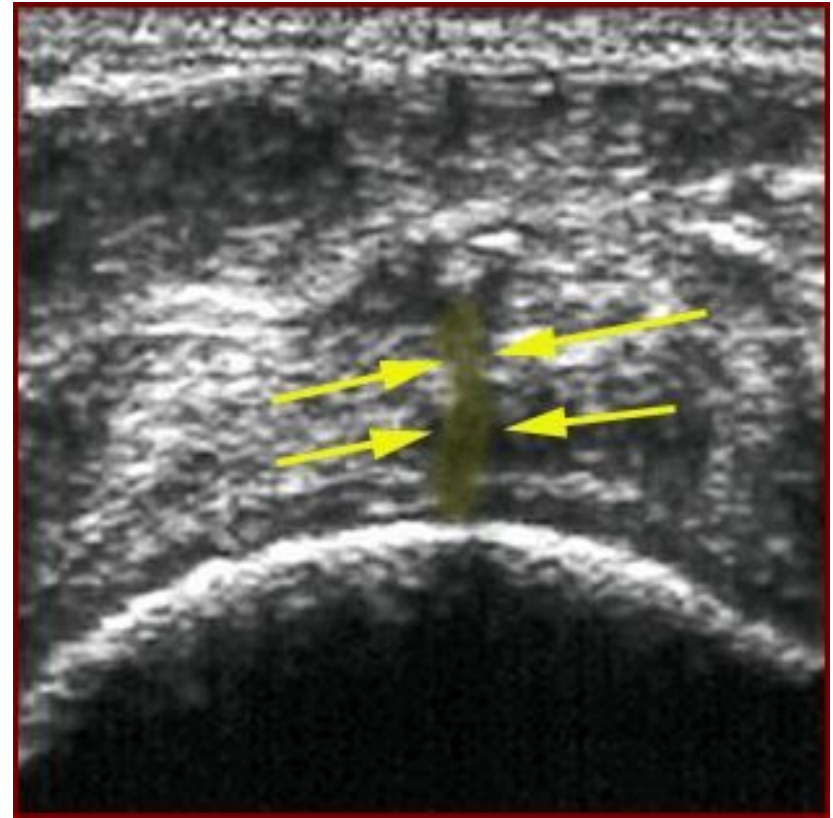
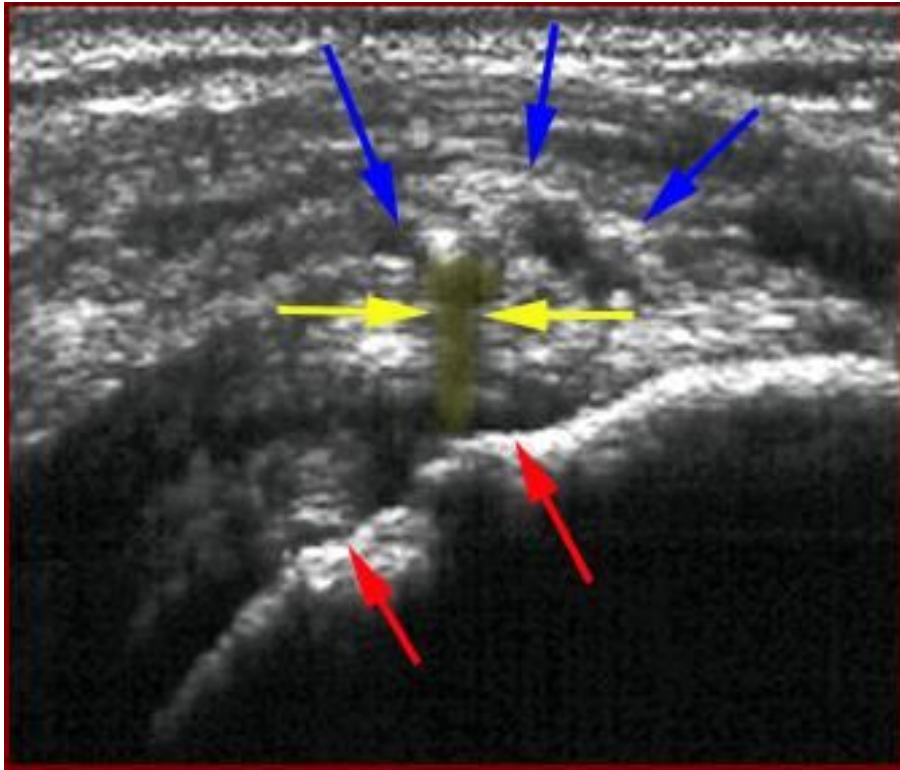
- Yellow – anechoic bursal surface tear, red – intact tendon fibers, blue – humeral cortex

Intrasubstance Tear?



