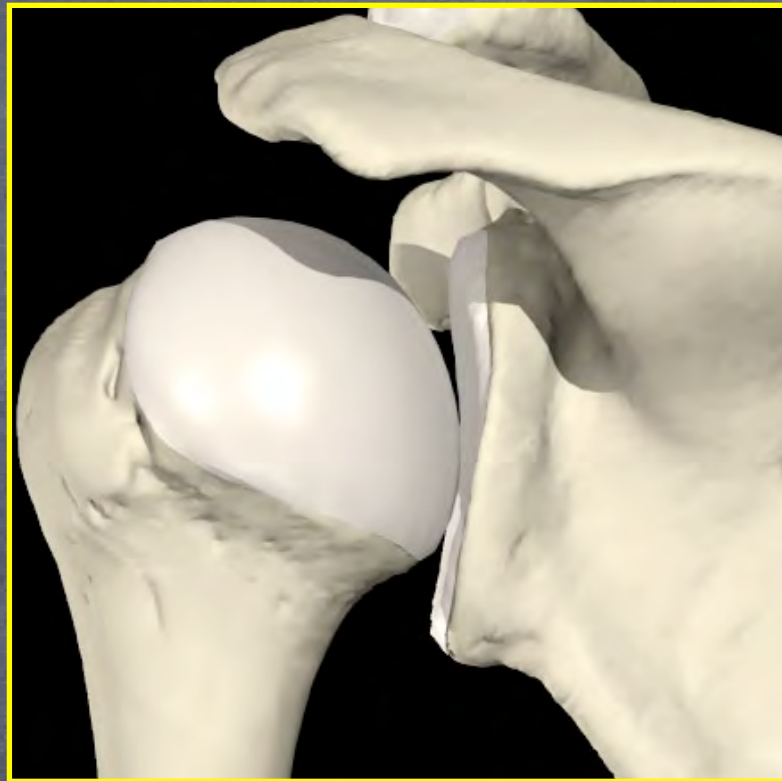


Anatomy and imaging of the shoulder in rotator cuff disease



Christian Dumontier
Hôpital saint Antoine & Institut de la Main
Paris

The shoulder

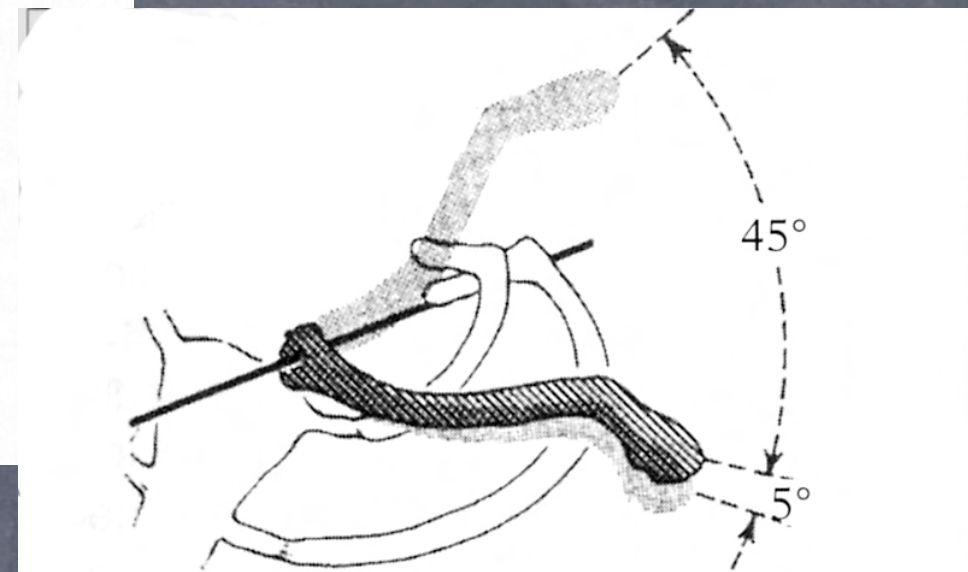
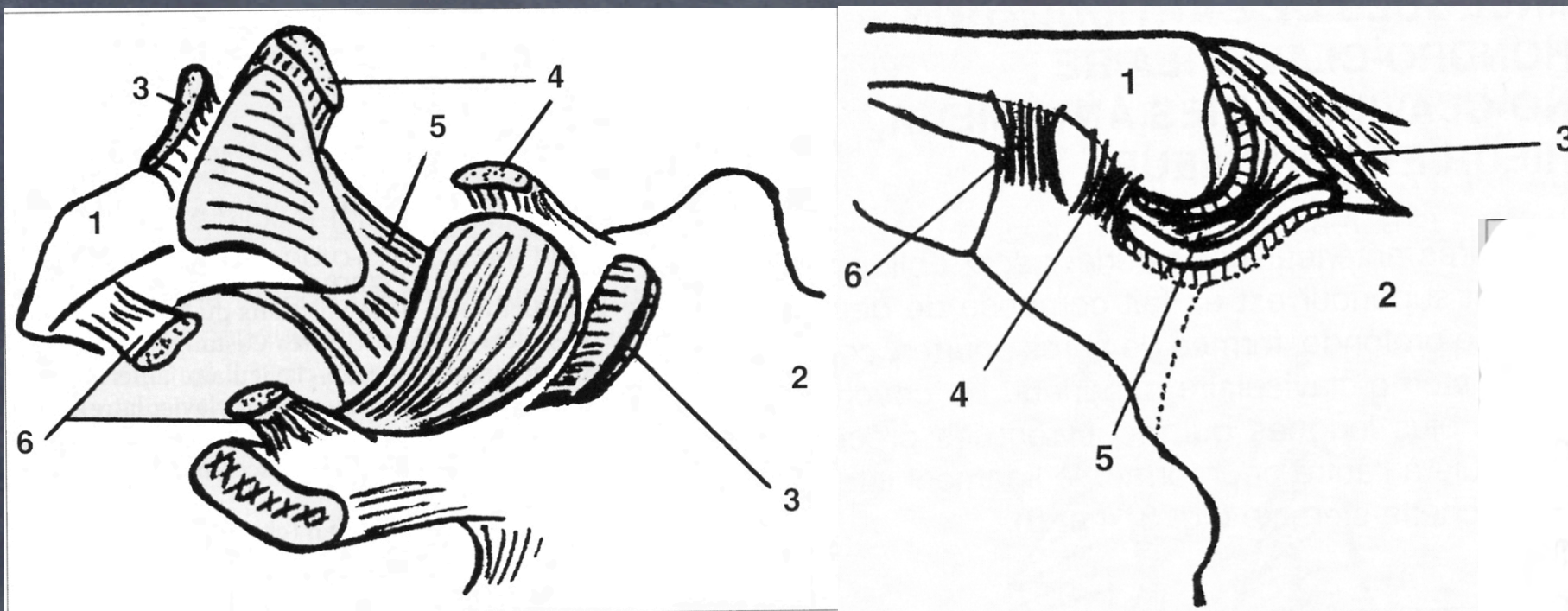
- Complex combination of multiple joints forms “the shoulder”
 - Sterno-clavicular
 - Acromio-clavicular
 - Scapulo-thoracic
 - Gleno-humeral (+ subacromial)
- Each joint has its specific motion and is mobilized by different muscles



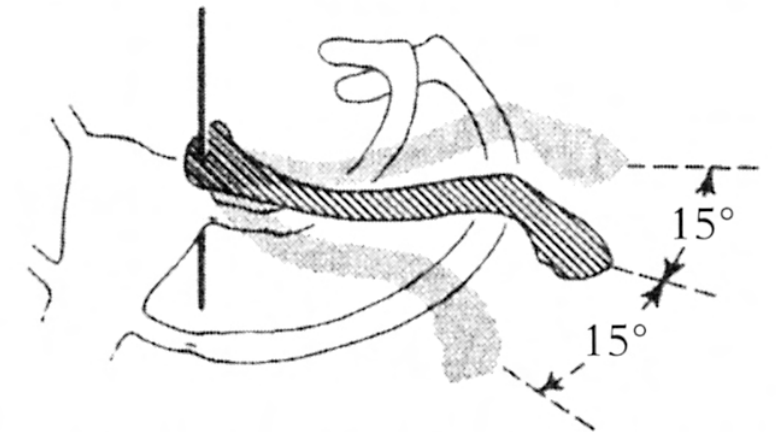
The sterno-clavicular joint



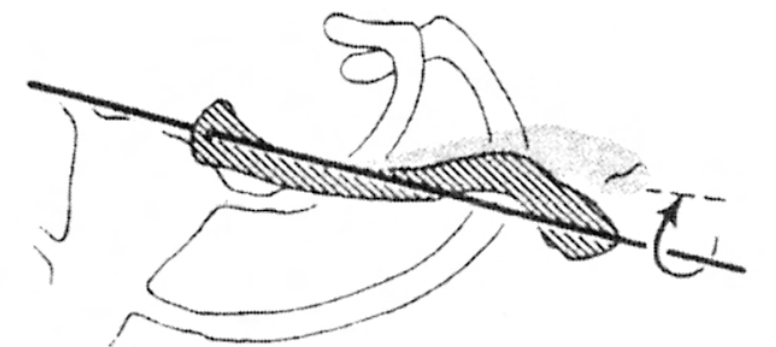
- Has a complex anatomy and physiology
- Participates (with the acromio-clavicular joint) for about 1/6 of the shoulder motion
- Has its specific pathology



ELEVATION-ABAISSEMENT



ANTEPULSION-RETROPULSION

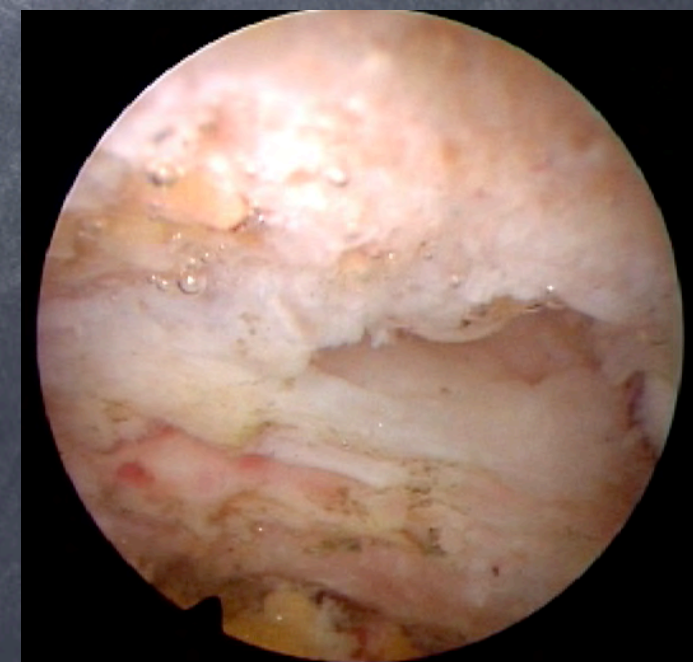


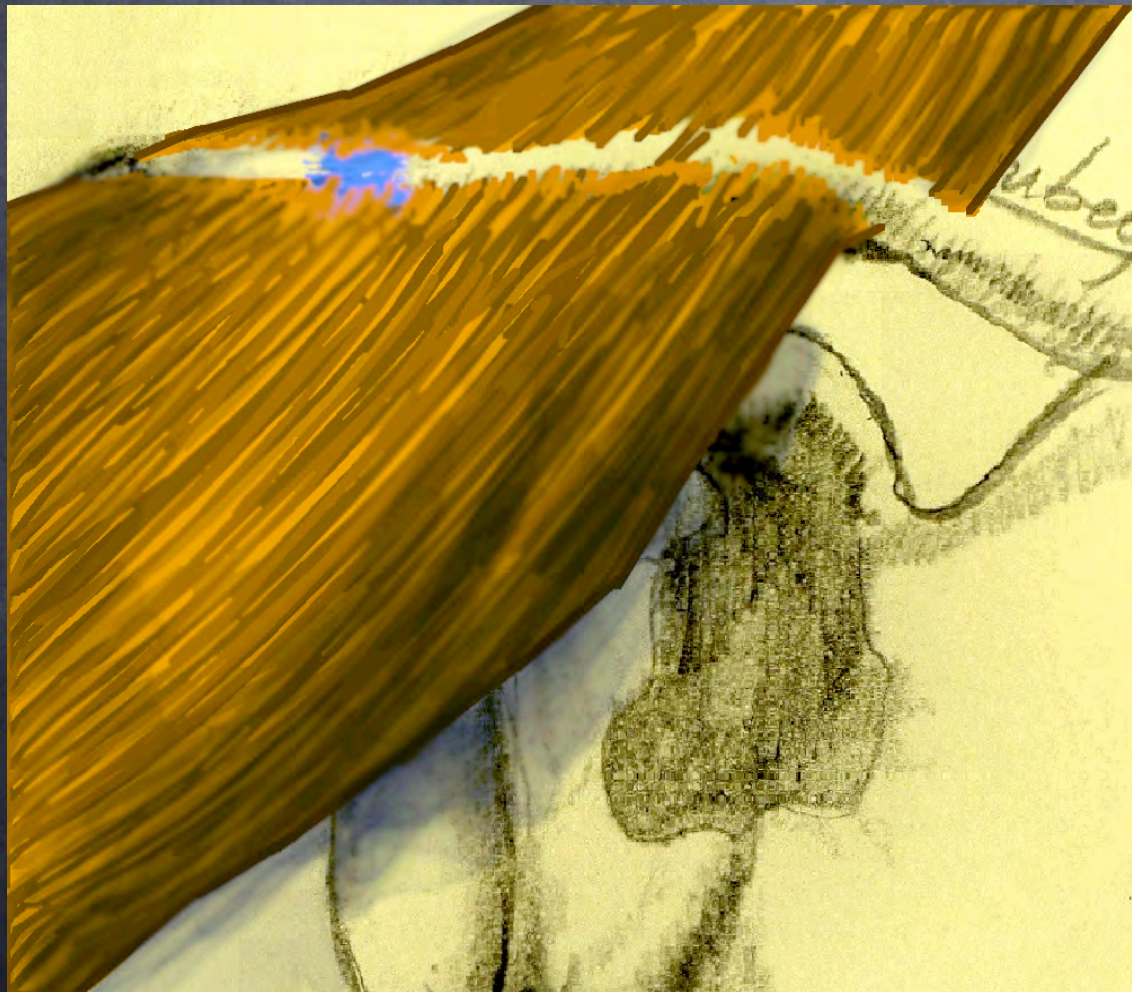
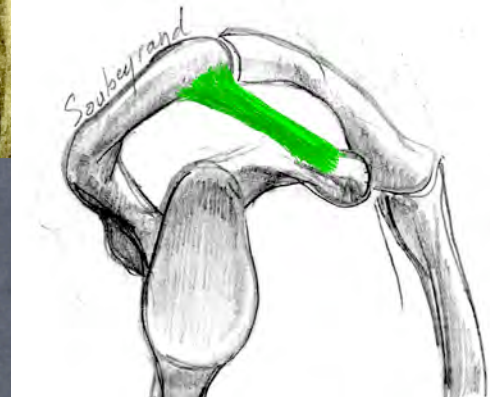
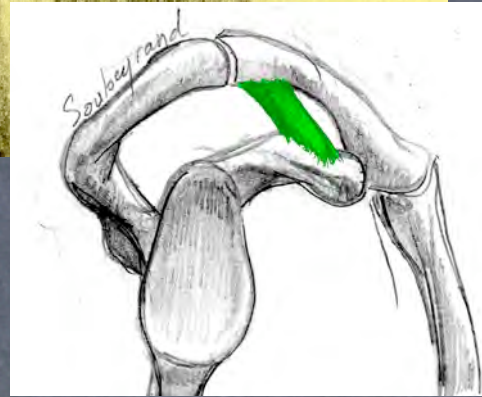
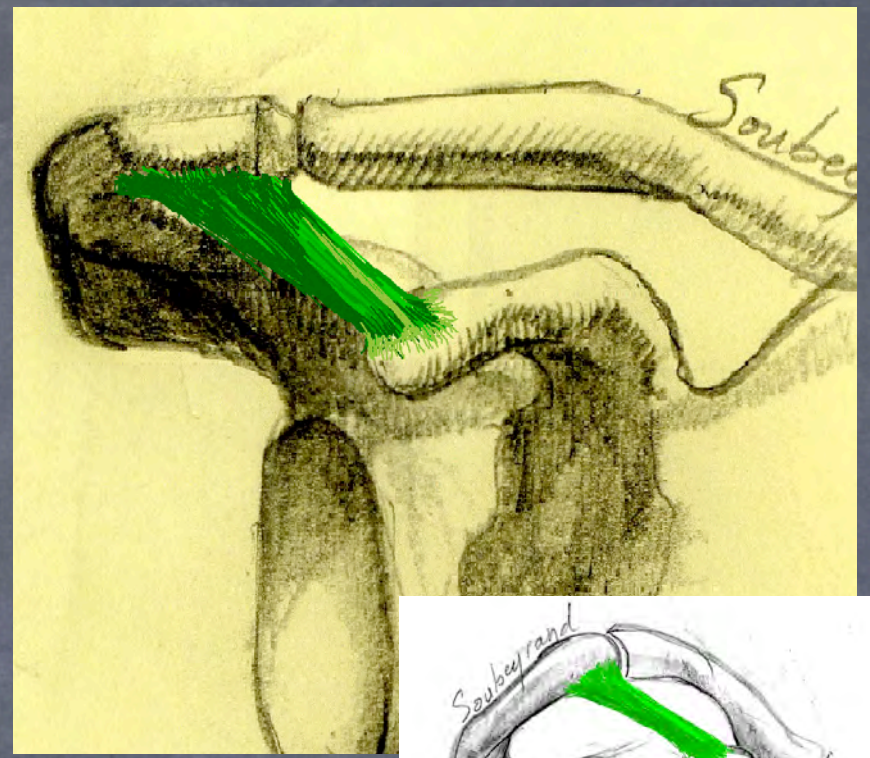
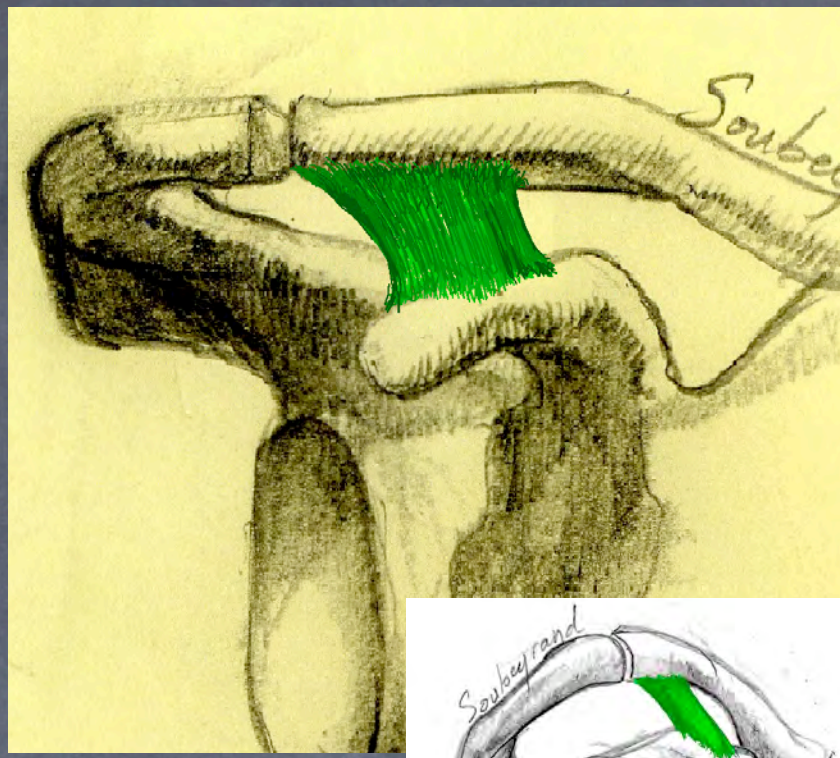
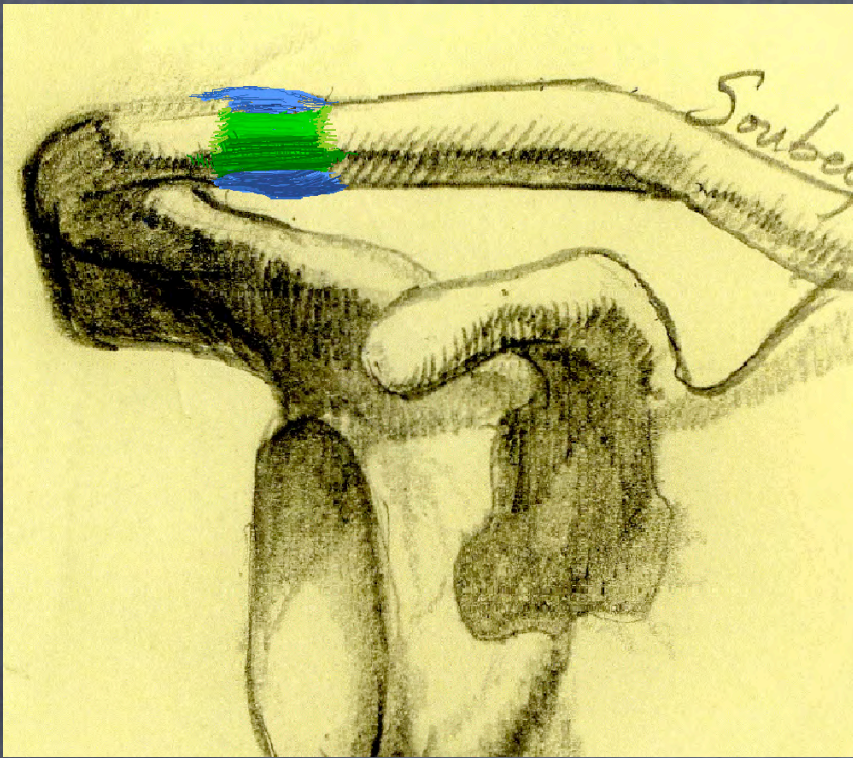
ROTATION AXIALE



