

MR IMAGING OF THE ROTATOR CUFF

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MR IMAGING OF THE ROTATOR CUFF

LEARNING OBJECTIVES

- Review relevant anatomy/MR imaging planes
- Review MR appearance of rotator cuff tears
- Discuss problem rotator cuff tears
- Discuss mimics of rotator cuff tear
- “What the surgeon wants to know”
 - The radiology report

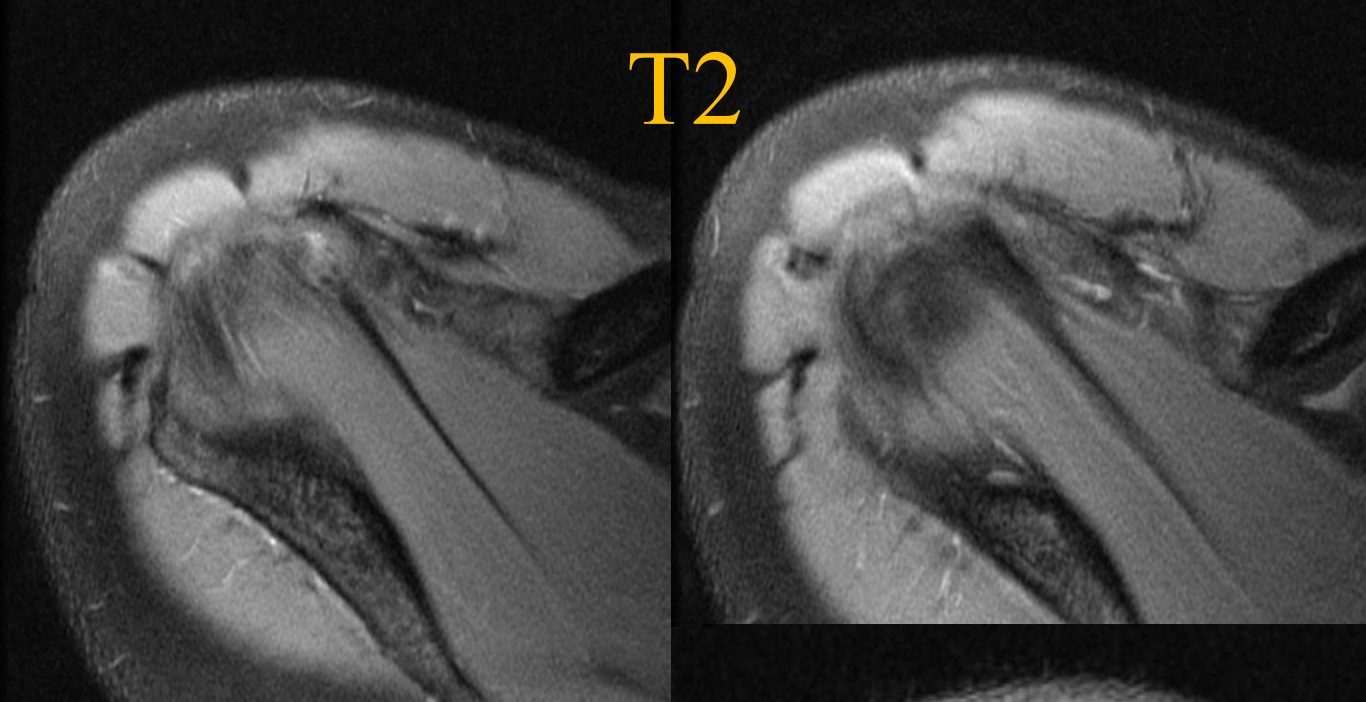
MR IMAGING ROTATOR CUFF TECHNIQUE

- Coil – dedicated shoulder
- Slice thickness – 3-4 mm
- Matrix – 256x192 or higher to 512
- FOV – 14-16 cm
- Patient position
 - External rotation vs neutral
 - ABER
- Contrast – Indirect or Direct

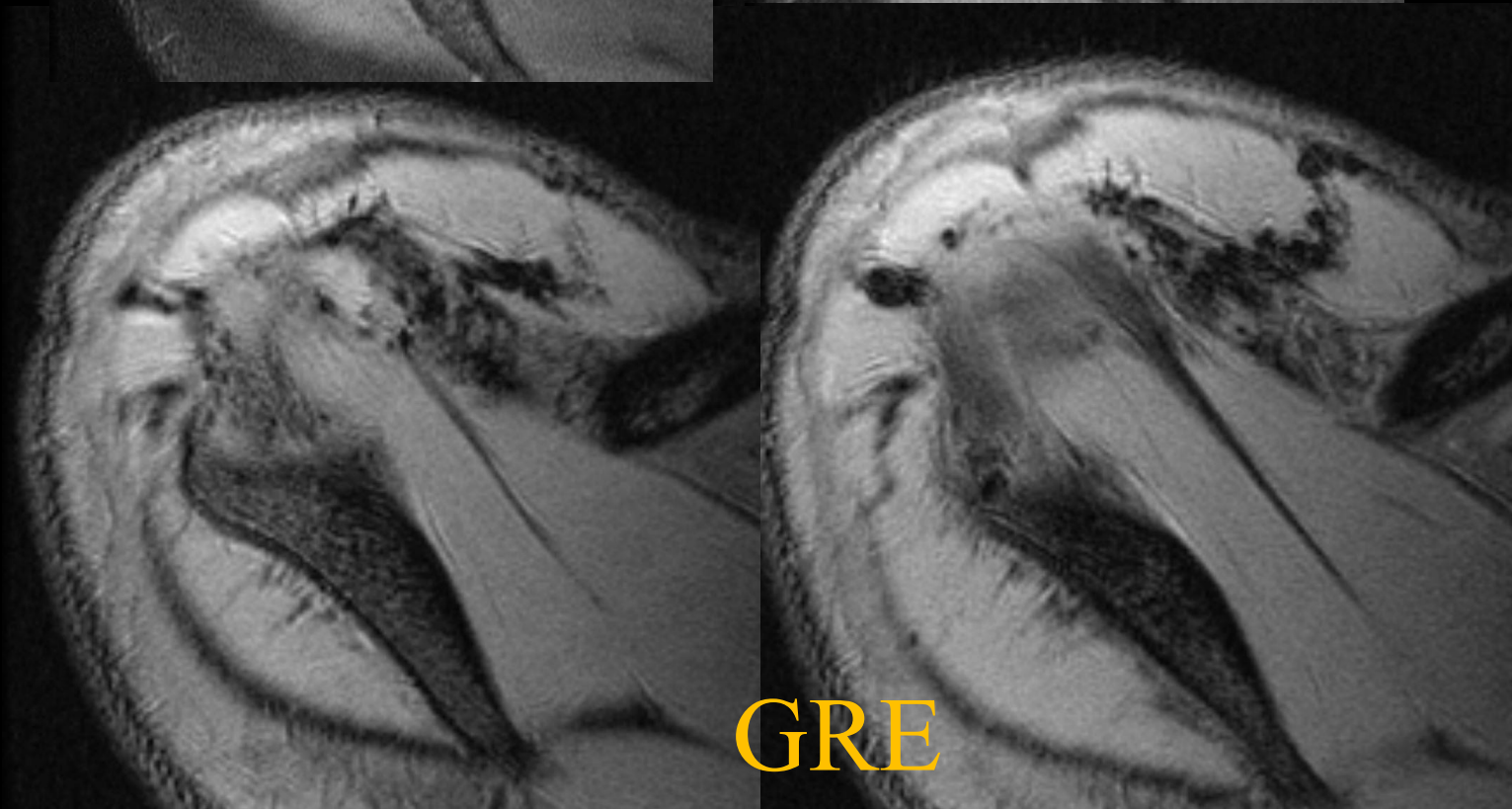
MR IMAGING ROTATOR CUFF OUR TECHNIQUE

- Axial T2 FS FSE, Axial GRE
- Coronal oblique PD and FS FSE T2
- Sagittal oblique T1 and FS FSE T2

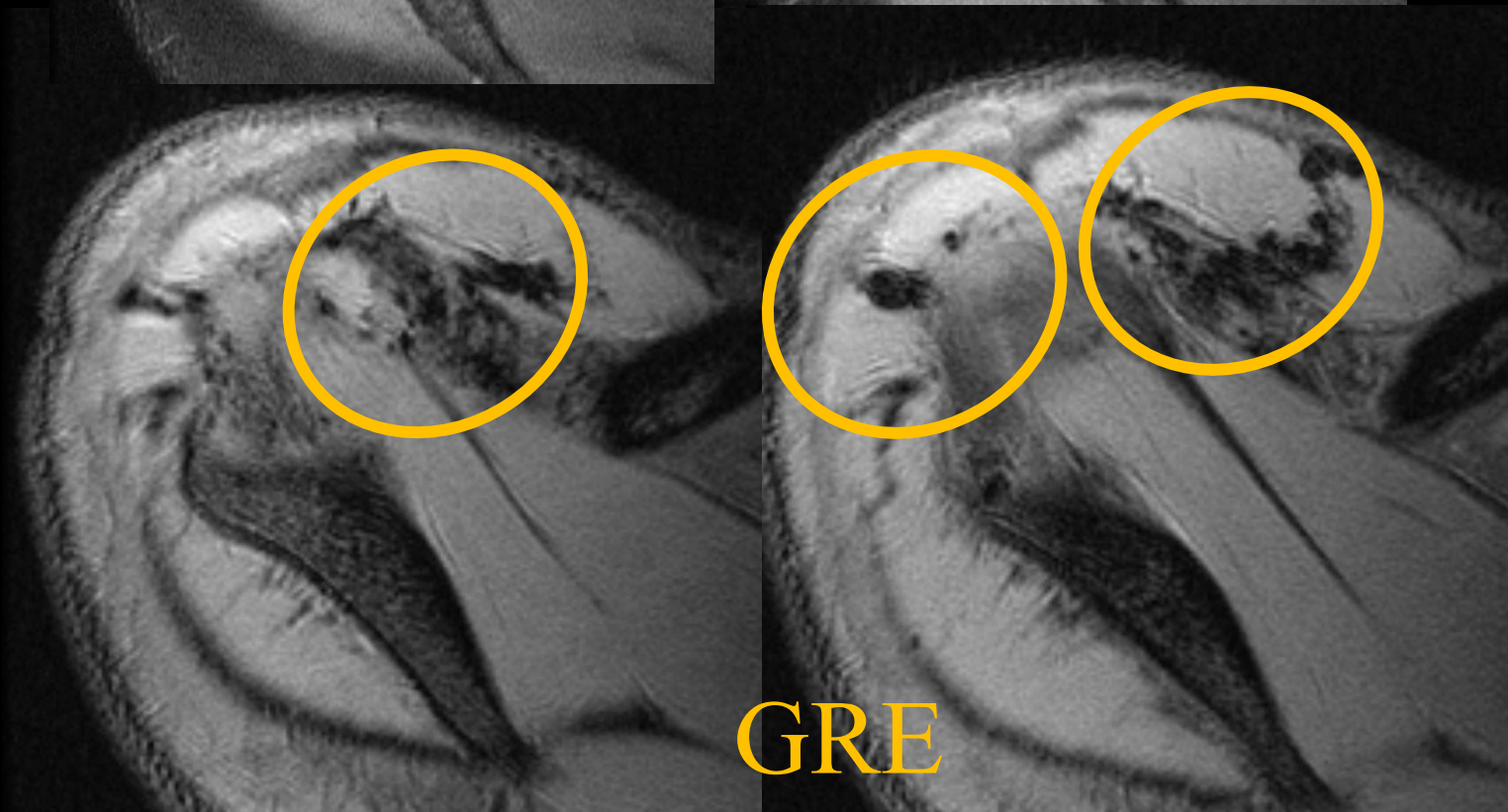
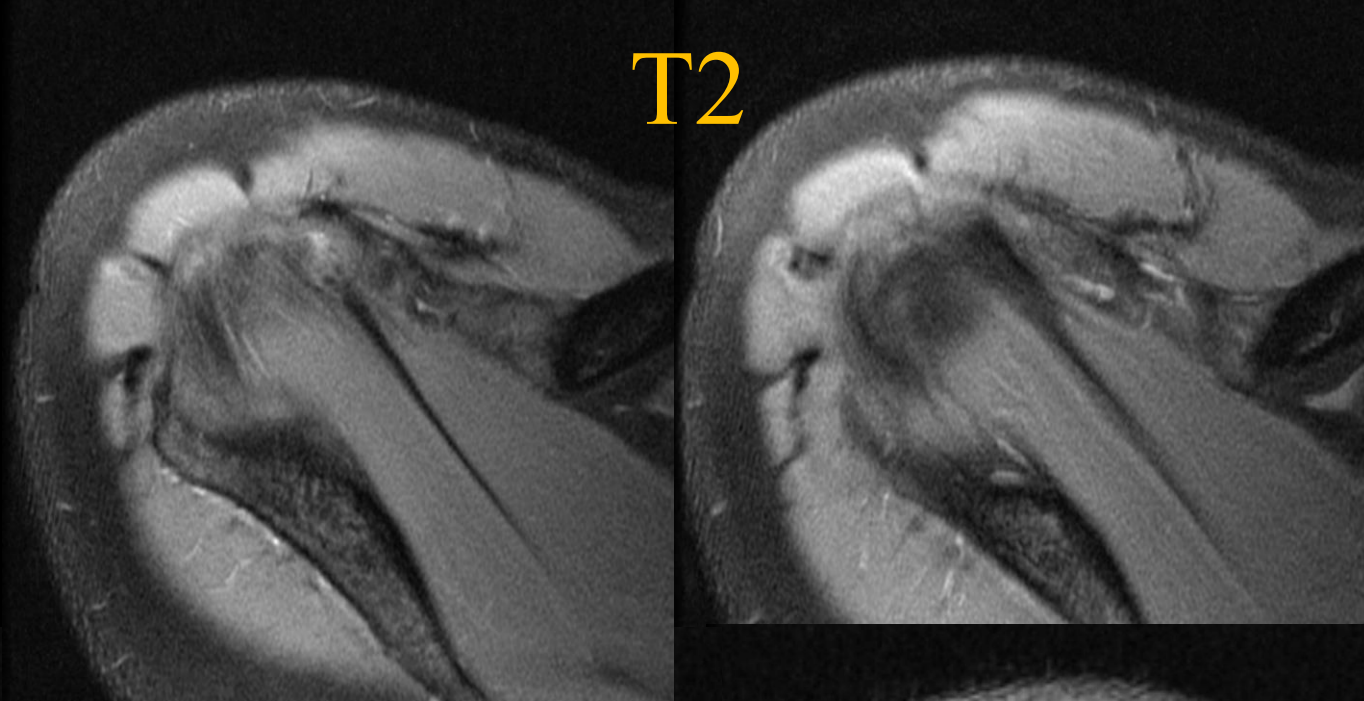
T2



GRE



T2



GRE

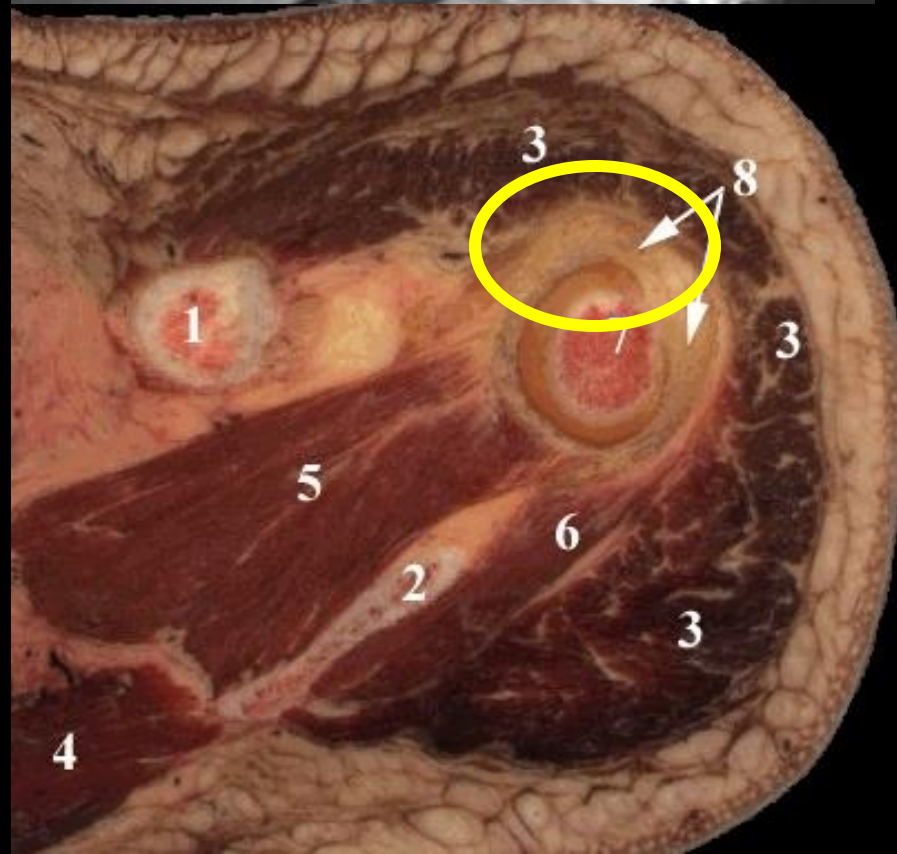
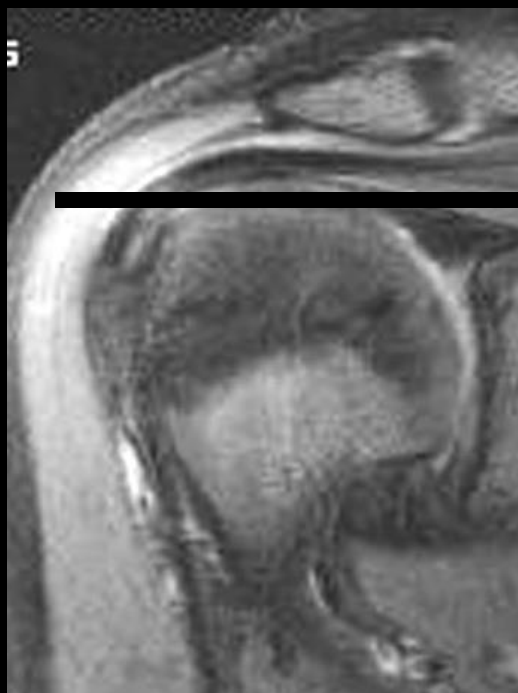
MR ARTHROGRAPHY TECHNIQUE

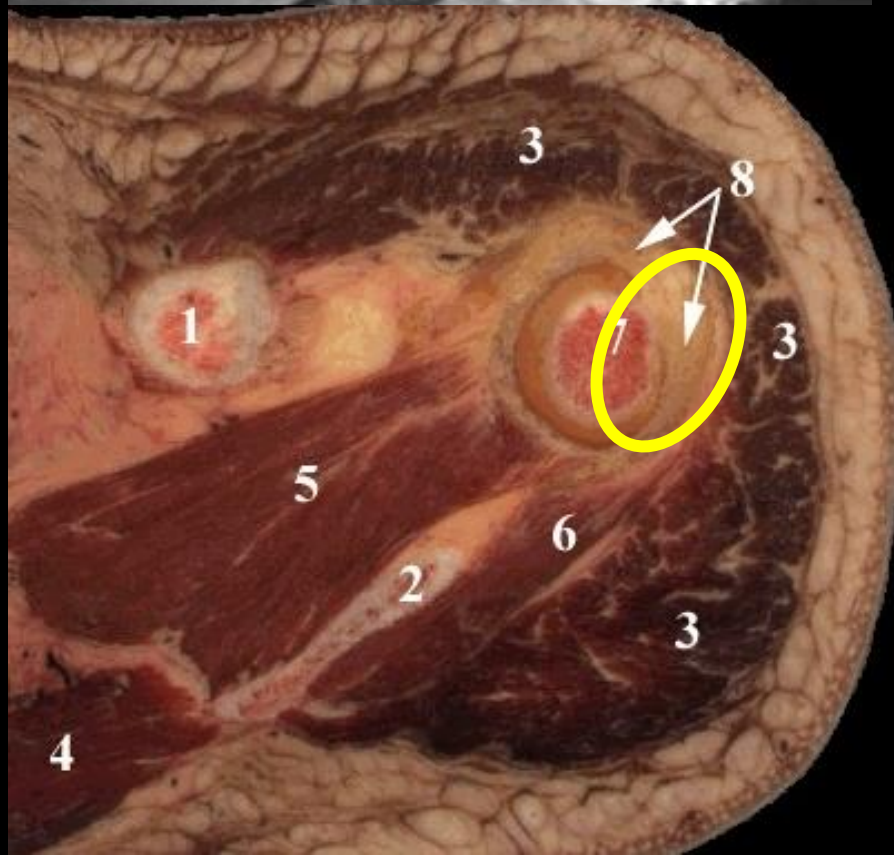
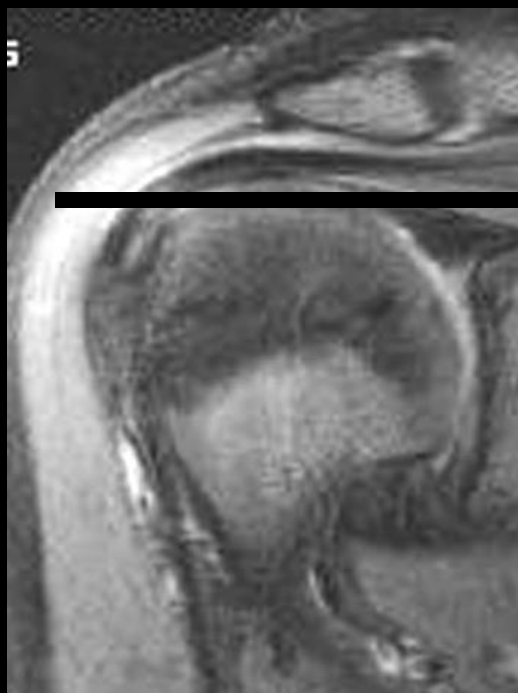
- 12-16cc (I put in less 8-12cc) mixture of contrast and gadolinium (10:10:0.1)
- Axial, oblique sagittal and oblique coronal FS T1-weighted images
- Additional fluid sensitive sequences

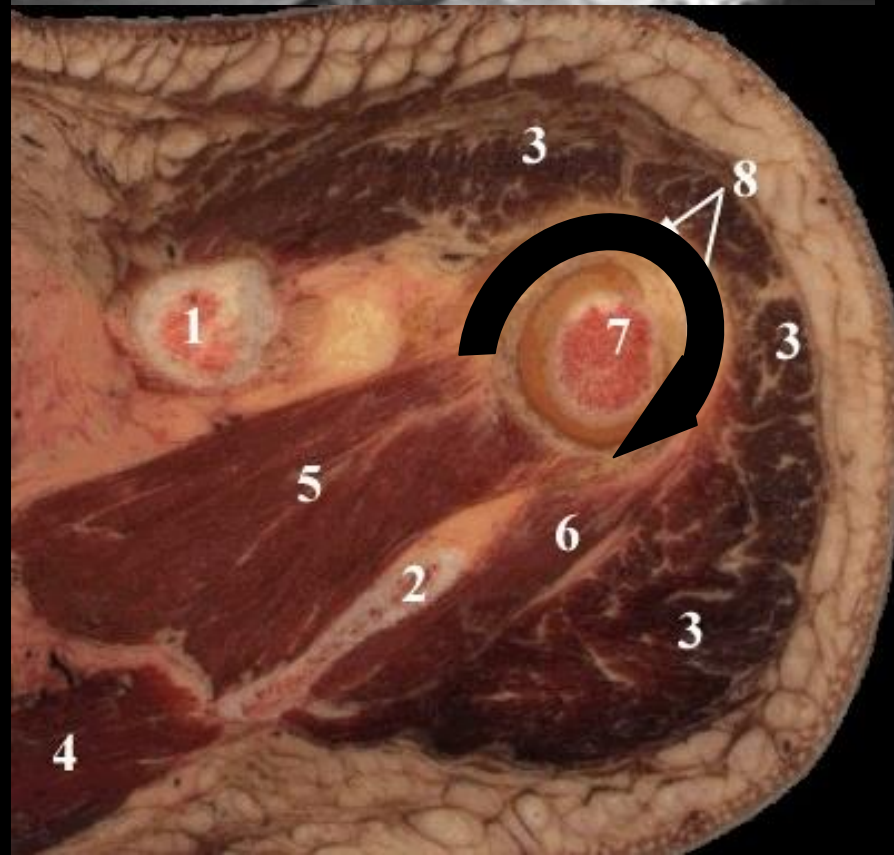
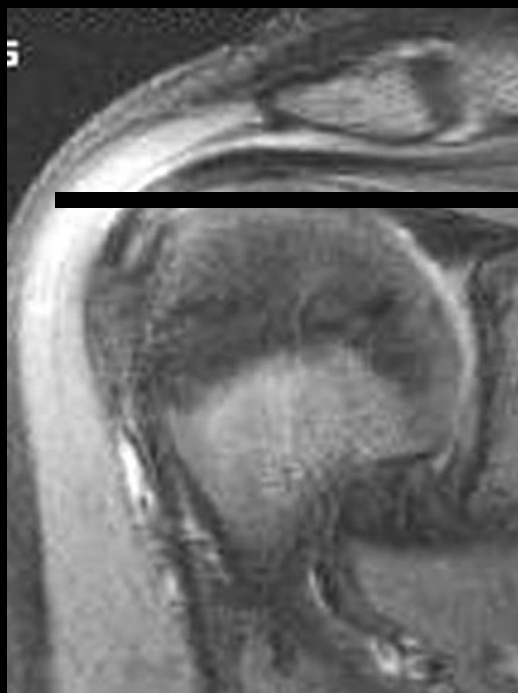
MR IMAGING PLANES

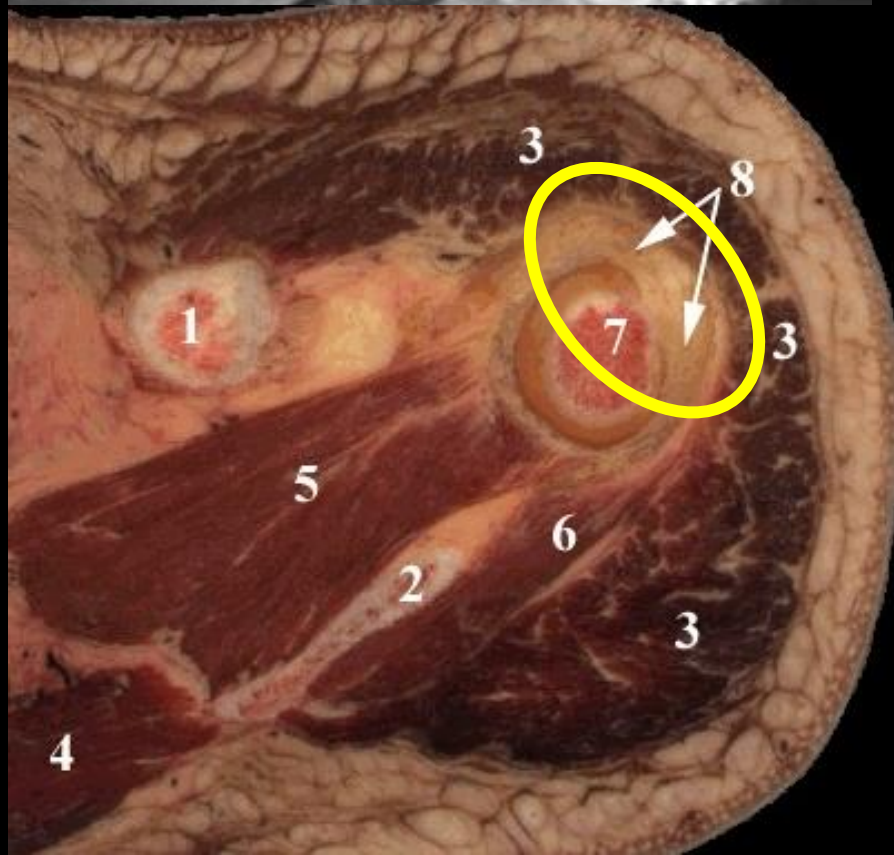
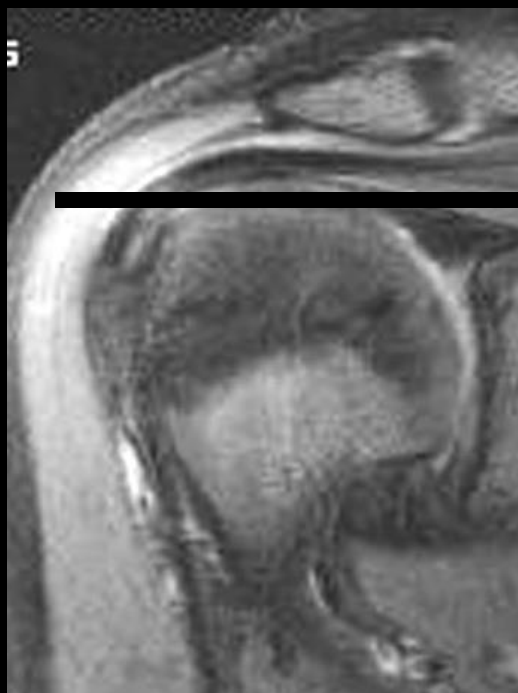
- Axial
 - Assess subscapularis, biceps tendon
- Coronal oblique
 - Parallel to supraspinatus tendon
 - Assess all tendons
- Sagittal oblique (FSE T2)
 - 90° to coronals
 - Assess all tendons

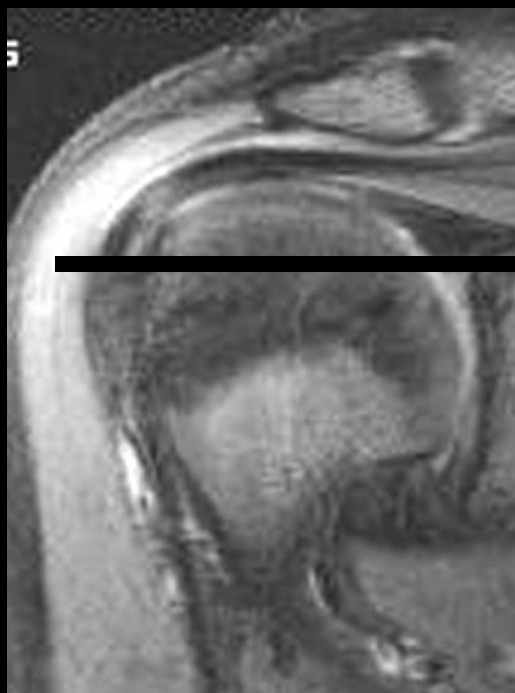


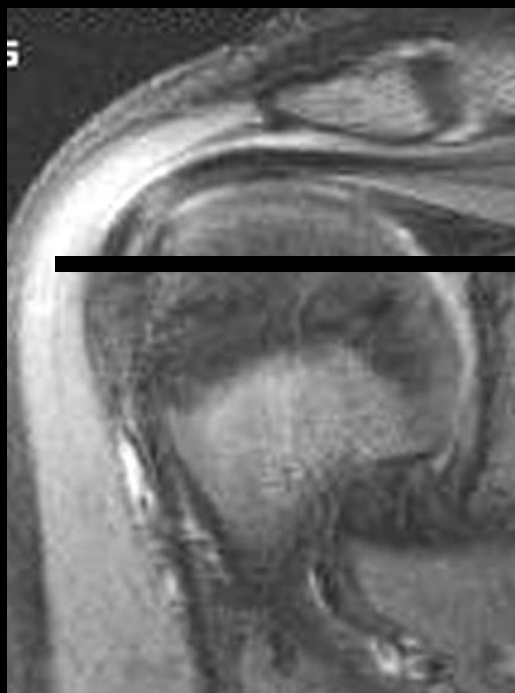


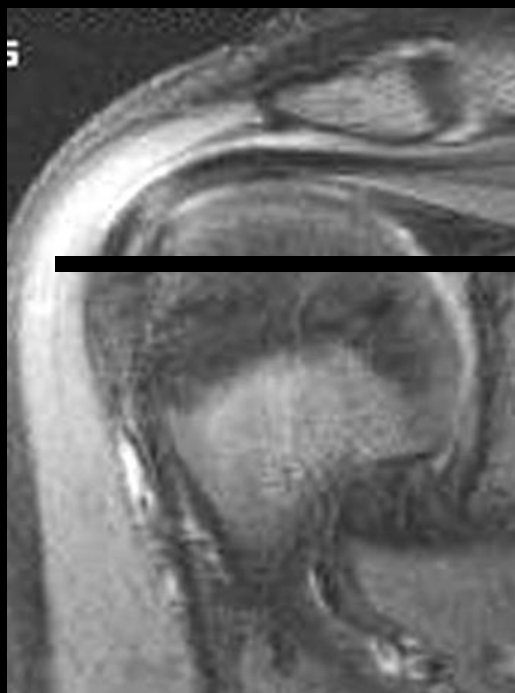


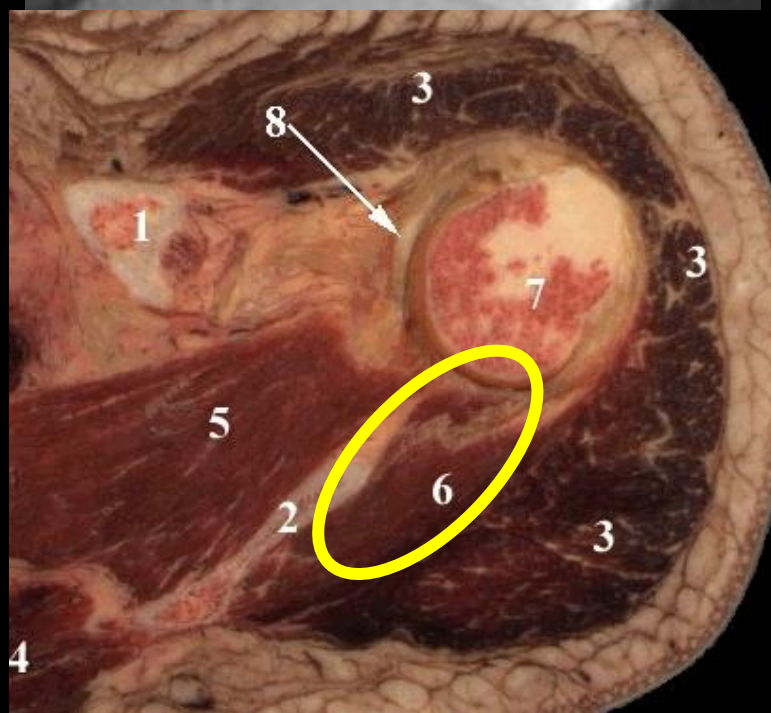


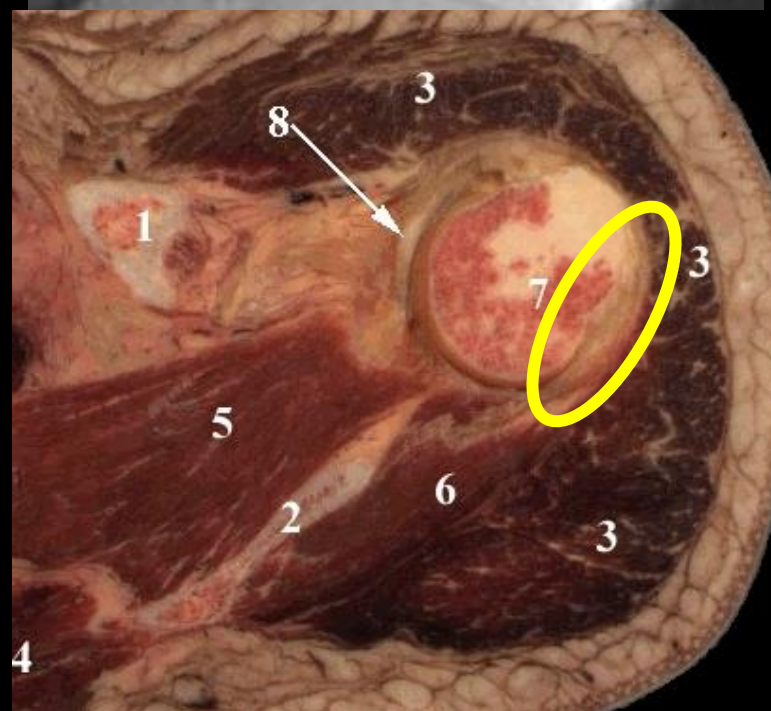
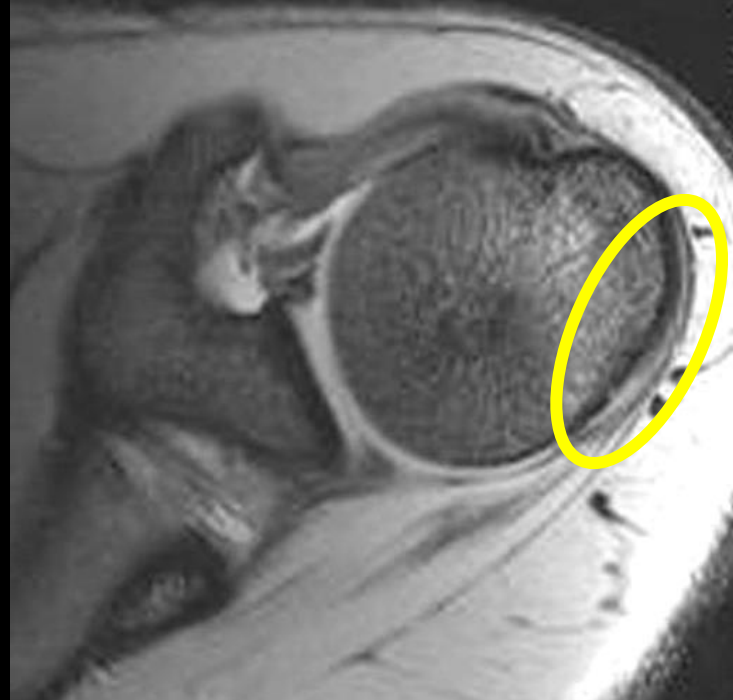












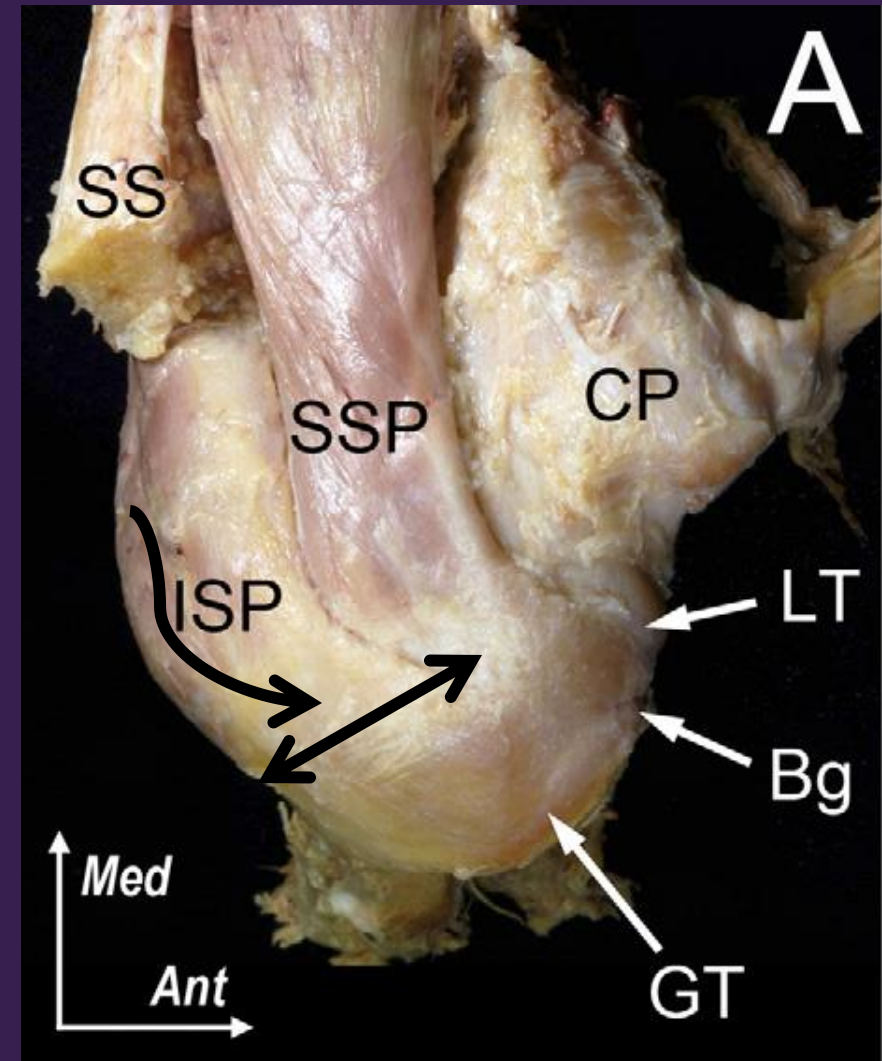
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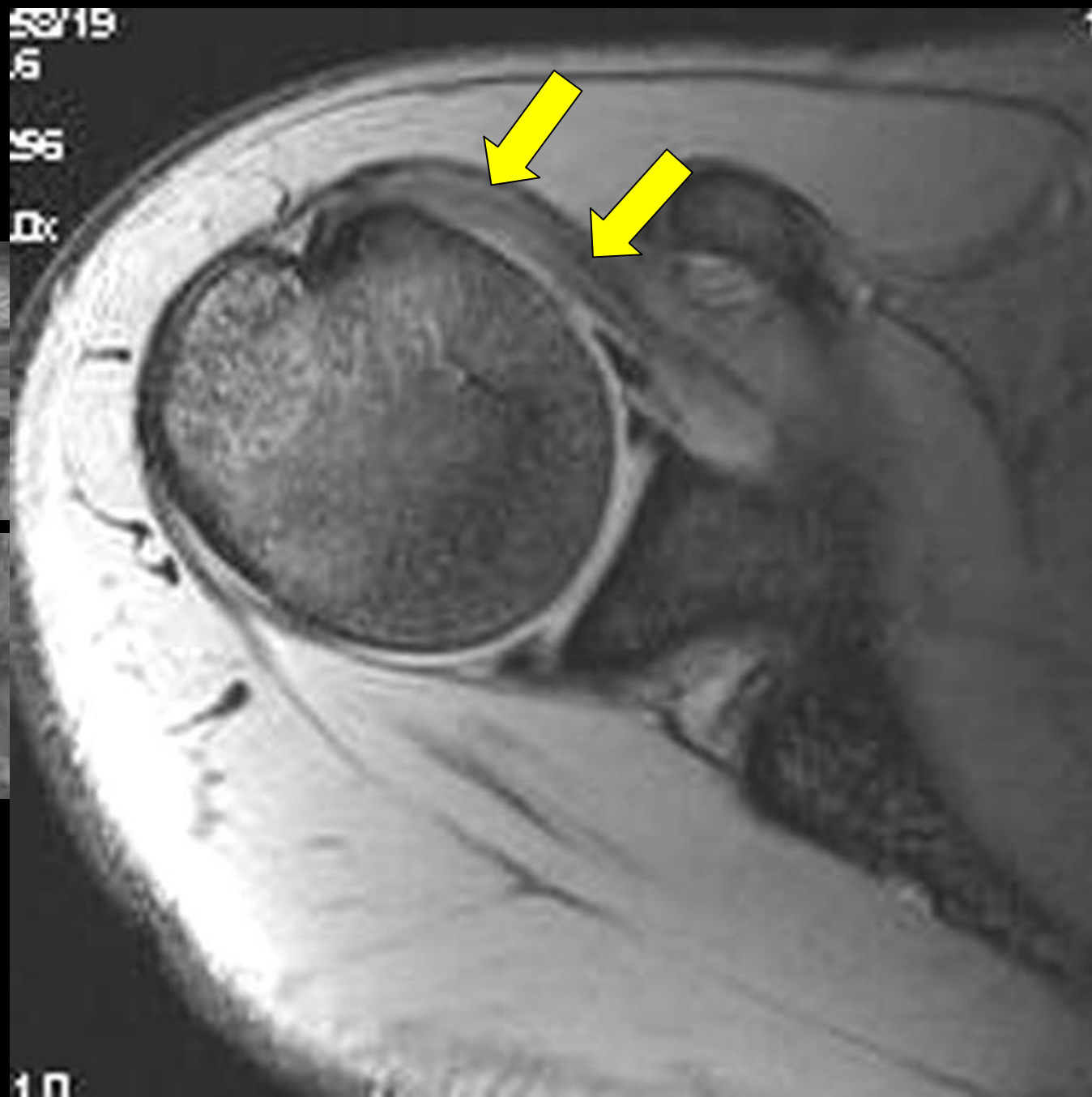
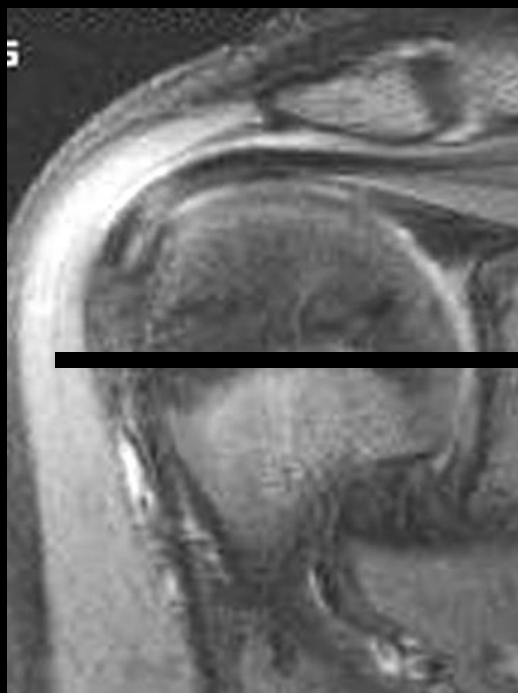
IS tendon curves forward

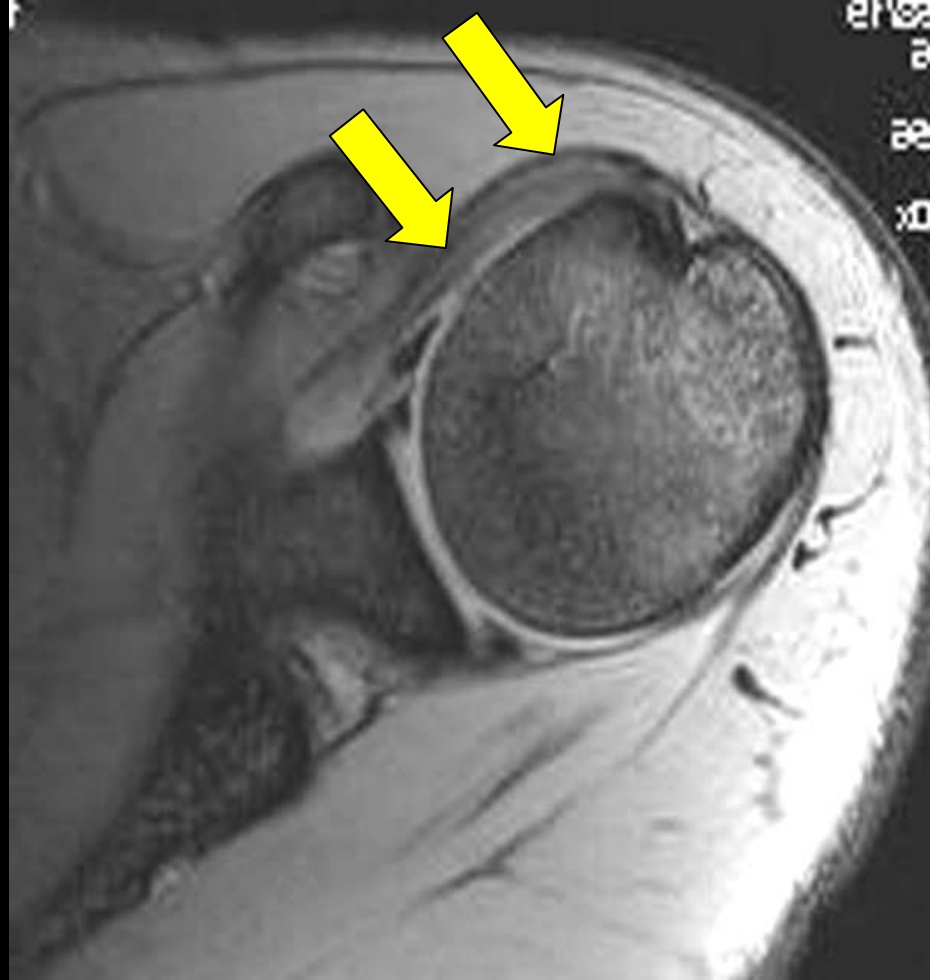
Large footprint – 3.3 cm

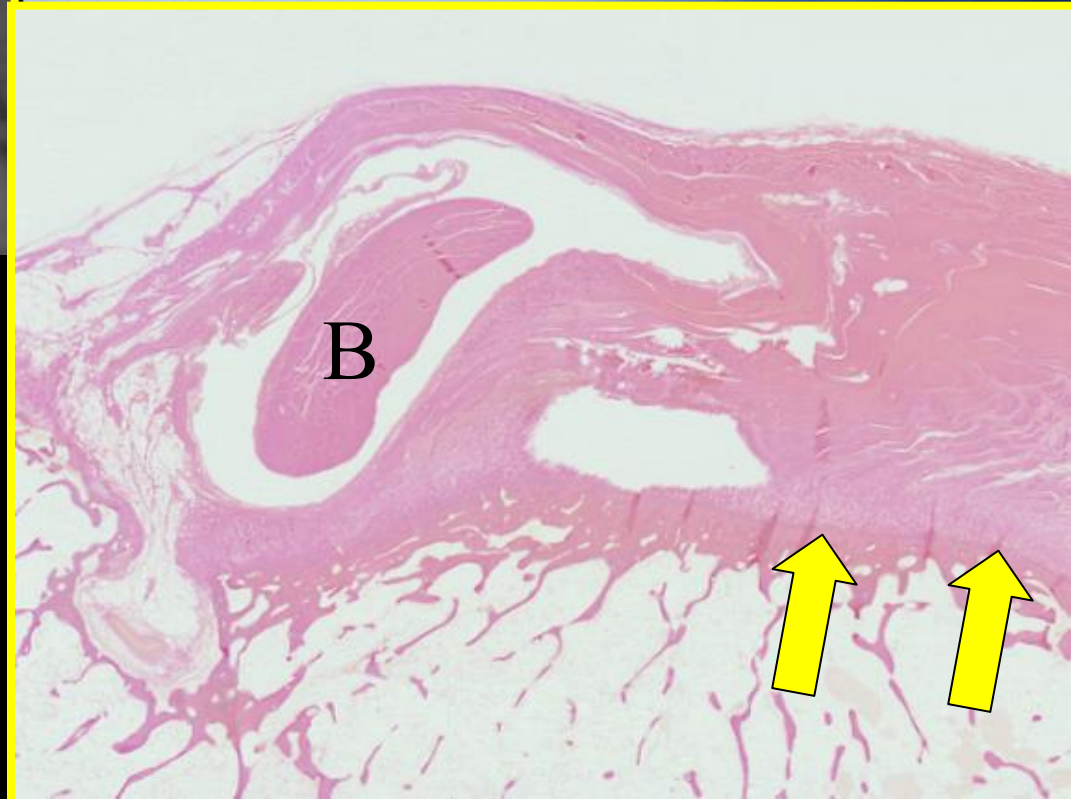
Overlaps SS – 12-13 mm

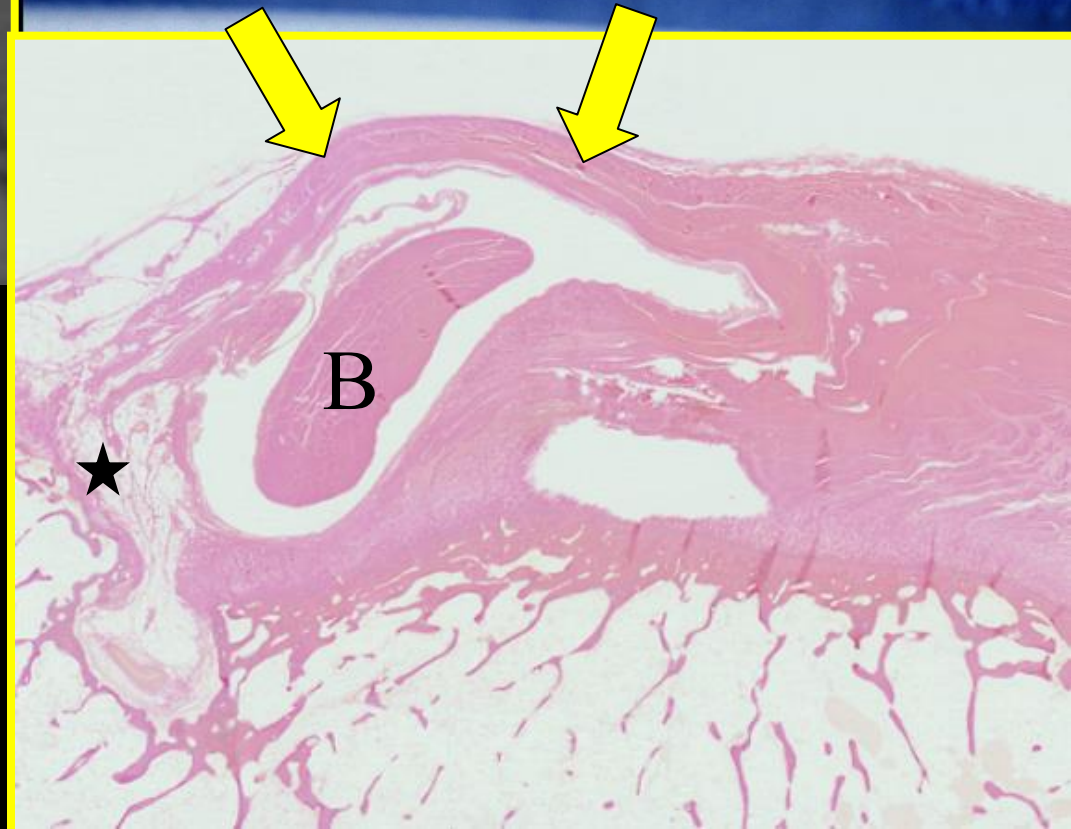
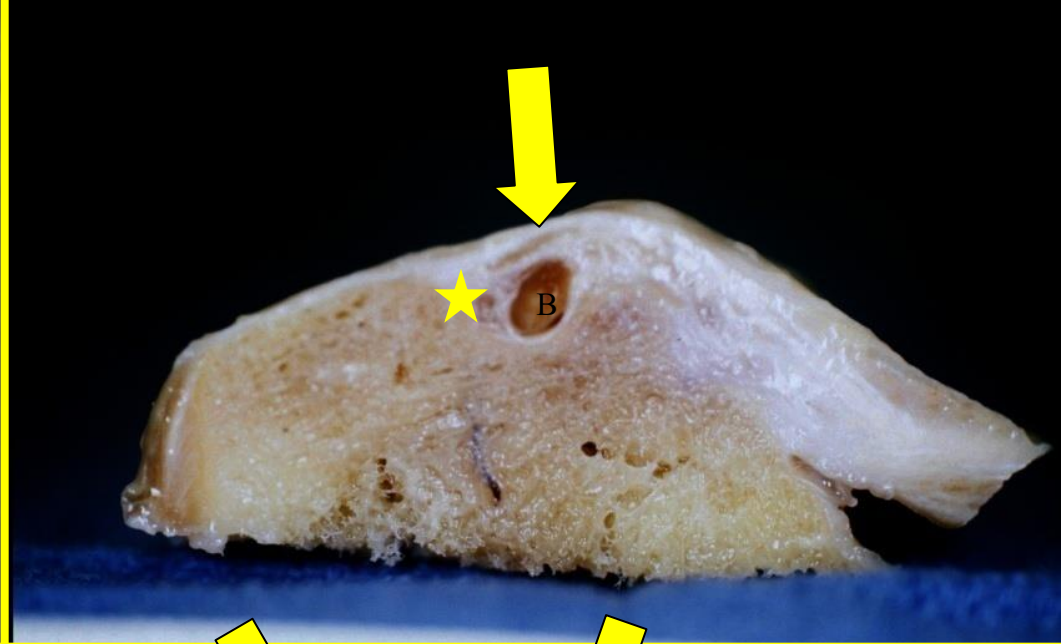
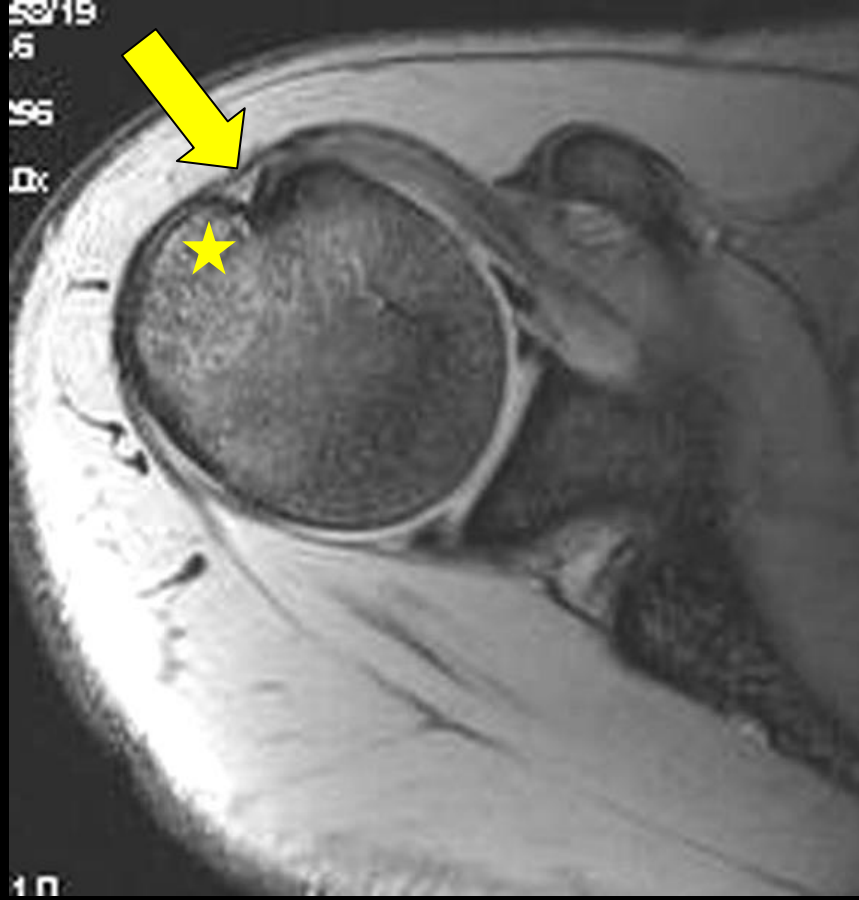
J Bone Joint Surg Am.
2008;90:962-9

