

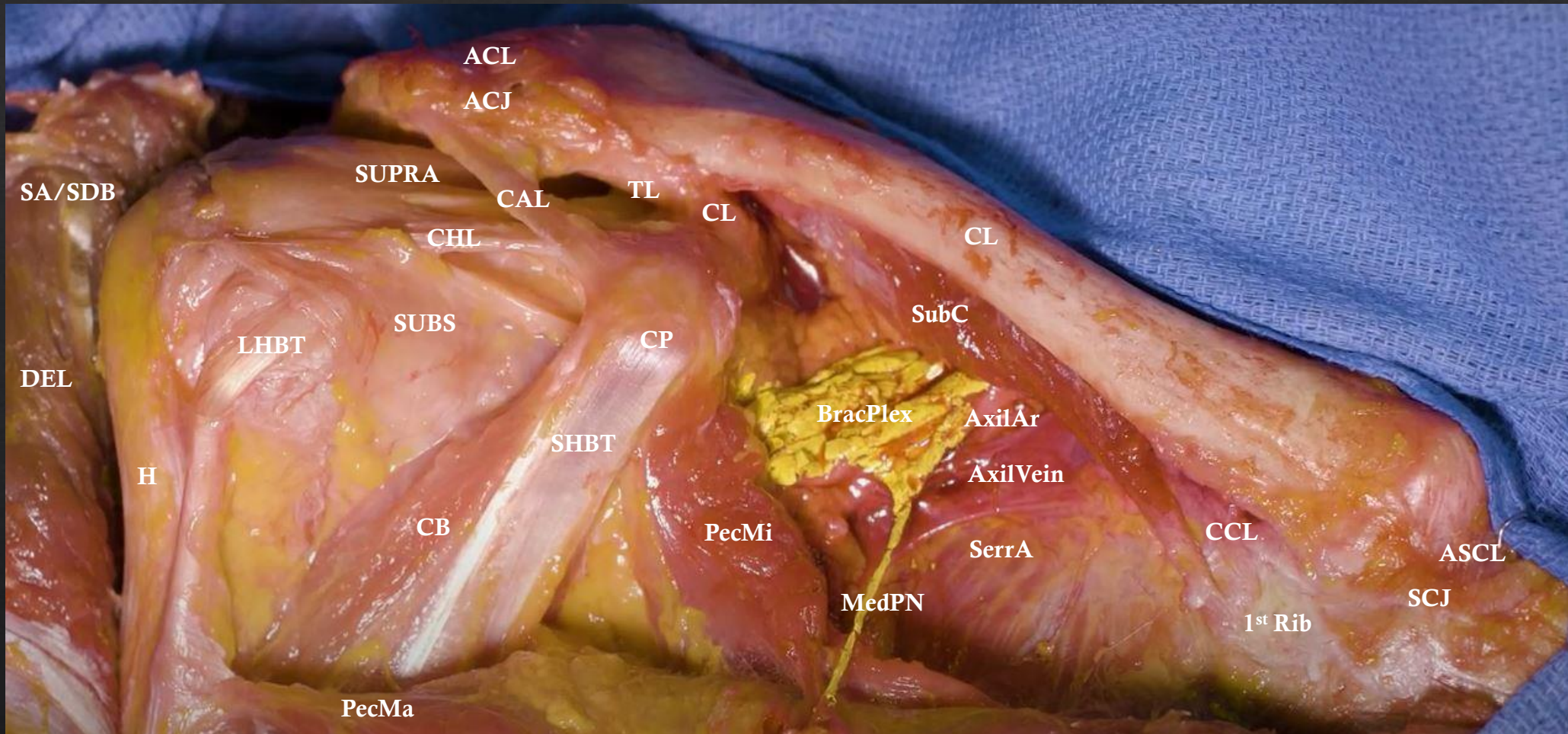
Ultrasound imaging of rotator cuff pathology

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MSc, GSR, PGCertUS

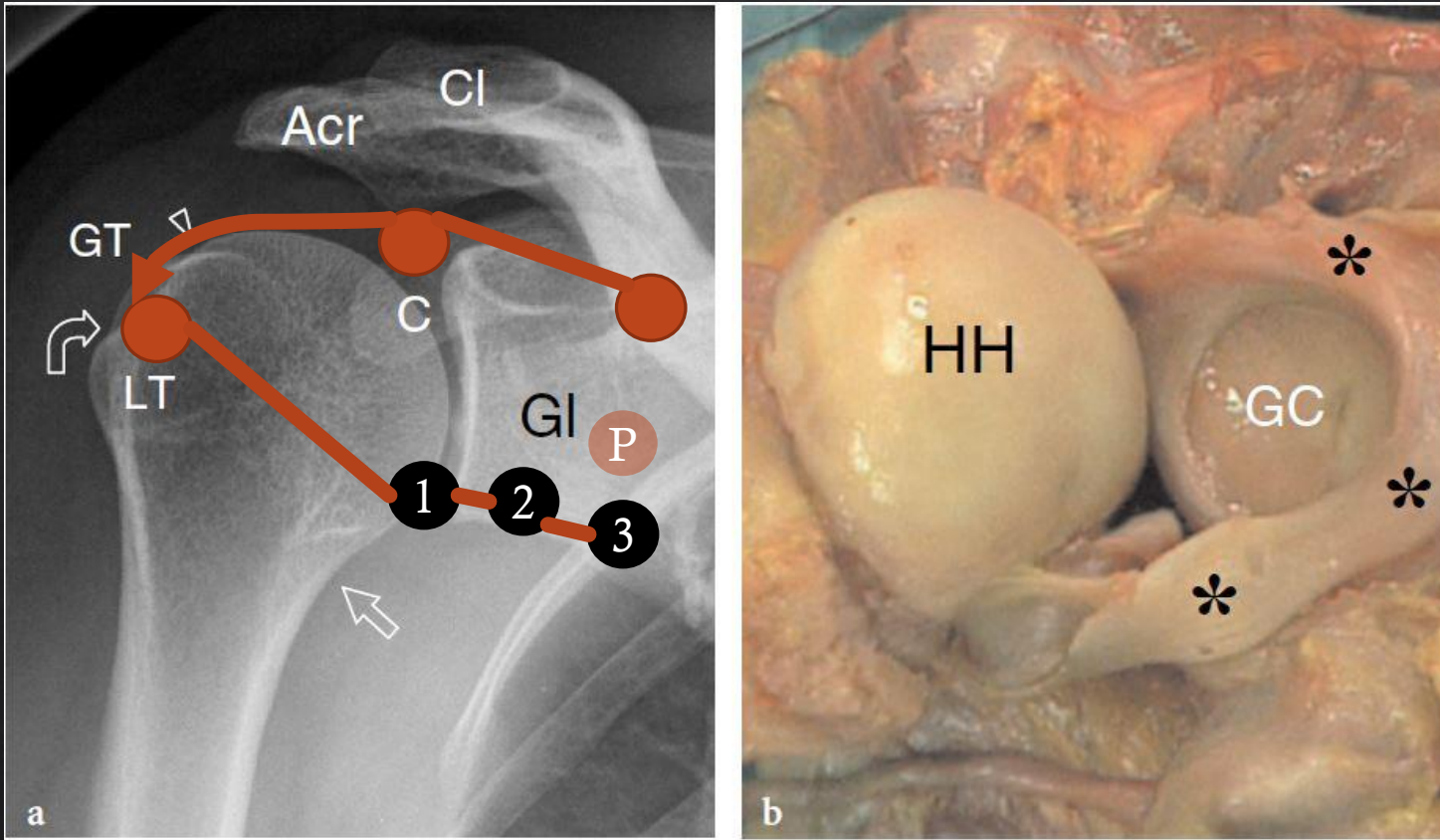
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The shoulder girdle



Glenohumeral joint (GHJ)



Bianchi S., et al. 2007

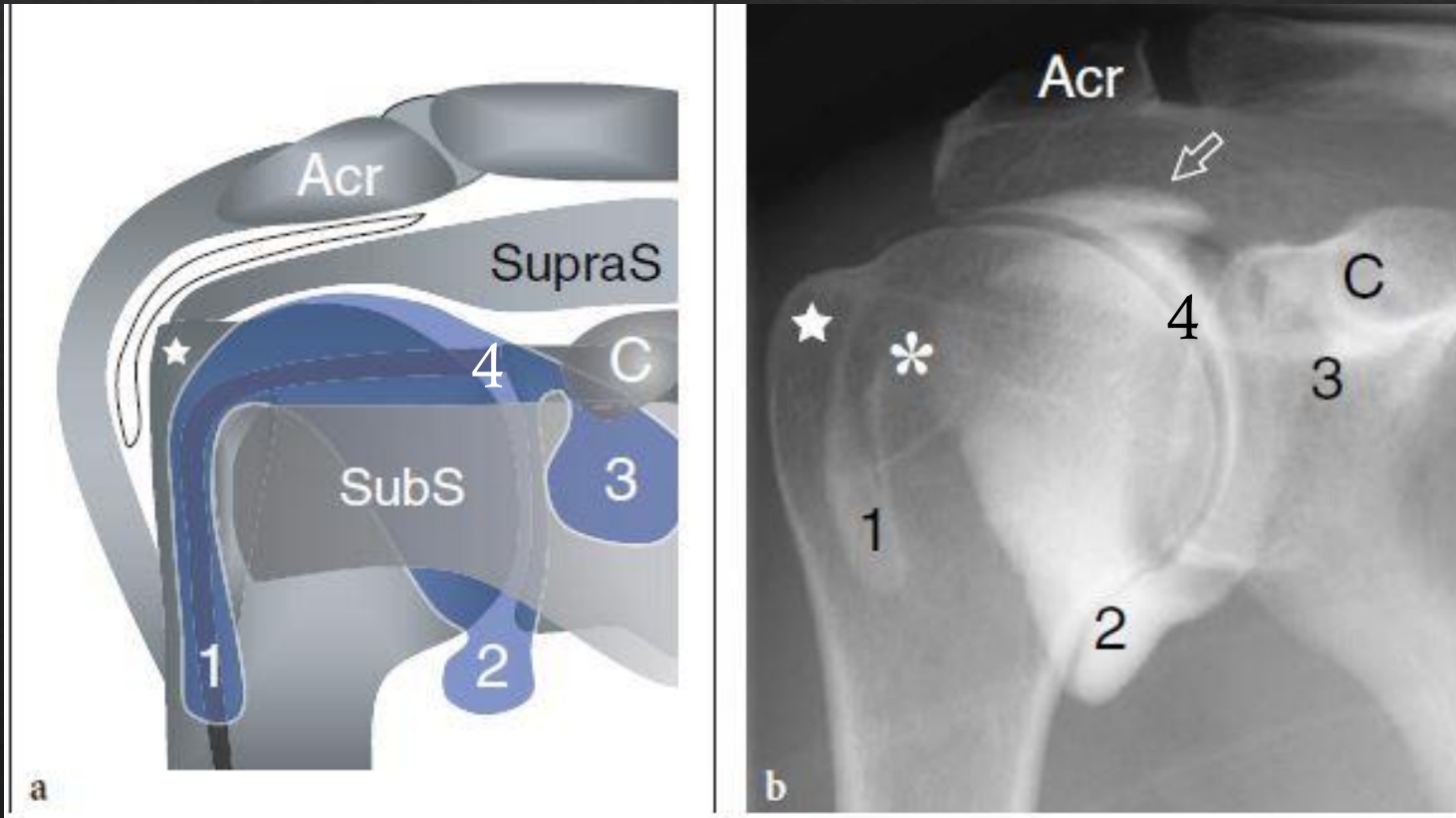
- The glenoid cavity covers only a small portion (about one-fourth) of the humeral head.
- The glenoid labrum is in direct continuity with the hyaline cartilage of the glenoid cavity.
- Capsule: base of the coracoid **medially**; supraglenoid region **superiorly**; anatomic neck **laterally**; three types of **anterior** insertion:
 - Type 1: directly on the anterior labrum and glenoid margin
 - Type 2: scapular neck but within 1cm of the labrum
 - Type 3: scapular neck greater than 1cm medially from the labrum

Type 3 is commonly observed for the **posterior** capsule

GHJ synovial recesses

There are 4 main GHJ synovial recesses:

1. Anterior recess/biceps tendon sheath
2. Axillary pouch
3. Subscapularis recess
 - Type 1: One recess above the MGHL (superior SR)
 - Type 2: One recess below the MGHL (inferior SR)
 - **Type 3: One recess above and below the MGHL (superior & inferior SRs)**
 - Type 4: One large recess with absent MGHL
 - Type 5: Two small synovial folds
 - Type 6: No recesses present
4. Posterior recess