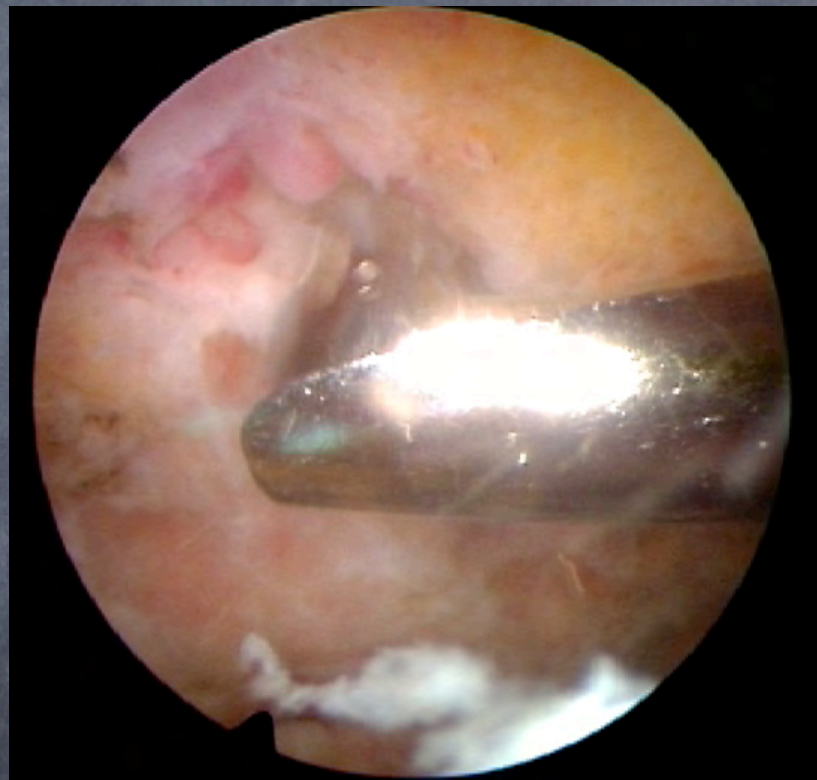
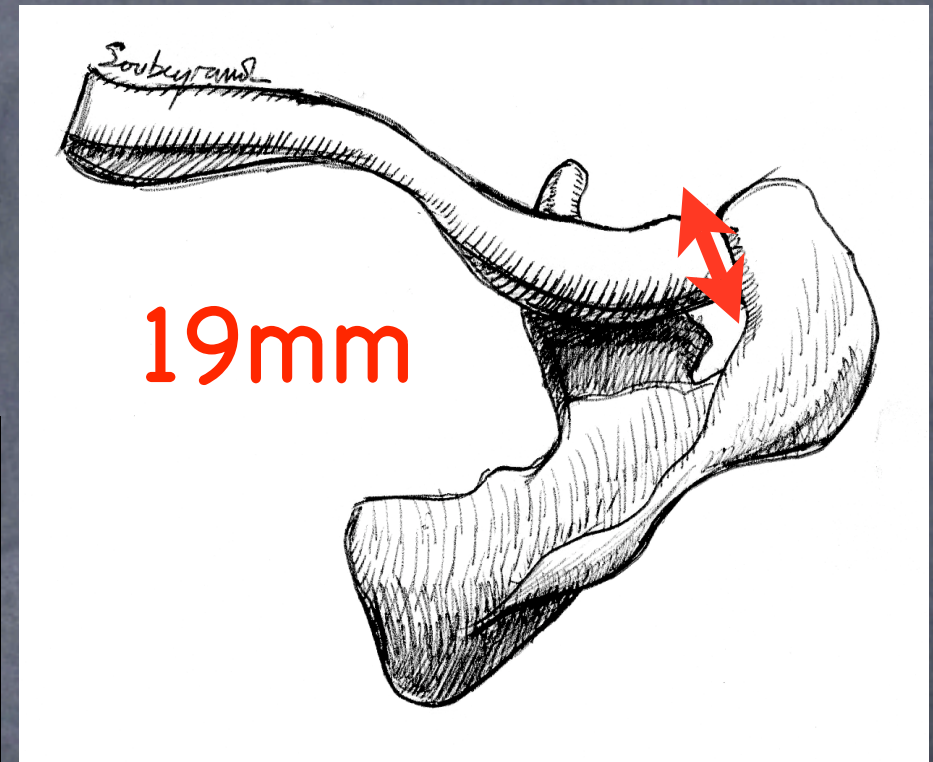
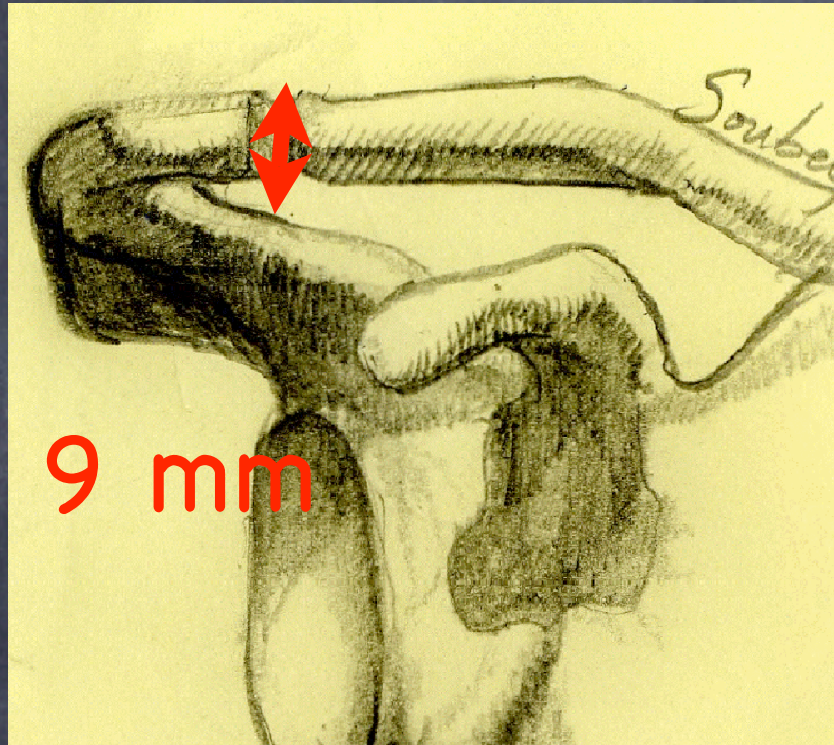
The acromio-clavicular joint

- Has also its own pathology
- May be involved in patients with rotator cuff pathology
- Degenerative AC joint may impinge onto the rotator cuff
- Degenerative AC joint may be painful during shoulder elevation



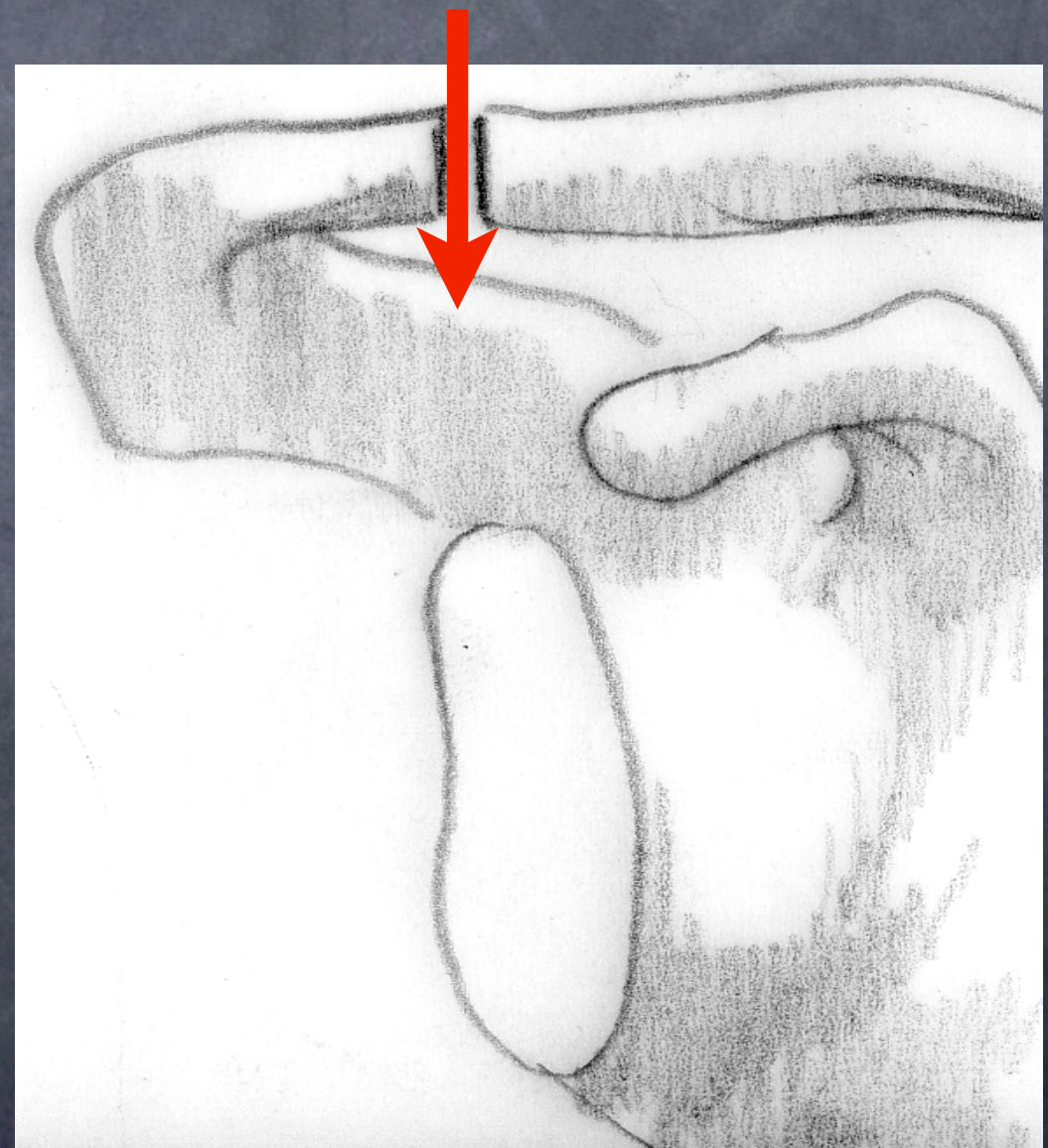
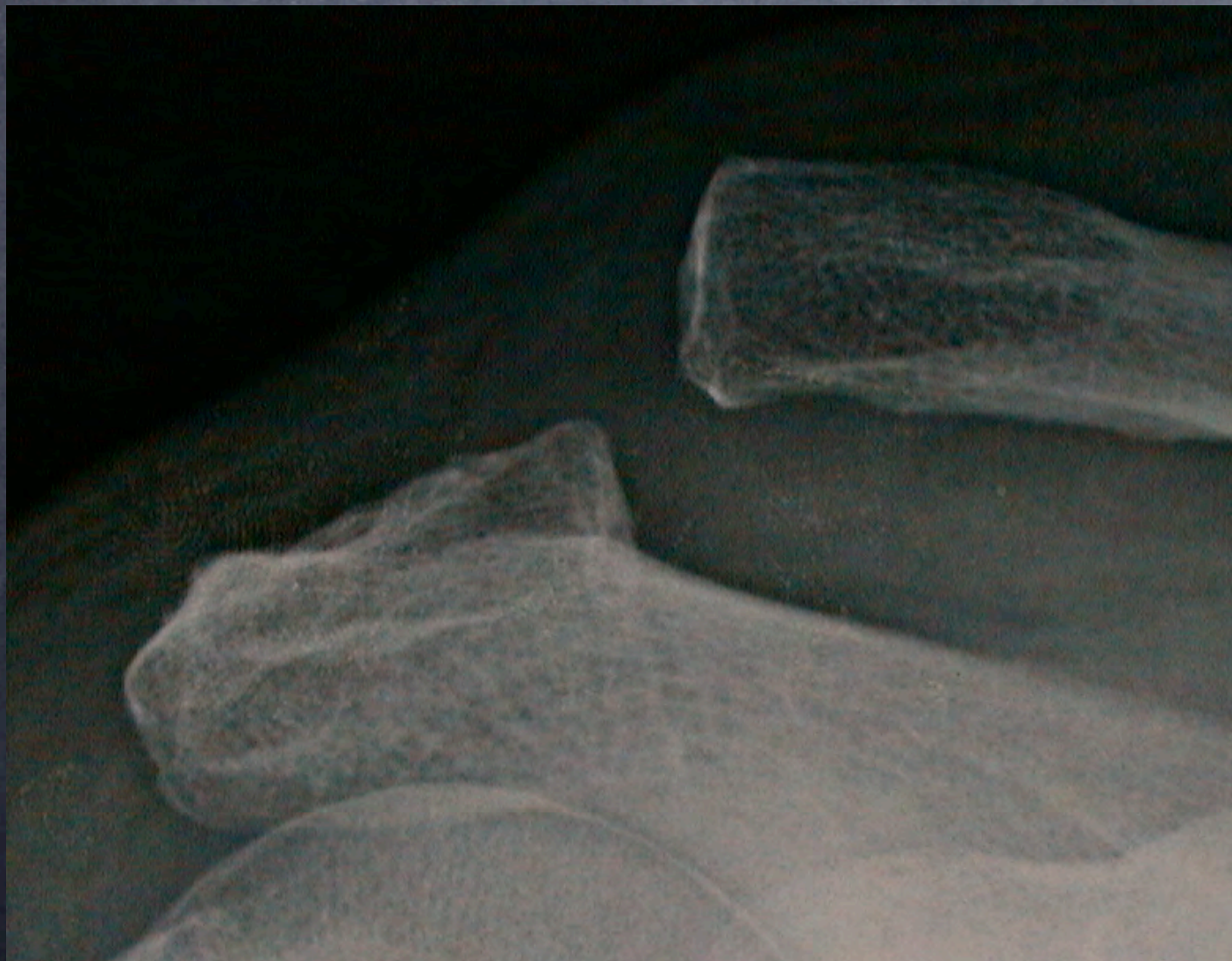


• **Mean dimensions : 9 x 19 mm (Bosworth)**

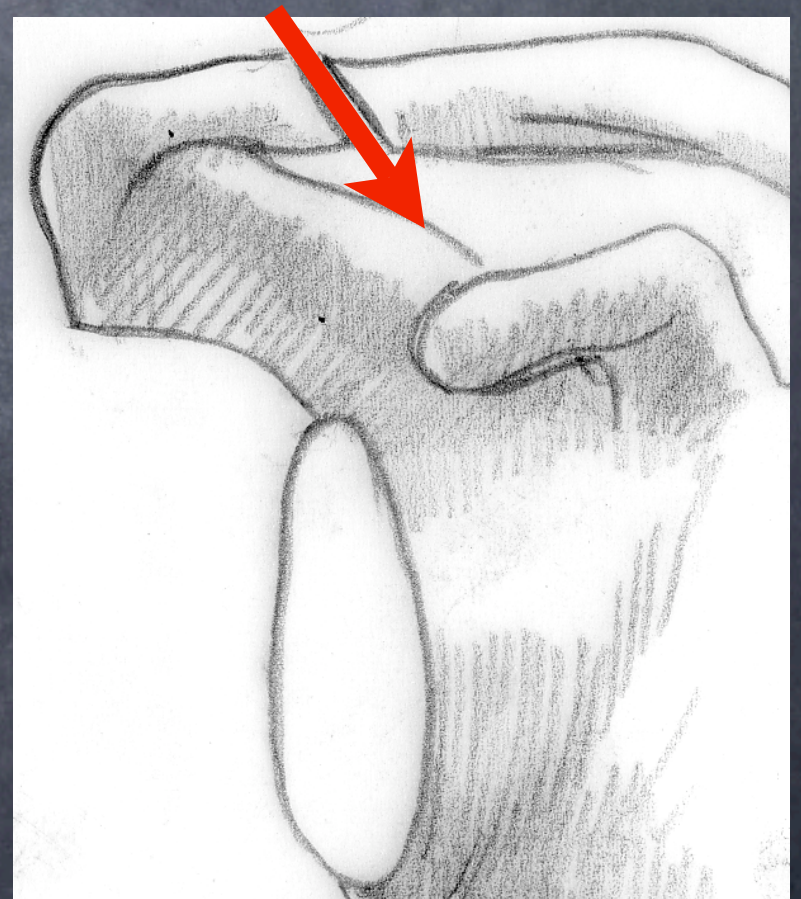
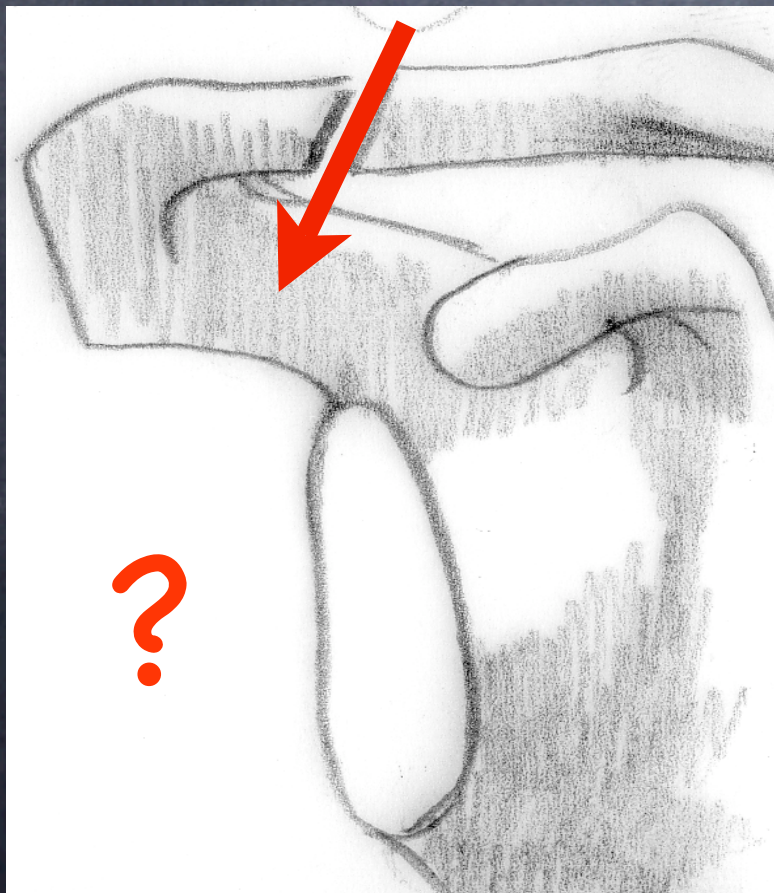
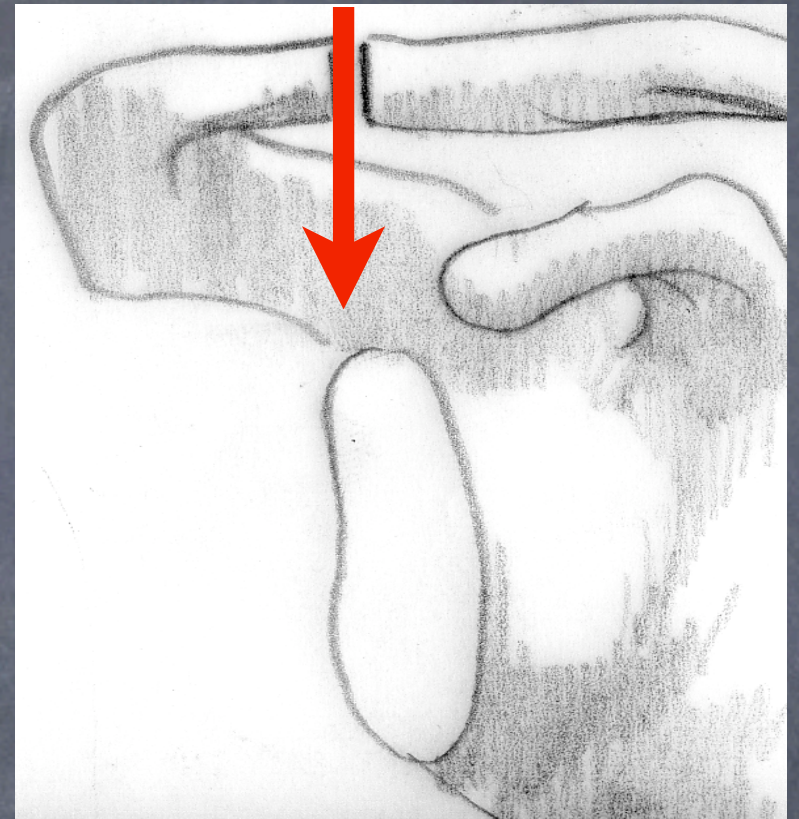


Joint orientation

- Vertical > 50% (De Palma)



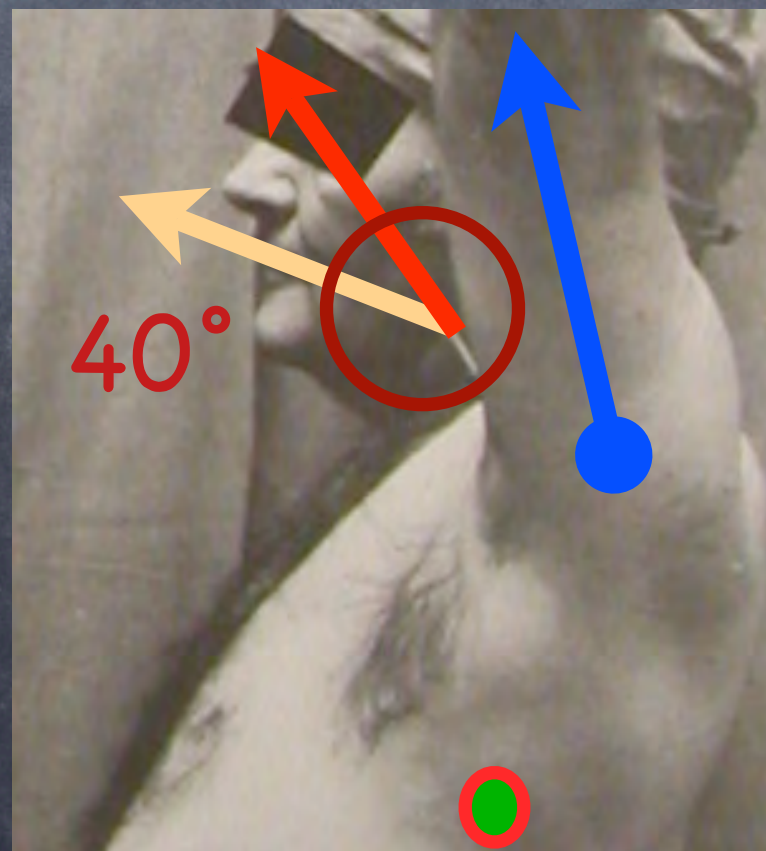
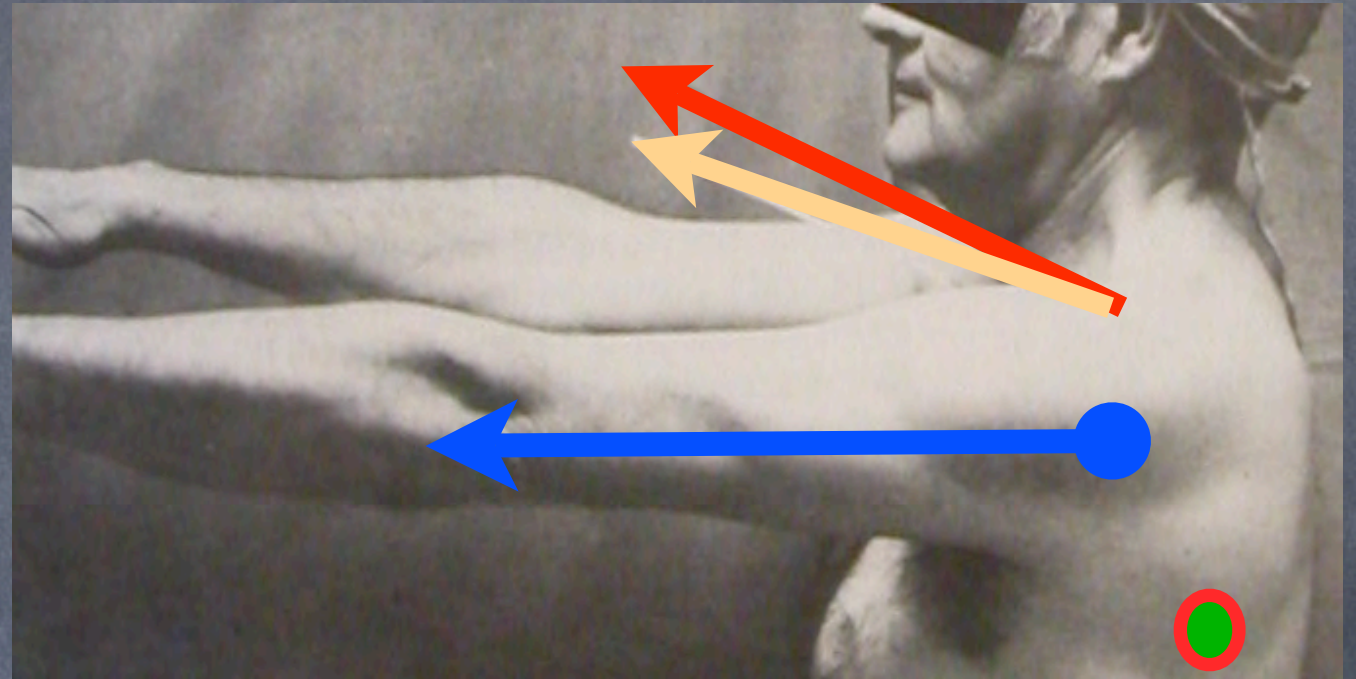
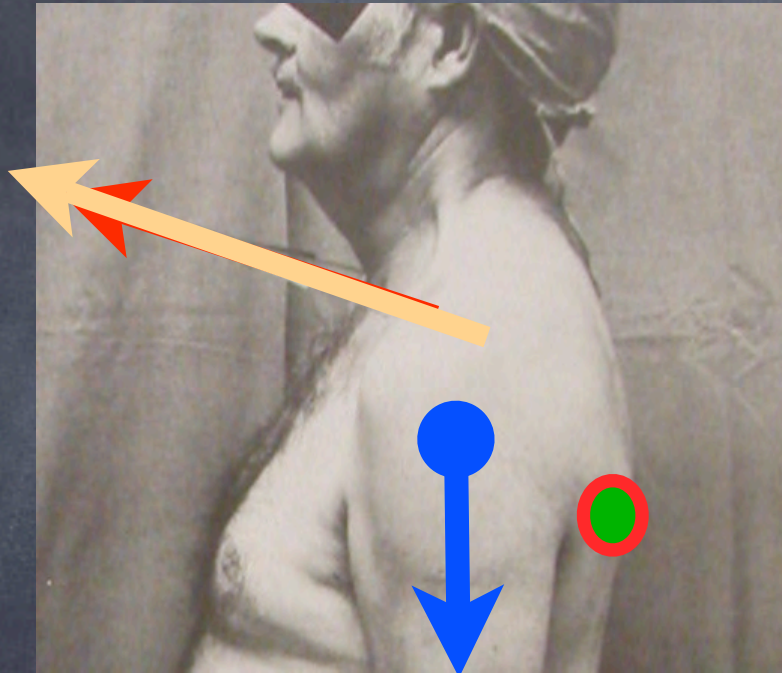
- Vertical > 50% (De Palma)
- Downward and medial < 50% (Urist)
- Downward and lateral ?