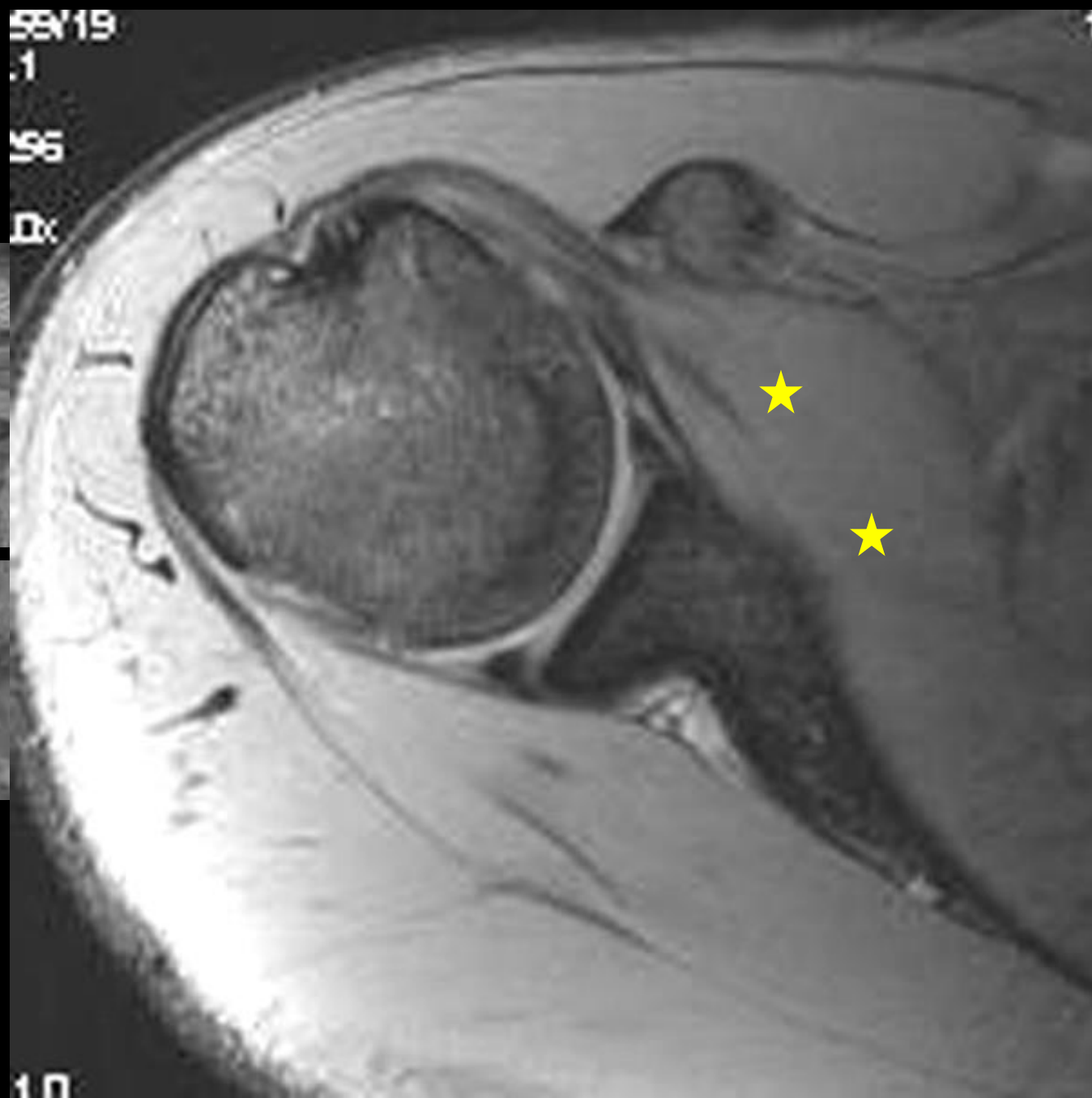
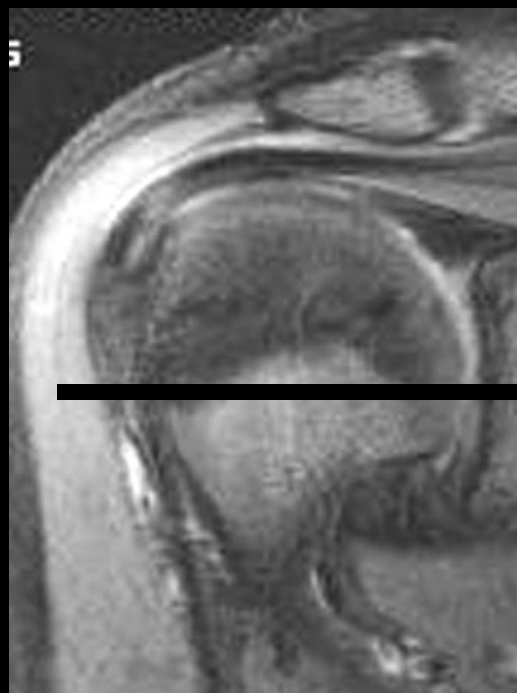


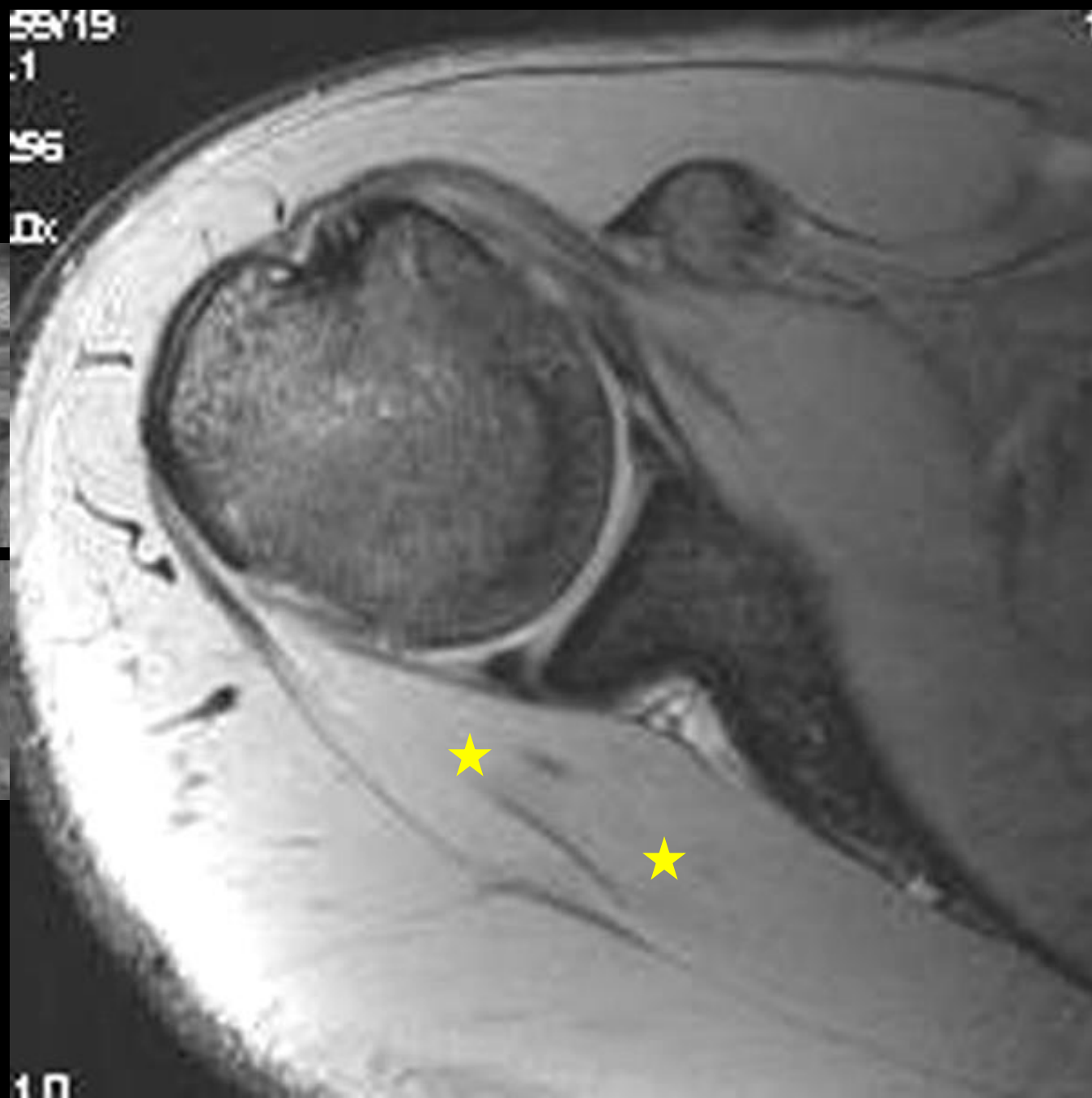
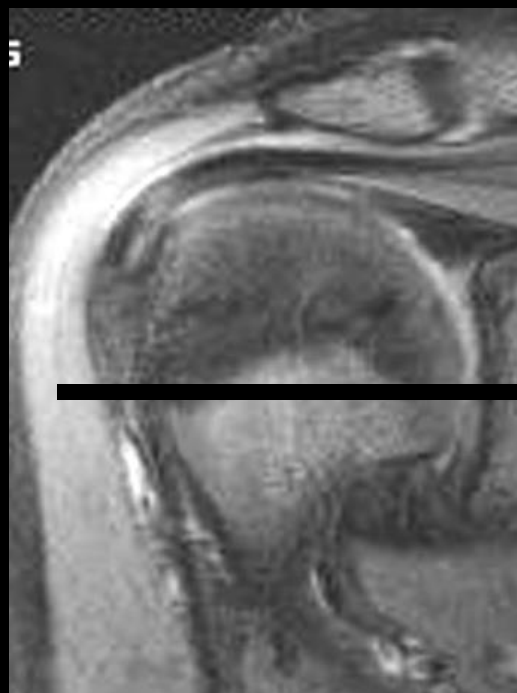








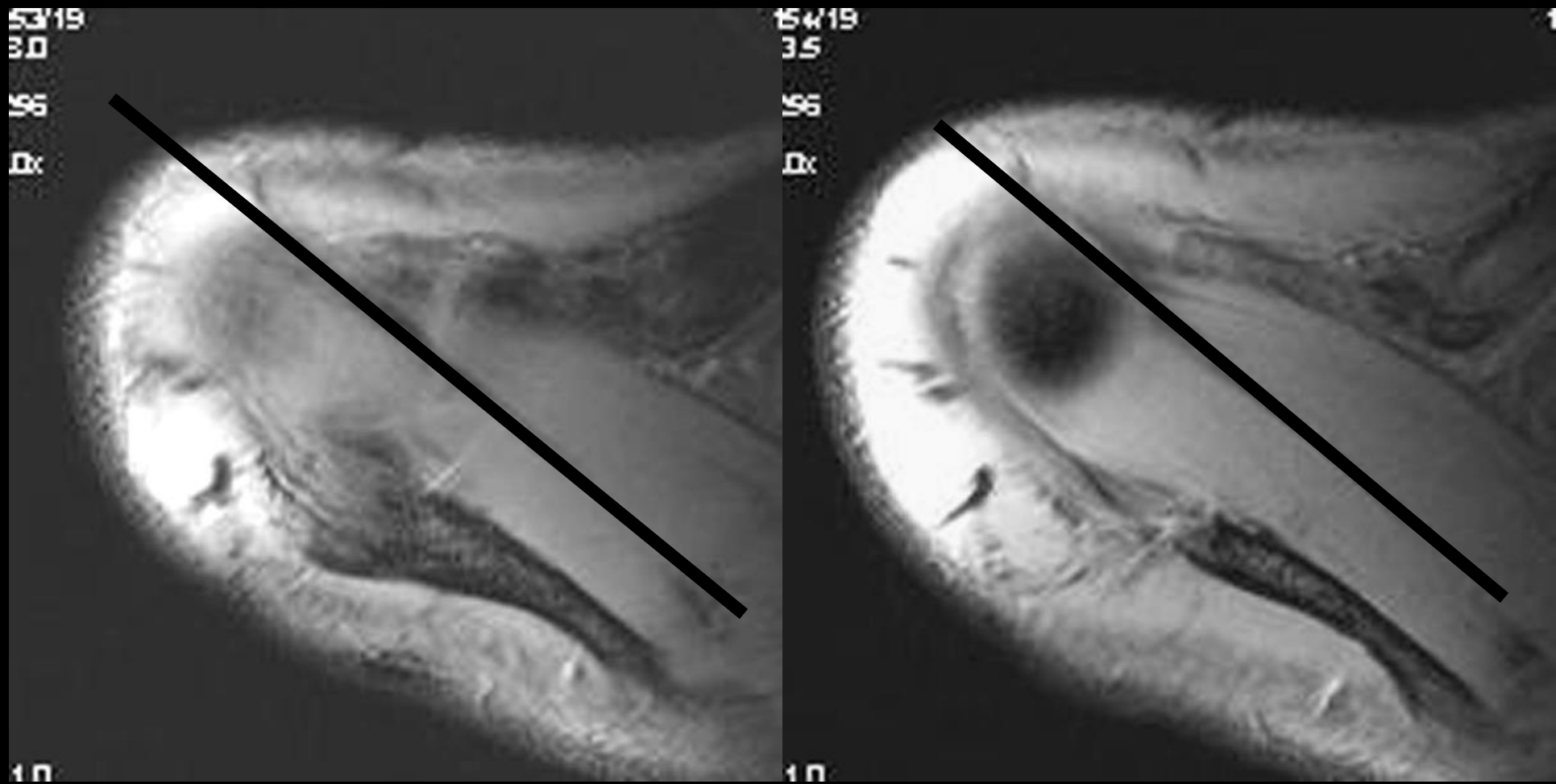




MR IMAGING PLANES

- Axial
 - Assess subscapularis, biceps tendon
- Coronal oblique
 - Parallel to supraspinatus tendon
 - Assess all tendons
- Sagittal oblique (FSE T2)
 - 90° to coronals
 - Assess all tendons

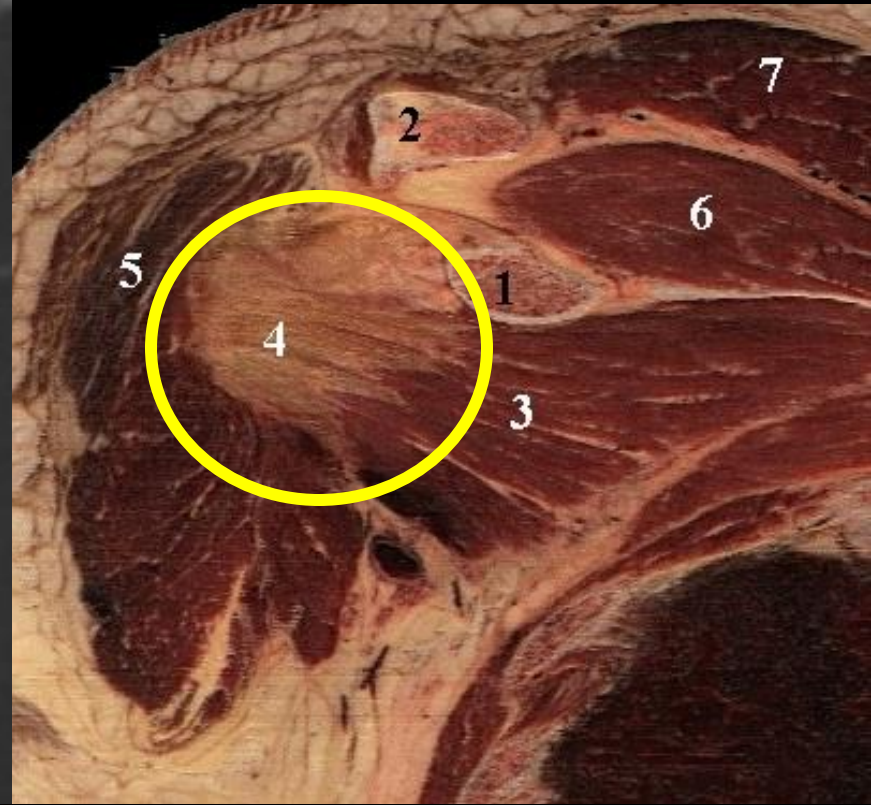
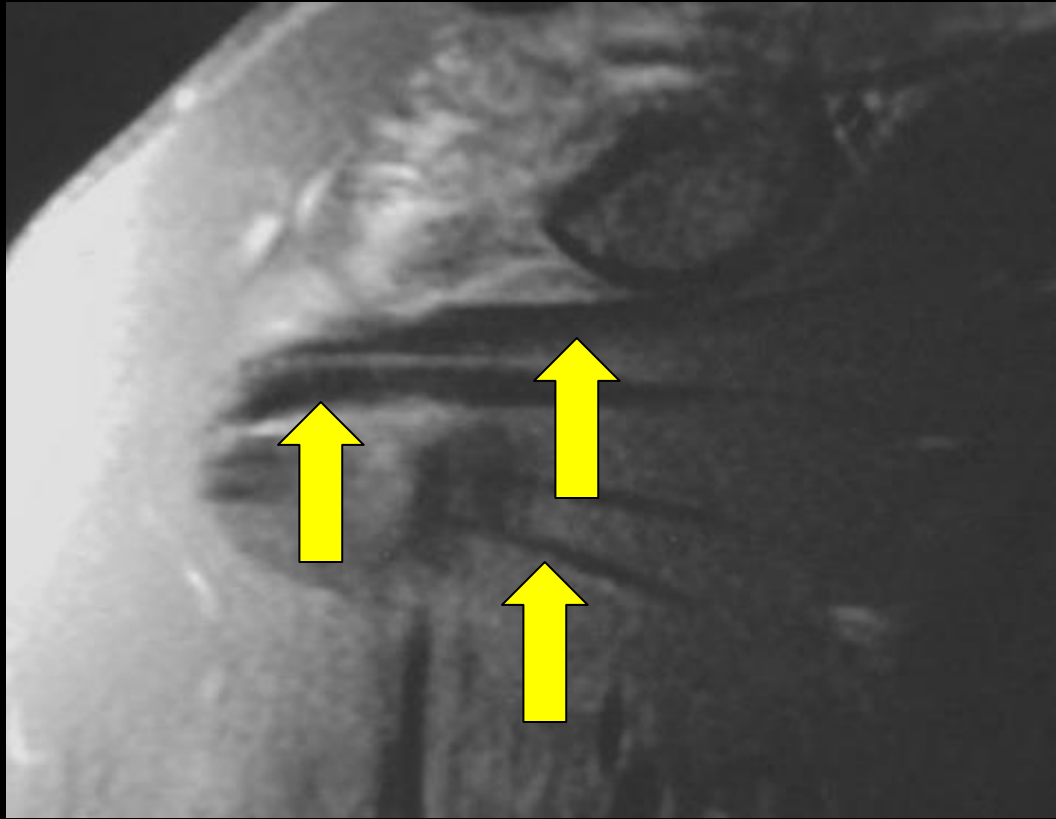
Parallel to Tendon

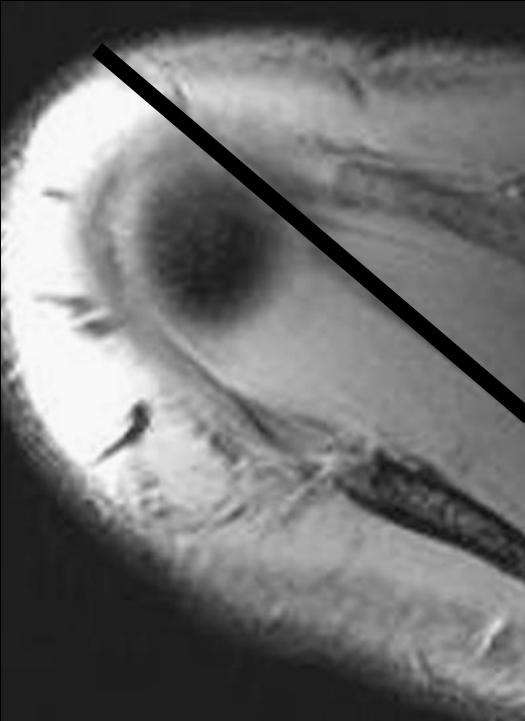


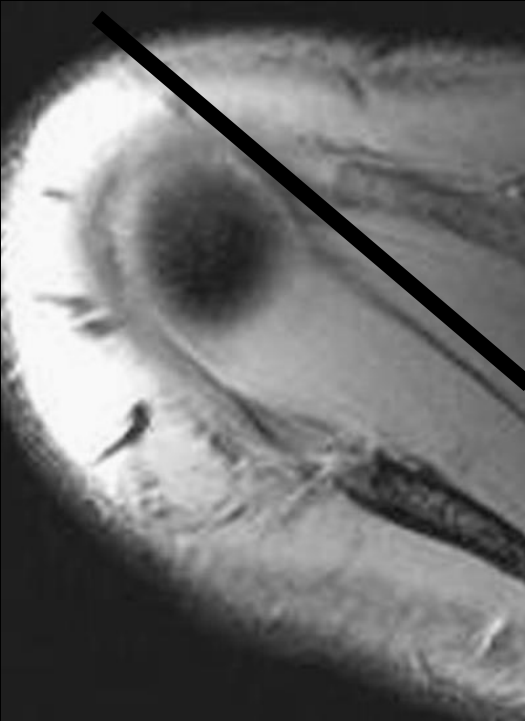
Coronal Anatomy



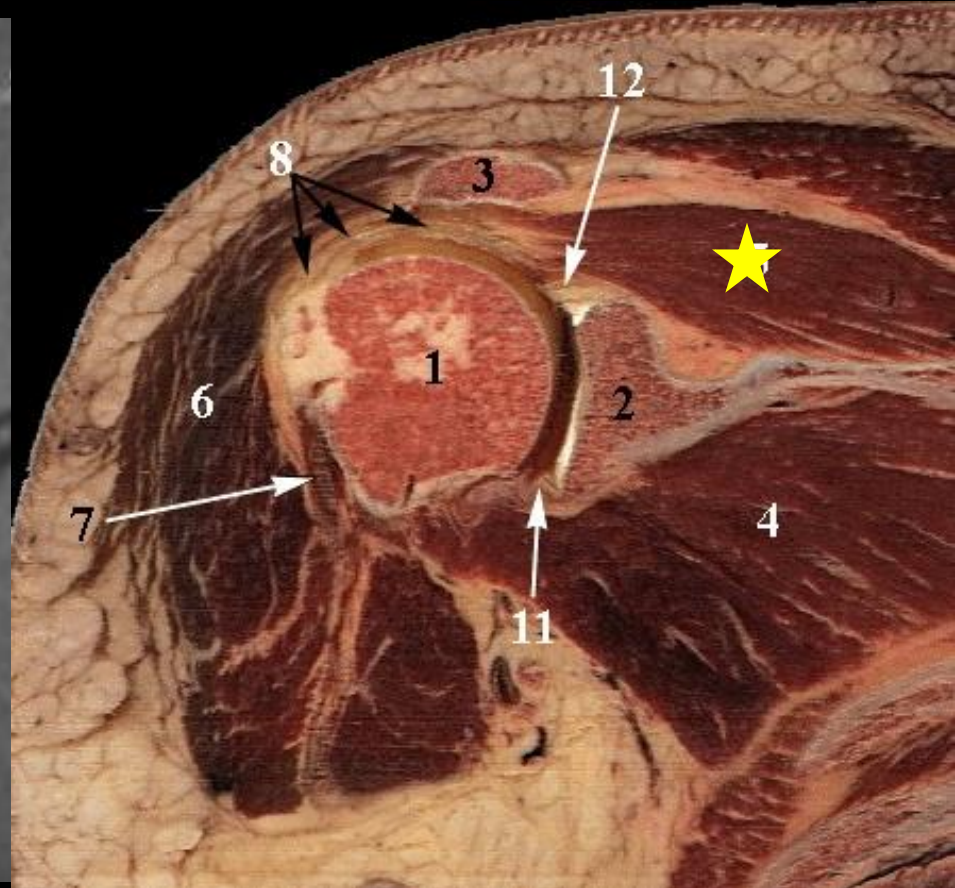
Coronal Anatomy



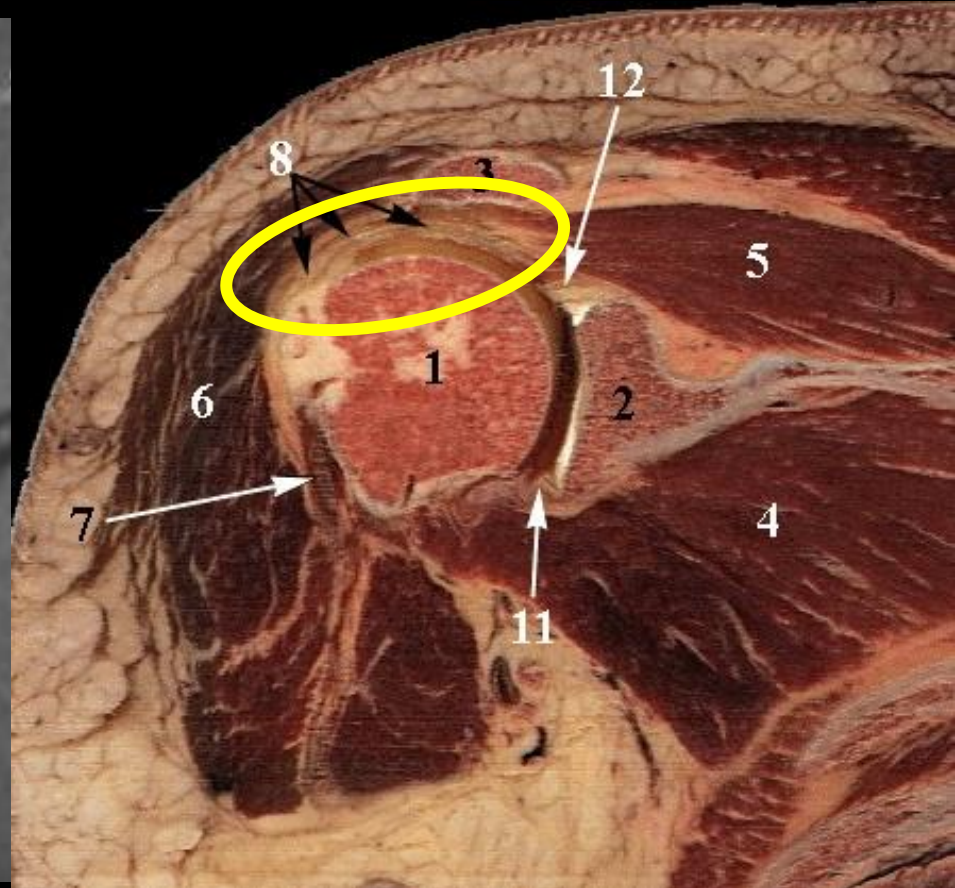
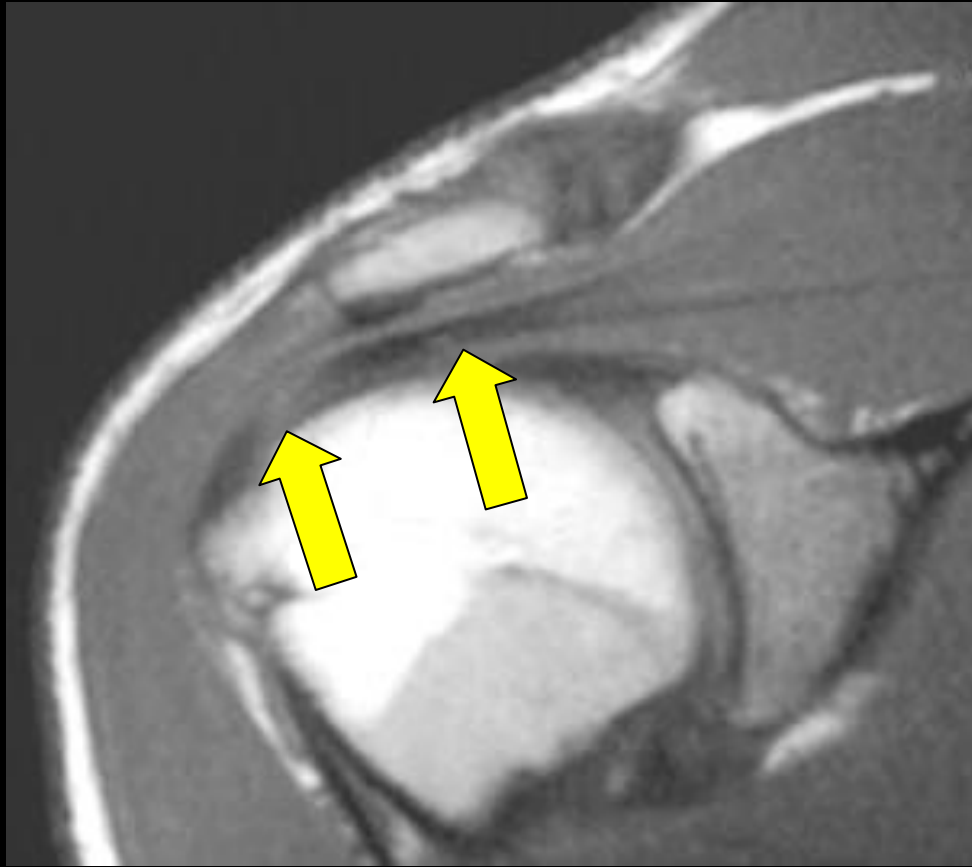


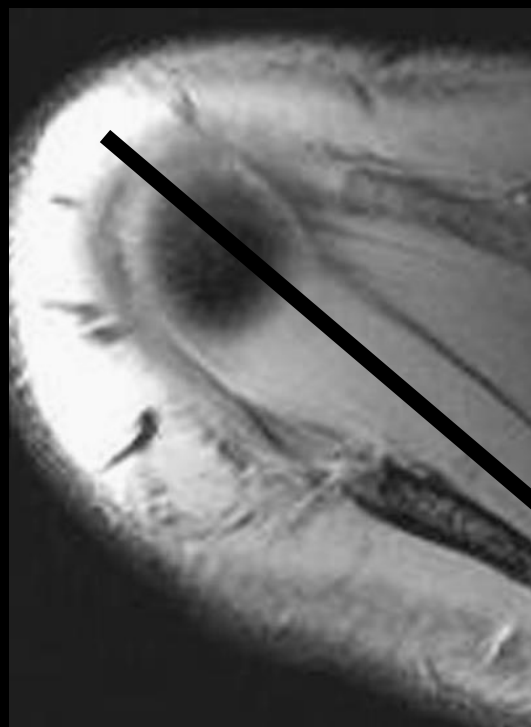


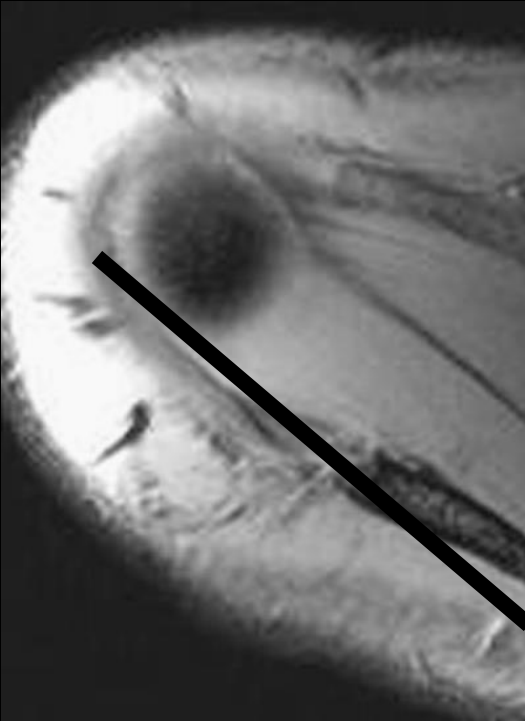
Coronal Anatomy



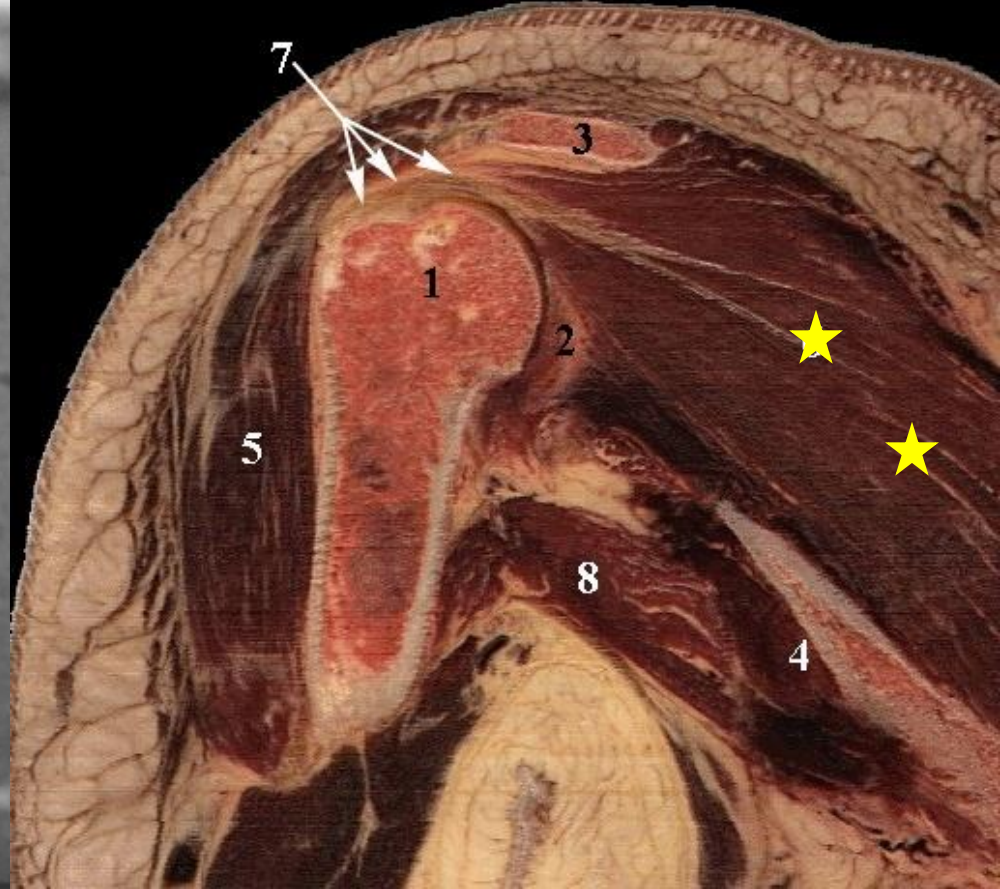
Coronal Anatomy



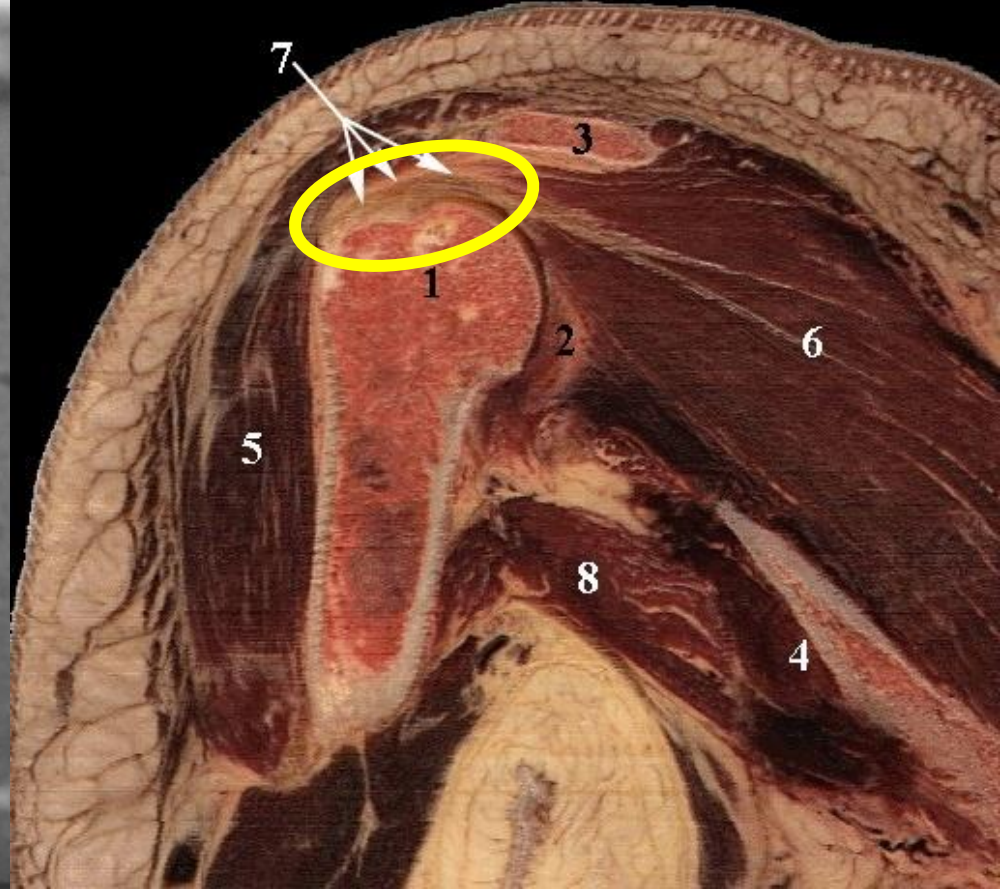


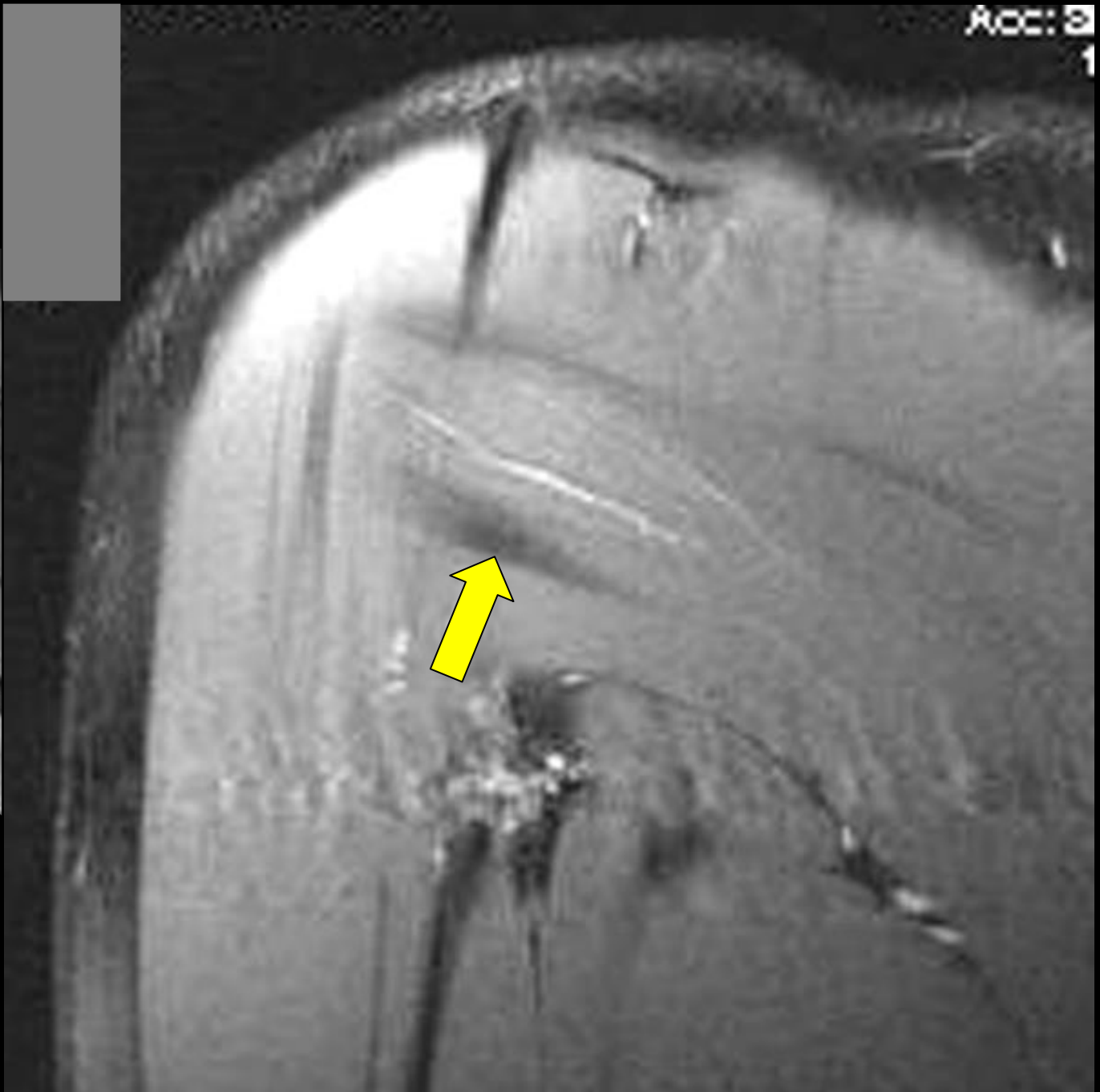


Coronal Anatomy



Coronal Anatomy

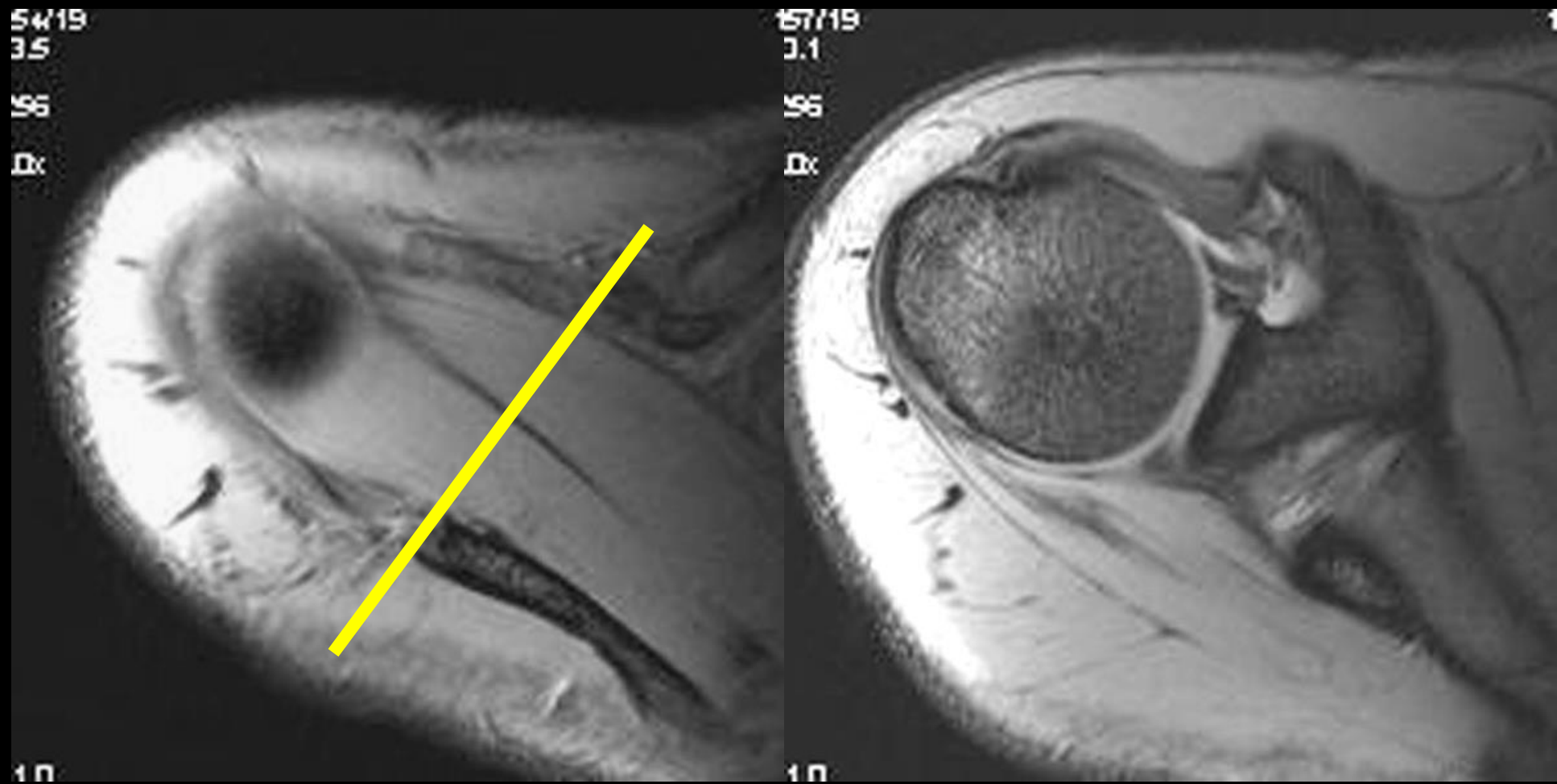




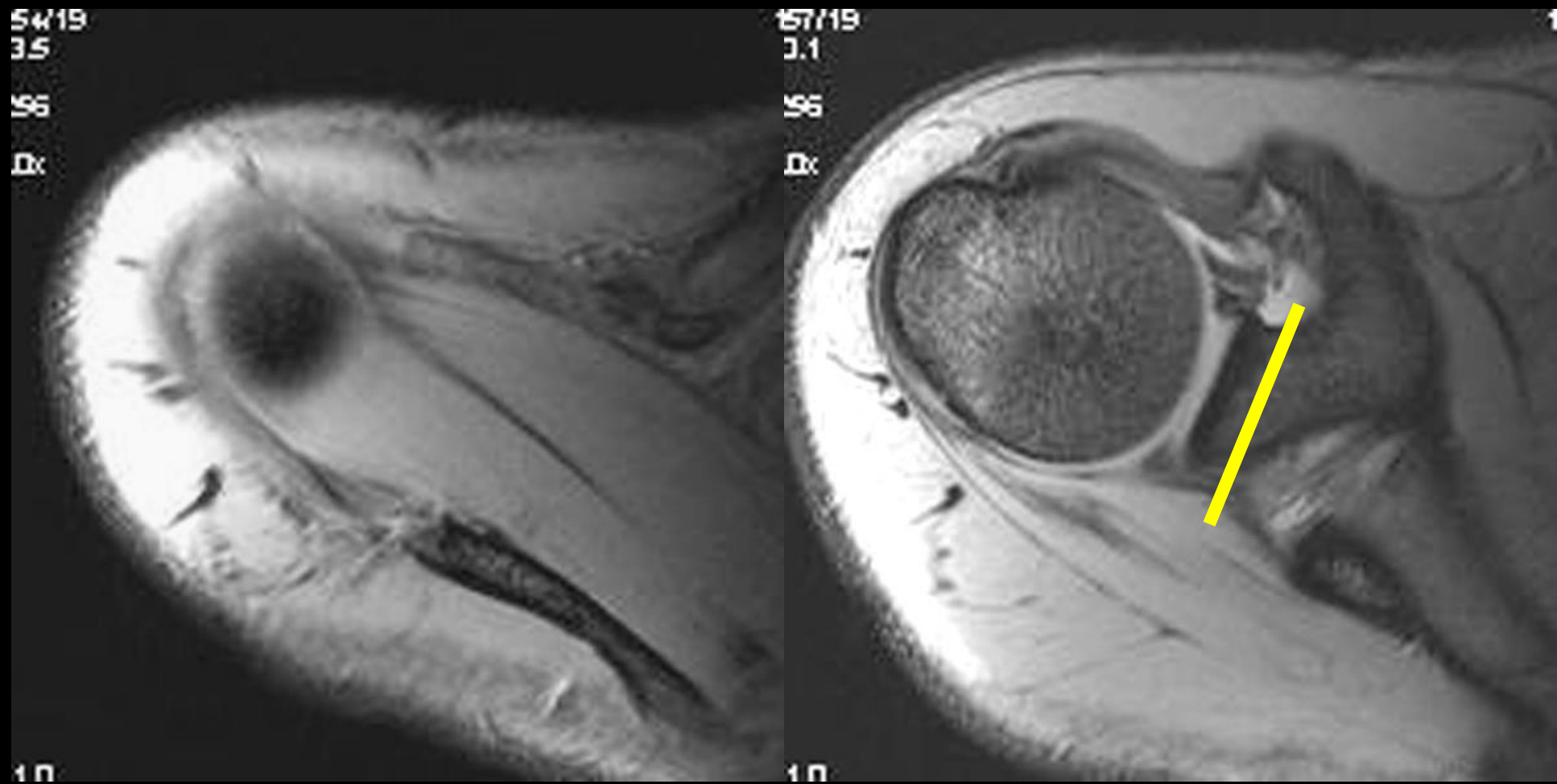
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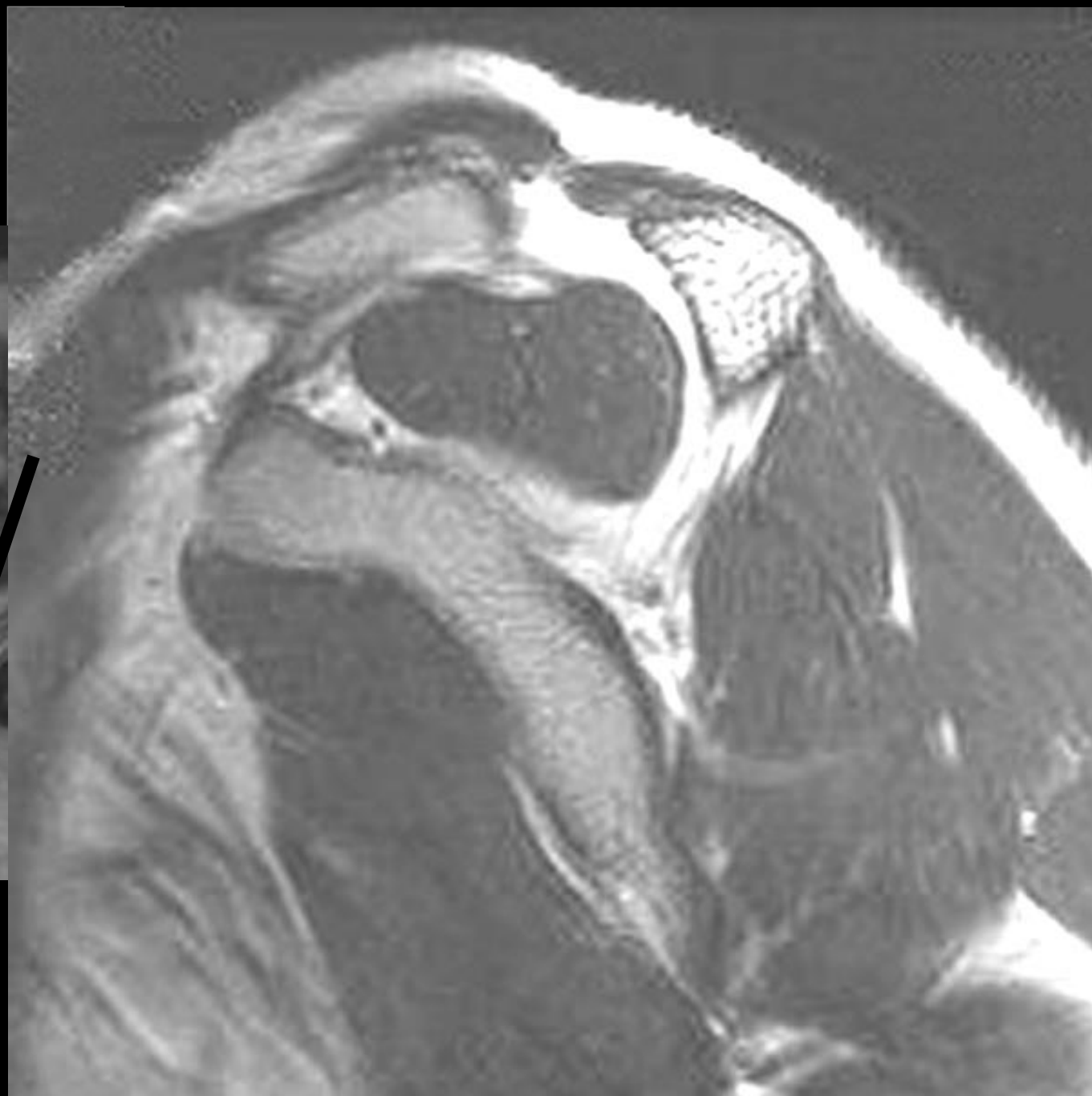
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 - 90° to coronals
 - Assess all tendons/muscle bulk