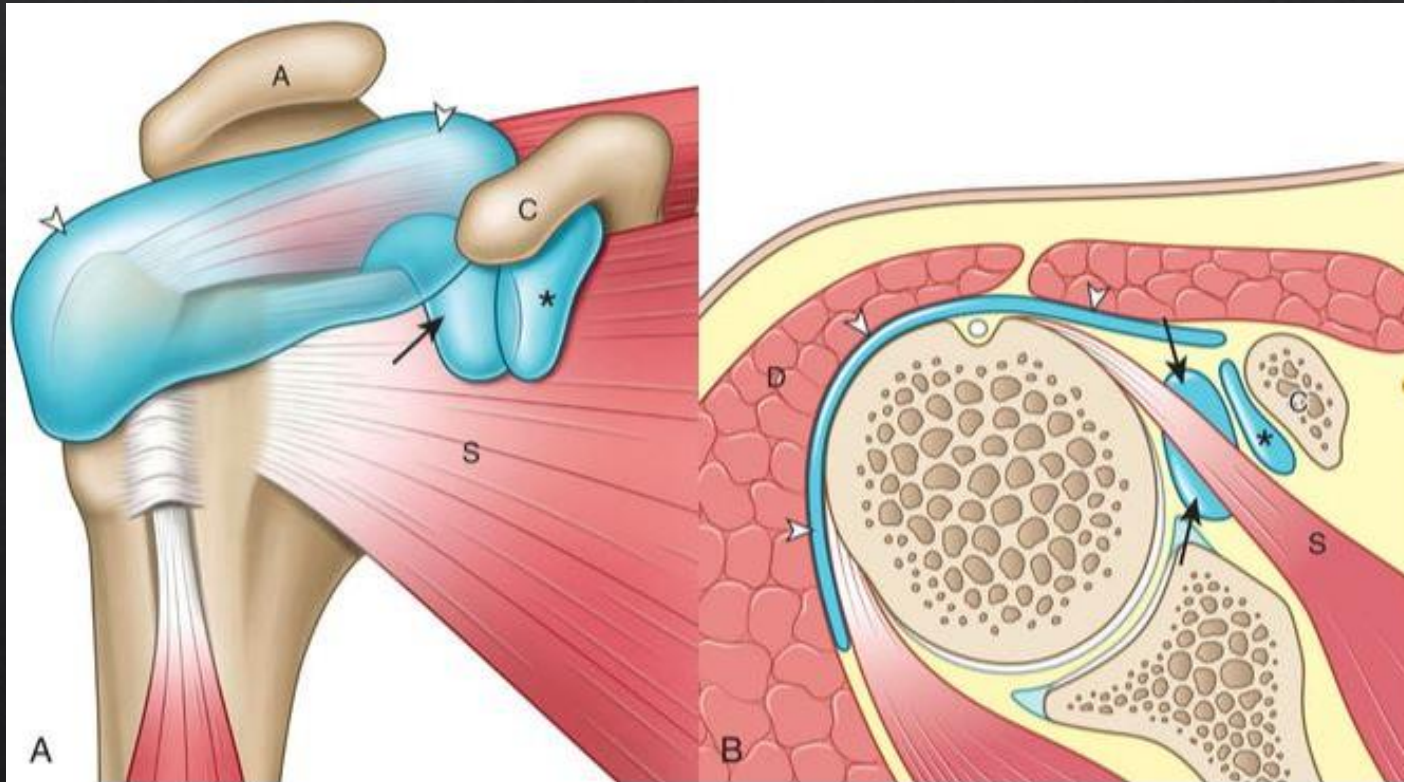
Bianchi S., et al. 2007

The width of the MGHL was reduced in Type 3 SR recesses as compared to Type I SR recesses.

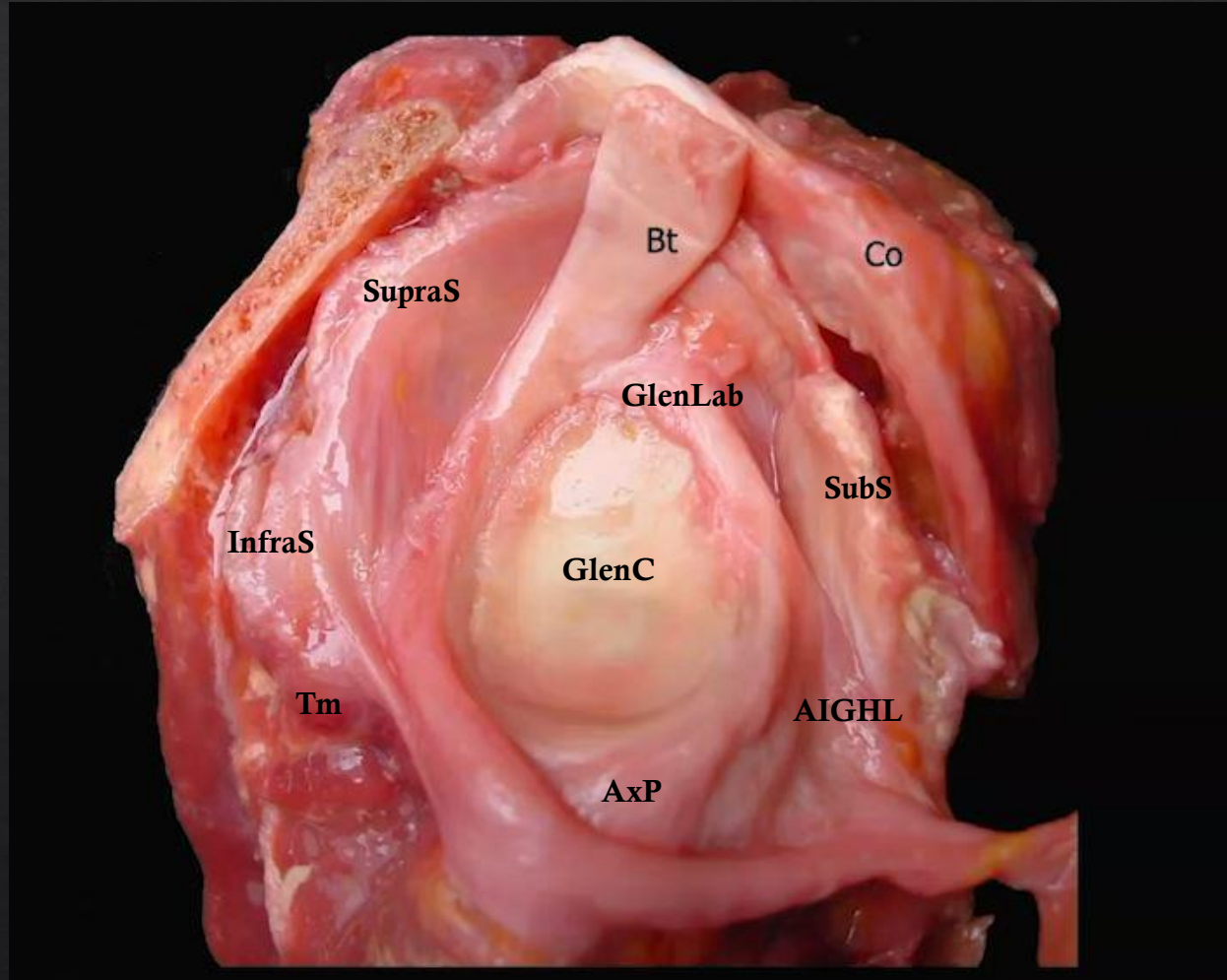
Bursae

There are 2 main bursae:

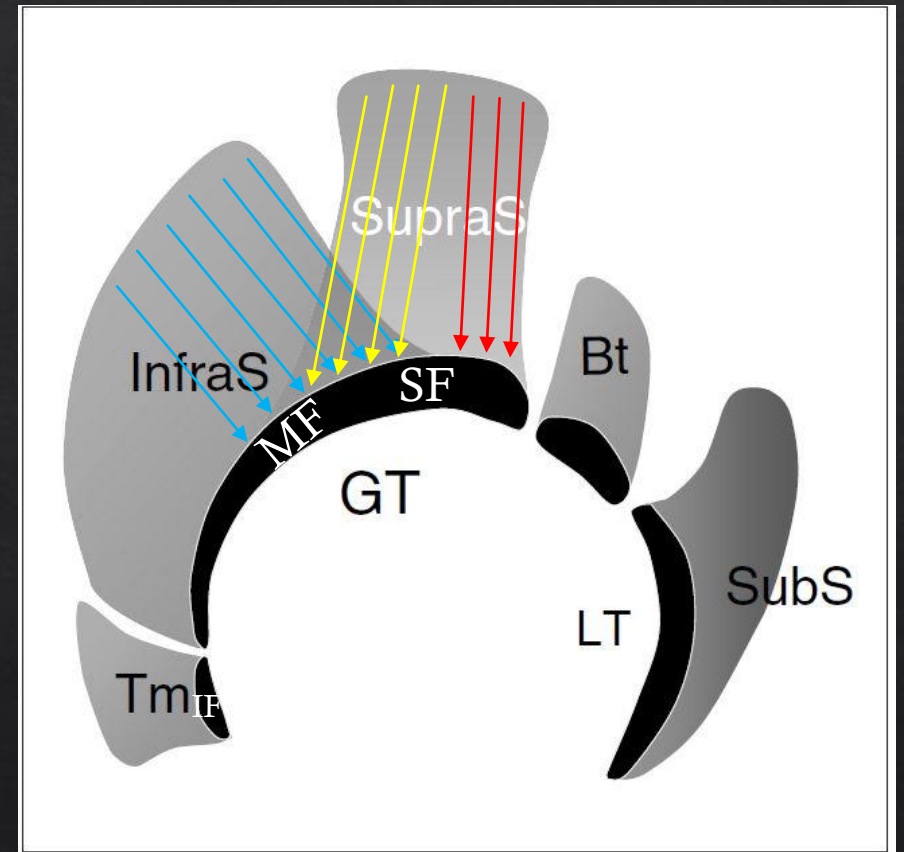
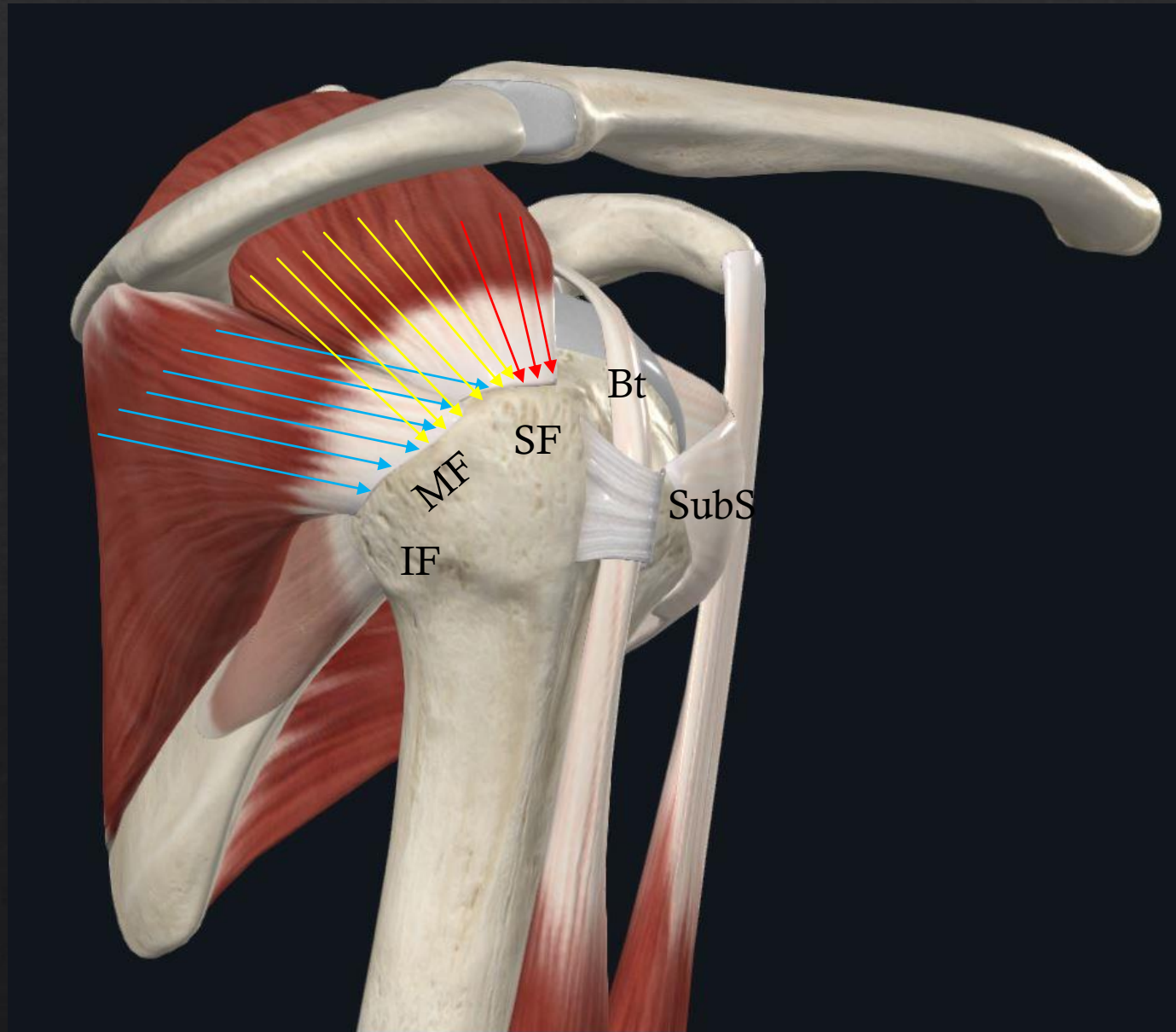
1. Subacromial/subdeltoid (SASD) bursa
 - Laterally over supraspinatus and proximal humerus
 - Anterior over subscapularis and LHBT
 - Posteriorly over infraspinatus
2. Subcoracoid bursa
 - Anterior to the subscapularis tendon directly inferior to the coracoid. It does not communicate with the GHJ.



