Updates of Diagnostic & Interventional Radiology

Scientific Day

PROGRAM

Friday 14 Jan 2022		Topic	Speaker
1	1.30	Introduction , Welcoming & Registration	
		SESSION 1	
1.30	1.45	Ablation of Liomyoma	Dr. Hesham Algahlaan
1.45	2.00	Updates in MSK Imaging	Dr. Mahmoud Yosef
2.00	2.15	Review of Shoulder MRI	Dr. Hemadan AbdelHameed
2.15	2.30	DISCUSSION	
2.30	3.00	Coffee Break	
		SESSION 2	
3.00	3.15	CPA & IAC MASSES	Dr. Mohammad Hassan
3.15	3.30	Percutaneous lumbar disc ozone nucleolysis	Dr. Mohammad Ezz
3.30	3.45	Recommendations of Diffuse Lung Diseases Imaging	Dr. Ahmad Mokhtar
3.45	4.00	Review of Breast MRI	Dr. Ebtesam AbdelBarey
4.00		DISCUSSION	
4.15		Launch	

Coordinator

Dr. Ahmad Mokhtar Abodahab

President of Department

Prof. Dr. Mohammad Zakey

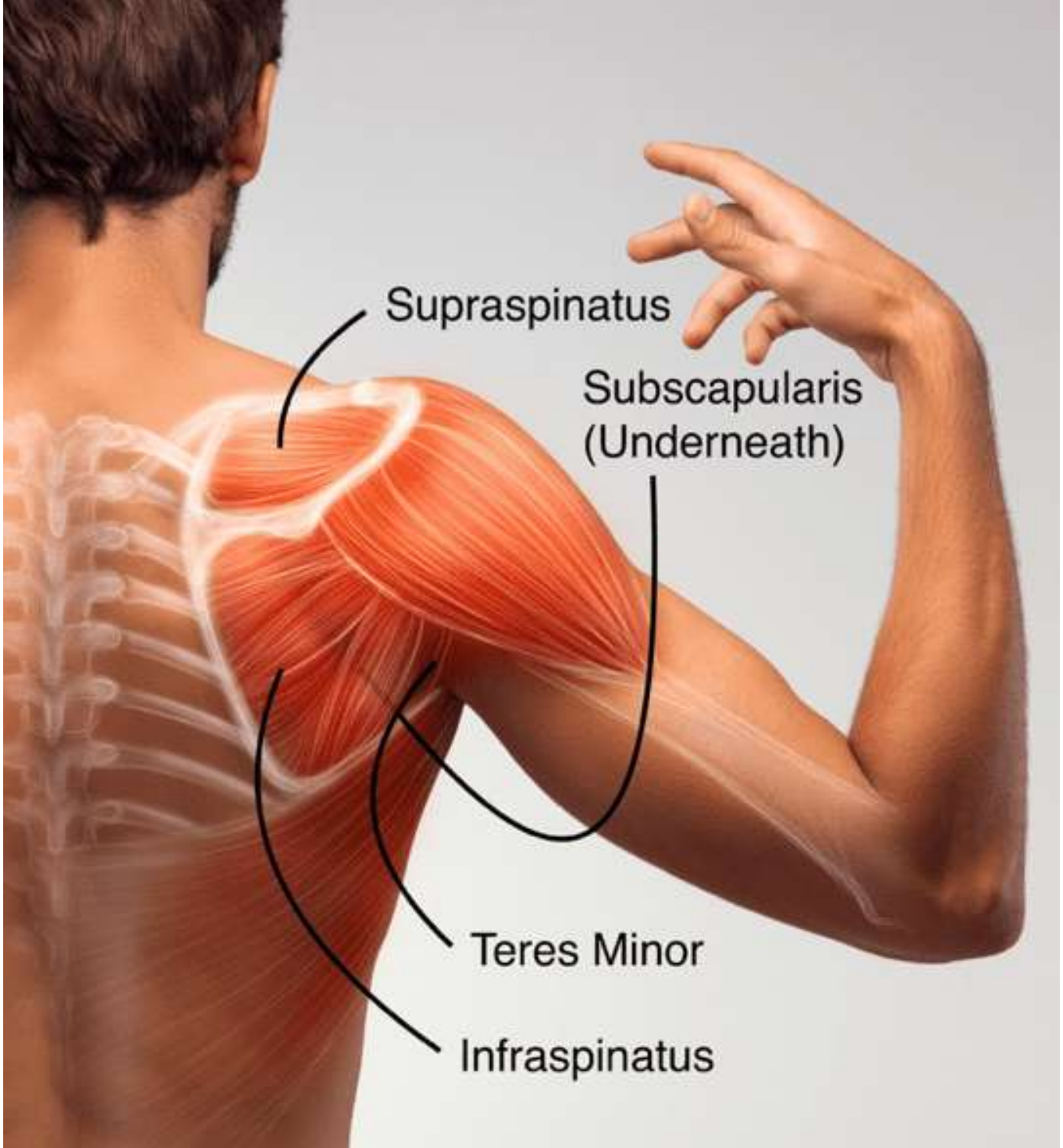
MRI of Common Shoulder Pathologies

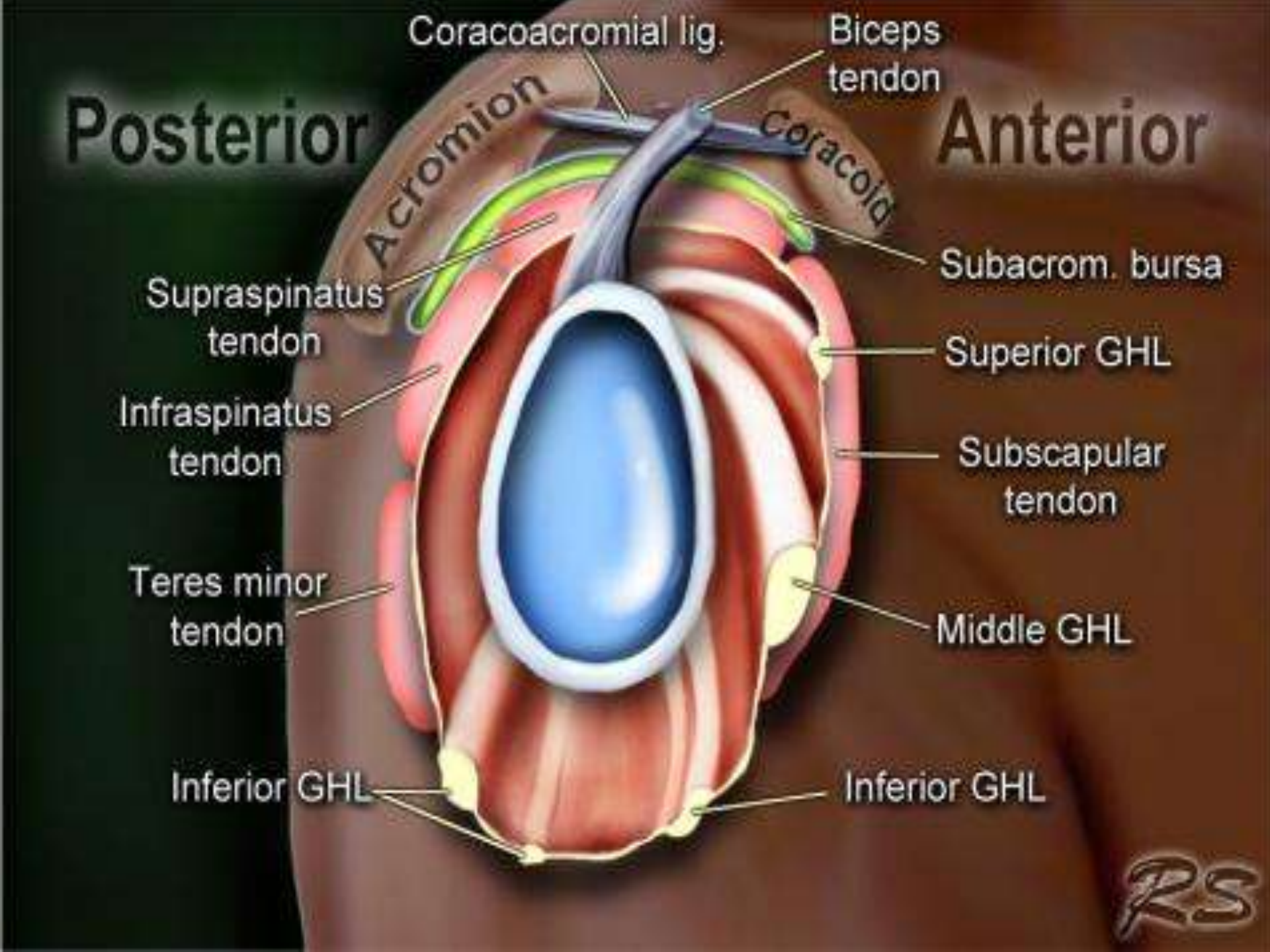
Dr. Hamdan Kassem. MD

Lecturer of Radiology – Sohag University

Rotator Cuff

- The teres minor tendon inserts on **the inferior facet**.
- The subscapularis tendon is multipennate and inserts broadly on the lesser tuberosity.


Supraspinatus
Subscapularis
(Underneath)
Teres Minor
Infraspinatus


Coracoacromial lig.
Biceps tendon
Posterior
Anterior
Acromion
Coracoid
Subacrom. bursa
Supraspinatus tendon
Superior GHL
Infraspinatus tendon
Subscapular tendon
Teres minor tendon
Middle GHL
Inferior GHL
Inferior GHL
RS