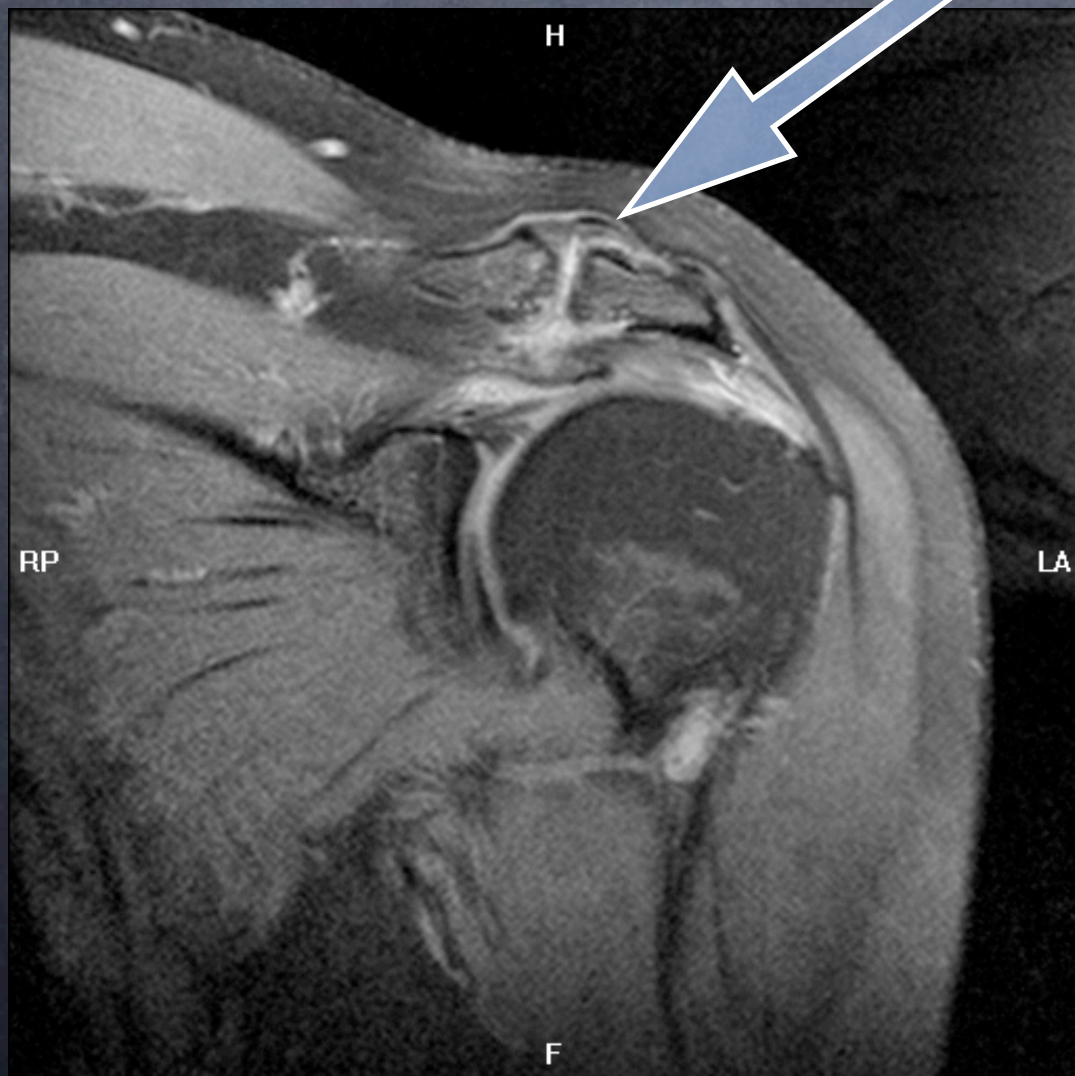
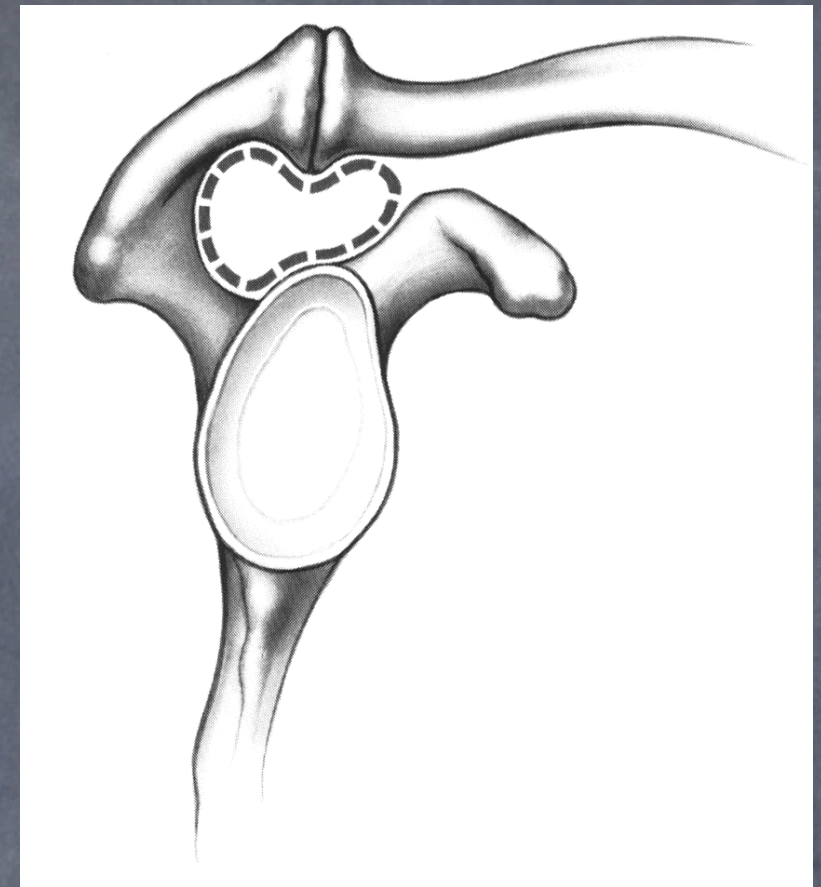
- “slightly movable, might swing a little, rock a little, twist a little, slide a little and act like a hinge” (Codman)



- Rotation of the Clavicle = 40 to 50°
- In combination with the sterno-clavicular joint



"Synchronous
scapuloclavicular
rotation"



The scapulo-thoracic joint

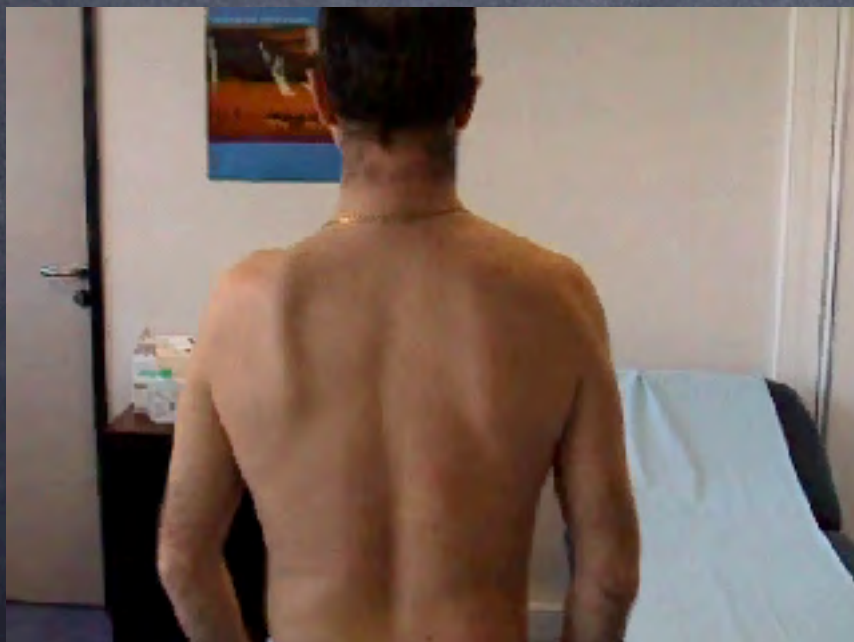
- Participates for about 1/3 (60°) of the shoulder motion
- Has its own pathology
- In rotator cuff disease, scapulothoracic motion is modified



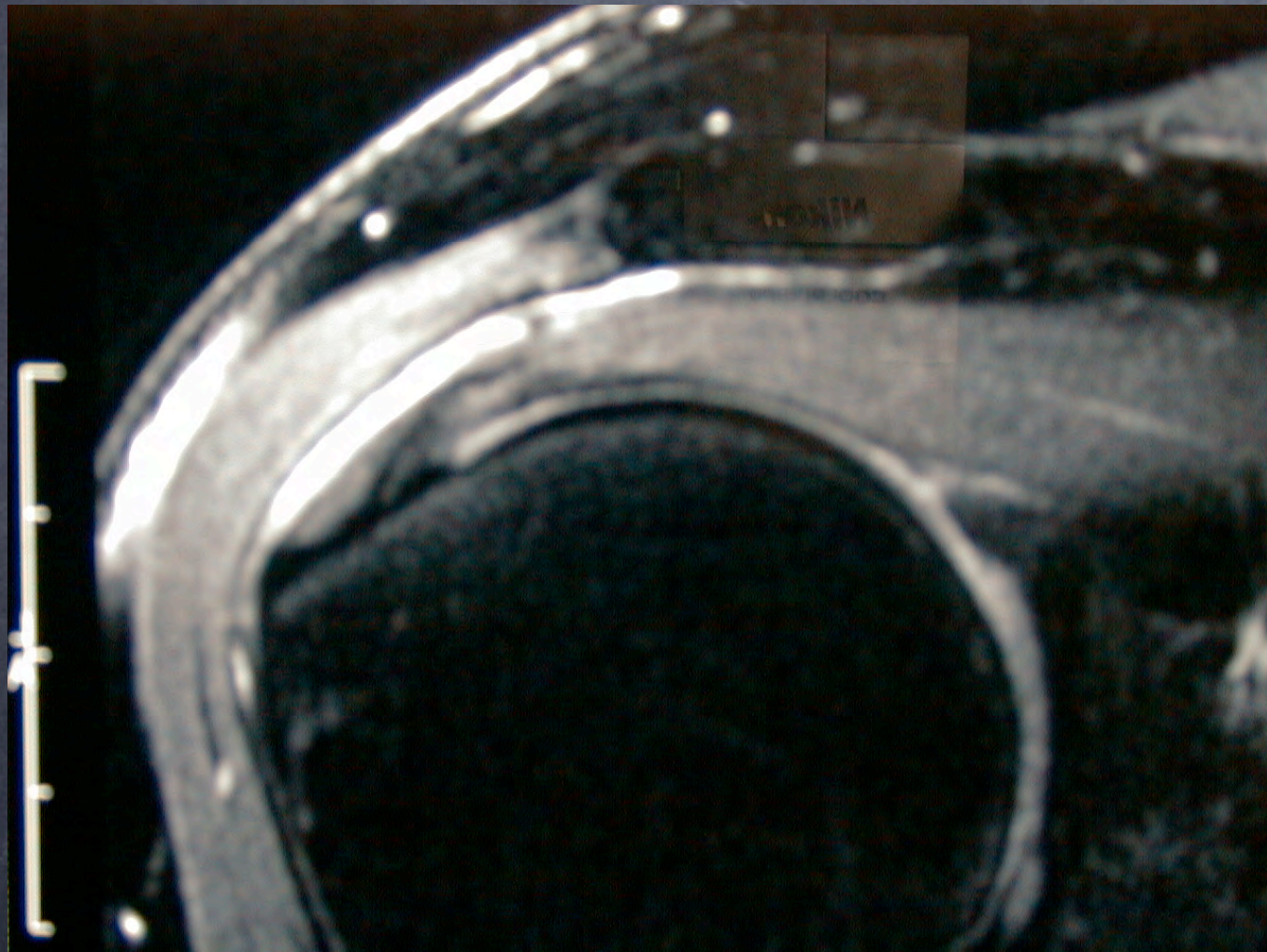
Serratus palsy



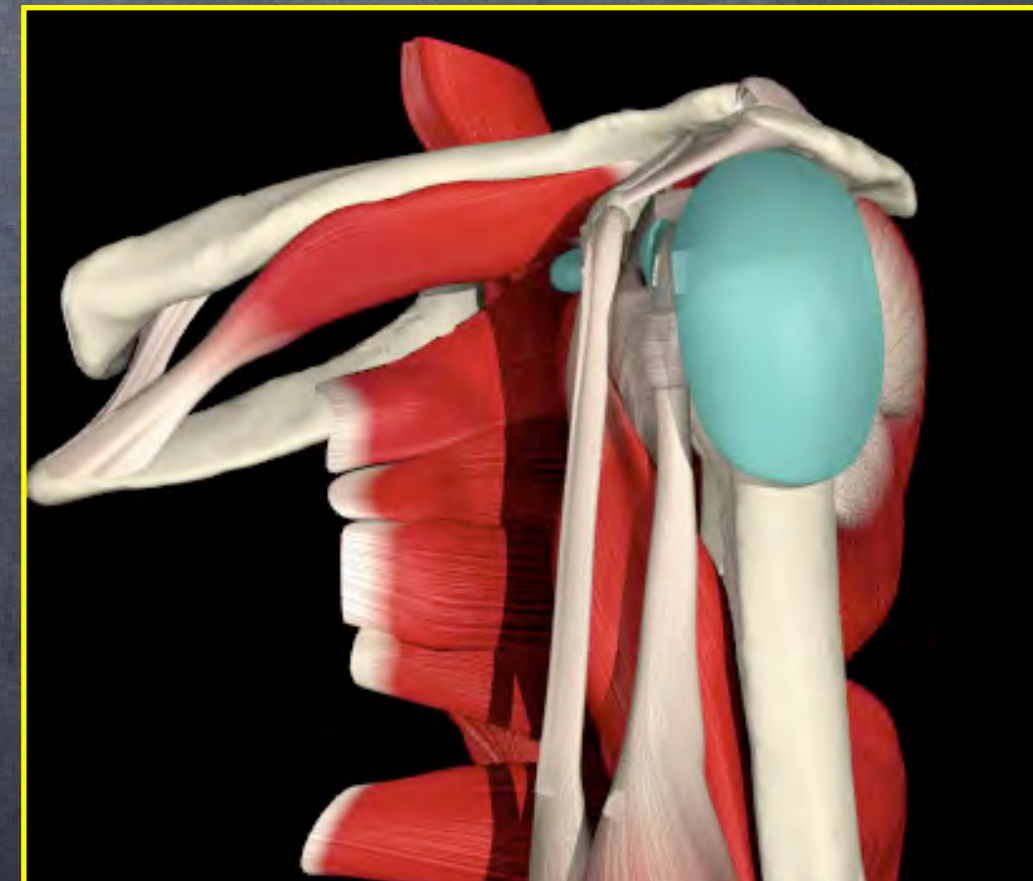
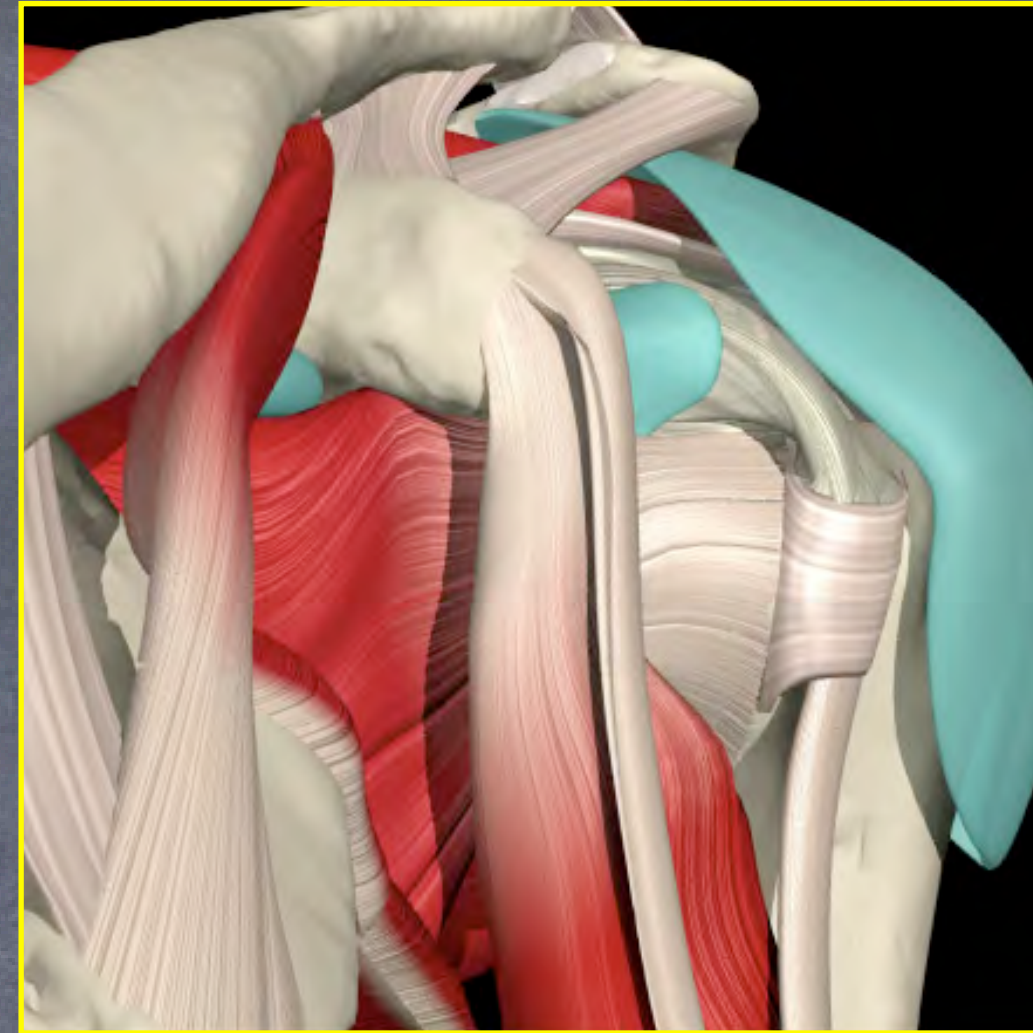
Trapezius palsy

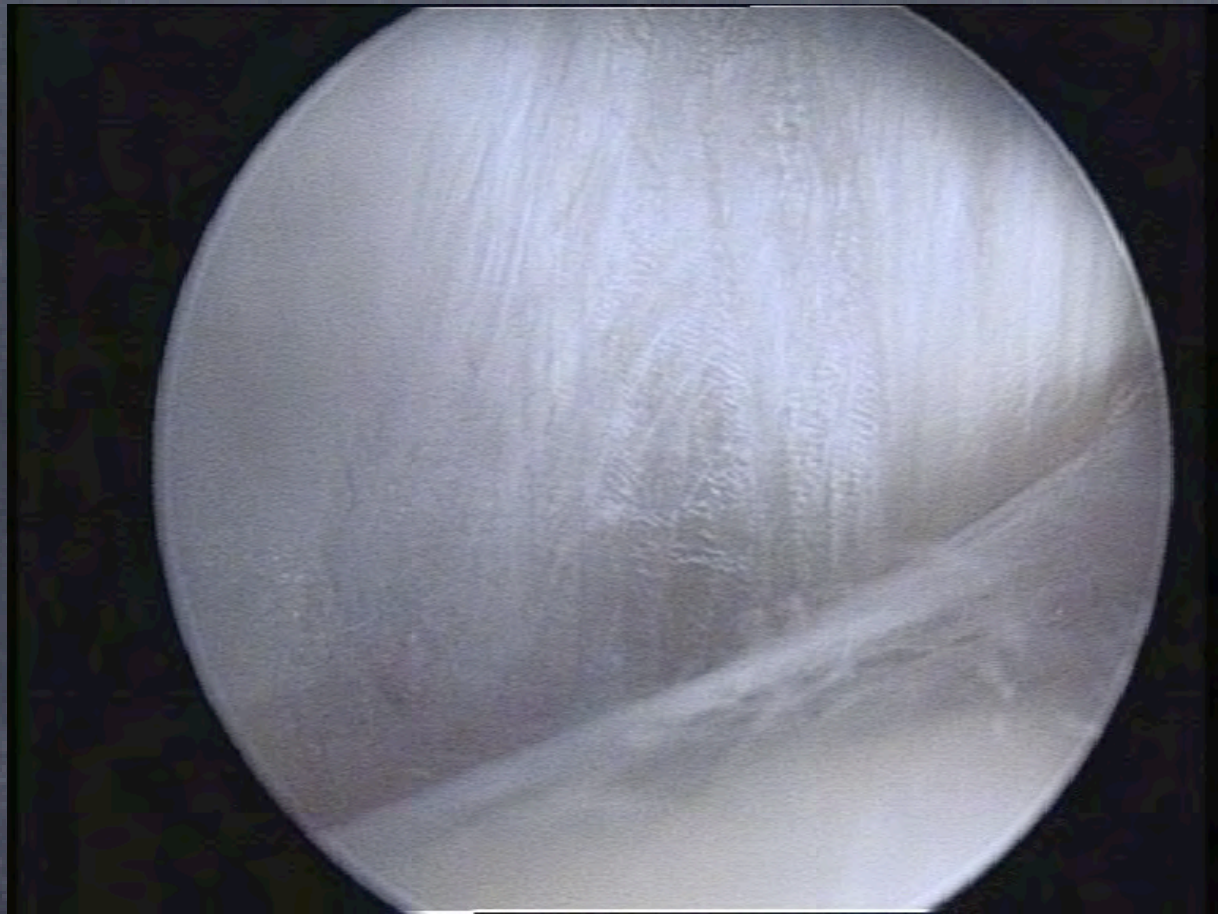


The subacromial space



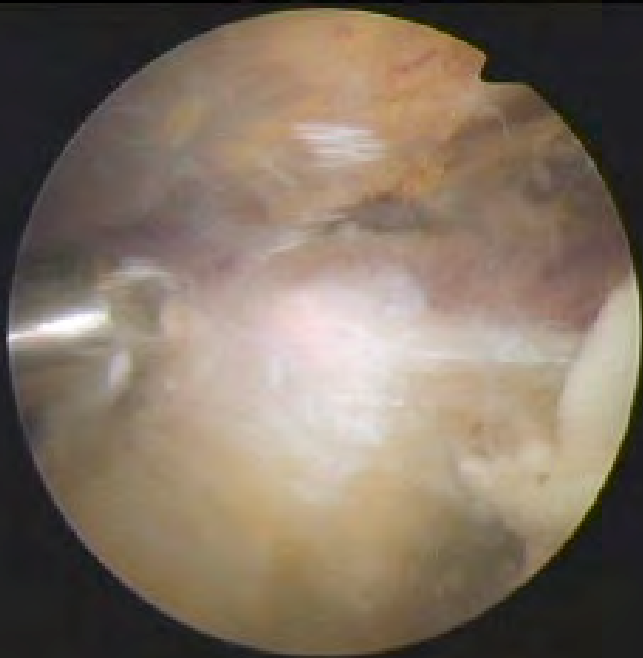
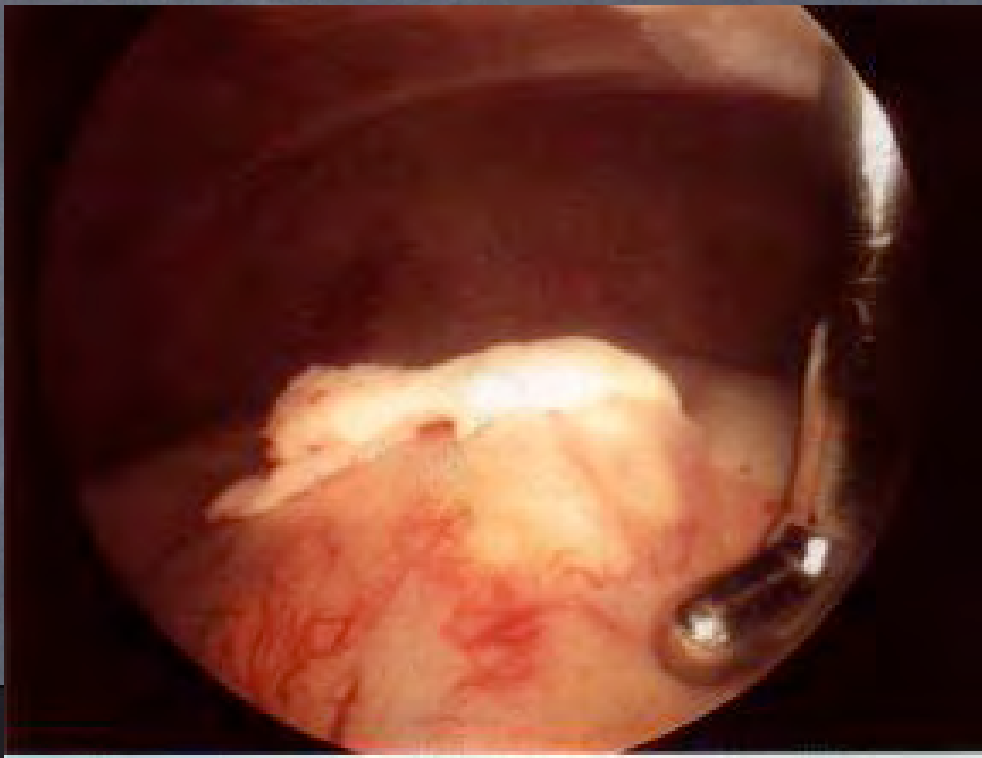
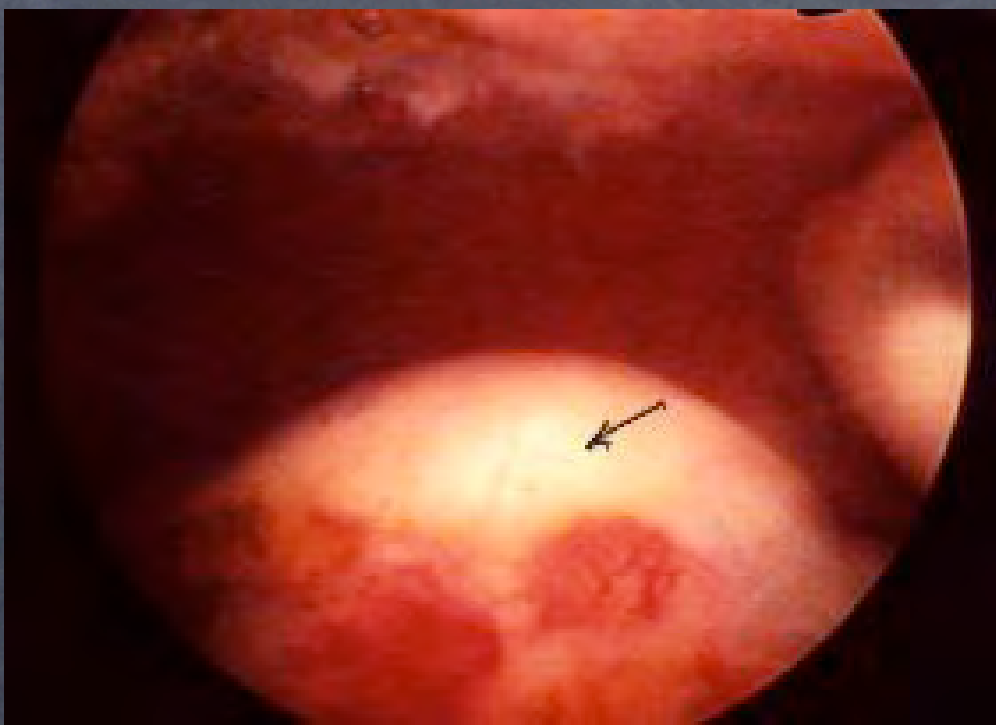
- The space between the acromio-clavicular arch and the rotator cuff
- The subacromial bursa usually communicates with the subscapularis bursa





