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"A systematic scan protocol clearly presented, and easily imitated."

Part of the complete Masters Series available through mskmasters.com, this high quality video instructs presents the complete shoulder scanning protocol in a step-by-step sequence. Dr. Randy Moore, a prominent educator in musculoskeletal sonography systematically presents imaging procedures and offers many clinical pearls from over two decades of MSK scanning and teaching. Imaging of the Biceps, Subscapularis, Acromio-Clavicular Joint, Supraspinatus, Infraspinatus, Teres Minor, Gleno-Humeral Joint, Anterior Impingement are included.

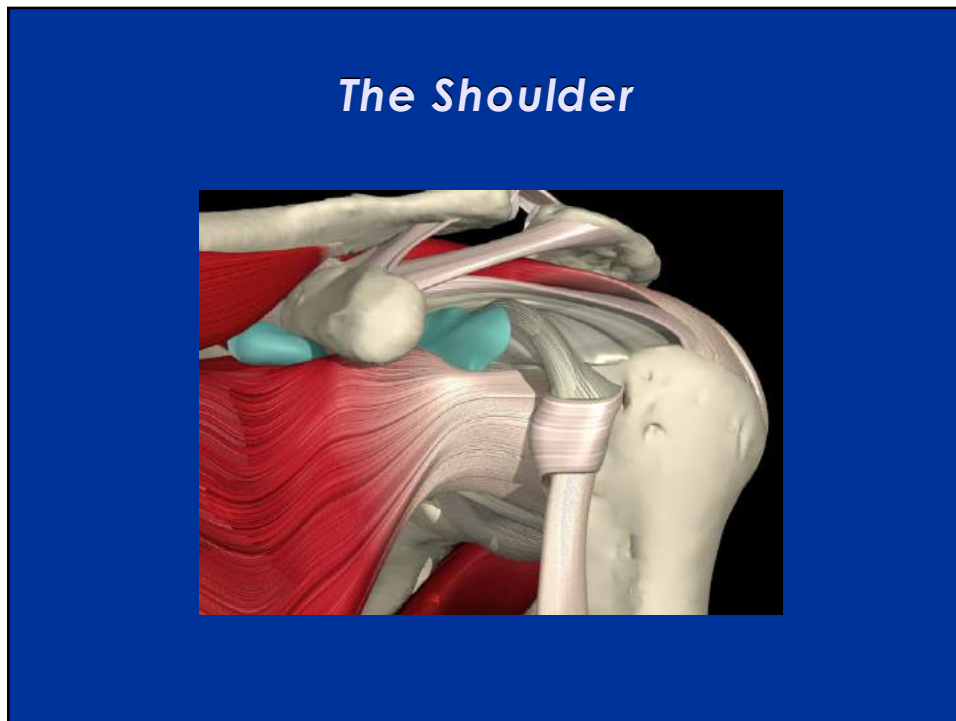
Visit [www.mskmasters.com](http://www.mskmasters.com) for the complete MSK Masters Series! Also, 4th Revision 2015 Sonography of the Extremities now available. The straight-forward, highly illustrated, step-by-step, MSK protocol manual that takes you through scan protocols like no other text. The MSK "How to" book!

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Randy E. Moore DC RDMS RMSK

**SONOGRAPHY OF THE EXTREMITIES**  
TECHNIQUES AND PROTOCOLS

The Shoulder: The Most Vulnerable Joint



## *The Shoulder*

- *The most ACCESSIBLE to sonographic exam*
- *The most MOBILE and VULNERABLE extremity*

*AND...*

*Systematically scanning the shoulder provides extremely useful diagnostic information*

## *The Shoulder*

- *The Goal for this section is ..*

*To first present a systematic scanning protocol that quickly and accurately evaluates common shoulder pathologies*

*Secondly; demonstrate images which may be performed as part of any shoulder ultrasound examination*

## The Shoulder

### Standard Anatomy Evaluated

- Biceps Tendon
- Subscapularis Tendon (dynamic)
- Supraspinatus Tendon
- Infraspinatus Tendon
- Teres Minor Tendon
- Anterior & Posterior Glenoid Labrum
- Gleno-Humeral Joint & Spino-Glenoid Notch
- AC Joint
- Impingement Evaluation (dynamic)

## 3 Steps to Successful Imaging

### Image GENERATION

\* Patient & Probe Position, Grayscale settings

### Image RECOGNITION

\* **I**dentify ... **I**ndividual ... **I**nterfaces

From the bony cortex UP !