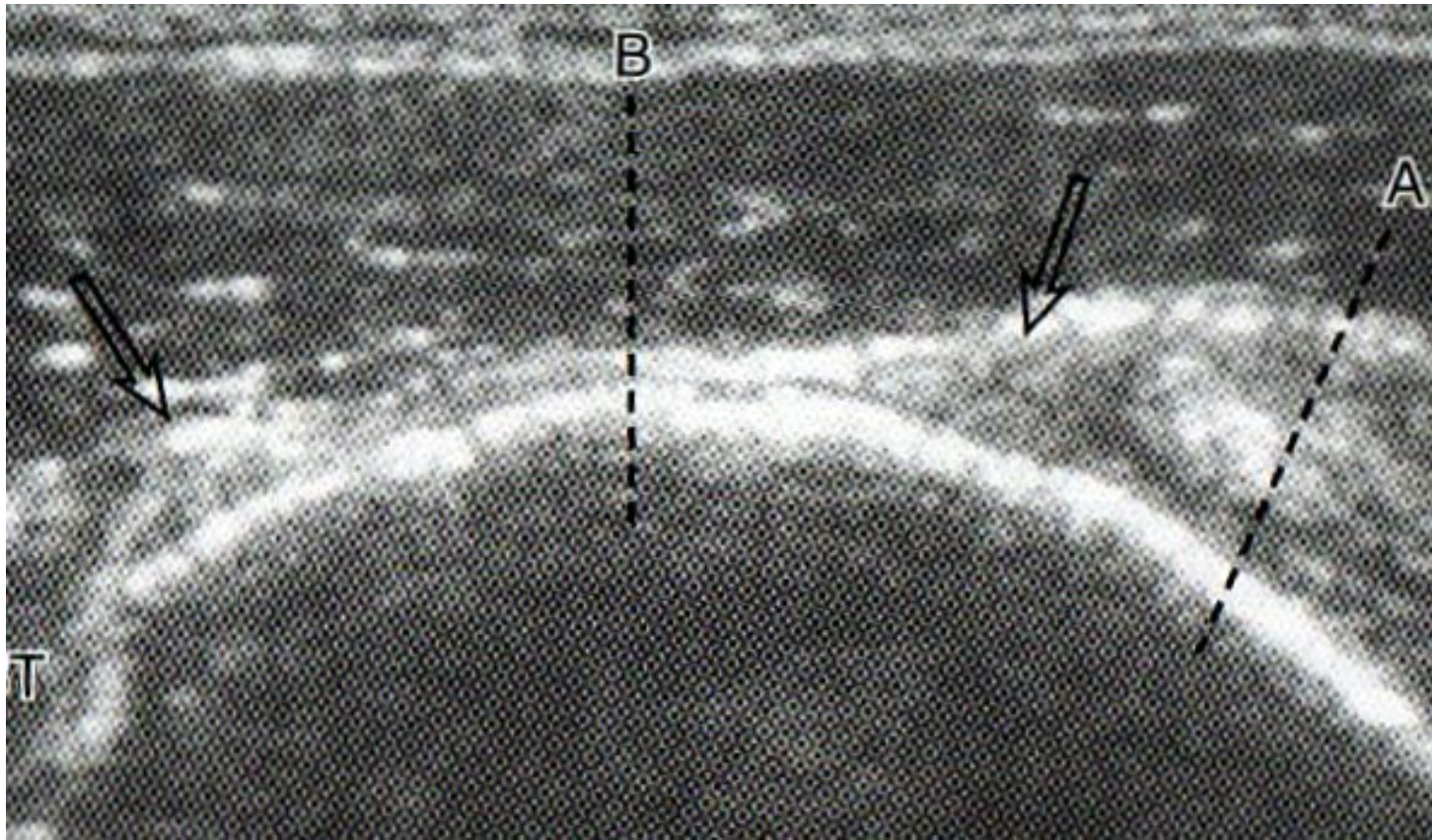
- Longitudinal on left, transverse on right

NO! Full-thickness!