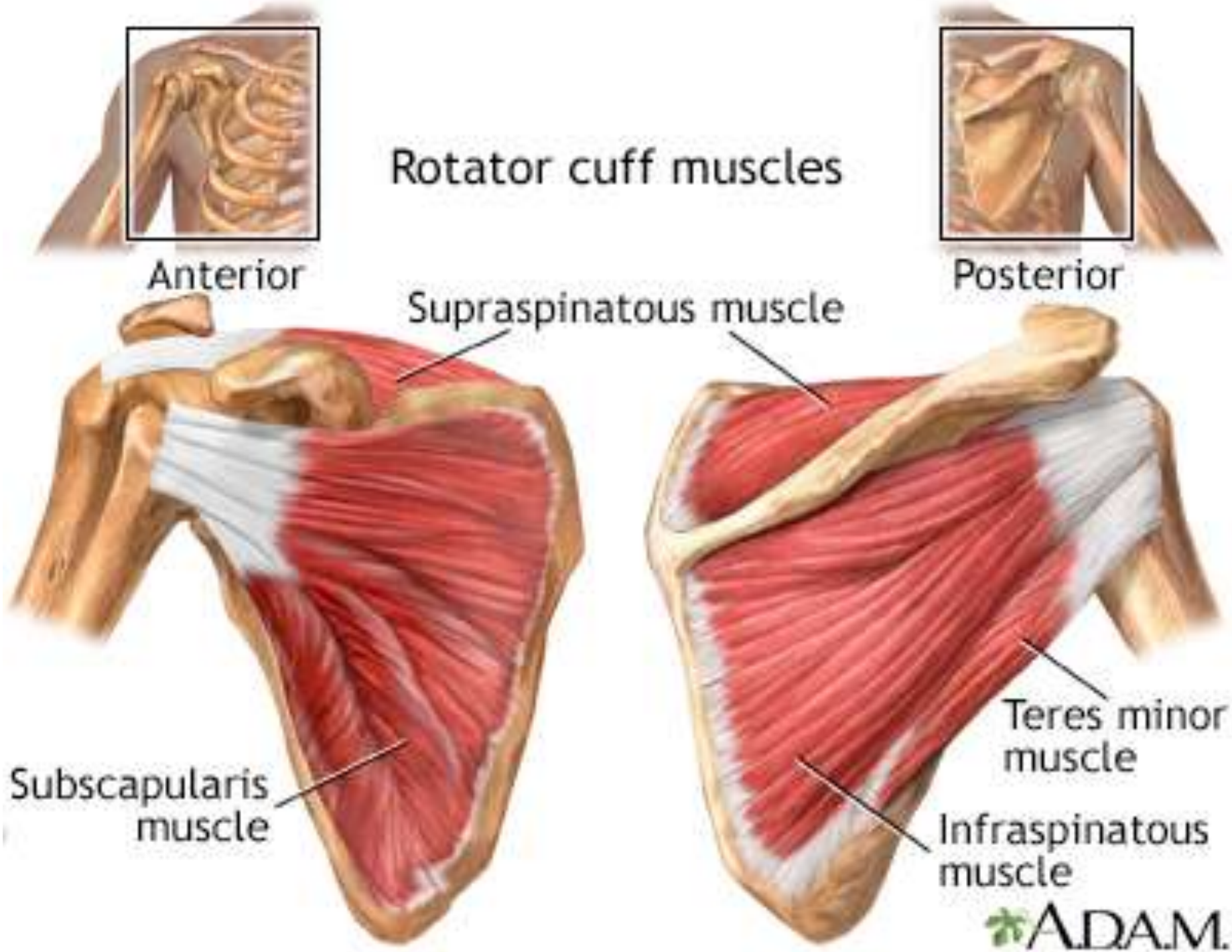
Rotator Cuff Tendinosis

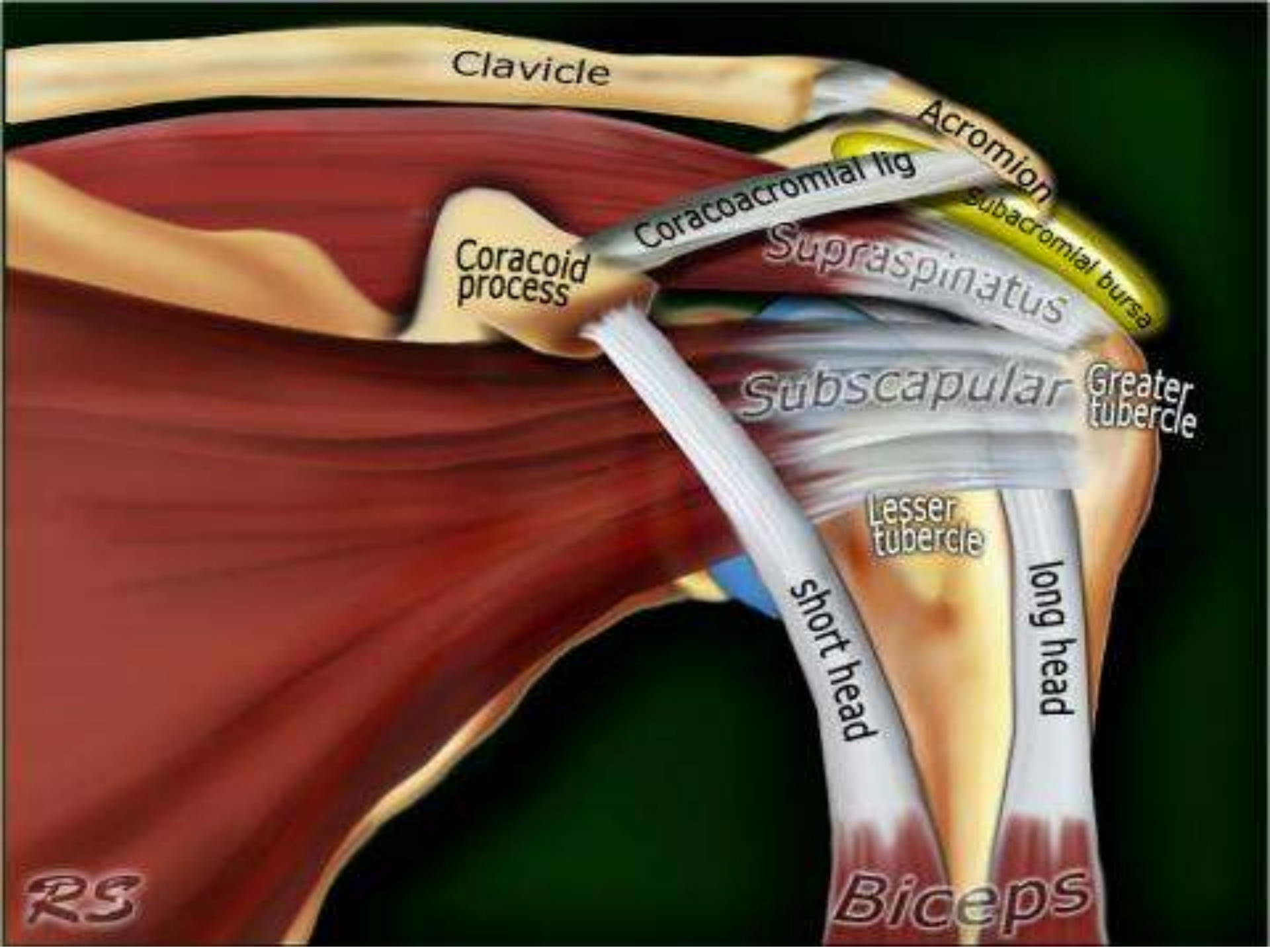
- **Rotator Cuff:**

❑ Supraspinatus, infraspinatus, teres minor, and subscapularis tendons.

❑ **Origin :** Scapula

❑ insertion: Tuberosities of the HH.


Rotator cuff muscles
Anterior
Posterior
Supraspinatous muscle
Subscapularis muscle
Teres minor muscle
Infraspinatous muscle
A.D.A.M.


Clavicle
Acromion
Coracoacromial lig
Subacromial bursa
Coracoid process
Supraspinatus
Subscapular
Greater tubercle
Lesser tubercle
short head
long head
Biceps
RS

Rotator Cuff Tendinosis

- SS tendon inserts onto the superior facet of the GT, just posterior to the bicipital groove.
- **The infraspinatus tendon** is much larger, and the anterior fibers interdigitate with the posterior fibers of the SS tendon and insert on the posterior aspect of the superior facet.
- The remainder of the infraspinatus tendon inserts onto the middle facet of the GT.

Normal MR appearance

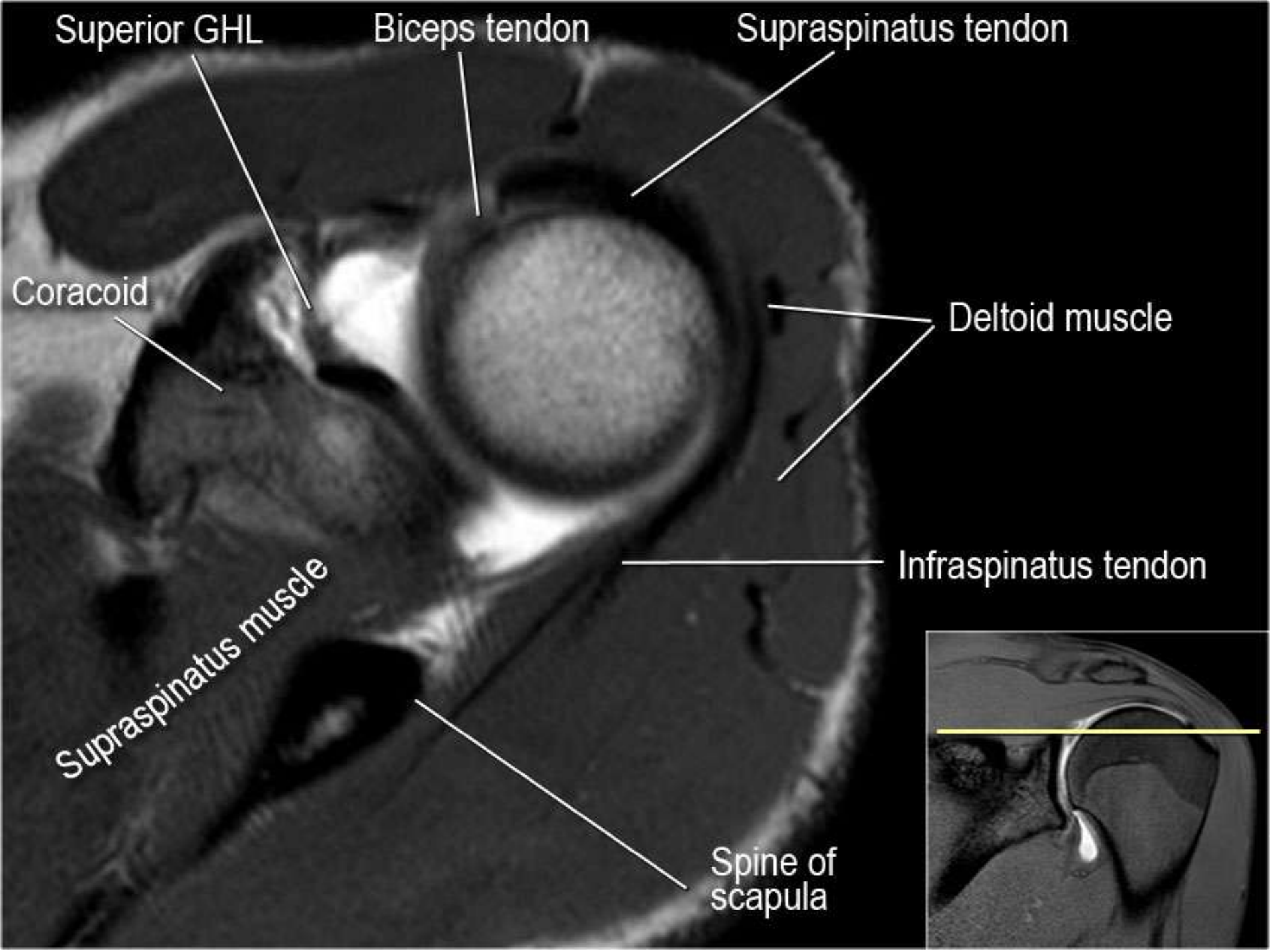
- **On MRI,** the normal RTC tendons show **uniform hypo intense signal intensity on all pulse sequences** since they are composed of **dense collagen bundles**.
- **The supraspinatus and infra spinatus tendons** :