Evacuation of calcifications in the bursa





The vault has a double origin

- Osseous:

- Acromion over and posterior
- Coracoid Down and anterior
- (+/- the acromio-clavicular joint)

- Ligamentous

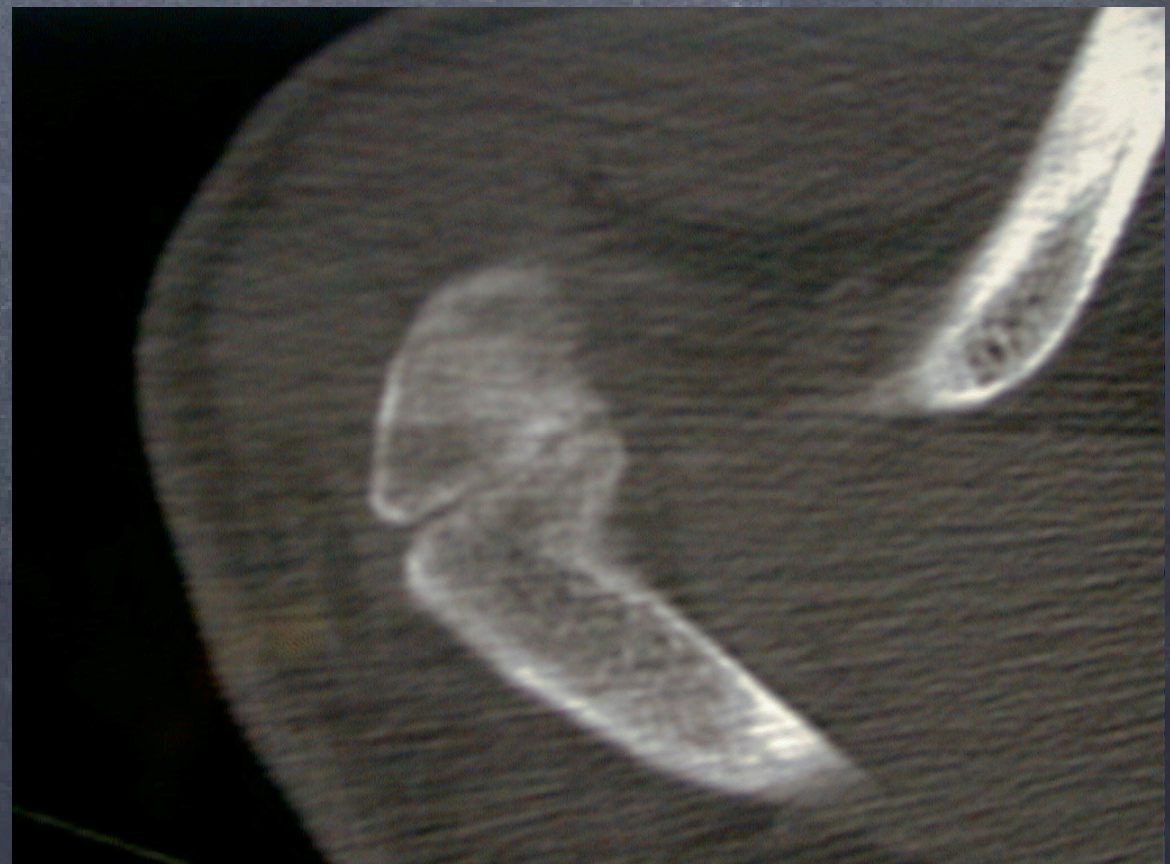
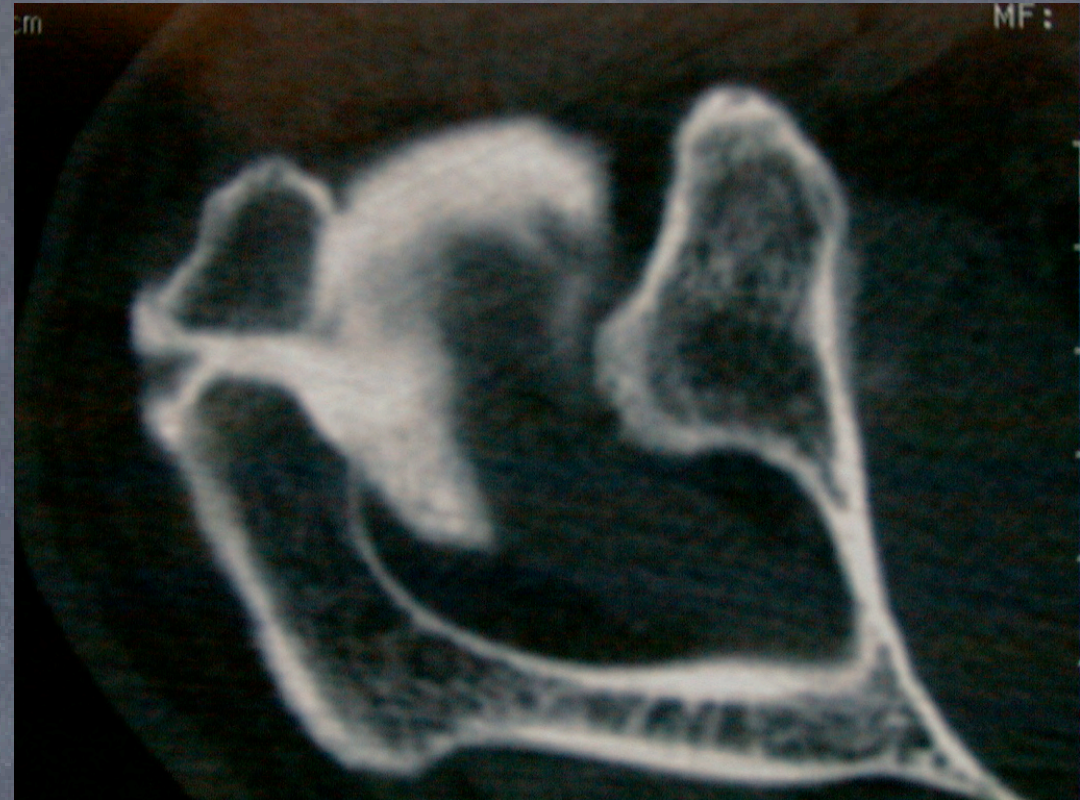
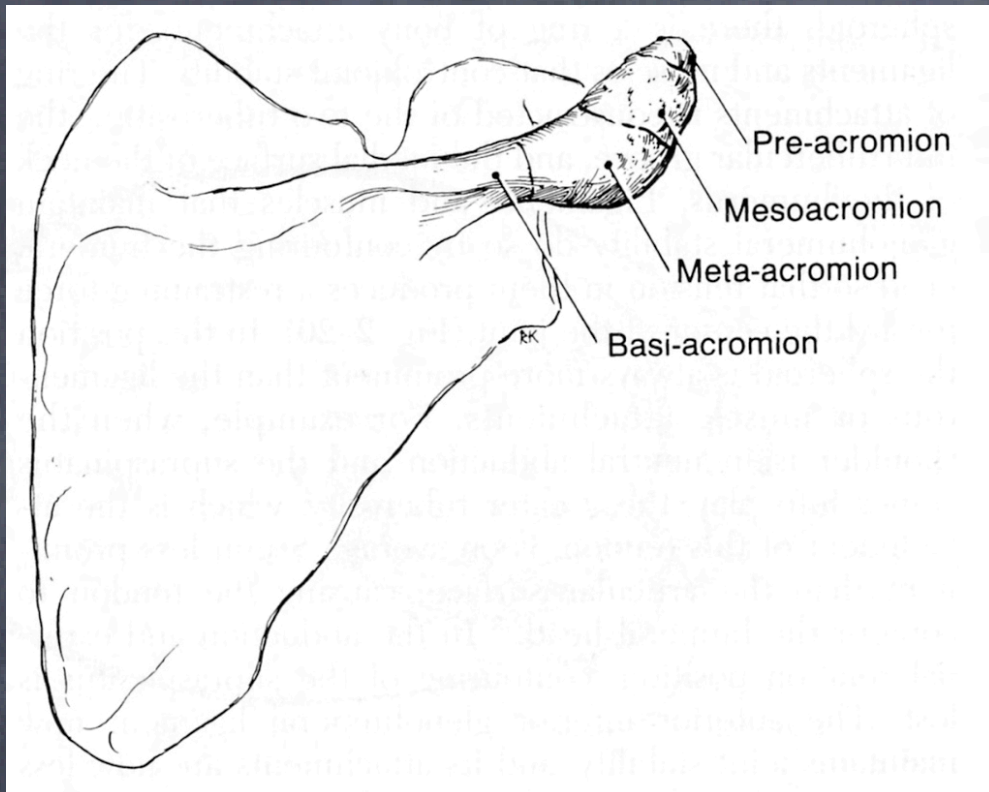
- Coraco-acromial ligament

The “bony” vault

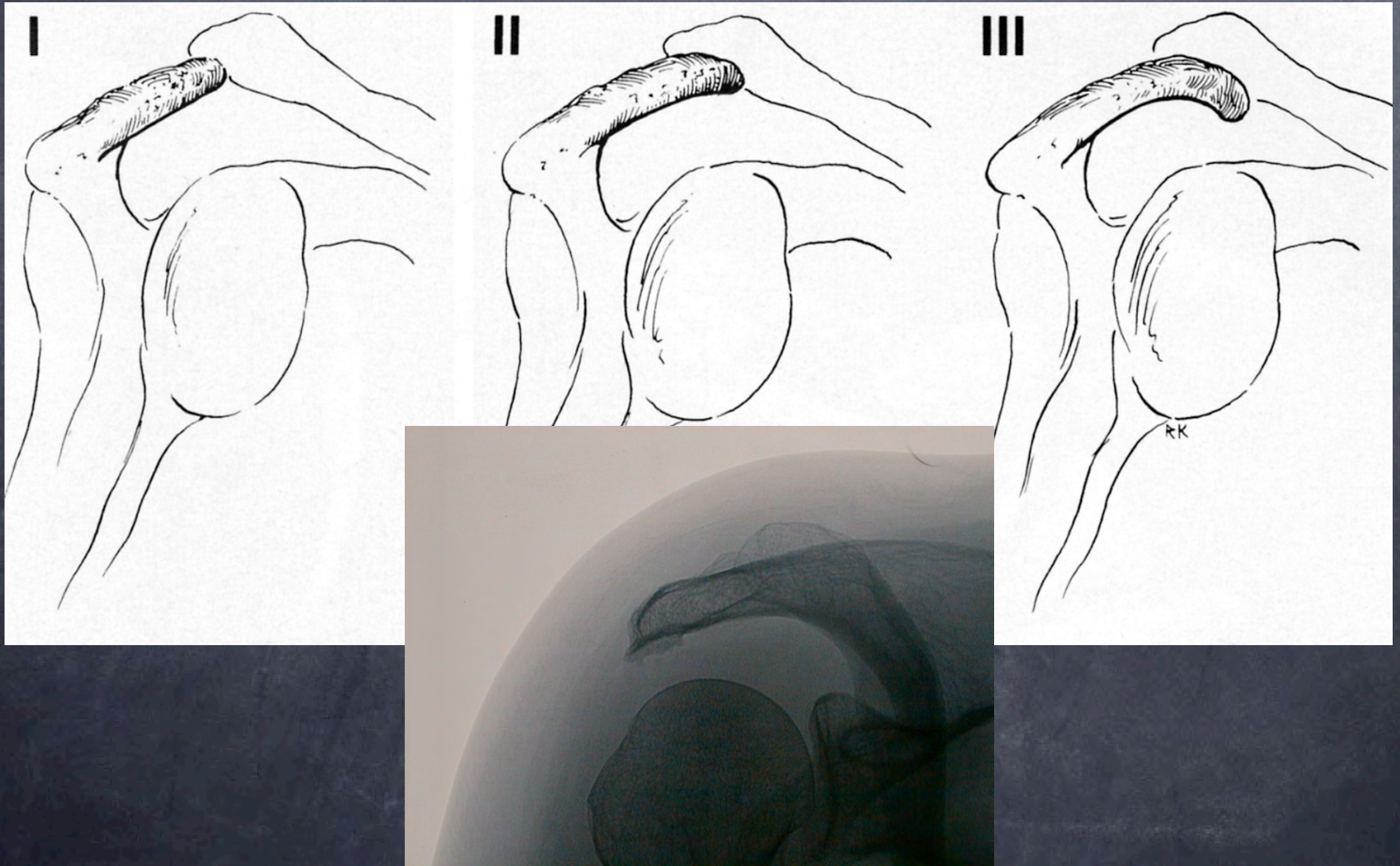
- The acromion may be responsible for cuff impingement
 - If it is unstable (acromion bipartite)
 - If it has a hooked curvature



Bi-partite acromion



Curved or Hooked acromion



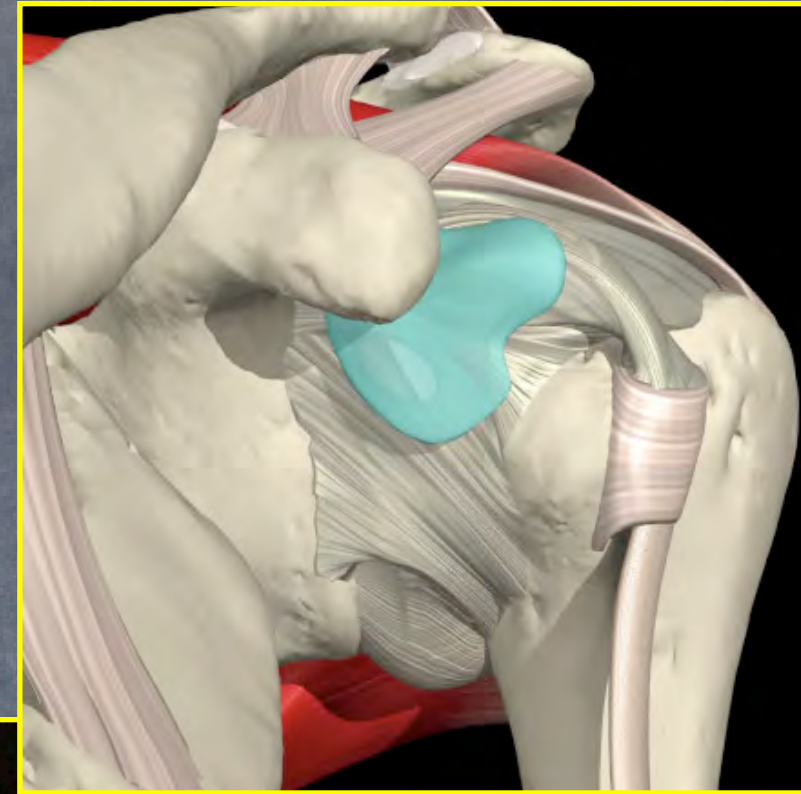
Curved or Hooked acromion



Curved or Hooked acromion



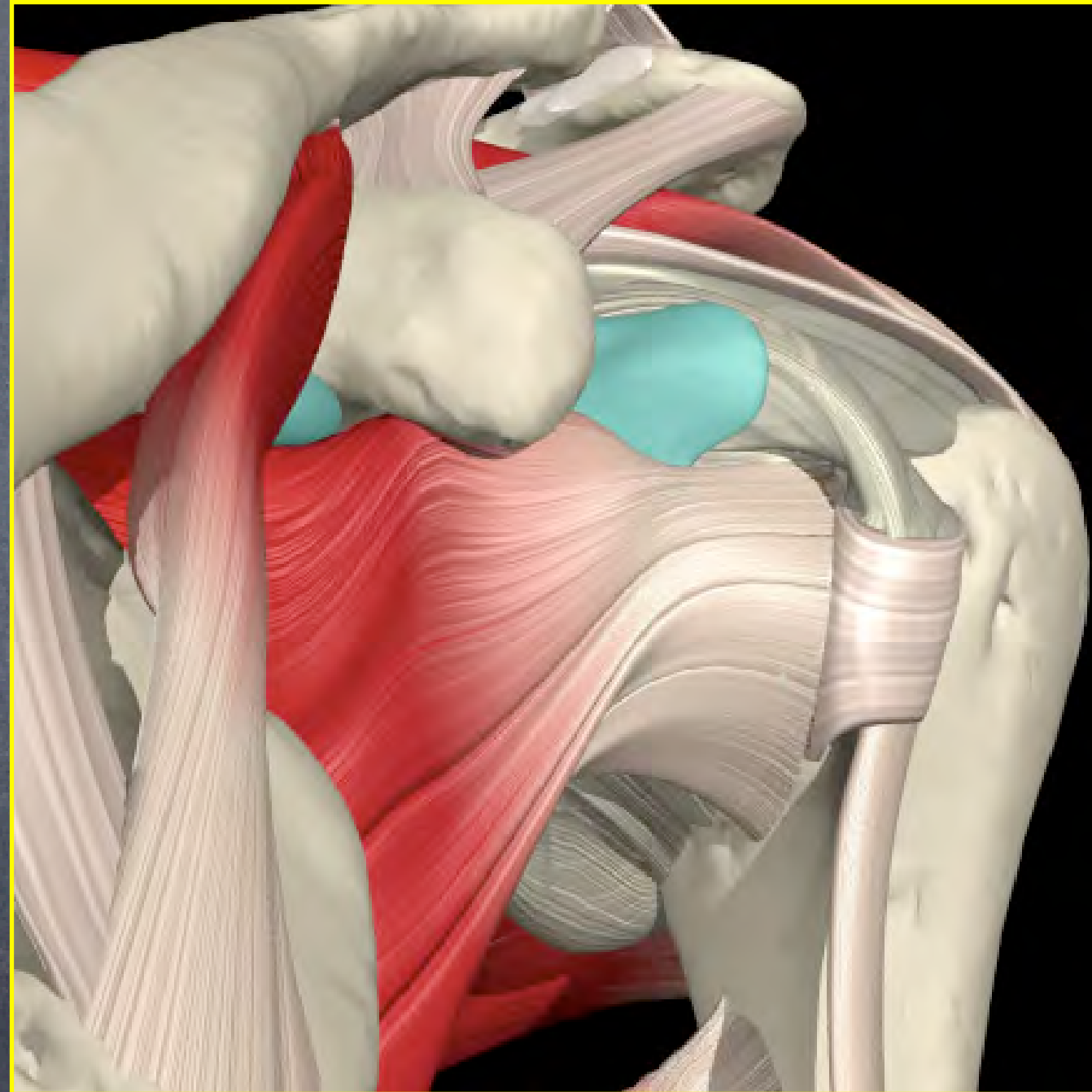
The ligamentous vault





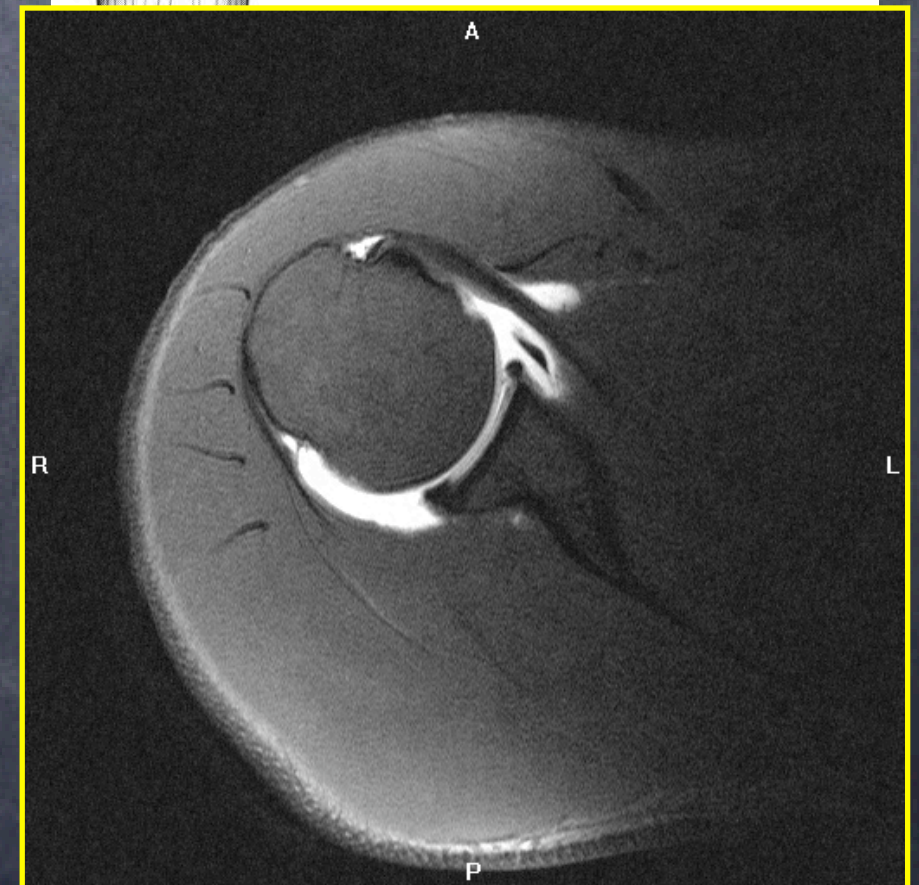
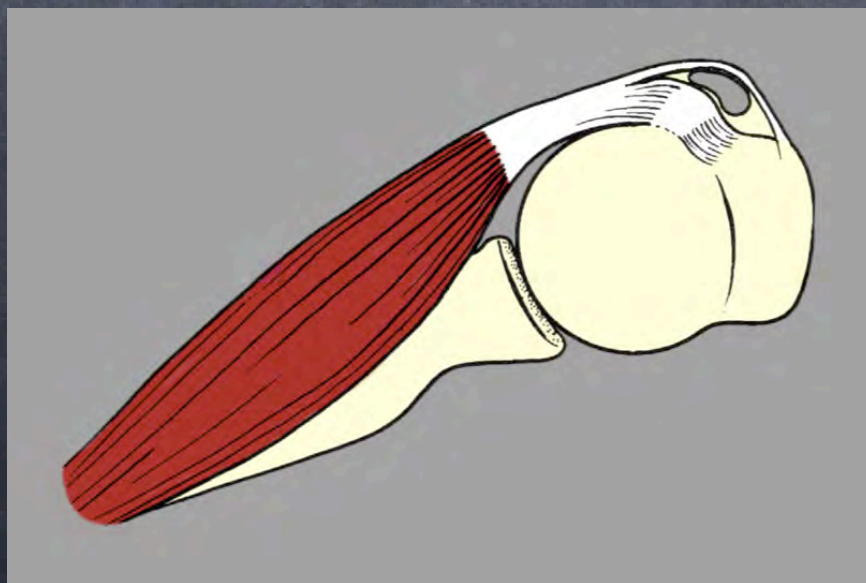
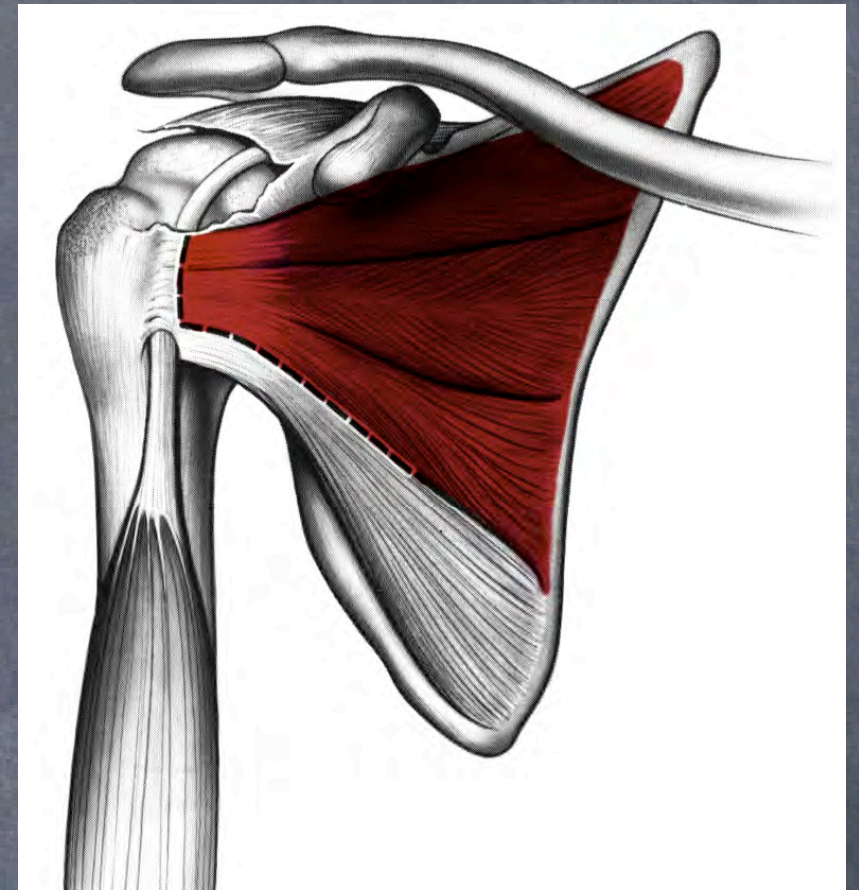
Rotator cuff muscles