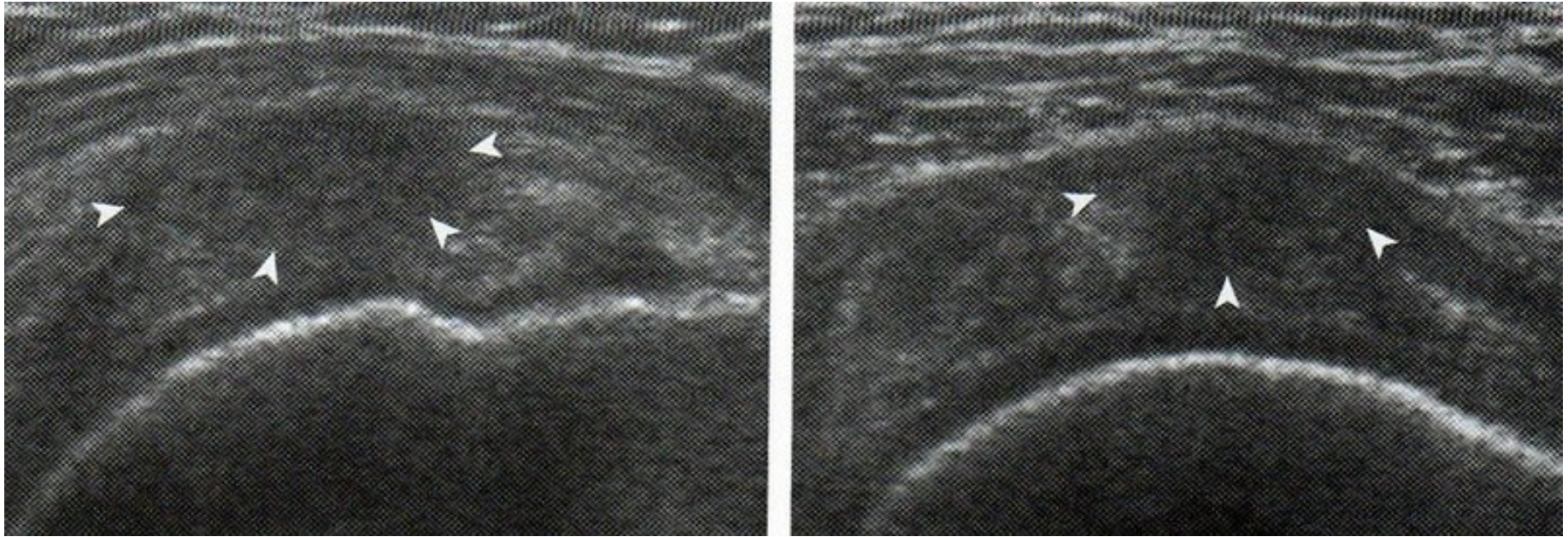
- Yellow – linear full-thickness tear, extending from articular (red) to bursal surface (blue)

The value of a transverse view



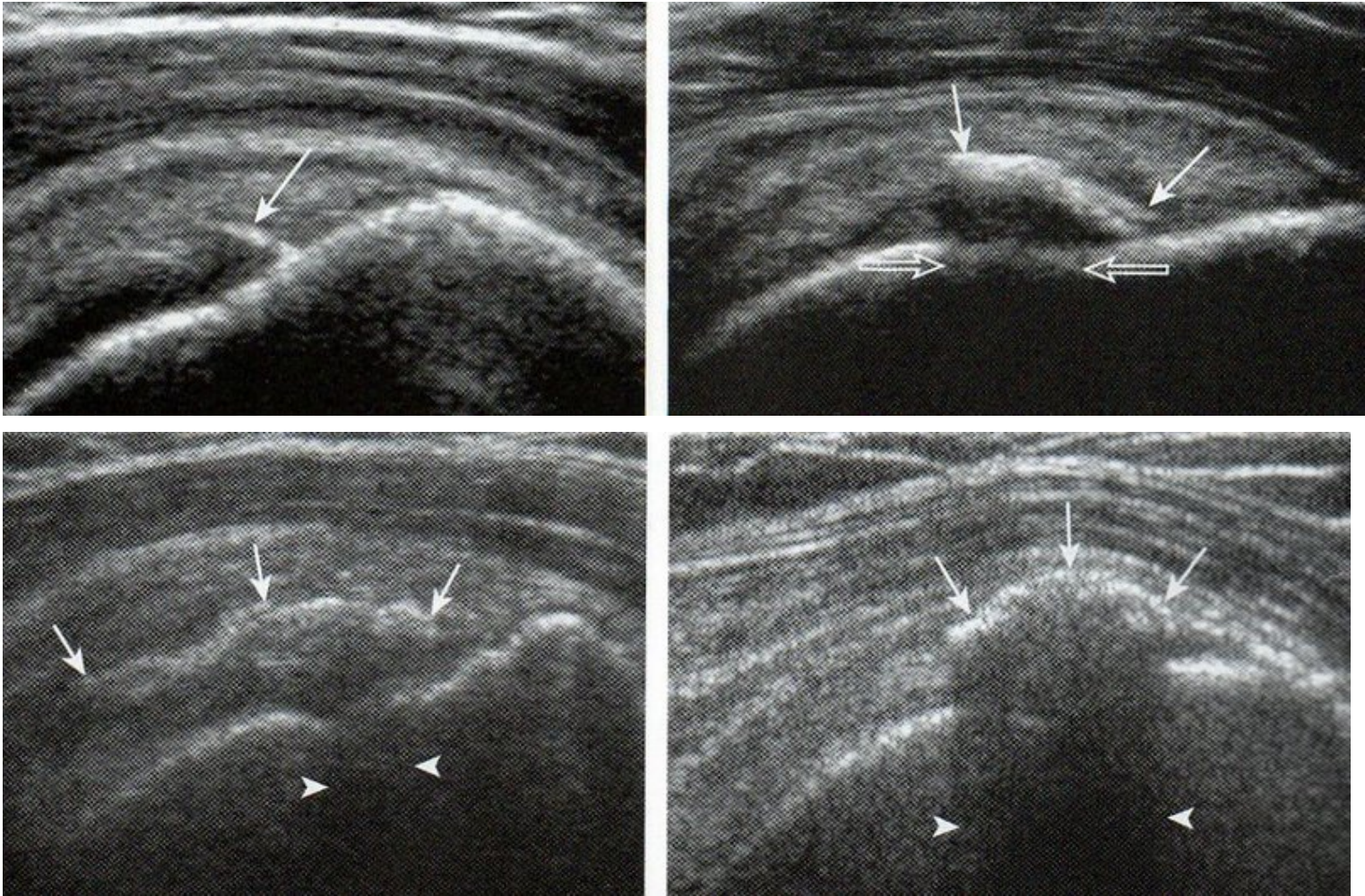
- Anterior side is on left
- Reminder to examine entire width of supraspinatus