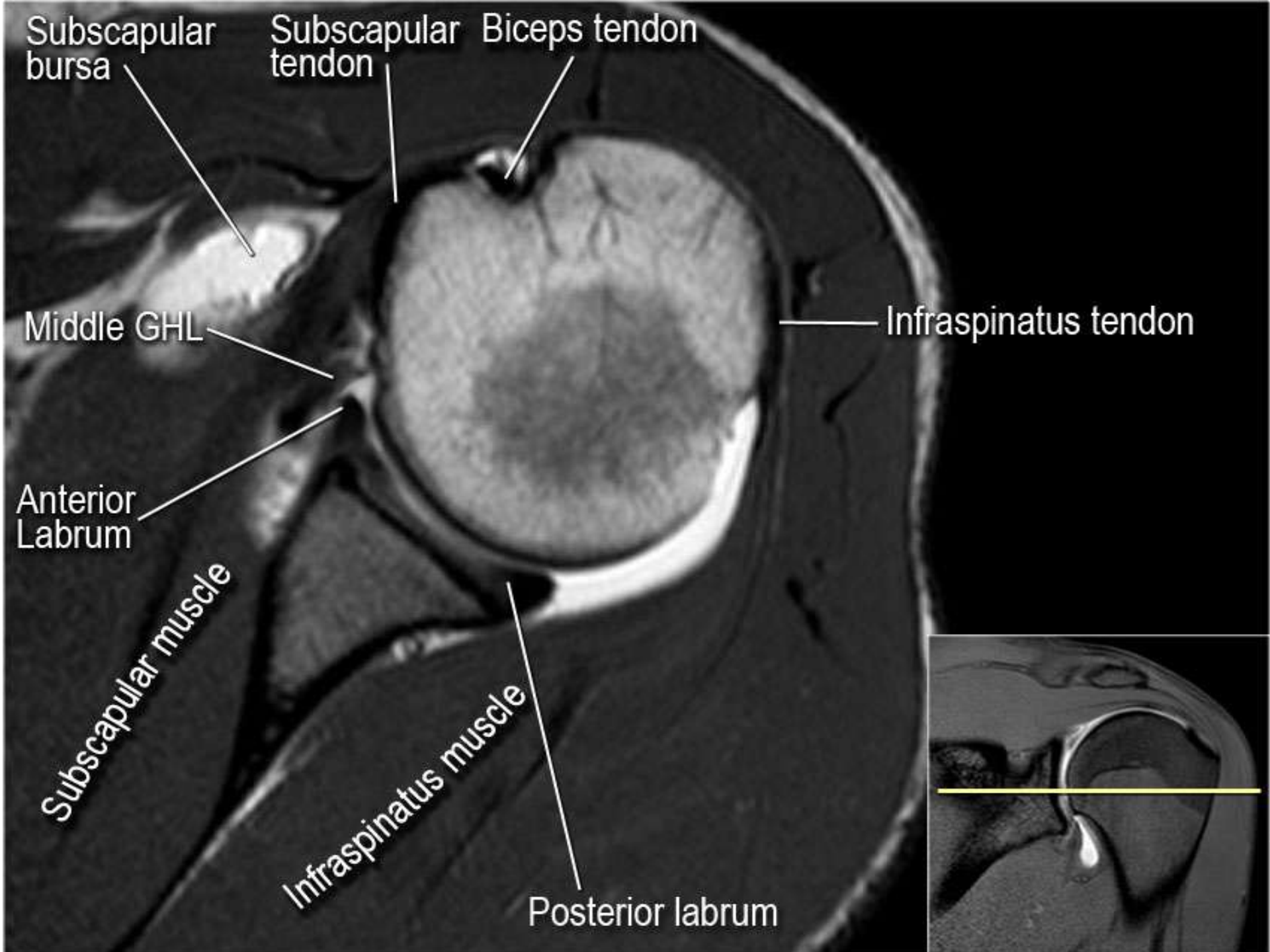
- Best evaluated on the **coronal** and **sagittal oblique** sequences,

while the **subscapularis** and **teres minor tendons :**

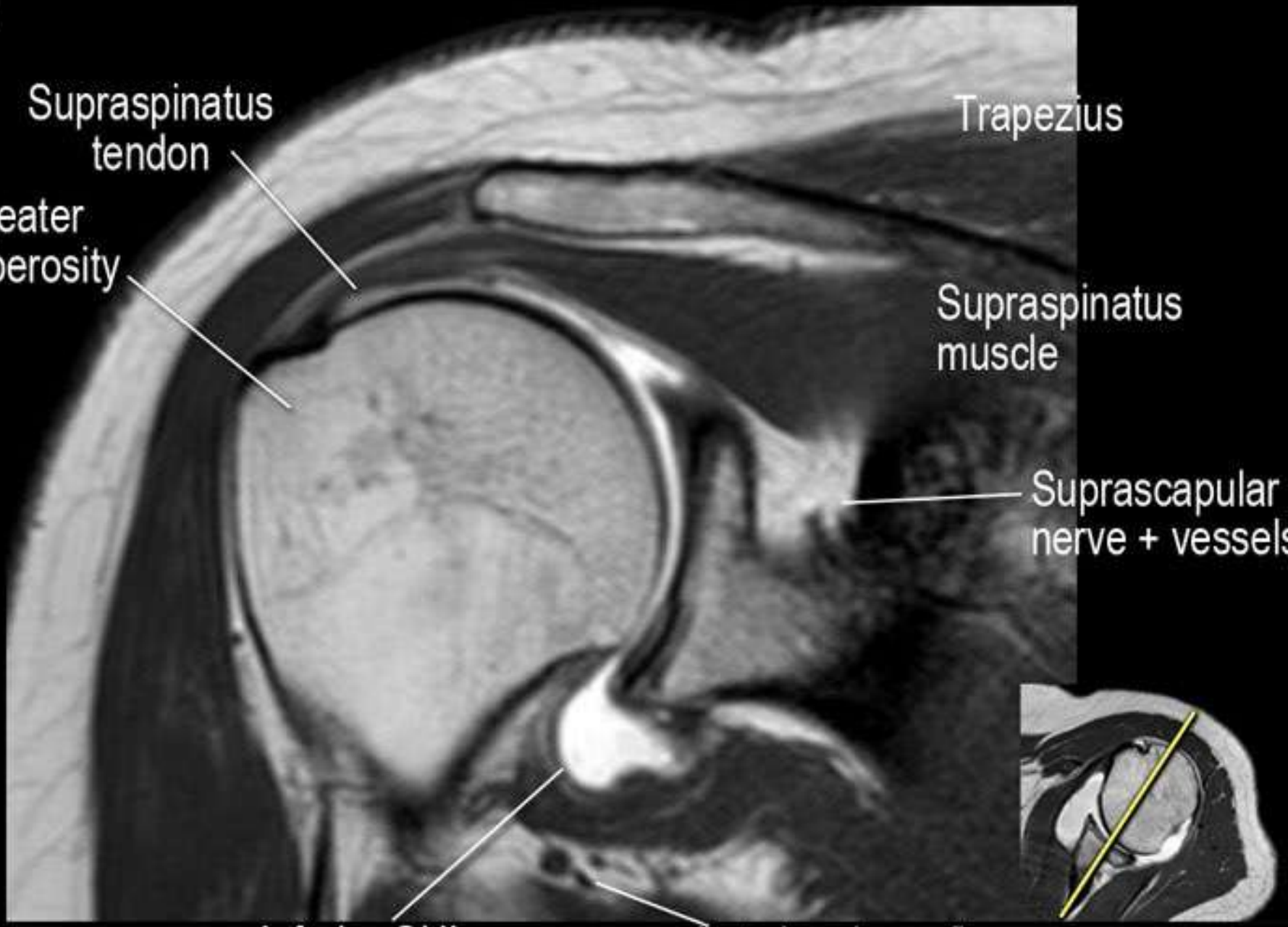
- are best assessed on the axial and sagittal sequences.

MR Anatomy

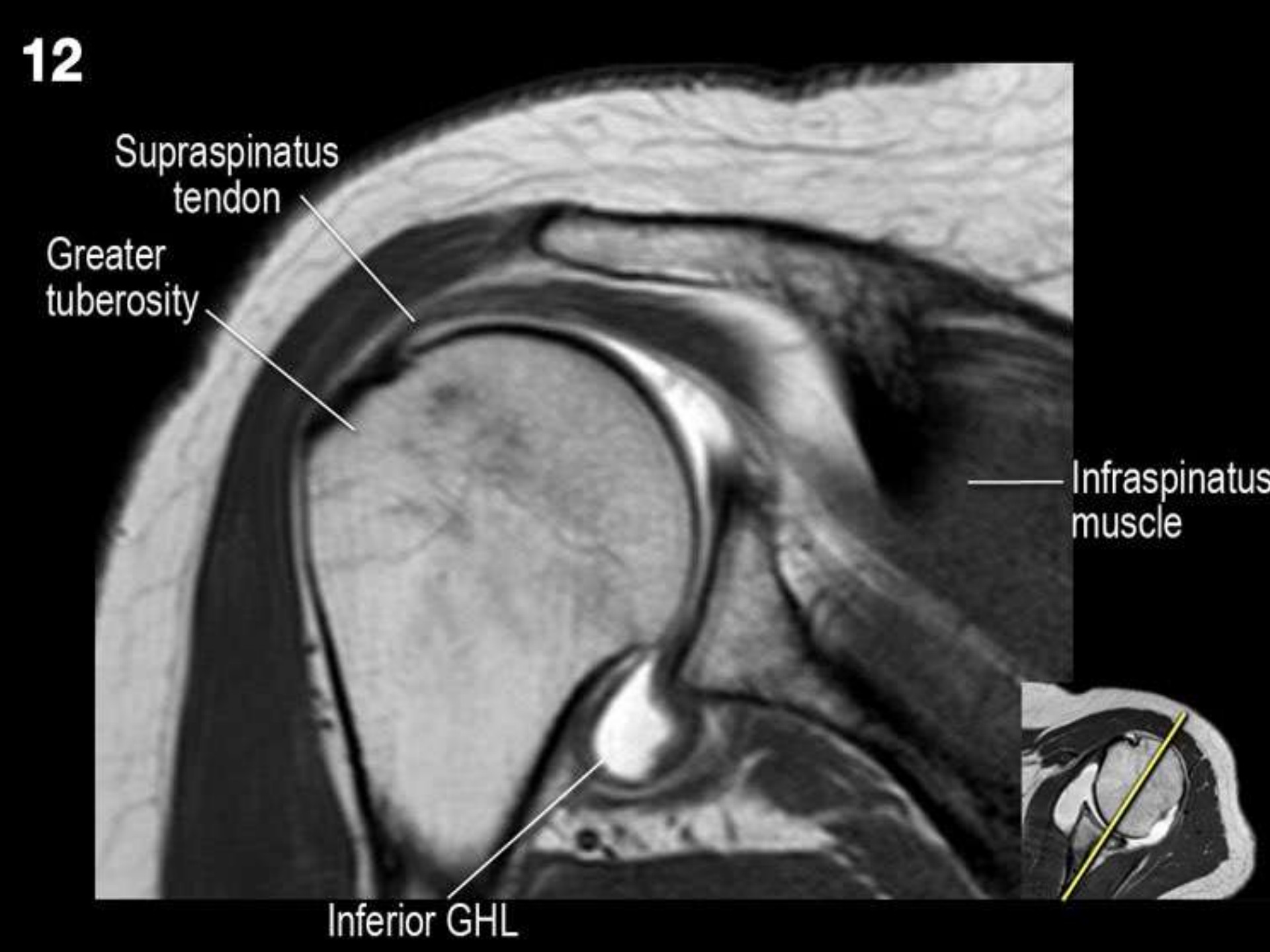

Superior GHL
Biceps tendon
Supraspinatus tendon
Coracoid
Deltoid muscle
Infraspinatus tendon
Supraspinatus muscle
Spine of scapula


Subscapular bursa
Subscapular tendon
Biceps tendon
Middle GHL
Infraspinatus tendon
Anterior Labrum
Subscapular muscle
Infraspinatus muscle
Posterior labrum

10


Supraspinatus tendon
Greater tuberosity
Trapezius
Supraspinatus muscle
Suprascapular nerve + vessels
Inferior GHL
Anterior circumflex a-v

12


Supraspinatus tendon
Greater tuberosity
Infraspinatus muscle
Inferior GHL

15


Infraspinatus tendon
Hill-Sachs defect
Infraspinatus muscle
Inferior GHL
Teres minor muscle