The rotator cuff

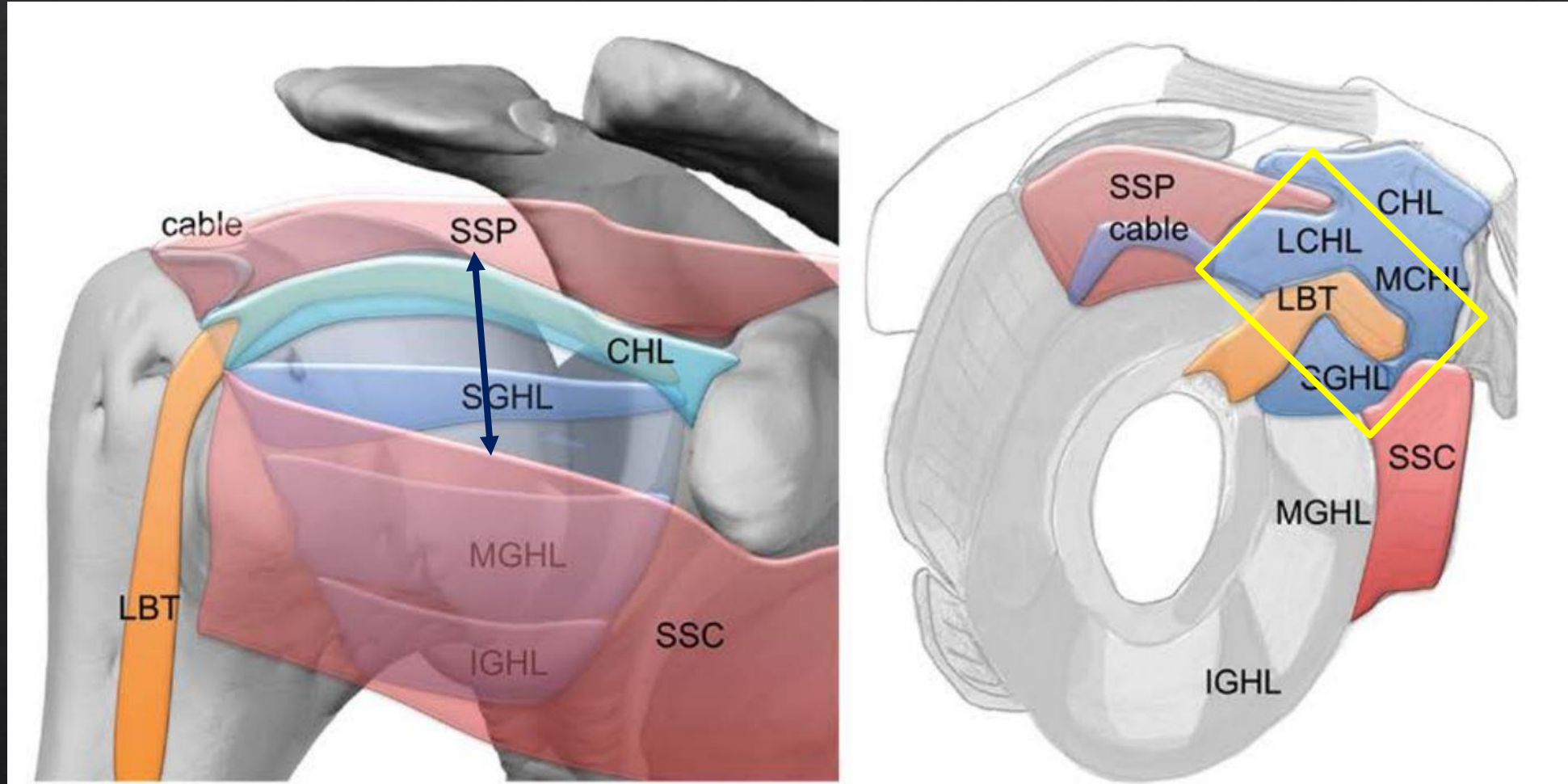


Supraspinatus-Infraspinatus Complex

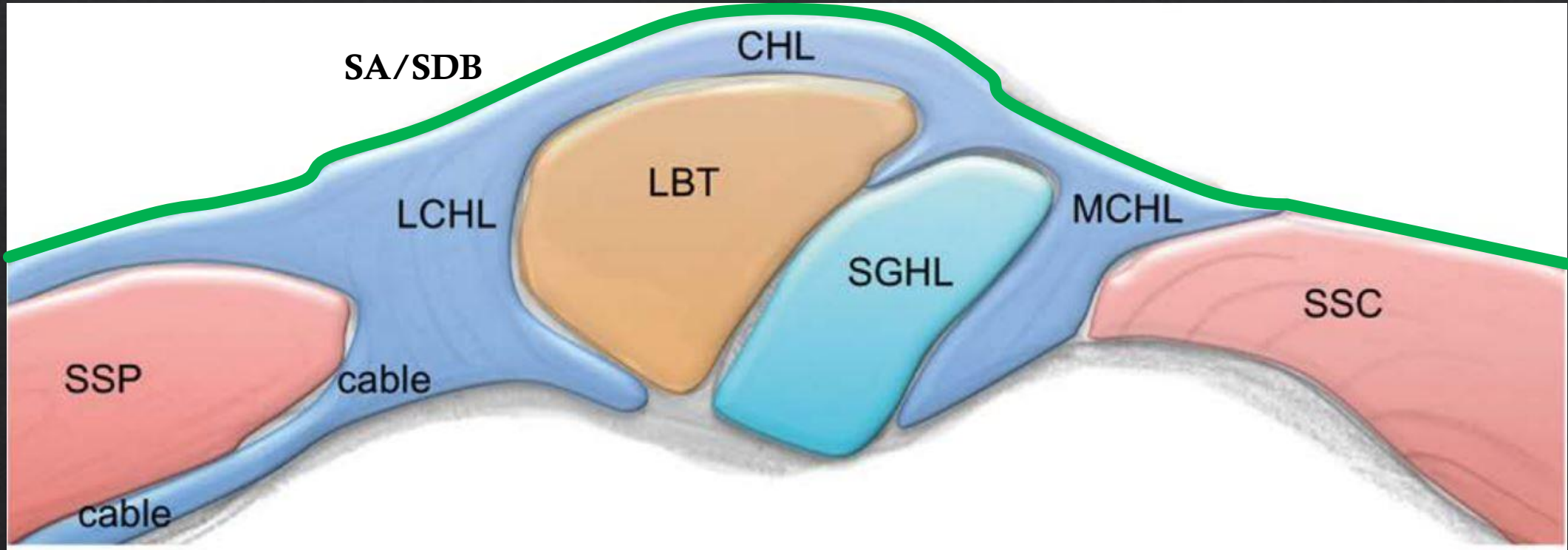


Bianchi S., et al. 2007

The rotator interval

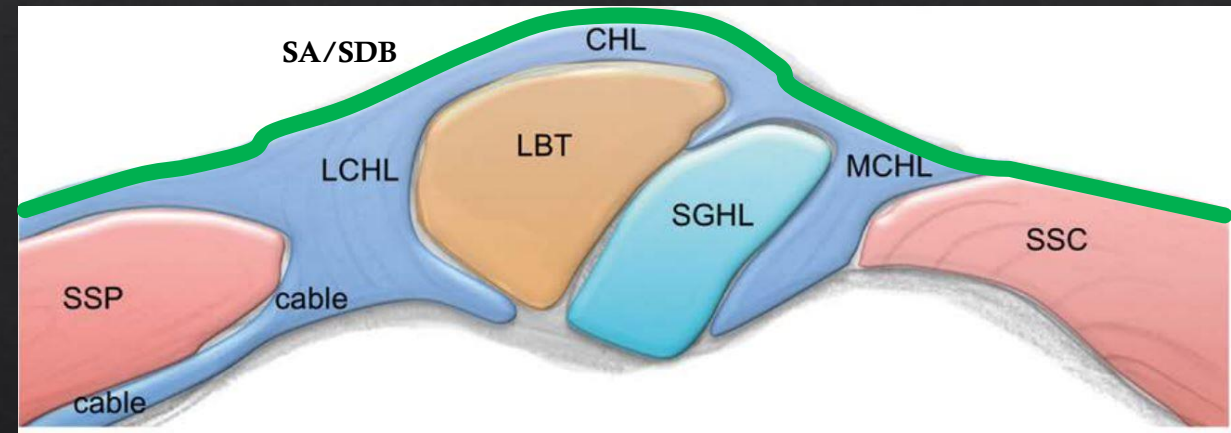
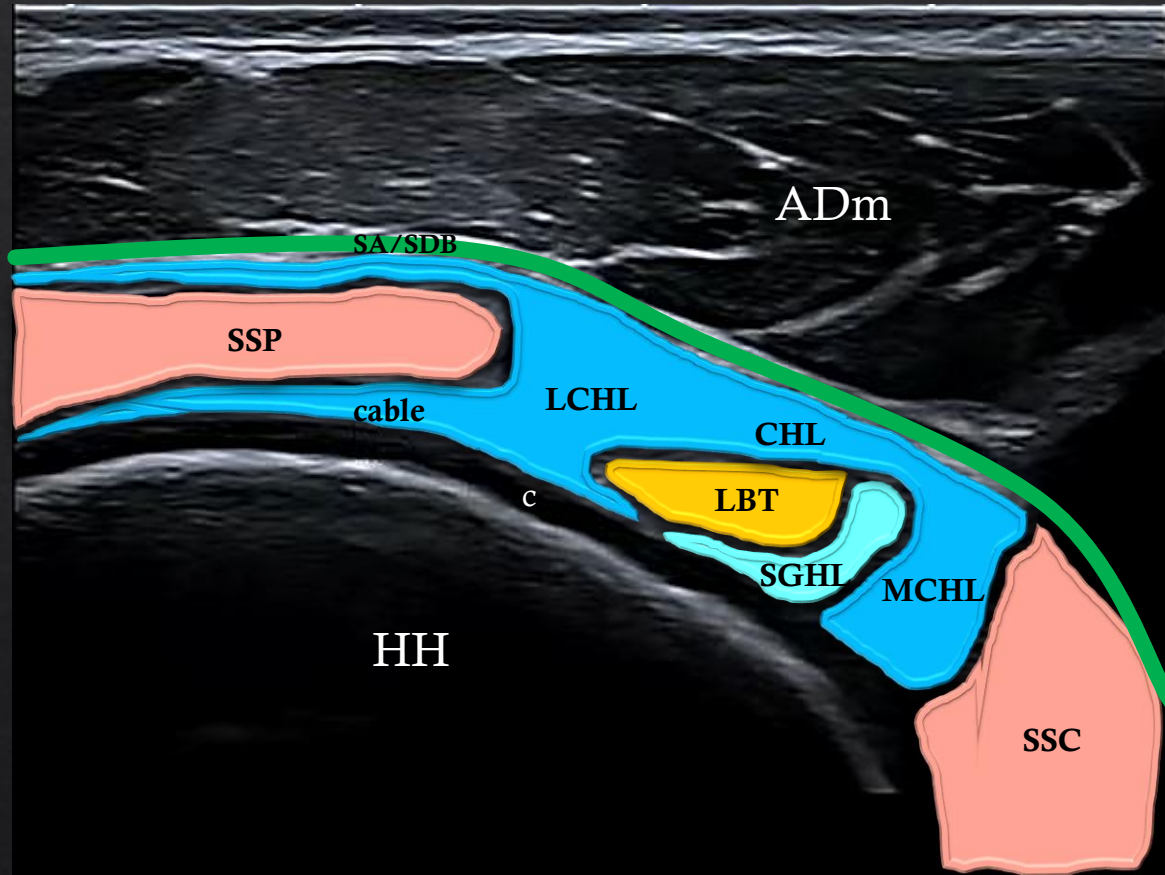


Rotator Interval (RI)



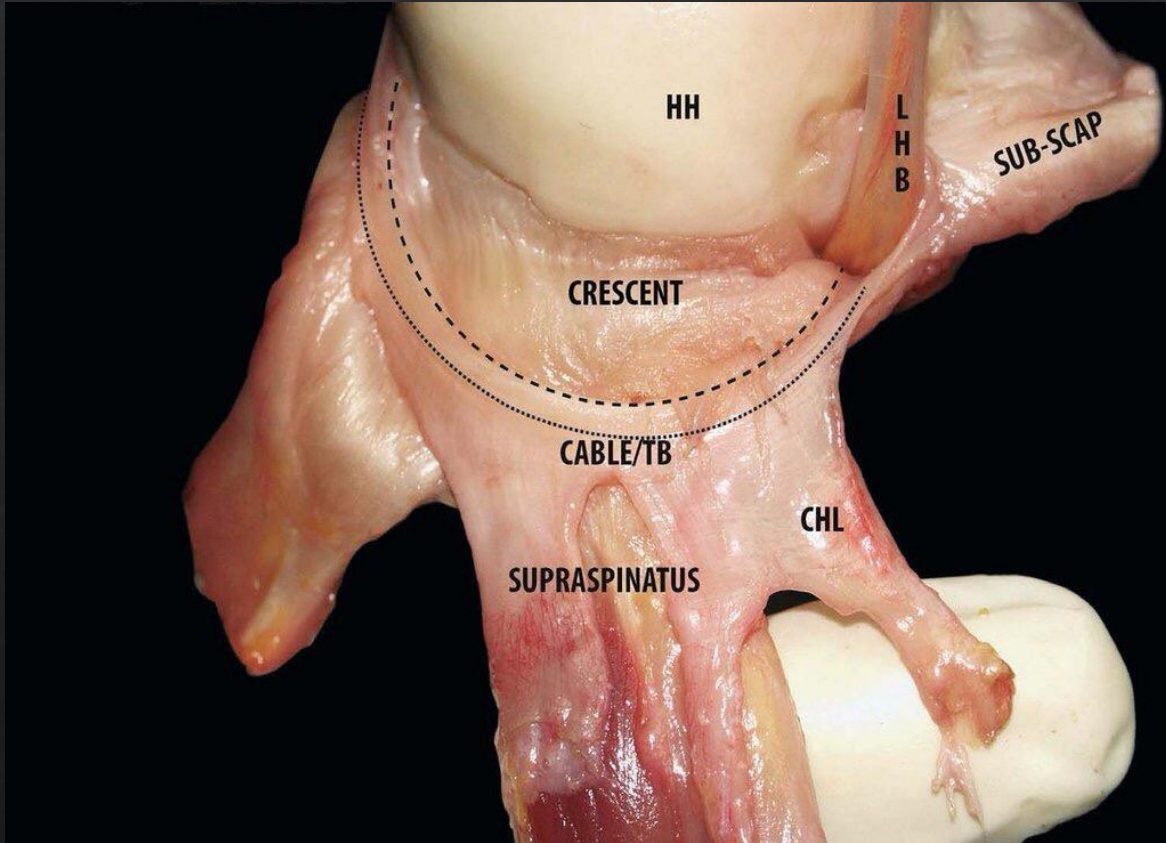
1. **Limit the inferior translation of the GHJ**
2. **Important stabiliser of the long head of the biceps brachii**
 - Reflection pulley / anterior biceps sling:
 - ◇ Coracohumeral ligament, Lateral and Medial Coracohumeral ligaments
 - ◇ Superior Glenohumeral Ligament