Tendinosis / Tendinopathy



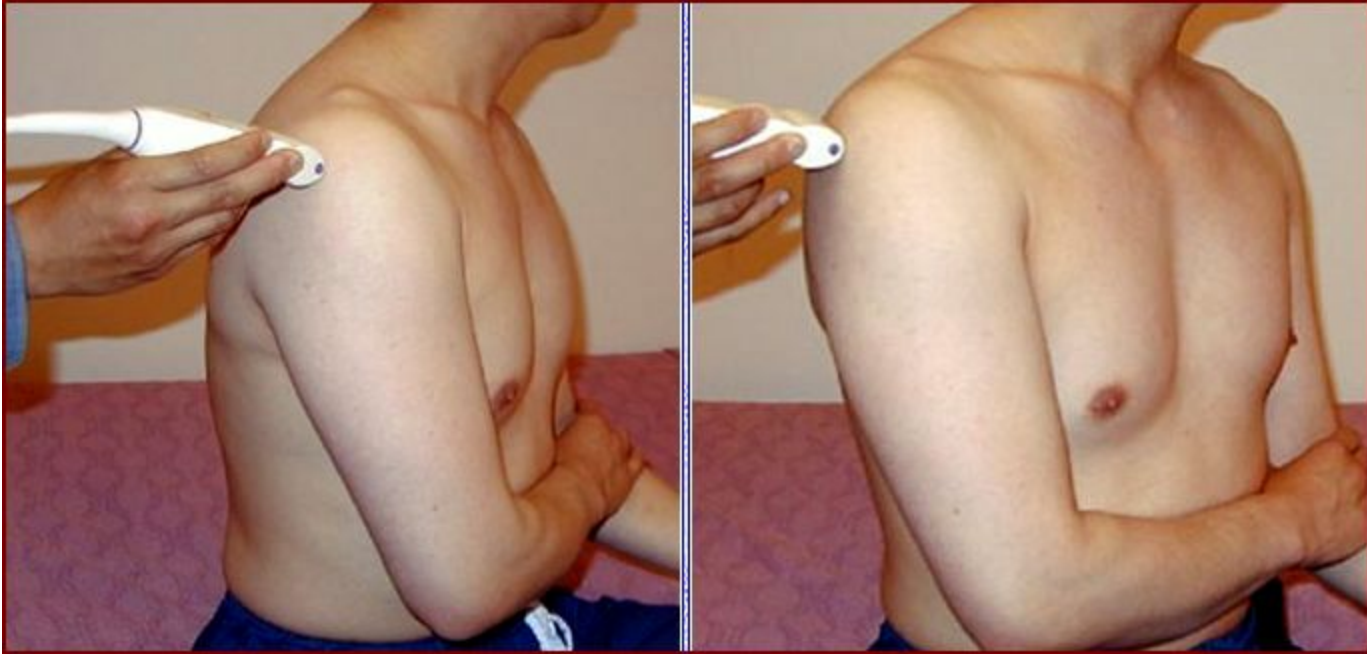
- Can be focal (like above) or diffuse
- Hypoechoic (like muscle around it) thickening (normal is < 6 mm)
- No discrete tear, no cortical irregularity