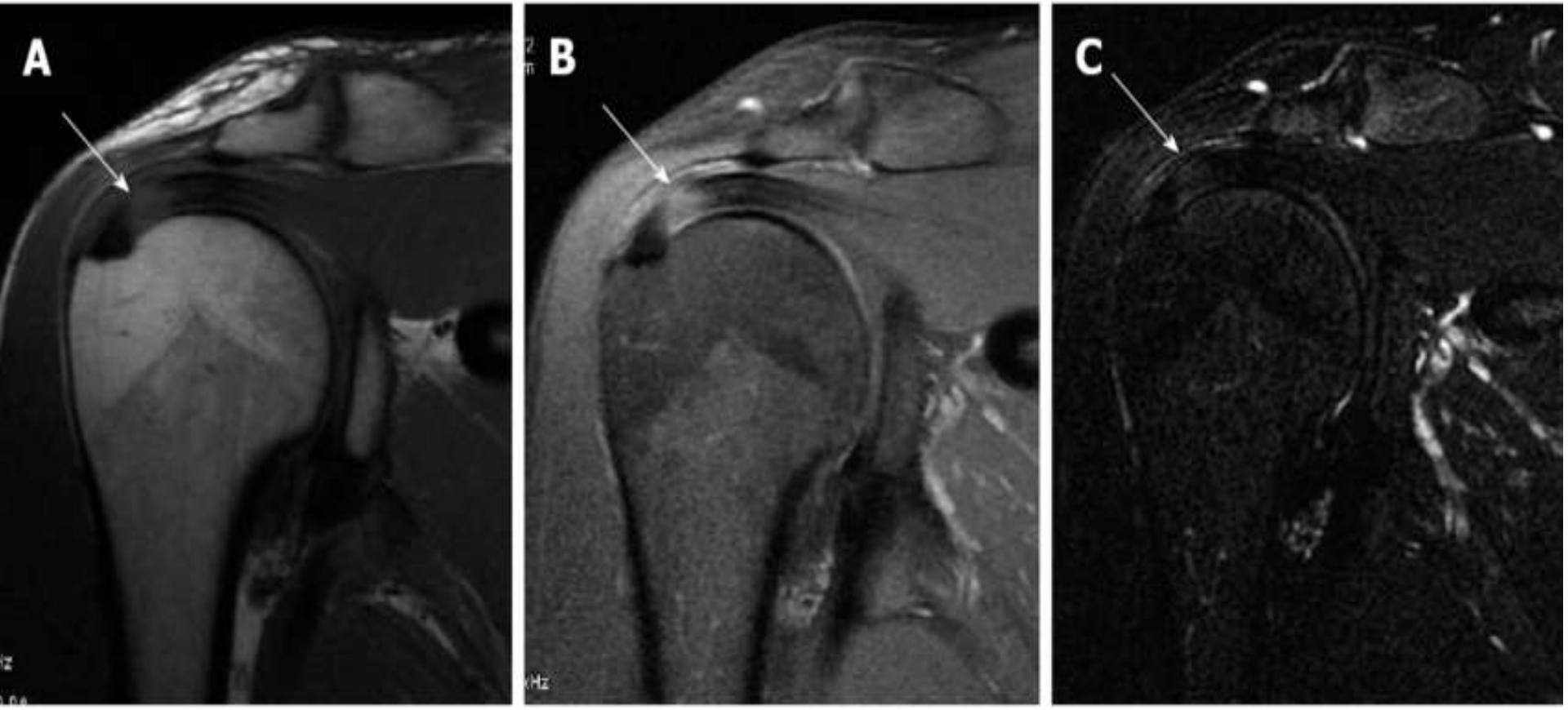
Rotator Cuff Tendinosis

- Common finding
- Refers to chronic degeneration of the tendons.
- **On MRI**, appears as

- mild to moderate **diffuse thickening of the tendon** and diffuse intermediate signal intensity within the substance of the tendon on T1- and T2WIs.

Rotator Cuff Tendinosis

- **It is important to differentiate tendinosis from low-grade partial tears.**
- The T2 signal intensity in RTC tendinosis should not reach the intensity of fluid signal, while tendon tears should demonstrate fluid signal intensity This is best seen on a T2-weighted fat-suppressed sequence.


A
B
C

Rotator Cuff Tendinosis

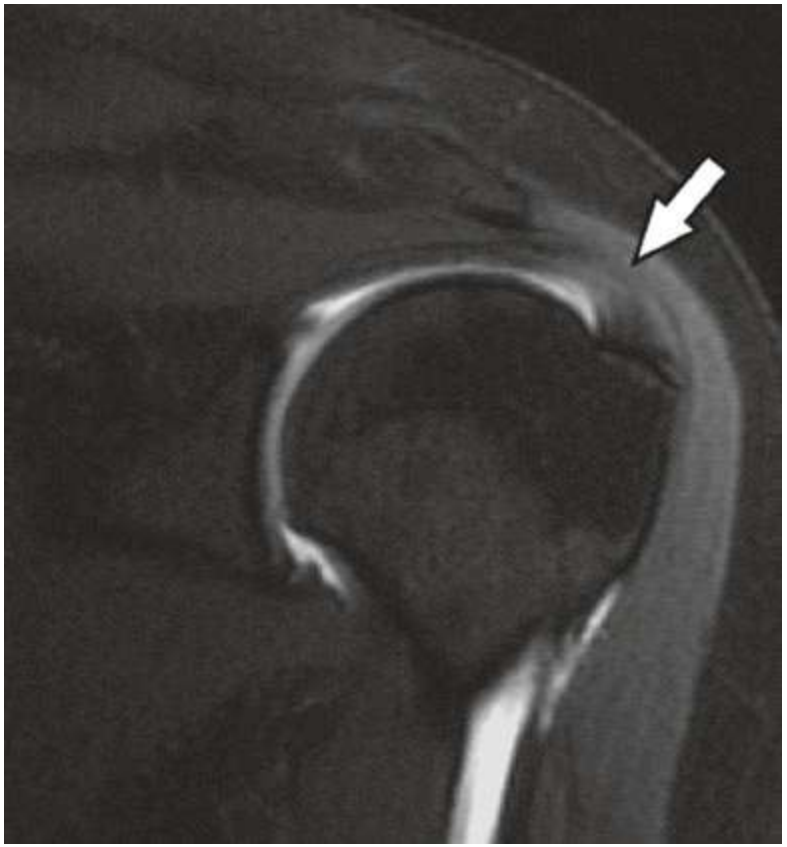
- Tendinosis is often associated with **fluid in the subacromial/subdeltoid bursa** indicating bursitis.
- The terms:
  - Tendinosis,
  - Tendinitis, and
  - Tendinopathy.

Tendinosis is tendon degeneration due to chronic overuse, whereas tendinitis indicates inflammation of the tendon with an inflammatory response, often due to microtears or arthropathies.

Rotator Cuff Tendinosis

- **Tendinopathy** is the broader term that includes both tendinosis and tendinitis.
- Most patients with RTC tendinosis respond well to physiotherapy, NSAI, and heat/ice therapy. Infrequently, surgery may be required.

Coronal T2 fat saturated



Coronal T1 fat saturated arthrogram

^^ signal in the SS tendon just proximal to its footprint (arrowhead).

- The signal intensity is not as bright as fluid, thus excluding a focal tear.

- **On the T1-weighted post-arthrogram images, no contrast extending into the tendon substance (arrow) to indicate an articular surface tear.**
- **No fluid in the subacromial/ subdeltoid bursa**

Rotator Cuff Tears

- **Full thickness:**

  Communication between joint space and SA bursa

- **Partial thickness**:

- ❑ Partial undersurface
- ❑ Partial Bursal surface
- ❑ Intra substance
- ❑ “Rim rent”

Rotator Cuff – Full-Thickness Tear

- RCTs are **extremely common** and are the result of degeneration, often beginning as tendinosis.
- A full-thickness RCT involves the entire (thickness) of the tendon from superior to inferior with communication between the glenohumeral joint and the subacromial-subdeltoid bursa.

Rotator Cuff – Full-Thickness Tear

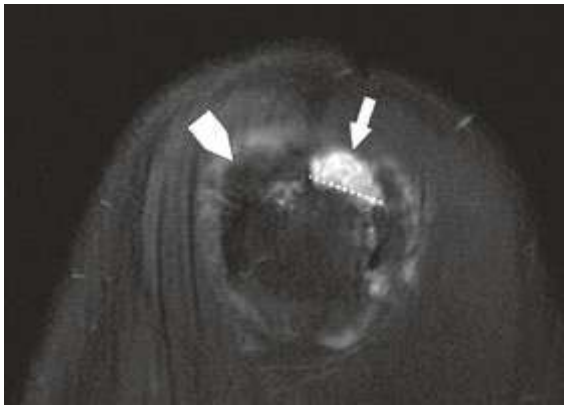
- These tears are most commonly seen at the most anterior fibers of the supraspinatus tendon and can either extend posteriorly to involve the infraspinatus tendon or extend anteriorly to involve the superior fibers of the subscapularis tendon.

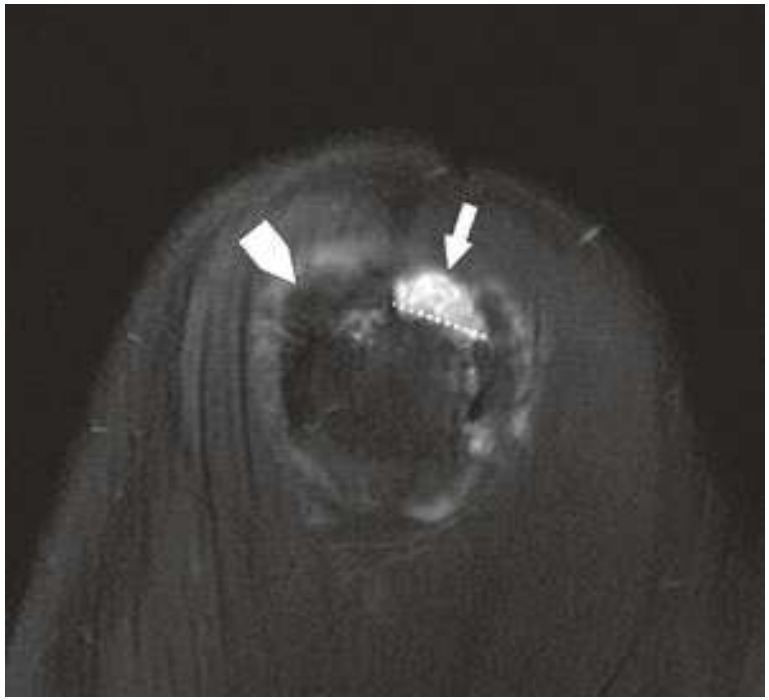
Rotator Cuff – Full-Thickness Tear

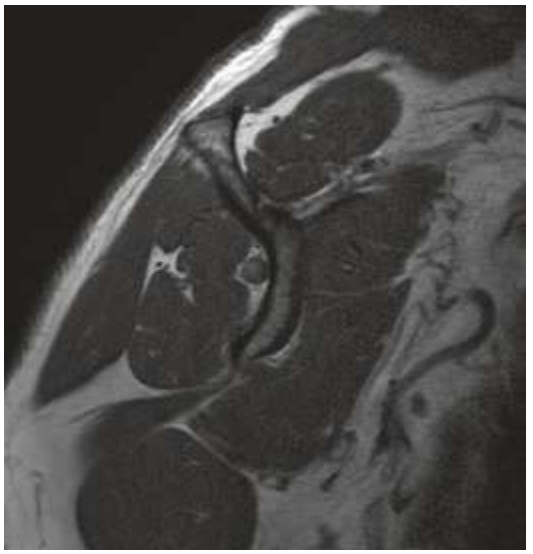
- A **“complete” tear** is defined as a full thickness tear that involves the *entire width* of the tendon in the anterior to posterior dimension.
- These types of tears are usually associated with retraction of the torn tendon fibers medially.

Rotator Cuff – Full-Thickness Tear

- Tears of the supraspinatus and infra spinatus tendons are best evaluated on the coronal and sagittal oblique sequences.
- The size of the tear should be reported in the anterior to posterior dimension, measured on the sagittal plane, and in the medial to lateral dimension measured on the coronal plane.
- The distal free edge of the tendon should also be described.
- If the free edge is frayed or has extensive tendinosis, this can have implications for surgery 'tendon free edge may have to be debrided to allow for adequate bony reattachment'. *The presence of a tendon* stump on the humerus should also be reported to aid in surgical planning







- **full-thickness tear (arrows) of the anterior fibers of the supraspinatus tendon at its humeral insertion with fluid filling the tendon defect.**
- **The tear measures 1.5 cm (dashed line) in anterior to posterior dimension.**
- **Retraction of the superior tendon fibers (notched arrow) by 1.5 cm and of the undersurface fibers (arrowhead) by 3.2 cm.**
- **No muscle atrophy on the sagittal T1-weighted images.**

Full-thickness tear of the anterior fibers of the supraspinatus tendon with 3 cm of tendon retraction.