- Subscapularis
- Supraspinatus
- Infraspinatus
- Teres minor
 - plus the caput longae biceps brachii



Subscapularis

- Inserts on the lesser tuberosity
- Internally rotates and pulls down on the shoulder
- Subscapularis rupture is responsible for biceps instability



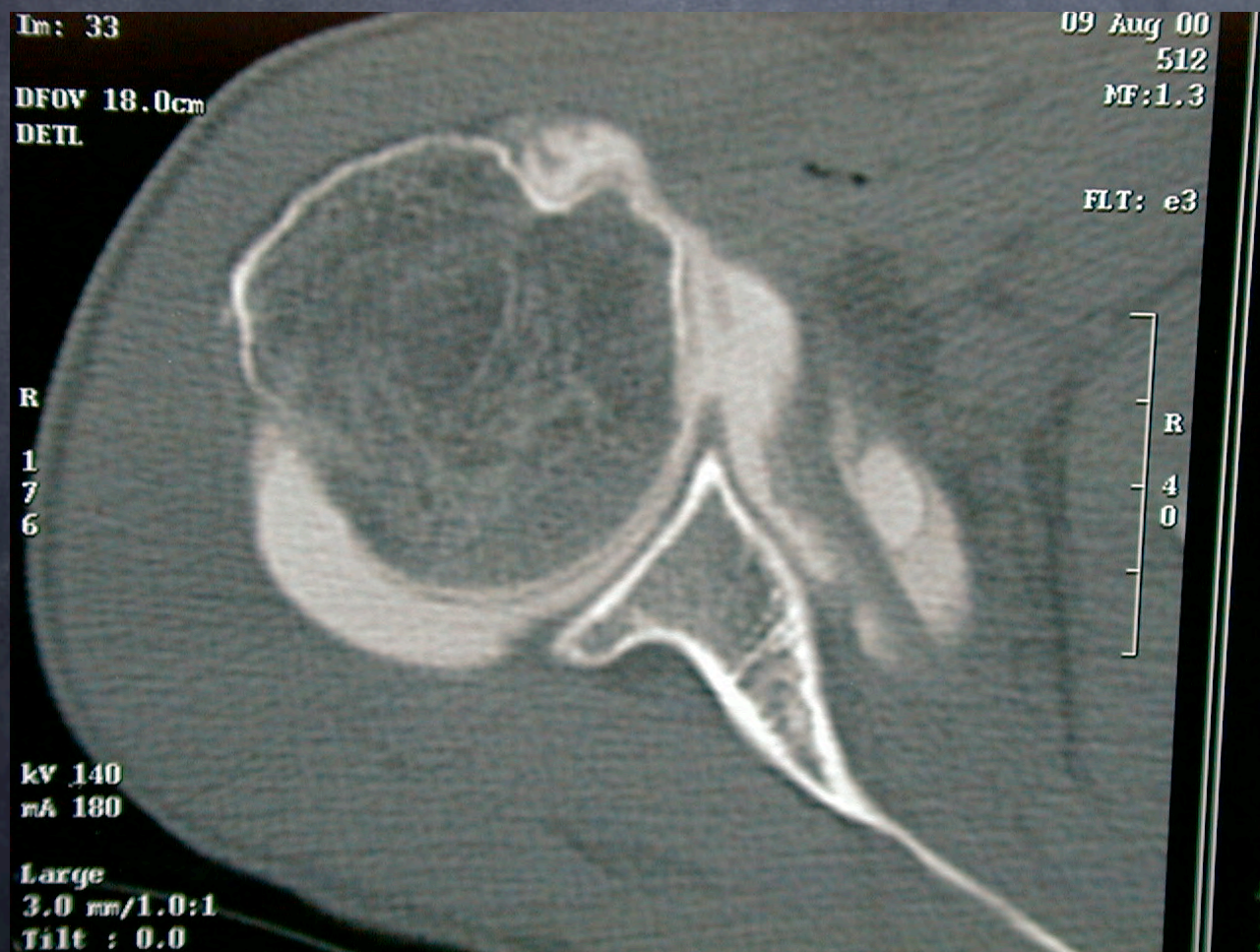
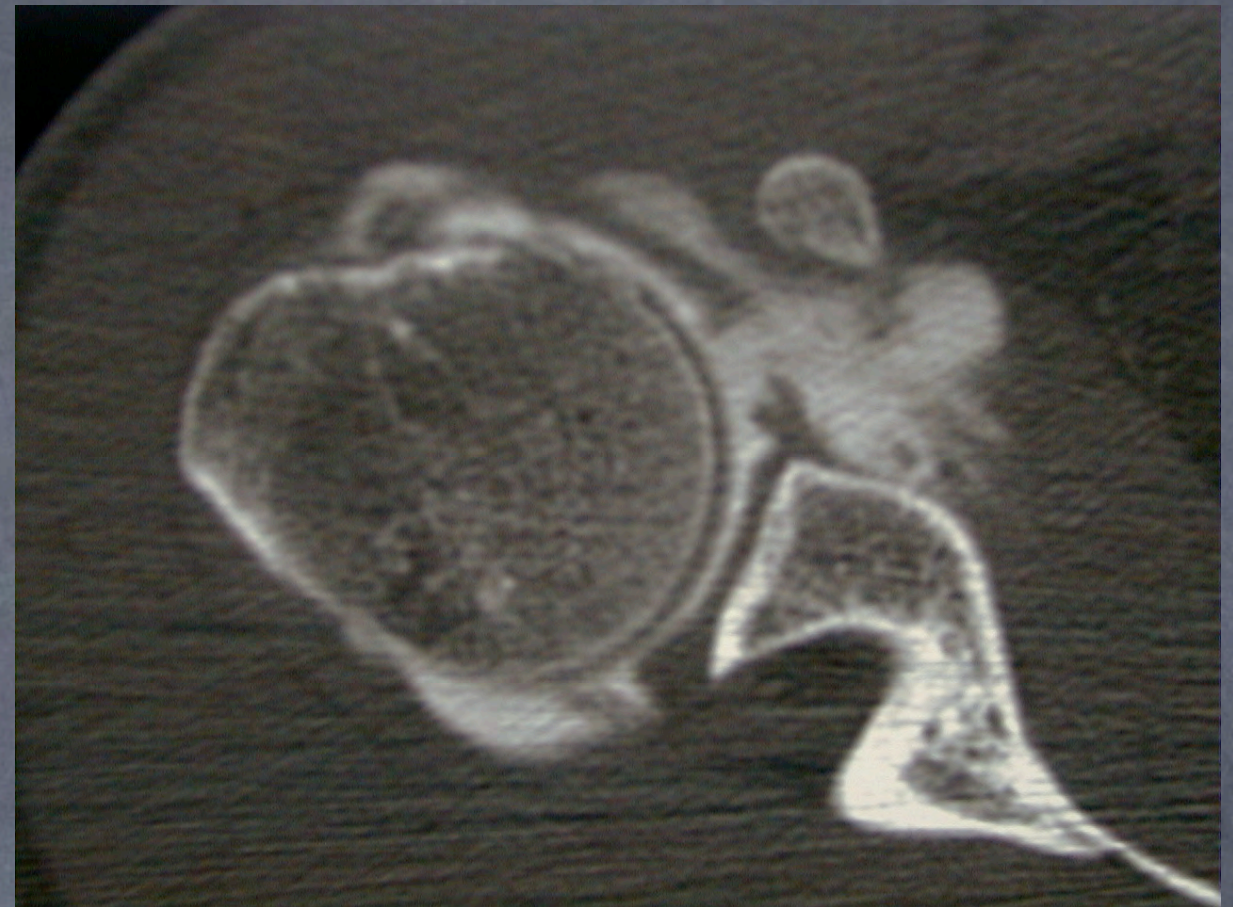
Subscapularis



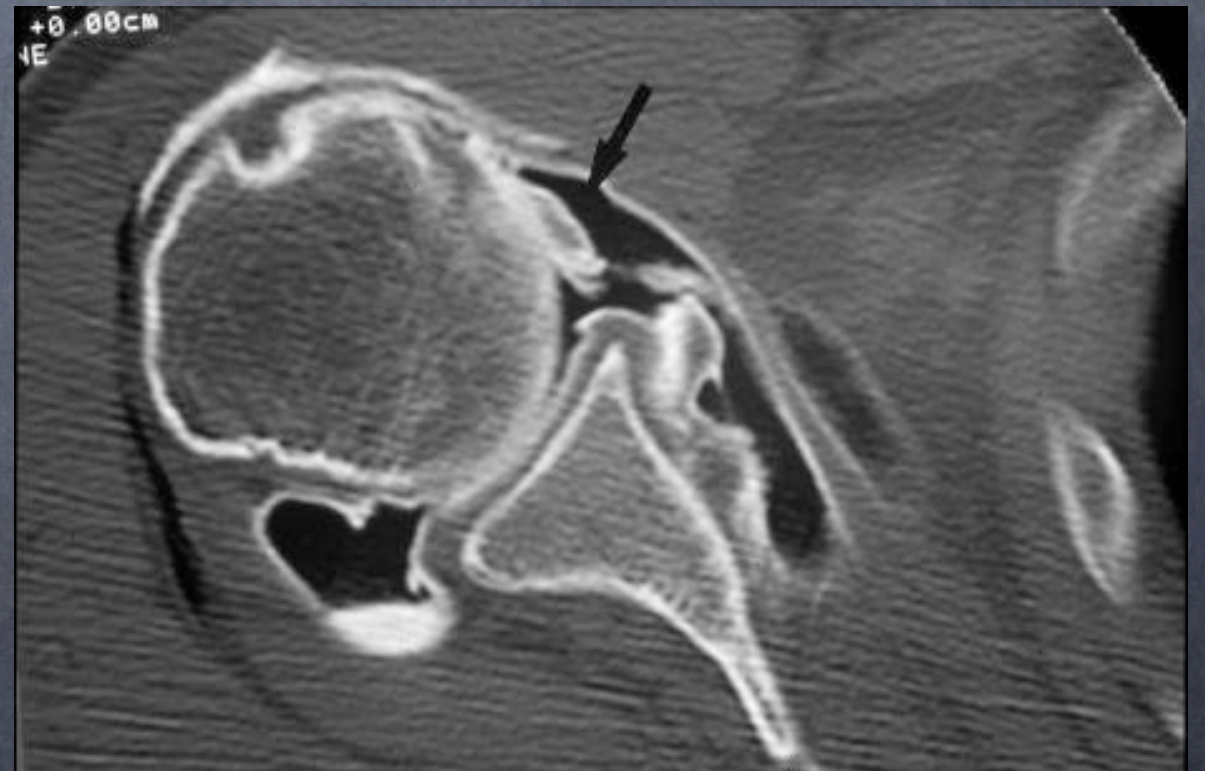
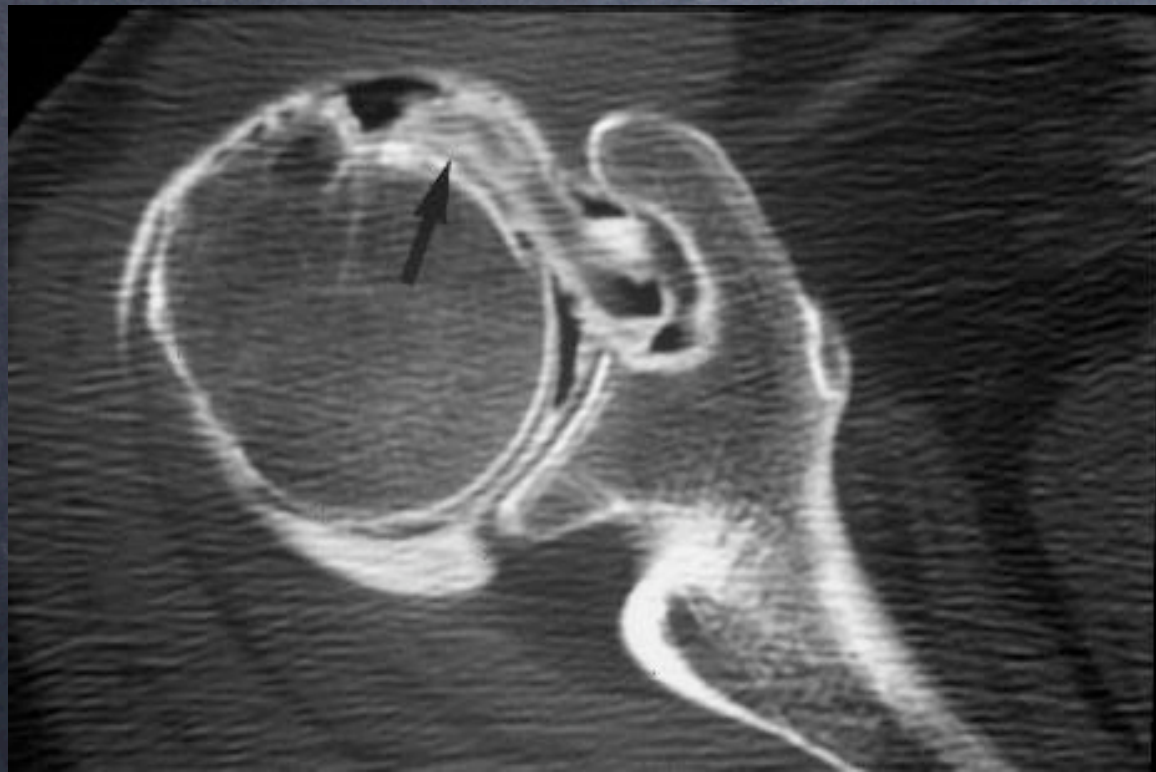


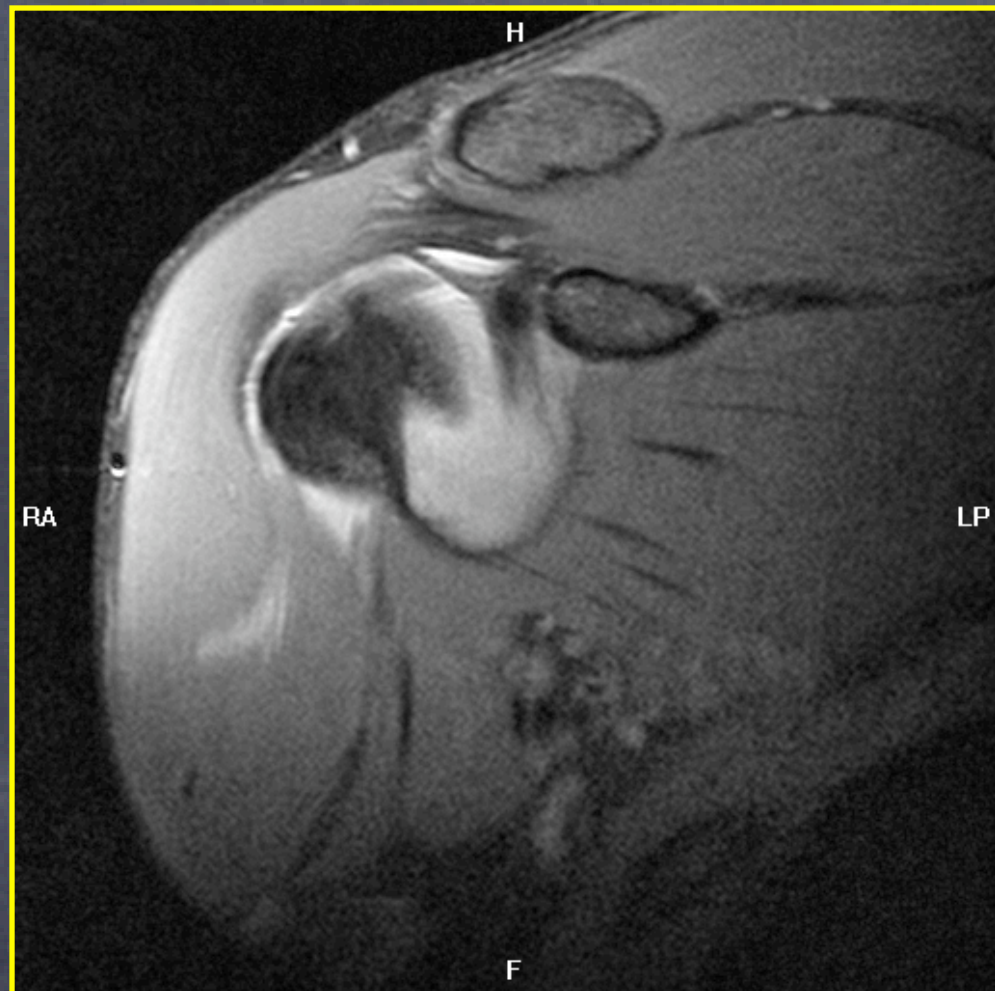
R.E

The key for the diagnosis is: as soon as the bicipital groove is visible, there must be no dye on the lesser tuberosity



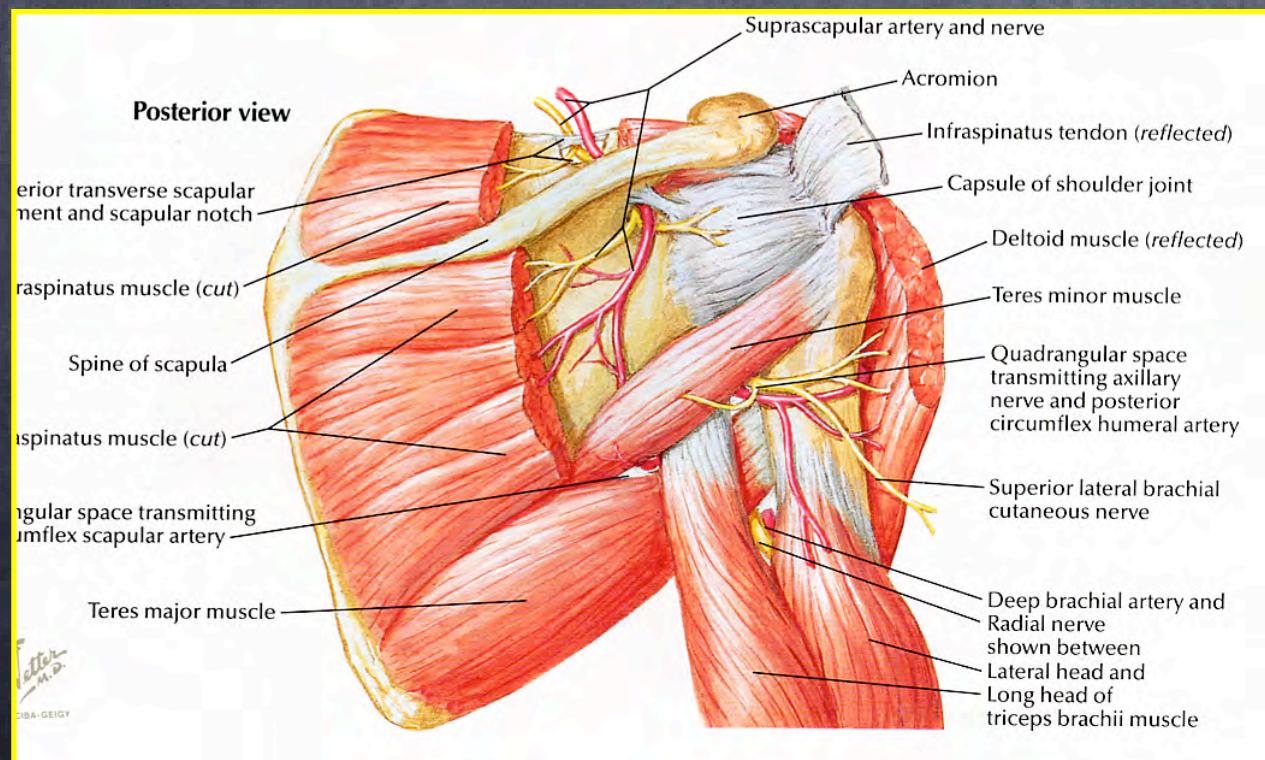
Subscapularis tears are seen on transversal views