Sagittal Imaging

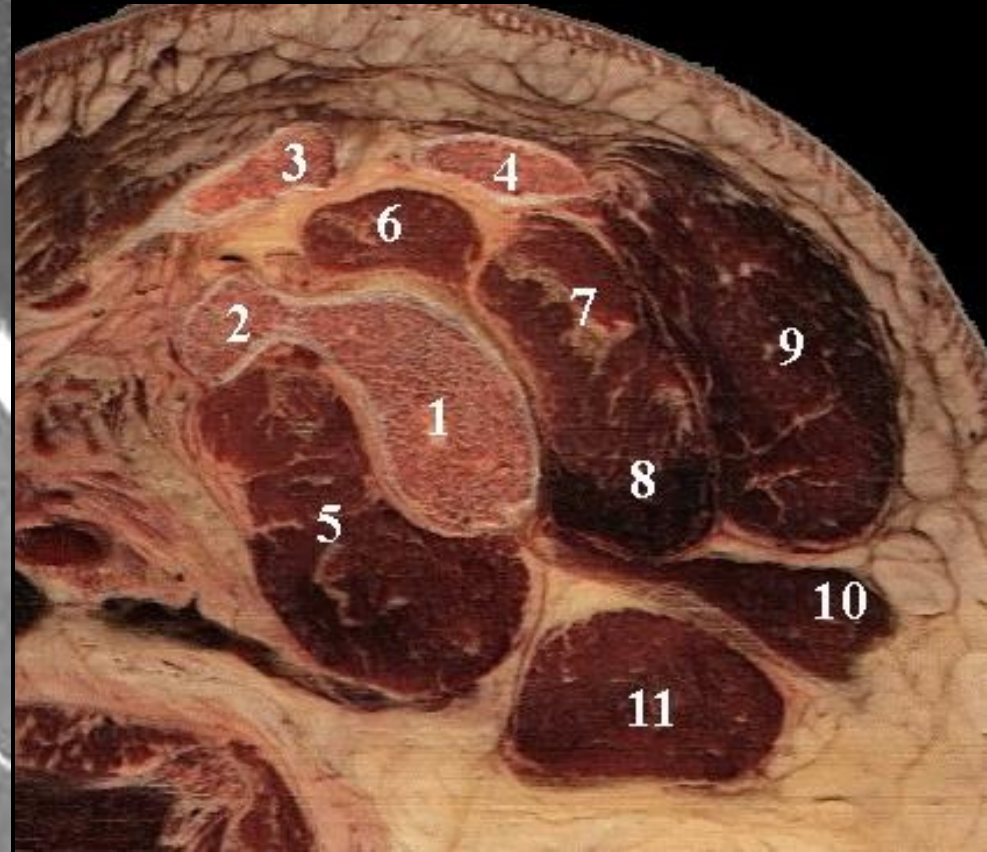


Sagittal Imaging





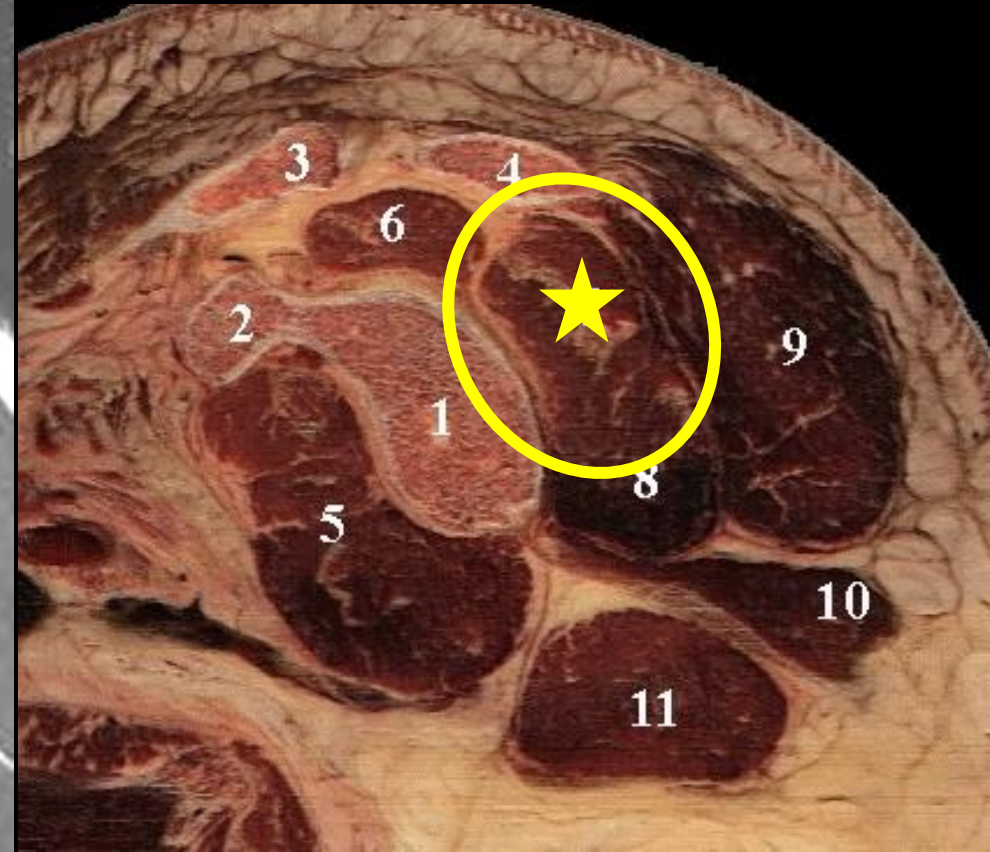
Sagittal Anatomy



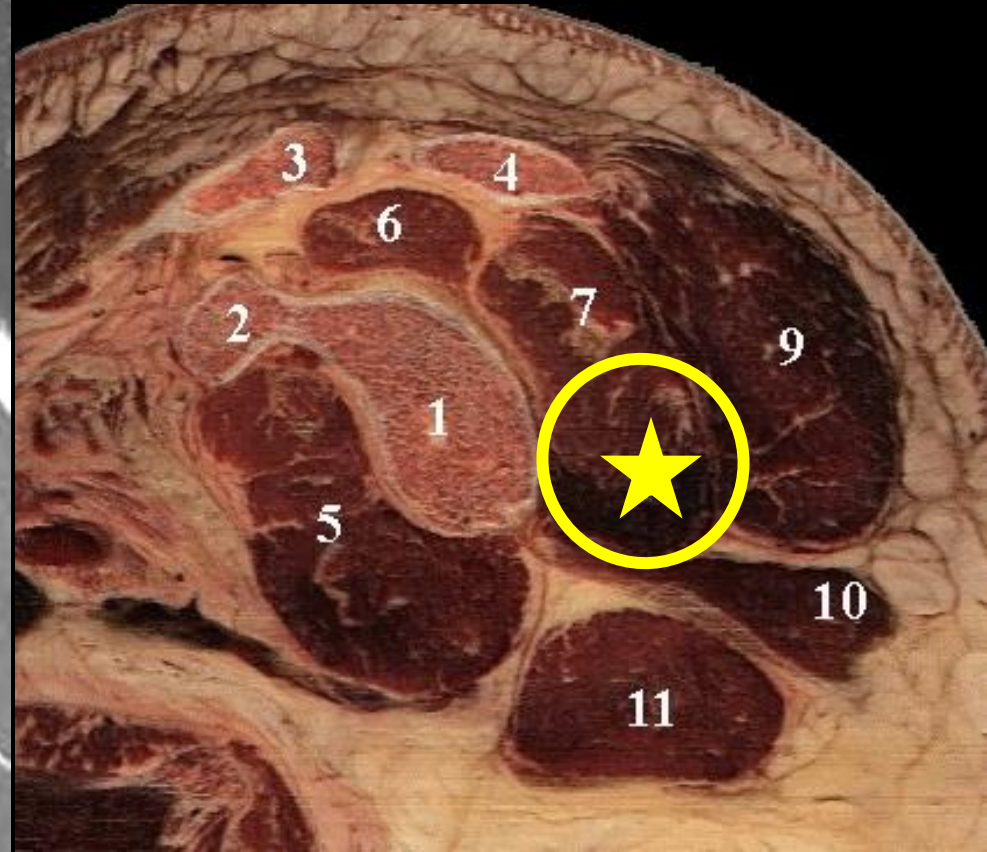
Sagittal Anatomy



Sagittal Anatomy



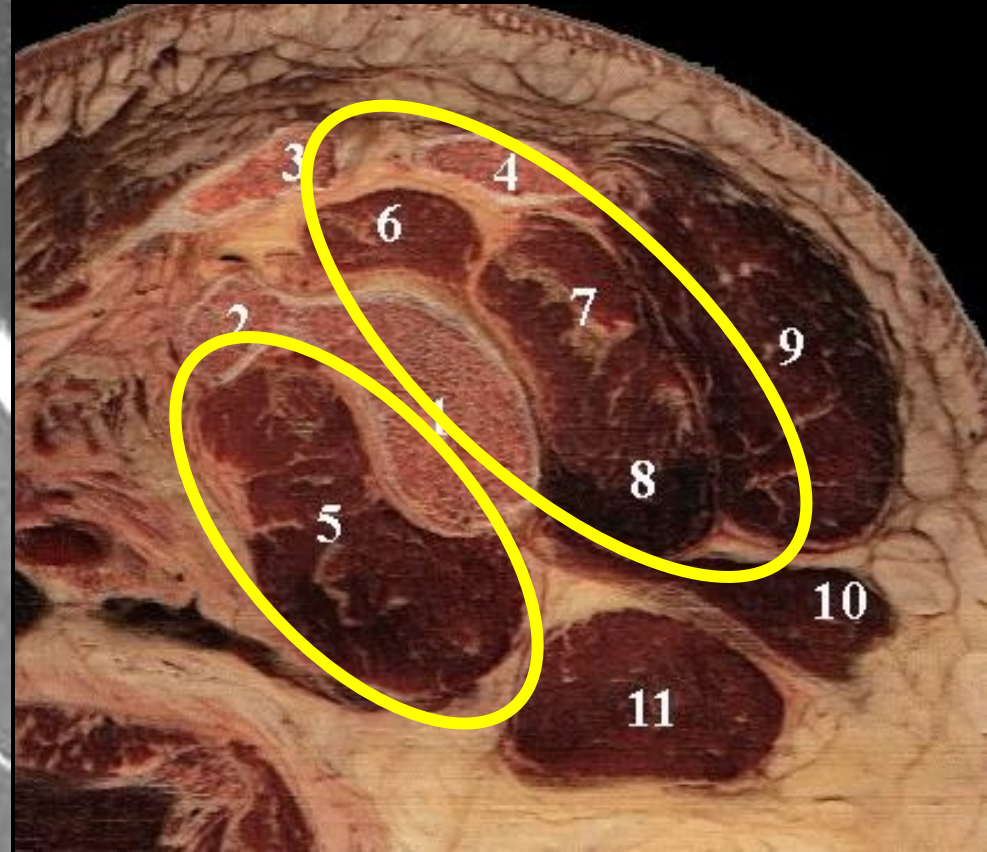
Sagittal Anatomy

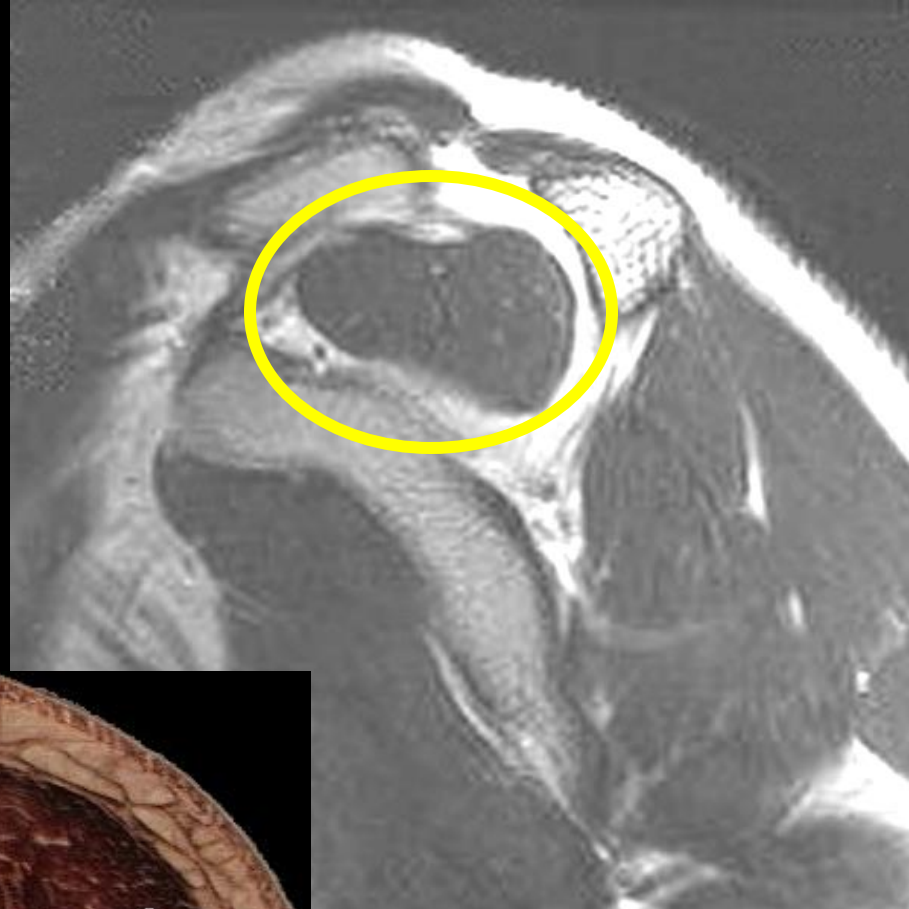
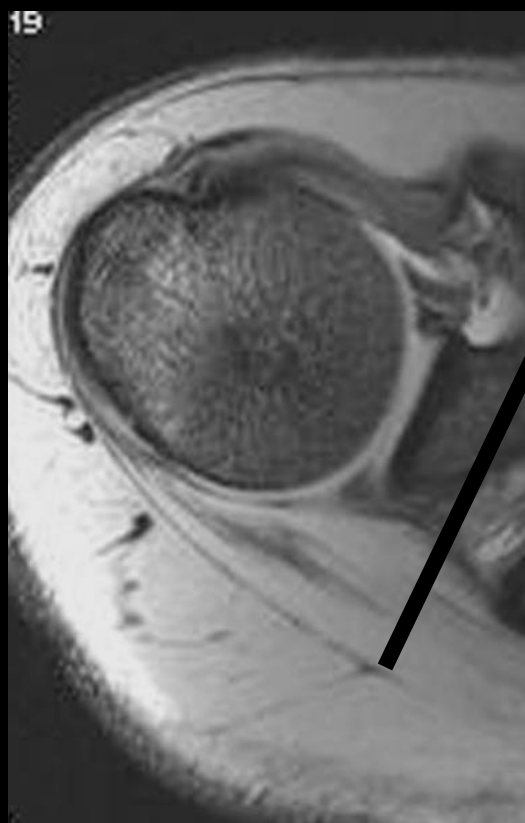


Sagittal Anatomy

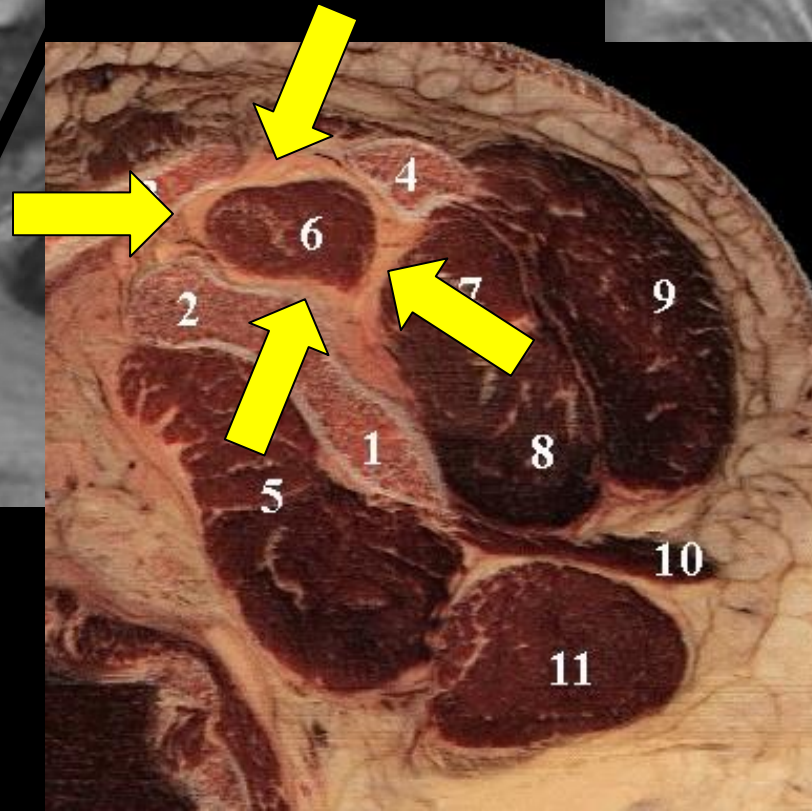
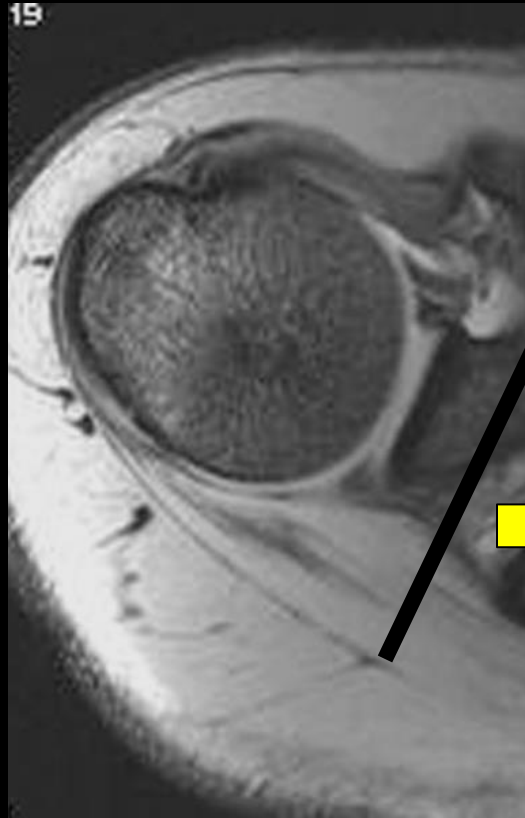


Sagittal Anatomy

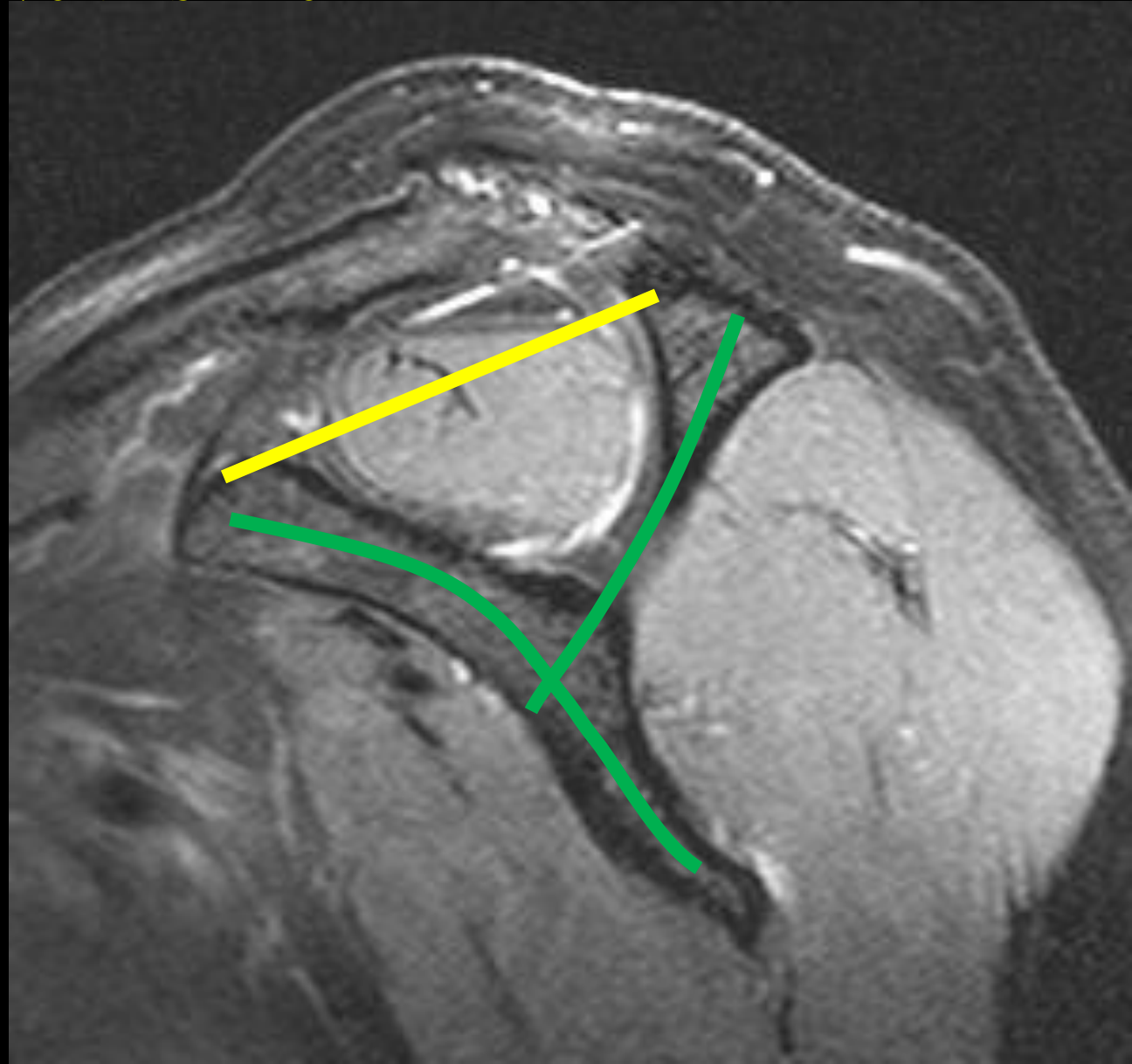
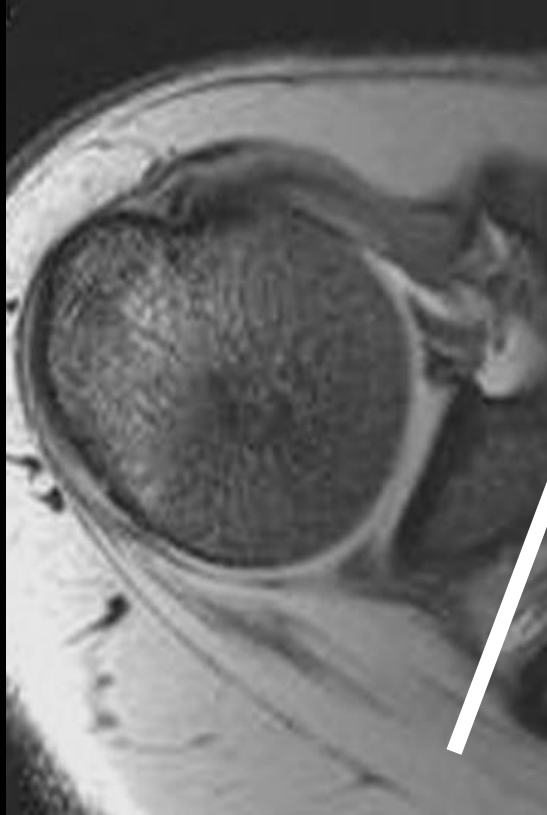


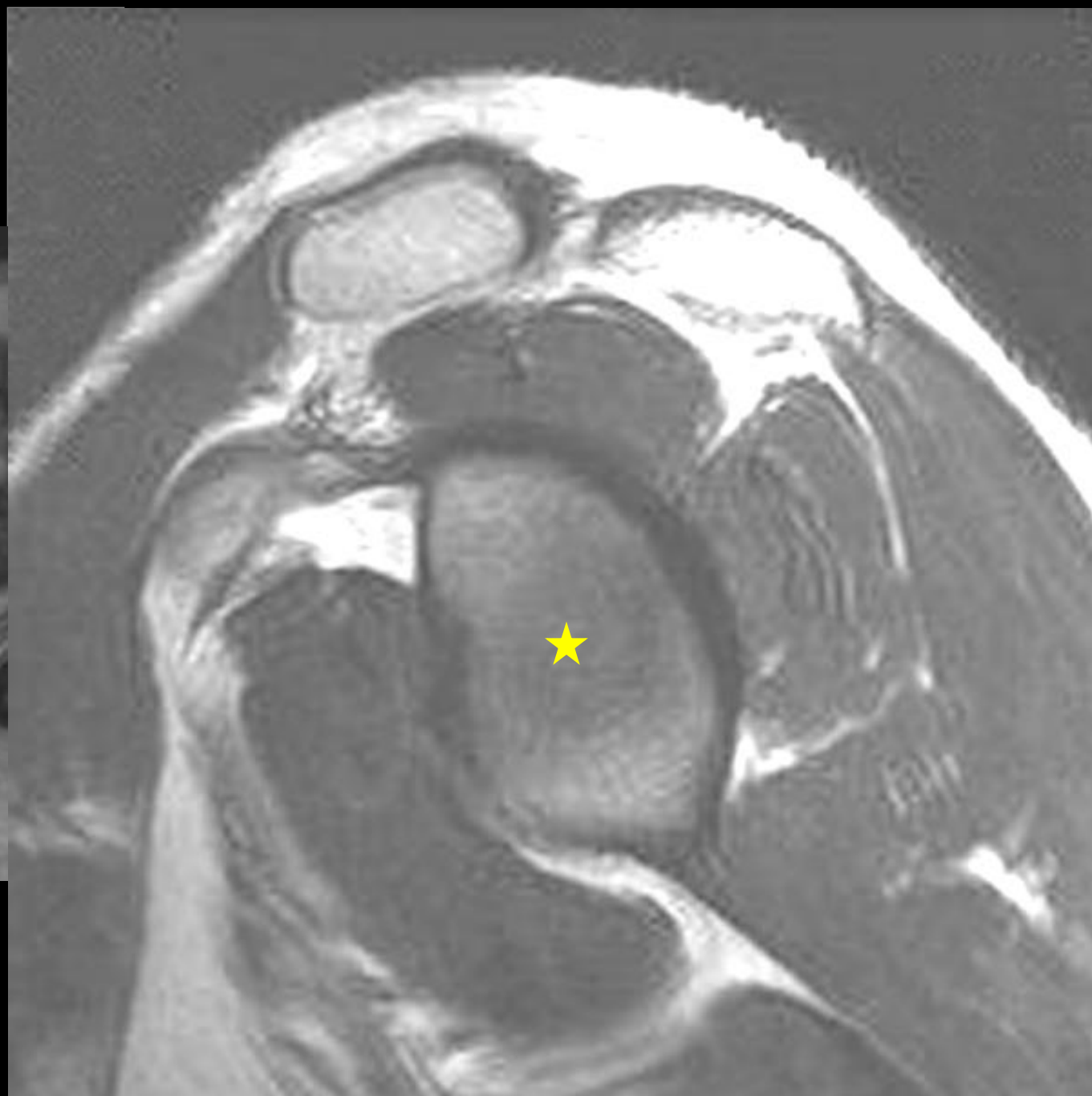


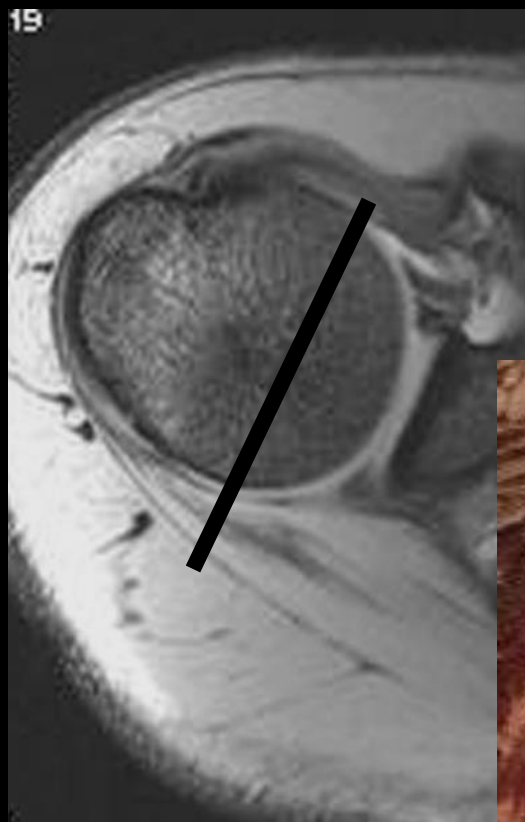
Scapular ratio
Occupation ratio
Should be at least 50%



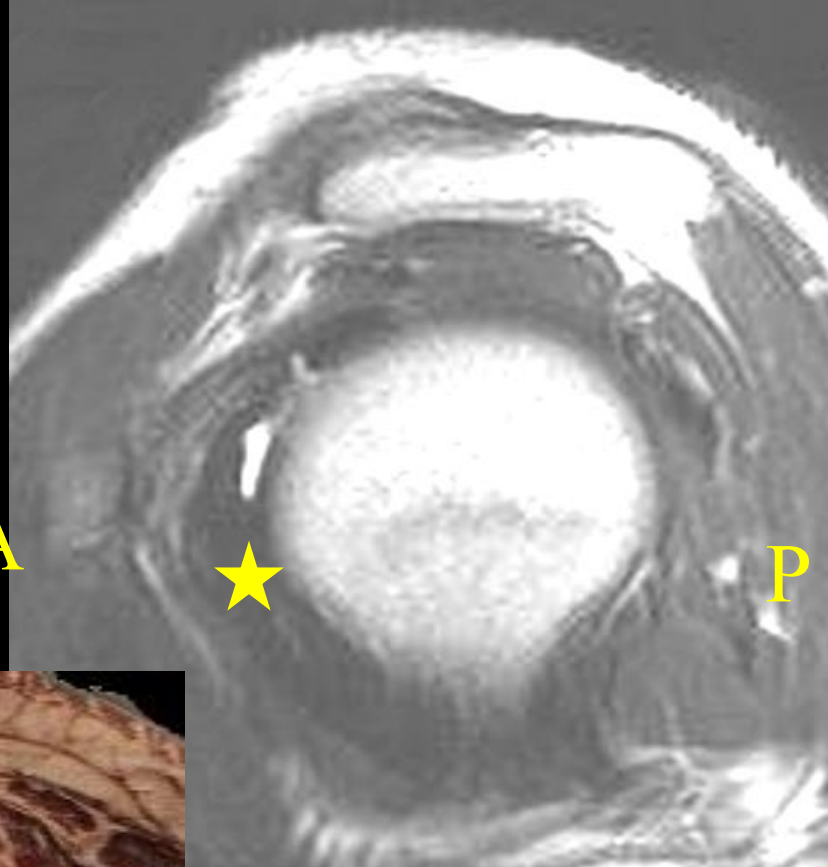
Tangent sign
Supraspinatus above this line



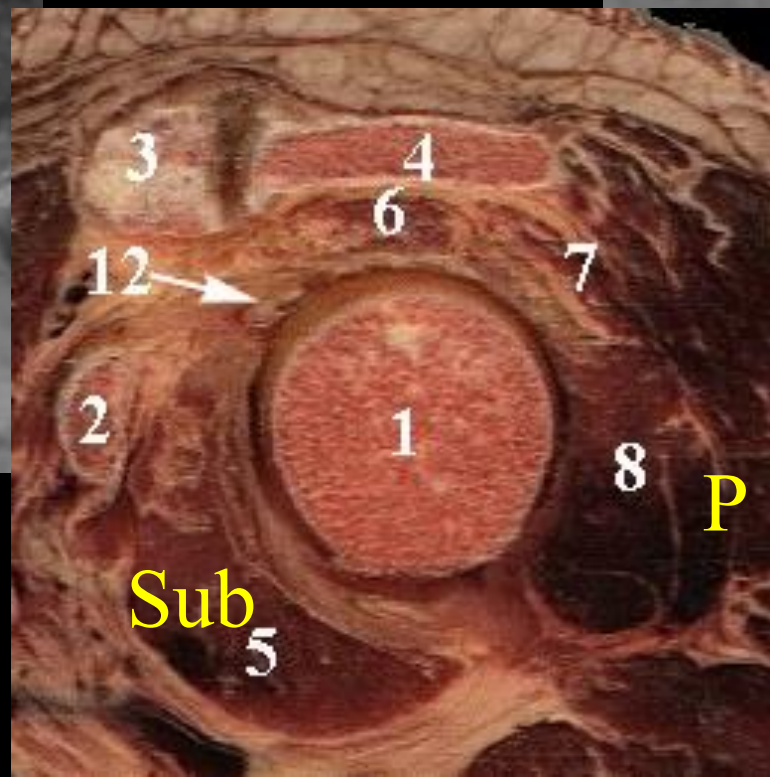


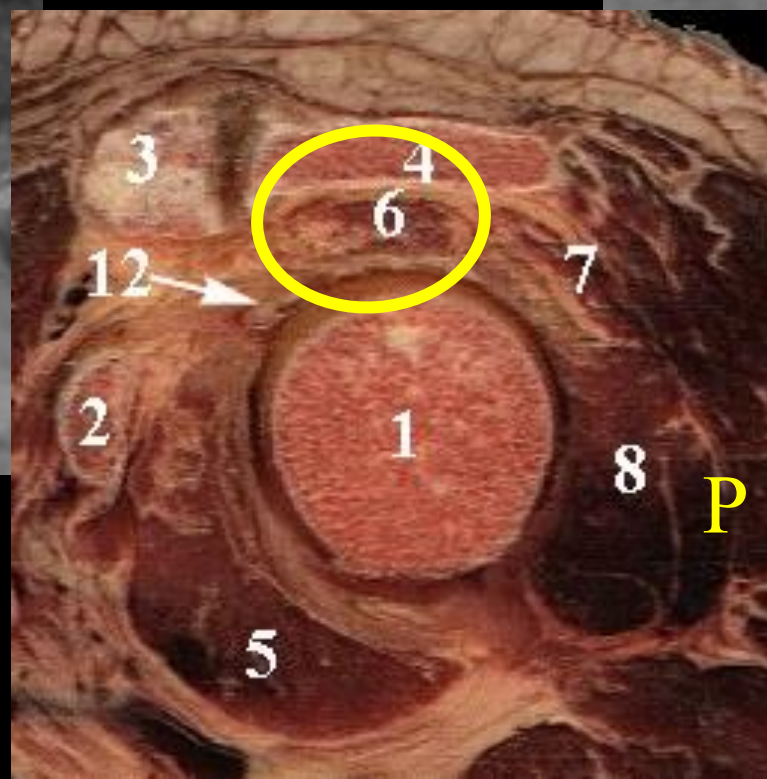
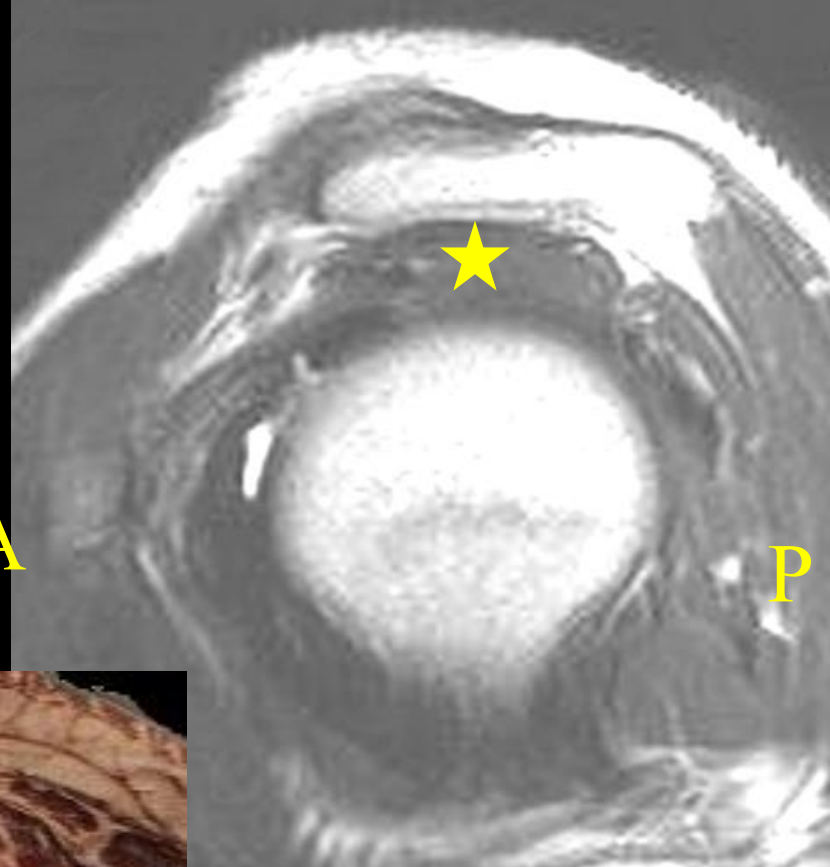
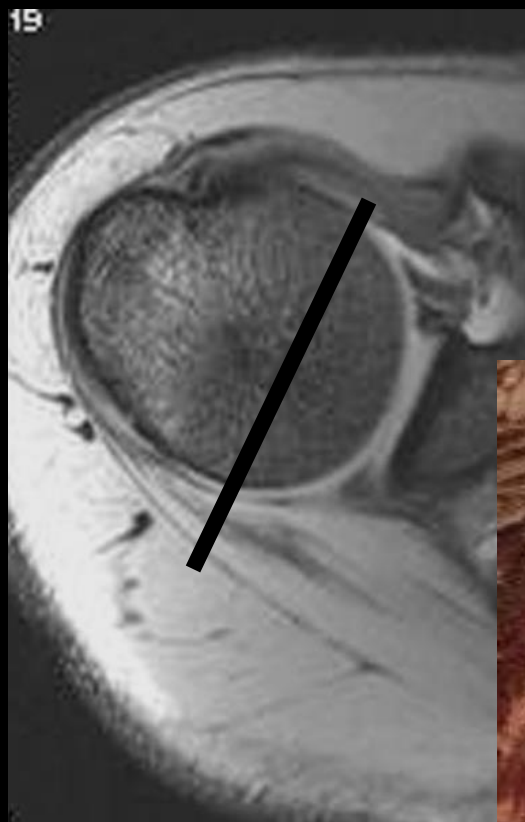


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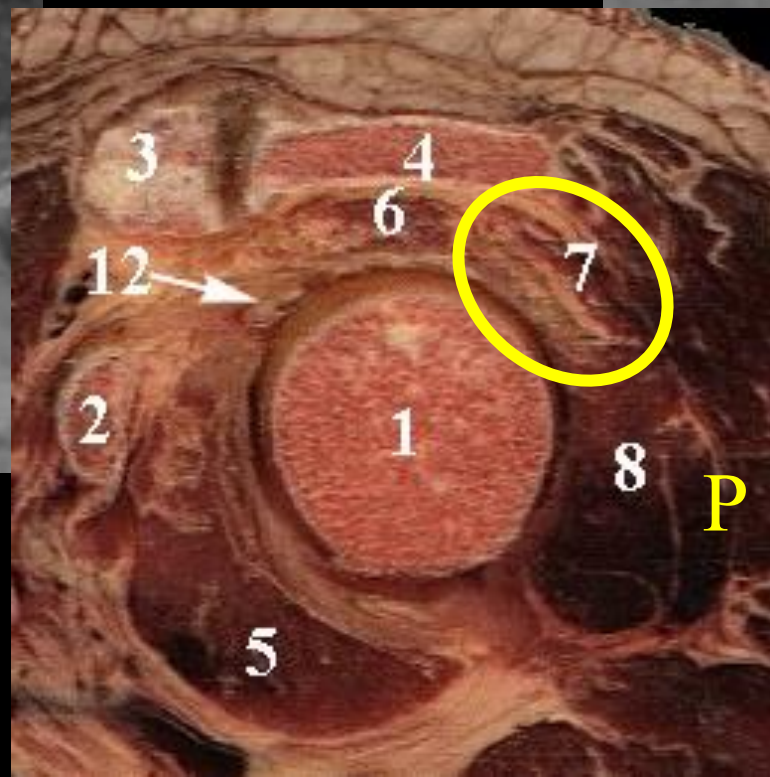
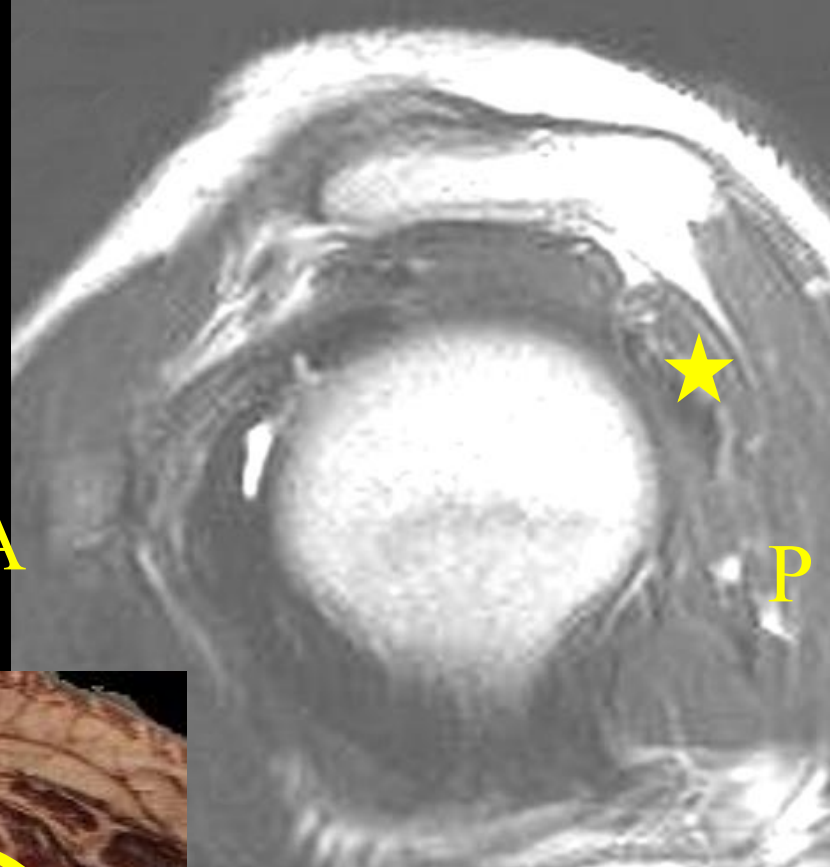
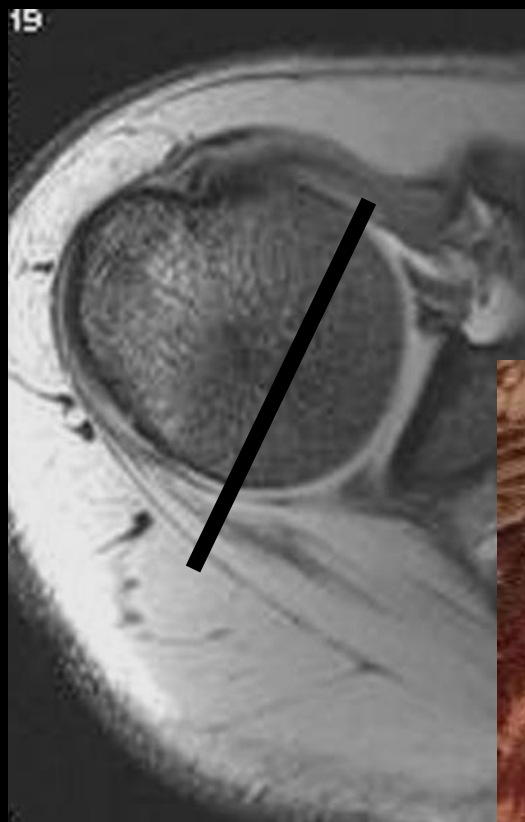


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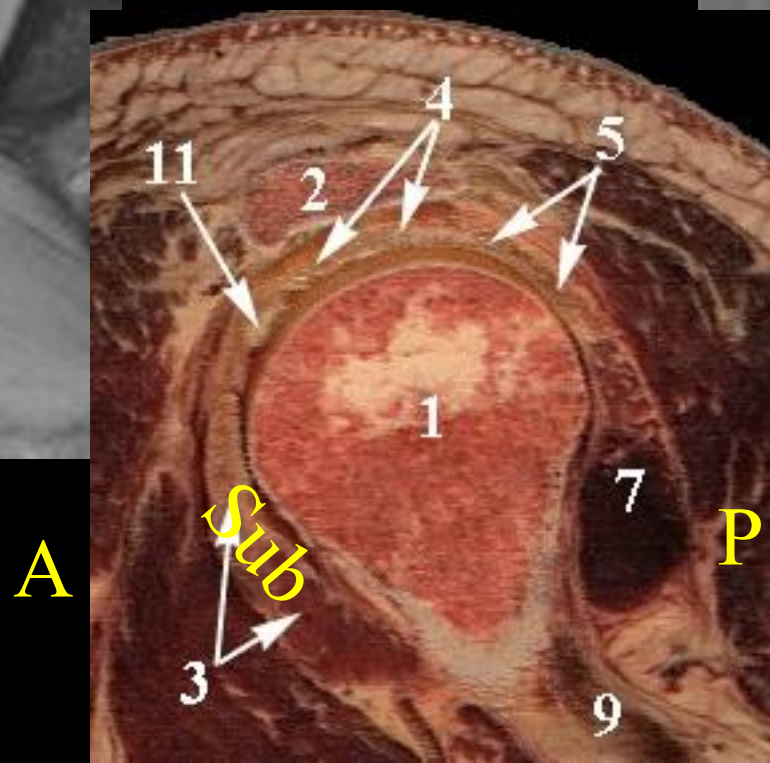
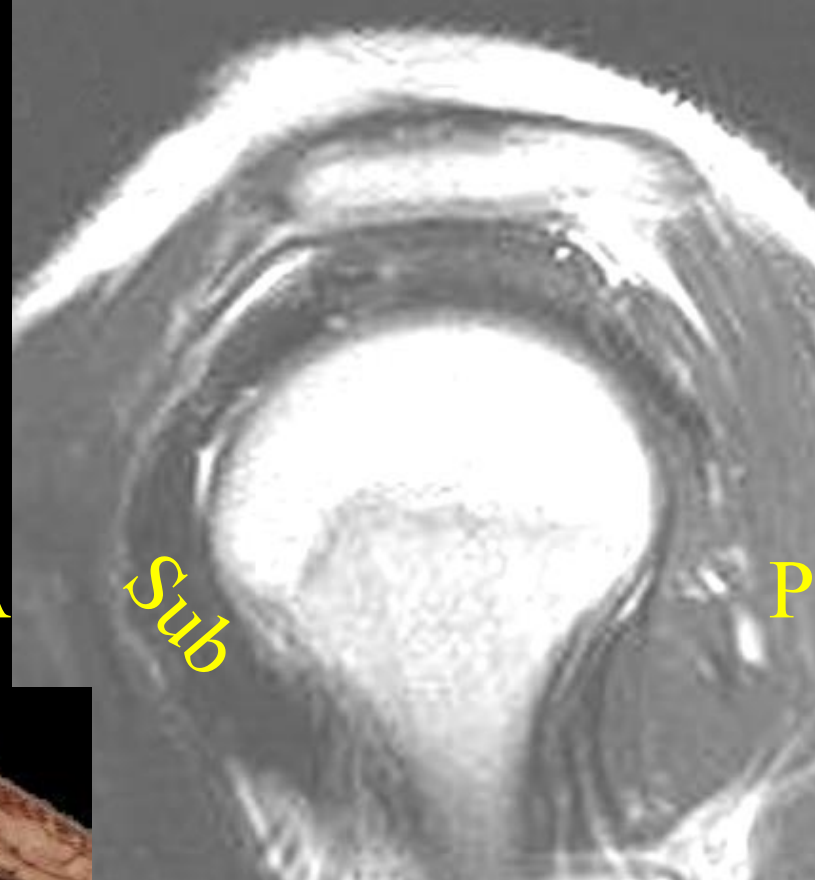
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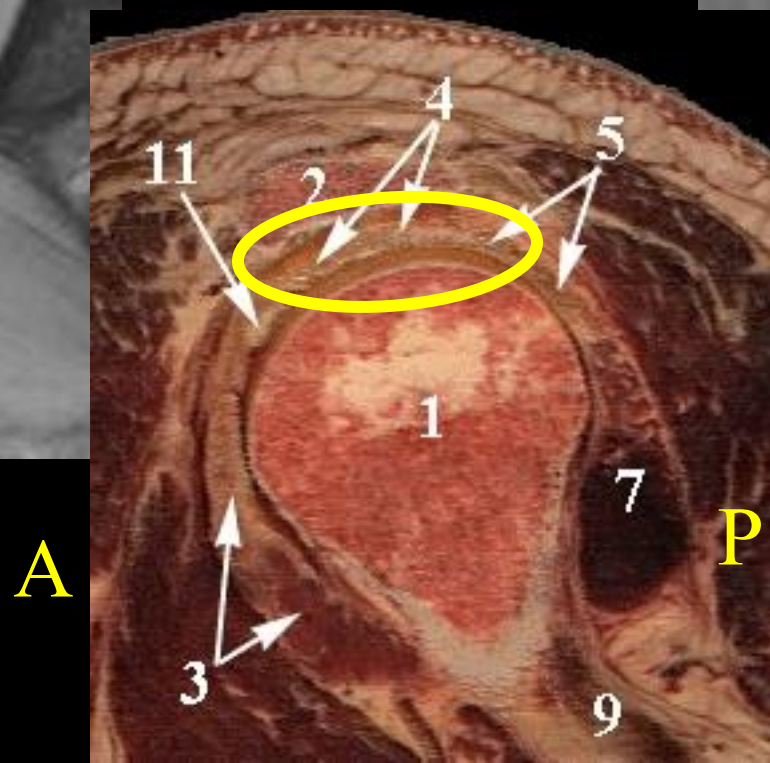
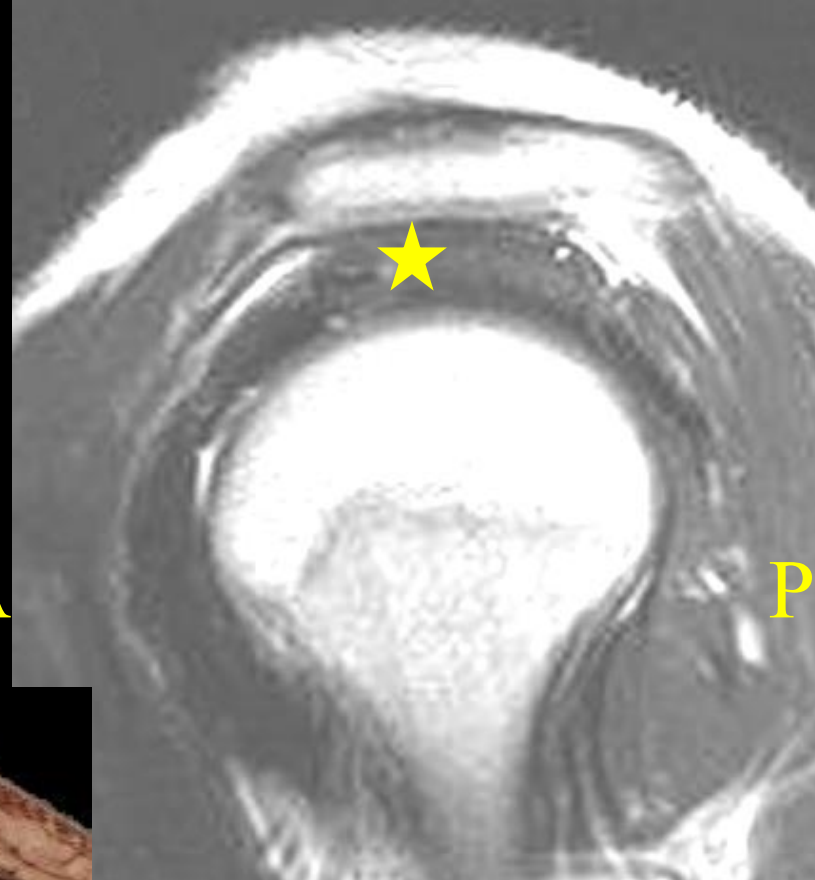
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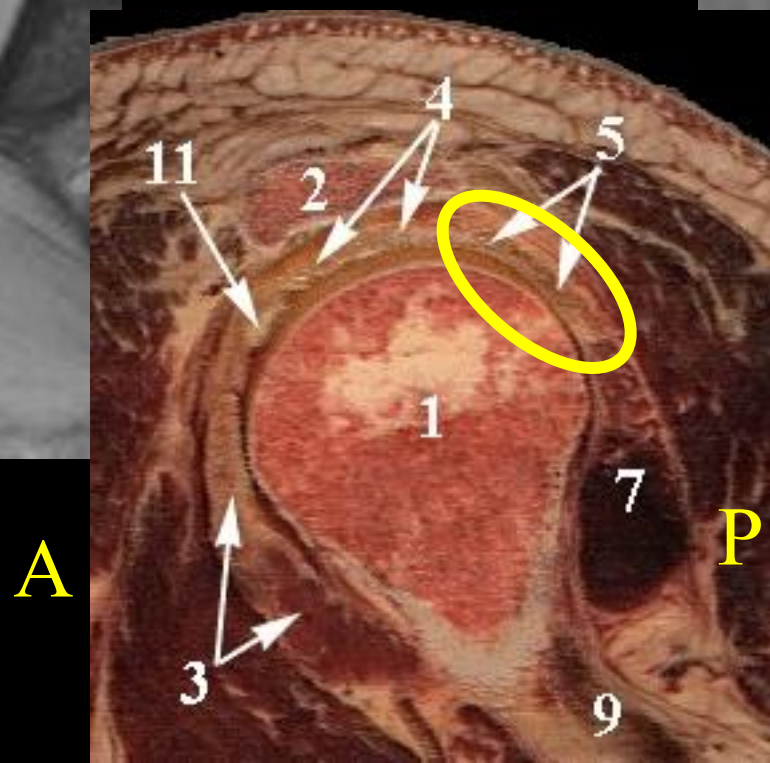
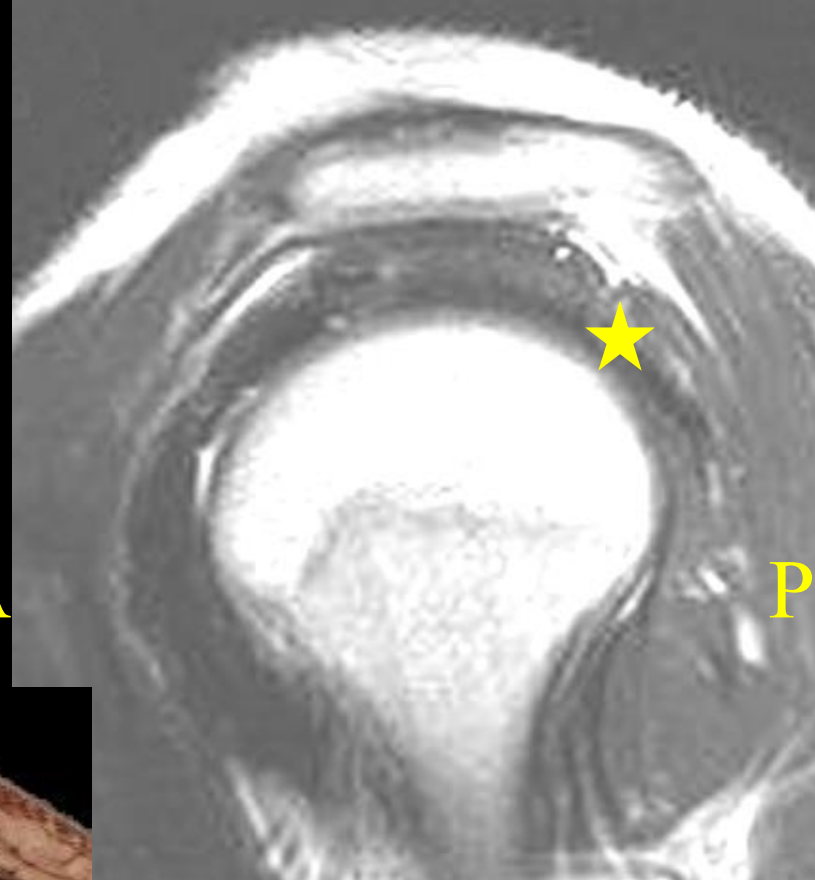