Rotator Cuff – Full-Thickness Tear

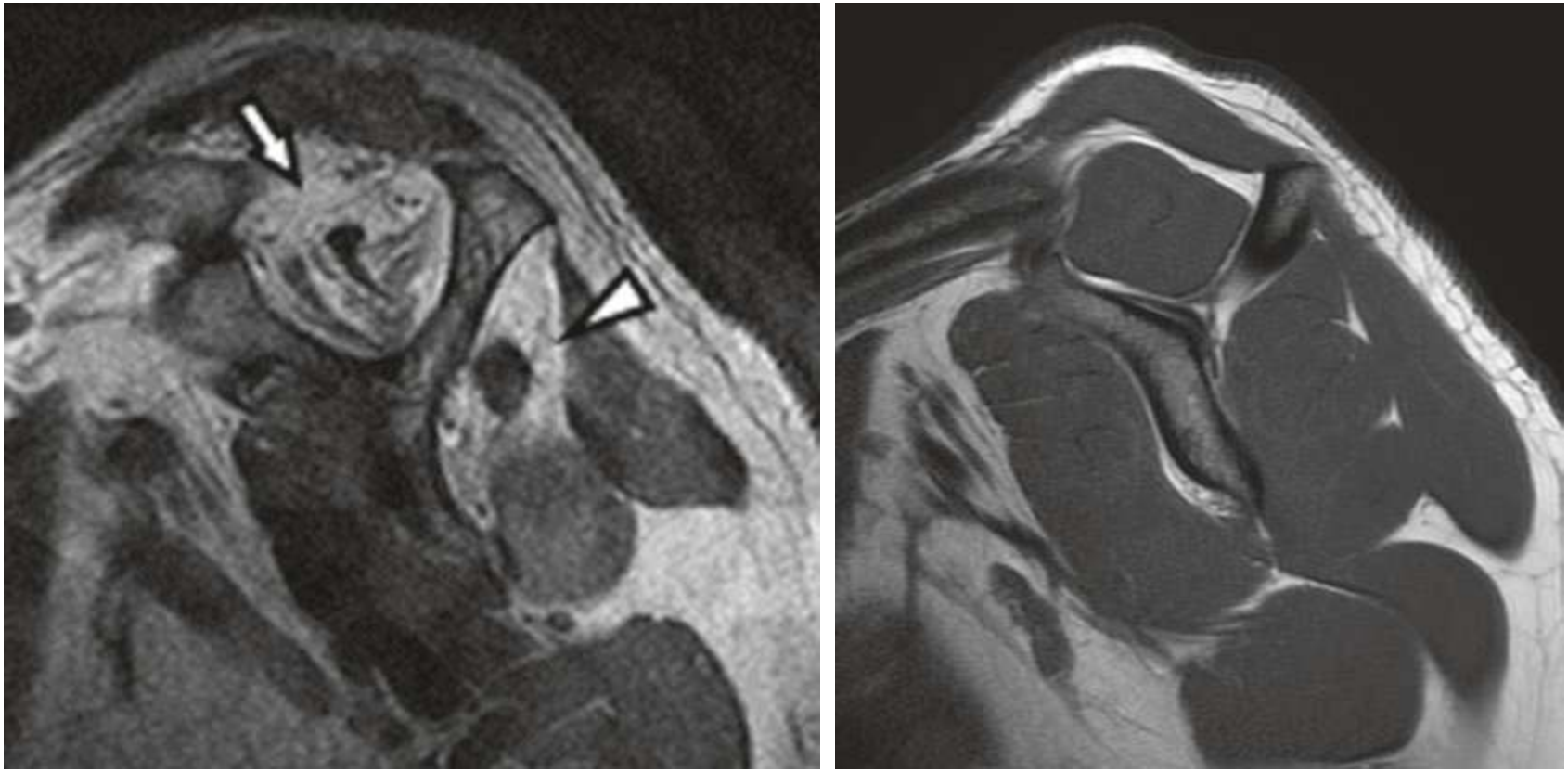
Assessment for RTC fatty muscle atrophy is important.

Fatty areas of ^^ intensity in the muscle on the T1-weighted images (best seen in the sagittal plane).

The *Goutallier classification* (although initially created for CT) is commonly used to quantify the amount of fatty atrophy of the RC muscles:

Rotator Cuff – Full-Thickness Tear

- **grade 0**, normal muscle;
- **grade 1,** some fatty streaks;
- **grade 2,** less than 50% fatty muscle atrophy;
- **grade 3**, 50% fatty muscle atrophy;
- and **grade 4,** greater than 50% fatty muscle atrophy‘ grade 3 or 4 have poor surgical outcome, and these patients often will not undergo surgical repair.



First image shows severe fatty atrophy (Goutallier grade 4) and loss of muscle bulk of the supraspinatus (arrow) and infraspinatus (arrowhead) muscles. Second image shows normal muscle bulk of the rotator cuff in a different patient

Rotator Cuff – Partial-Thickness Tear

- Twice as common as full thickness.
- Partial RTC tears can be articular, bursal, or interstitial.

❑ Intra substance - most common

❑ Bursal Surface - least common

- Increased detection:

❑ Contrast

❑ ABER

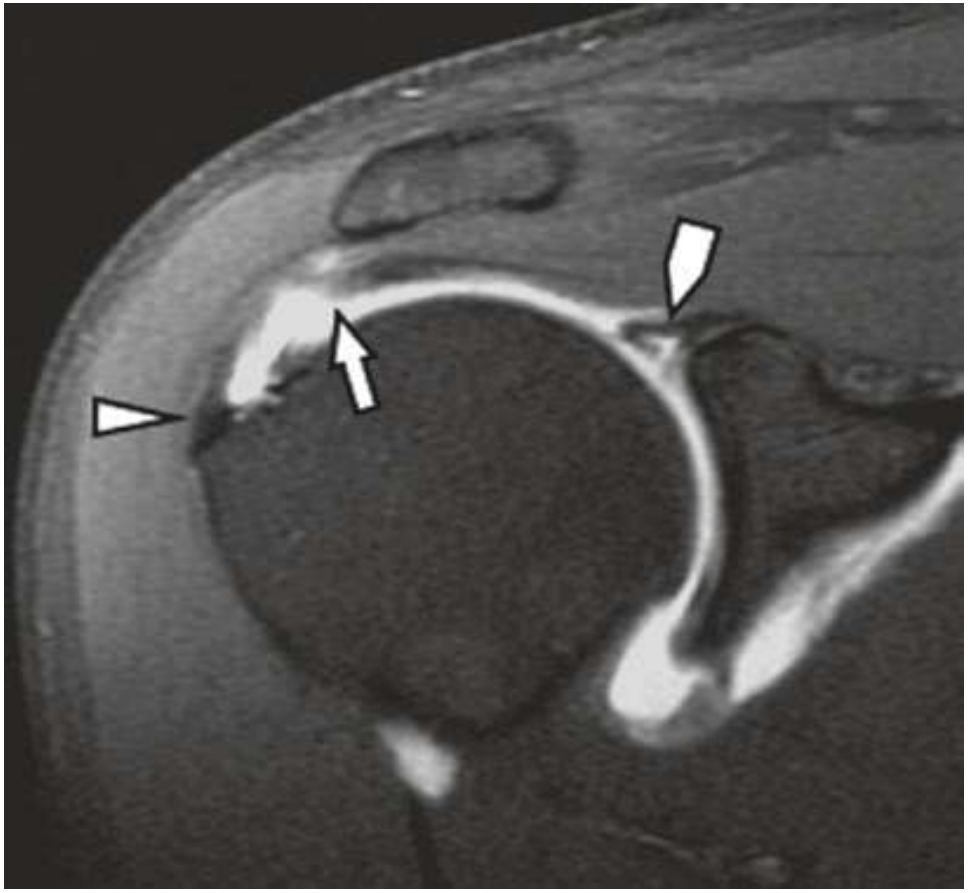
❑ significant if > 50% of tendon thickness.

Rotator Cuff – Partial-Thickness Tear

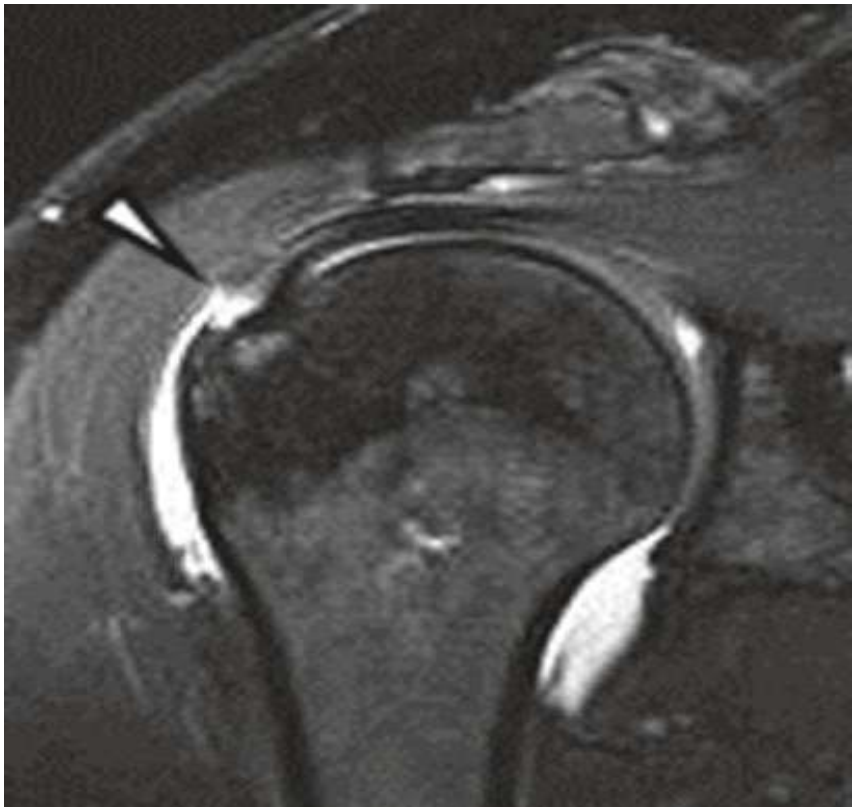
- The majority at the anterior insertional fibers of the supraspinatus tendon just posterior to the long head of biceps tendon,
- special attention to this region should be made on every MRI so as not to miss these small tears.
- Generally seen as **focal fluid signal on the T2-weighted** images extending partially through the thickness of the tendon touching either the bursal or articular fibers or remaining entirely intrasubstance (interstitial).

Rotator Cuff – Partial-Thickness Tear

- **The extent** of involvement of the tendon thickness should be reported as either being :
  - **low grade (<25**% of the tendon thickness),
  - **moderate (25–50%** of the tendon thickness), or
  - **high grade (>50%** of the tendon thickness).
- Also, the extent of the tear in the anterior to posterior dimension should be measured on the sagittal plane similar to full-thickness tears.