Calcific Tendinopathy



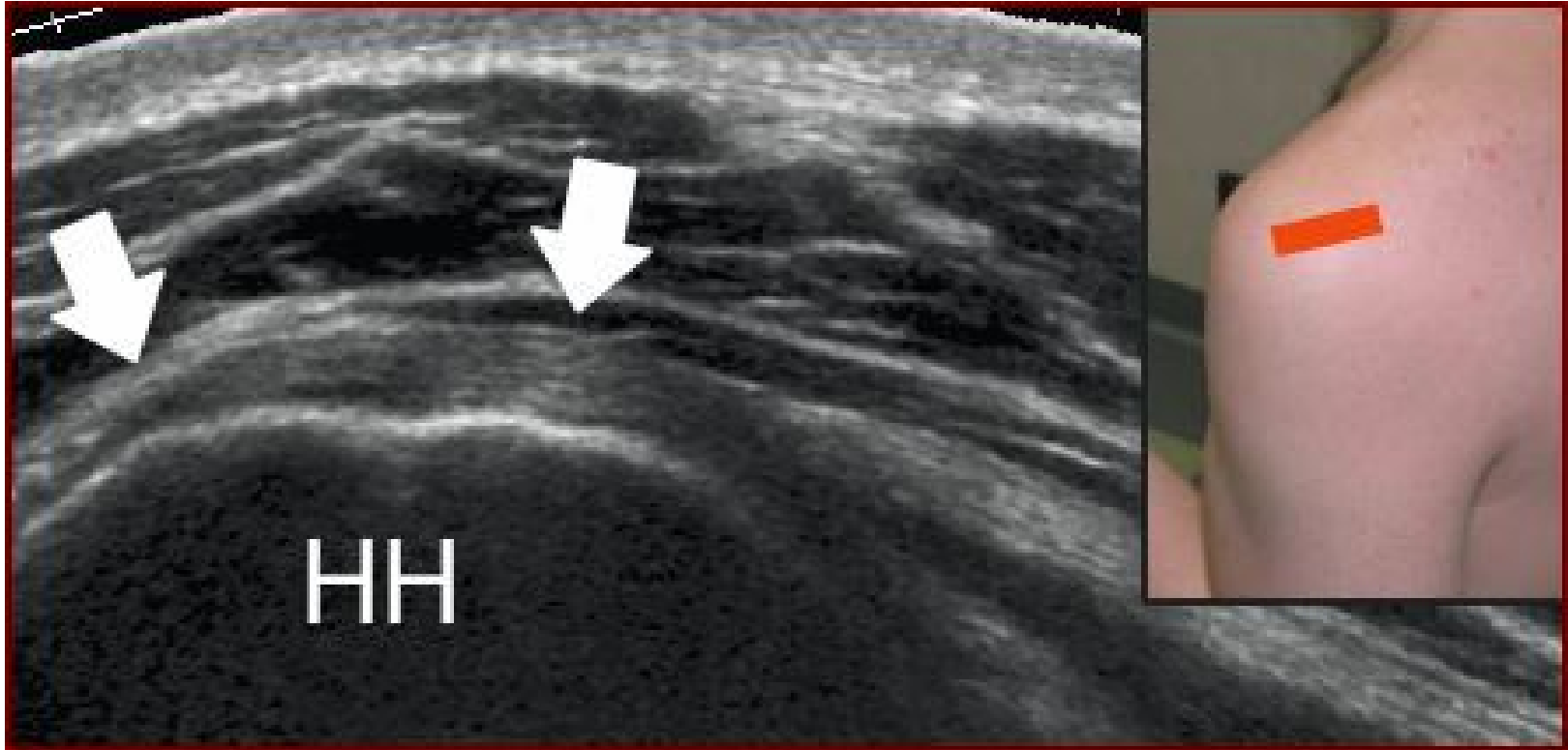
Hyperechoic calcific deposits with acoustic shadowing