Rotator Interval (RI) – Ultrasound appearance



Huri, et al. 2019

Rotator cable (RC) \ *ligamentum semicirculare humeri*

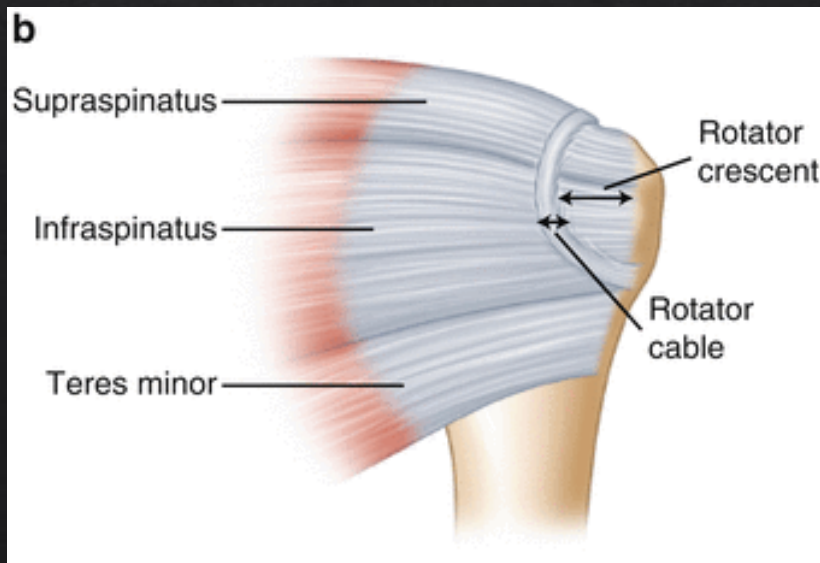
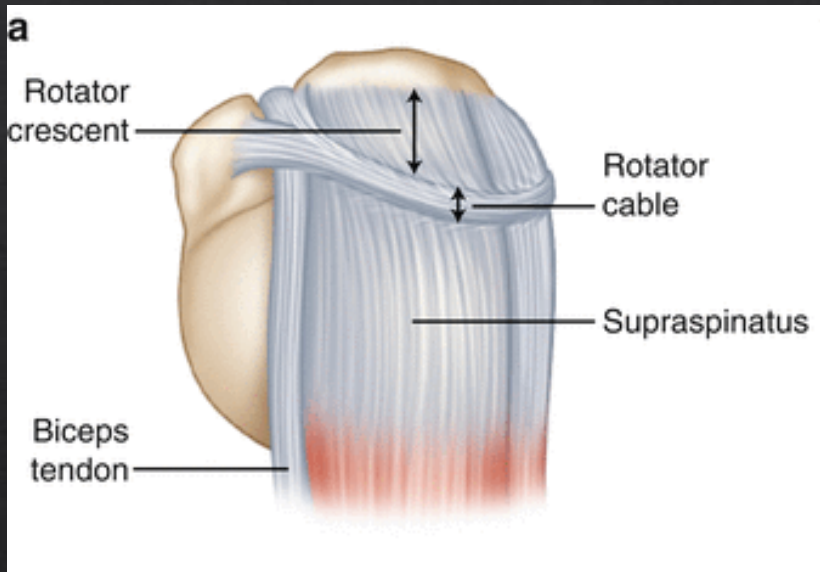


A fibrous bundle located in the articular surface of supraspinatus and infraspinatus, and oriented perpendicular to the axis/direction of the tendon fibres.

The RC acts as a 'suspension bridge' that works to keep load stress out of the rotator crescent, which tends to be more vulnerable to tears.

Huri, et al. 2019

Rotator cable (RC) \ *ligamentum semicirculare humeri*



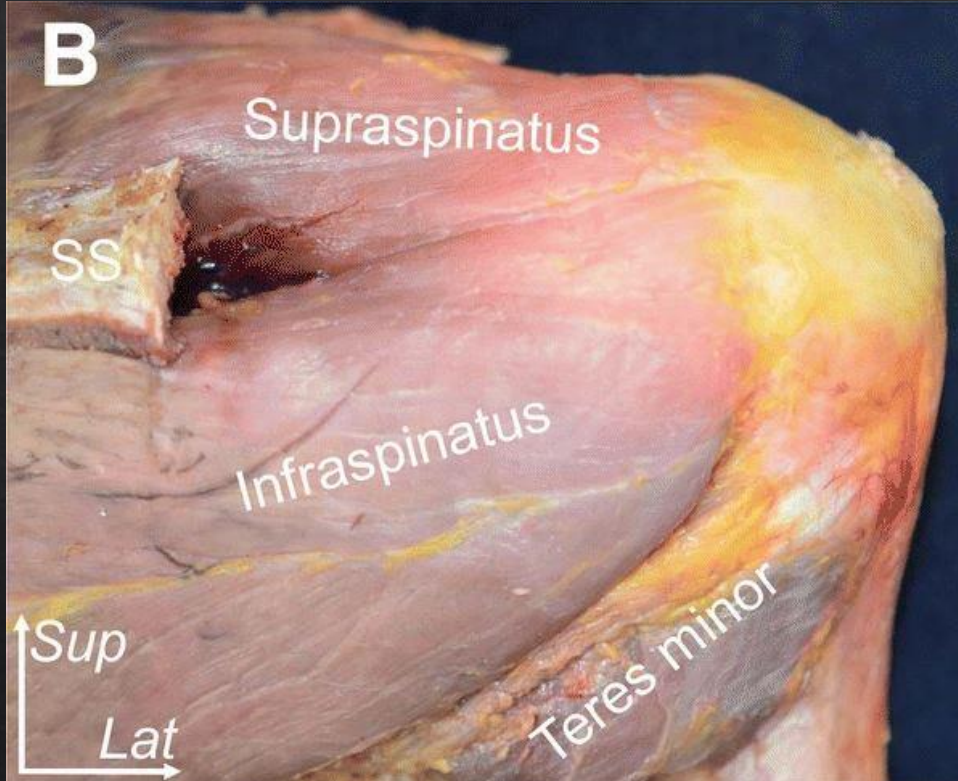
Two categories:

1. Crescent-dominant
2. Cable-dominant

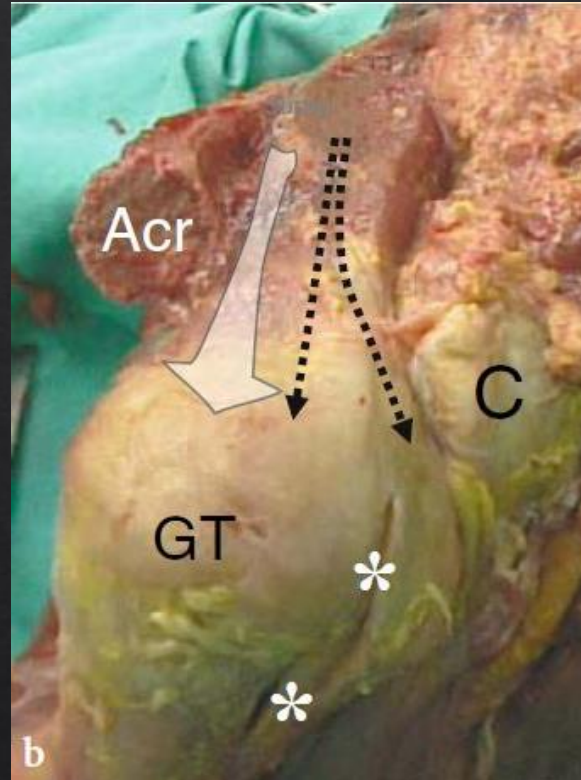
Biomechanics:

- ◆ Patients with massive rotator cuff tears, but the RC intact, had increased ROM compared to conjoined RC tear. (Denard P., et al 2012)
- ◆ Re-tears occur more frequently in the setting of the rotator cuff ruptures involving the RC. (Cho NS., et al 2017)

Supraspinatus tendon (SSP)



Momma D., et al. 2018



Bianchi S., et al. 2007

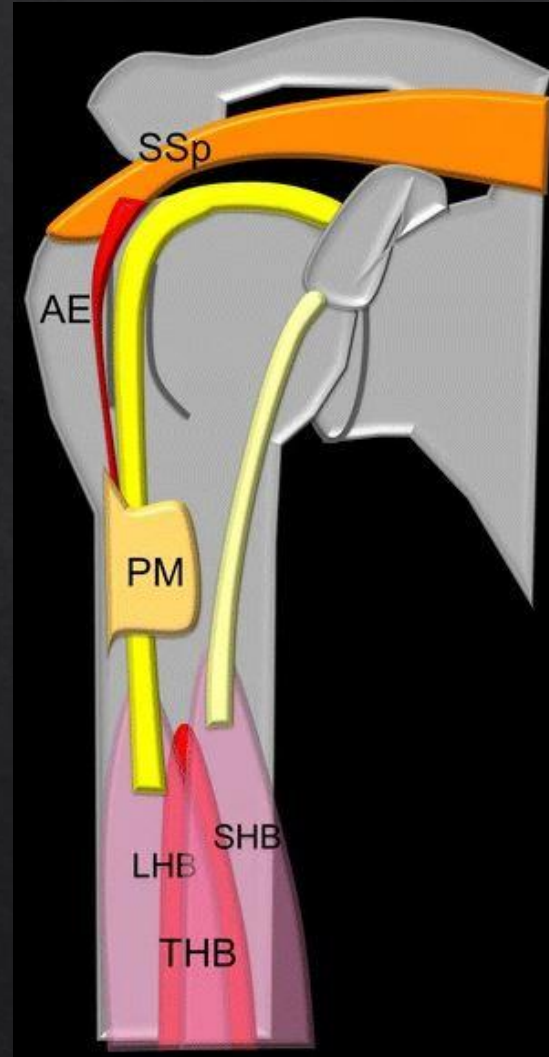
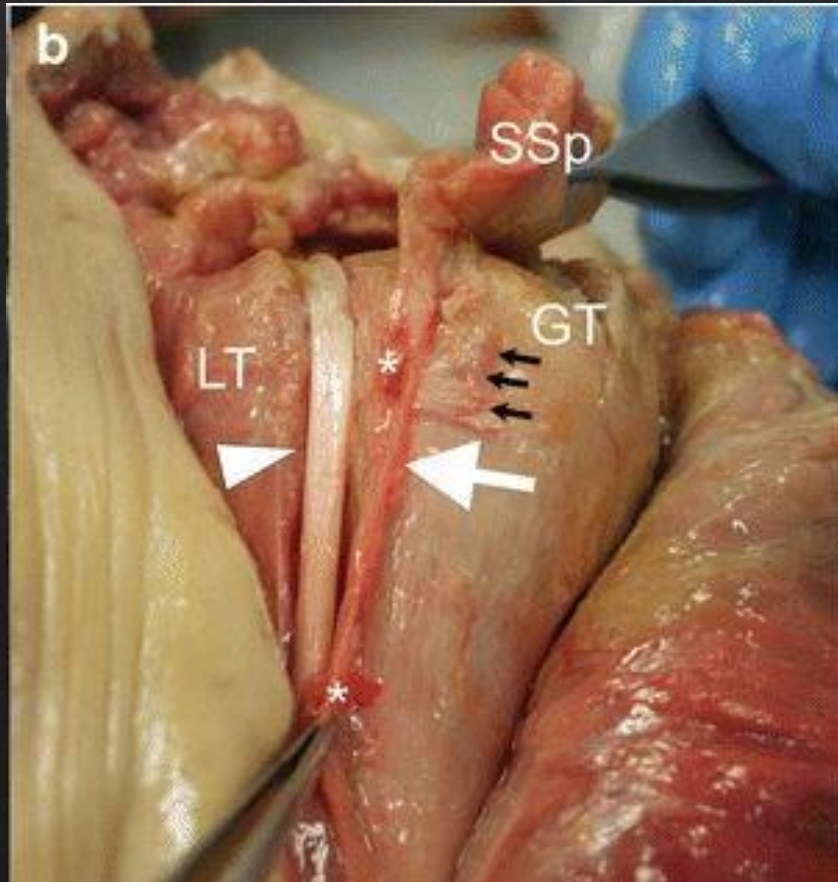
From supraspinous fossa to two distinct portions: dorsal and ventral.

- ◇ Dorsal: to the superior and part of middle facets of GT
- ◇ Ventral: to the LT

Responsible for GHJ stability, abduction. Weak internal/external rotator.