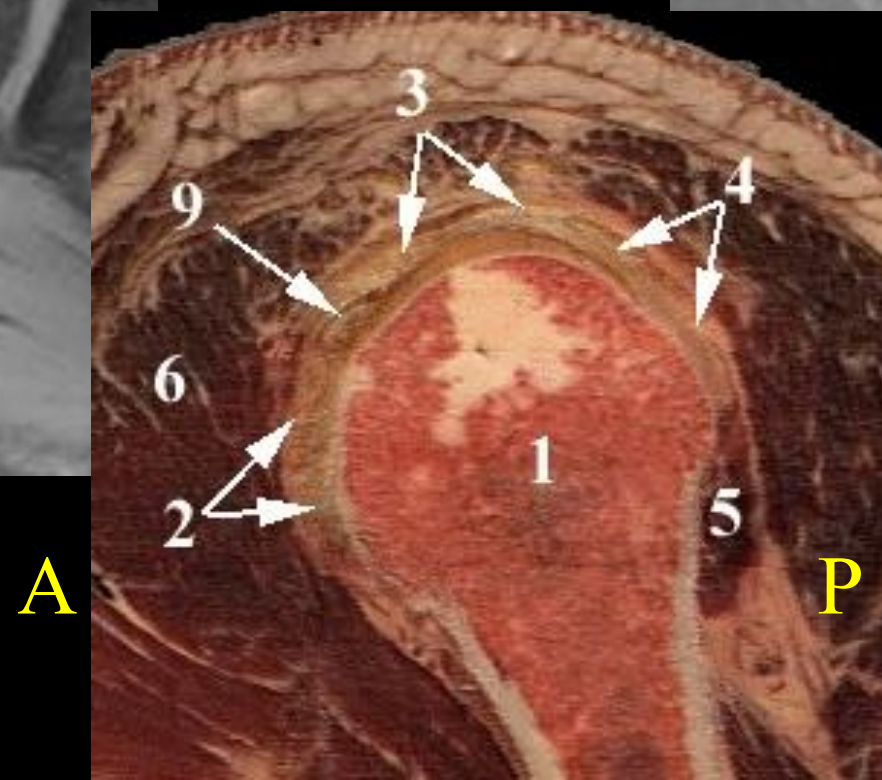
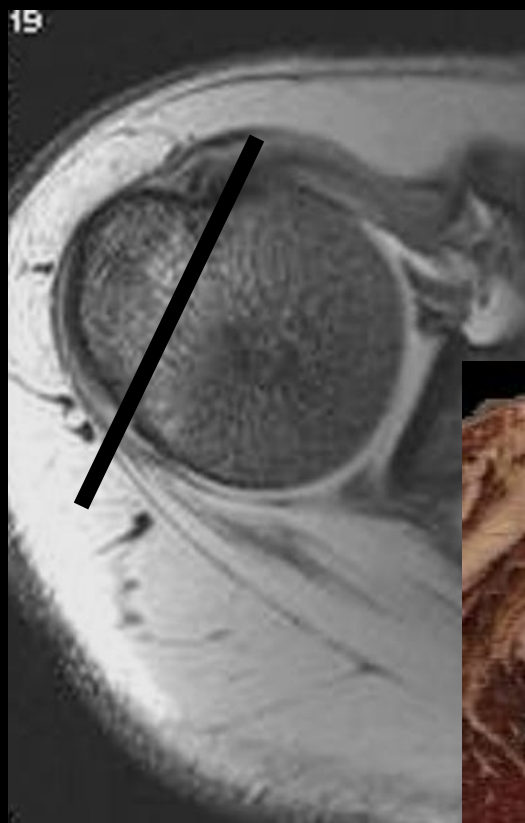
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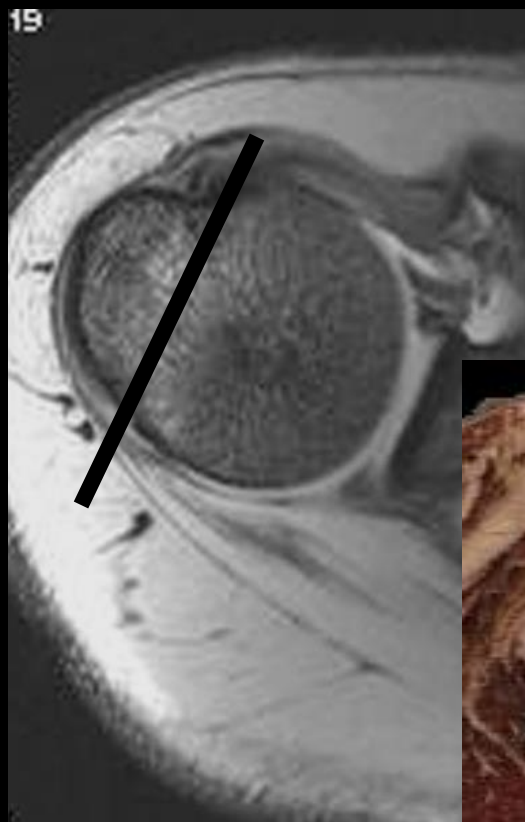
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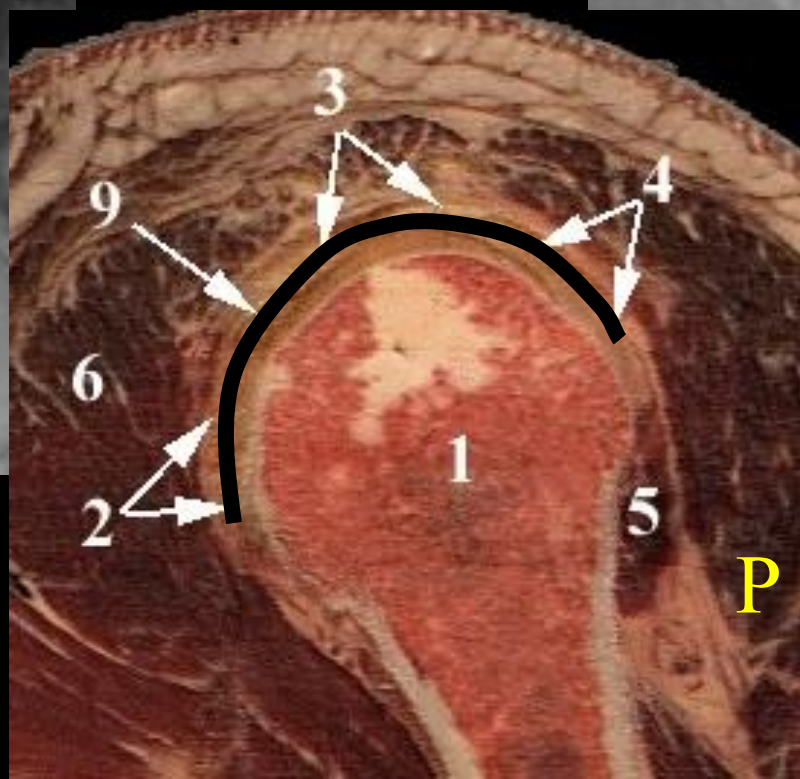




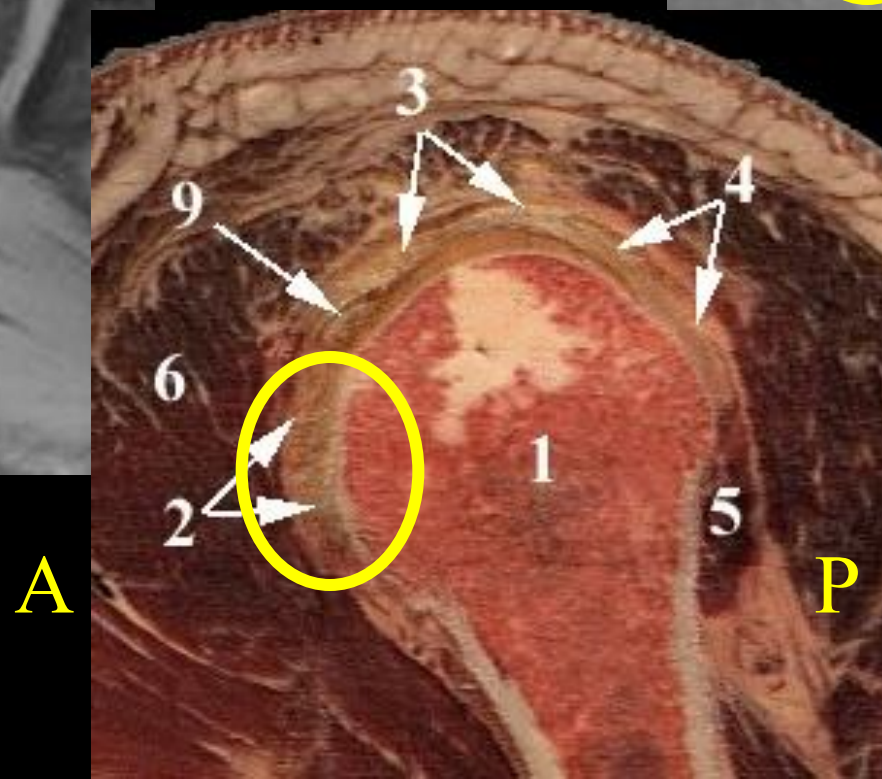
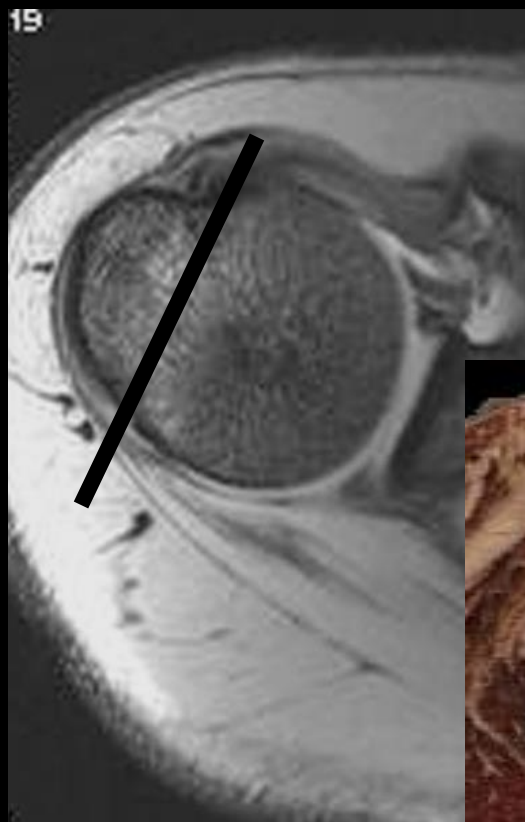




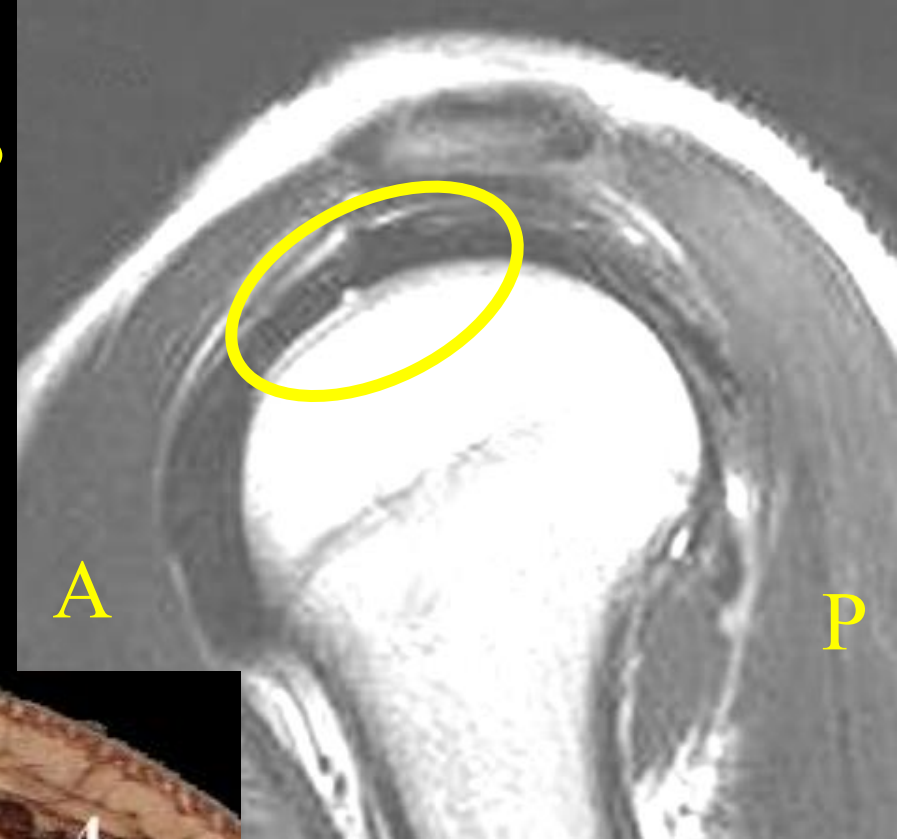
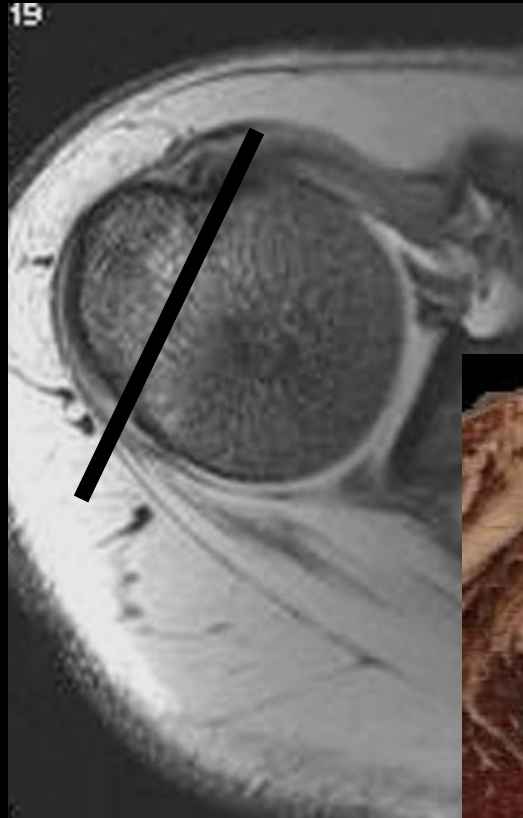
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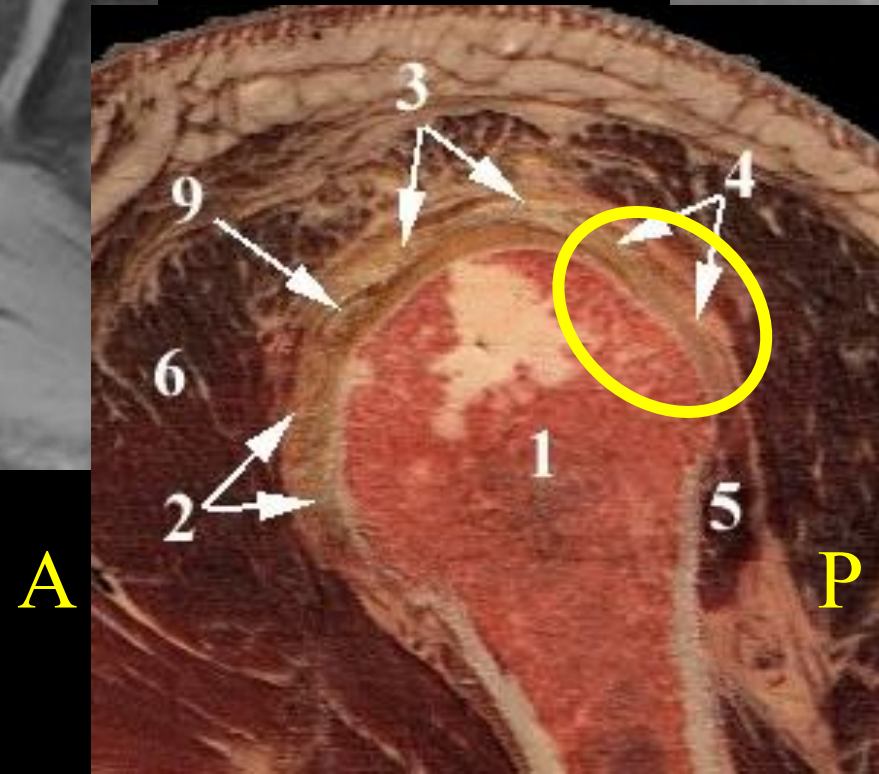
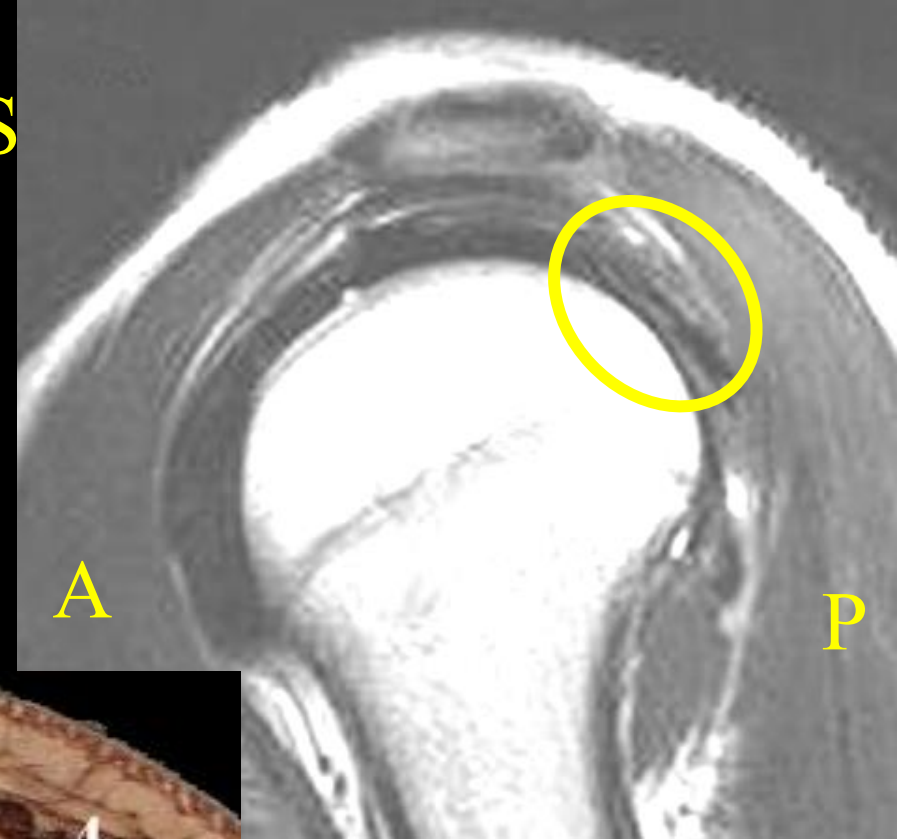
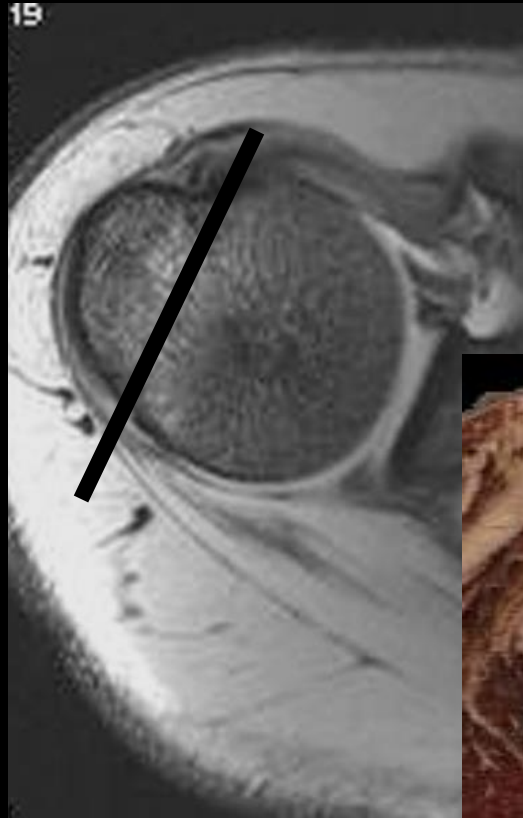
SUBSCAPULARIS



SUPRASPINATUS

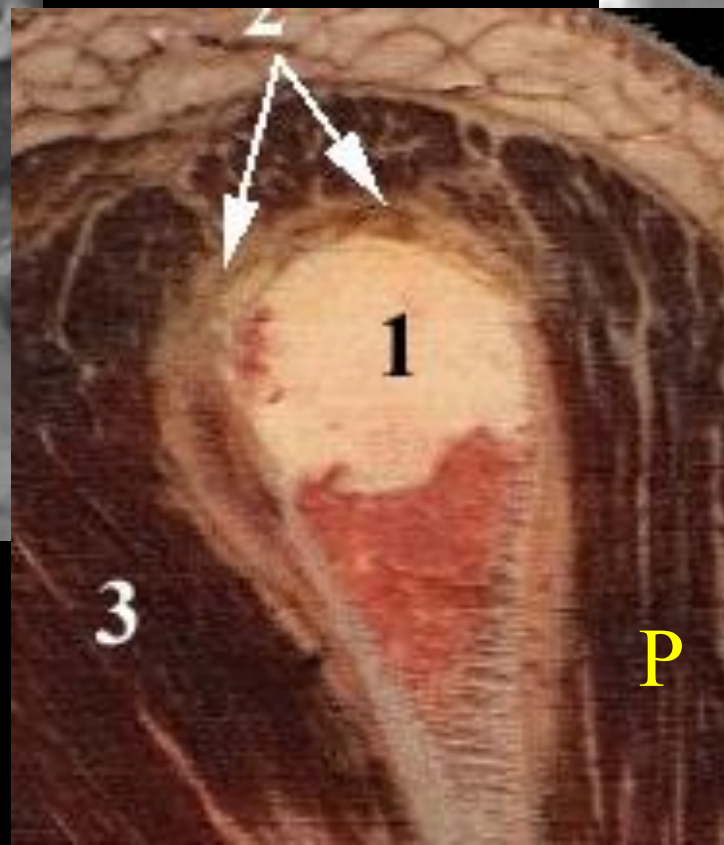
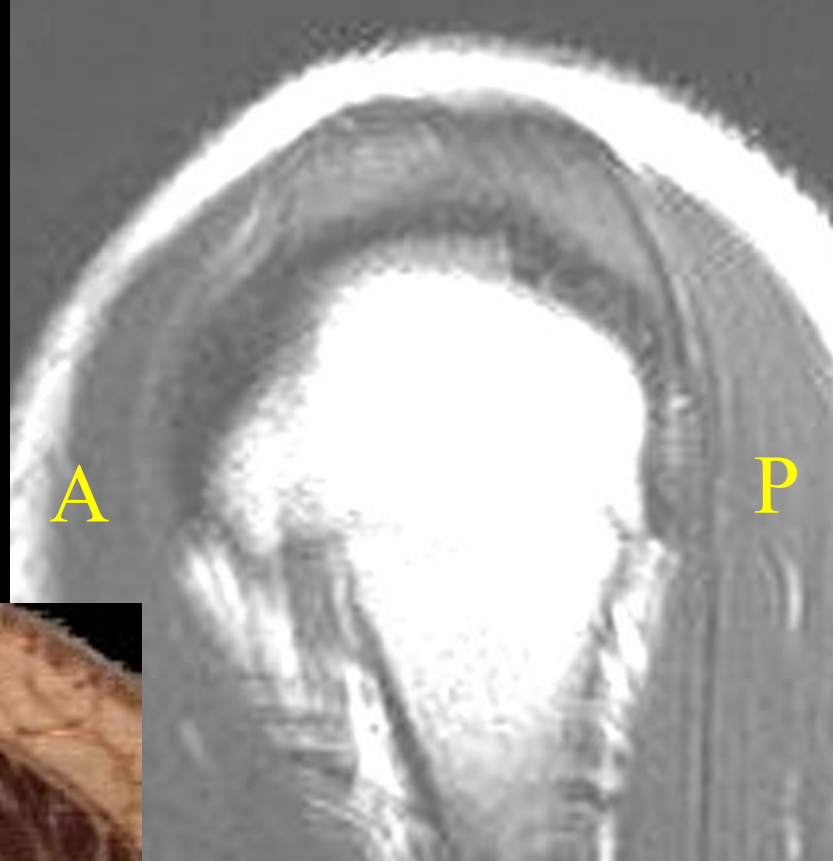


INFRASPINATUS

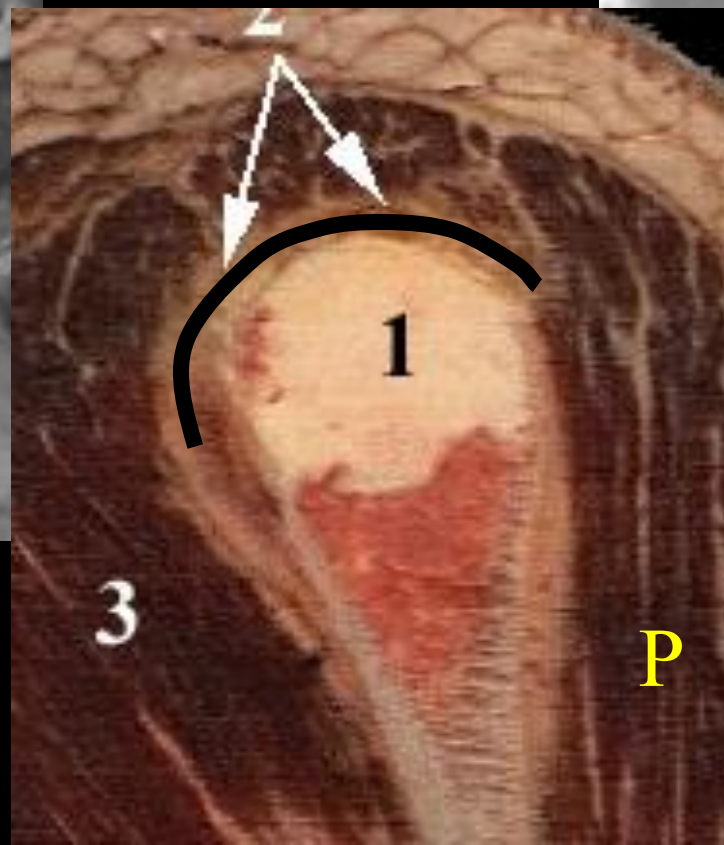
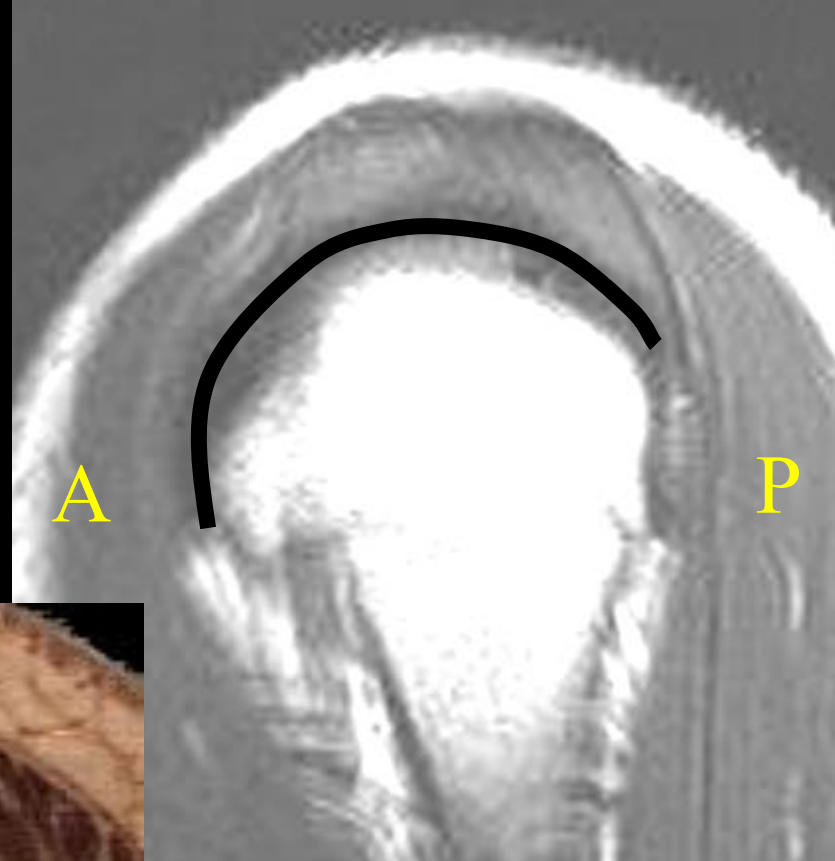




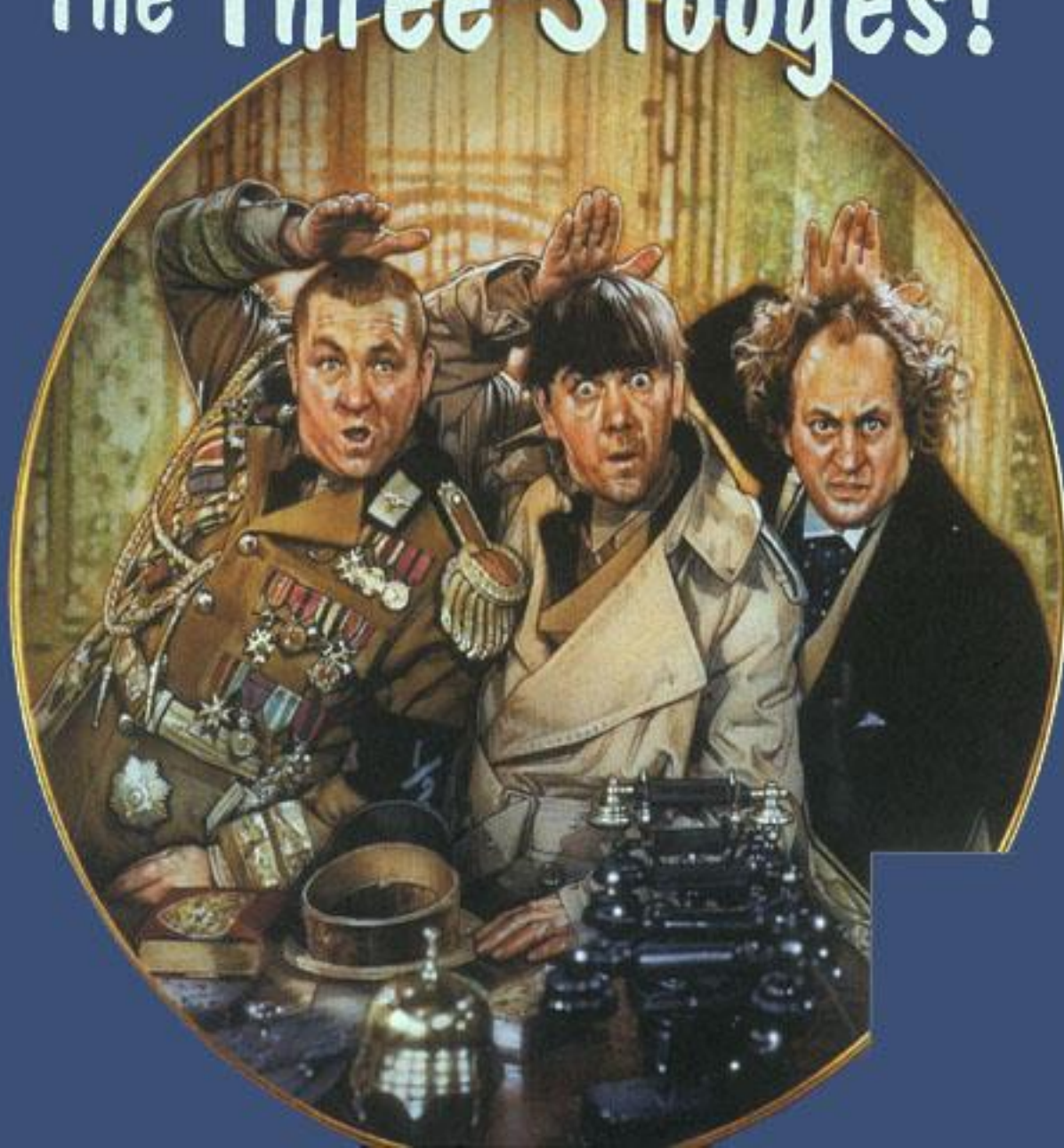
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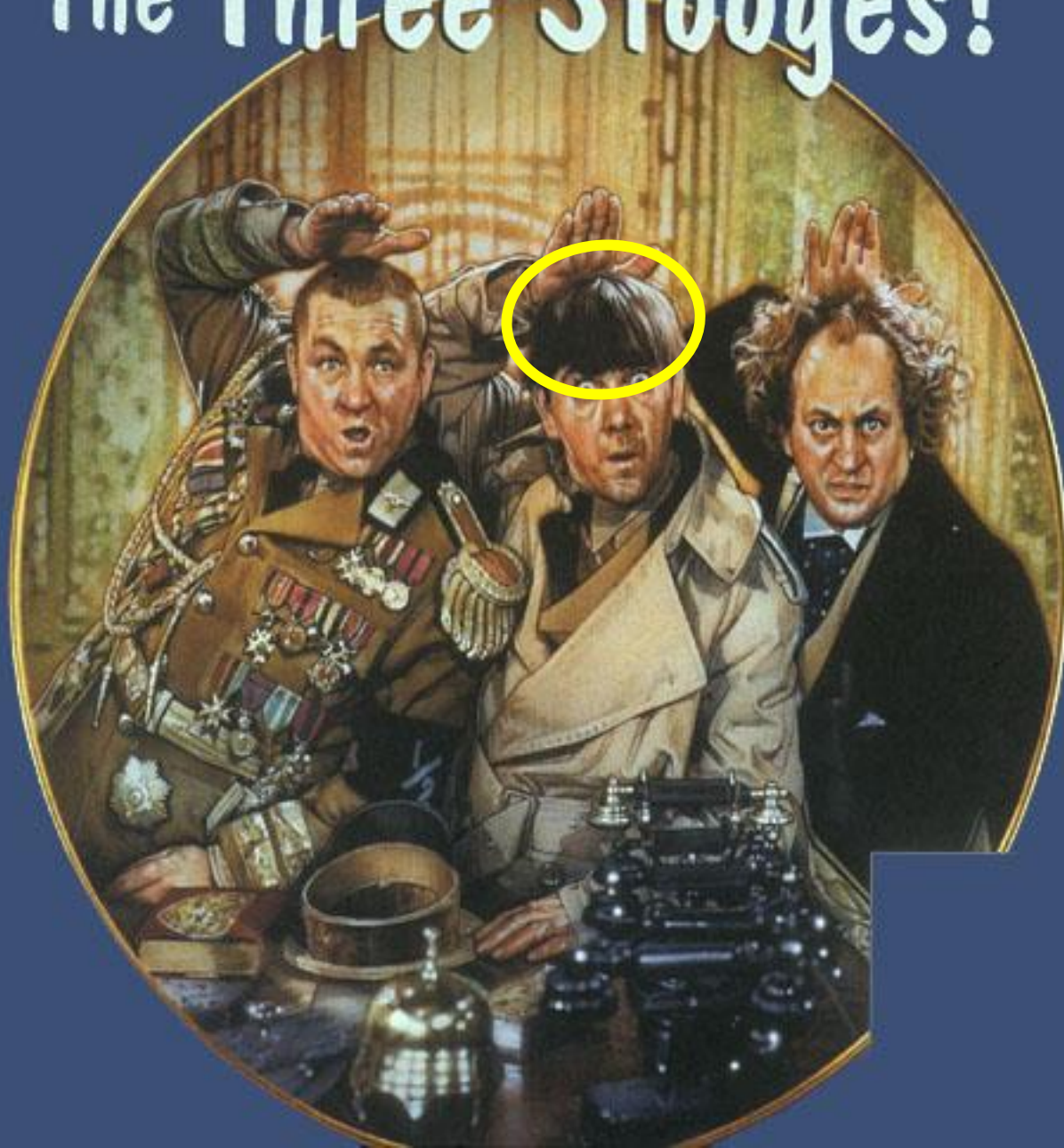
P



The Three Stooges!

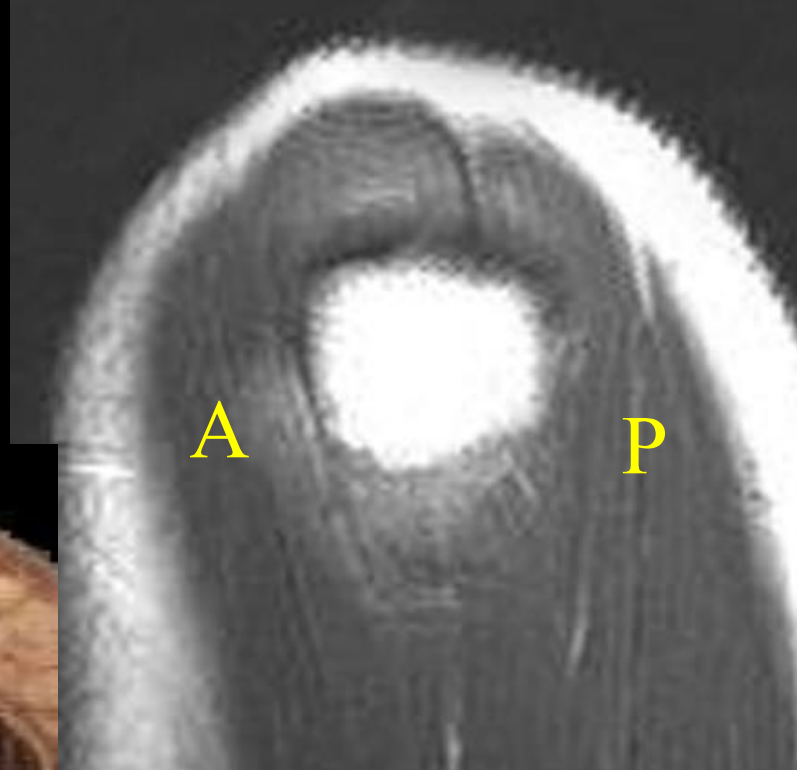


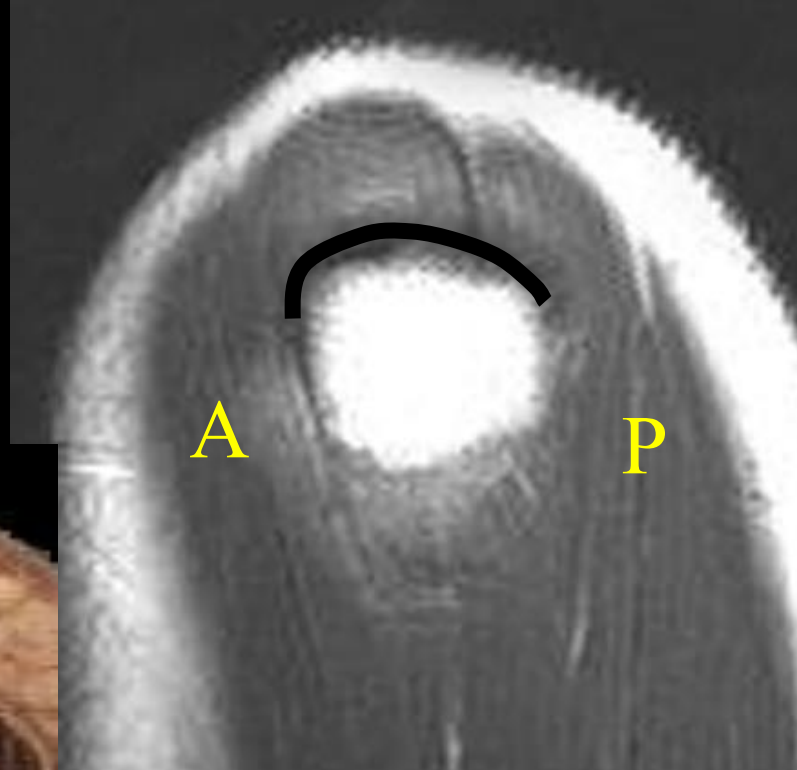
The Three Stooges!











MRI ROTATOR CUFF TEARS

	<u>SENSITIVITY</u>	<u>SPECIFICITY</u>
MR FTT	80%-100% (92%)	88%-97% (93%)
MR PTT	35%-87% (64%)	71%-83% (92%)
MR IAr FTT	80%-100%	78%-100%
MR IAr PTT	50%-71%	88%
MR DAr FTT	96%	99%
MR DAr PTT	80%-84%	96%-97%

ROTATOR CUFF TEARS

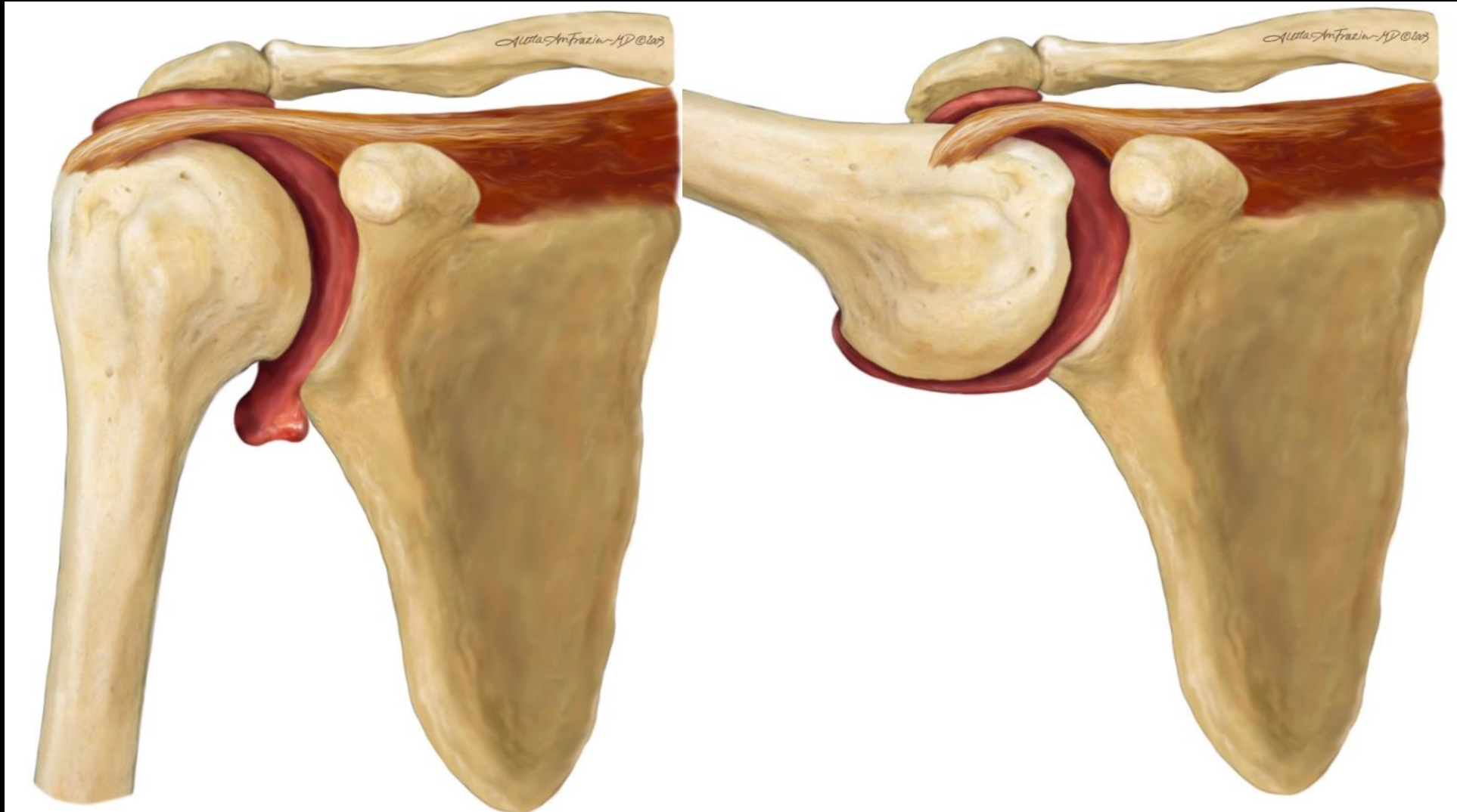
ETIOLOGY

- Impingement
- Overuse
- Aging (25% over age 60; 50% over age 80)
- Chronic inflammatory disease
- Acute trauma
- Instability

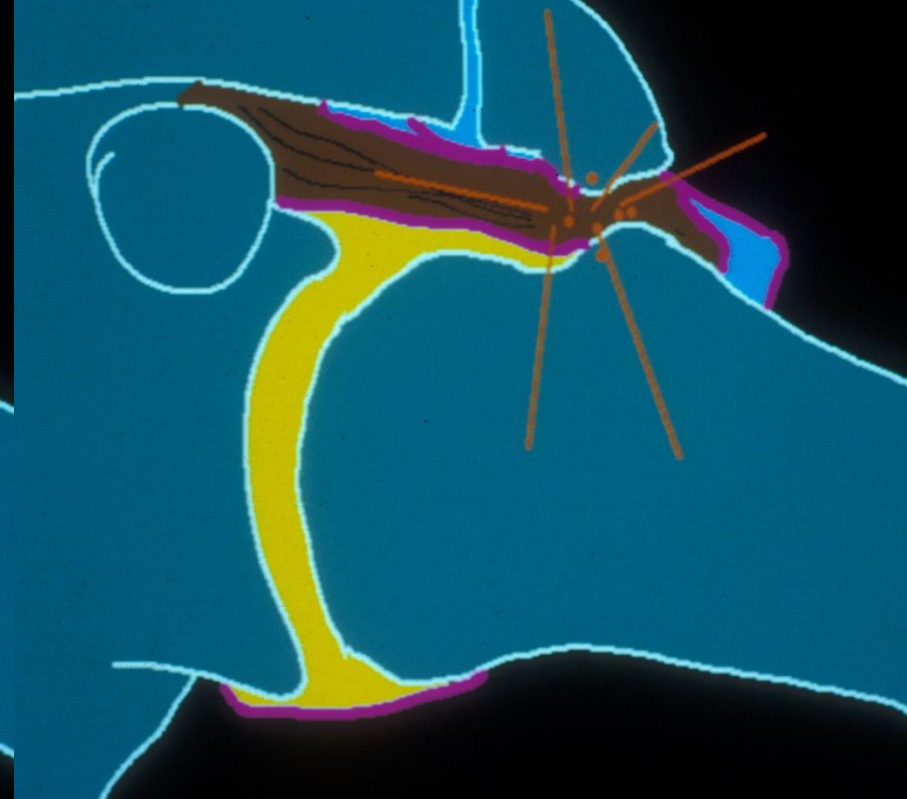
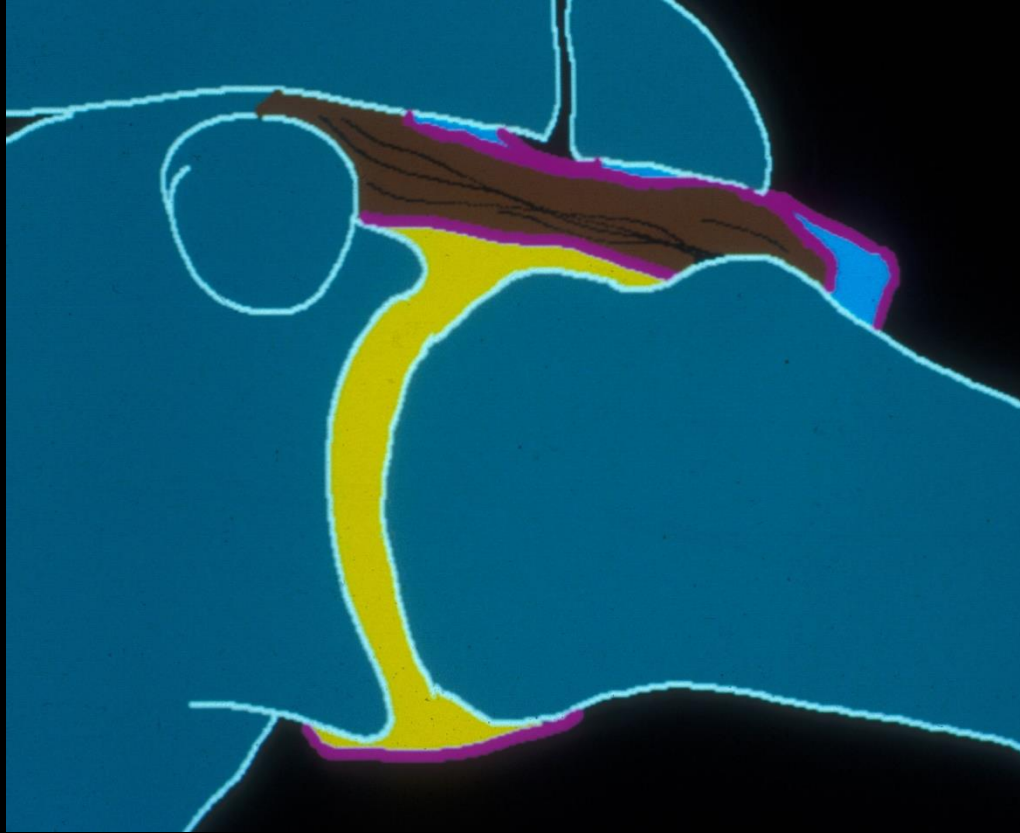
IMPINGEMENT SYNDROME

- Clinical – not radiologic diagnosis
 - Pain with abduction and external rotation
 - Pain with elevation and internal rotation (Neer impingement sign)
 - Probably not as important as previously
- Mechanical causes
 - Acromial shape, position
 - AC joint osteophyte
 - Thick coracoacromial ligament
 - Instability