Posterior Shoulder

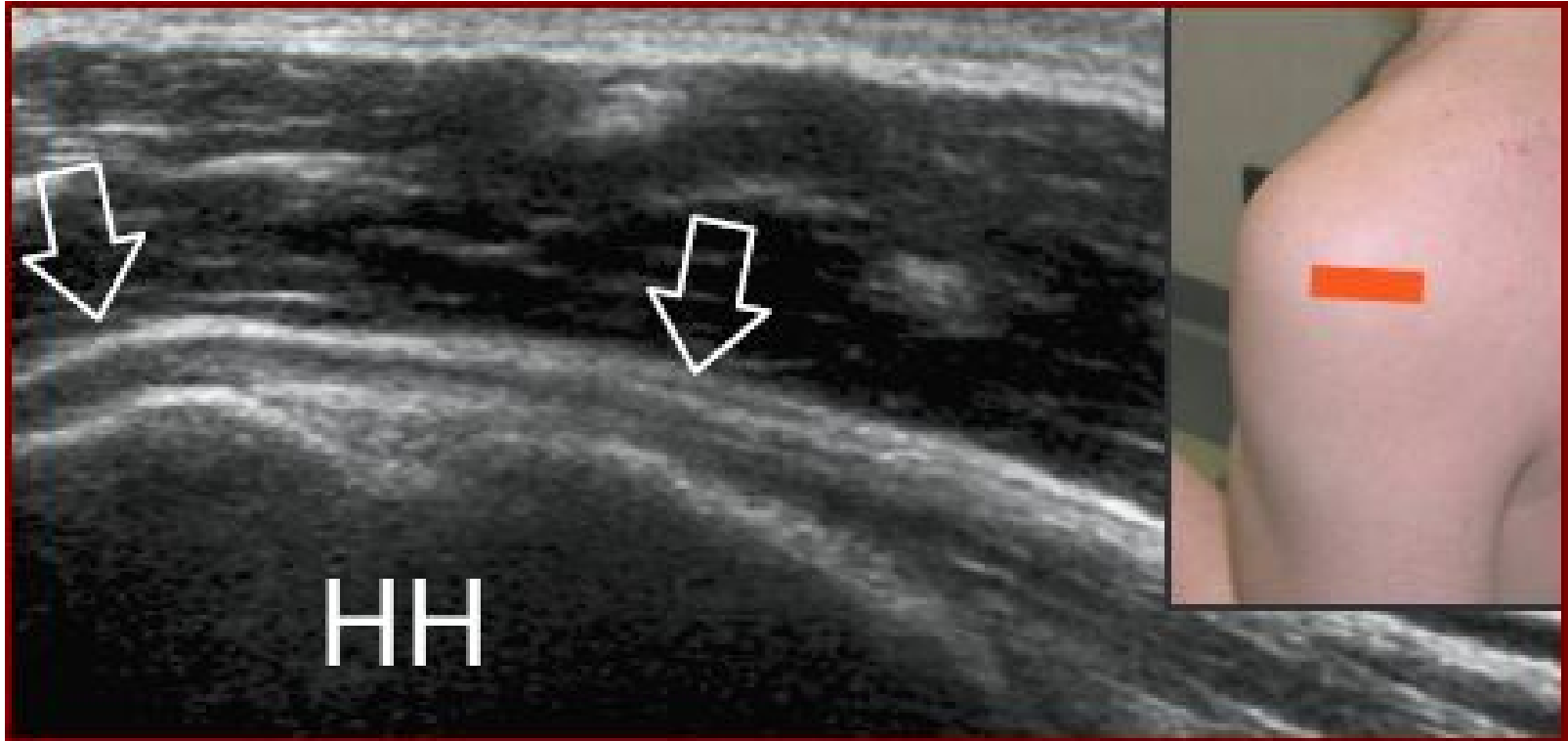


- Arm in cross adduction, internal rotation, hug probe just below spine of scapula (aim a little more downward than you'd expect)