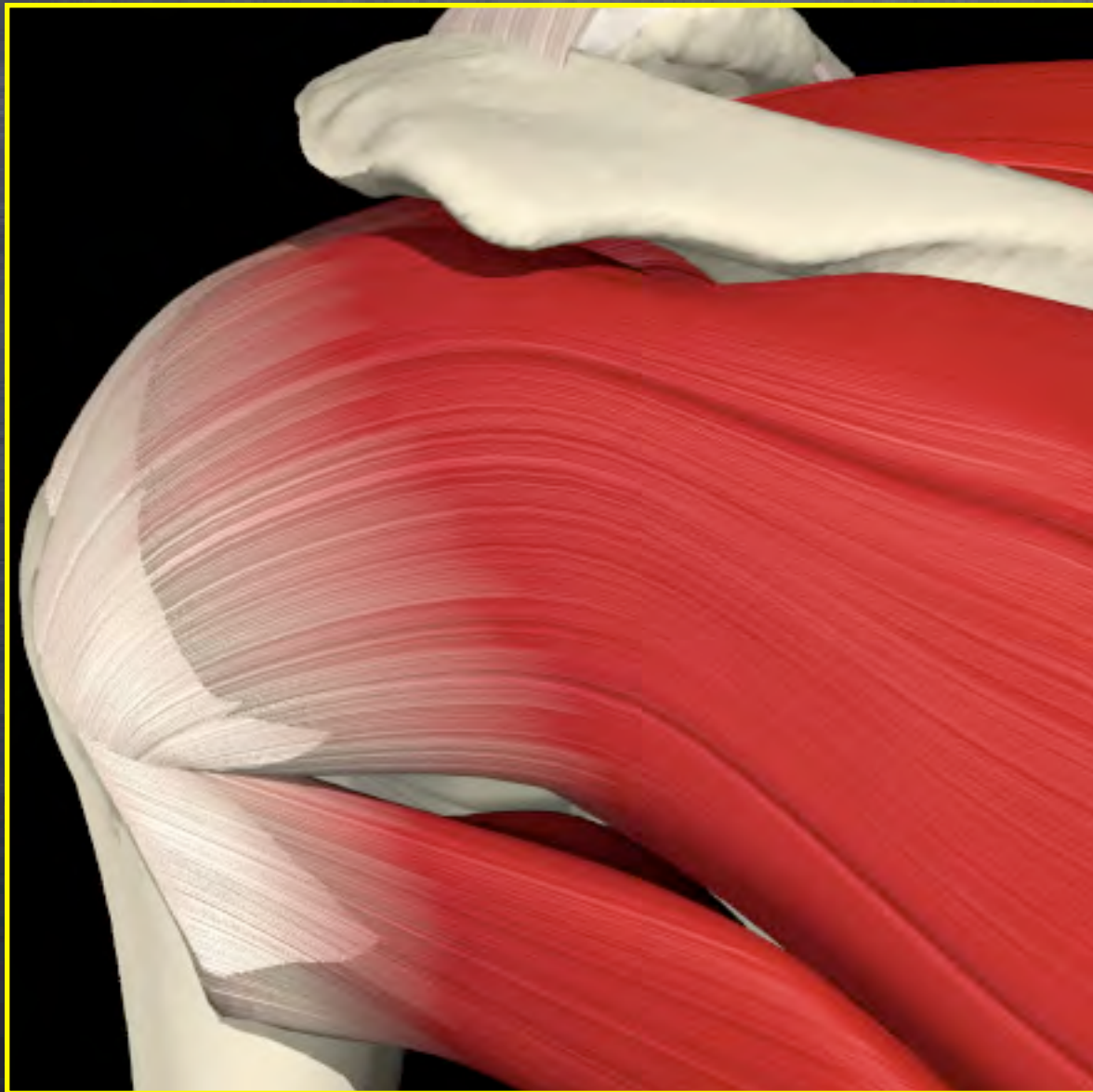


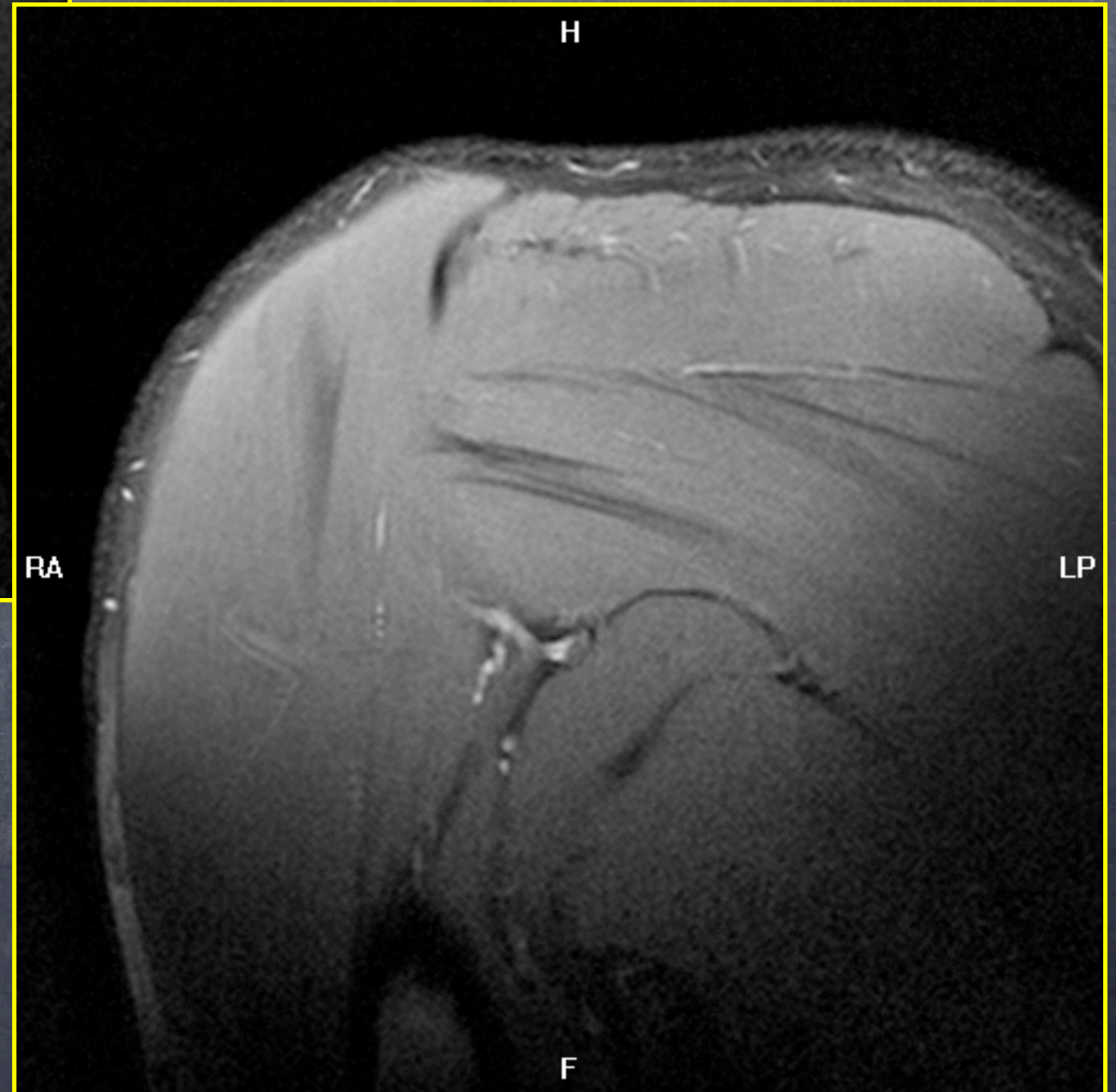
Infraspinatus et teres minor

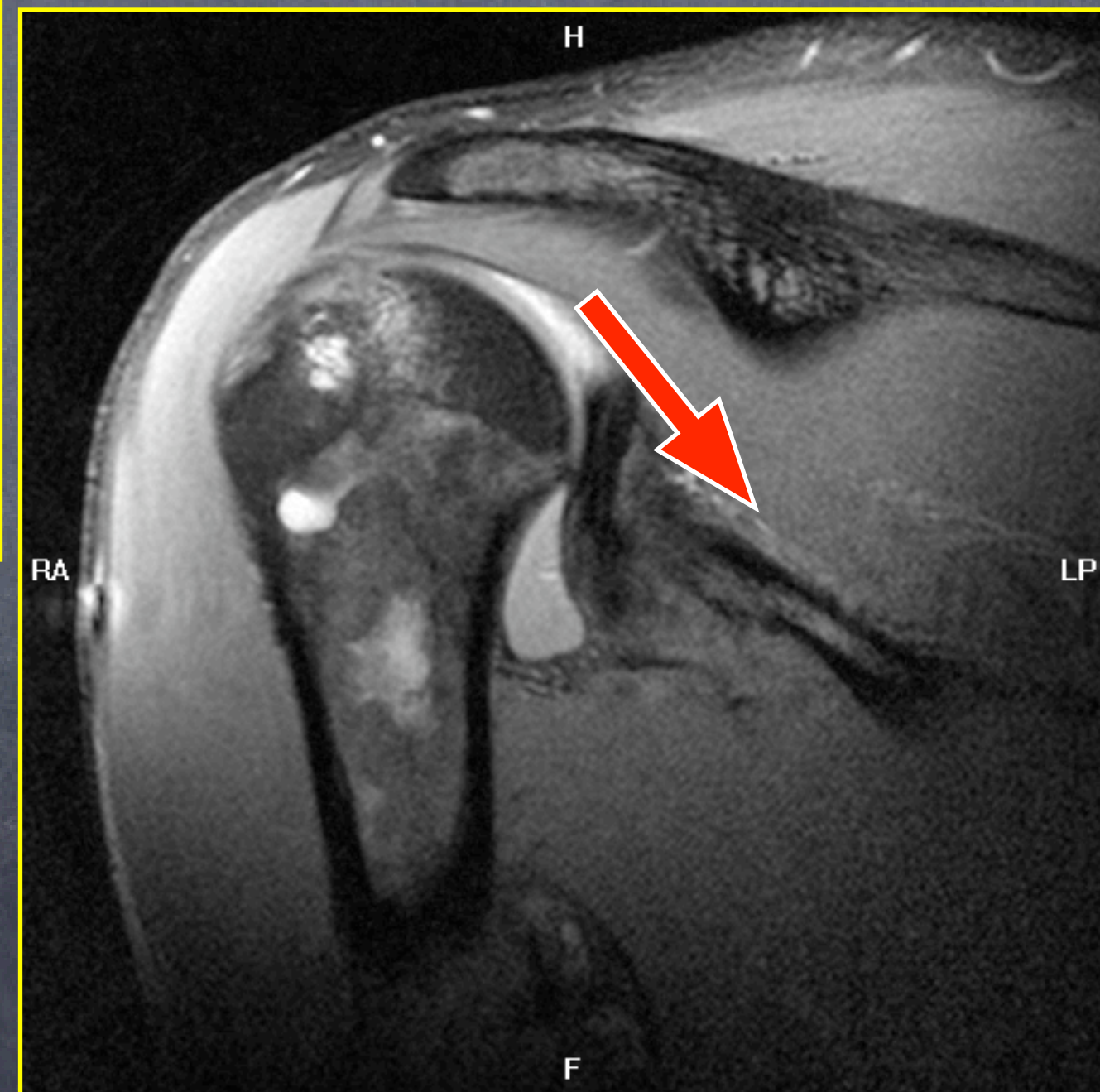
- They externally rotate and pull down the humeral head
- Innervated by the suprascapular (infraspinatus) and axillary nerve (teres minor)

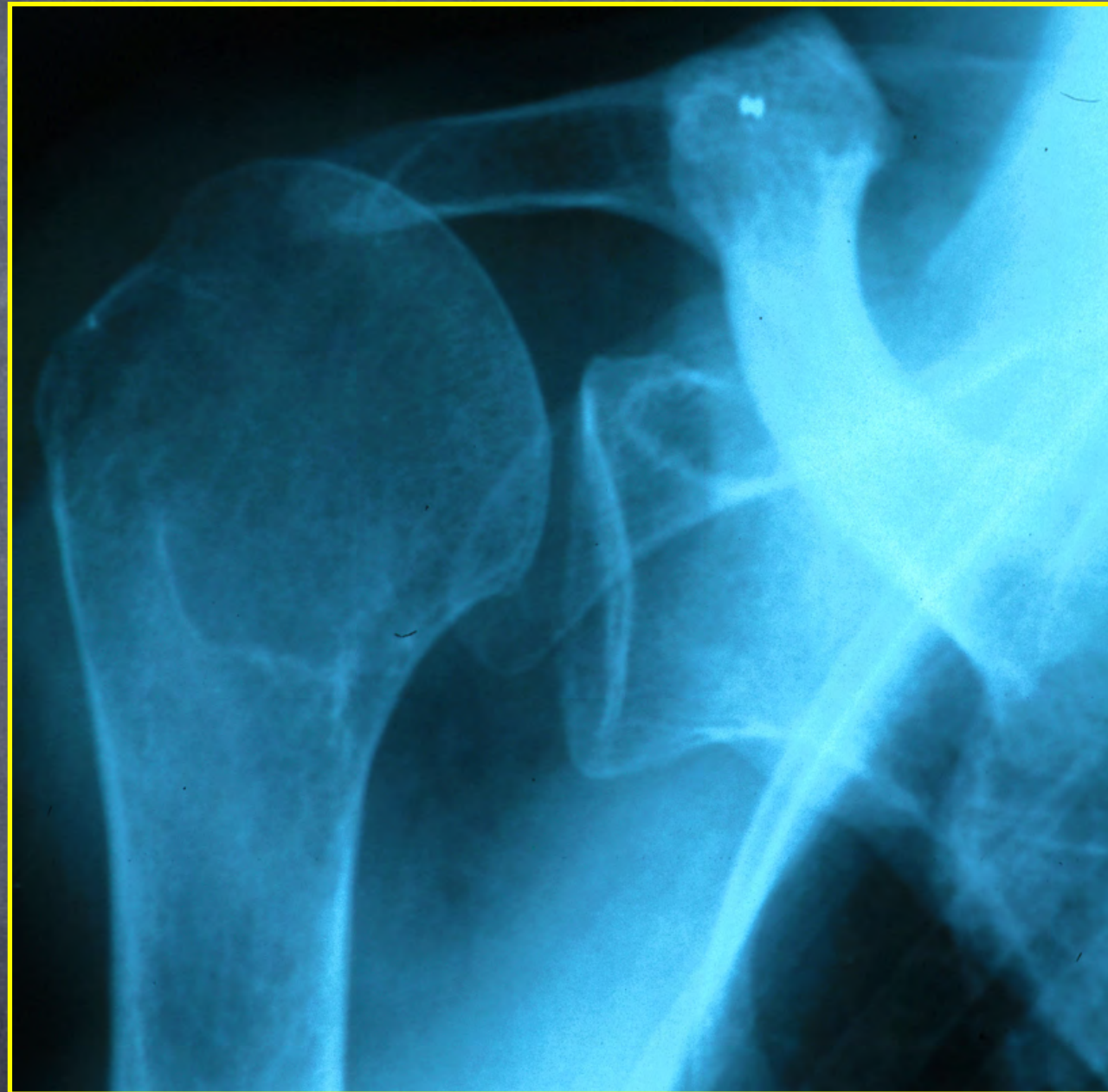


Infraspinatus and teres minor



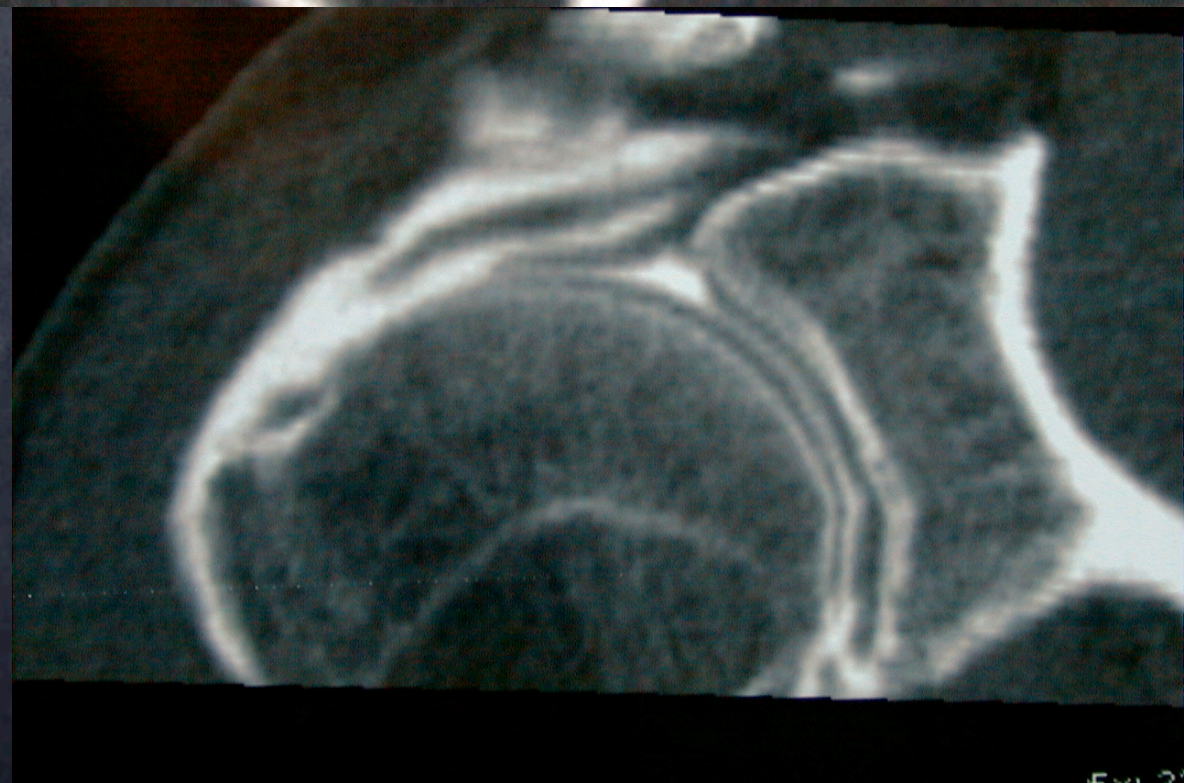








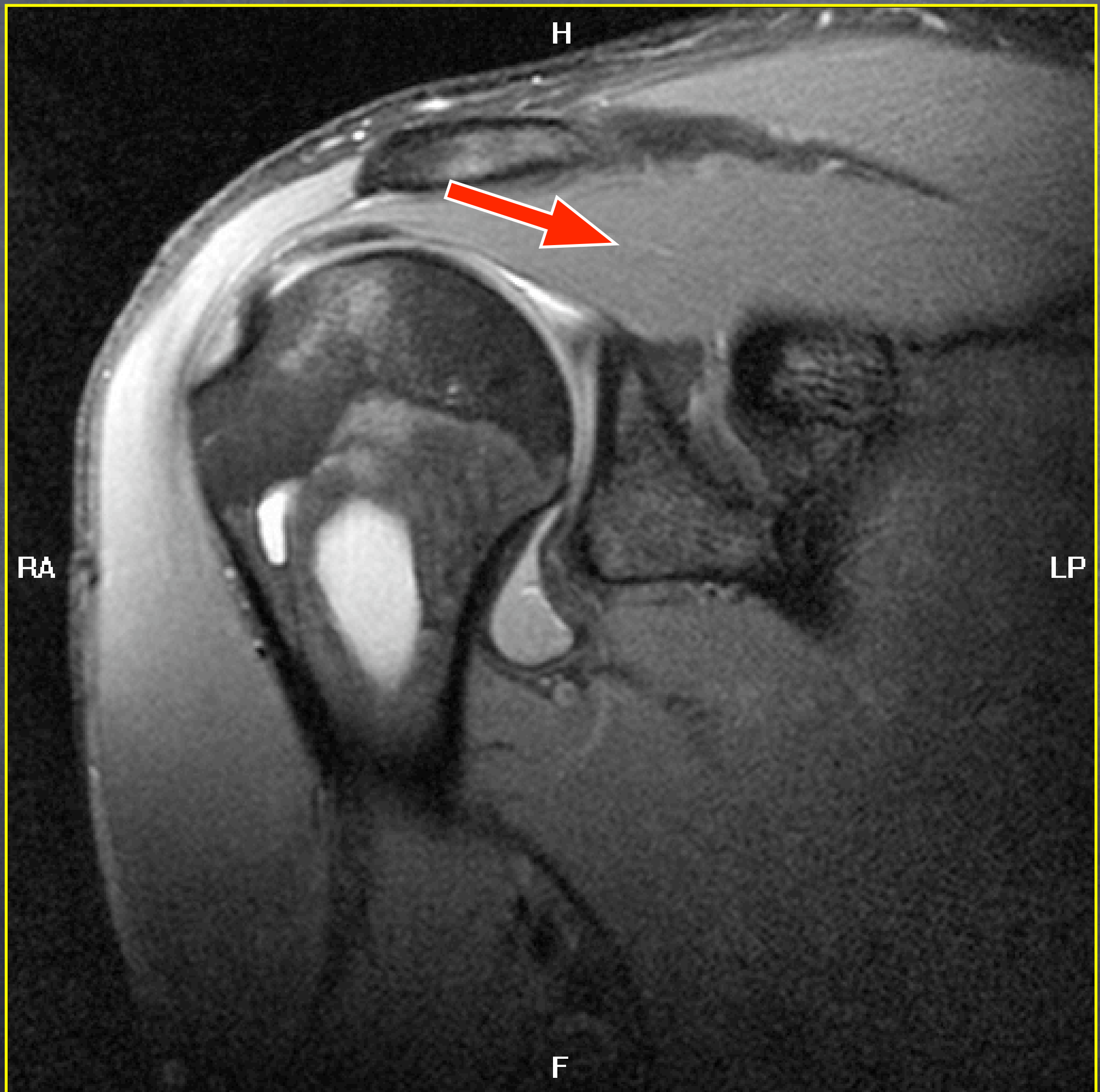
Lesions are better
seen on frontal view

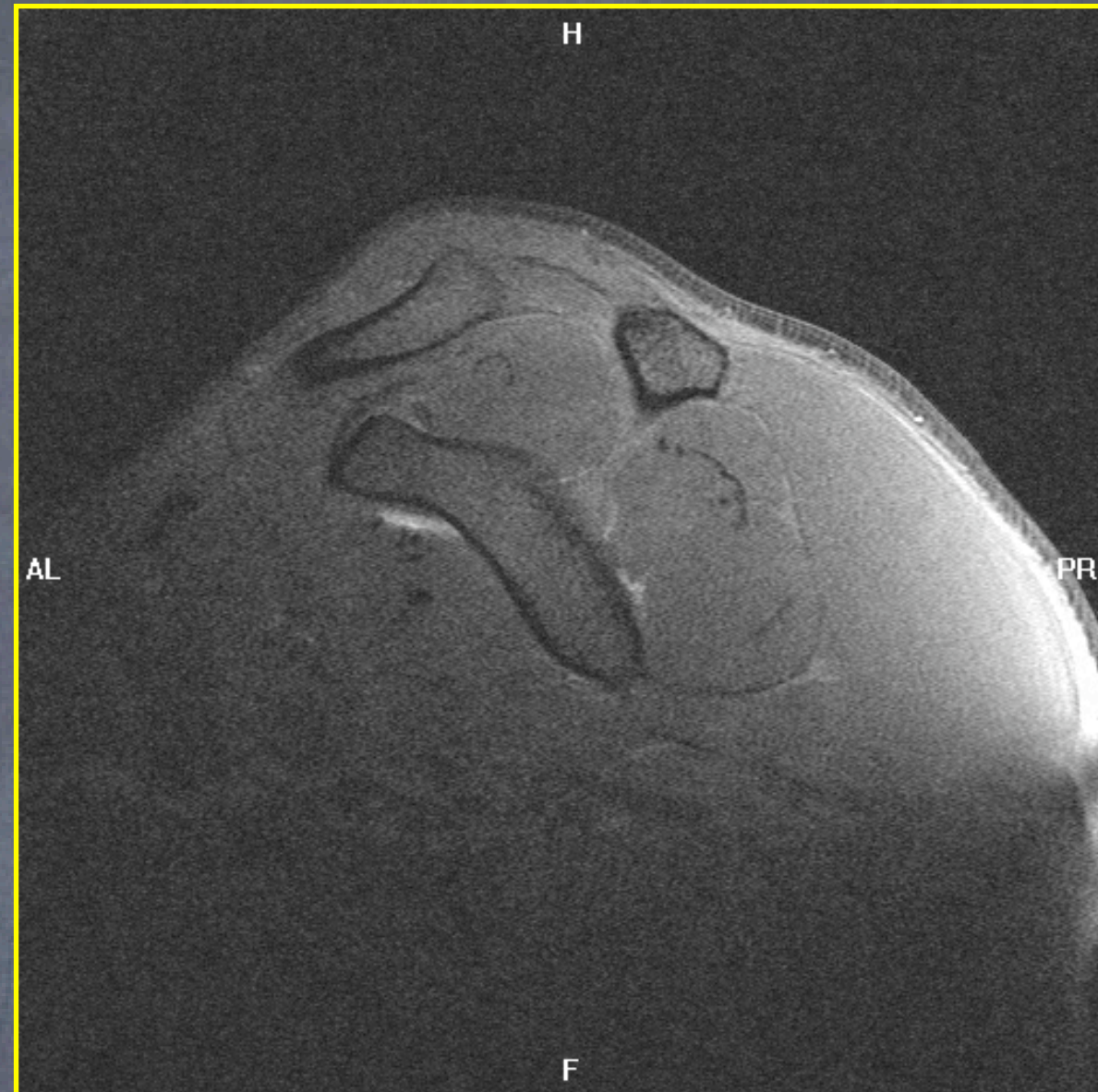
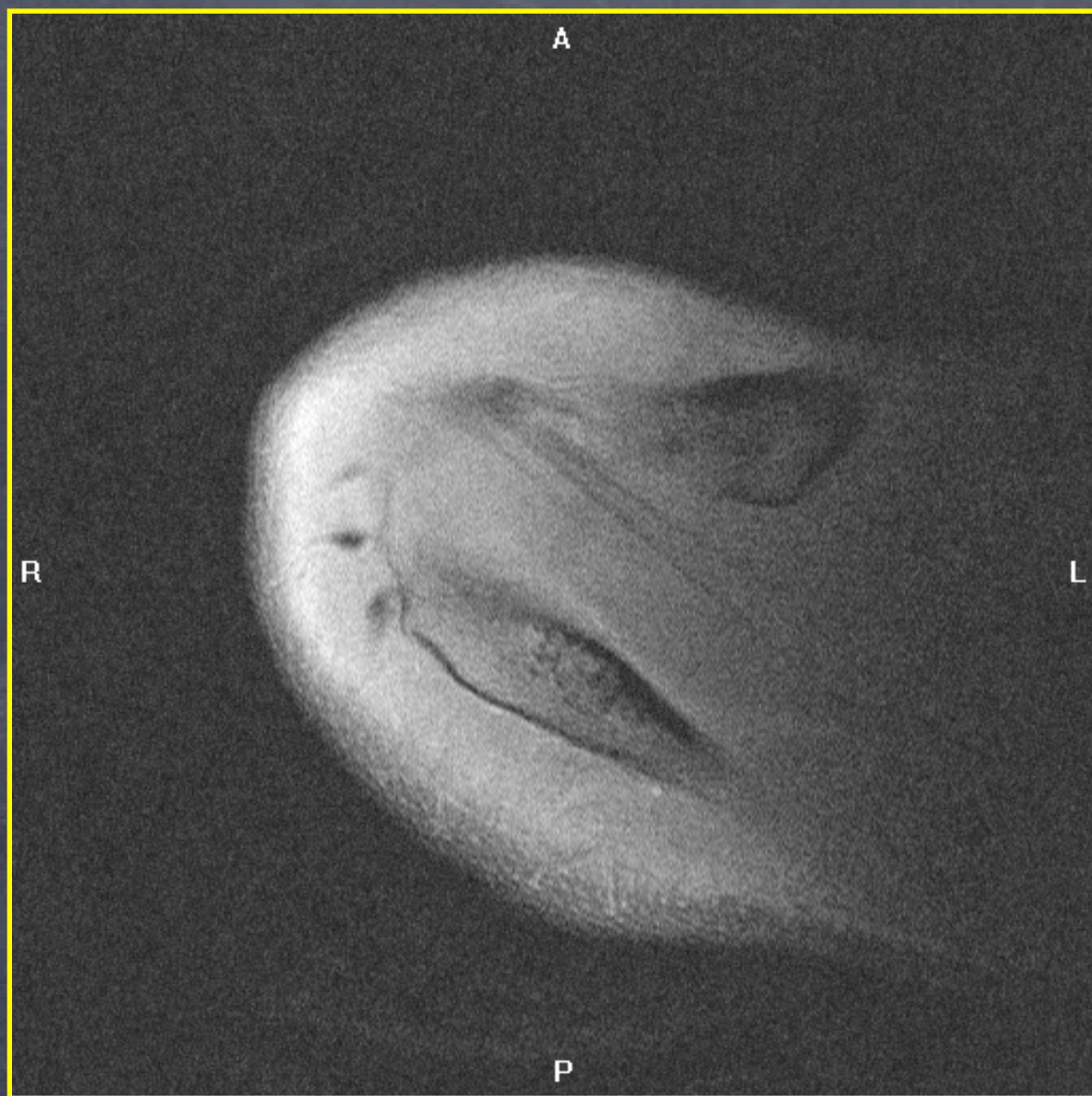