Key muscle in GHJ arthrokinematics; inferior slide of humeral head.

Aponeurotic expansion of SSP



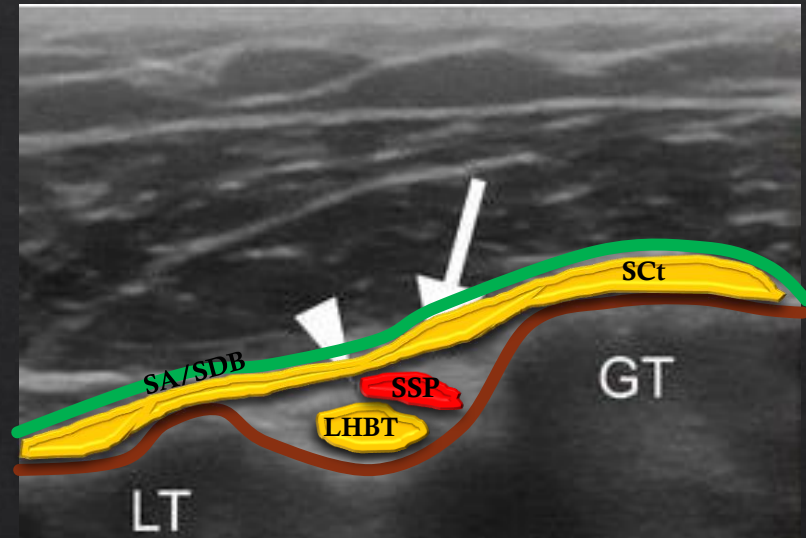
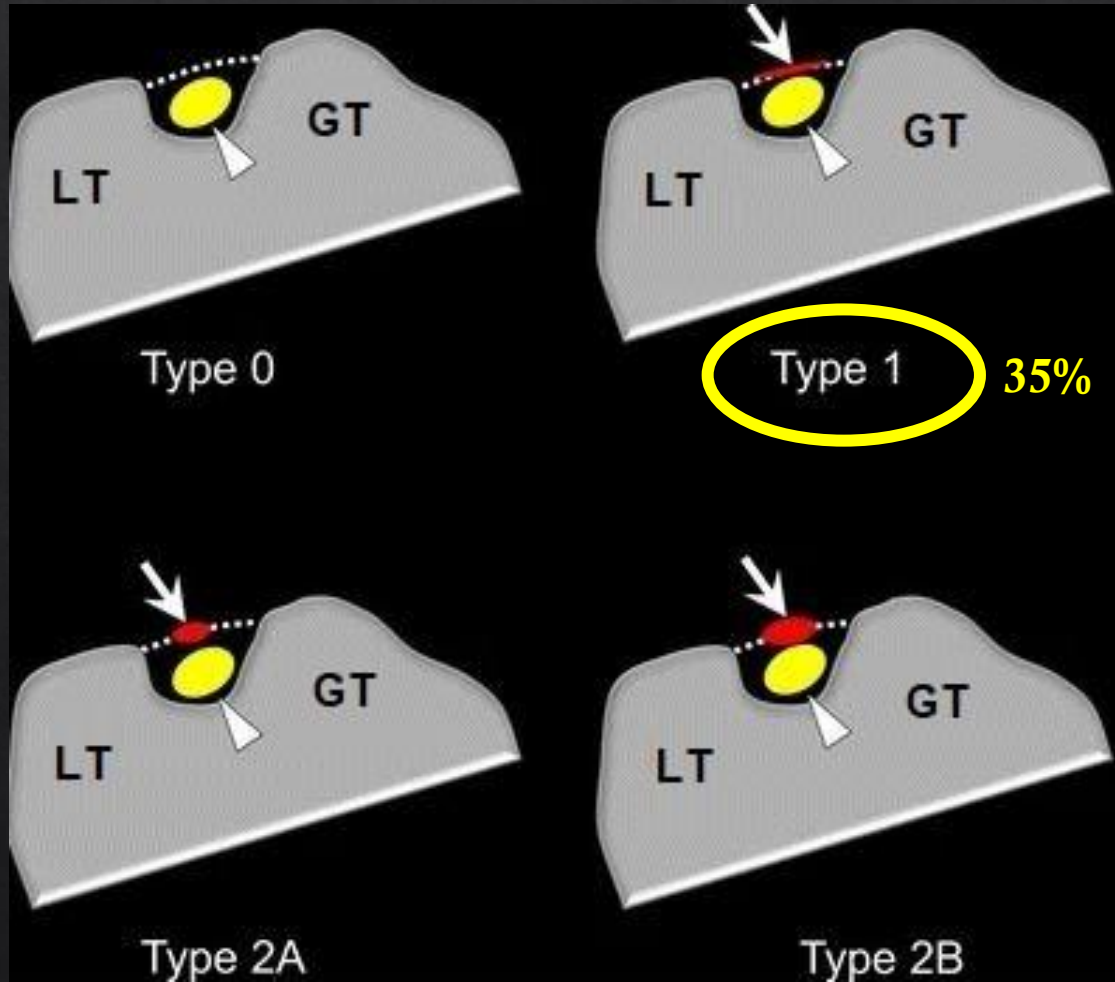
An aponeurotic expansion of the supraspinatus located anterior and lateral to the LHBT in its groove. (outside the synovial sheath)

Demonstrated in 49% of the shoulders. (cadaveric study)

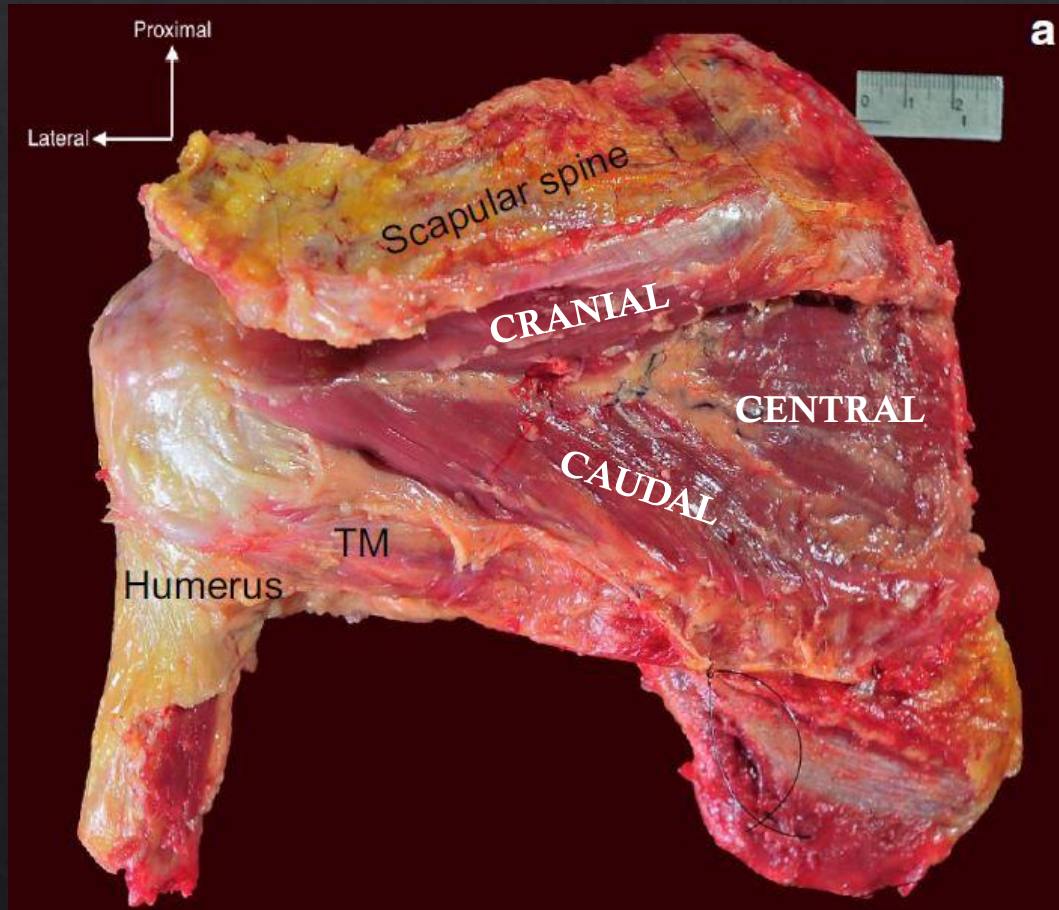
It can mimic a split tear of the LHBT.

May play a role in reinforcing the anterior portion of the supraspinatus tendon.

Aponeurotic expansion of SSP – Ultrasound appearance



Infraspinatus tendon



Bacle et al. 2017

IFS tendon

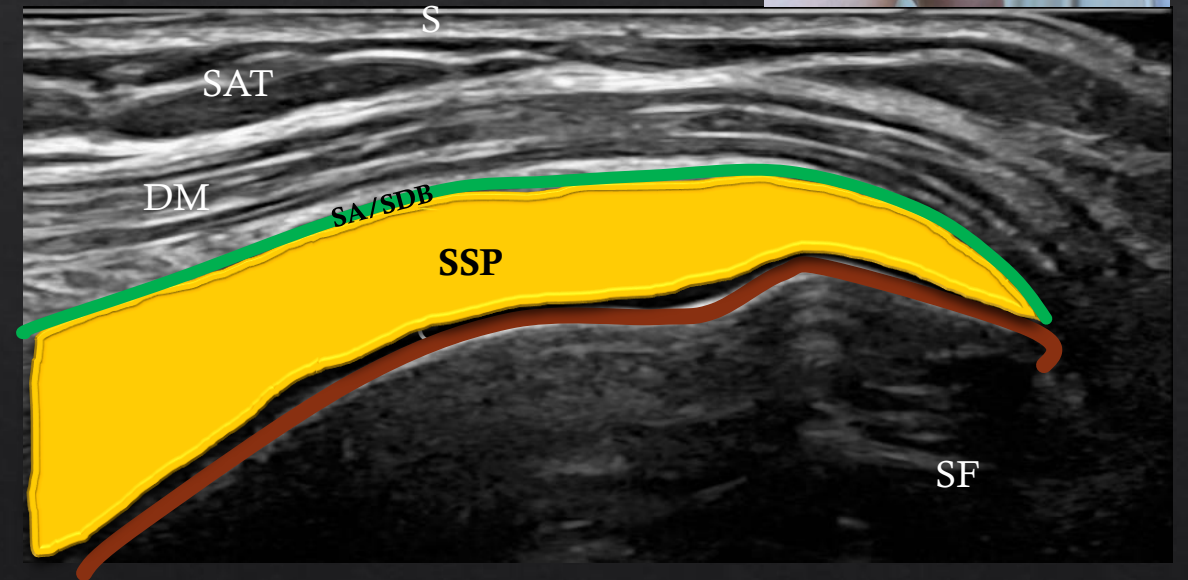
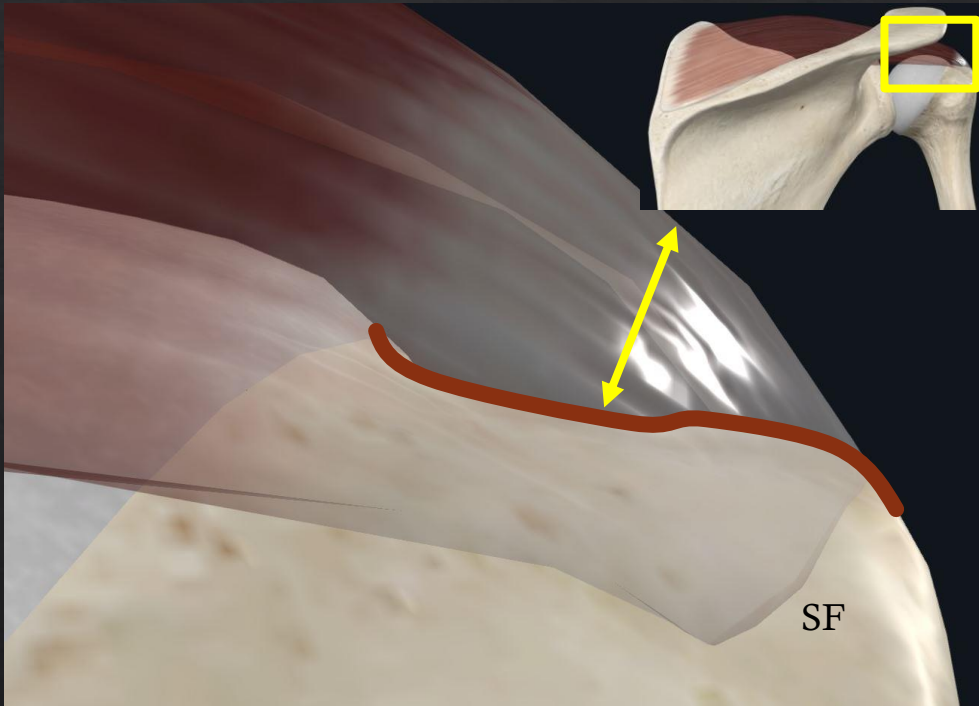
Three (3) distinct group of fibres:

- ◇ Cranial: Inferior aspect of medial half of scapular spine
- ◇ Caudal: Deep IFS fascia
- ◇ Central: Medial 2/3 of infraspinous fossa