Longitudinal view infraspinatus

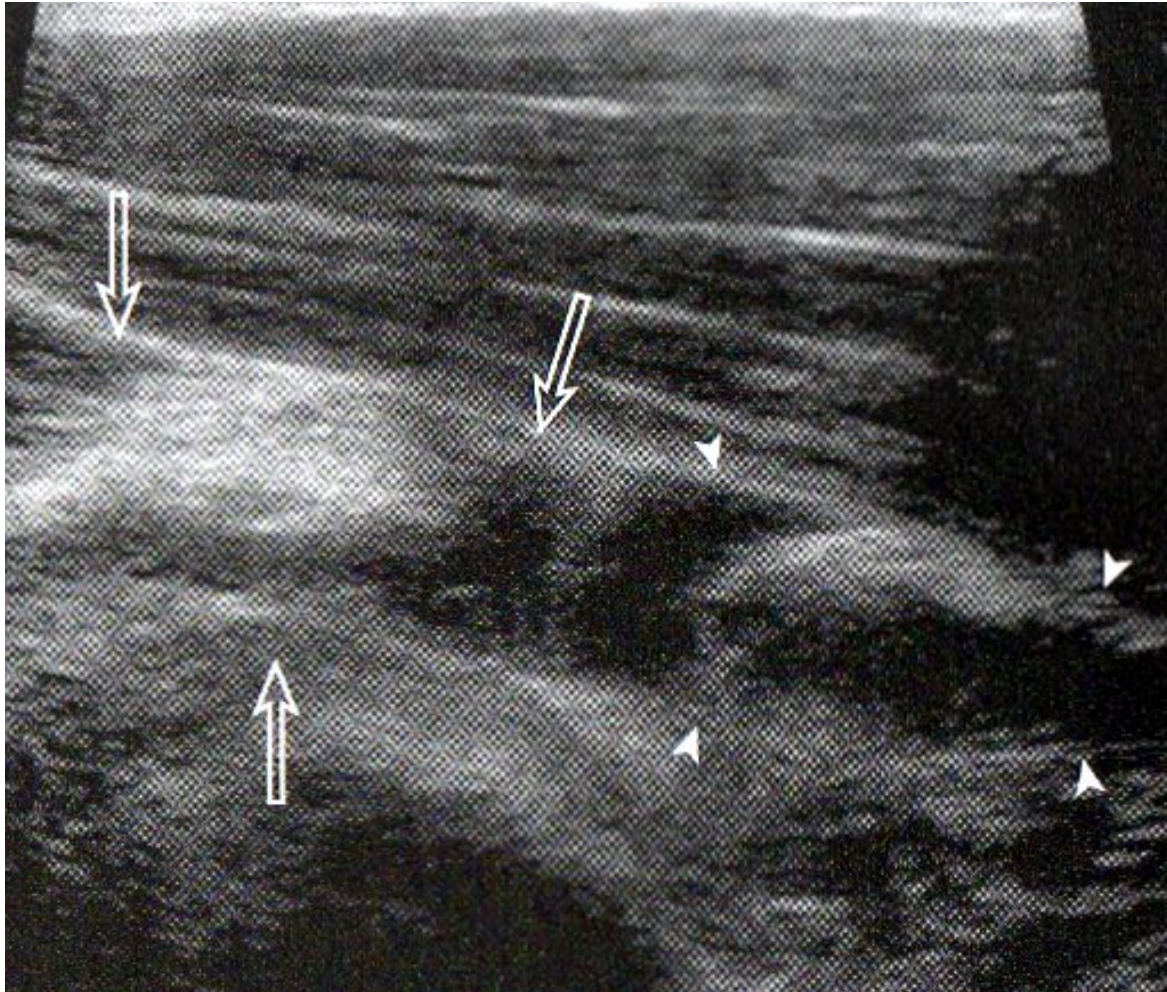


Teres minor



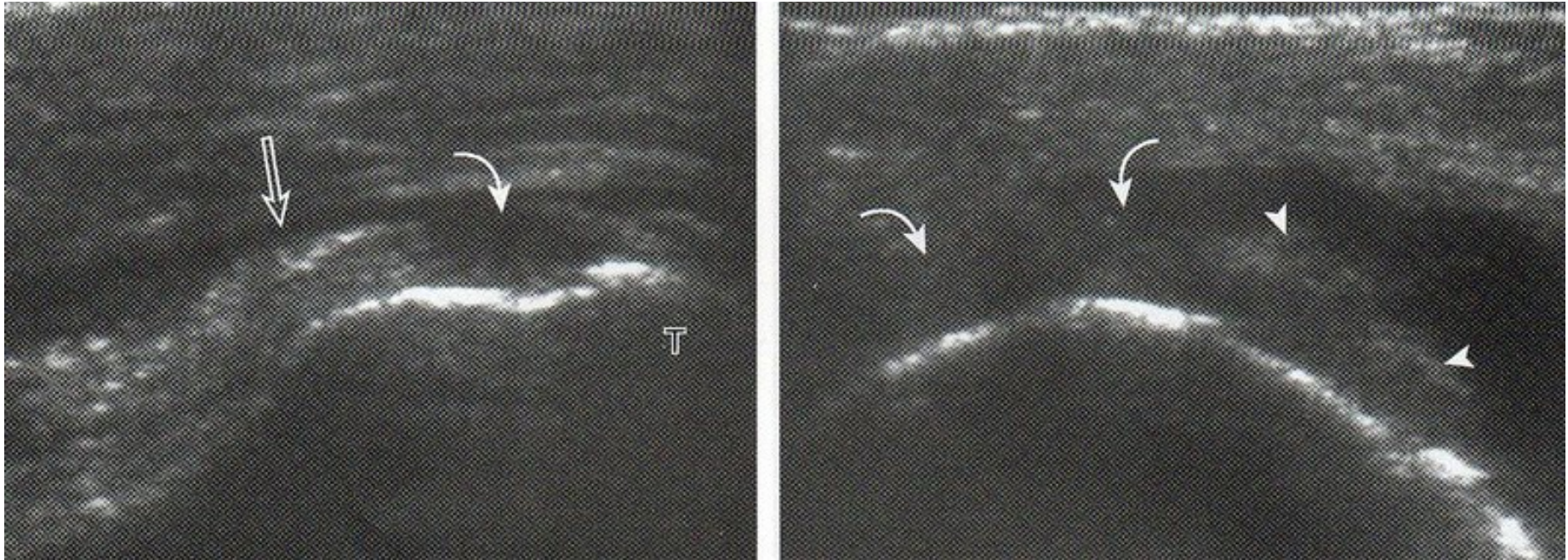
- Rotate medial end inferior just a little
- Teres minor is thinner, $\sim \frac{1}{2}$ the thickness
- They converge together on posterior GT (mid, inferior facets)