### Image INTERPRETATION

\*determine abnormal findings by knowing normal !

**TIP III ... It is NOT your Job to find pathology !**  
Follow scan protocol. Endeavor to produce normal image

## The Shoulder Long Head Biceps Transverse

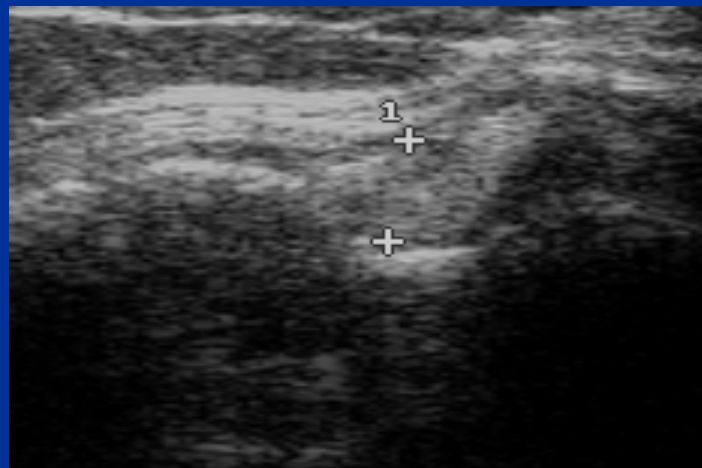
Image Orientation ??



Arm close to the side,  
and elbow flexed  
90 degrees .  
No active supination.

Tendon has ovoid,  
bright, dense...  
"bristle-like pattern."

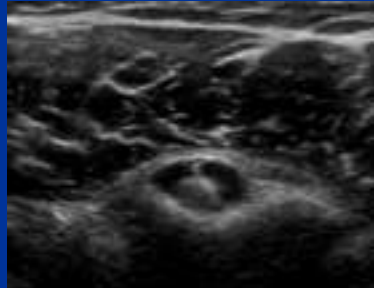
**5MM = Biceps Tendon Thickness/Depth**



## The Shoulder

### Tenosynovitis or Capsulitis ?

#### Biceps Tendon



SAX at bicipital groove



LAX

Anechoic ring or "halo" seen on SAX suggests either pathology because BIC is just exiting capsule.

LAX view reveals presence of fluid distally...tenosynovitis

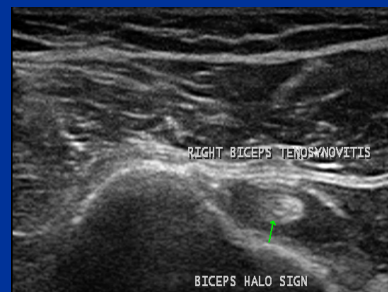
## The Shoulder

### Long Head Biceps Transverse : Distal



Patient position unchanged from proximal view.

Translating the probe distally down the arm



From the medial side, the tendon of Pec Major is seen at it's inter-tubercular attachment

## The Shoulder Long Head Biceps Longitudinal

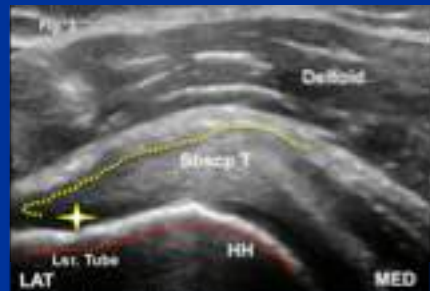


Arm relaxed, flexed  
at 90 degrees.  
No active supination .