IMPINGEMENT SYNDROME



IMPINGEMENT SYNDROME



ROTATOR CUFF TEARS

NEER STAGING

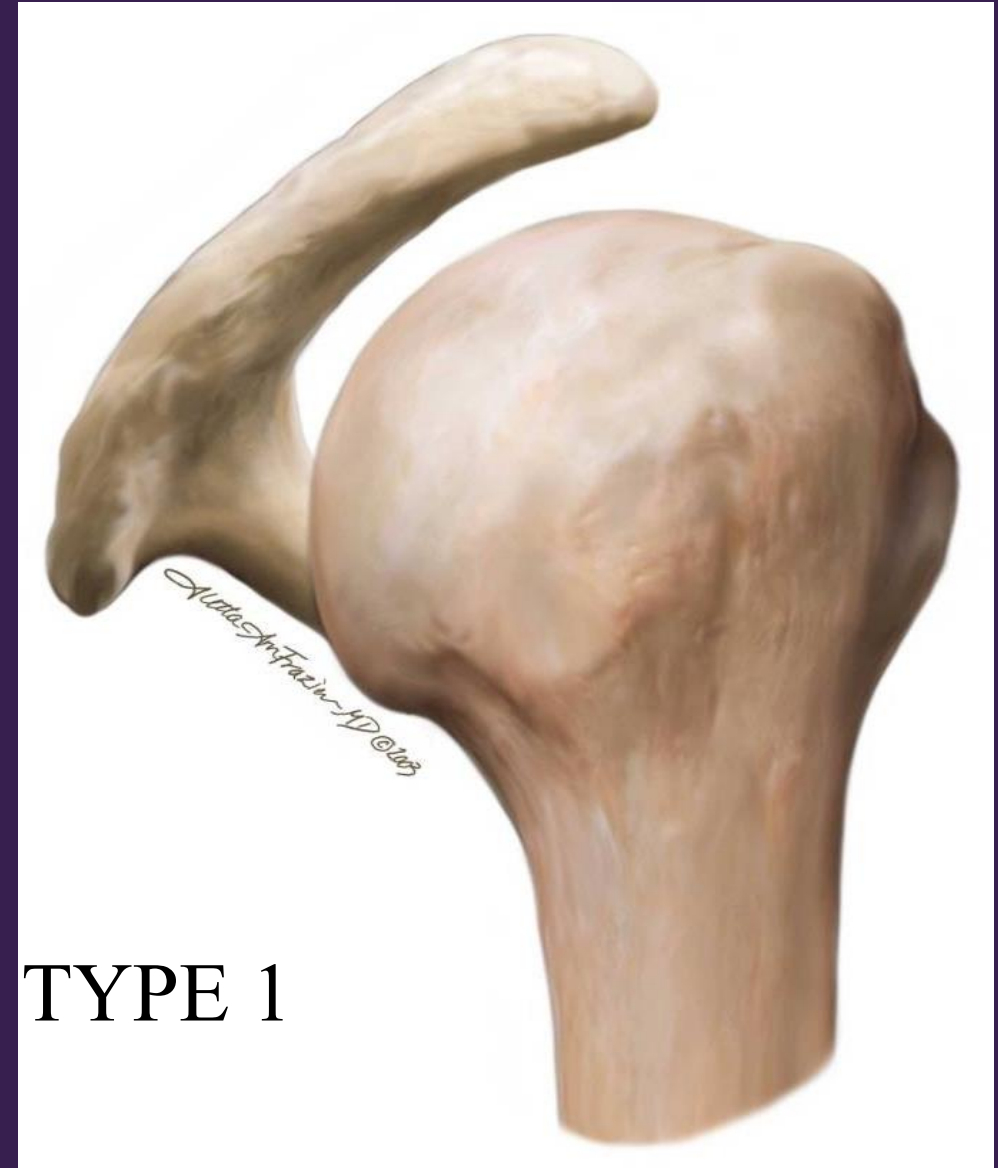
- Stage I (<25 y/o)
 - Edema/hemorrhage
- Stage II (25-40 y/o)
 - Fibrosis/thickening
- Stage III (>40 y/o)
 - Partial/Complete Tear

ACROMIAL SHAPE

- Shape
 - Type I
 - Type II
 - Type III
- Lateral Downsloping
- Anterior Downsloping
- Os acromiale

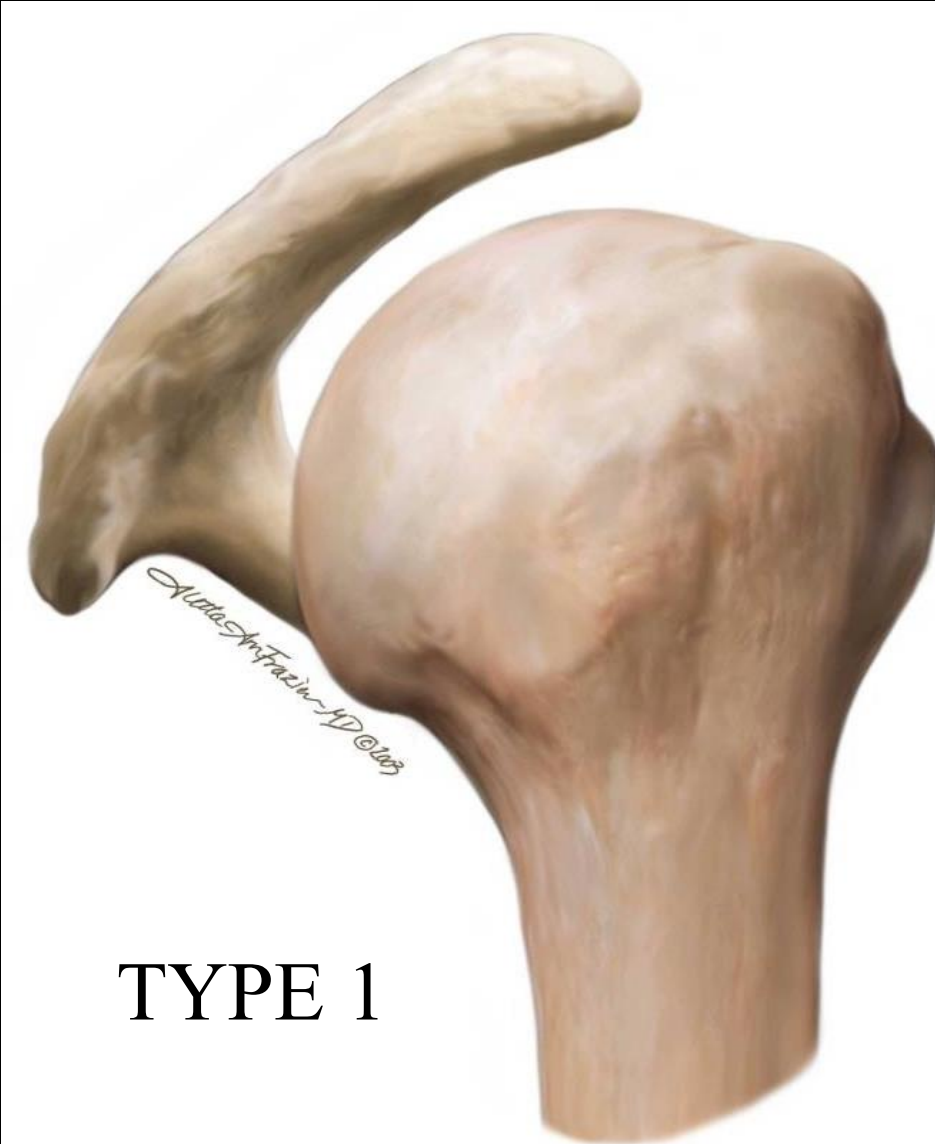
ACROMIAL SHAPE

- Increase in number increases risk of tear
- Type I – flat
- Type II – curved
- Type III – hooked
- Assess on sagittal images
- Not reproducible

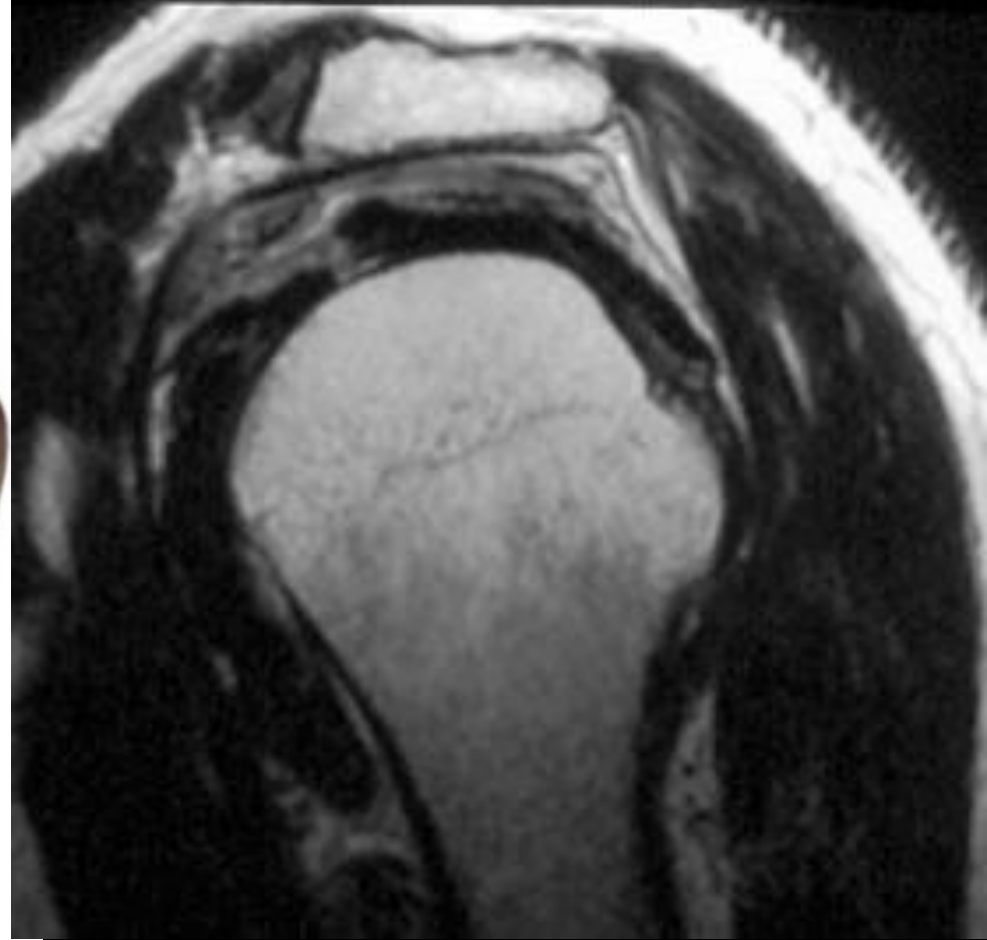


TYPE 1

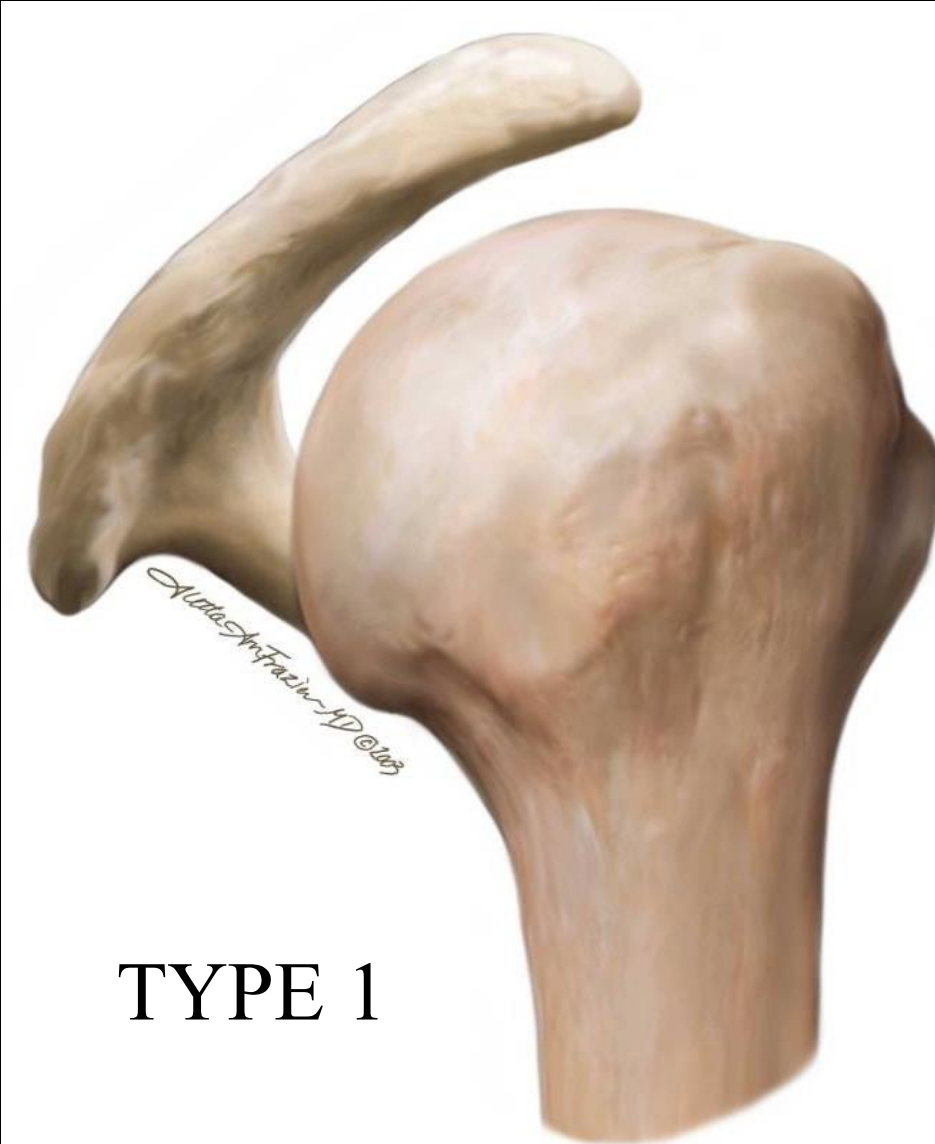
ACROMIAL SHAPE



TYPE 1



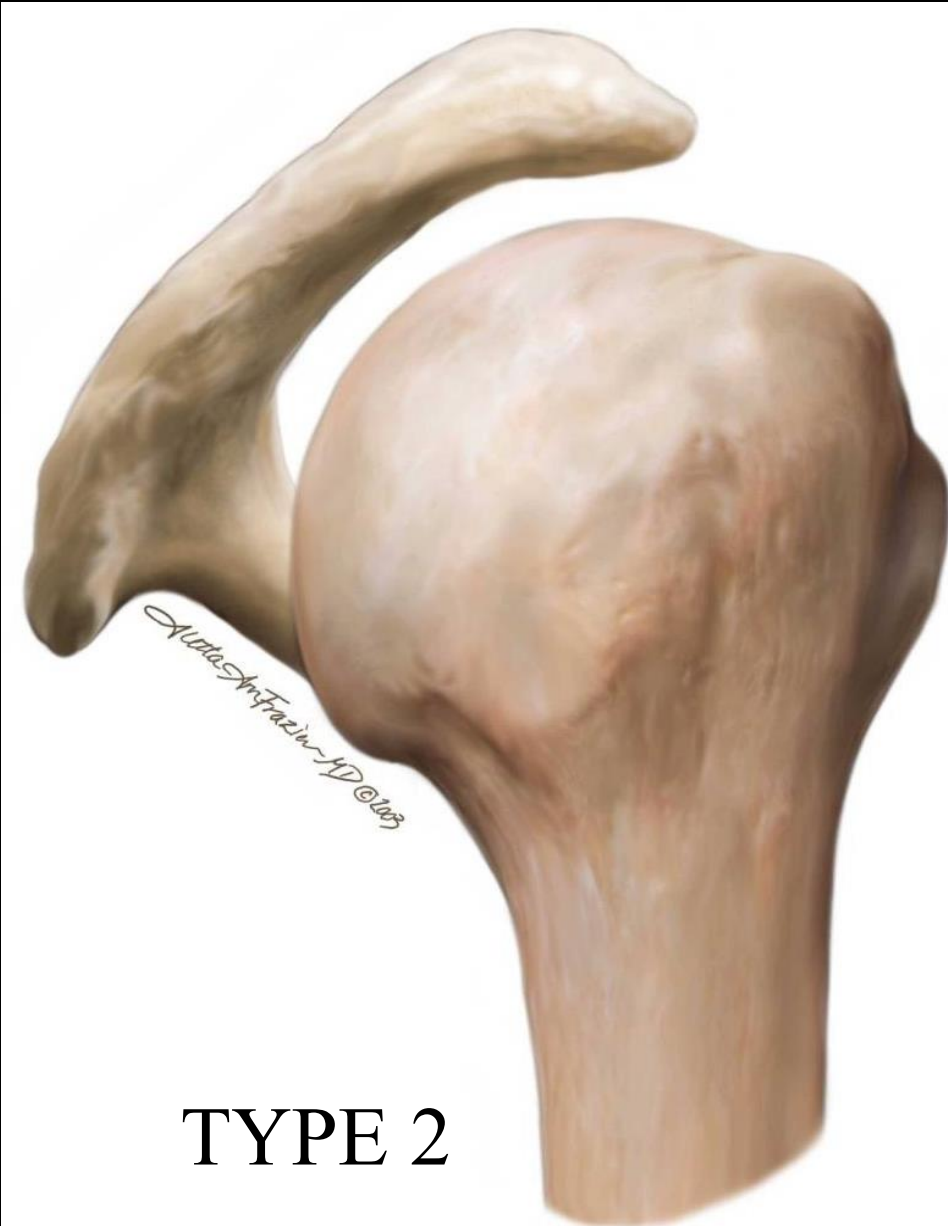
ACROMIAL SHAPE



TYPE 1



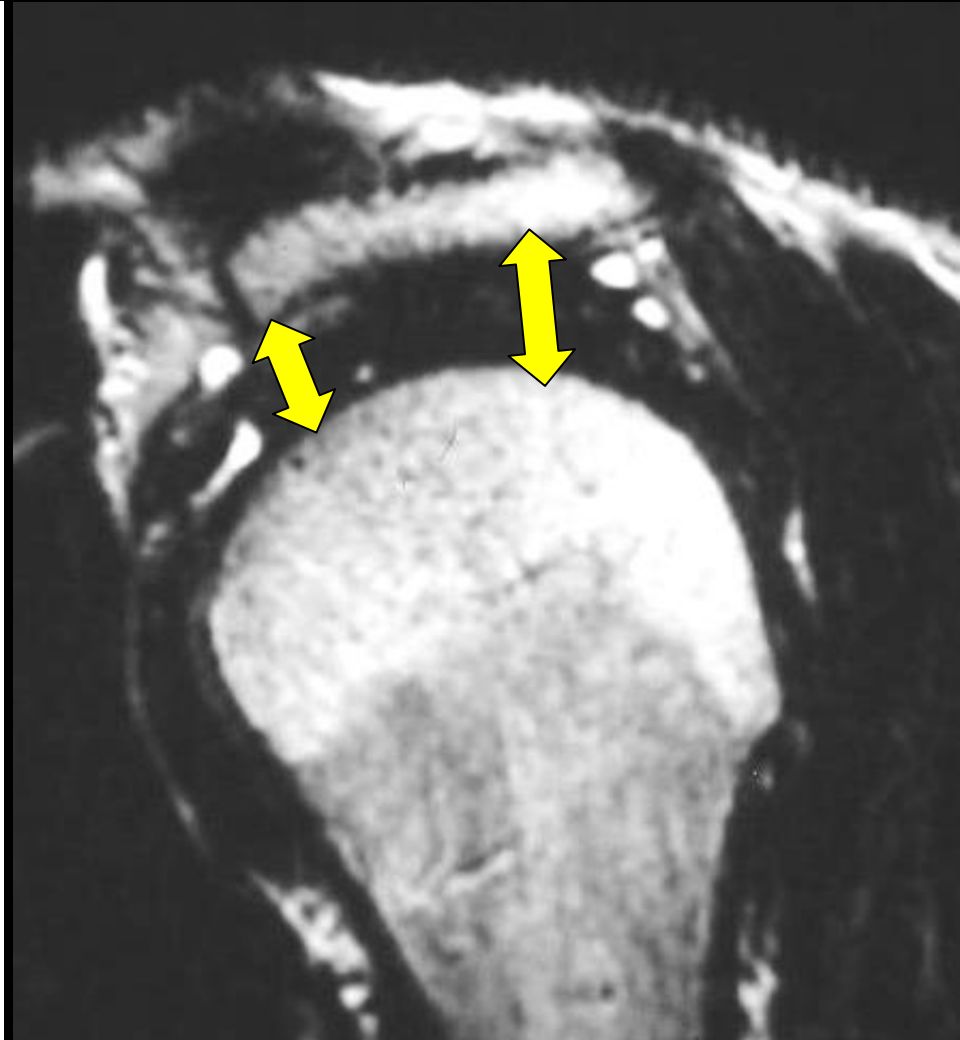
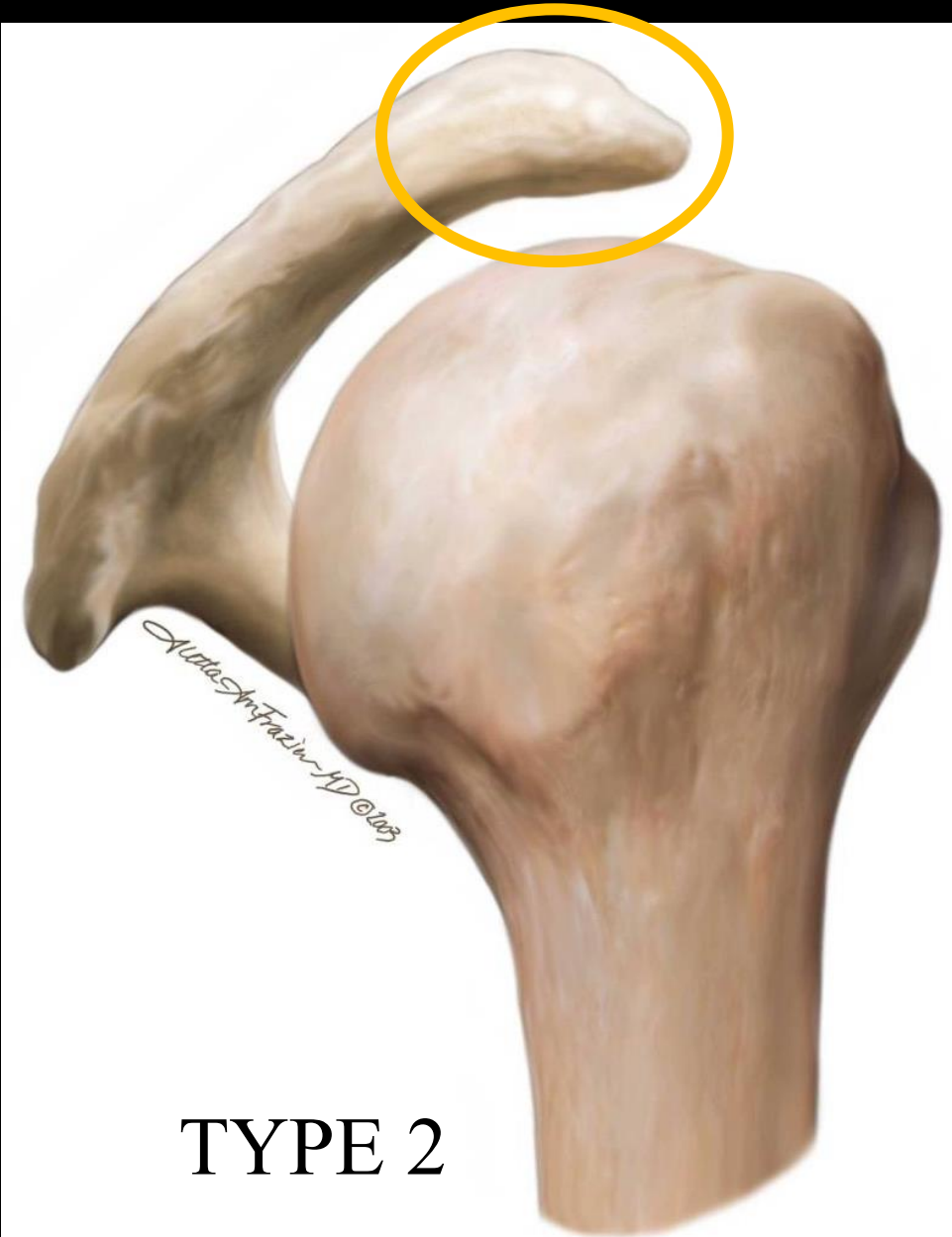
ACROMIAL SHAPE



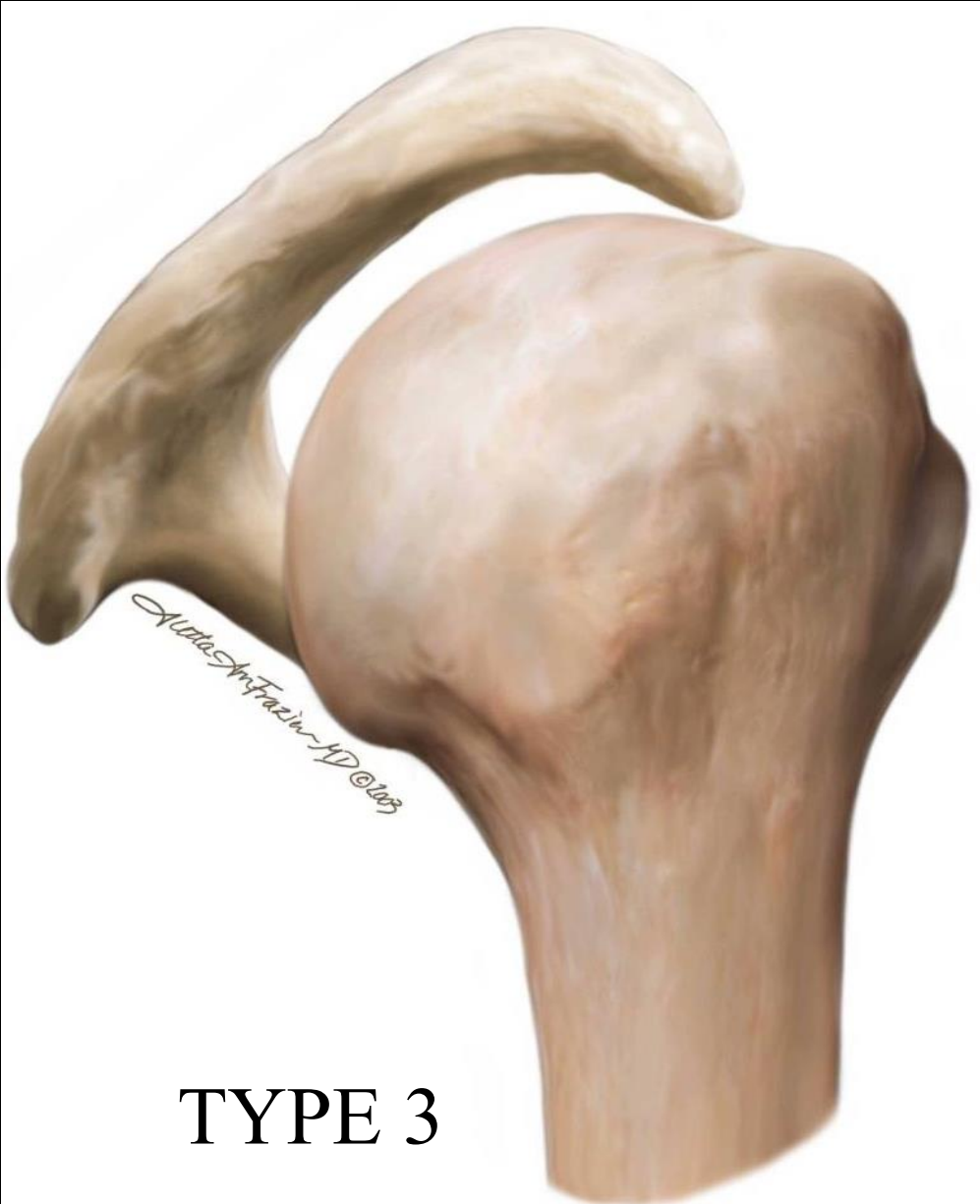
TYPE 2



ACROMIAL SHAPE



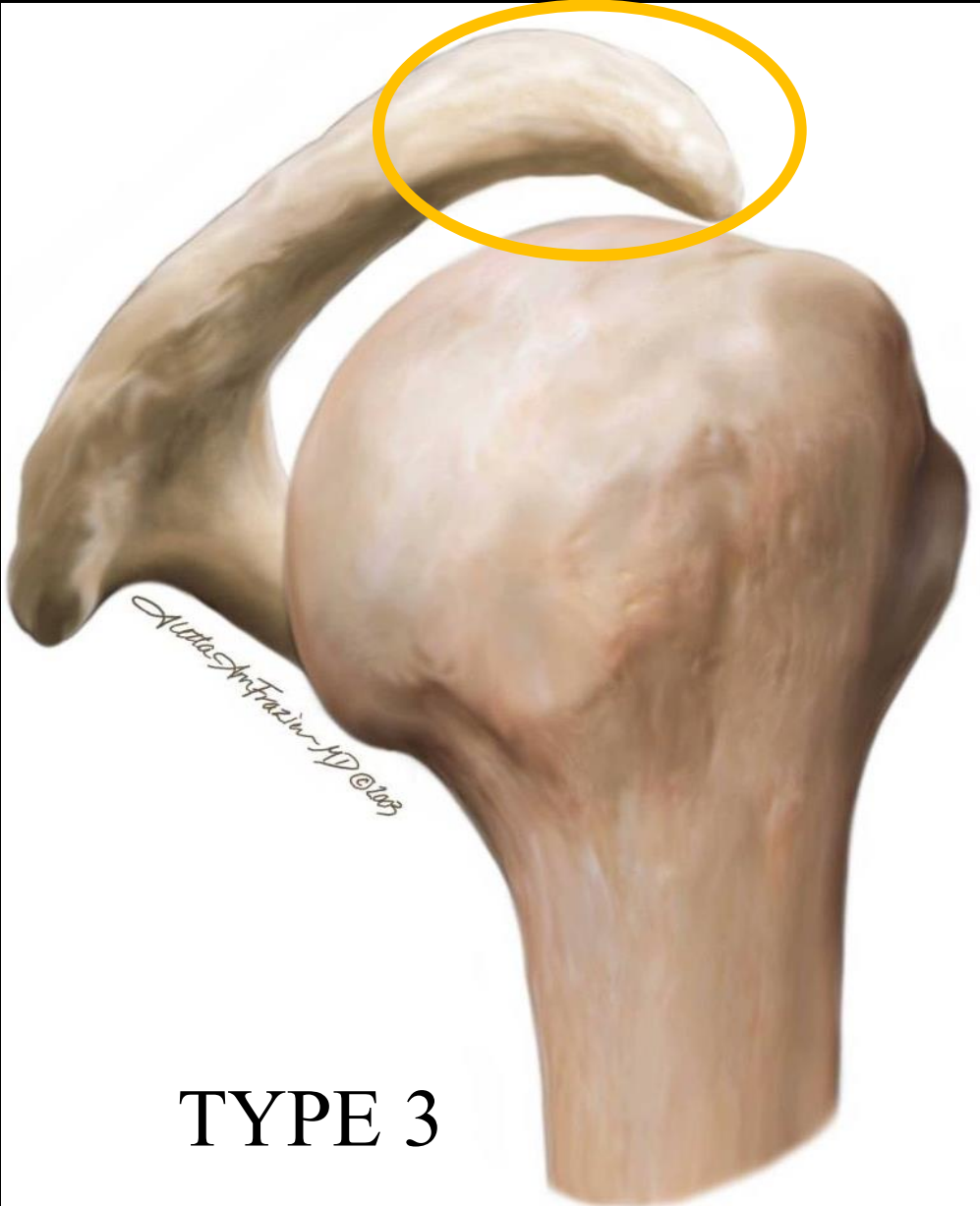
ACROMIAL SHAPE



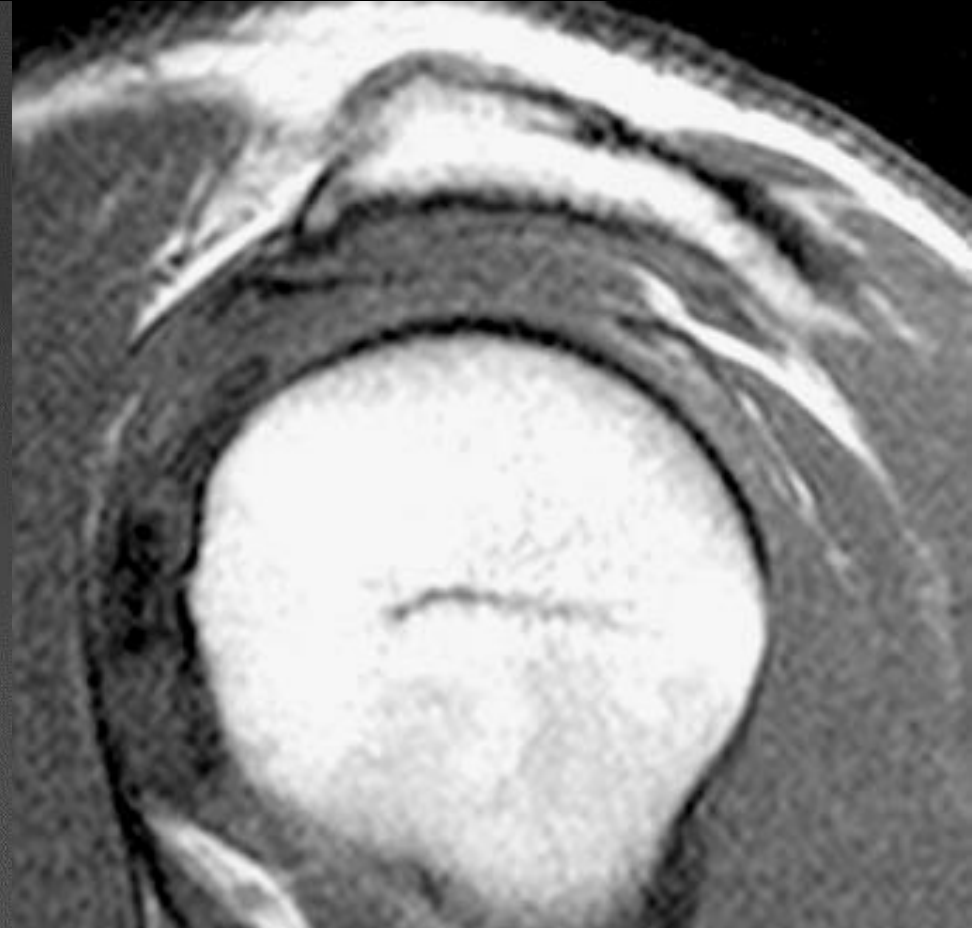
TYPE 3



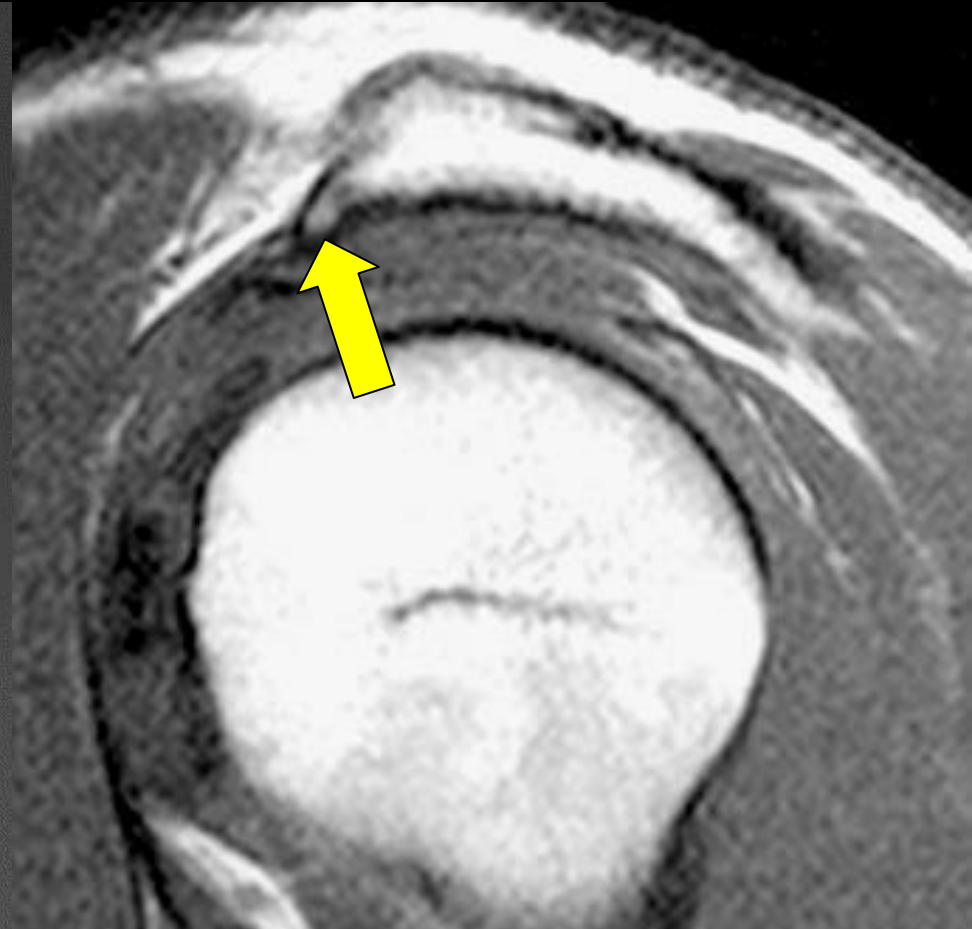
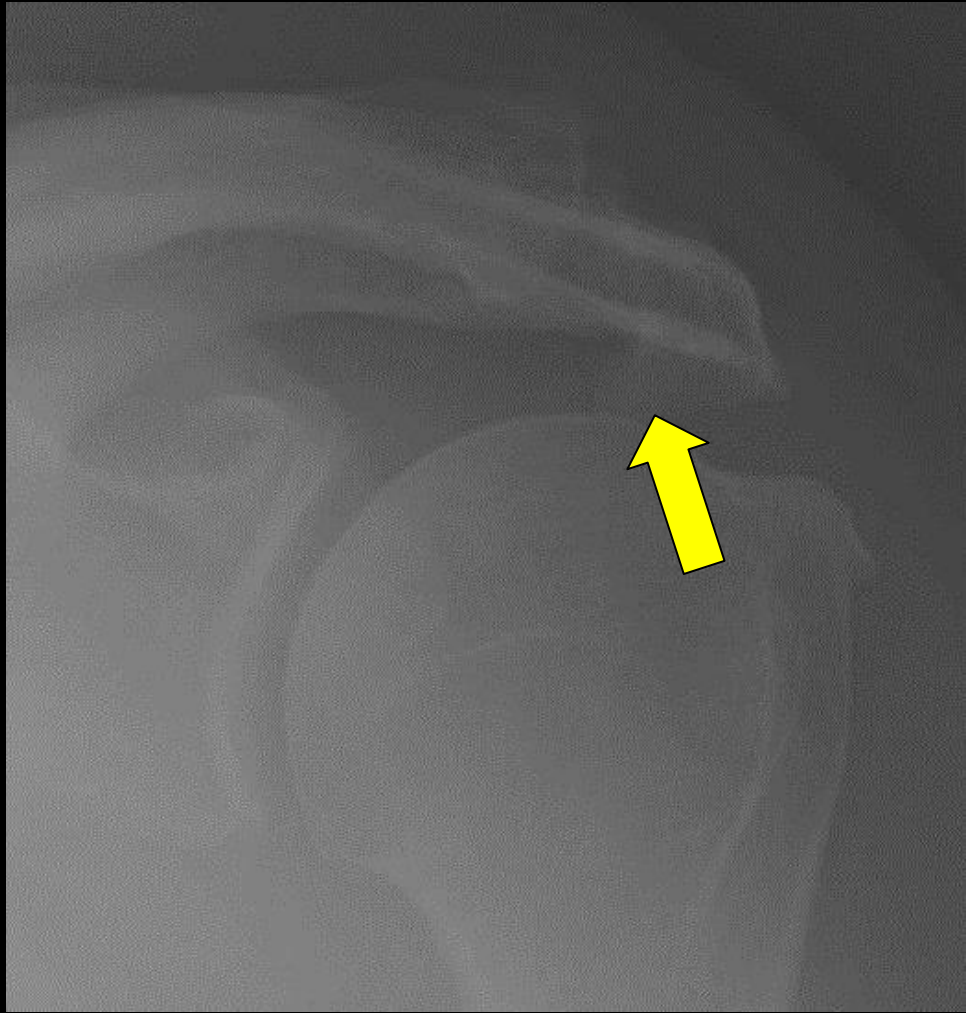
ACROMIAL SHAPE



SUBACROMIAL SPUR



SUBACROMIAL SPUR



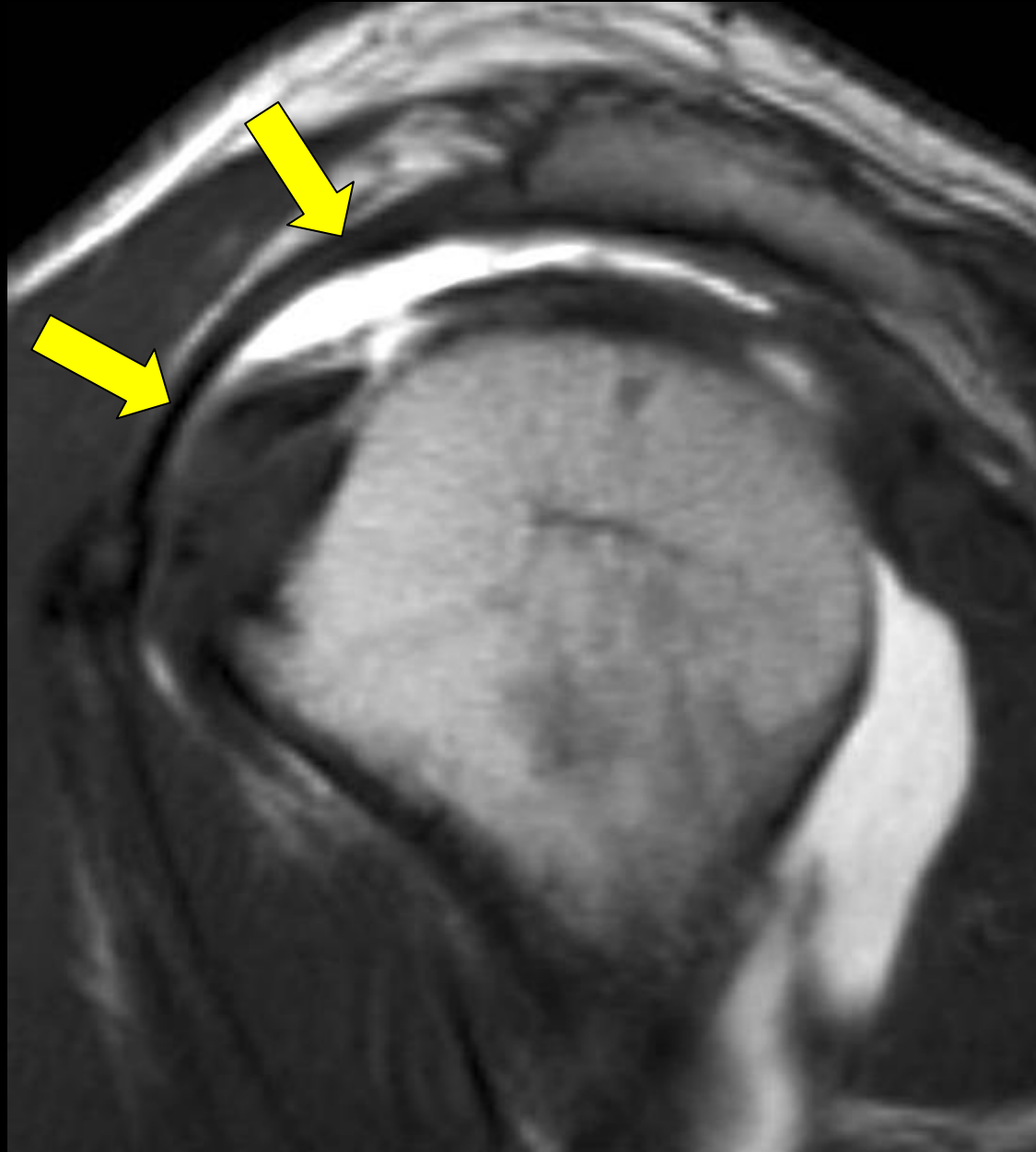
AC JOINT OSTEOPHYTES



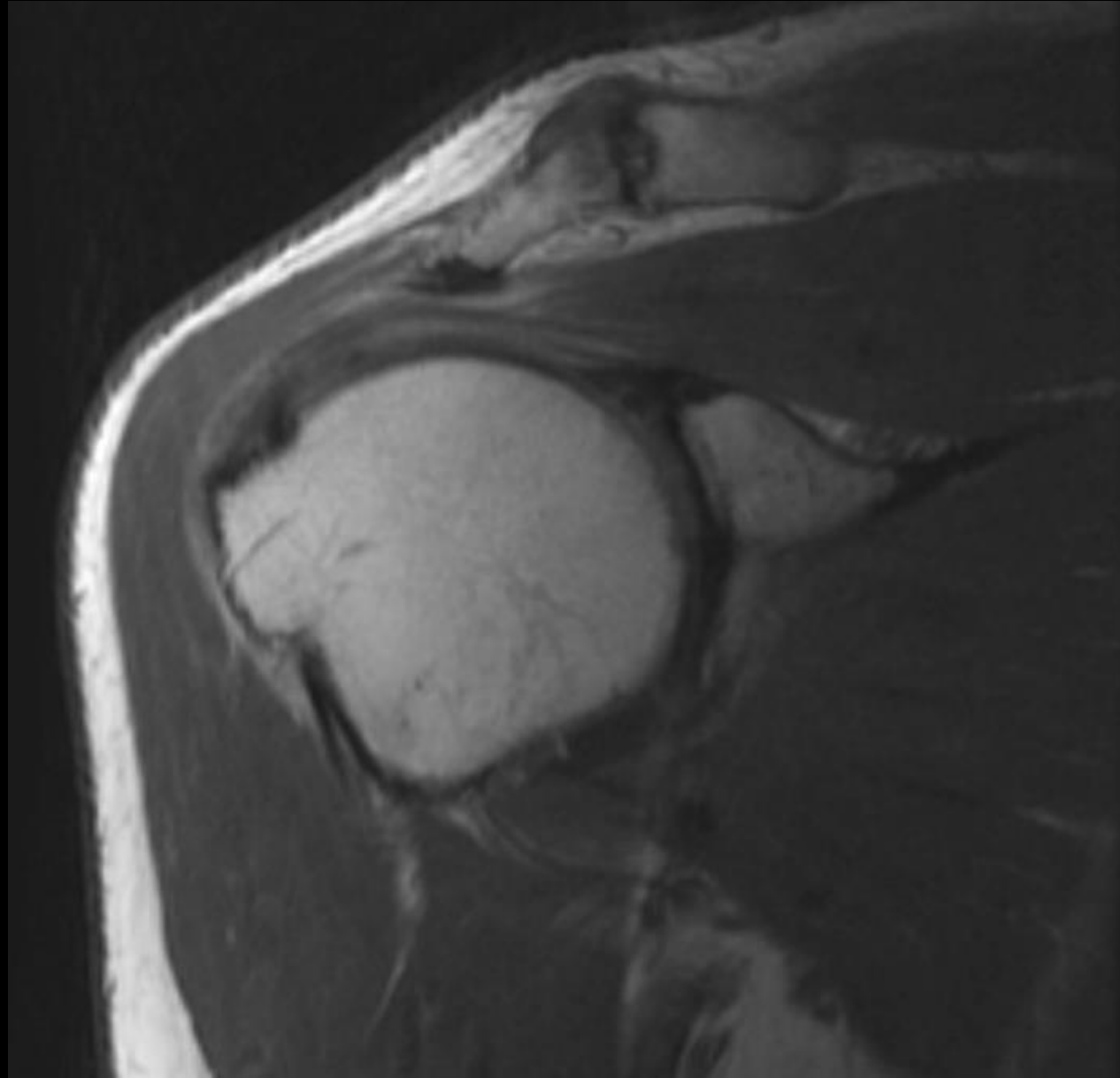
AC JOINT OSTEOPHYTES



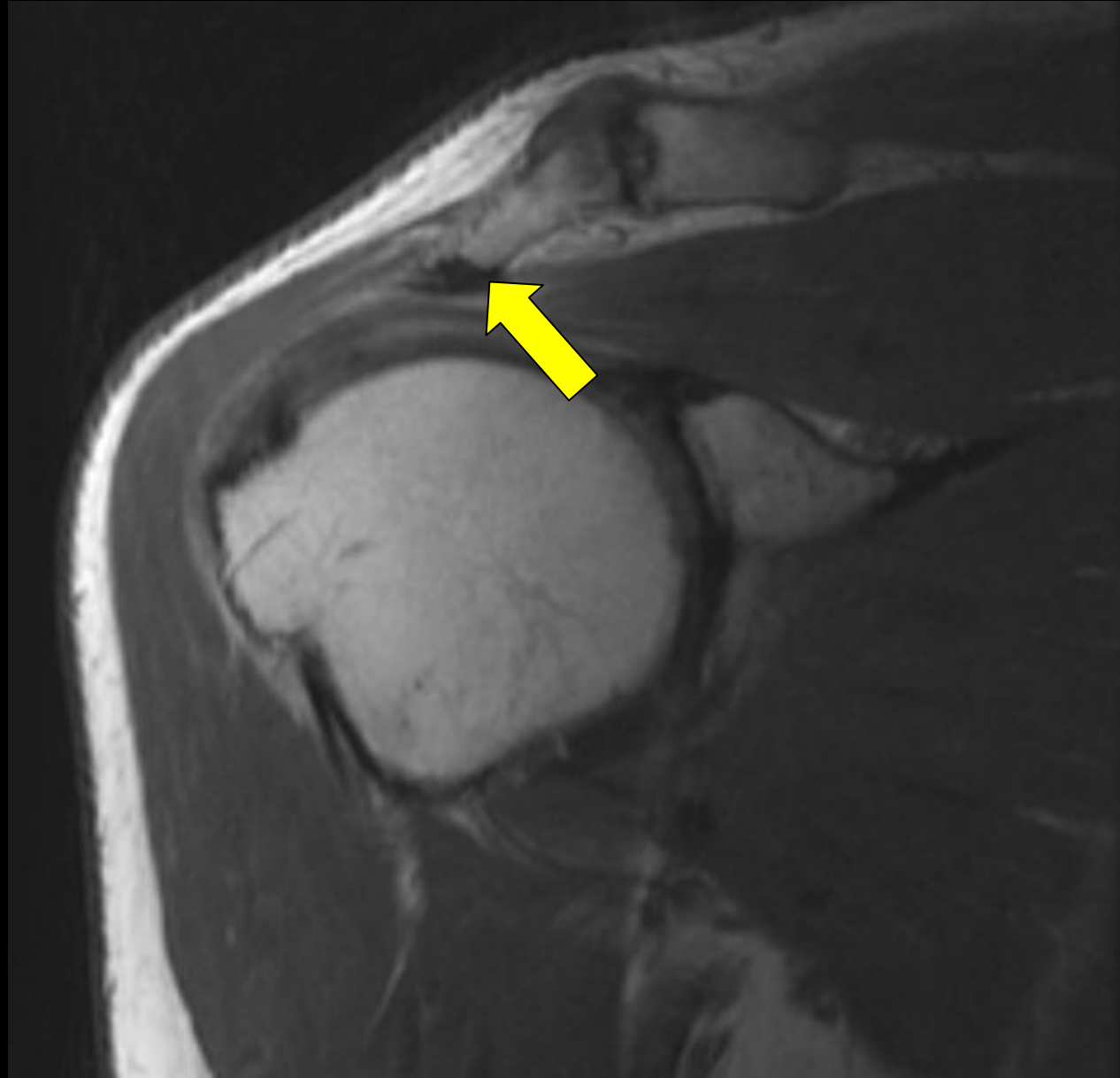
CORACOACROMIAL LIGAMENT



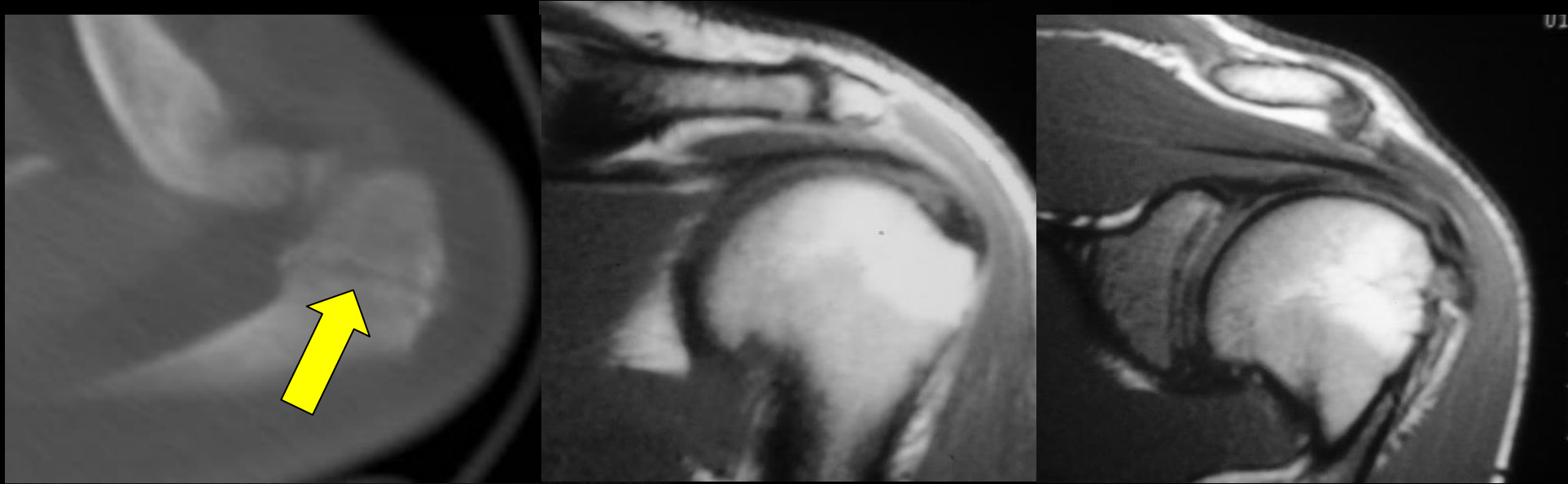
ACROMIAL DOWNSLOPING



ACROMIAL DOWNSLOPING



OS ACROMIALE

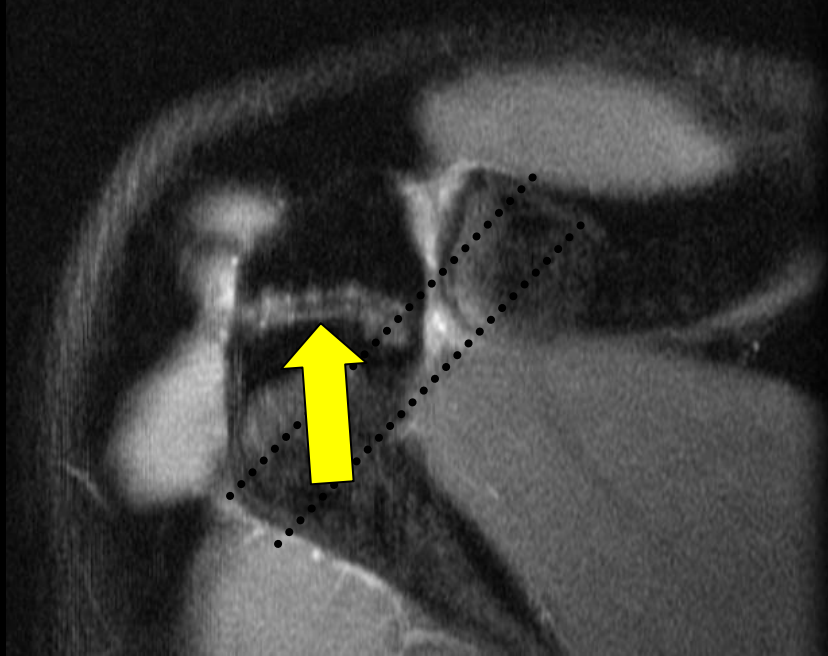


Increased risk rotator cuff tear?