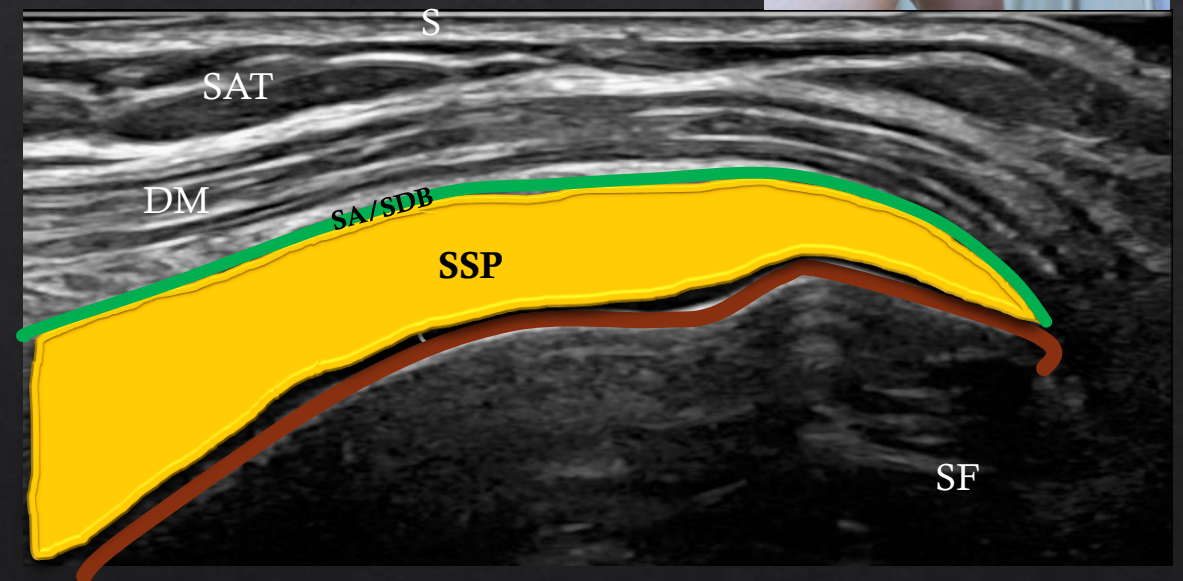
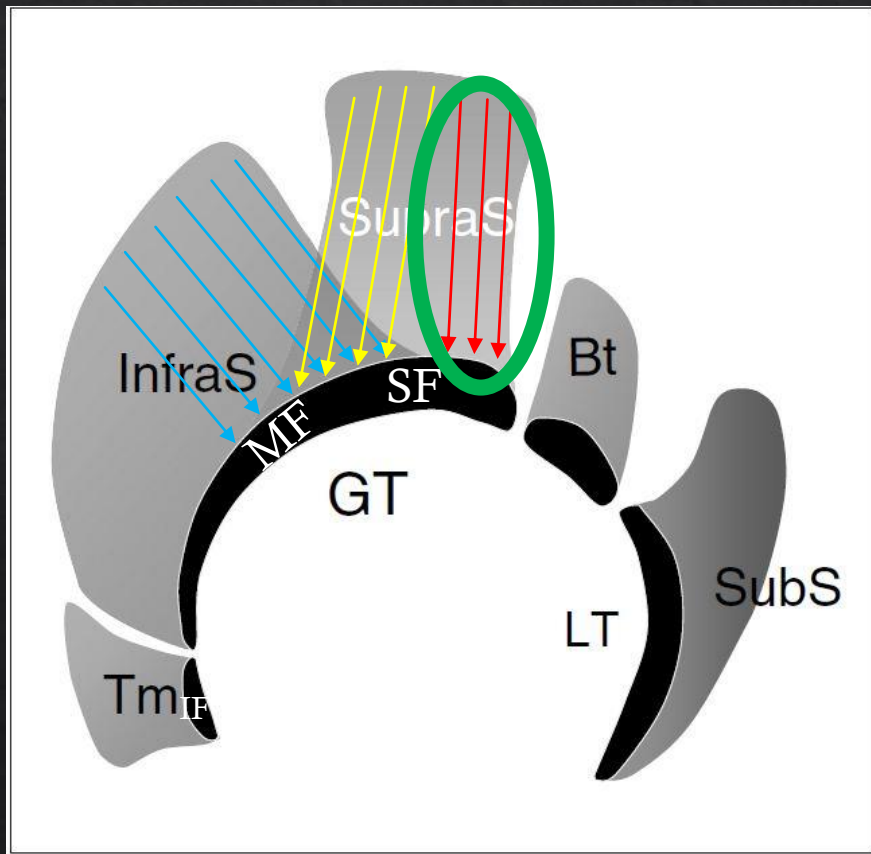
Inserting onto the superior-middle facets of GT.

Responsible for GHJ stability and external rotation.

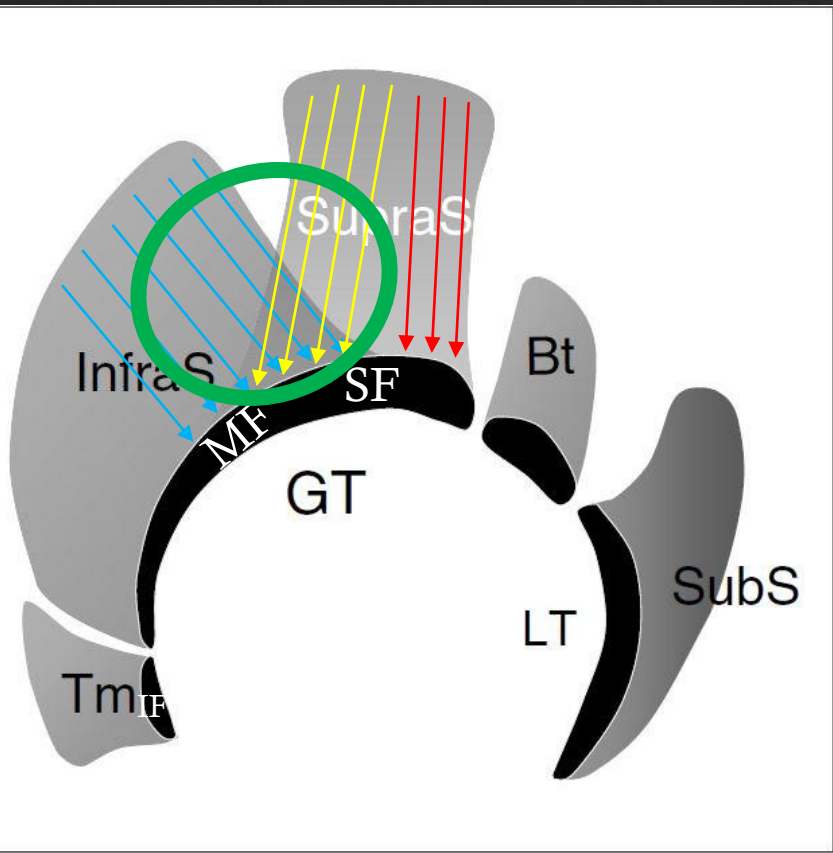
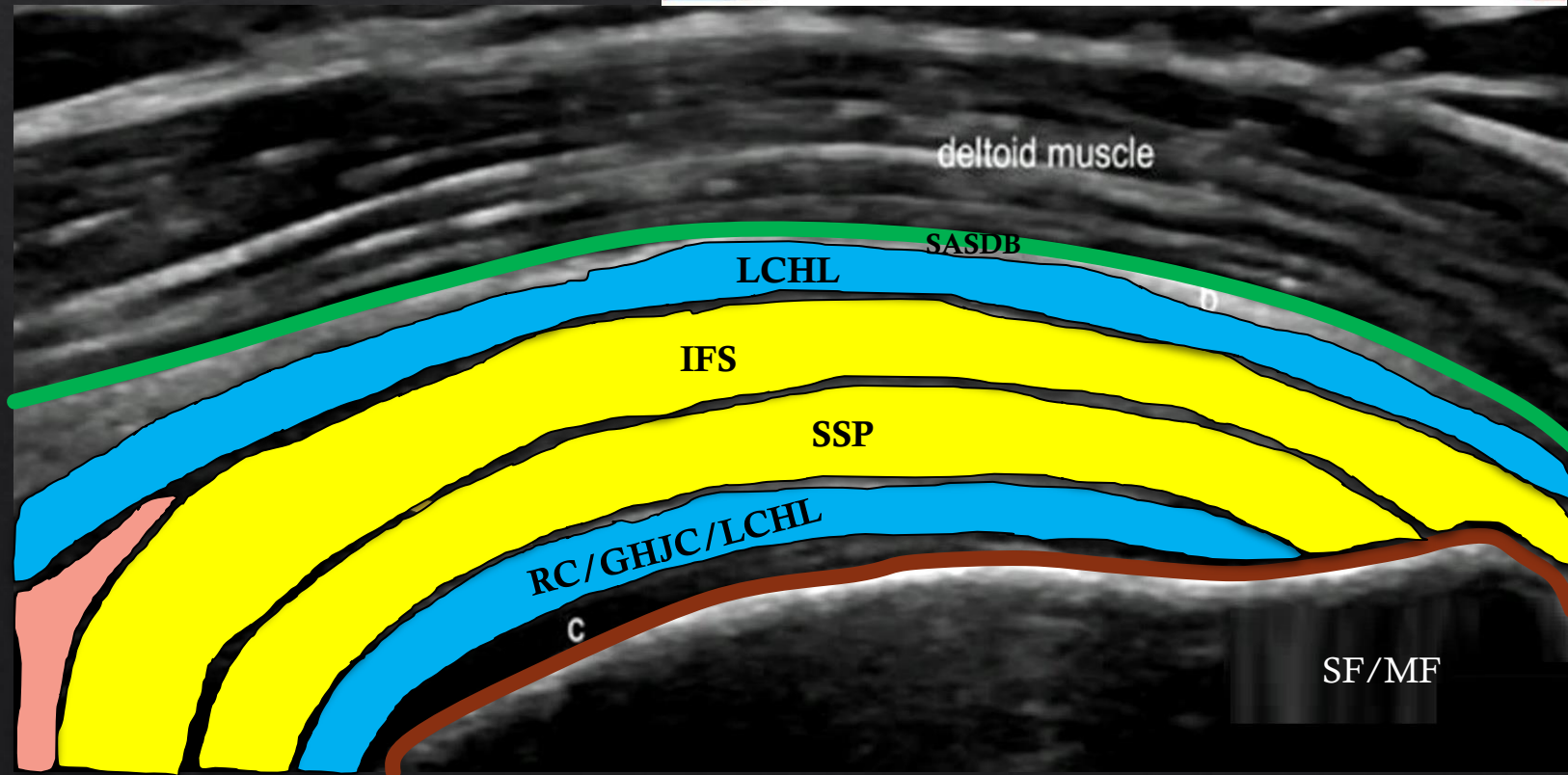
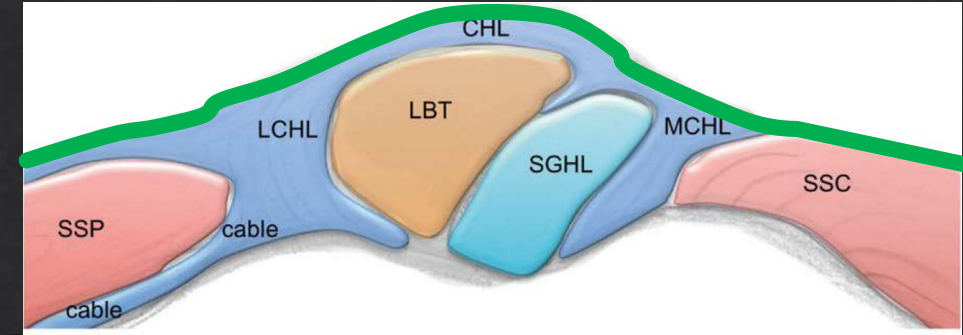
Supraspinatus tendon – Long axis