Tendon follows  
humeral contour

Parallel with Humeral shaft.

## The Shoulder Subscapularis Transverse w/ External Rotation Dynamic View

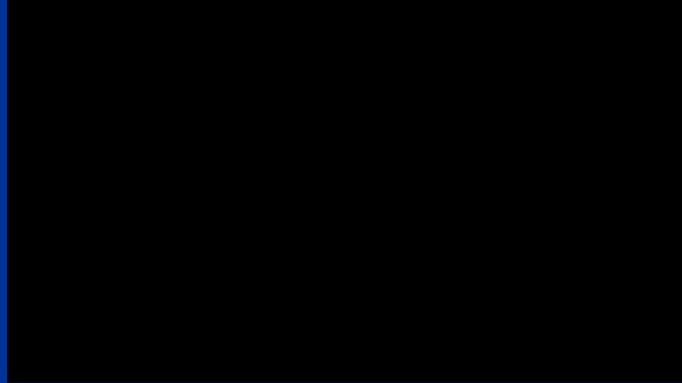


Externally rotate  
arm from Biceps  
SAX view.

Subscap arises from  
RIGHT of image.

## The Shoulder

### Subscapularis Transverse w/ External Rotation



## The Shoulder

### Subscapularis Longitudinal w/ External Rotation



Long axis probe  
Maintain External  
Rotation



“Mixed echoes” of  
hyper-echoic tendon and  
hypo-echoic muscle

## The Shoulder Rotator Cuff Patient Position



Supraspinatus  
(Modified Crass position)



Infraspinatus ,Teres Minor  
and Posterior GH joint

## The Shoulder Supraspinatus Transverse



SAX Probe  
Parallel with floor



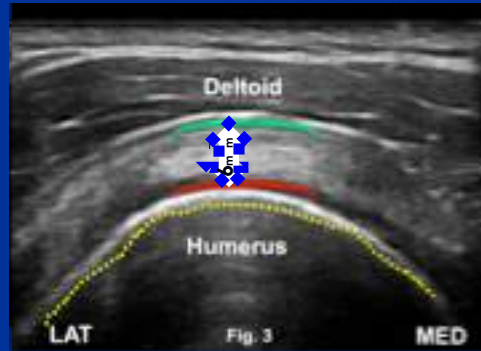
Visualize interfaces of  
Humeral head, cartilage,  
the tendon , and bursa



“tire on the rim”



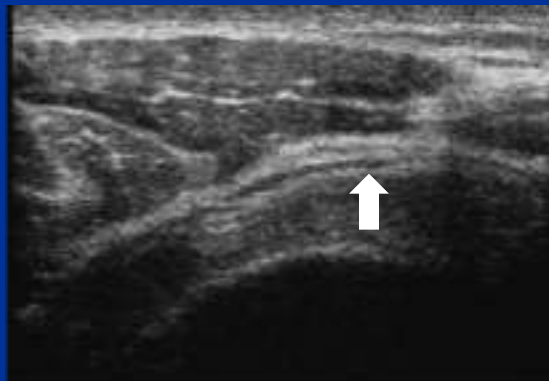
## ***6mm = Supraspinatus Thickness***



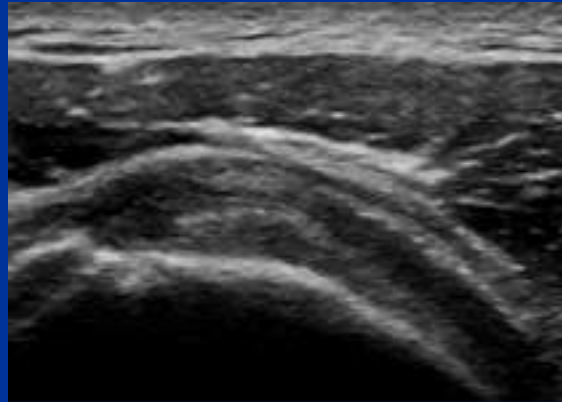
**< 6mm = thinning, degenerative , volume loss**

**> 6mm = edema, increased cellularity**

## ***2mm= Normal Sub Deltoid Bursa***



# Full Thickness Tear SSP



## The Shoulder

### Supraspinatus Longitudinal The "Critical Zone"

Image orientation ?