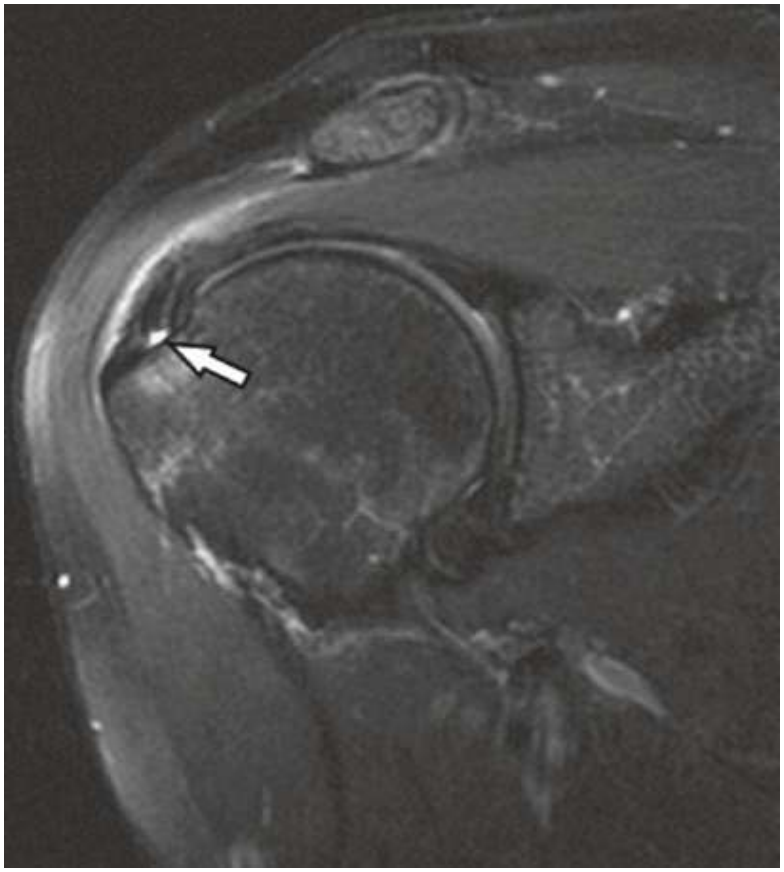
High-grade articular tear of the **supraspinatus.**
The free edge of the articular tendon fibers (arrow) is retracted by 2 cm. Few intact bursal surface fibers still attaching to the humeral head (arrowhead). There is no contrast in the subacromial/subdeltoid space to indicate a full thickness tear.



Bursal-sided tear (arrowhead) of the supraspinatus tendon with tendon defect filled with fluid from the subacromial/ subdeltoid space

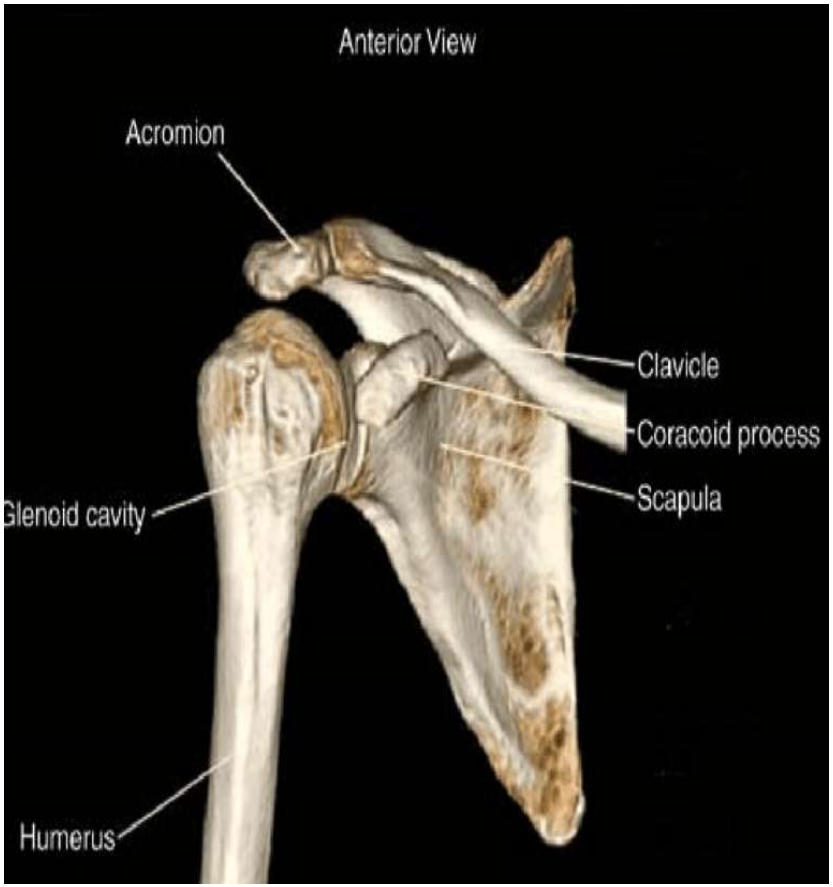
“Rim-rent tear”

- A particular type of **partial-thickness tear**
- represents an articular-sided acute avulsion usually occurring at the **insertion of the supraspinatus** tendon at the bone-tendon interface.
- *They* appear as a small focal linear discontinuity deep to the footprint of the tendon.
- Also termed a **PASTA lesion** in the orthopedic literature **(partial articular side supraspinatus tendon avulsion).**



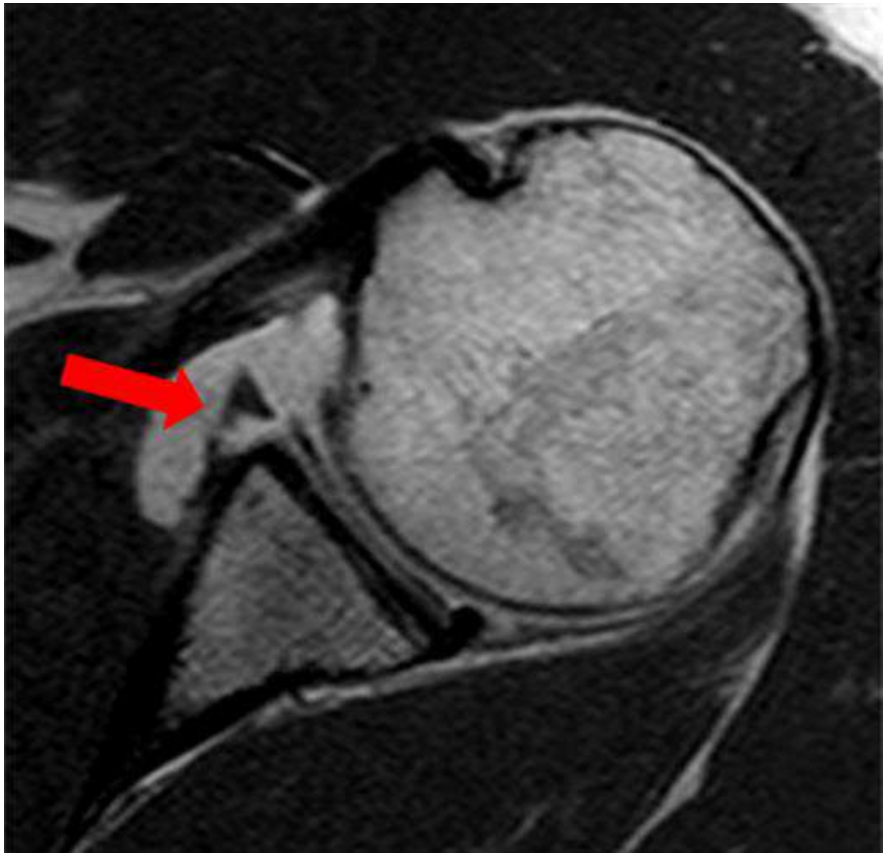
GH Instability

- **Intrinsically Unstable joint**
  - ➢ Shallow glenoid fossa
  - ➢ Large articular surface of HH.
- **Static Stabilizers**
  - ✓ Joint capsule
  - ✓ Glenohumeral Ligaments
  - ✓ Glenoid labrum
- **Dynamic Stabilizers**
  - ✓ Rotator cuff
  - ✓ Long Head of the Biceps Tend



Bankart Lesion

- An anterior dislocation can result in disruption of the labroligamentous complex in the anteroinferior quadrant of the glenoid located in the 3–6 o'clock position.
- The most common lesion that results from an anterior dislocation is the **classic Bankart lesion.**



Bankart Lesion

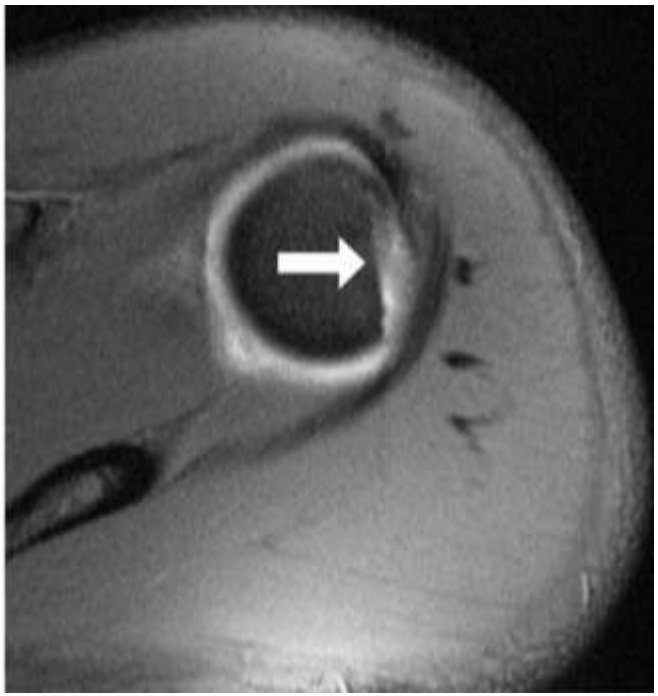
- is an **avulsion of the anteroinferior glenolabral** complex along with disruption of the associated scapular periosteum.
- Typically, the anteroinferior labrum appears triangular in shape on MRI with a sharp free margin; this is best evaluated on the axial imaging plane.
- Although the majority of large labral tears can be seen on conventional MRI, **MR arthrography** offers better sensitivity and specificity in detecting subtle labral tears and should be the modality of choice in these clinical situations.

‘Bony Bankart’

- When only the labrum is torn, this injury is termed a soft tissue Bankart lesion.
- However, when there is an anteroinferior labral tear associated with a fracture of the adjacent glenoid rim, then this is termed a bony Bankart.

Hill-Sachs deformity

- When the humeral head impacts upon the anteroinferior aspect of the glenoid, this can result in an **impaction fracture** of the posterolateral aspect termed a Hill-Sachs deformity.
- **On MRI,** it can range from **minimal chondral injury** to a **large osteochondral defect** in the posterolateral humeral head.
- It is best identified on the axial images at or just above the level of the coracoid process.

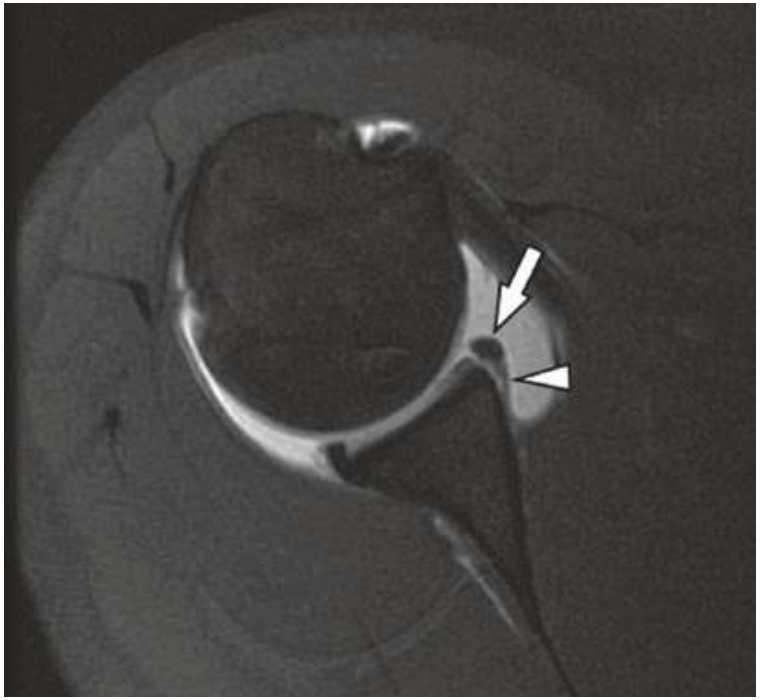


Hill-Sachs deformity

- A Hill-Sachs deformity **should not be confused** with the normal humeral groove on the posterior aspect of the humerus that is usually **seen >2 cm** from the **top of the humeral head.**
- ***The coracoid process*** *is* a reliable anatomic landmark to differentiate between the two, and if there is a defect on the humeral head while the coracoid process still visualized, then this will most likely represent a Hill-Sachs deformity.