Supraspinatus

- The most often injured tendon
- It pulls down the head and centers the humeral head
- Innervated by the suprascapular nerve
- It inserts on the greater tuberosity immediately after the cartilage

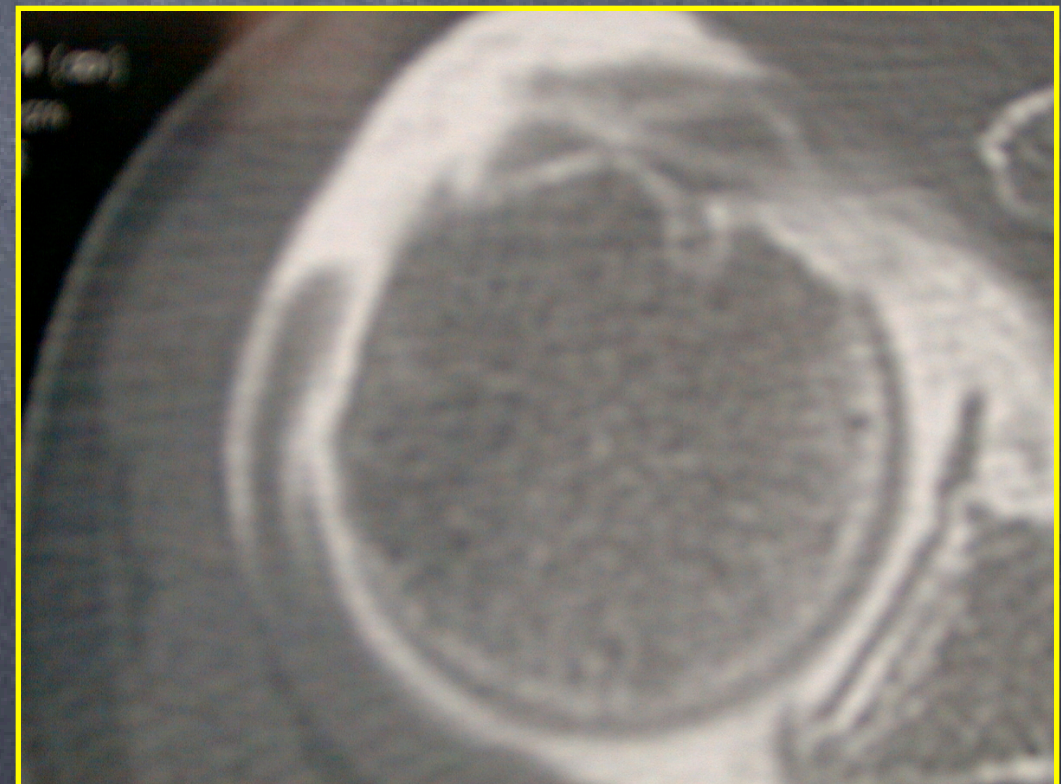
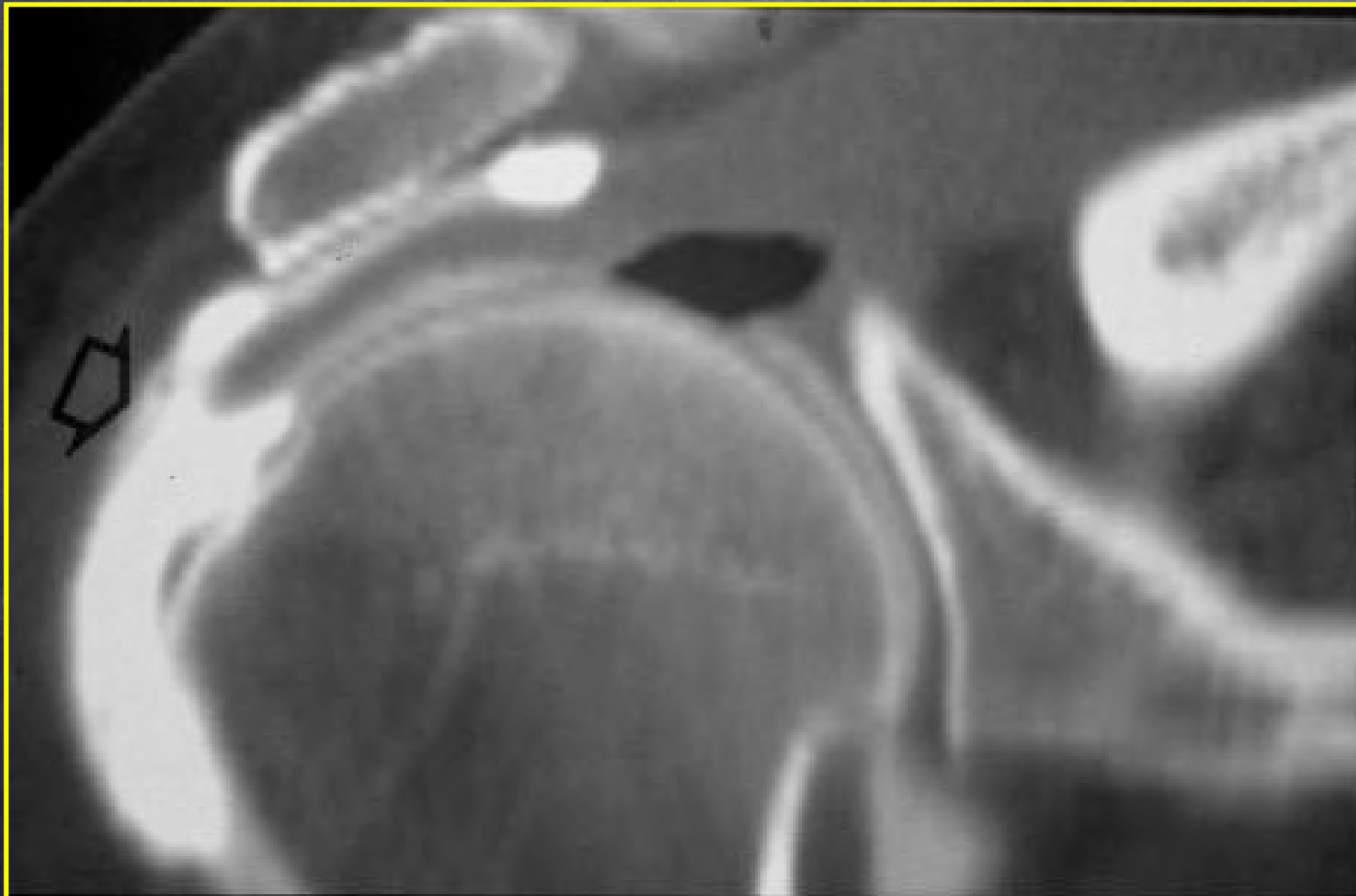
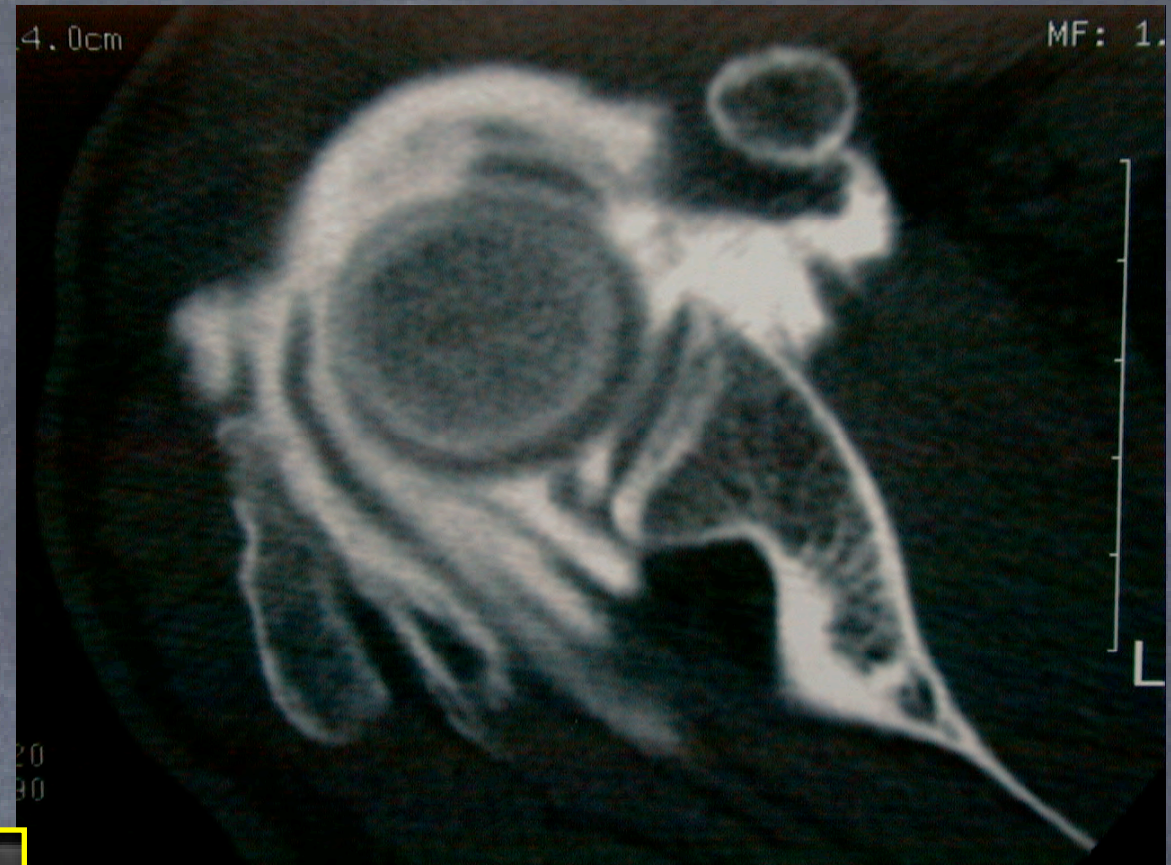






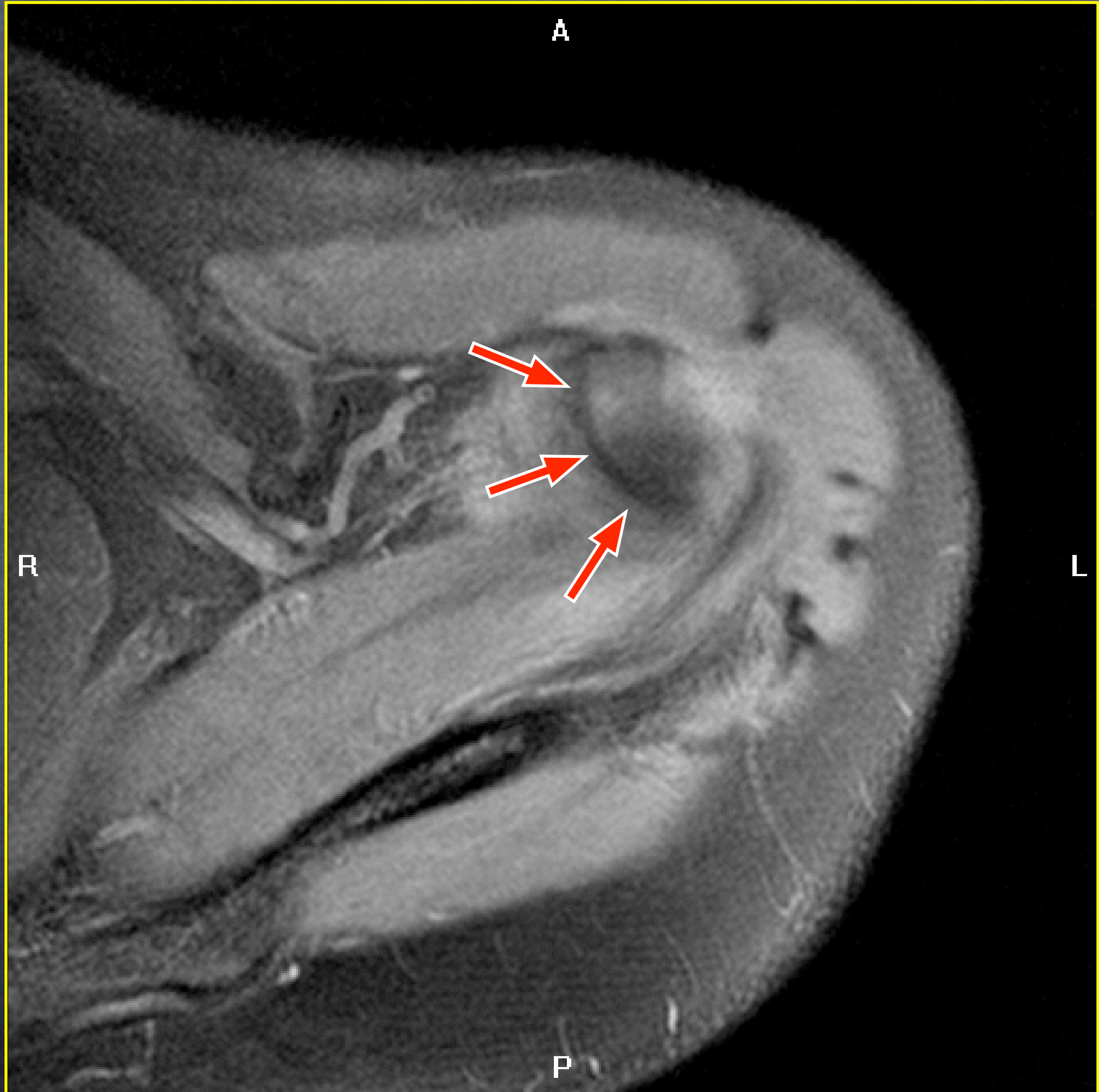


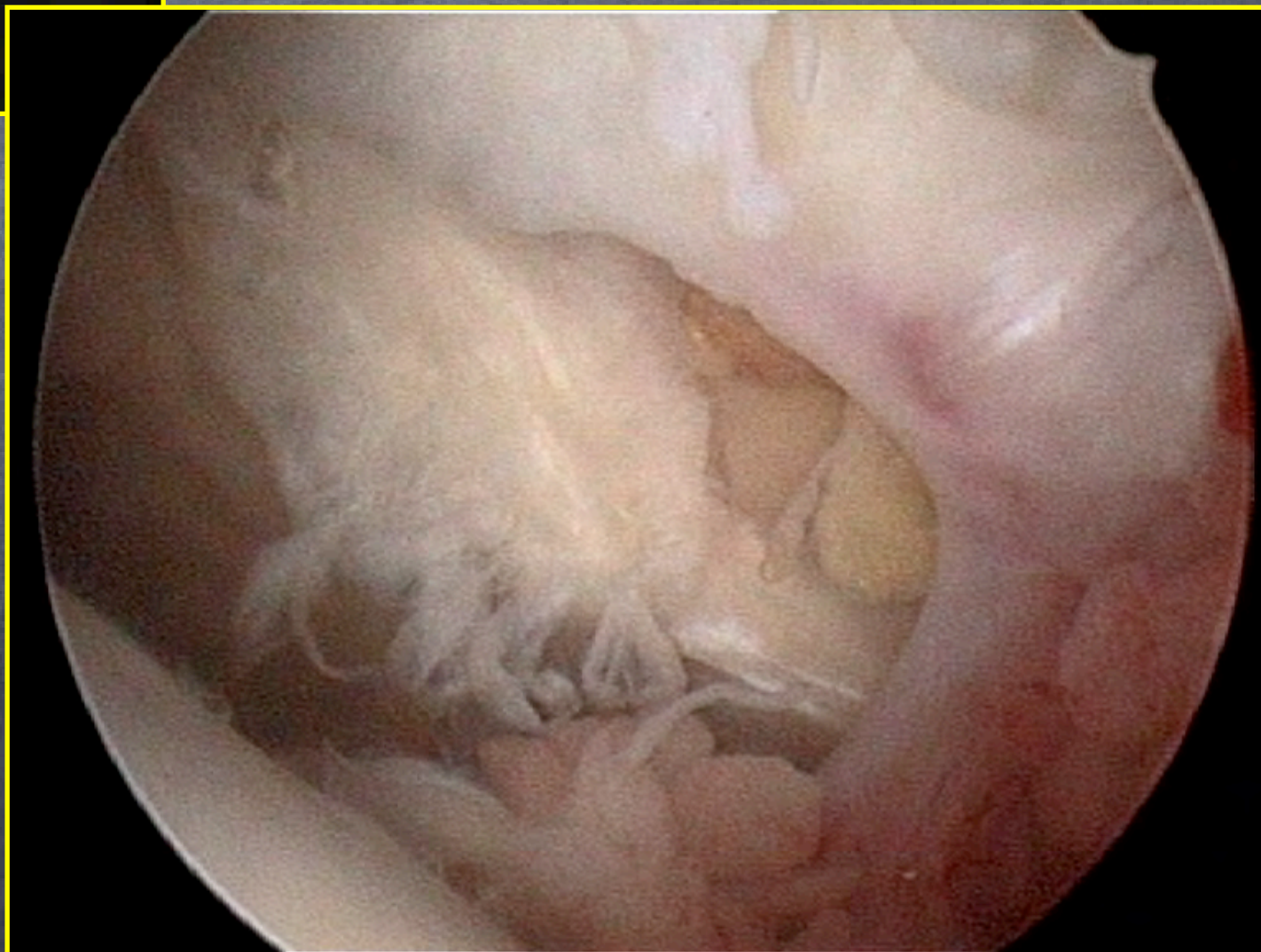
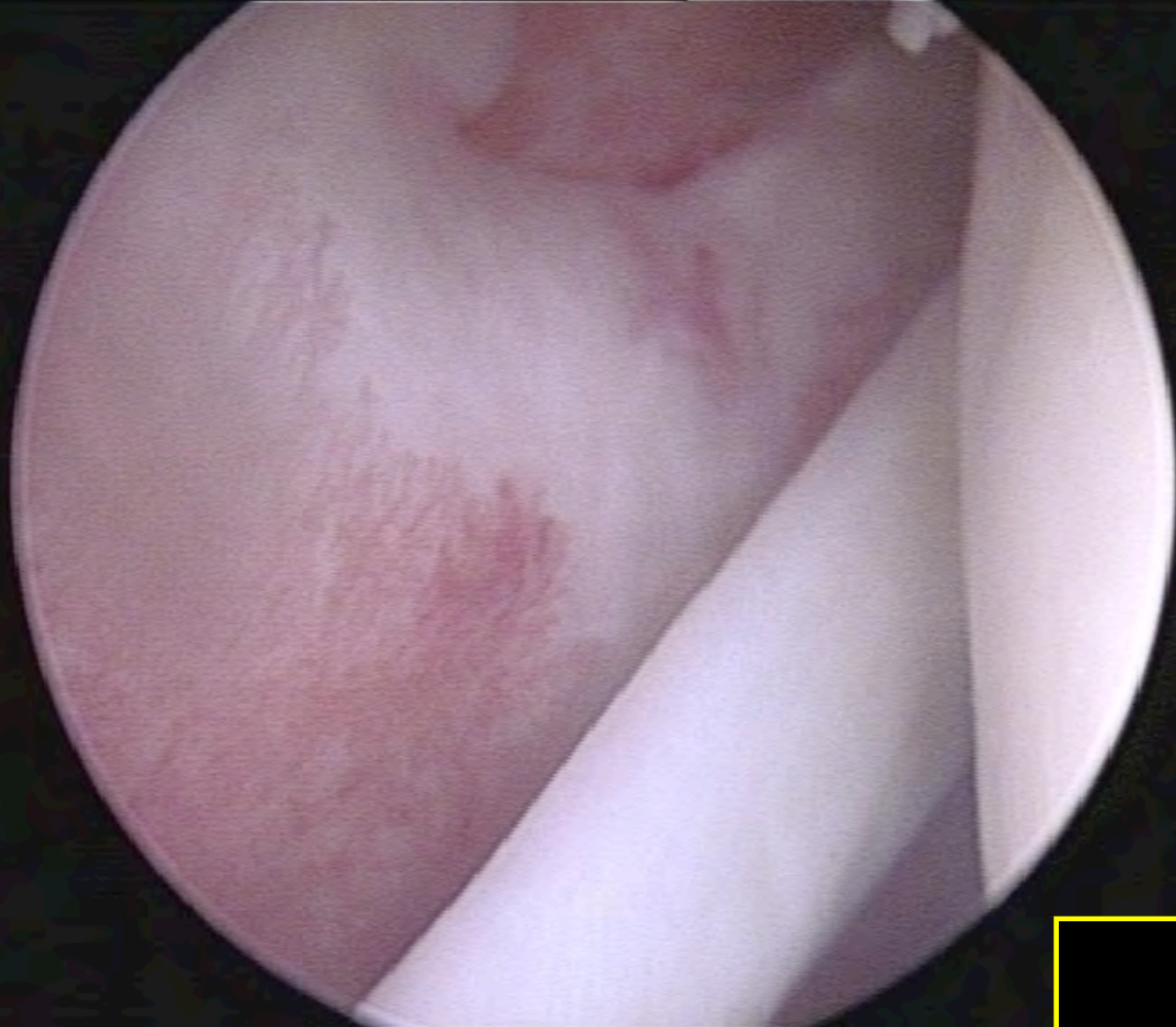
Supraspinatus ruptures may be seen on any of the three radiologic planes