Probe  
Obliquely LAX

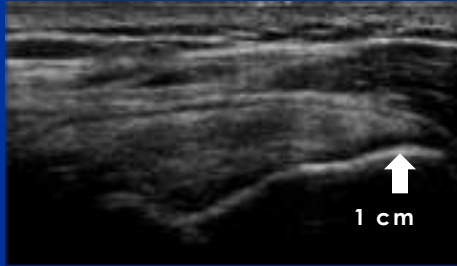


"Bird's Beak" view of SSP.  
Point of beak is insertion on GT.

SSP has a 1<sup>cm</sup> width attachment on GT  
Sweep A to P 1<sup>cm</sup> or less.

## The Critical Zone

1<sup>cm</sup> avascular area proximal to the Greater Tuberosity



Over 90 % of Rotator Cuff pathology occurs here

## The Shoulder

### Rotator Cuff Interval

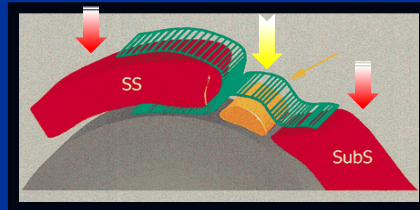
A short, variable sonolucent region on either side of the short axis biceps tendon



The biceps tendon exits the GH joint capsule through the RC interval

# The Shoulder

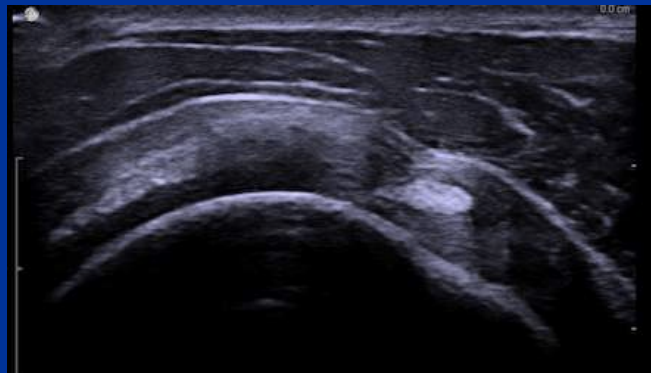
Rotator Cuff Interval : Patient/ Probe Position



*Modified Crass position. Slight medial probe translation and downward rotation from SAX Supraspinatus image.*

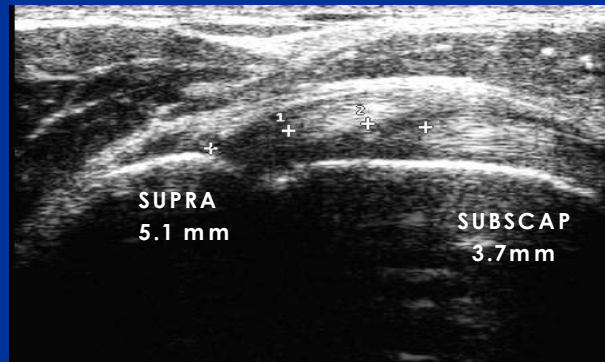
**3mm/3mm = Rotator Cuff Interval**

Increase in SSP and/or Subscap interval is abnormal

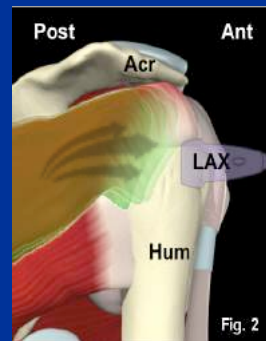


Effusion increases interval between the SSP and Subscap

**3mm/3mm = Rotator Cuff Interval**  
*Indicative of adhesive capsulitis*



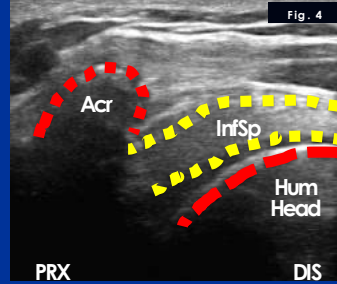
**The Shoulder**  
**Infraspinatus Imaging : Step One**