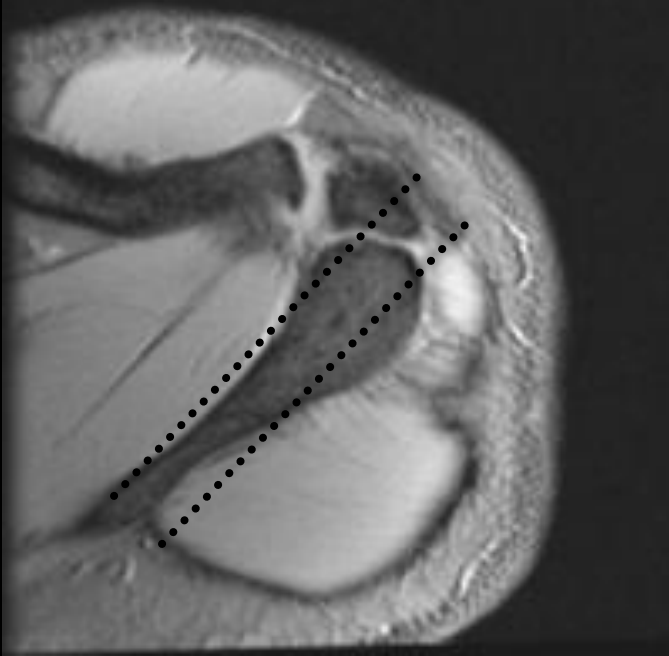
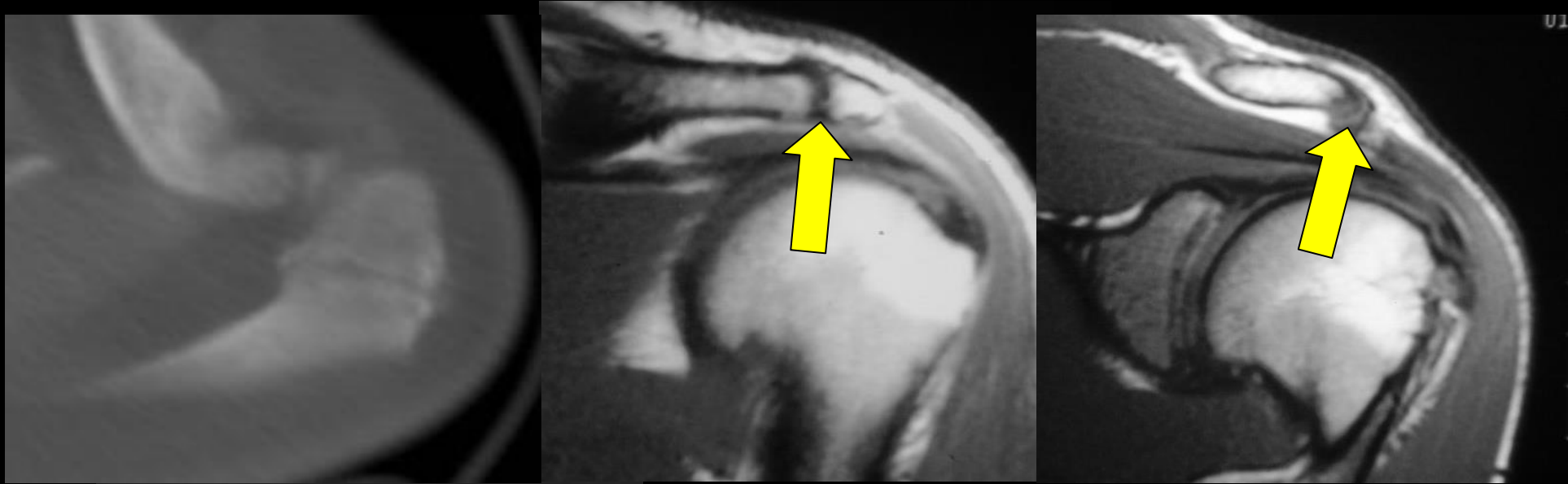
Best seen on axial images

Post-traumatic etiology

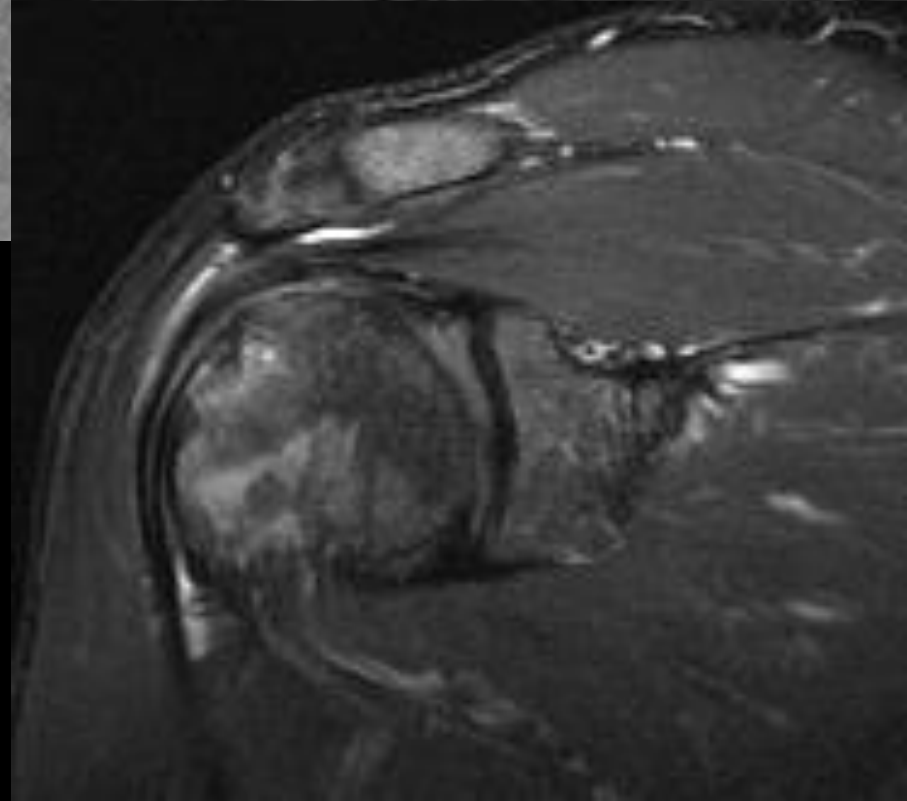
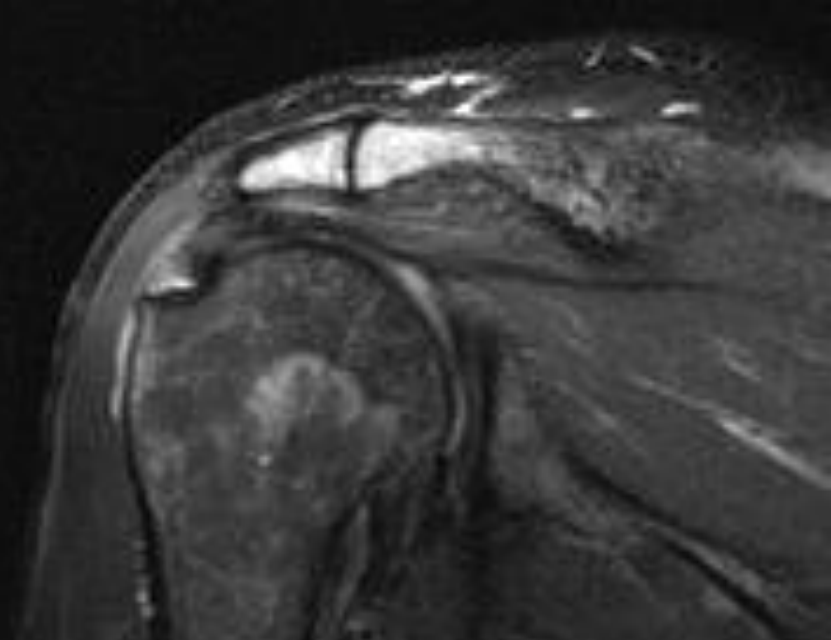
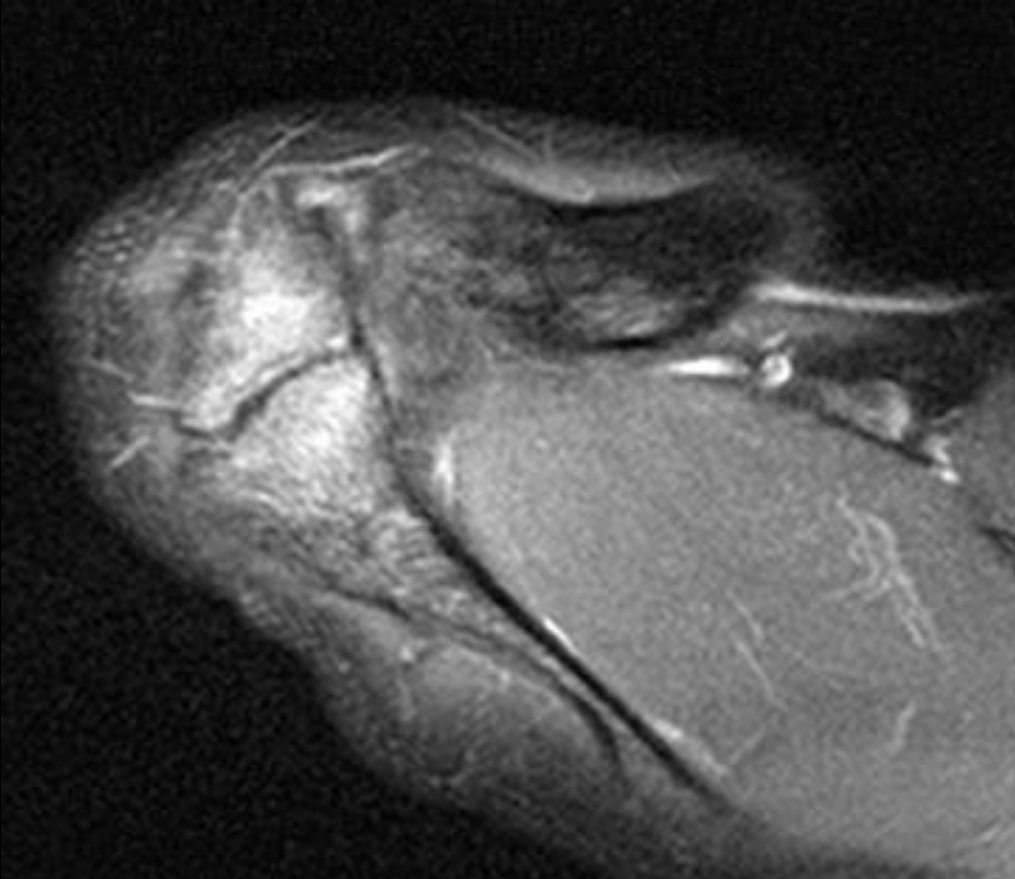
High signal intensity in cleft more likely symptomatic



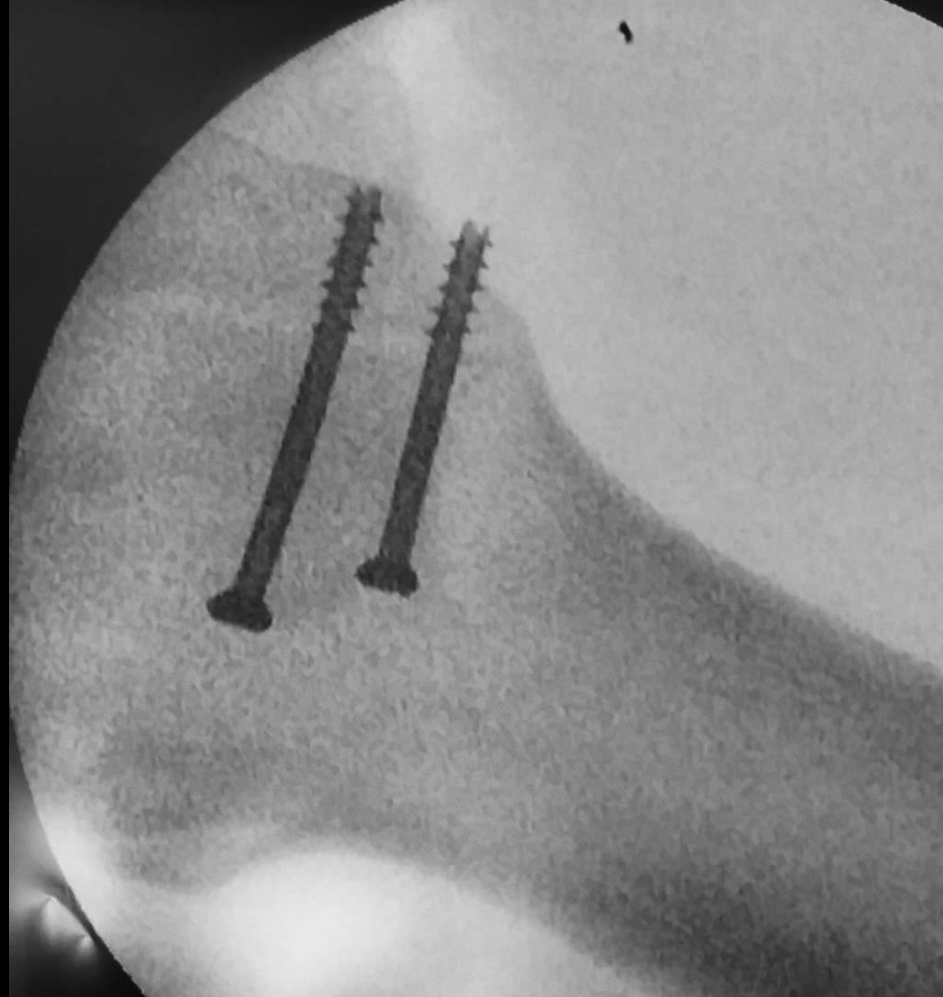
OS ACROMIALE



Incidence 1.3%-15%
Bilateral 33%-62%
Fuses normally age 20-25

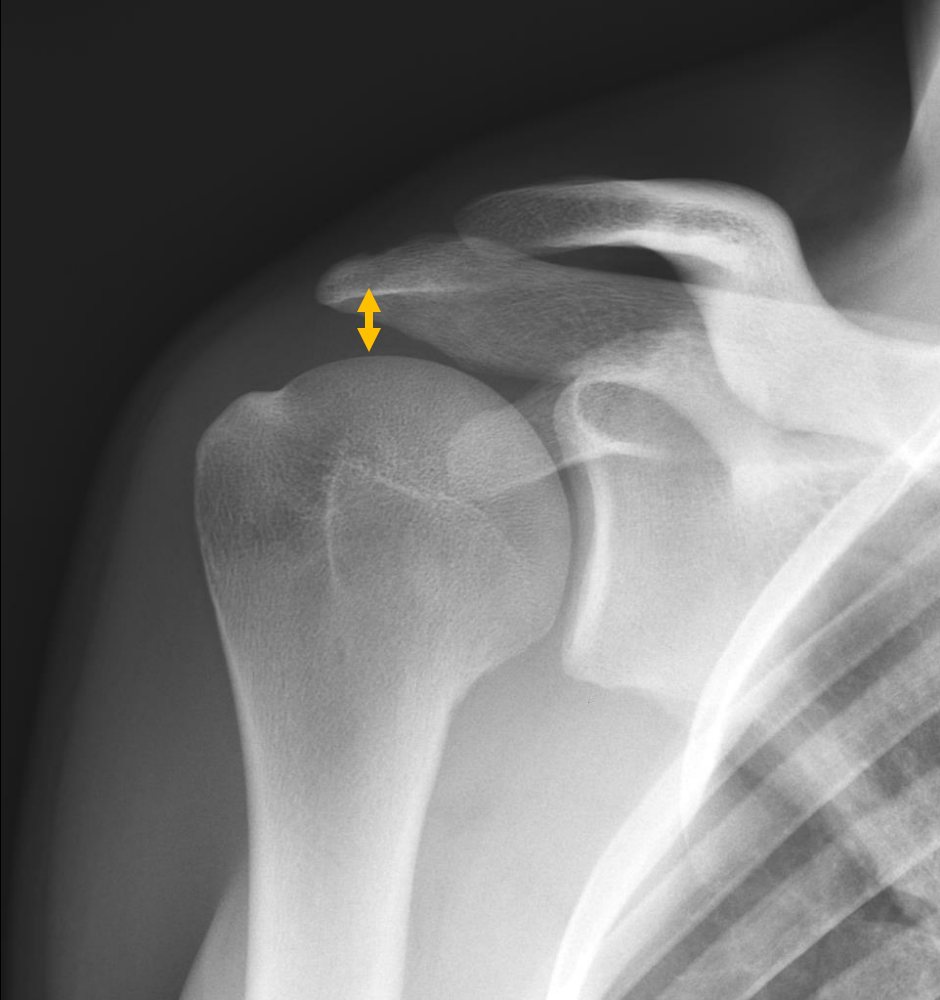


Symptomatic os acromiale



ROTATOR CUFF TEAR RADIOGRAPHY

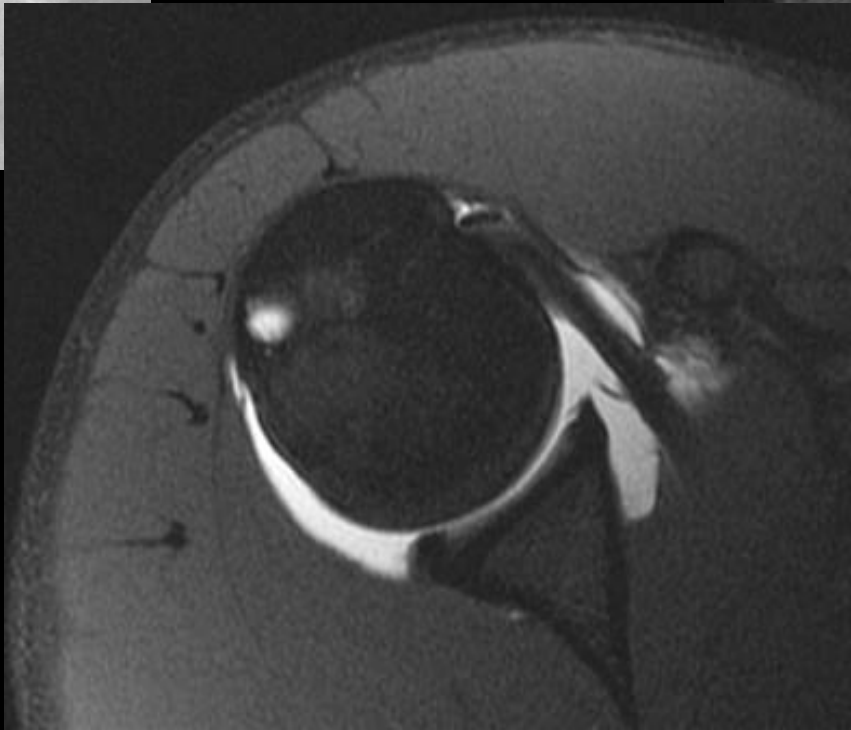
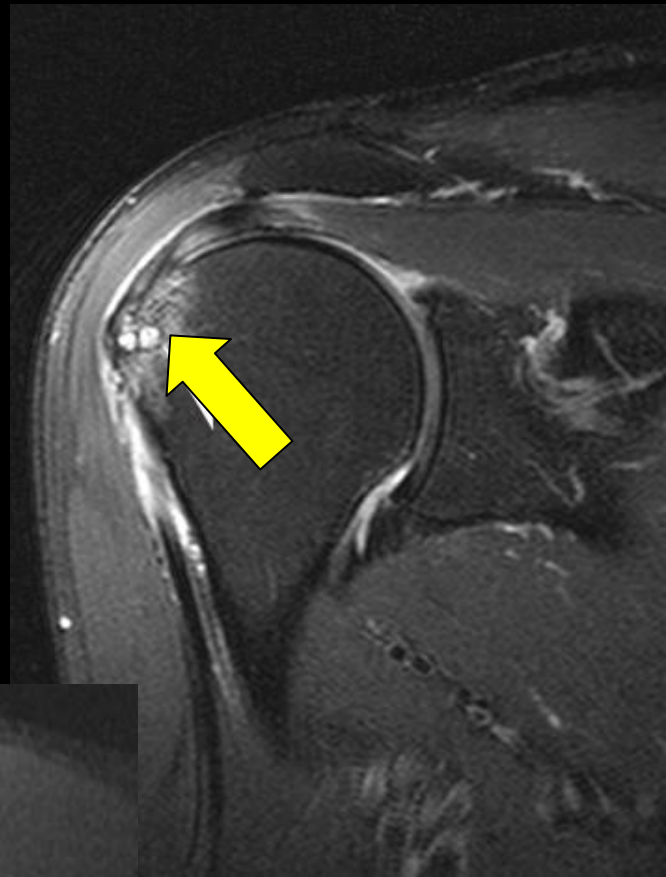
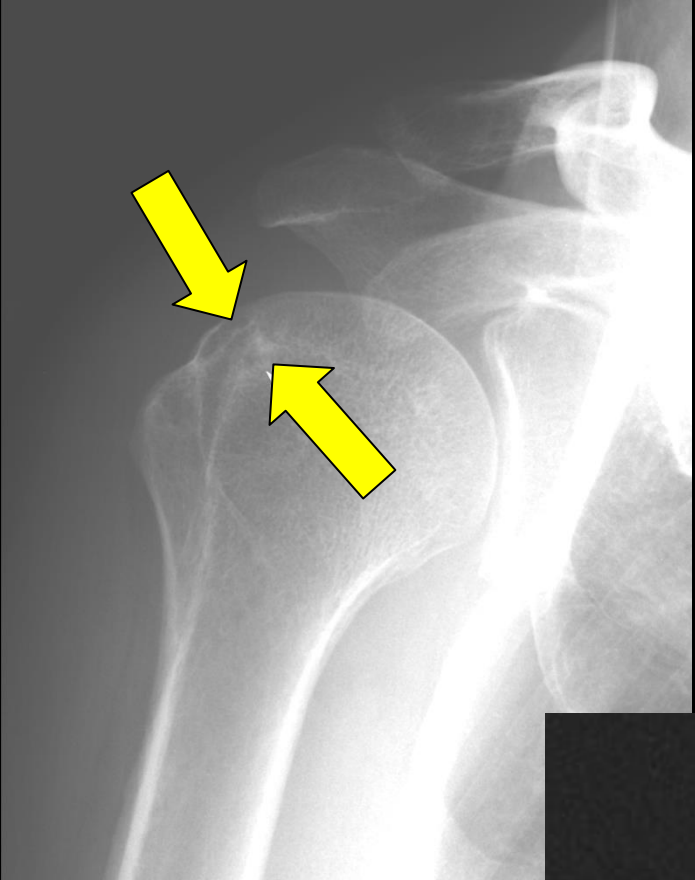
- Cysts in the greater (and irregularity) and lesser tuberosity have a high association with rotator cuff pathology; **Posterior “cysts” do not**
- Decreased space between the humeral head and acromial undersurface also associated with rotator cuff pathology
 - Normal >7mm
 - 5-7mm abnormal
 - <4/5 mm rotator cuff tear

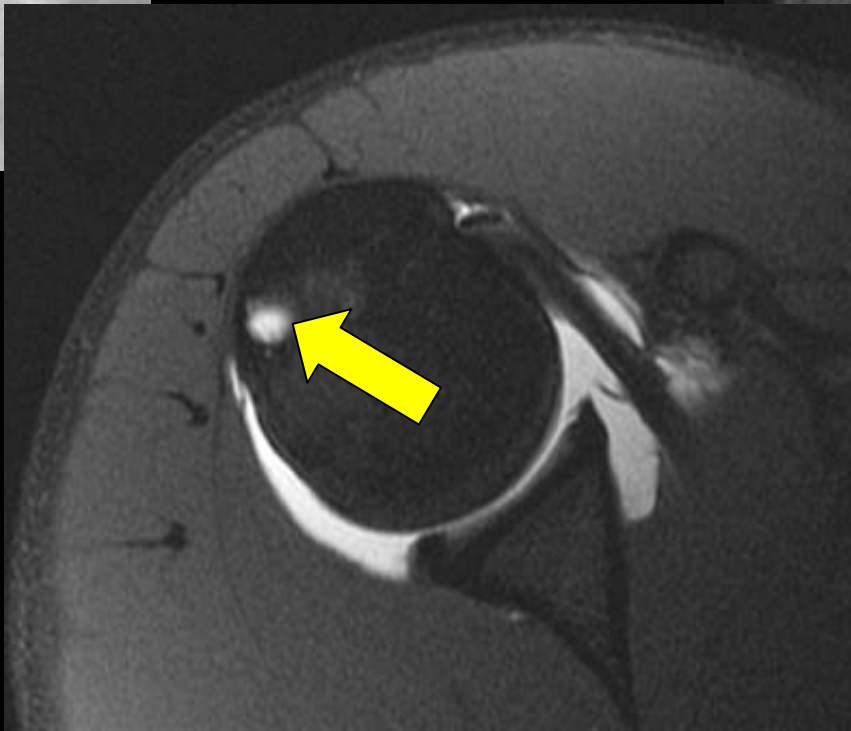
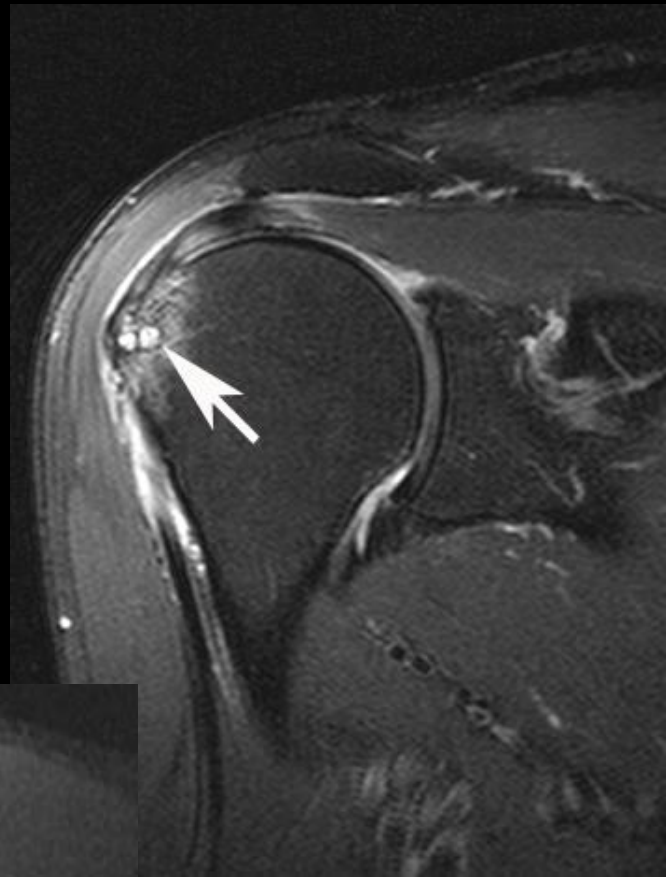
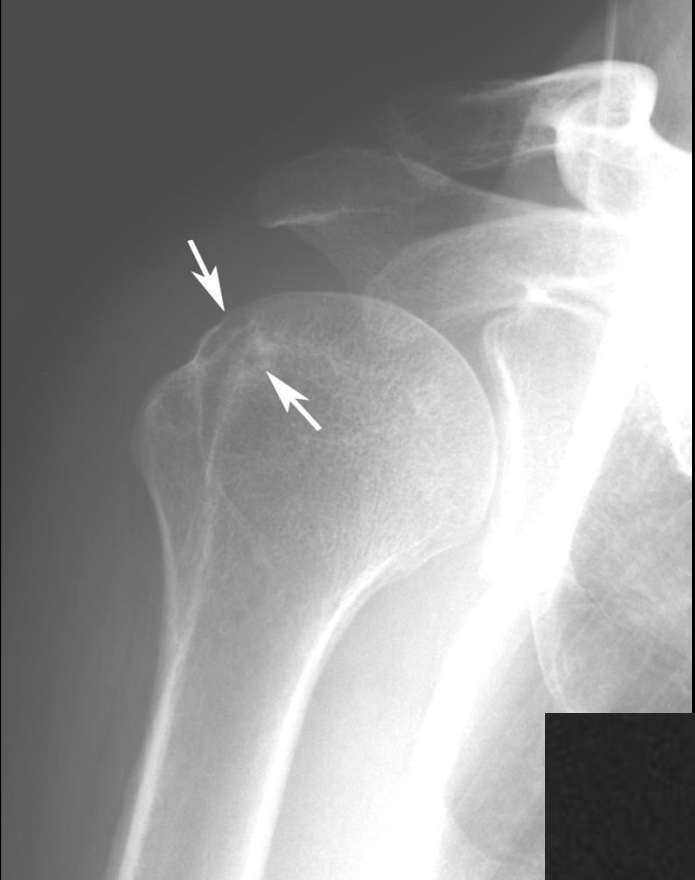


Normal



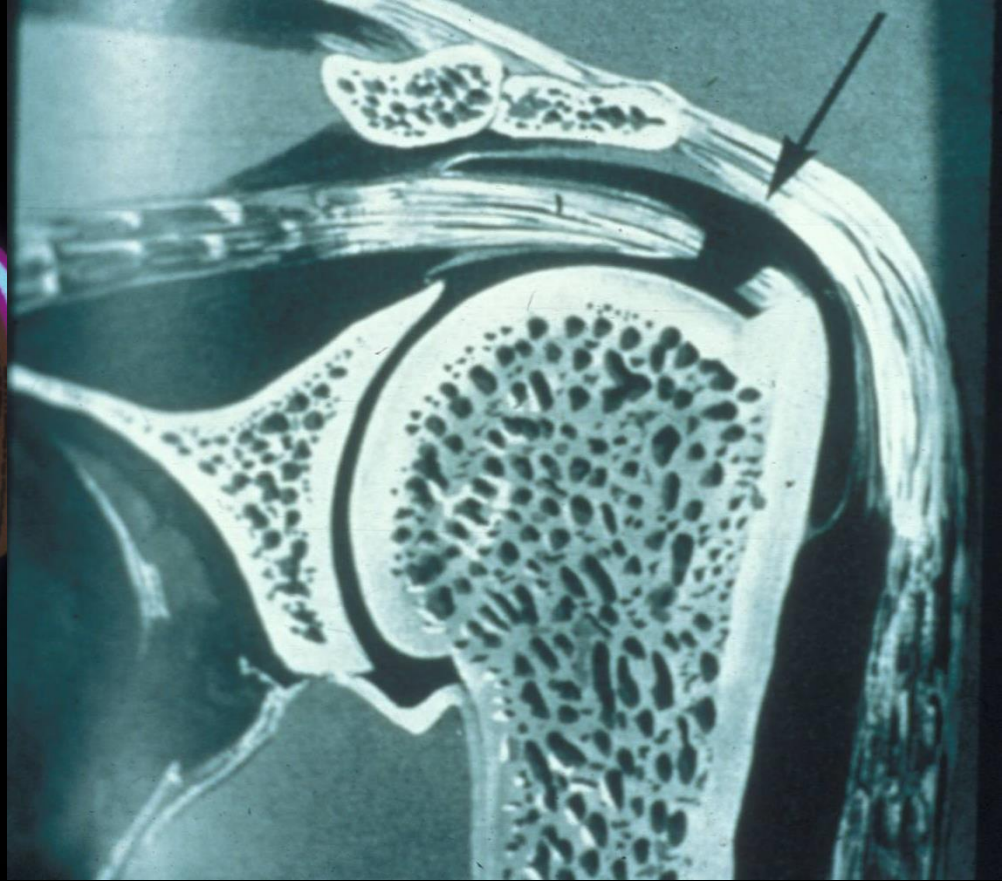
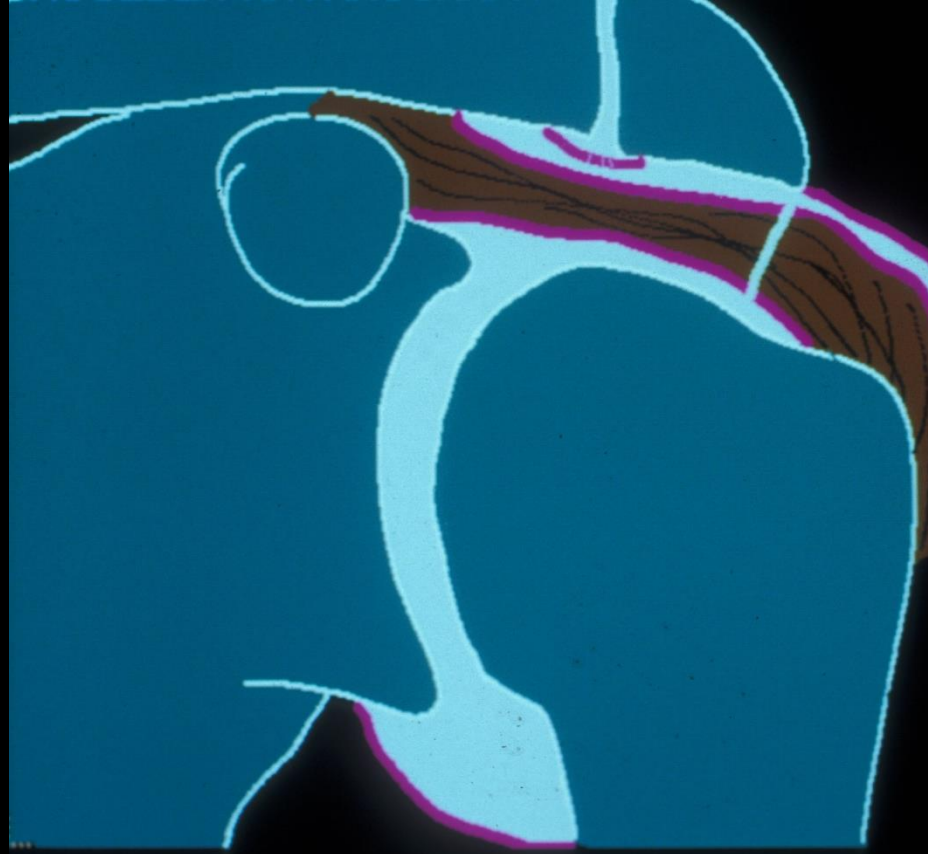
Rotator cuff tear

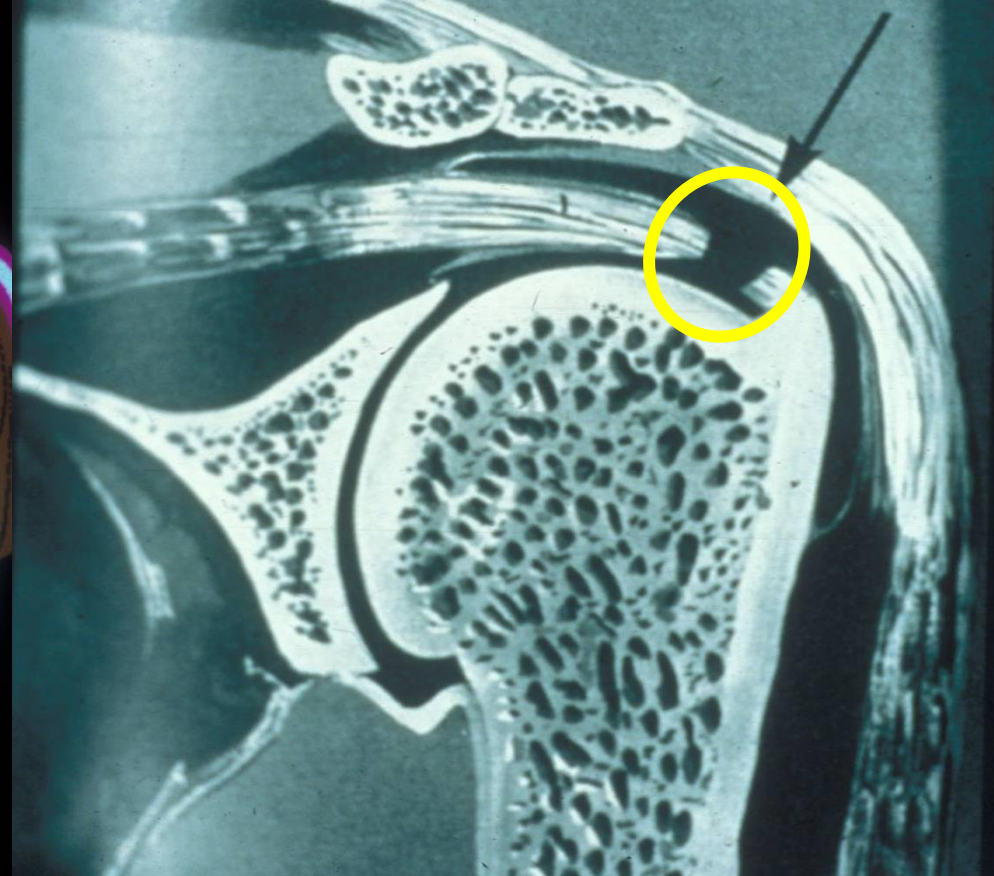
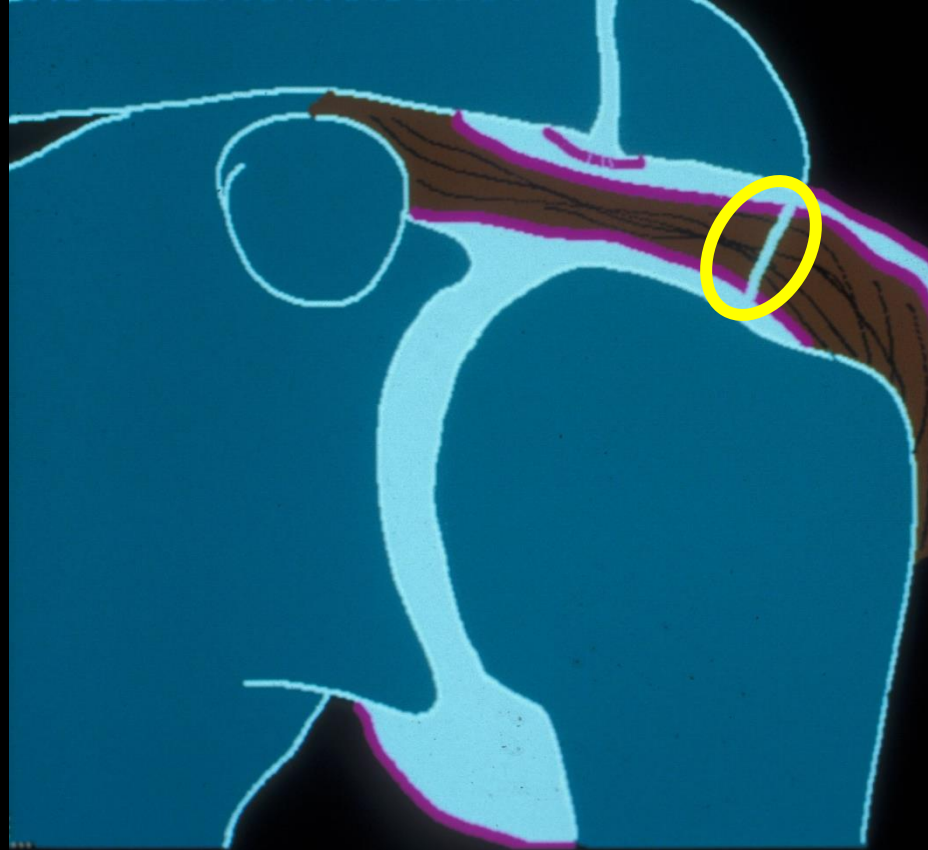




ROTATOR CUFF TEAR FULL THICKNESS

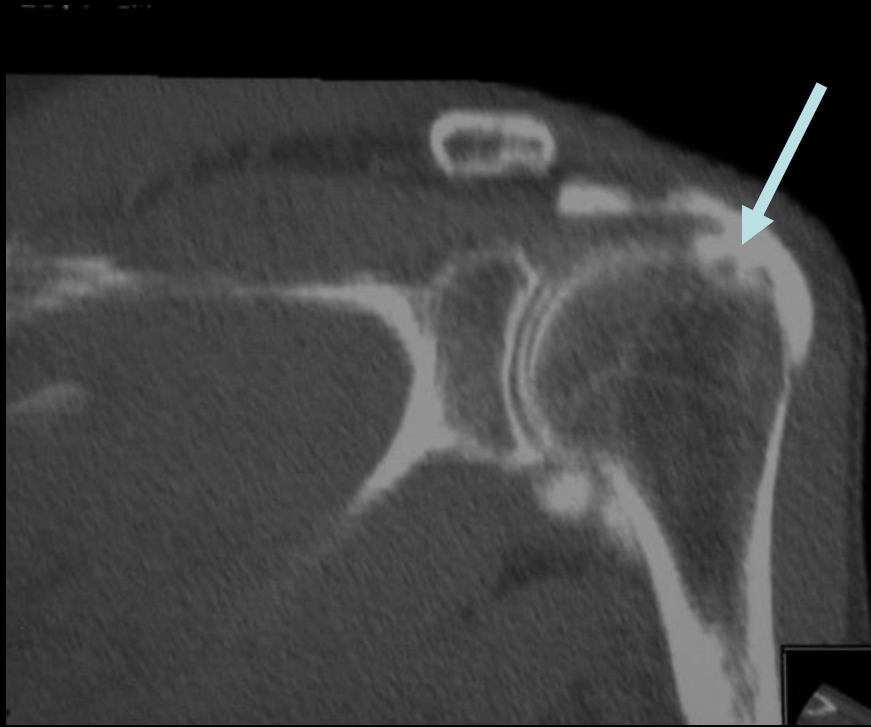
- Communication between joint and subacromial/subdeltoid bursa
- Increased fluid signal intensity in focus of tendon defect
 - At tendon attachment
 - Critical zone



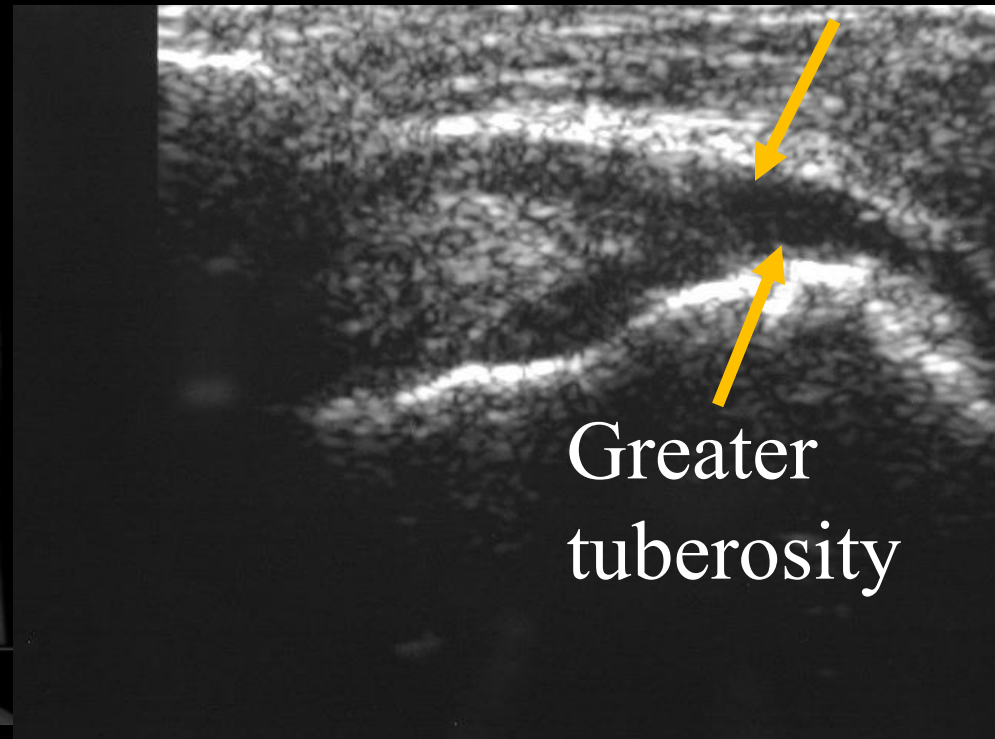




CT and Ultrasound

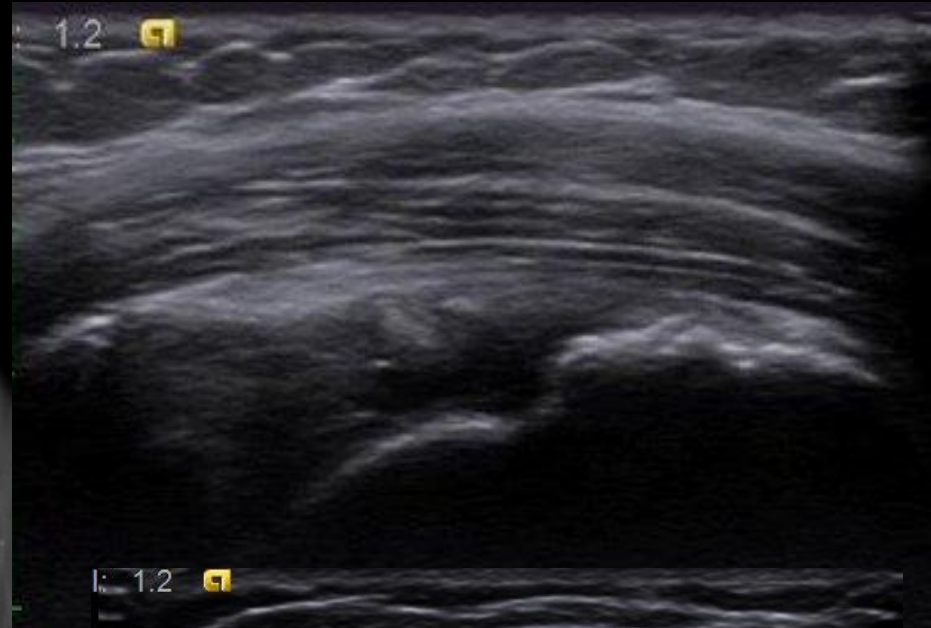


Coronal CT

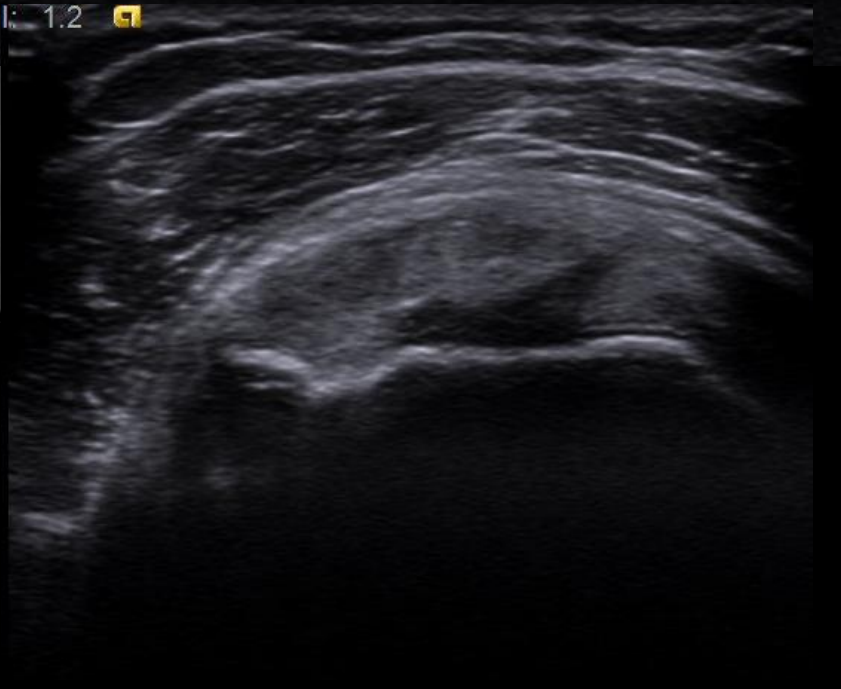


US findings of tear –
Hypoechoogenicity that
replaces hyperechoic normal
tendon

CT and Ultrasound



Longitudinal

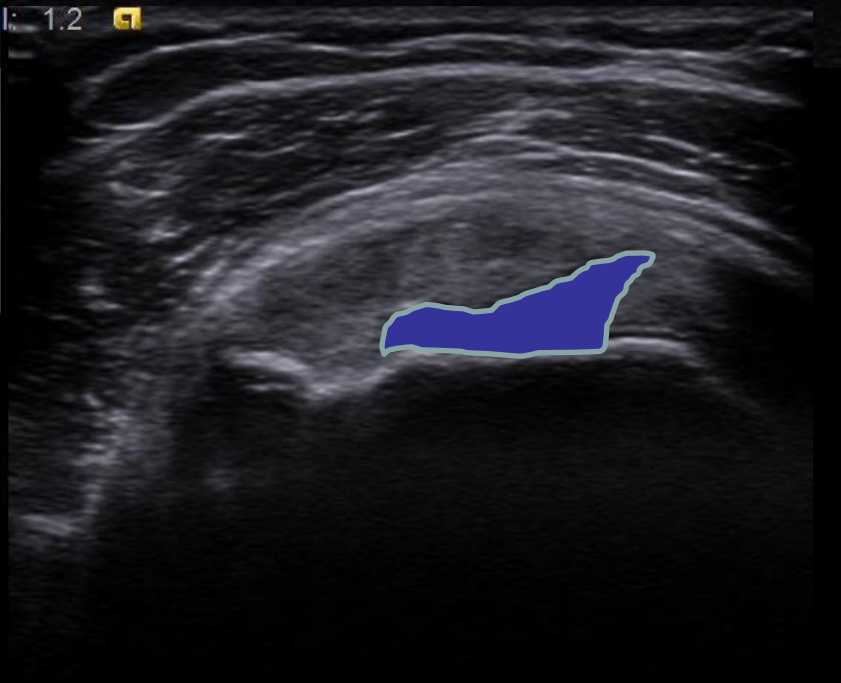


Sagittal

CT and Ultrasound

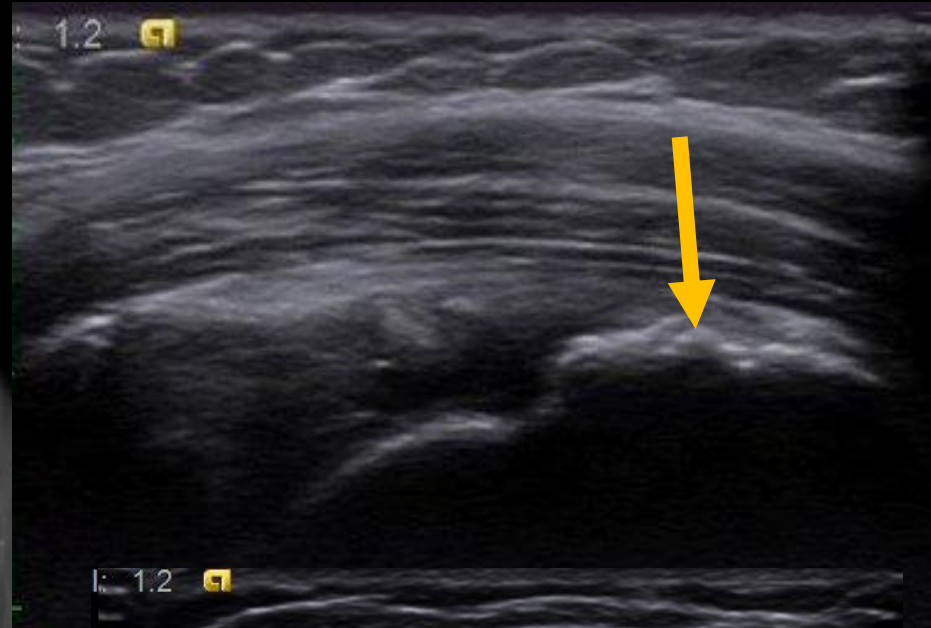


Longitudinal

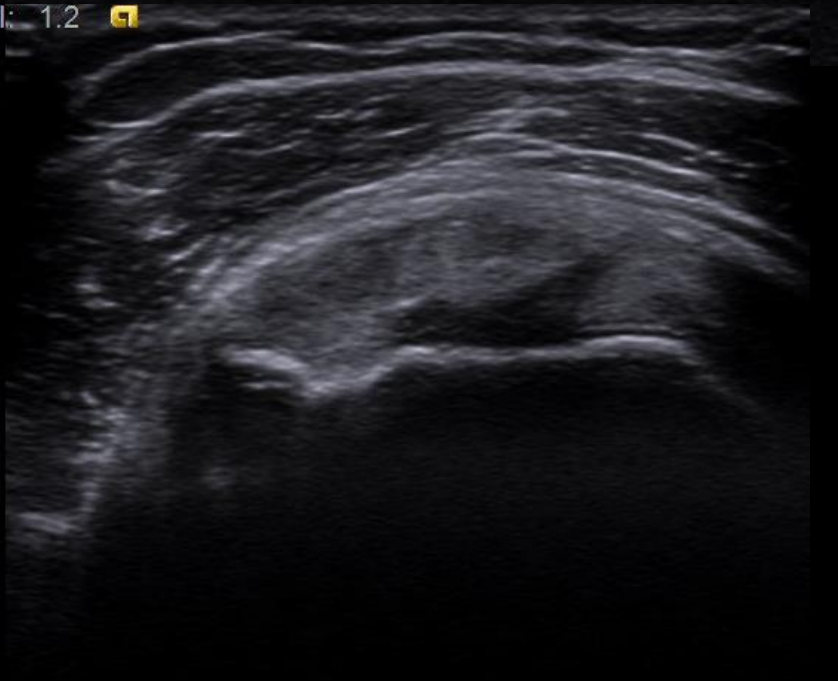


Sagittal

CT and Ultrasound



Longitudinal



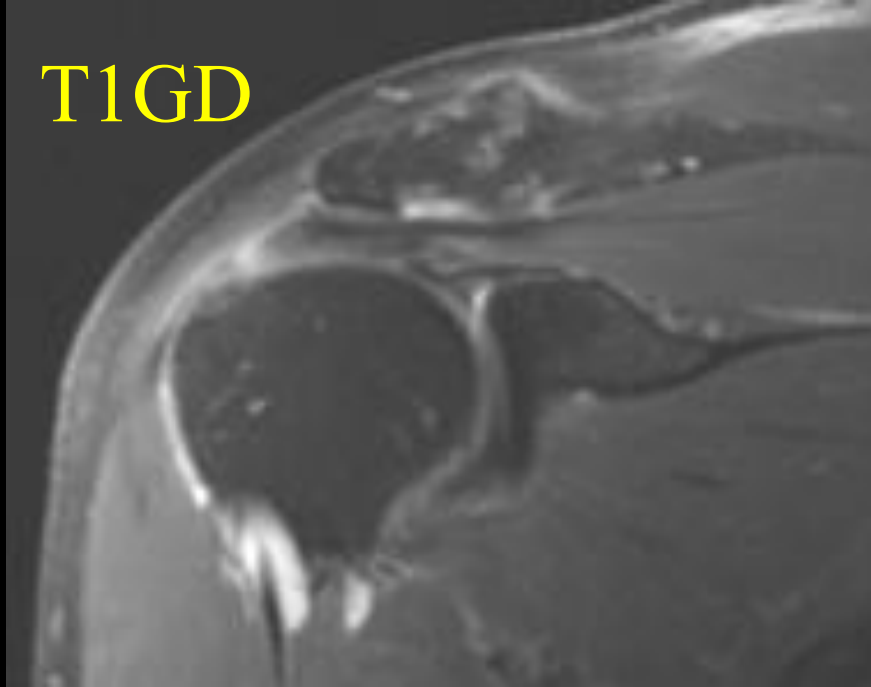
Sagittal

ROTATOR CUFF TEAR FULL THICKNESS

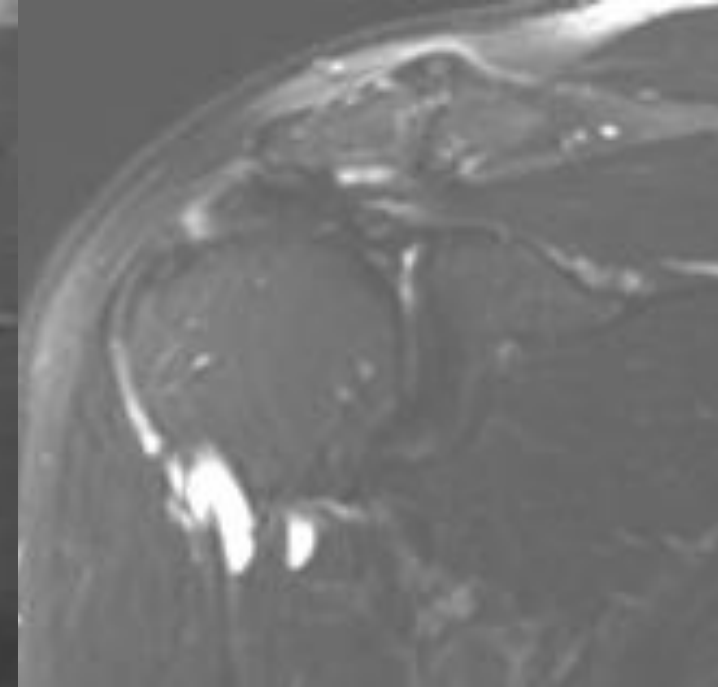
- Important associated findings/descriptors
 - Which tendons involved (portion of superior cuff)
 - Size of tear
 - Quality of the remainder of the cuff
 - Retraction of musculotendinous junction
 - Muscle atrophy
 - Fluid subacromial/subdeltoid bursa
 - Fluid (intramuscular cyst/ganglion) along tendon