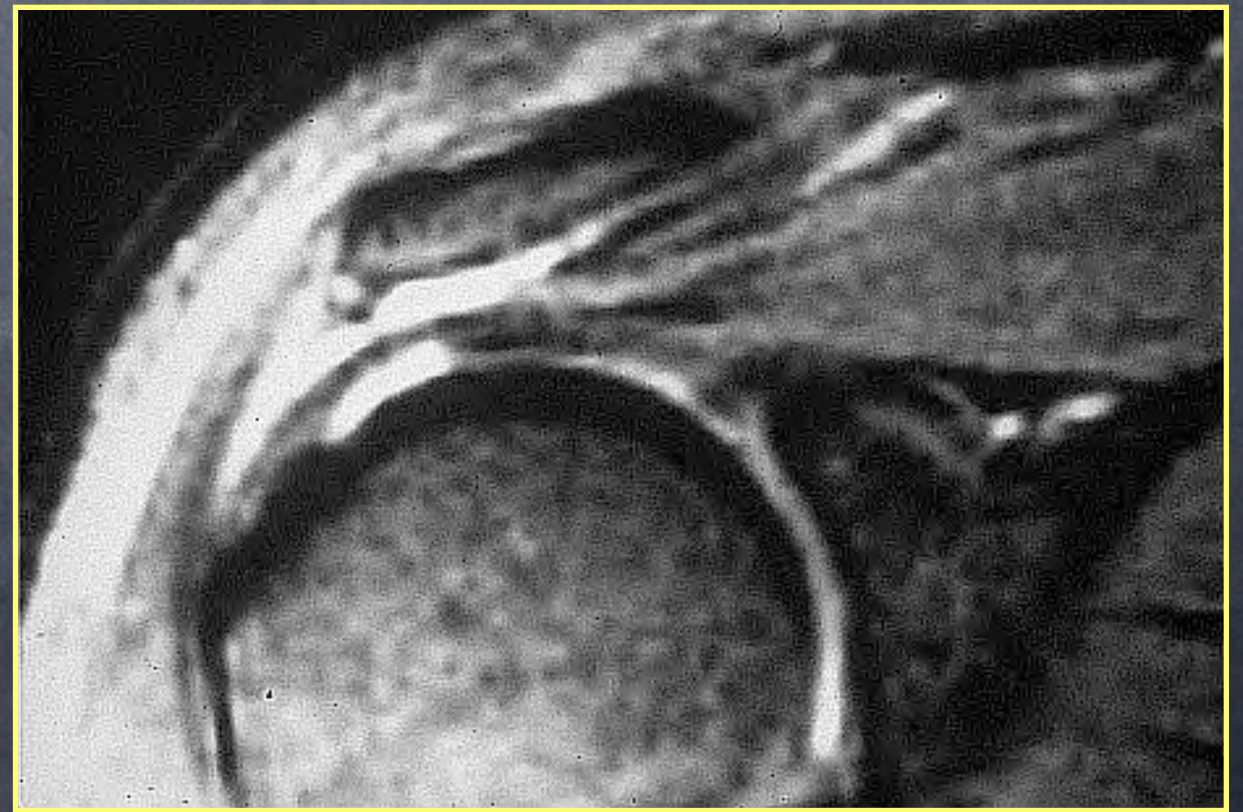
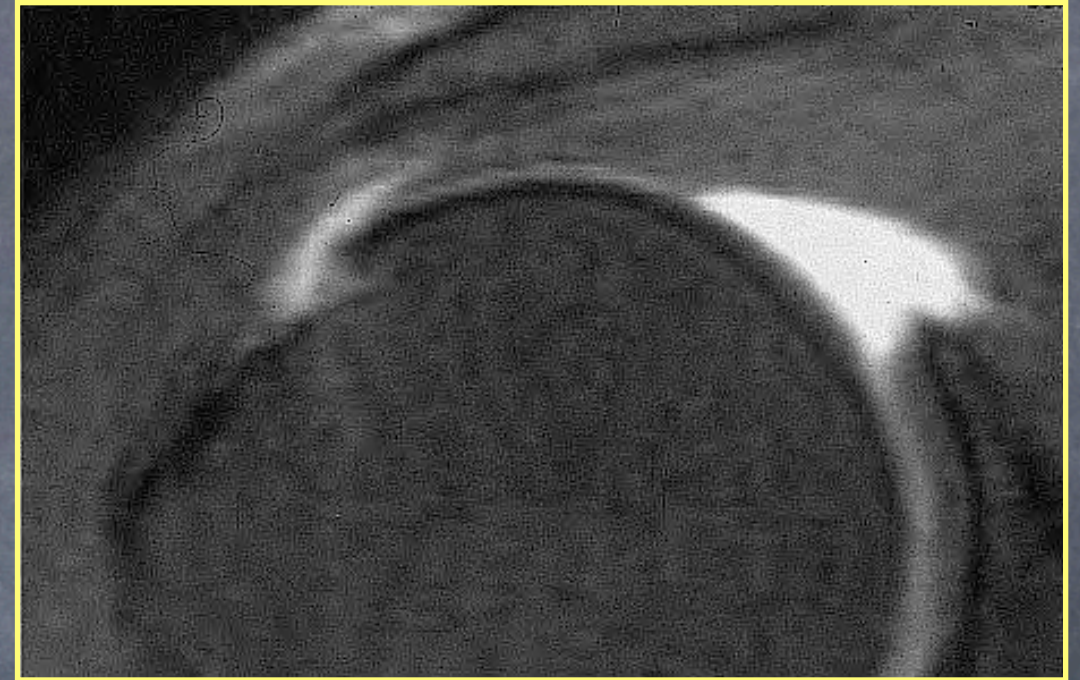
Supraspinatus ruptures may be seen on any of the three radiologic planes



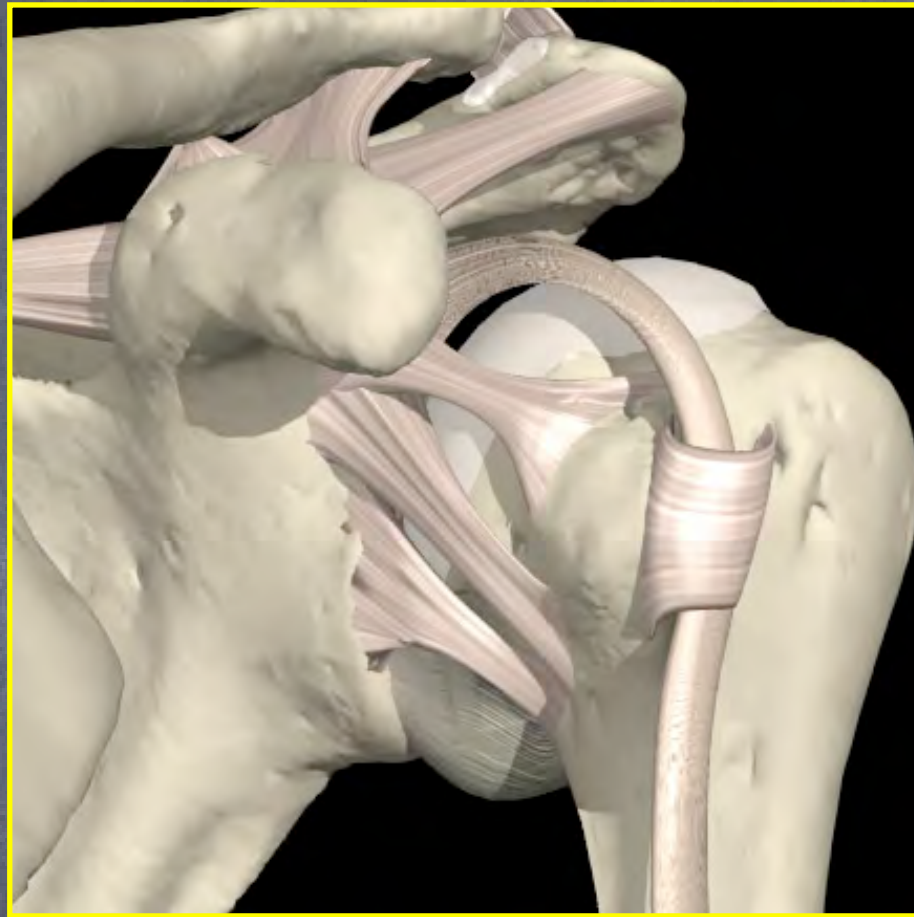




Partial ruptures

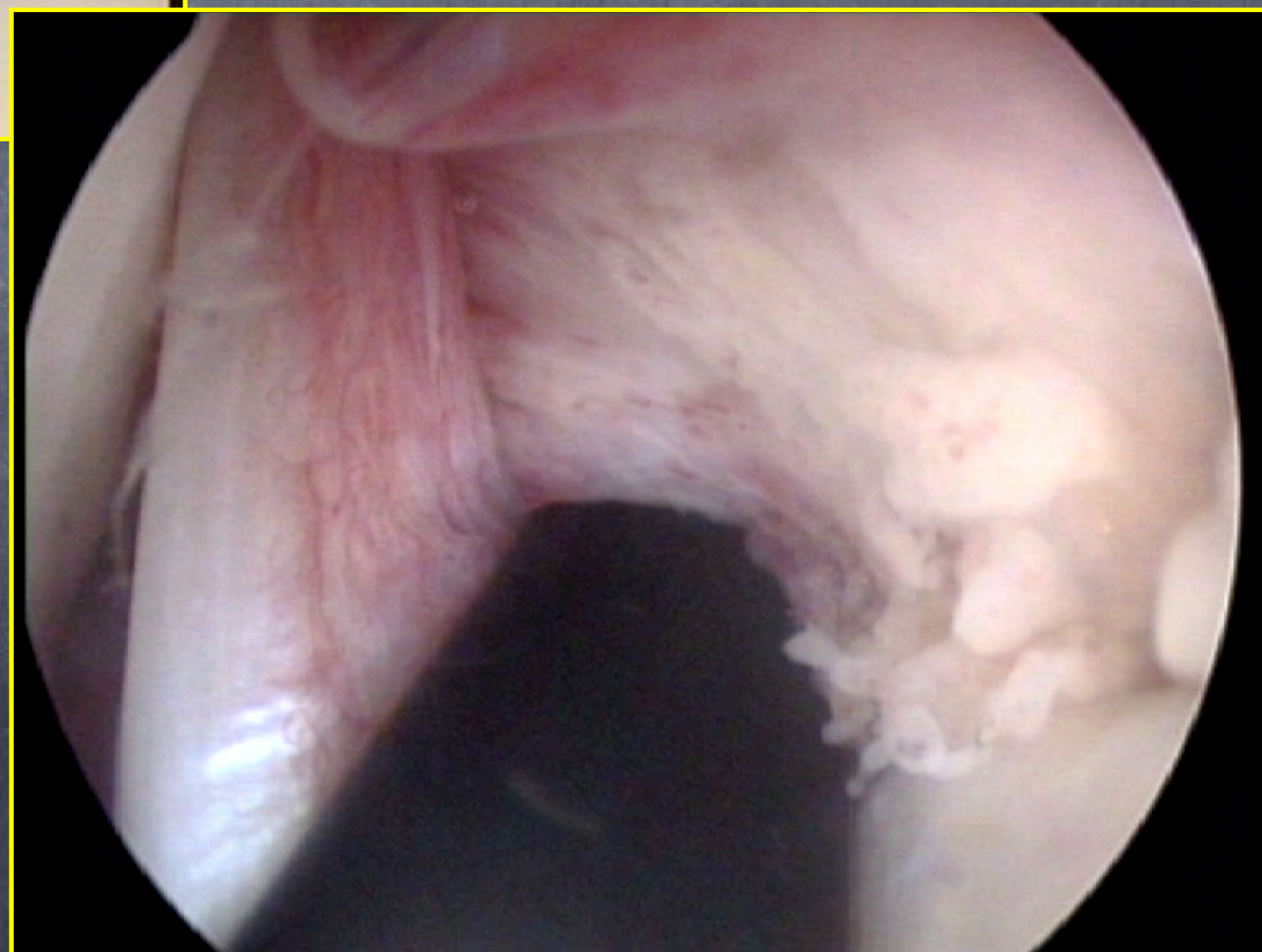


Biceps (caput longae)



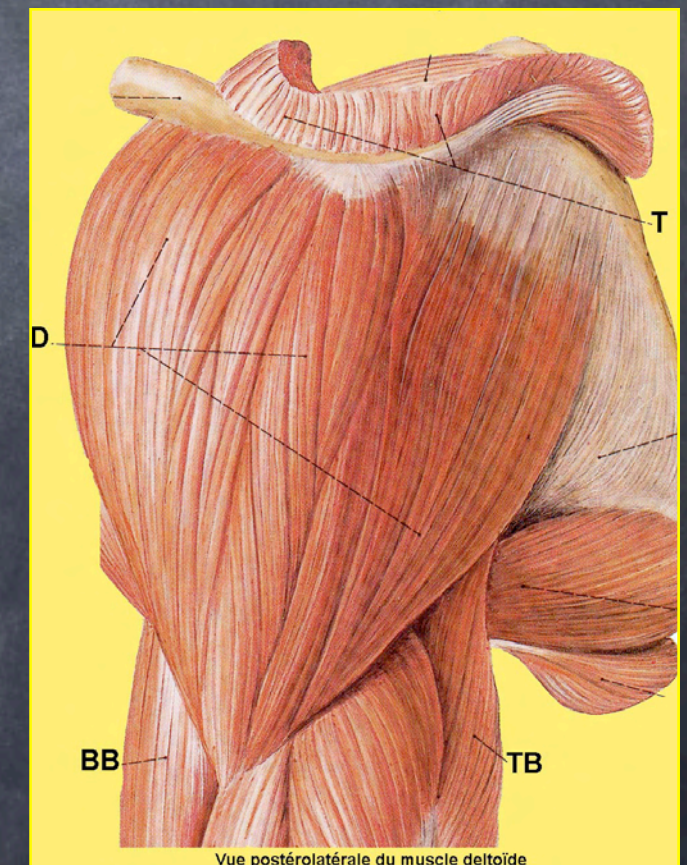
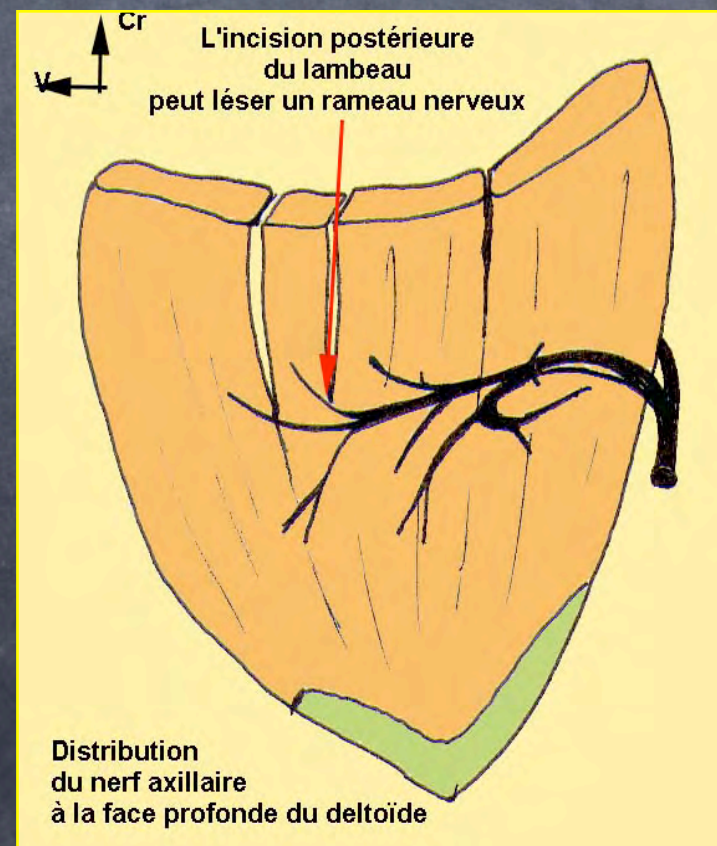
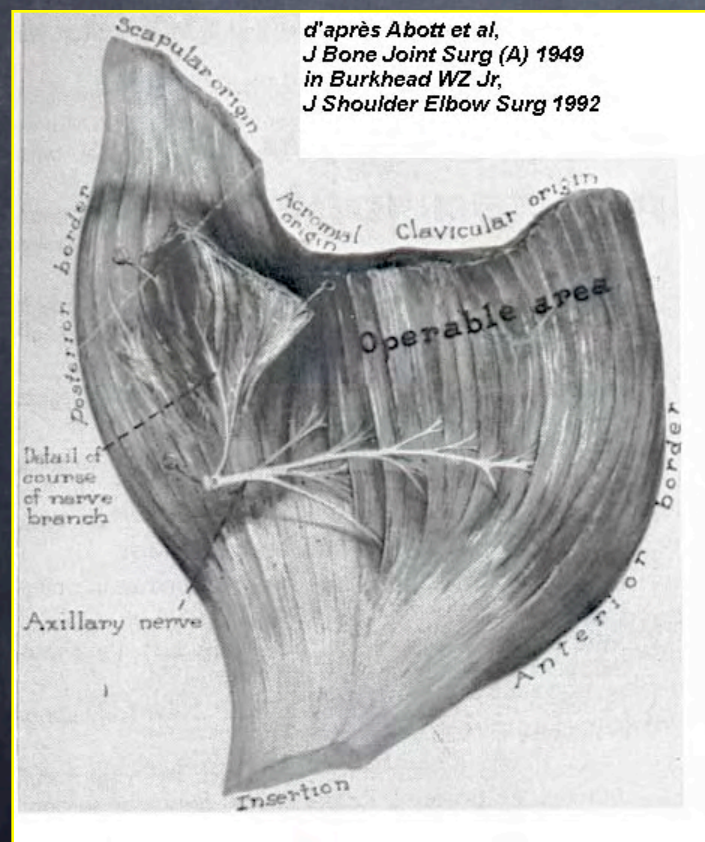
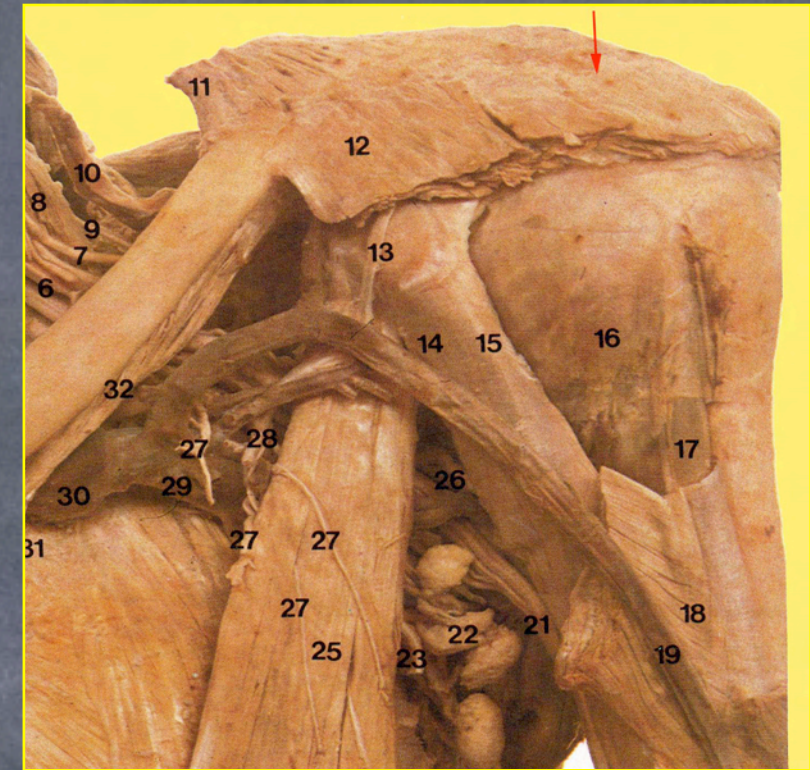
- The biceps tendon is not active during shoulder motion (it is a elbow flexor)
- However it resists antero-superior migration of the humeral head during activity

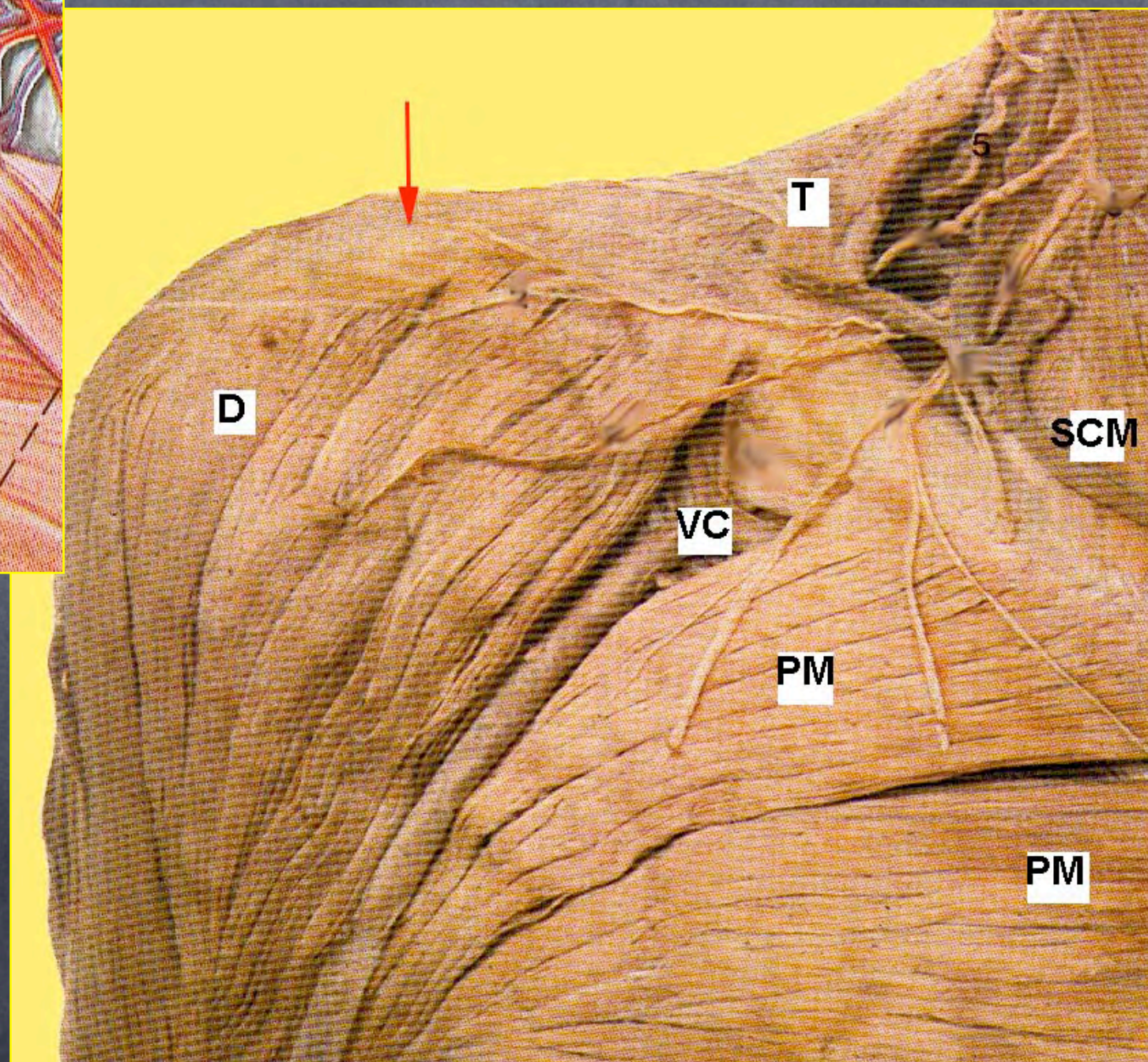
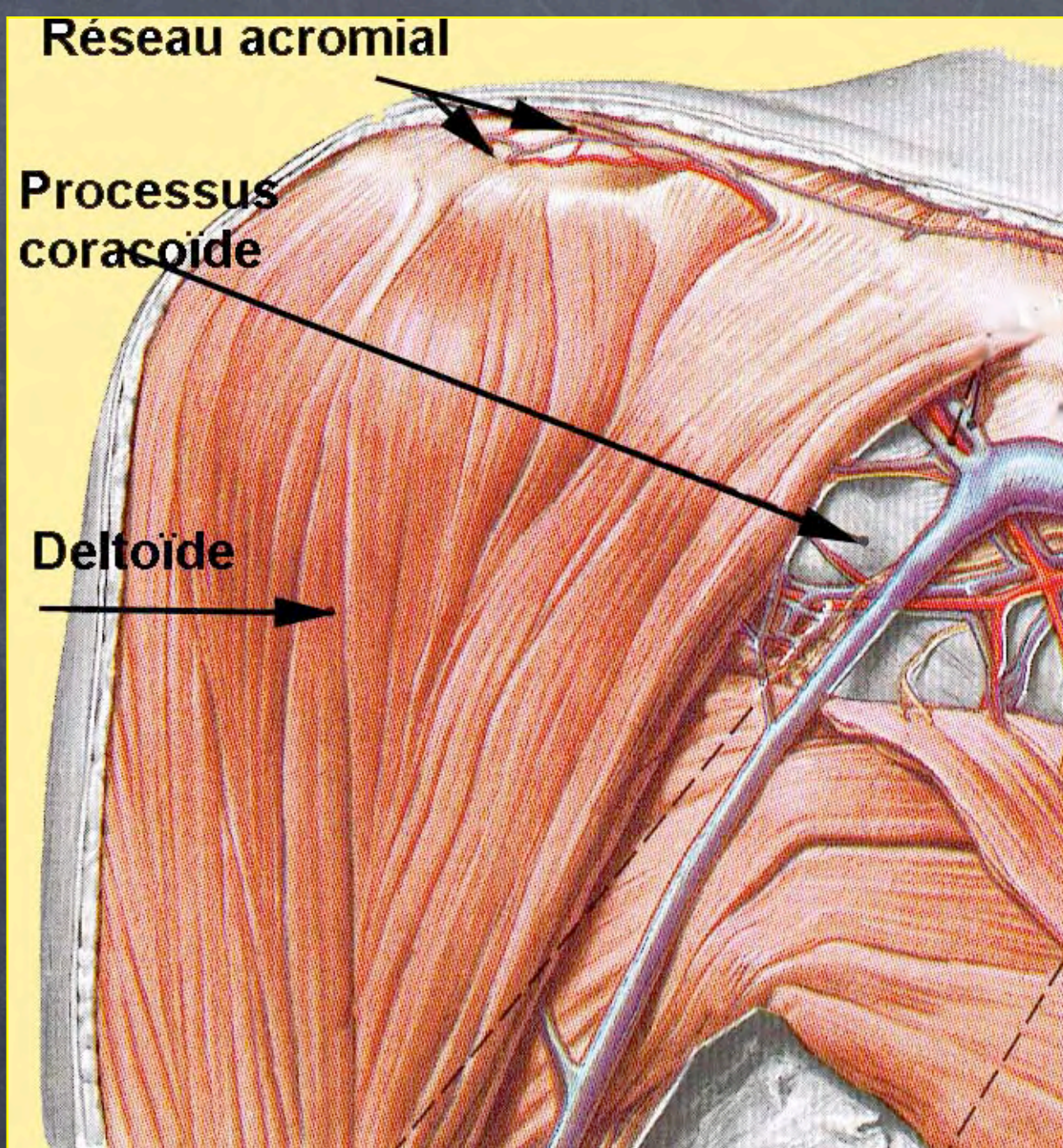




The deltoid muscle

- Deltoid: synergistic of the rotator cuff muscles
- Innervated by the axillary nerve





Conclusion

- As usually in surgery, knowledge of the anatomy is a prerequisite for:
 - Complete and efficient clinical examination
 - Reading and understanding imaging techniques
 - A adapted surgical technique