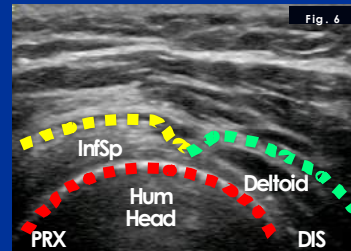
**ADduction w/ internal rotation brings  
InfSp attachment...Antero-lateral.  
Deltoid (not pictured) is superficial to Infsp.**

## The Shoulder Infraspinatus Imaging : Step One

LAX probe to see  
Acromion + Humerus



Translate probe  
Straight and distal  
Humerus only



## The Shoulder Infraspinatus Imaging: Step Two

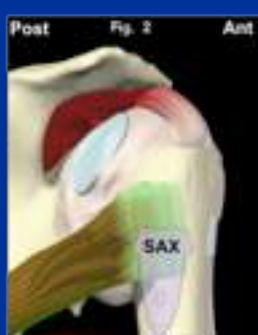


Rotate the probe Anteriorly  
into SAX to be in plane  
with InfSp fibers

A less sharp "birds beak"  
is characteristic of  
InfraSpinatus attachment

## The Shoulder

### Teres Minor Transverse (Rarely imaged/ pathologic)



Probe is in short axis  
inferior to Infraspinatus.

Teres  
Expect t



## Supraspinatus Tendon : Rotator Cuff Tears

### A Progression...

Type I : Cuff degeneration / tendinosis without visible tears on bursal or articular surface

Type II : Cuff degeneration / tendinosis with partial tears on bursal or articular surfaces.

Type III : Complete thickness rotator cuff tears of varying size, complexity, and functional compromise.

## Tendinosis : 3 key Ultrasound Findings

1. Increased cellularity... *thickened and...*

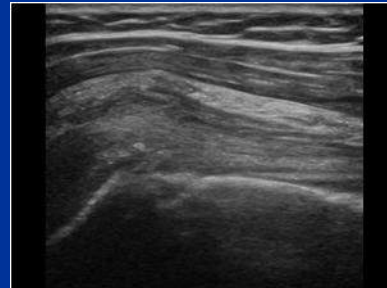
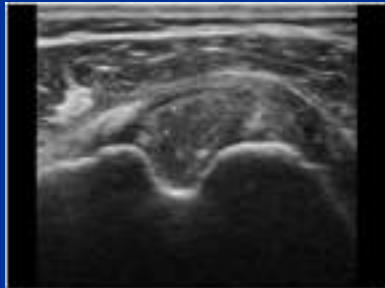
*“Inhomogeneous” ... Not homogeneous...*

*Mixed echoes of hyper and hypo echoic tissue.*

2. Neovascularization

3. Disrupted fibers within the tendon

## Biceps Tendinosis: Increased “cellularity”



*thickened and...*

*“Inhomogeneous” ... (Not homogeneous)...*

*Mixed echoes of hyper and hypo echoic tissue.*

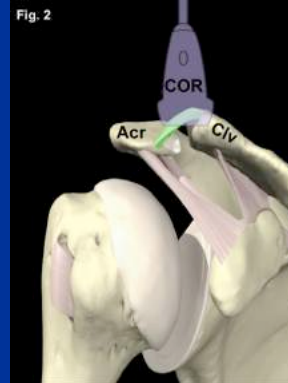


## The Shoulder

### The Acromio-Clavicular Joint



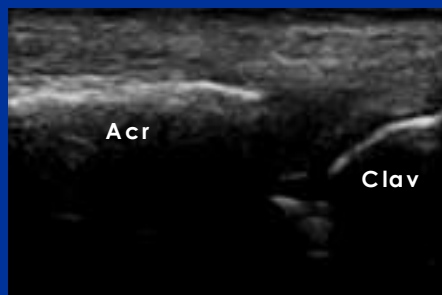
Patient seated  
shoulders relaxed



Rotating the probe  
to be more parallel to the  
Clavicle may help visualize  
a more well defined AC joint