Perthes Lesion
‘Nondisplaced Bankart’

- **Perthe’s lesion** is similar to ALPSA.
- **The anterior-inferior labrum** is avulsed, but again the scapular periosteum remains intact.
- Instead of displacing medially, the labrum may lie in its normal position

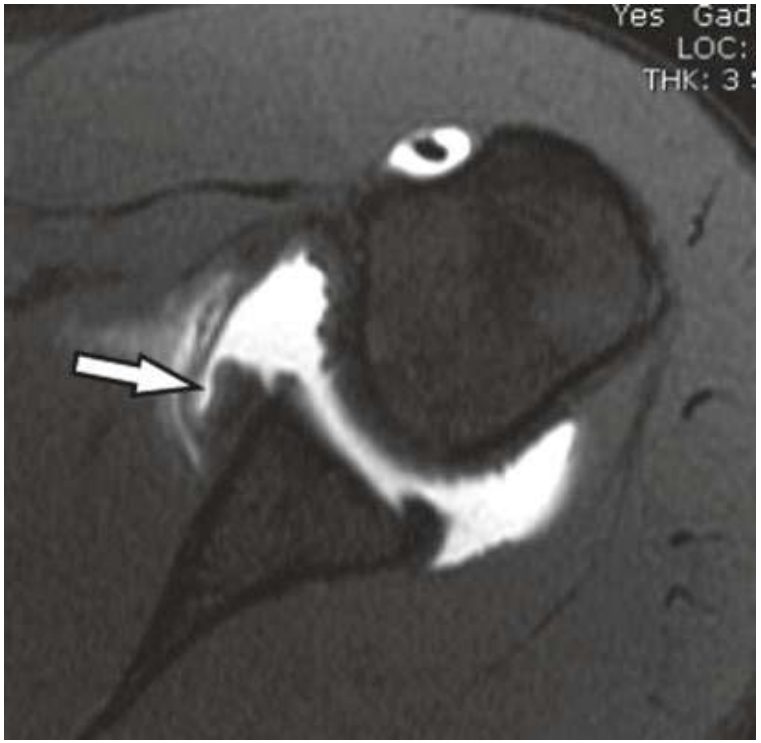


avulsed anteroinferior labrum ; intra-articular contrast undermines a medially stripped but intact scapular periosteum (arrowhead). The labrum is not significantly displaced.

ALPSA Lesion Medialized Bankart

- ALPSA Lesion '**Medialized Bankart**':

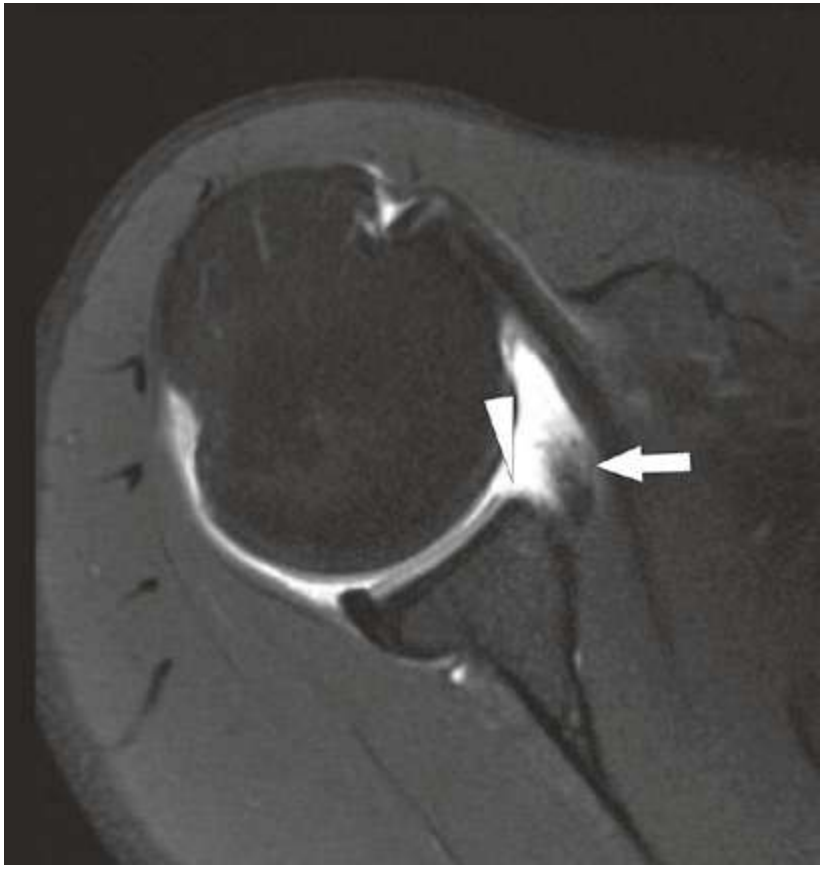
the anterior-inferior labrum is **avulsed** from the anterior glenoid margin, but the scapular periosteum remains intact

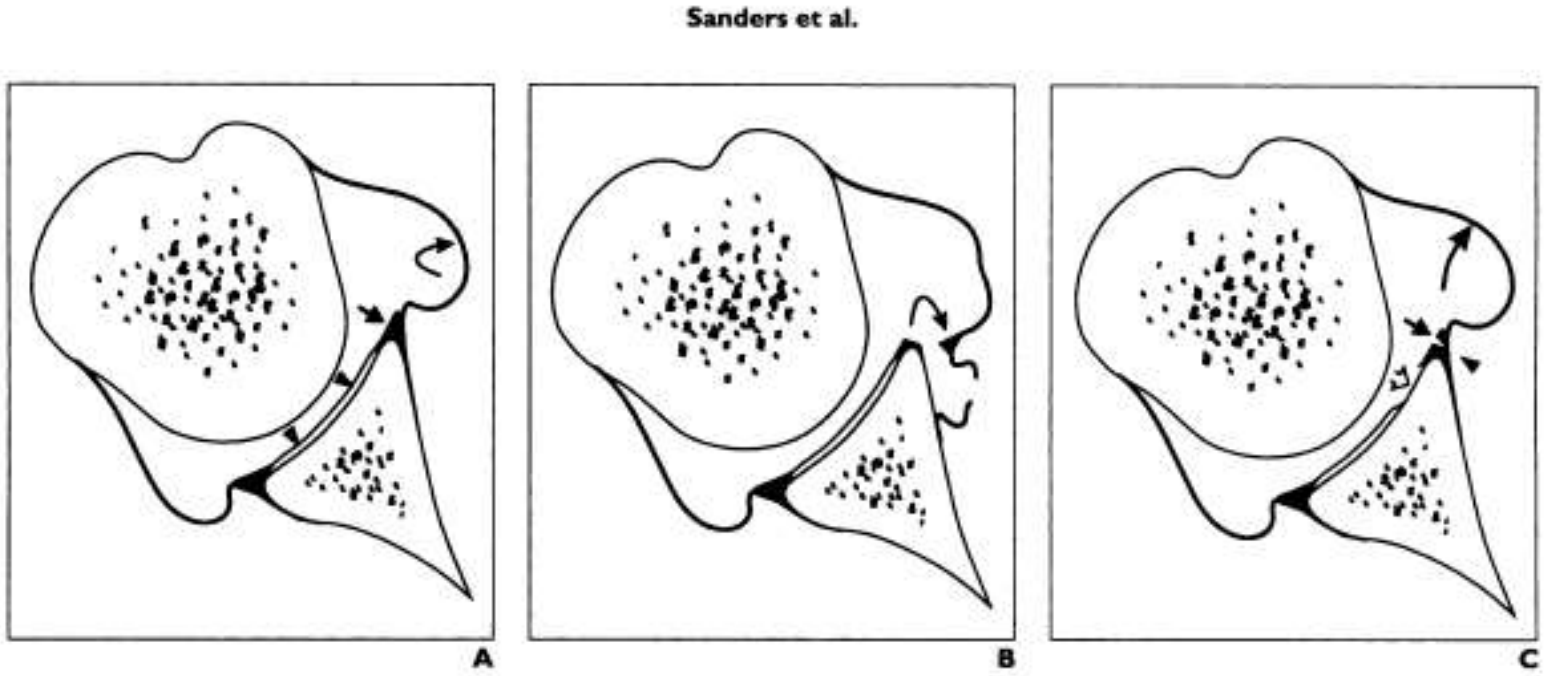


There is tearing and detachment of the anteroinferior labrum with medial displacement of the labrum (arrow) along the anterior aspect of the glenoid. The scapular periosteum remains intact.

Glenolabral articular disruption (GLAD lesion):

- The classic GLAD lesion comprises a **superficial tear to the anterior inferior labrum** with an associated articular cartilage injury
- As the anterior ligamentous complex and anterior scapular periosteum remain intact, the labrum is held firmly in place and there is no instability. As such, the GLAD lesion should be considered in cases of persistent pain with no clinical evidence of rotator cuff tears, tendinosis, impingement or instability.

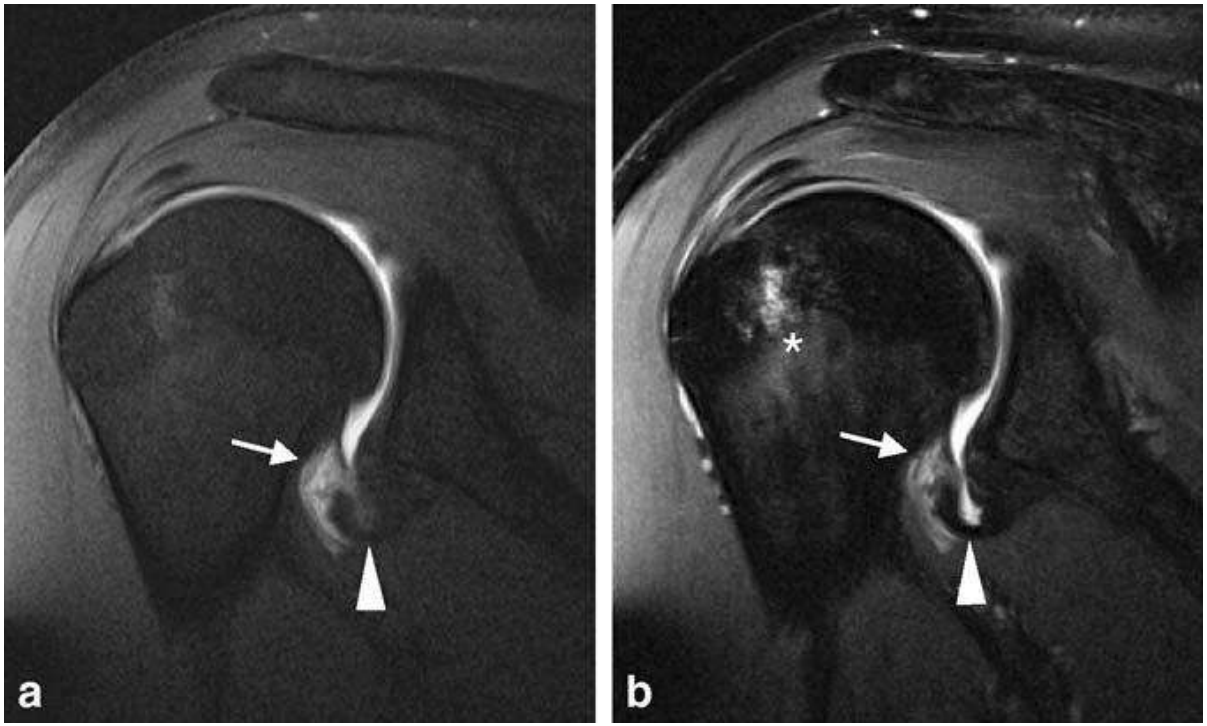




GLAD lesion

HAGL LESION

- It represents an avulsion of the IGHL, the most important anterior stabilizer of the shoulder, from the humeral attachment. On MR arthrography, a contrast medium leakage in the insertion area of the IGHL is the characteristic finding



(Quoted from Woertler&Waldt 2006).