Supraspinatus tendon – Long axis



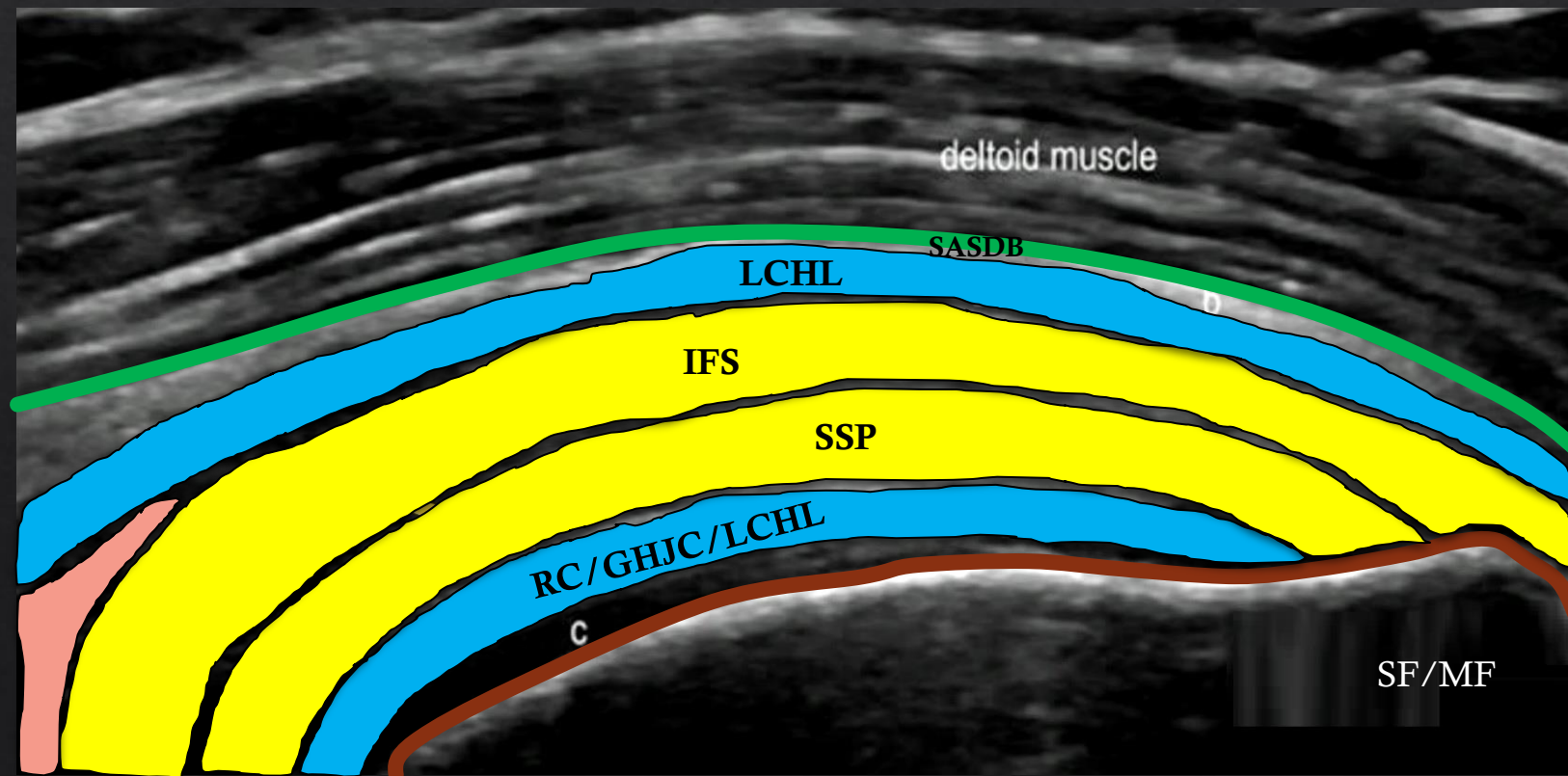
Supraspinatus-infraspinatus complex – Long axis



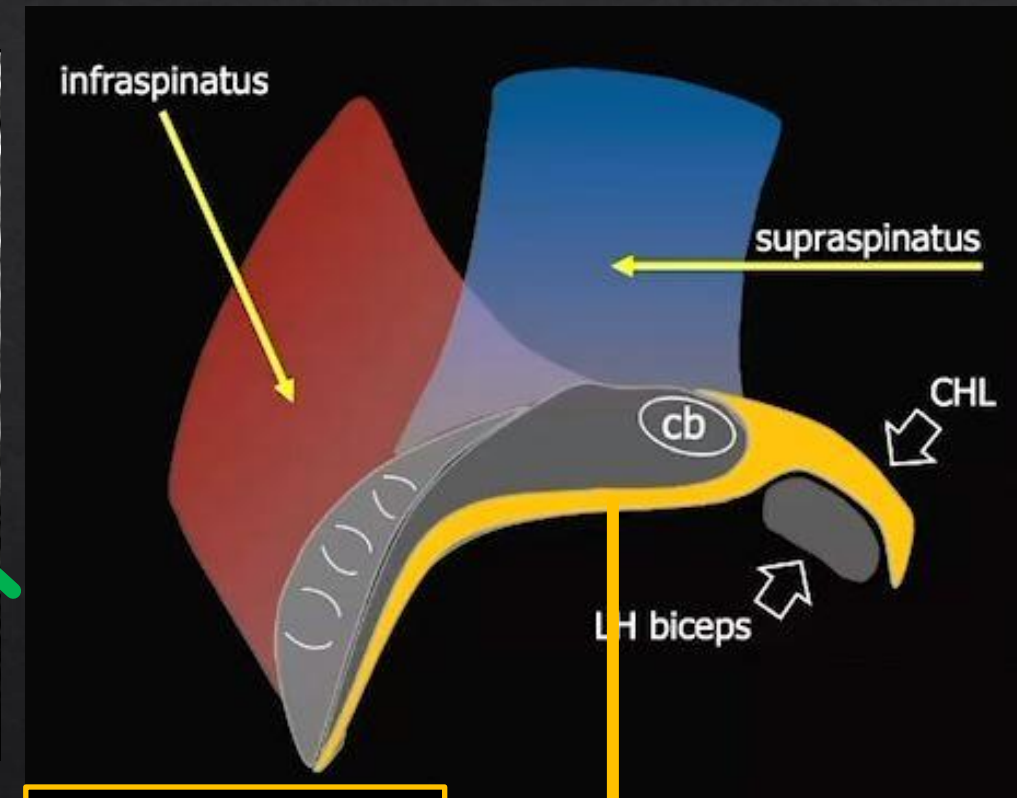
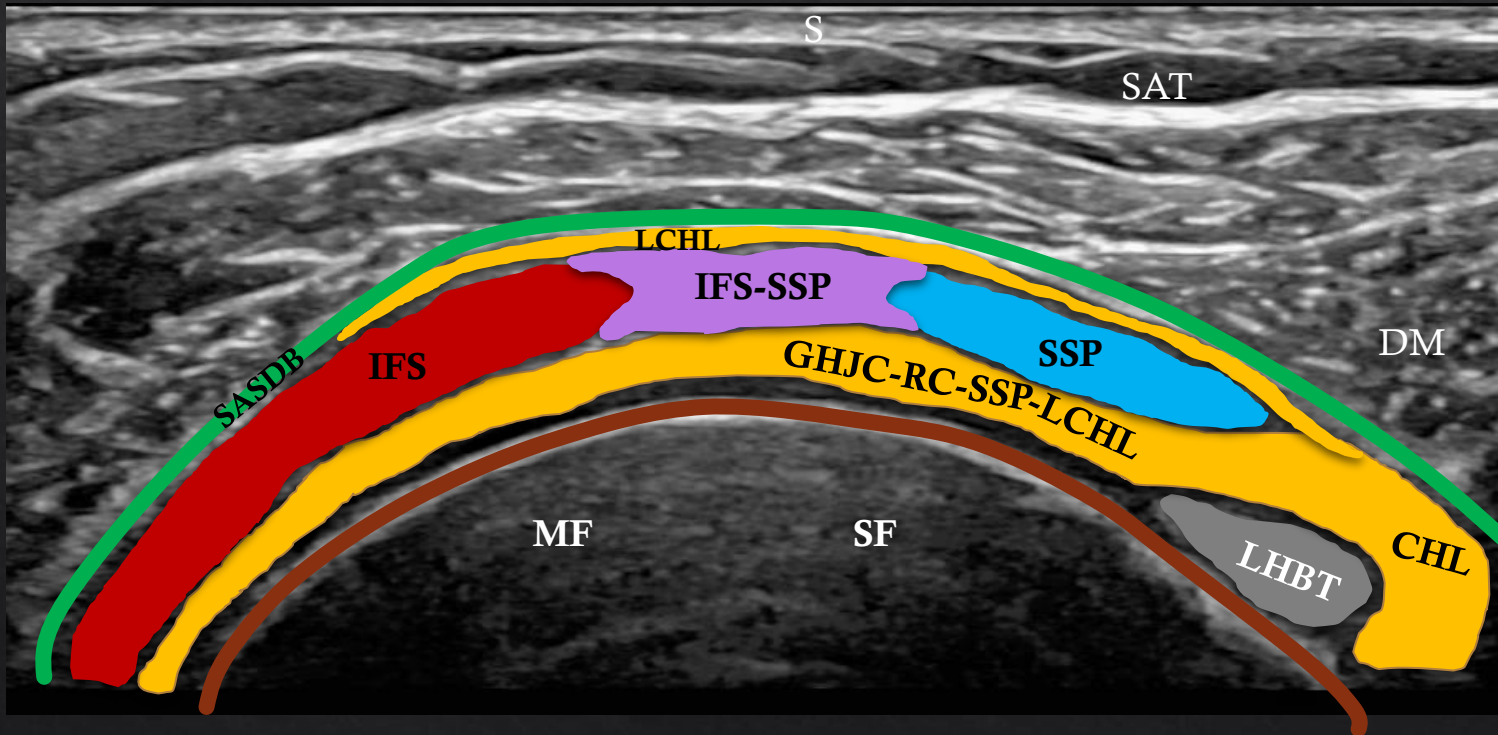
Supraspinatus-infraspinatus complex – Long axis

Superior complex:

- GHJ capsule
- Deep posterior supraspinatus fibres
- Rotator cable
- LCHL



Supraspinatus-infraspinatus complex – Short axis

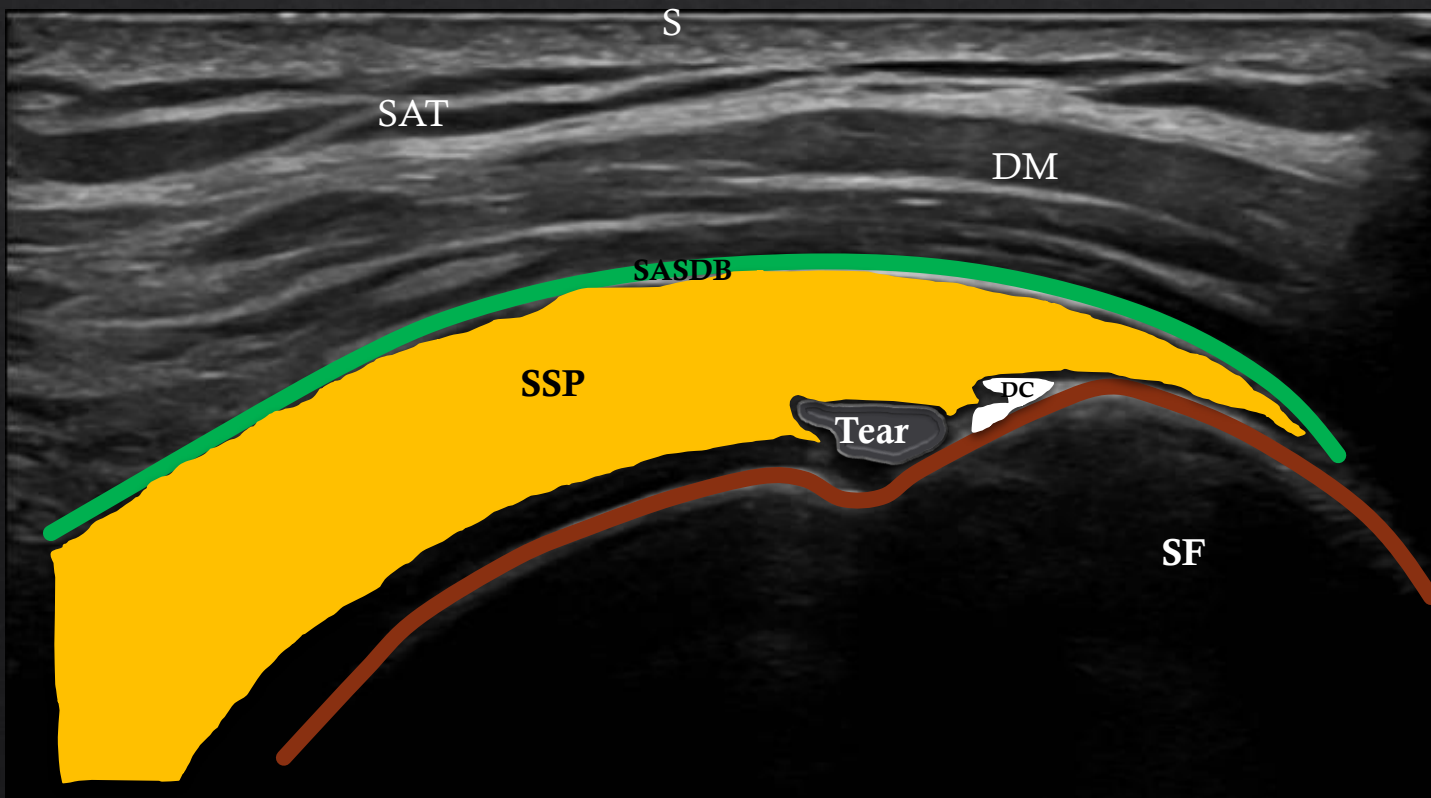
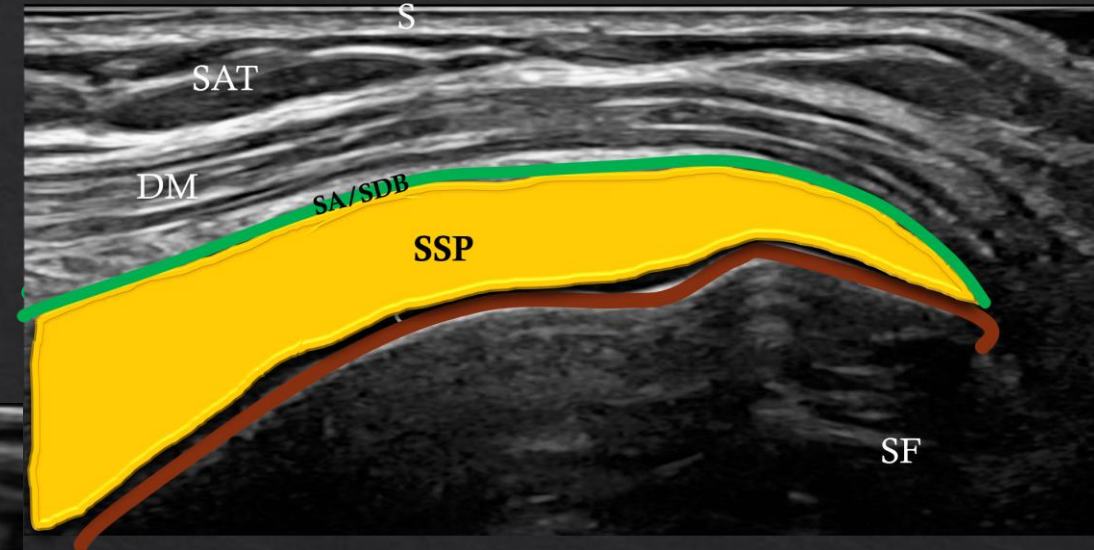