## The Shoulder

### The Acromio-Clavicular Joint



AC joint is a synovial joint with a capsule  
making it susceptible to inflammation/effusion.

**ECHOGENIC** fibrocartilage  
seen within joint space.

The Shoulder  
Anterior Impingement

Controversy exists ...

Impingement leading to cuff tear...

Or cuff tear leading to impingement.

Most common location is ANTERIOR...

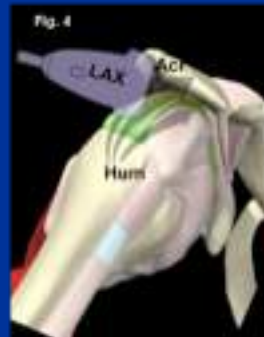
Decreased distance between the anterior one-third of  
the acromion and underlying tendons.

Anatomic or pathologic changes that have  
compromised the cuff, allowing  
proximal humeral migration are often seen with a tear.

The Shoulder

Anterior Impingement Imaging

Flexion with aBudson immediately abuts the  
Supraspinatus against the coraco-humeral ligament  
and the Acromion



## The Shoulder Anterior Impingement



Longitudinal probe  
Firmly anchored as the  
patient **SLOWLY**  
abducts and  
elevates the arm.

Supraspinatus should slide smoothly  
under the Acromion  
No shearing of bursal fluid by Acromion.  
No SSP "snapping" under Acromion

## The Shoulder Anterior Impingement



The Acromion is at far left/proximal side of image.

The bursal fluid is sheared off by the Acromion.

# The Shoulder

## Glenoid Labrum Posterior



Patient decubitus or seated

Arm internally rotated to open joint space



Probe SAX across joint space



Convex Humeral Head Upper "apex" of Glenoid  
Red Star = labrum

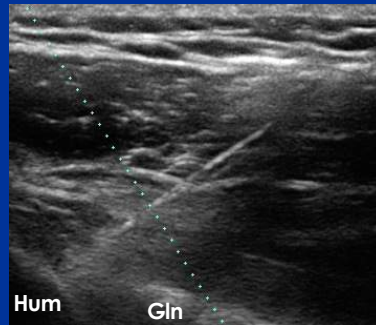
# The Shoulder

## Posterior Gleno-Humeral Injection



Patient in decubitus position

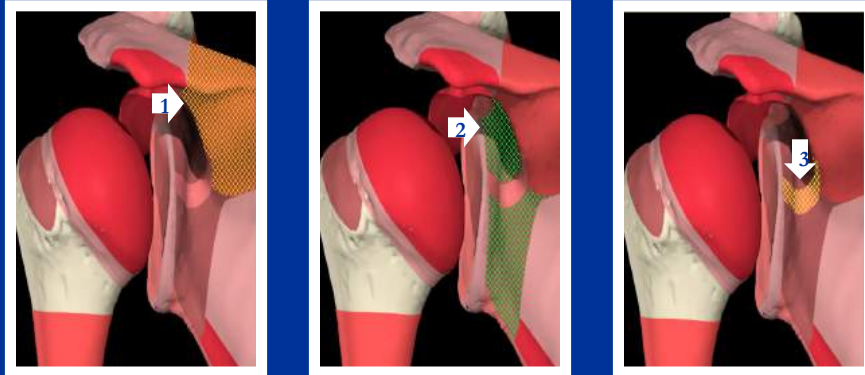
Arm internally rotated to open joint space



Upper apex of Glenoid and Humeral head are landmarks.