ROTATOR CUFF TEAR FULL THICKNESS

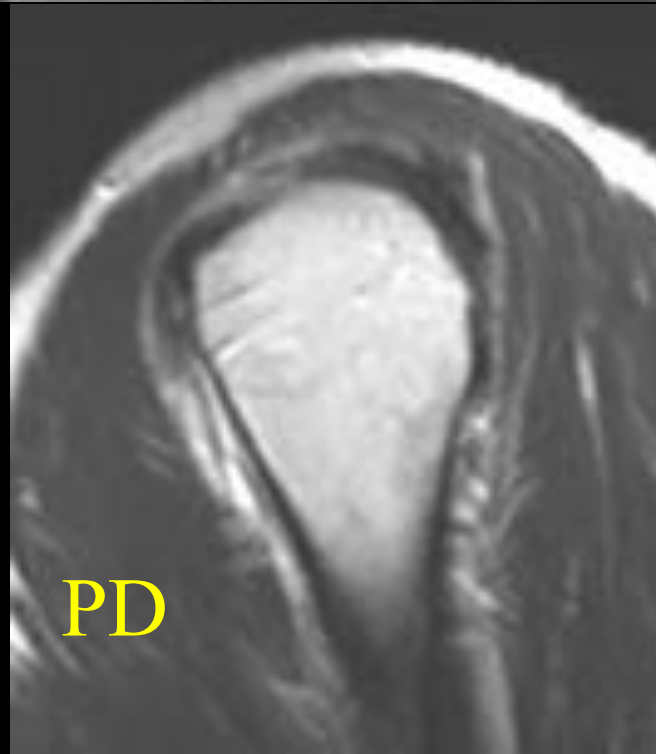
- Which tendons involved/Size of tear
 - Supraspinatus/Infraspinatus (Superior Cuff)
 - Subscapularis
 - 0-2cm mild; 2-3cm moderate;
3-4cm large; >4cm massive



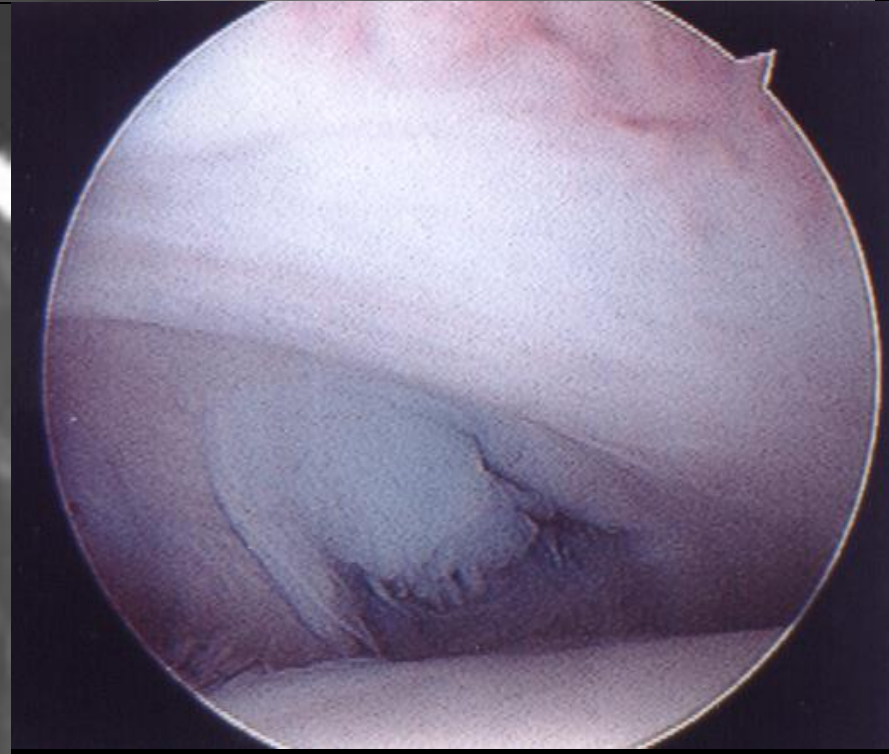
T1GD

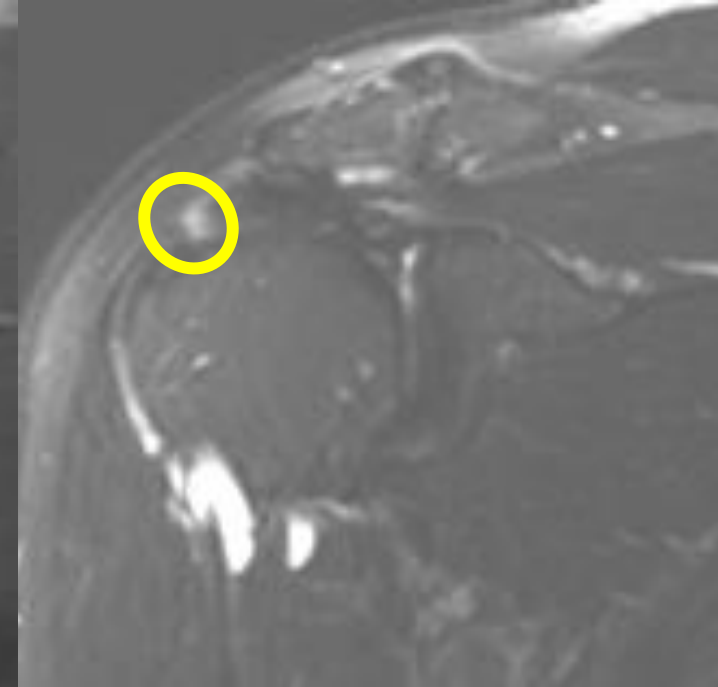
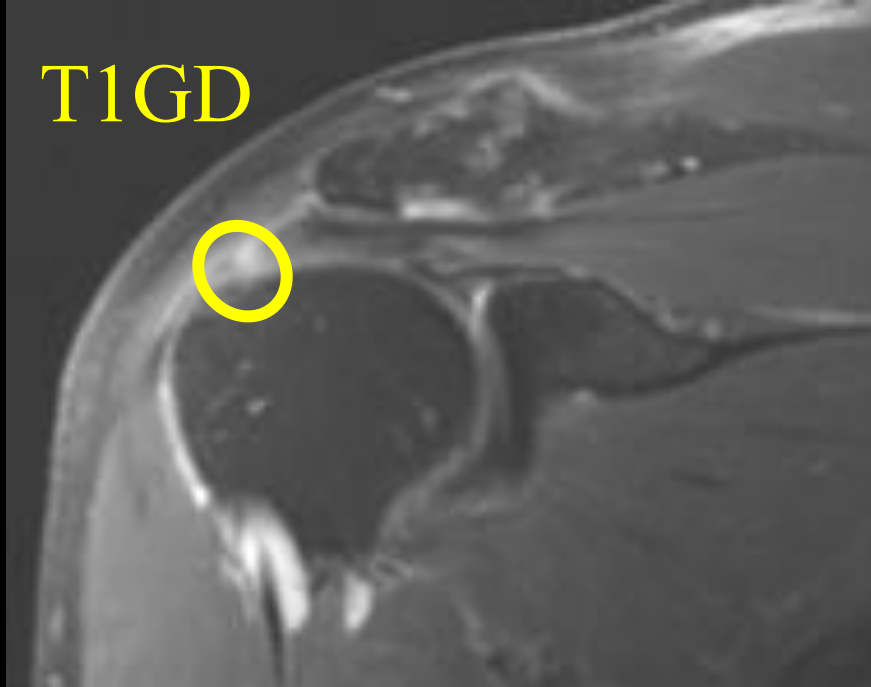


T2

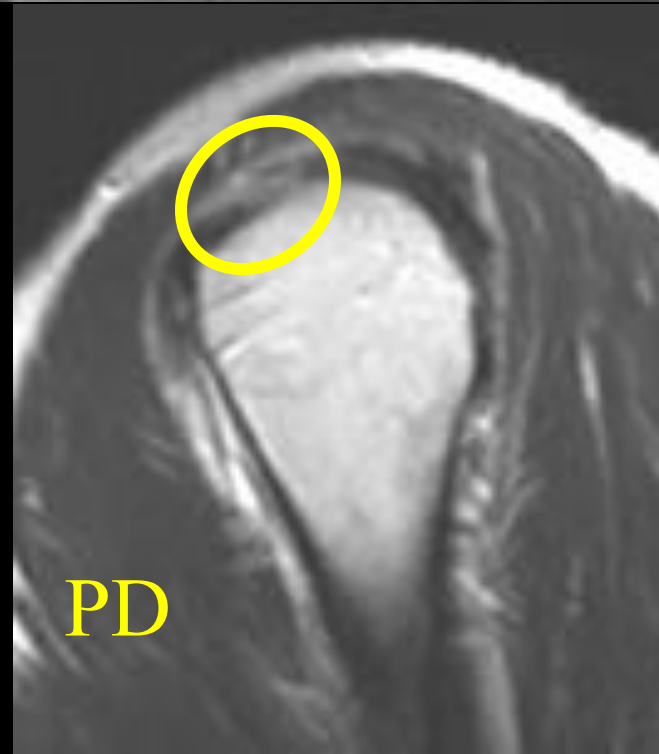


PD

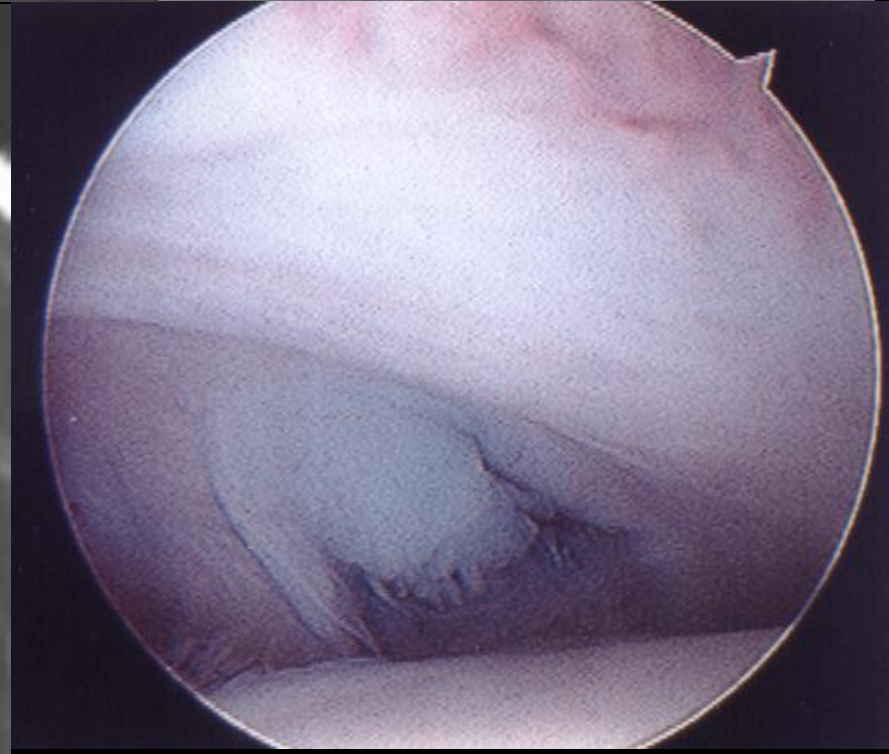


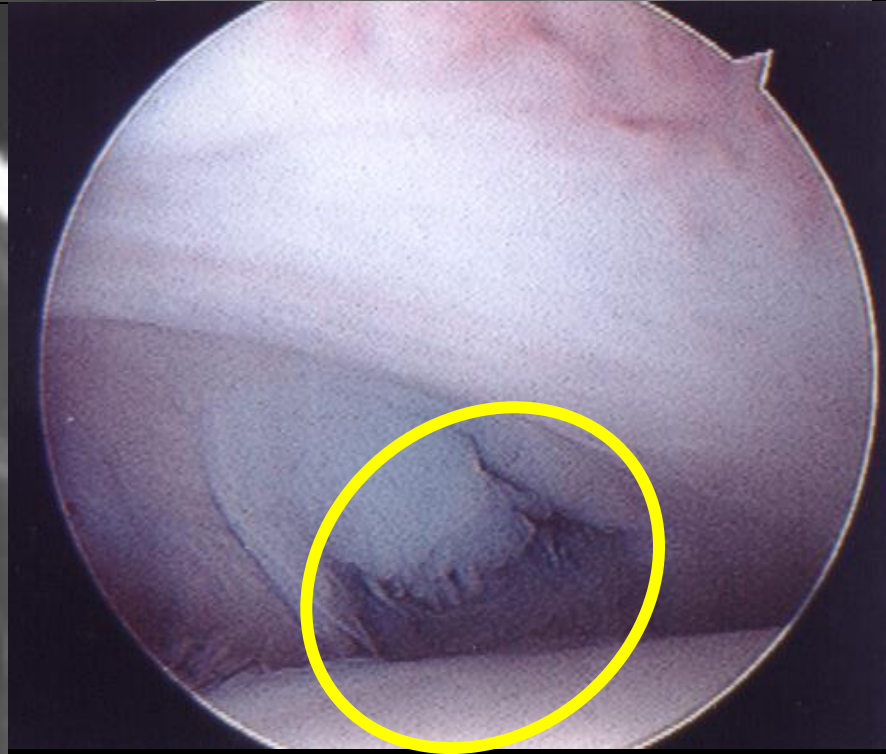
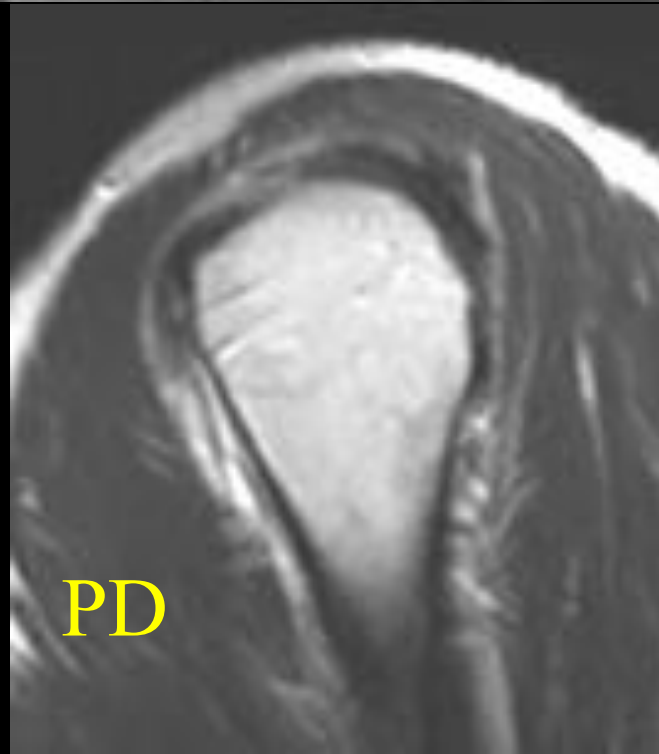
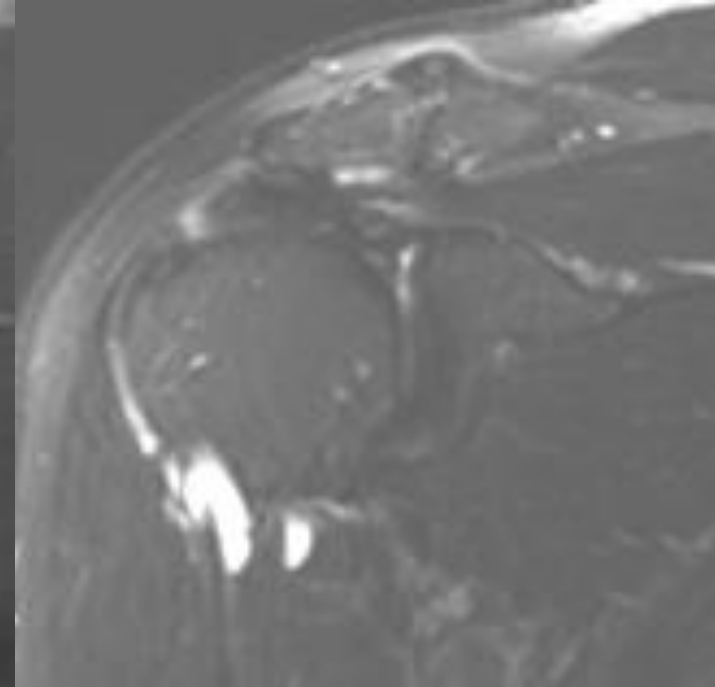
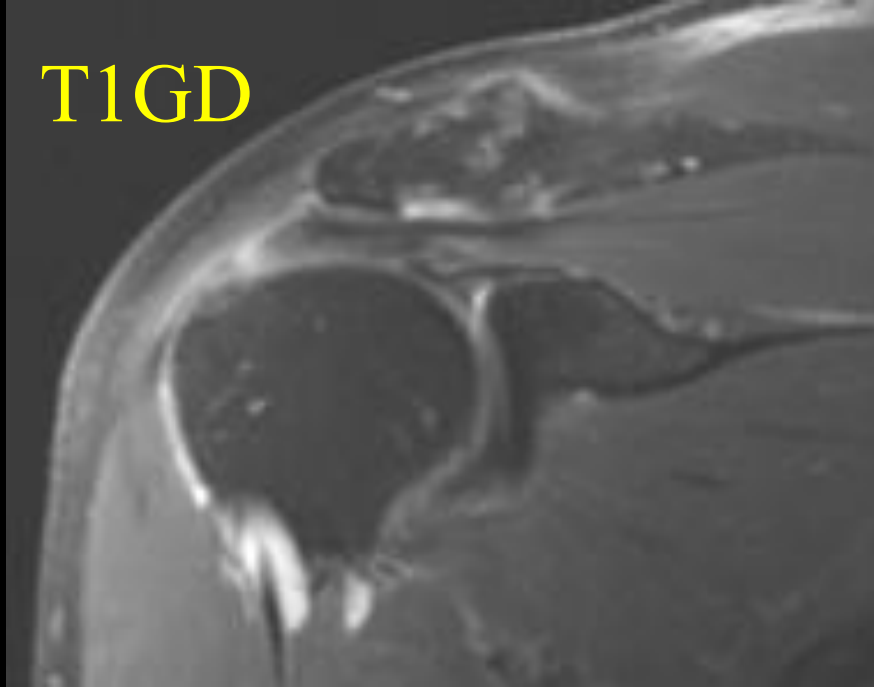


T2

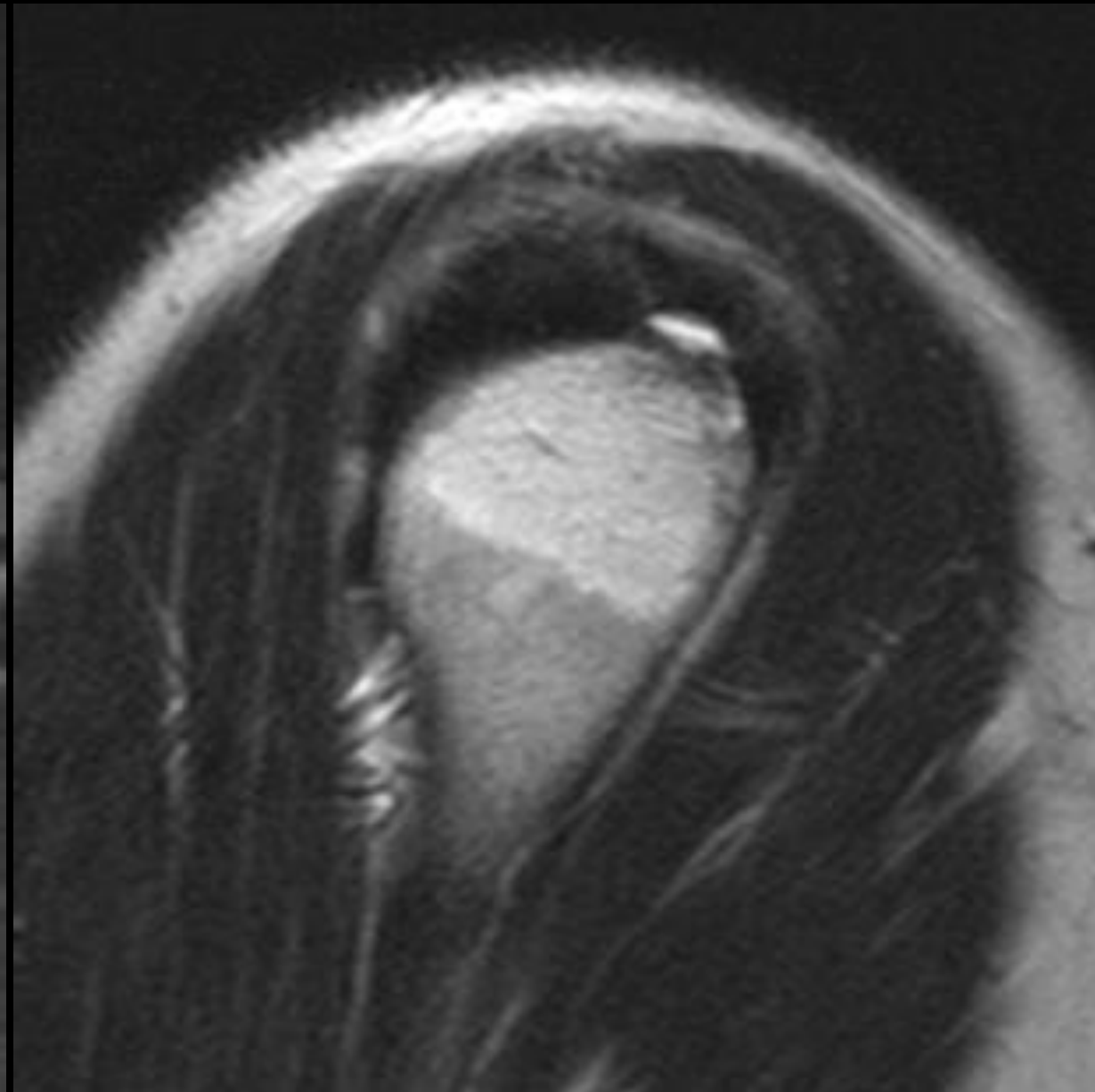
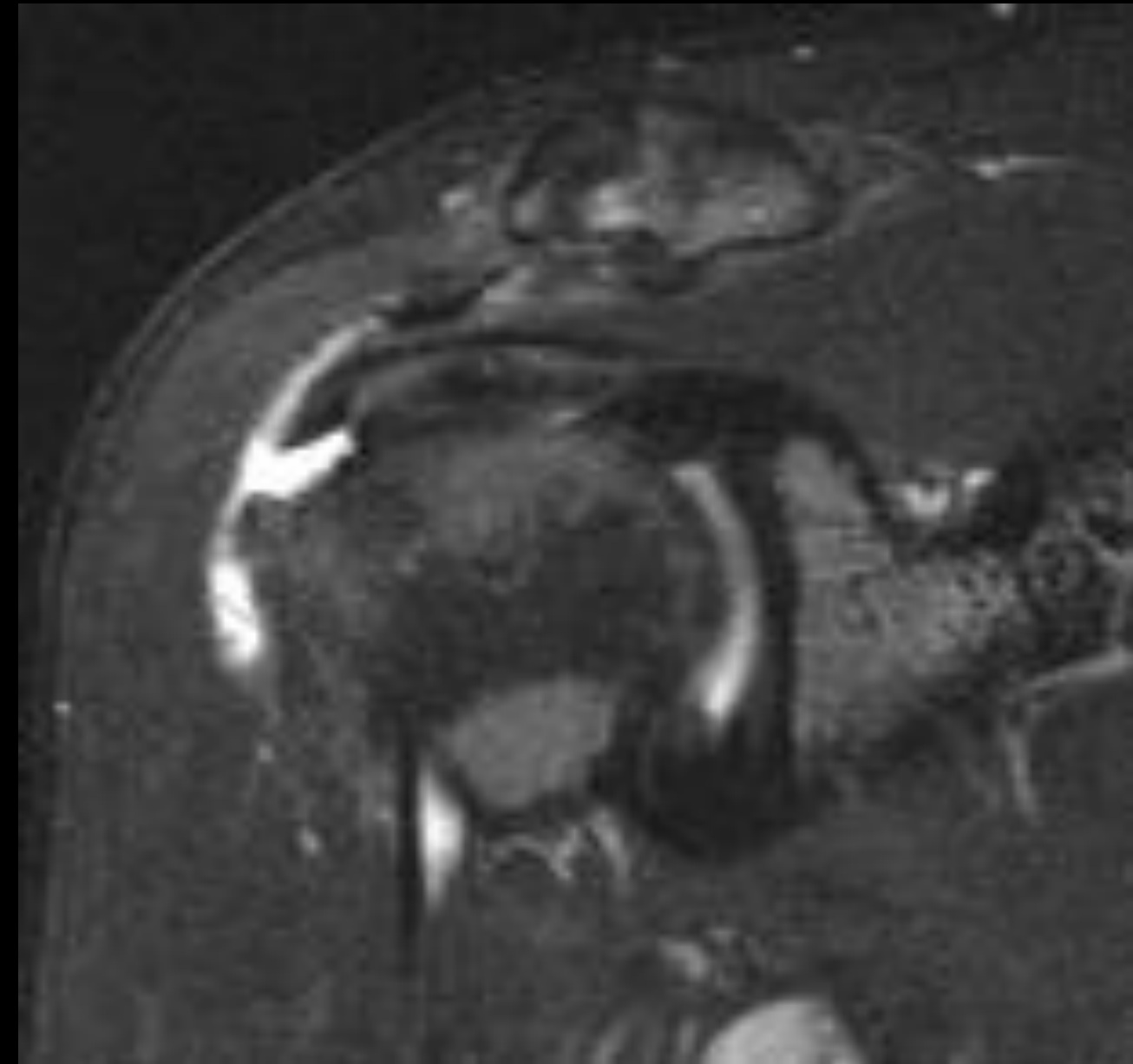


PD

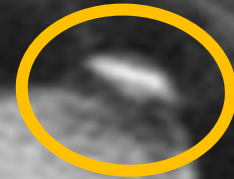




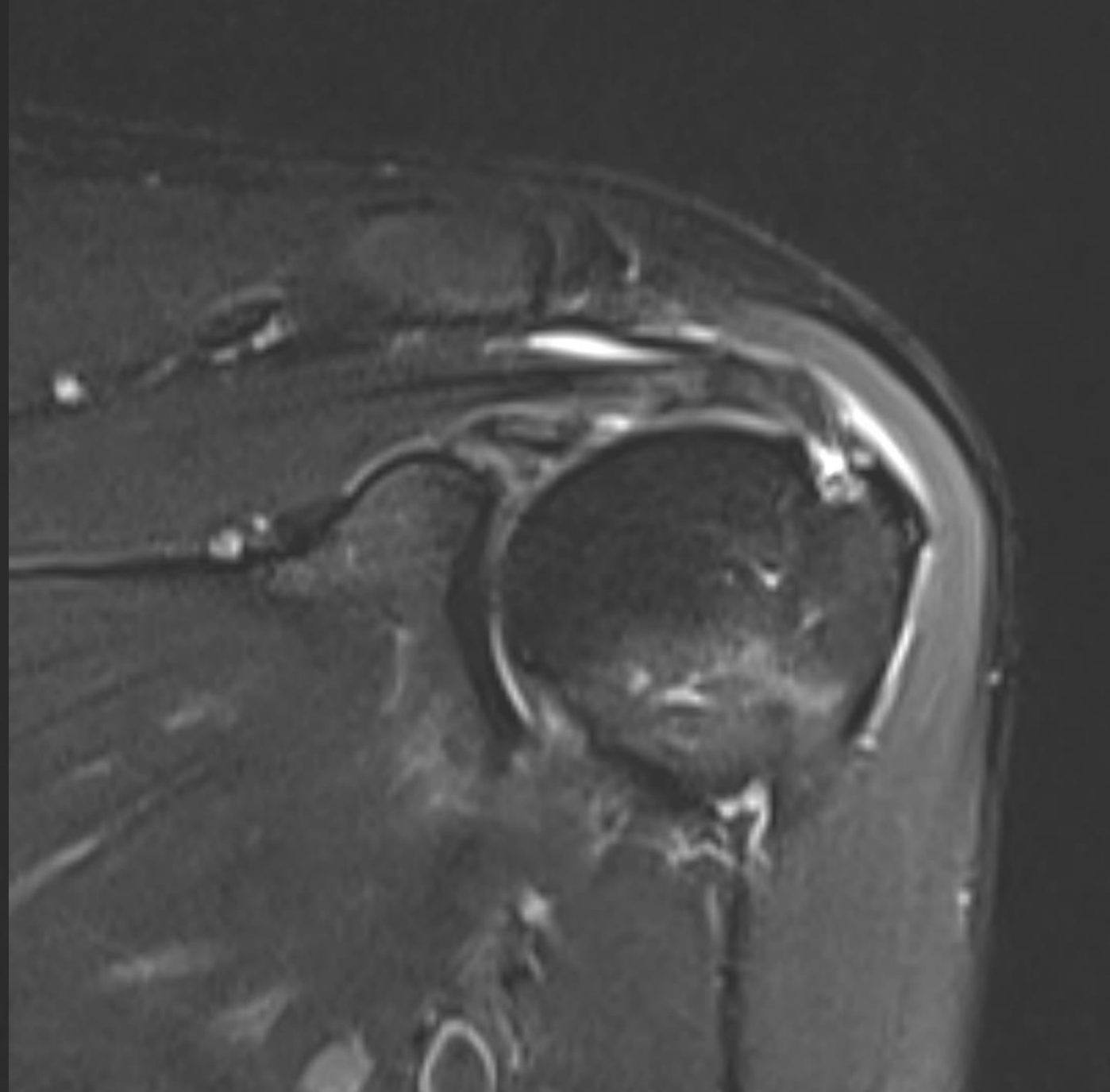
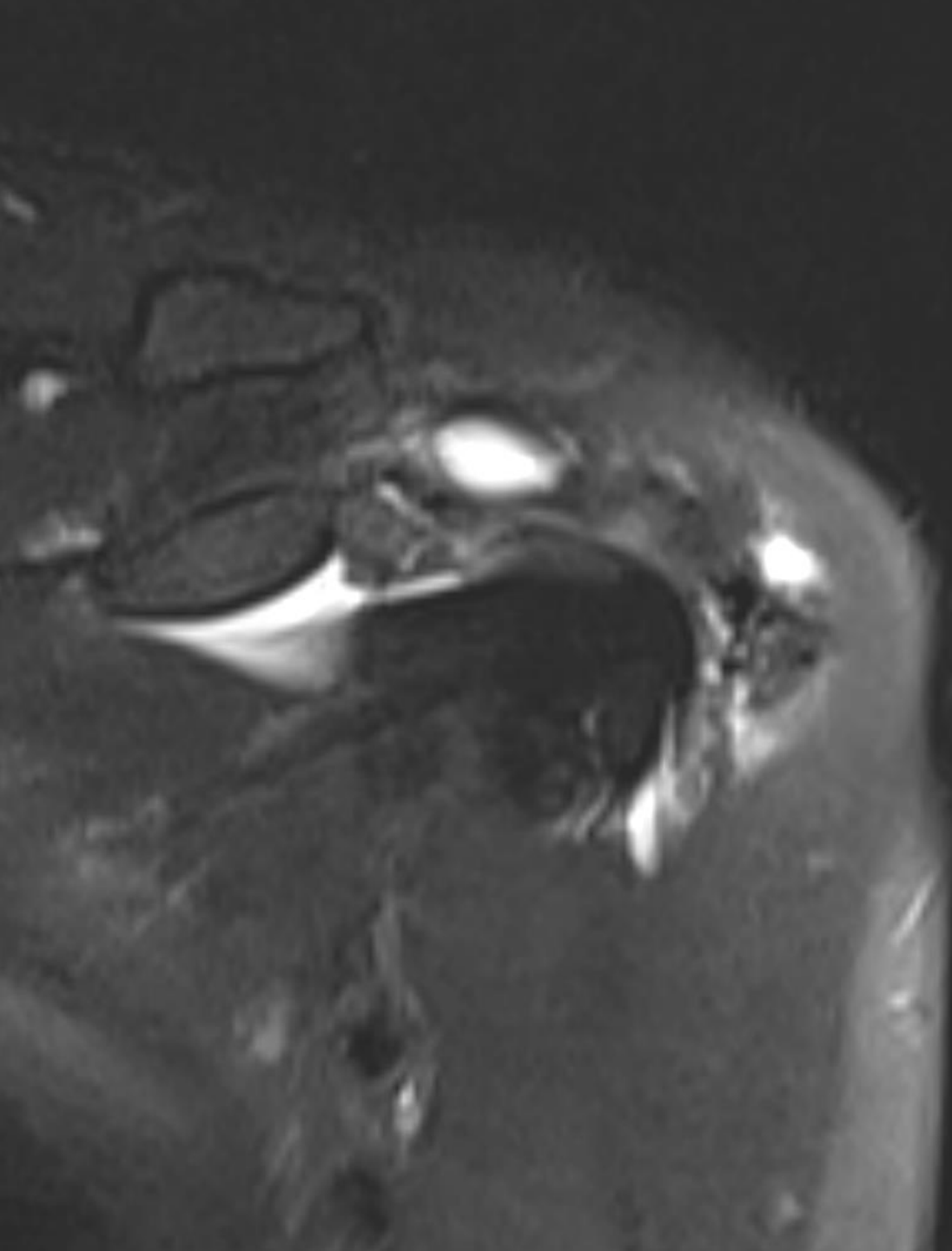
Full Thickness Tear

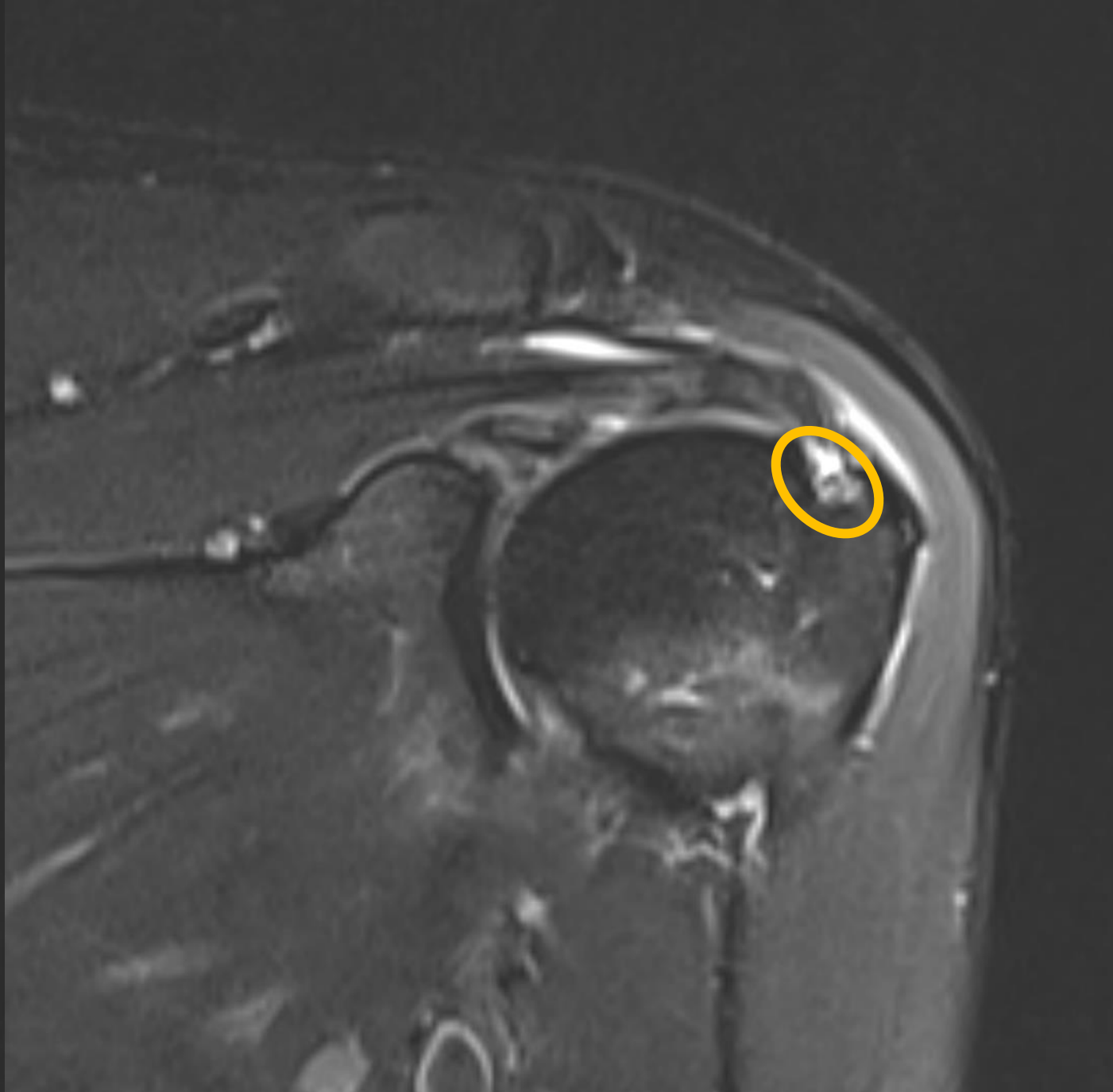


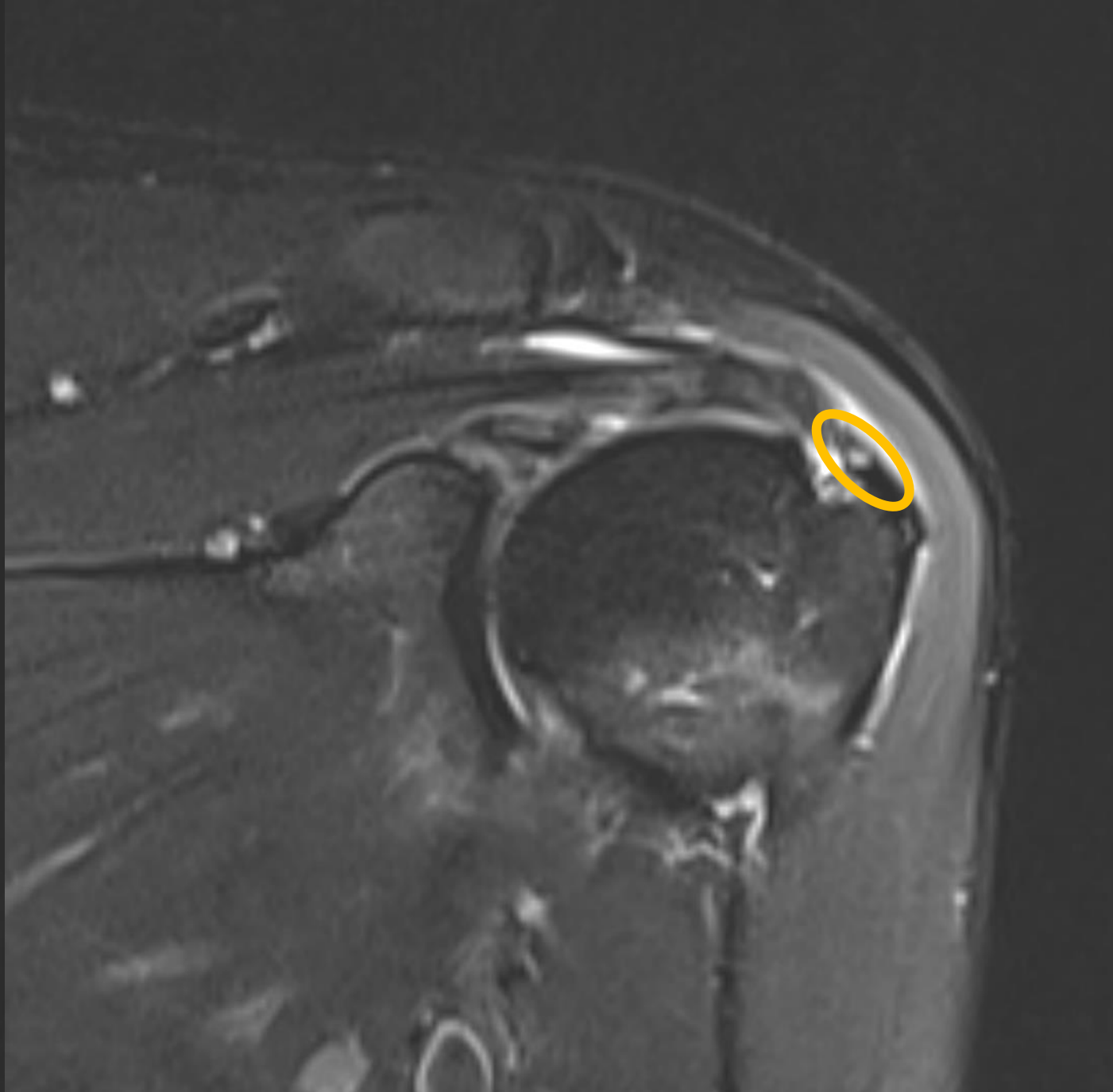
Full Thickness Tear

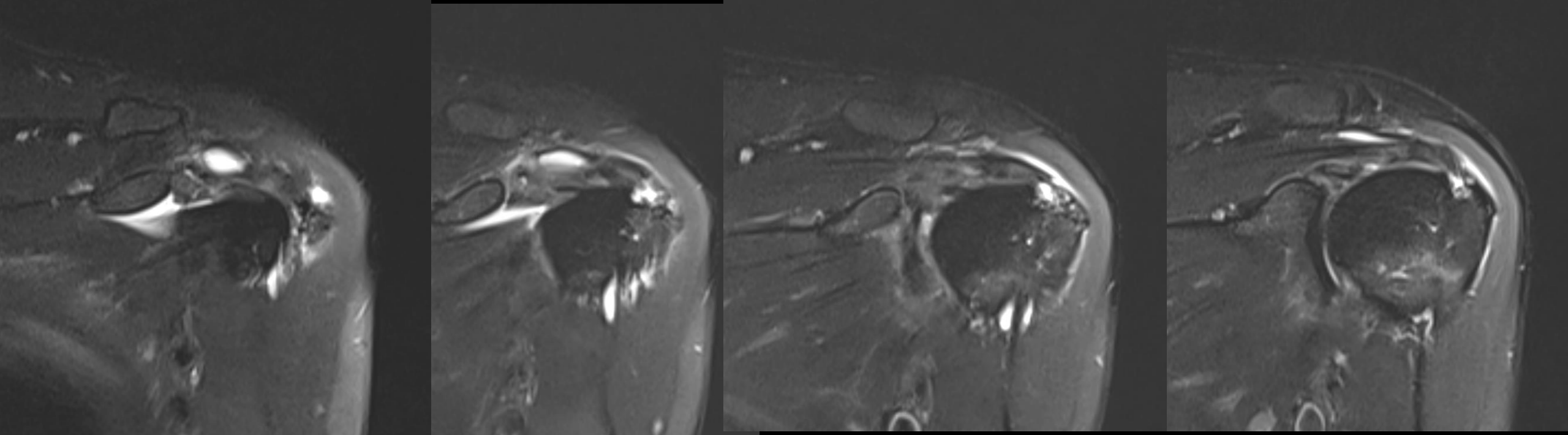


LOOK AT THE ANTERIOR LEADING EDGE





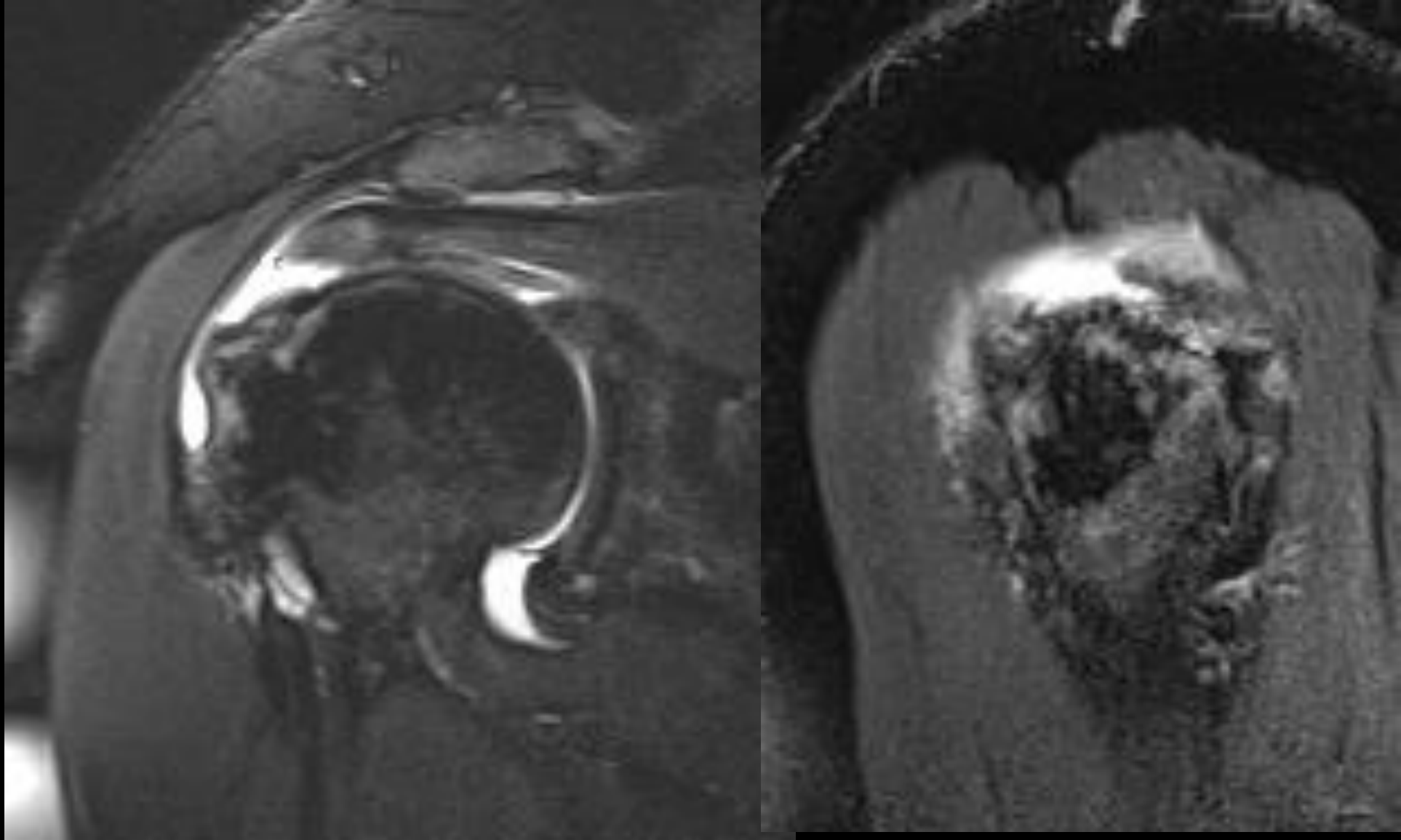




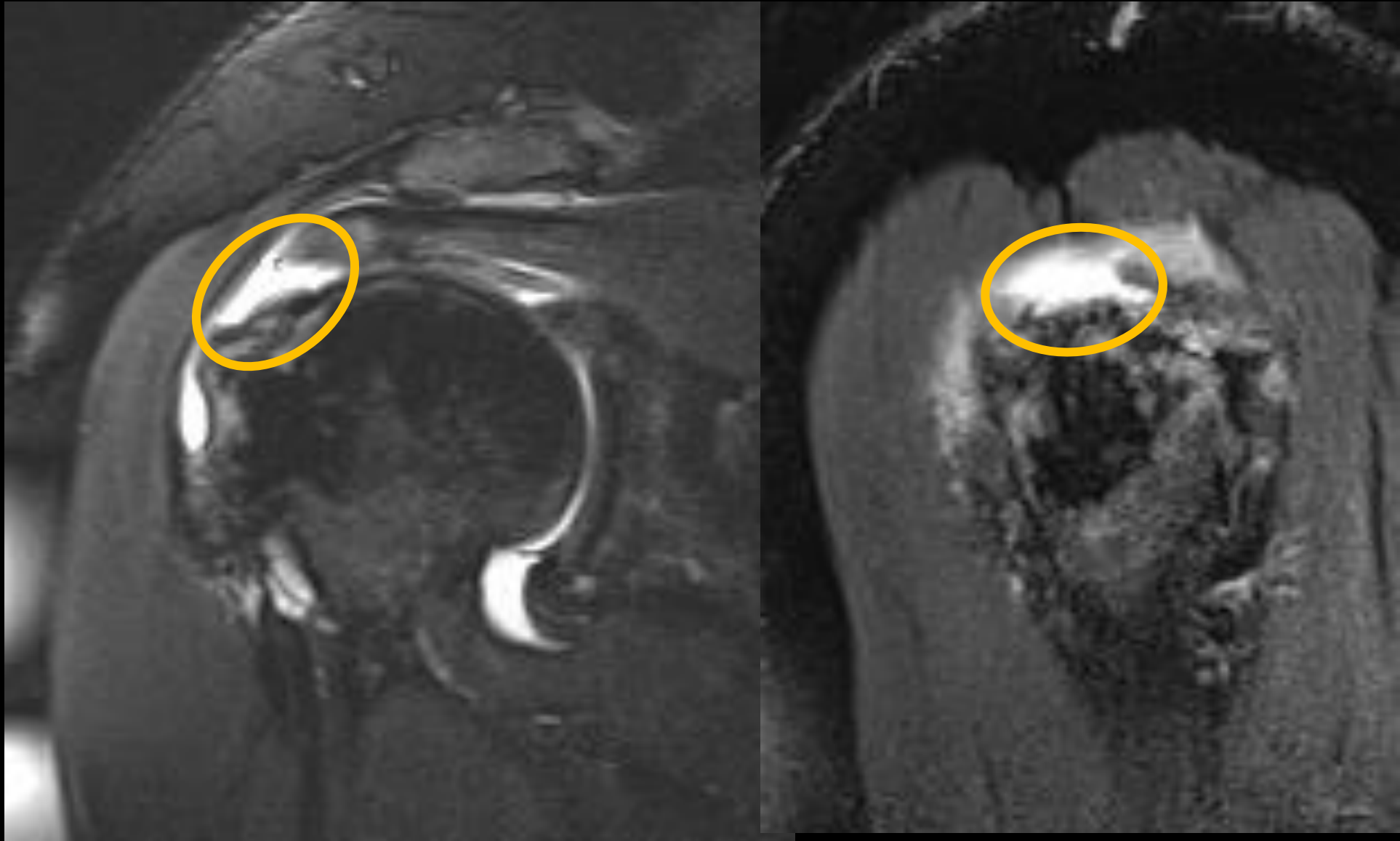
Obliquely-oriented focal full-
thickness tear