- Superior complex:**
- GHJ capsule
 - Deep posterior supraspinatus fibres
 - Rotator cable
 - LCHL

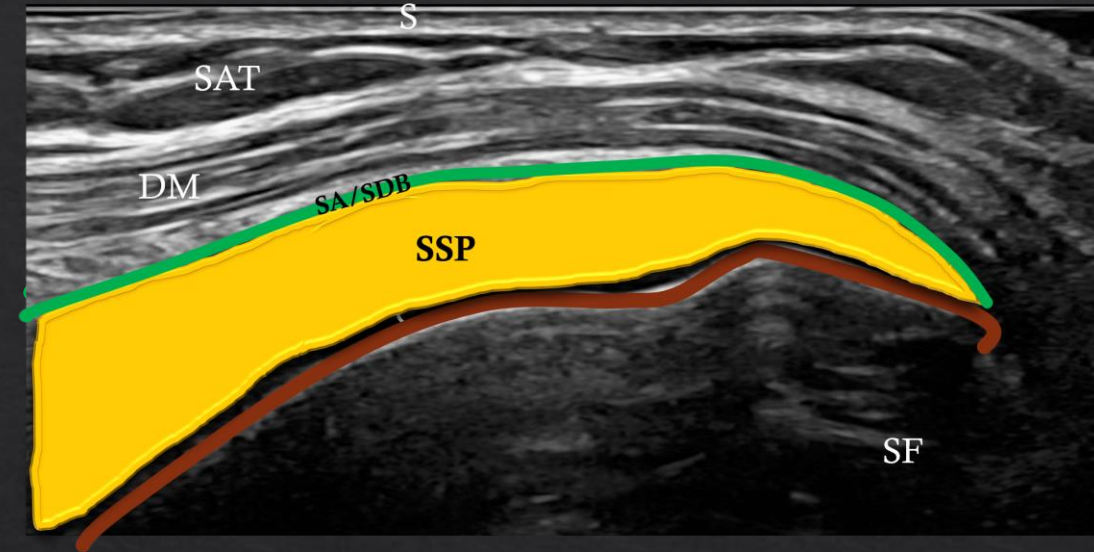
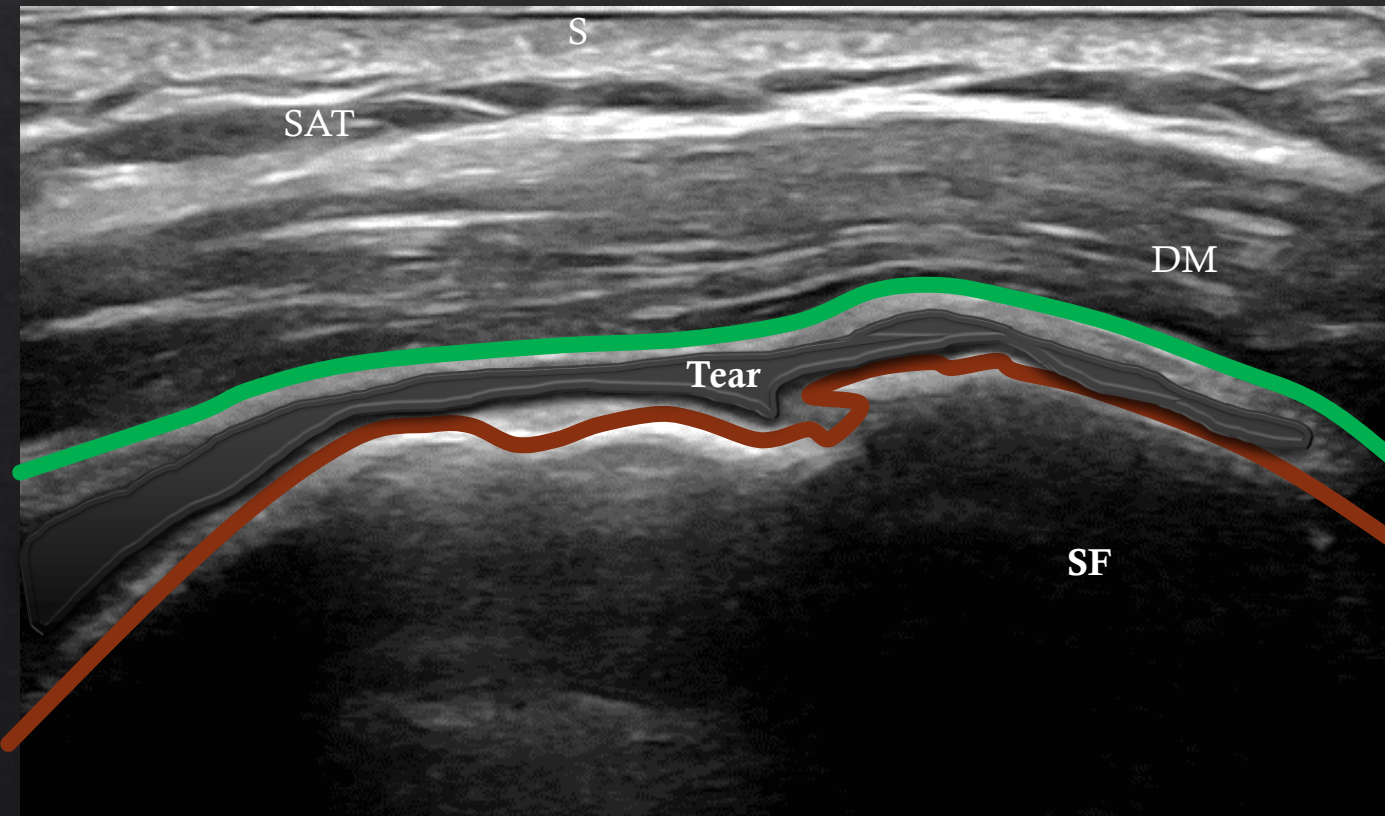
Supraspinatus-infraspinatus pathology

- ◇ Patients with rotator cuff pathology typically complain of night pain, particularly on the affected side.
- ◇ Supraspinatus is the most common tendon affected in rotator cuff pathology. (INF 3rd)
- ◇ Possible pathologies:
 - ◇ Partial-thickness tears (bursal-sided; articular-sided; intrasubstance/delaminated)
 - ◇ Full-thickness tears (complete; incomplete)
 - ◇ Tendinosis
 - ◇ Calcifications (degenerative calcification; Calcium Apatite Deposition Disease - CADD)
 - ◇ Enthesophytes
 - ◇ Osteophytes
 - ◇ Avulsion tears
 - ◇ Subacromial impingement from bursitis????????
- ◇ Adhesive capsulitis (Thickening of the sheath of LHBT; the CHL; and the capsule and IGHL; hyperaemia coracoid triangle fat pad)

Partial-thickness SPP tear & degenerative calcifications

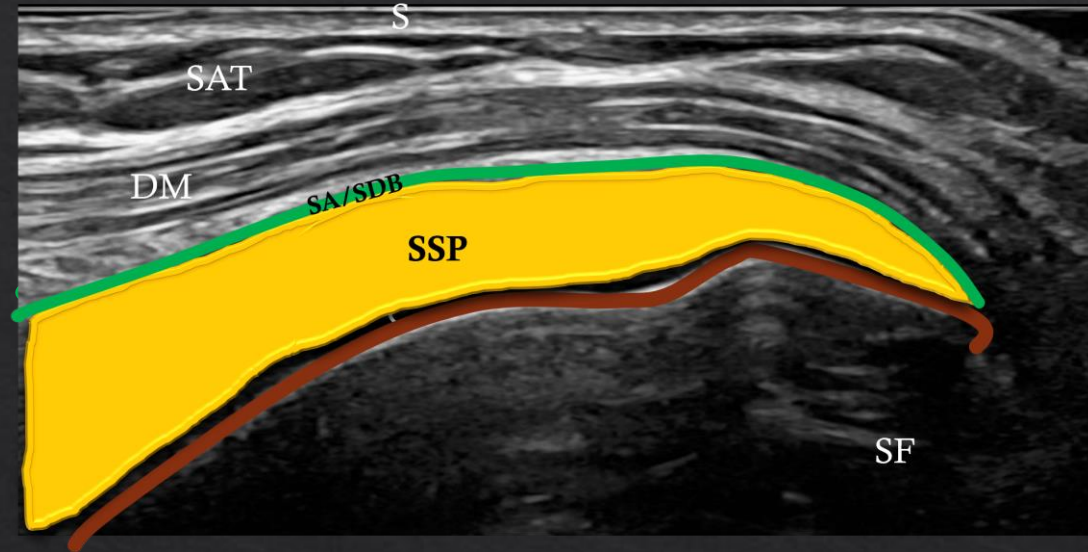
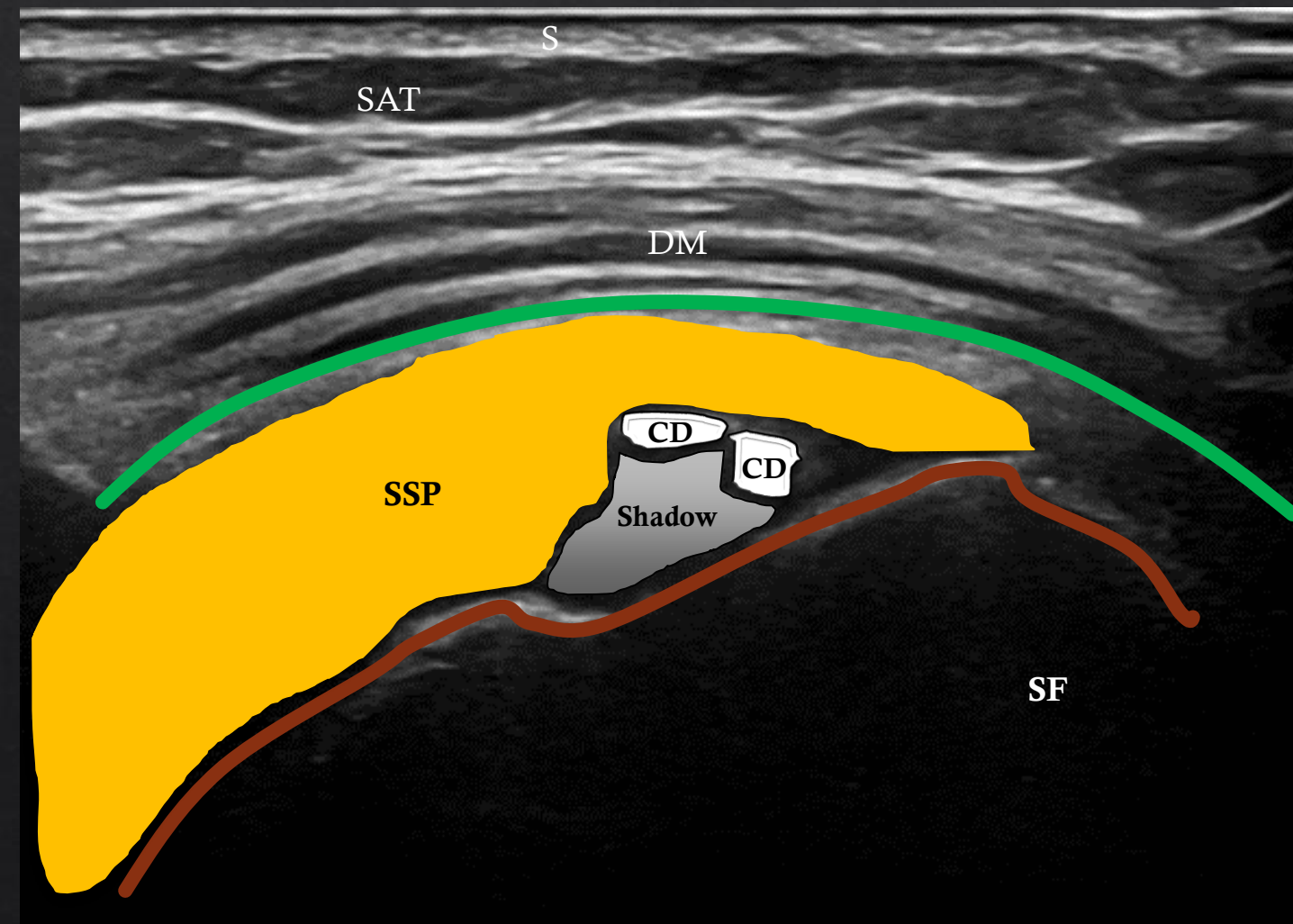


Complete full-thickness SPP tear



- ◇ Fibre discontinuity (superior complex; SSP)
- ◇ Deltoid herniation sign

SSP calcific tendinosis (CADD)



Take-home message

- ◆ Rotator cuff is more than the 4 tendons – superior complex
- ◆ Supraspinatus-infraspinatus complex tear most commonly seen than isolated supraspinatus tears
- ◆ Subacromial/subdeltoid bursal effusion/bursitis is commonly secondary to other rotator cuff pathology (unless acute trauma, infection is present)
- ◆ Global rehabilitation programmes that target all rotator cuff muscles (remember the accessory movements of muscles)

Thank you



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