Transverse view



Infraspinatus
on left and
teres minor
on right

Infraspinatus Tear

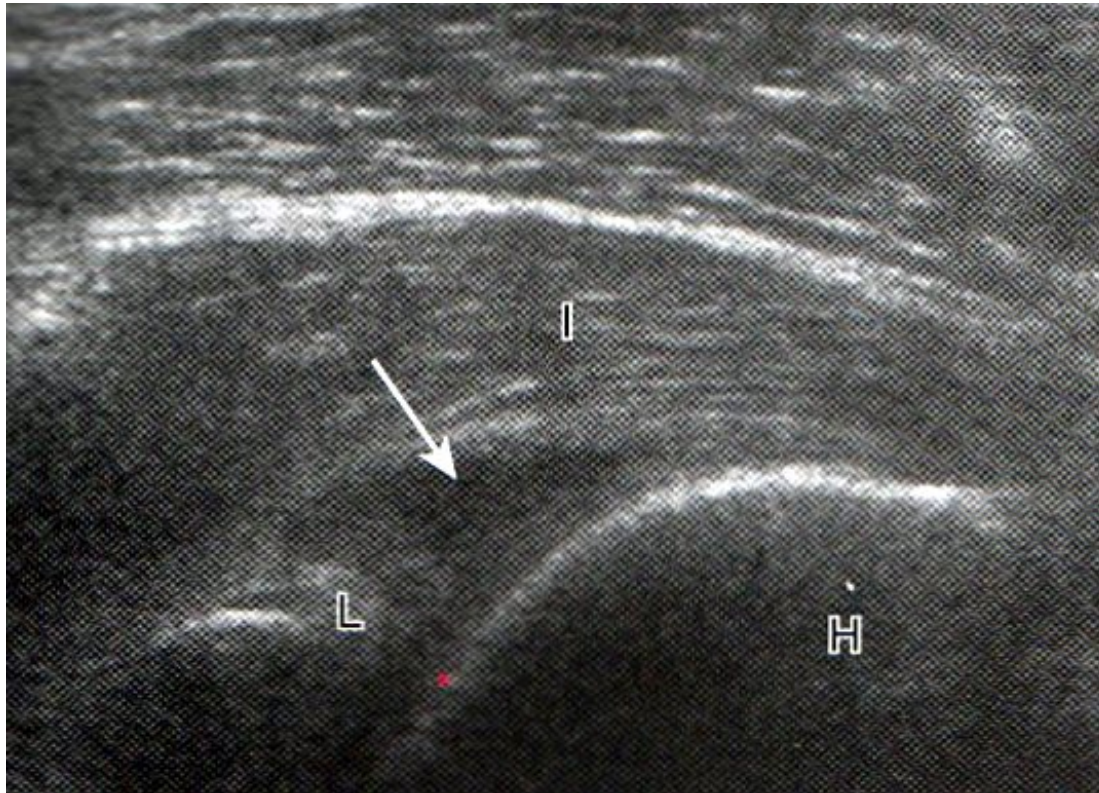


Curved arrow – full-thickness tear and anechoic fluid, open arrow – bursa fluid

On transverse view on right, arrowheads show intact teres minor

Isolated tear uncommon

Joint effusion



- L = Labrum, arrow = anechoic fluid
- External rotation can bring this out more

LET'S PRACTICE!