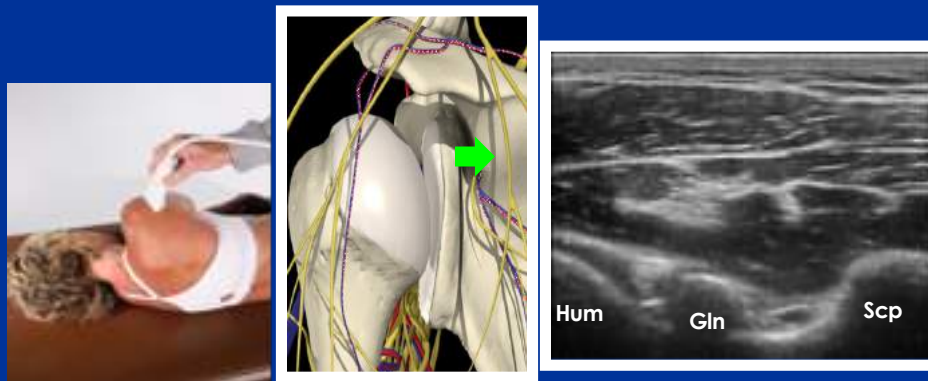
Needle advanced posterior to anterior (right to left)

## The Shoulder Spino-Glenoid Notch



1. Lateral margin of scapular spine merges with...
2. Dorsal aspect of scapular neck forming "notch"
3. Ligament spans notch and...Suprascapular AVN bundle pass thru... from top to bottom

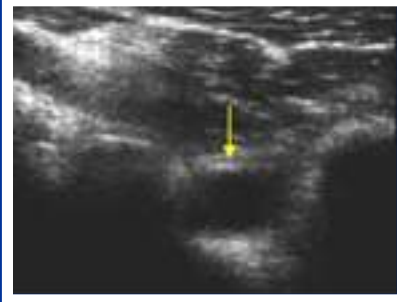
## The Shoulder Spino-Glenoid Notch Imaging Protocol : Posterior



Medial probe translation from Gleno-Humeral image  
will reveal the concavity of the notch

## The Shoulder

### Spino-Glenoid Cyst or... Para-Labral Cyst ?



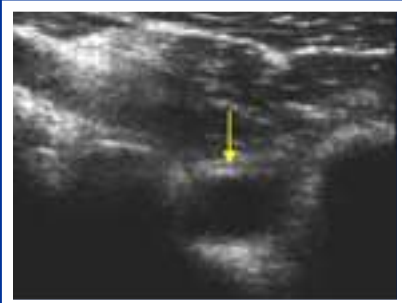
Dorsal Ganglion:  
**Located in notch.**  
**SSN compression**  
**may mimic TOS**



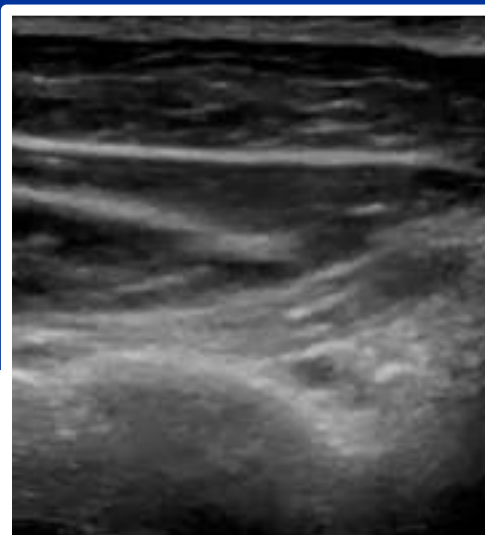
Labral Cyst:  
**Not in notch**  
**Overlying joint space**

## The Shoulder

### Spino-Glenoid Cyst or... Para-Labral Cyst ?



Tip: suprascap vein  
dilates w. ext. rotation  
& collapses w/ int. rotation.  
Cysts are non-compressible



*Thank you !*