SLAP tears

It describes a **focal tear within the superior labrum** centered at the origin of the long head of the biceps tendon that extends in an anterior to posterior dimension.

The tear can also extend into the periarticular soft tissues, including the long head of biceps tendon (LHBT), glenohumeral ligaments, and rotator interval.

Micro instability SLAP Tears

Definition:

A superior quadrant labral tear with anterior and posterior components of the tear is labeled an SLAP lesion.

Mechanism:

- ❑ Fall on outstretched arm
- ❑ Repetitive overhead activity (throwing, swimmers).

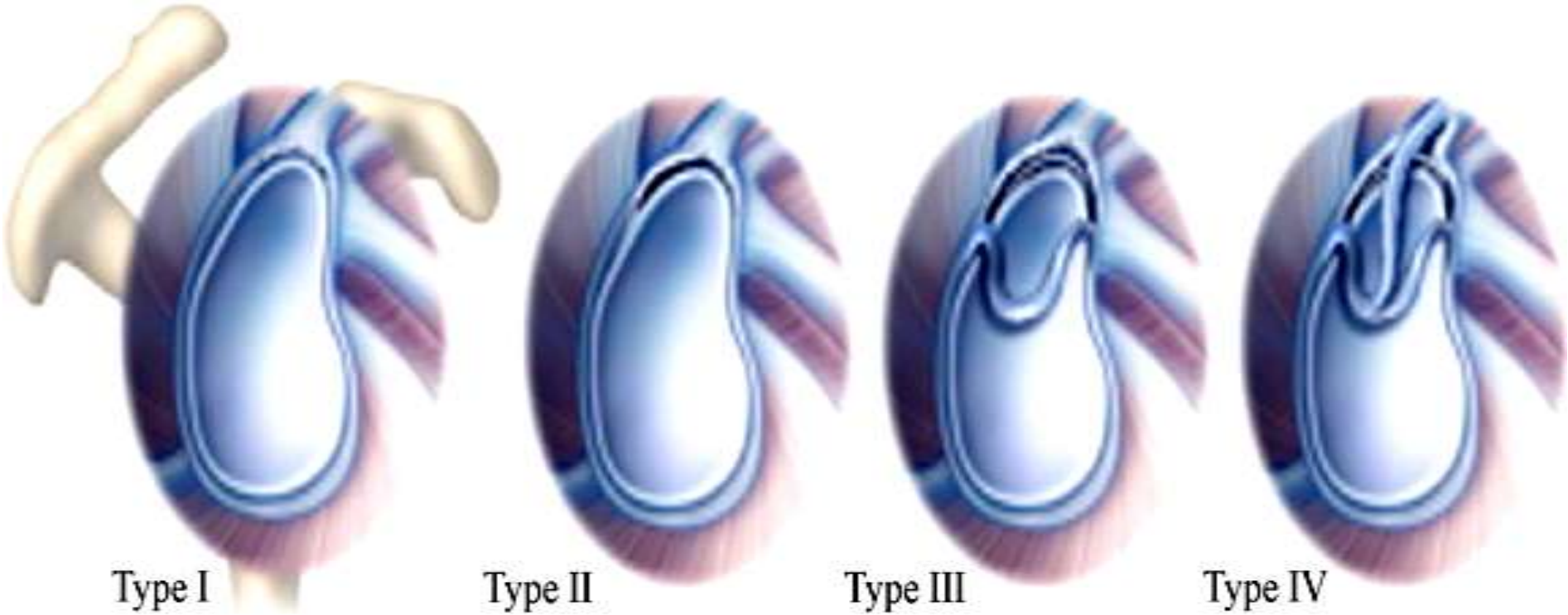
Clinical diagnosis of SLAP tears is difficult because these lesions present with nonspecific anterior shoulder pain. Symptoms pain with overhead activity, catching, popping sensation.

Classification

- Snyder and colleagues initially described four patterns of injury from arthroscopic findings:

- **Type I**: wearing and fraying of the **superior labrum** which is often asymptomatic and seen in elderly individuals
- **Type II**: separation of the biceps anchor and the superior labrum from the underlying glenoid, the most frequent type
- **Type III**: displaced bucket handle tear of the superior labrum without extension into the long head of biceps tendon
- **Type IV:** an extension of a bucket handle tear into the long head of biceps tendon

SLAP Tears



Ahsan et al., 2016.

MRI findings

- **MRI findings of SLAP lesions include:**

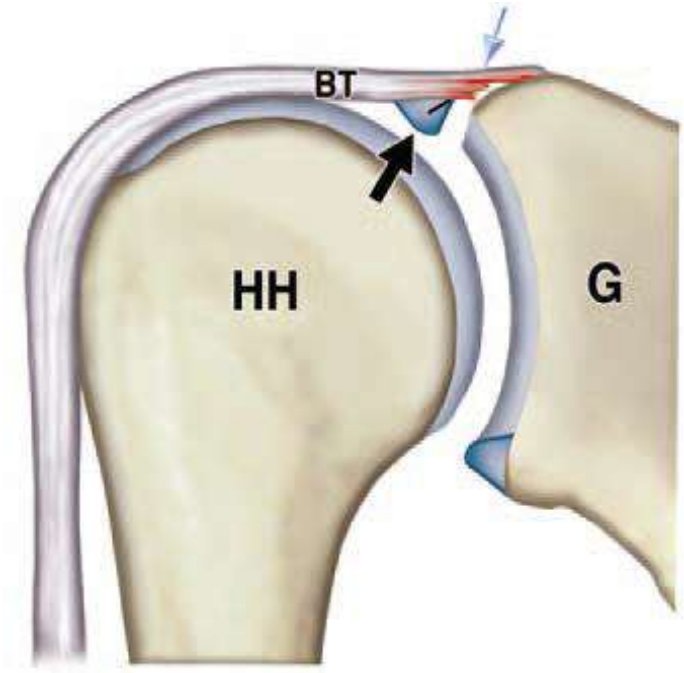
  Laterally oriented intra labral signal seen on oblique coronal images and separation of the labrum with or without extension to the biceps tendon and adjacent structures.

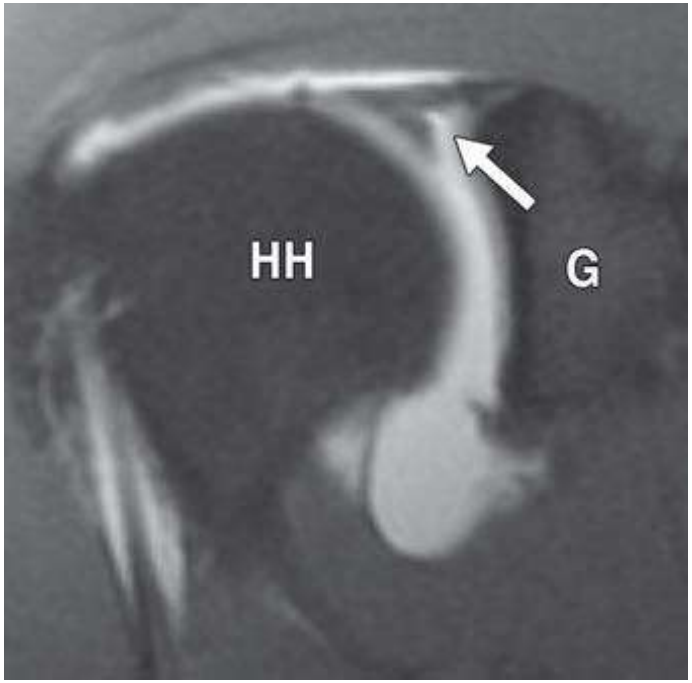
- The presence of a para labral cyst indicates a labral tear even when an abnormal labral signal is not visualized.

- *High signal extends medially and follows the contour of the glenoid cartilage*
- *Smooth margin*
- *< 3mm*
- *Located at biceps anchor*

- *High signal extending laterally*
- *Irregular margin*
- *Can be > 3mm*
- *Located at biceps anchor and posteriorly*

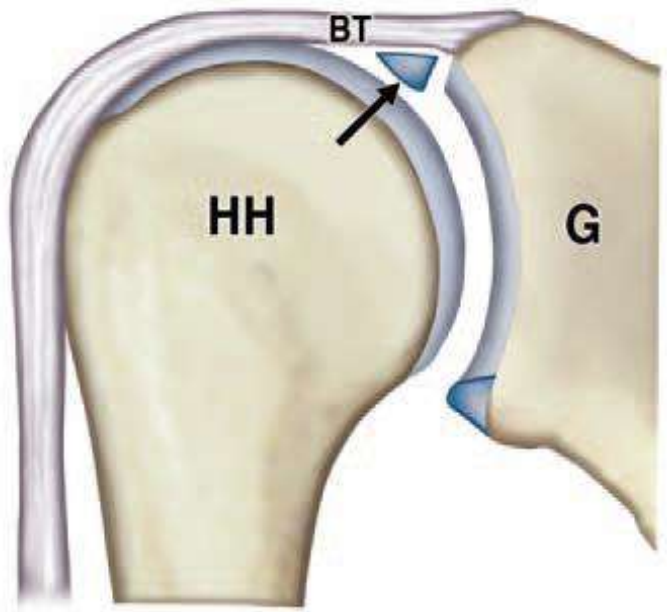
SLAP Tears

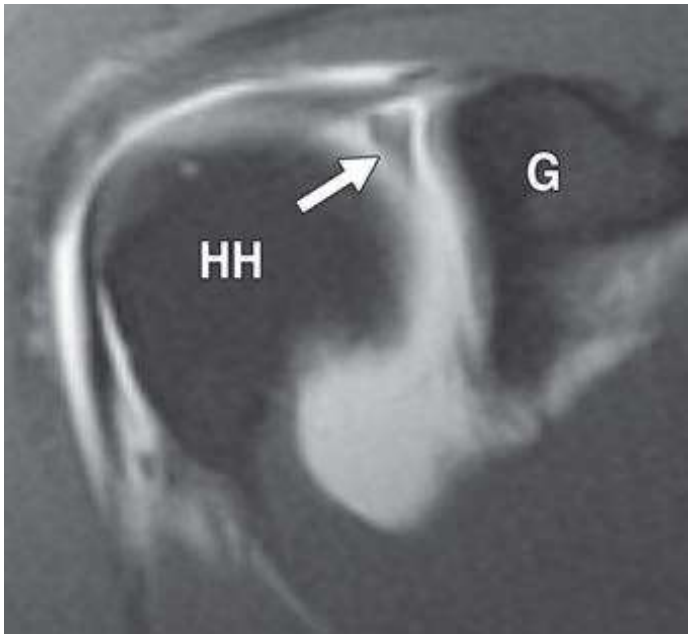




Quoted from Modarresi et al., 2011.

SLAP Tears





Quoted from Modarresi et al., 2011.

THANK YOU