LOOK AT THE ANTERIOR LEADING EDGE

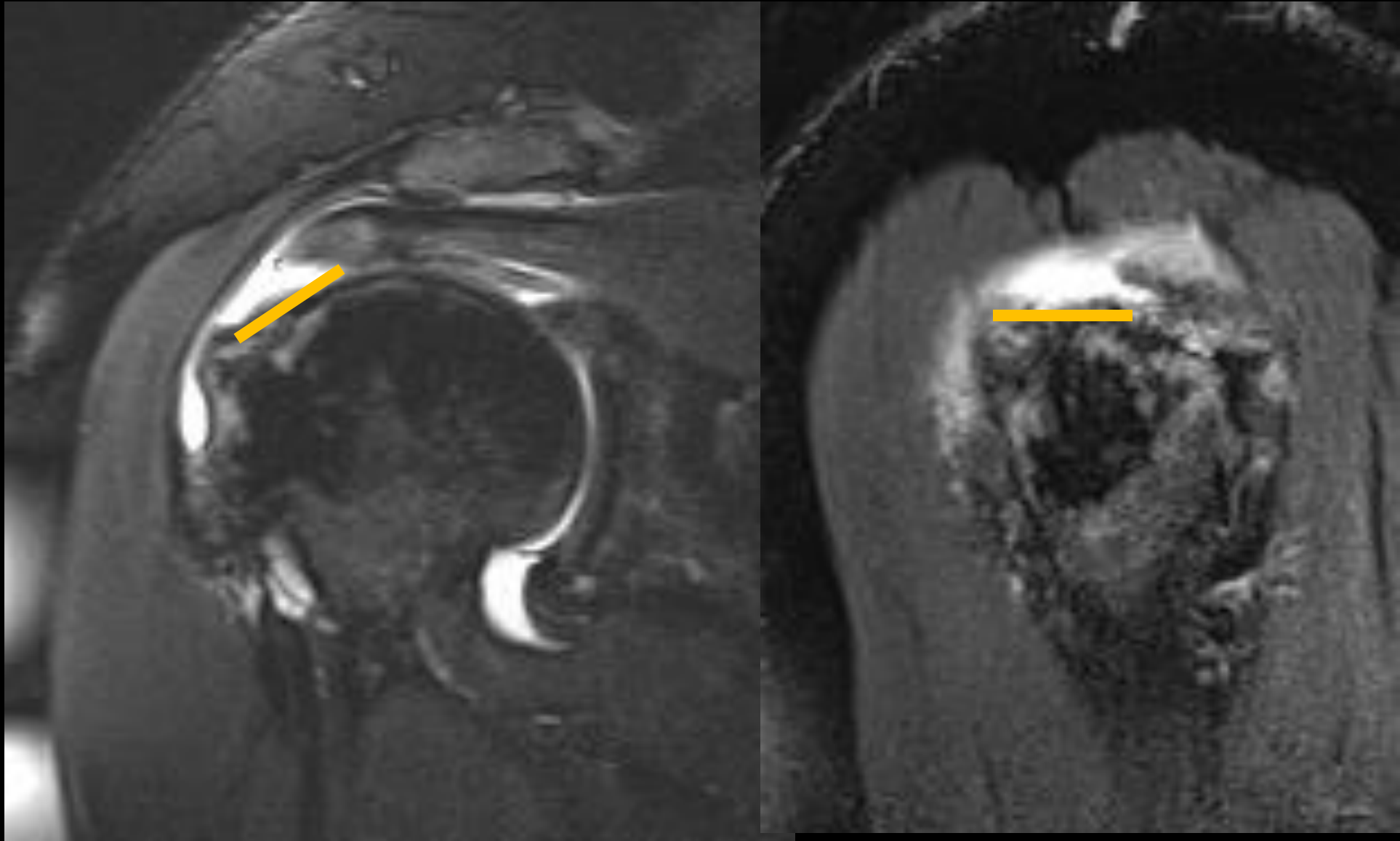
Full Thickness Tear

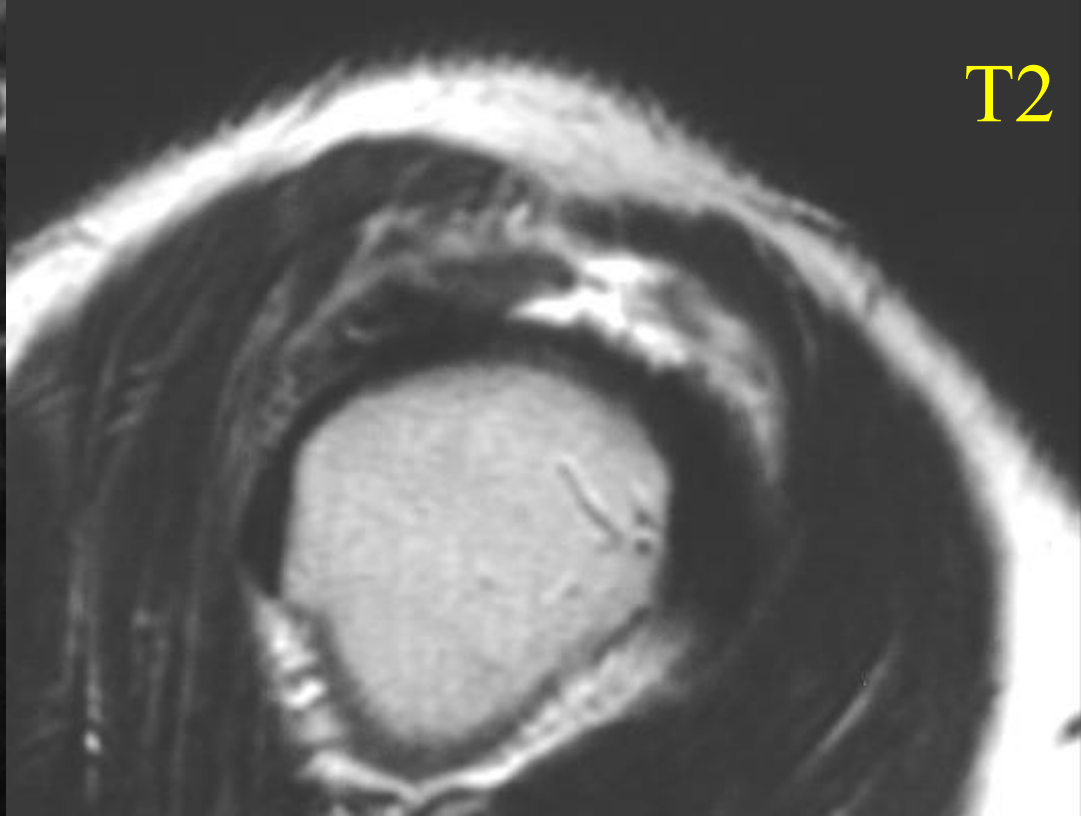
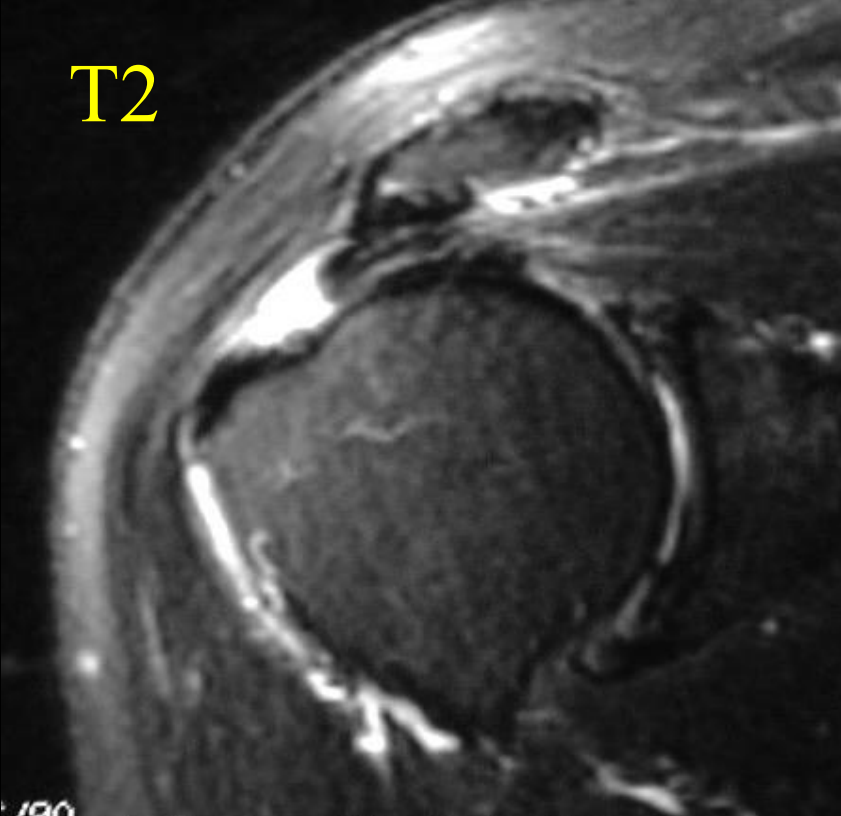


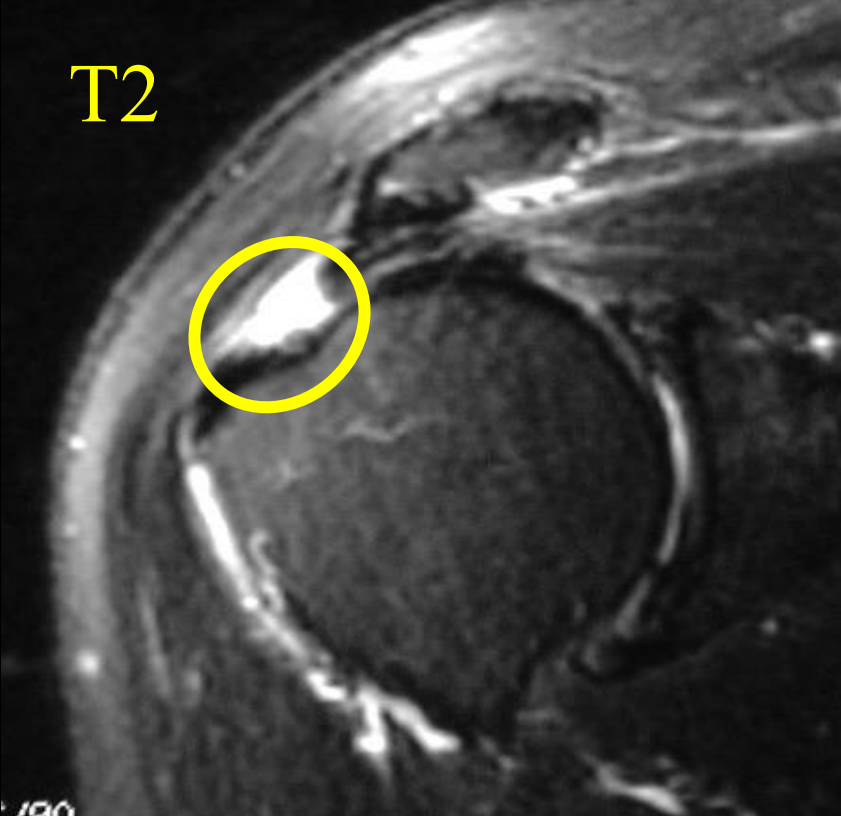
Full Thickness Tear

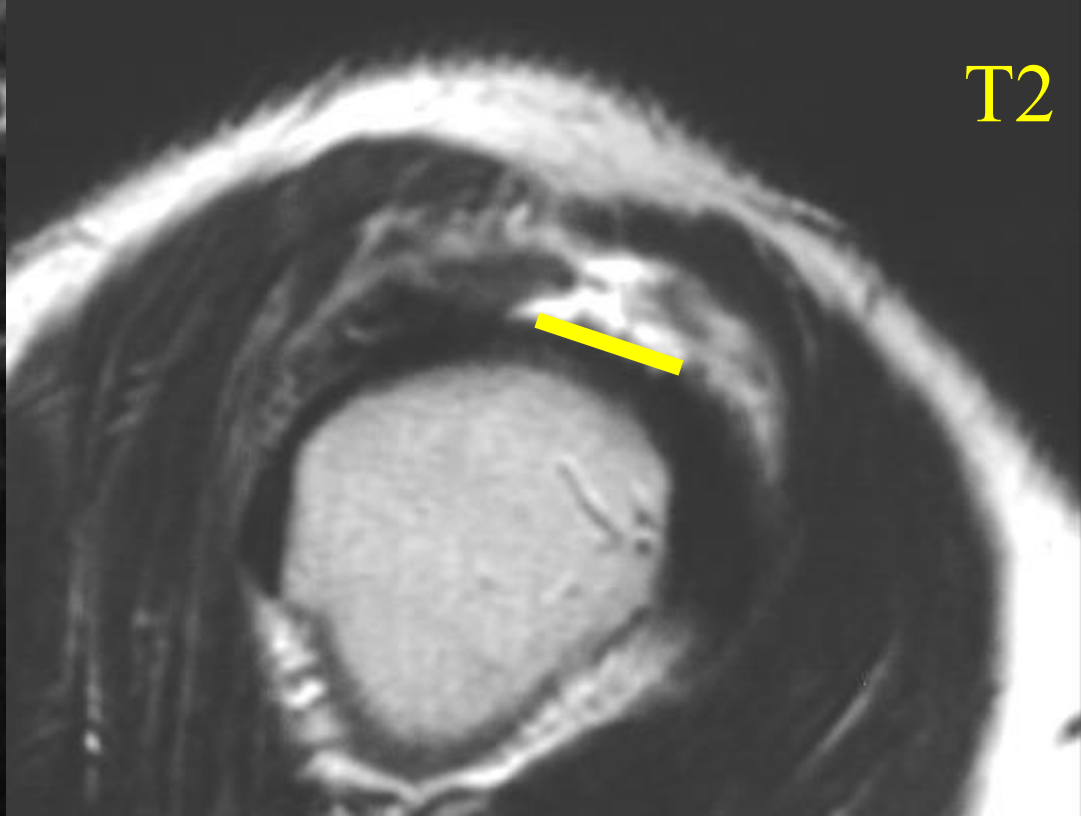
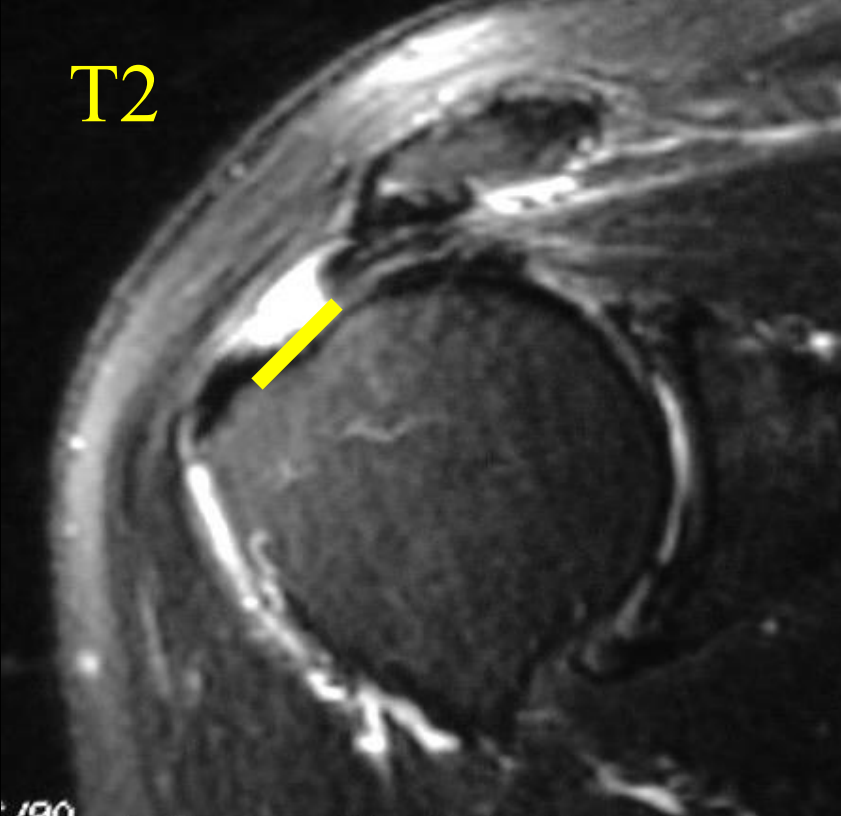


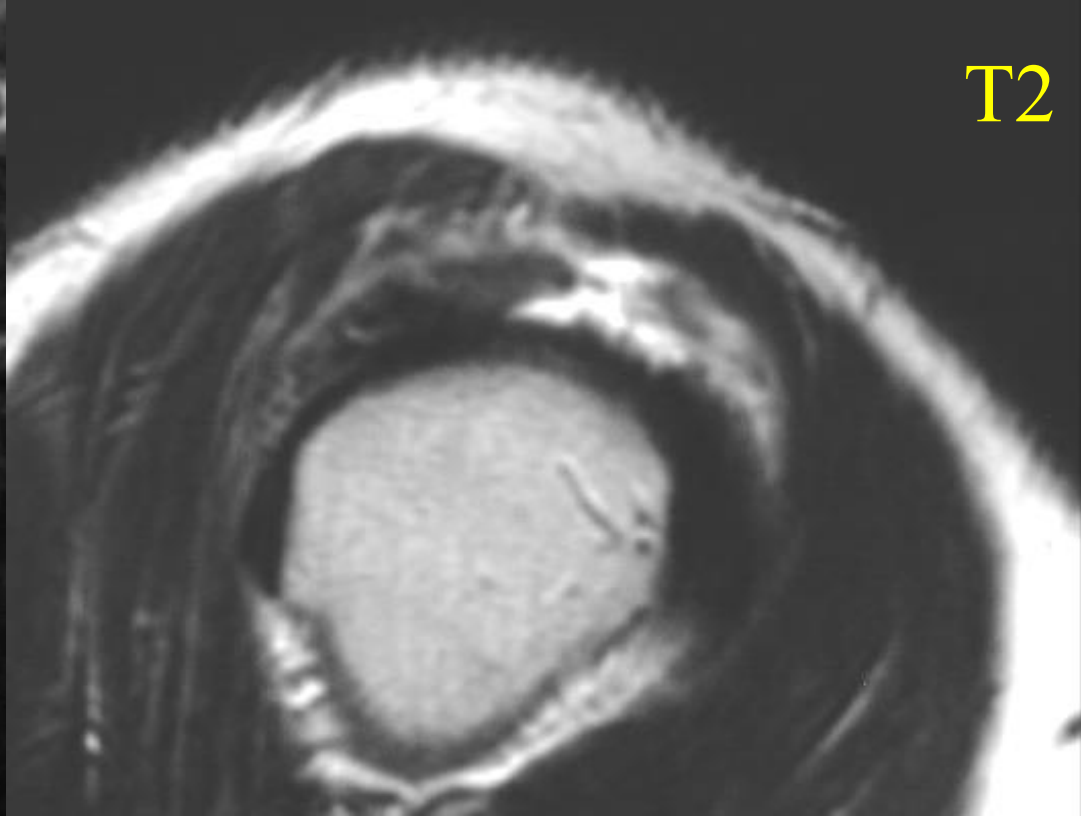
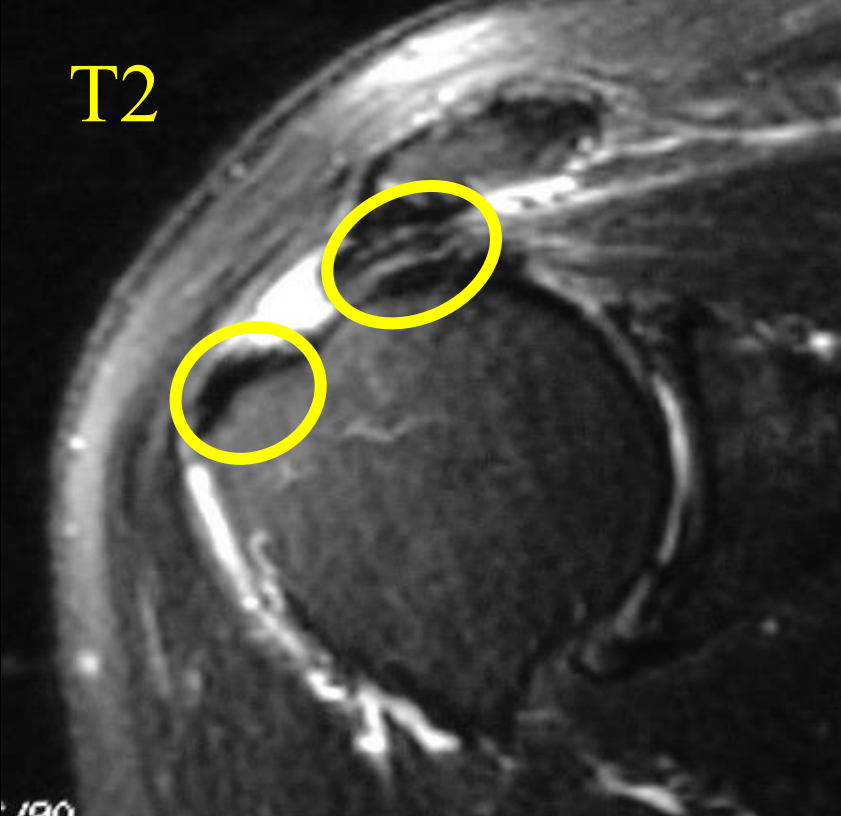
Full Thickness Tear

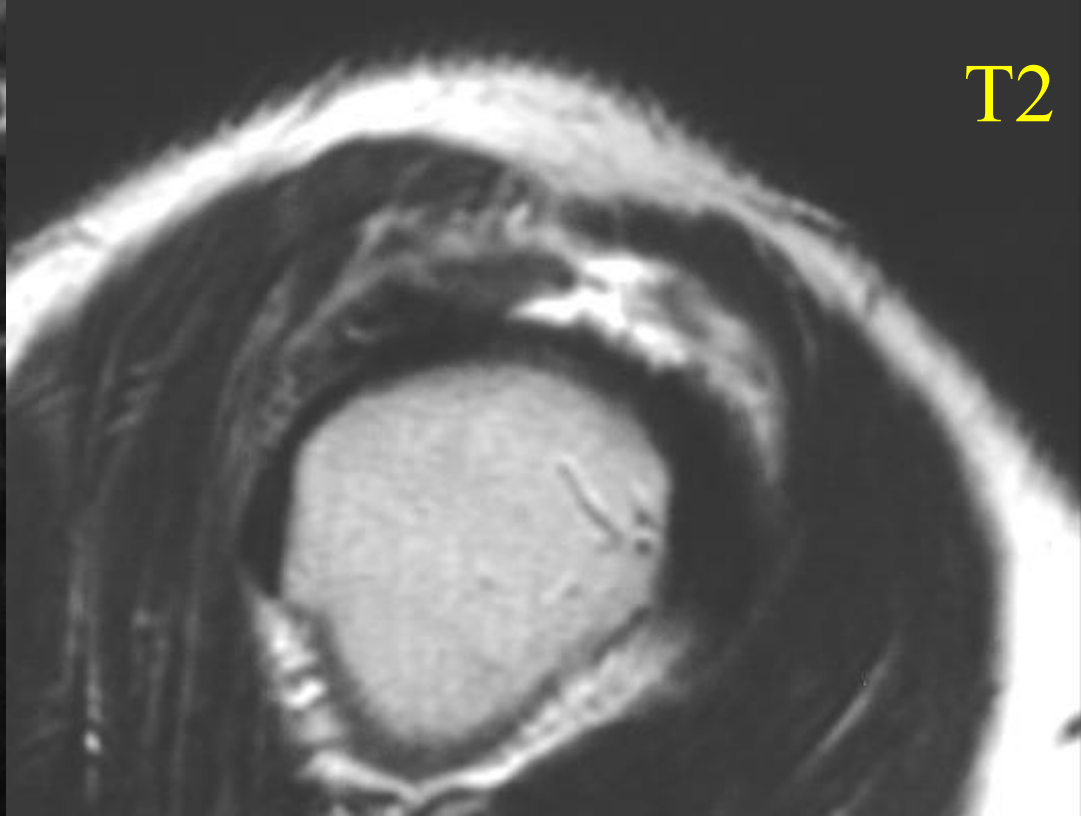
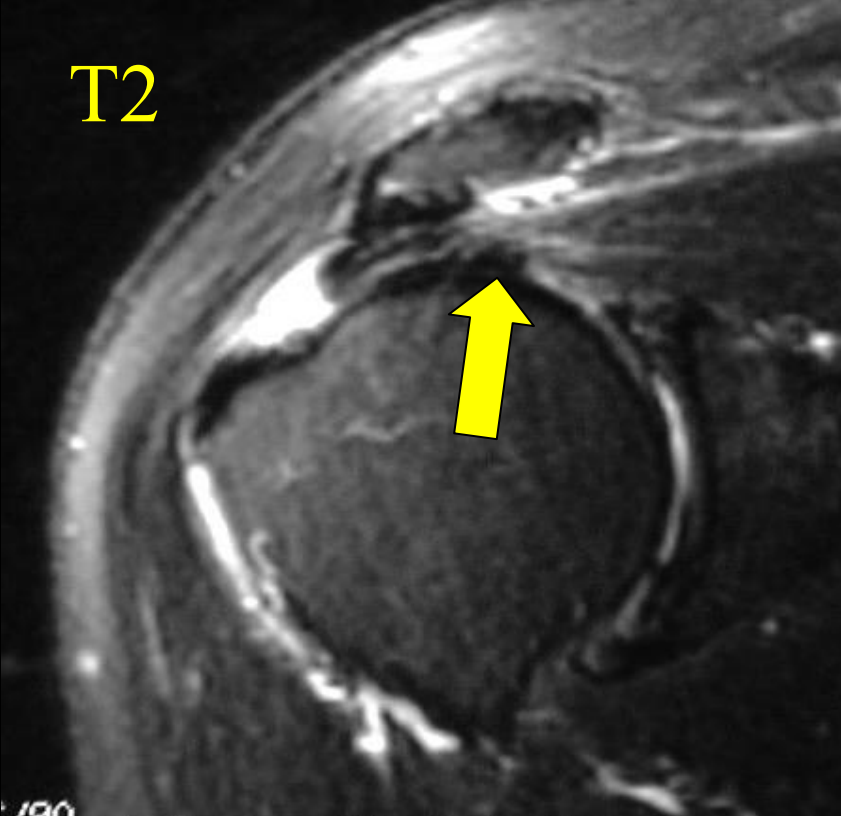


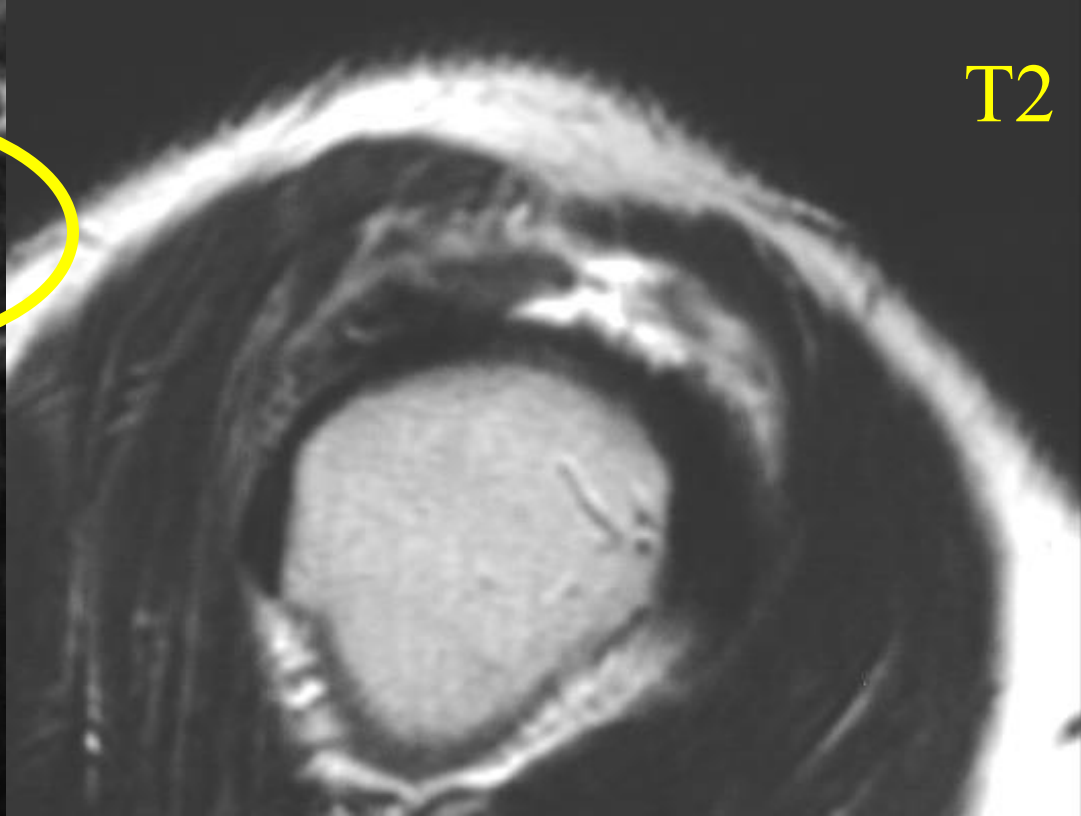
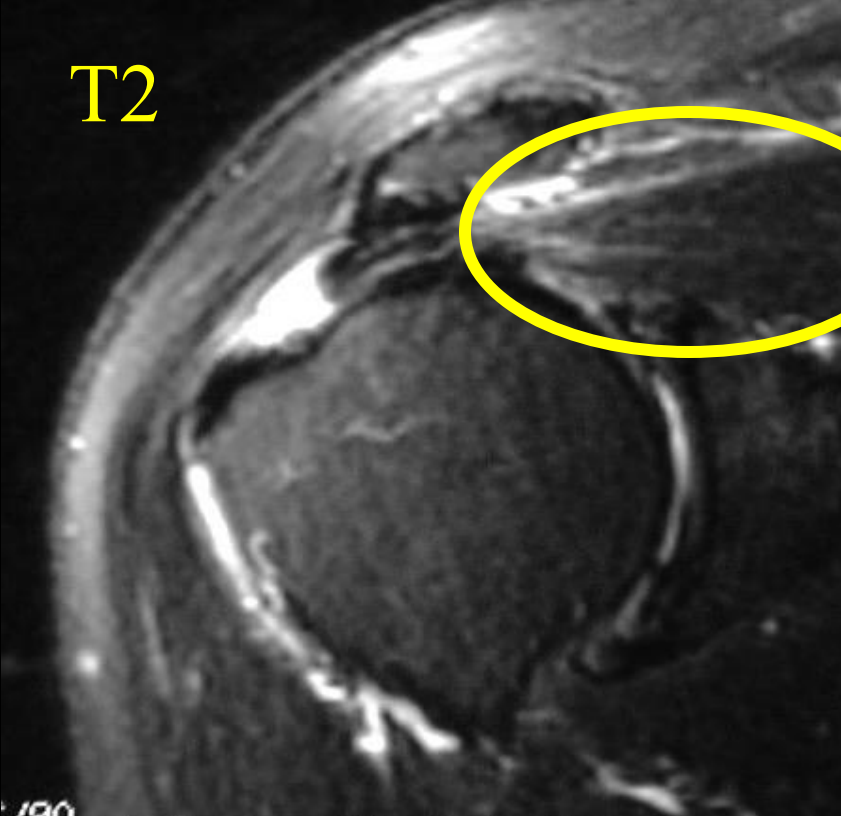


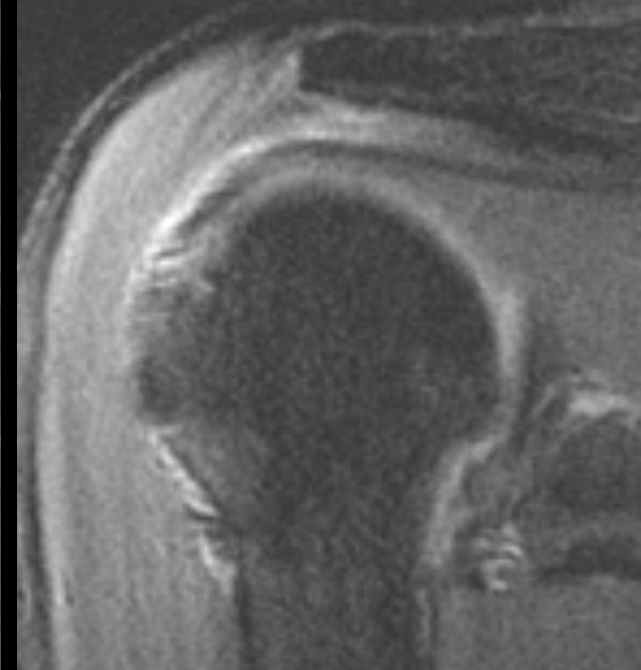
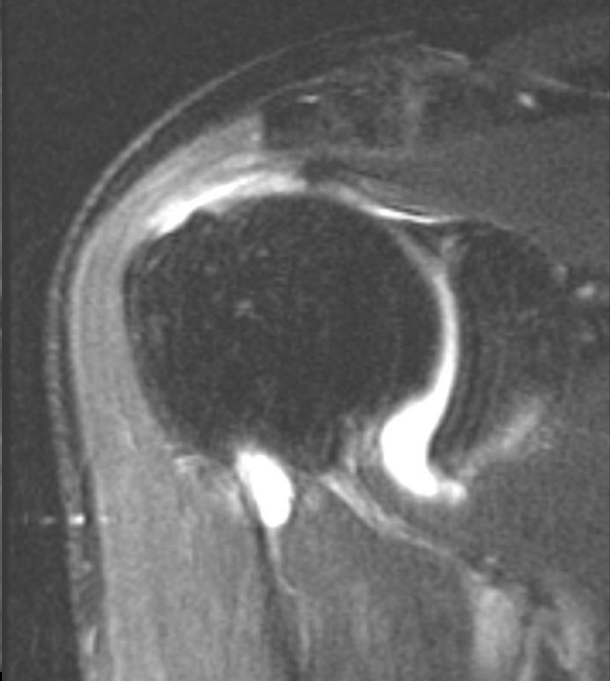
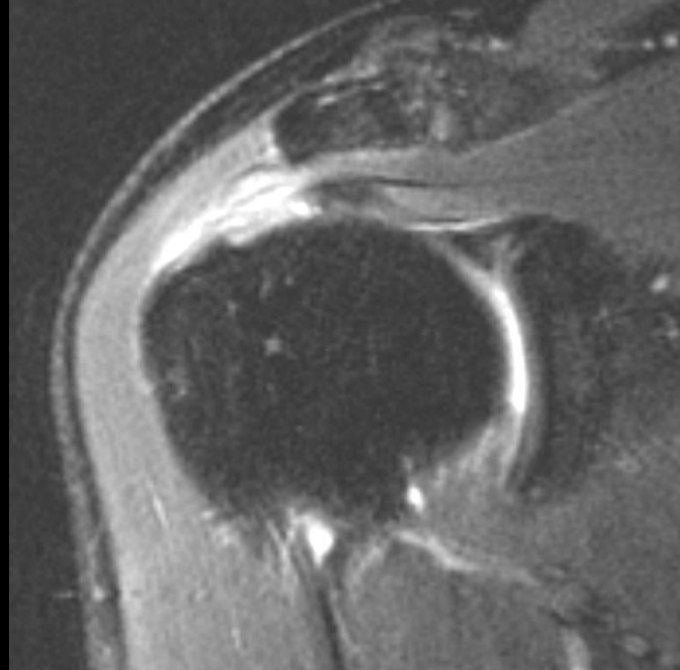


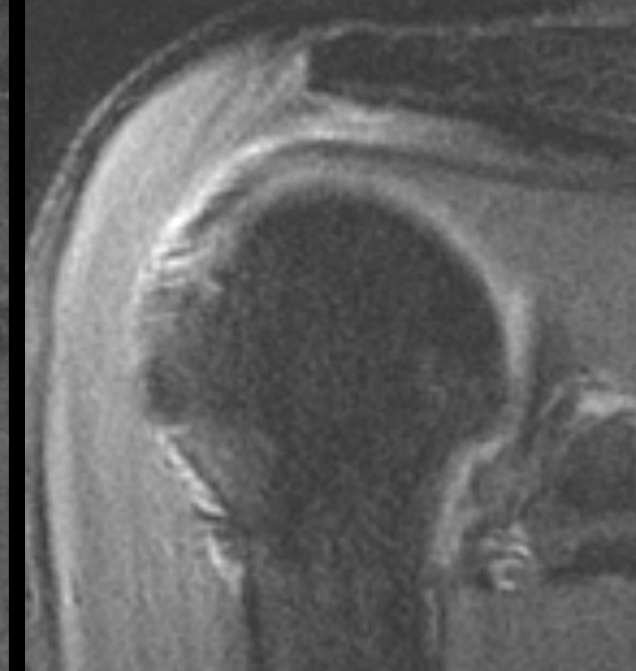
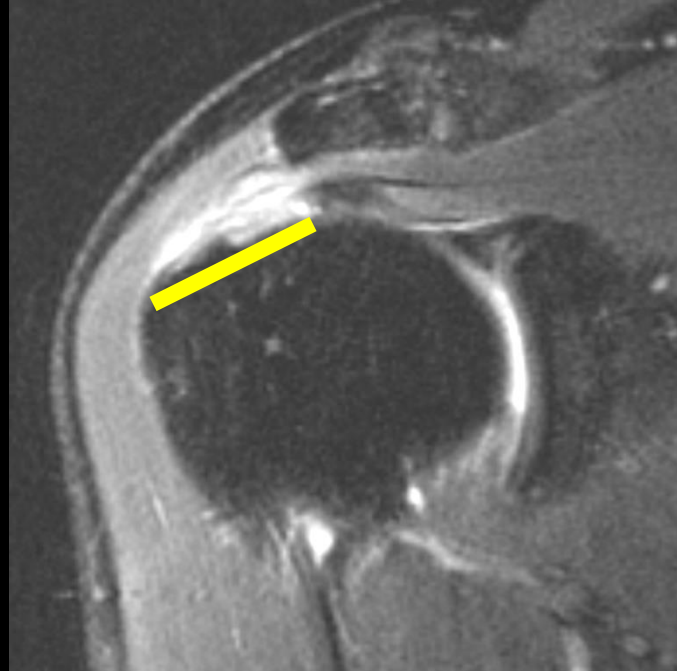


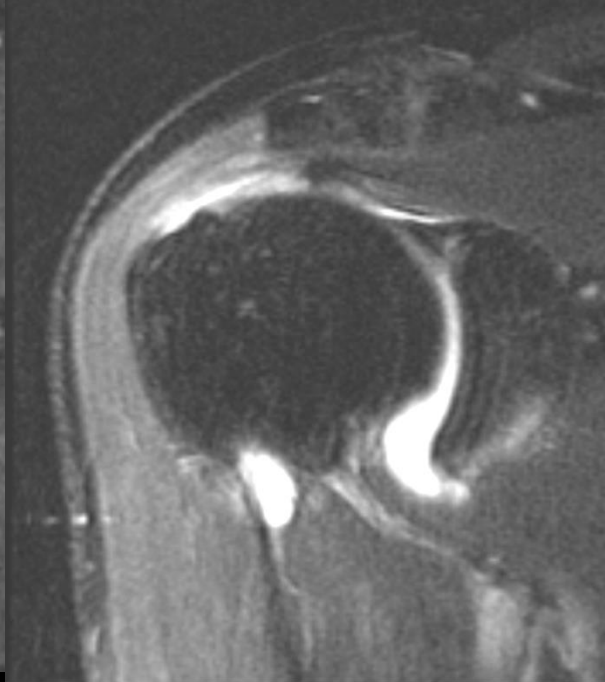
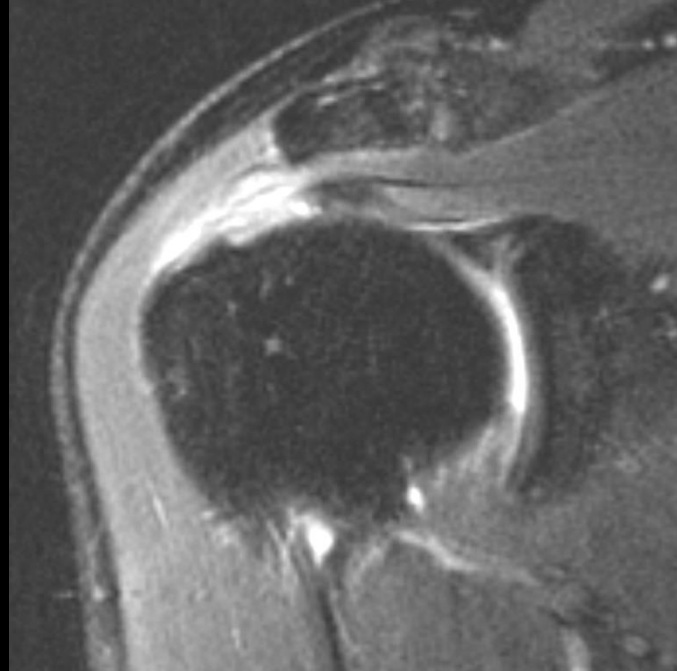


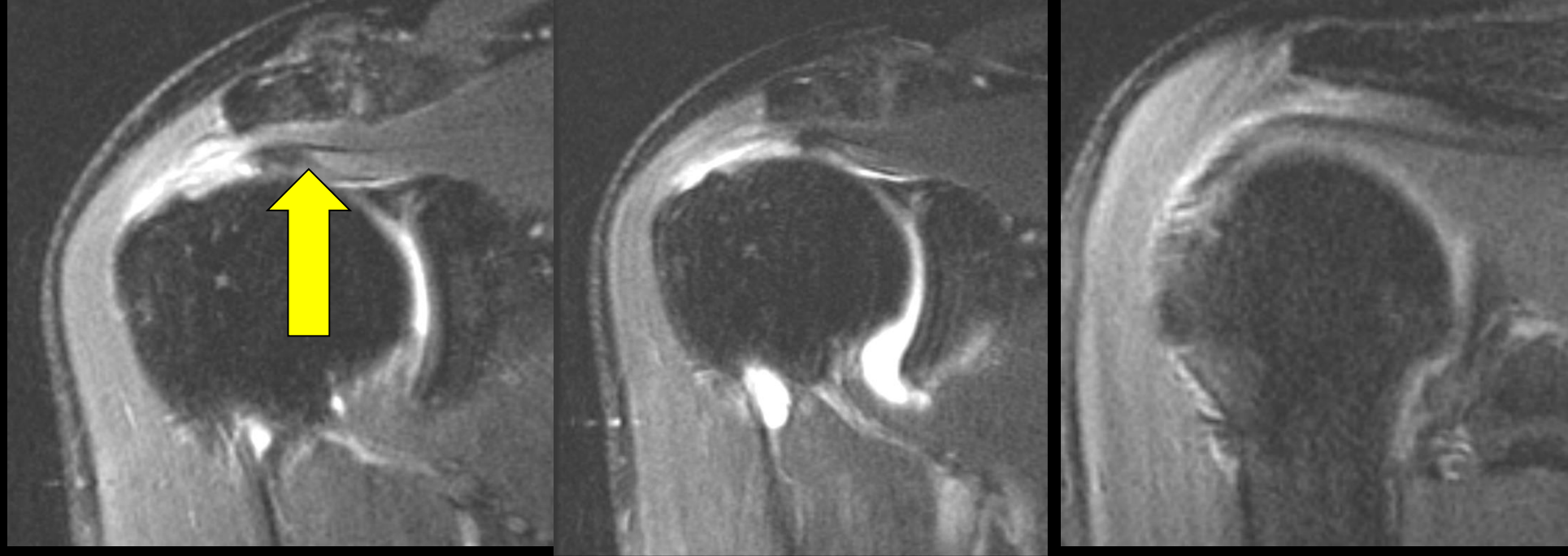


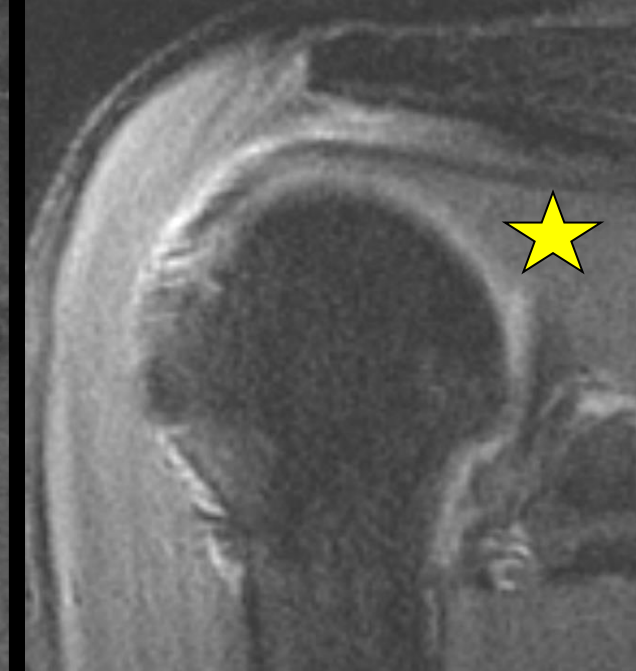
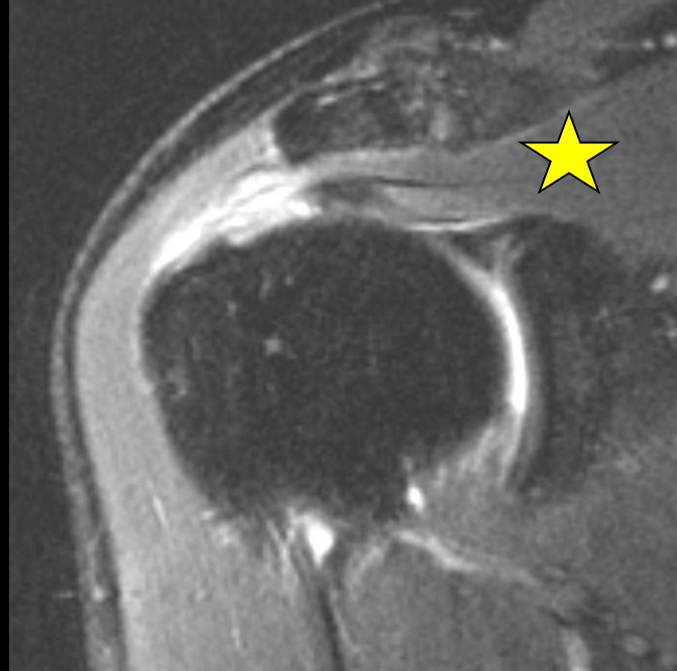














T2



T2



T2



T2



T2



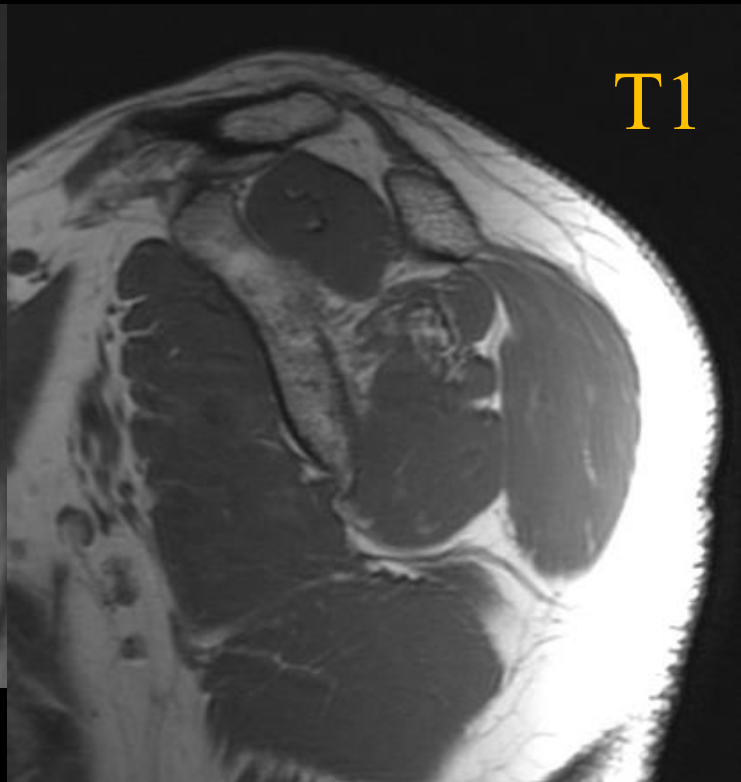
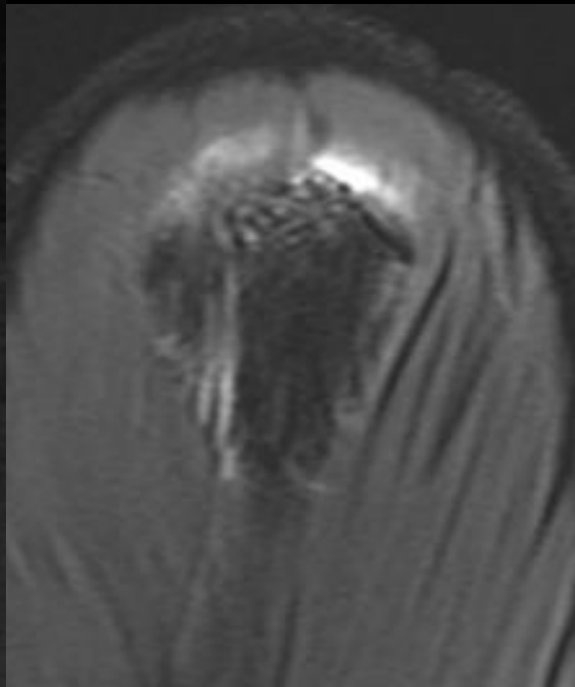
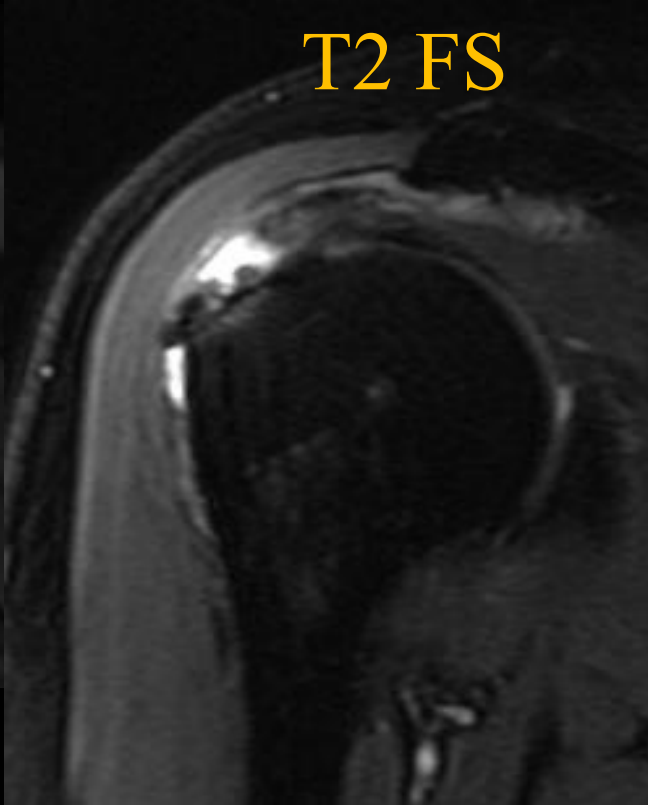
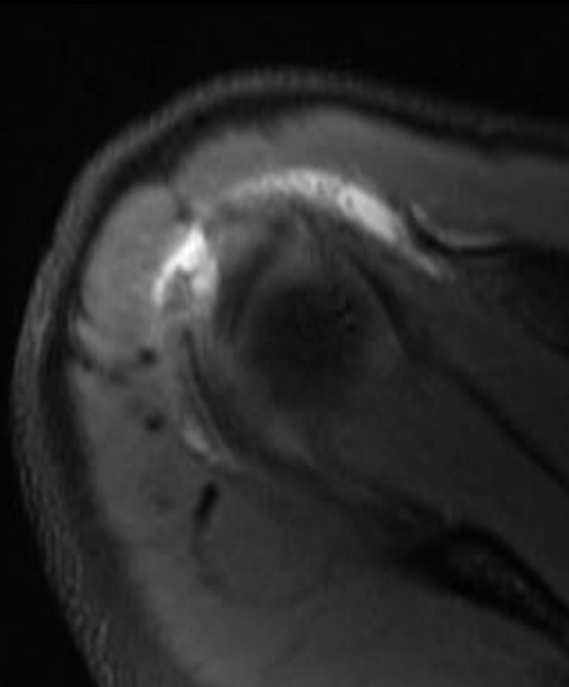
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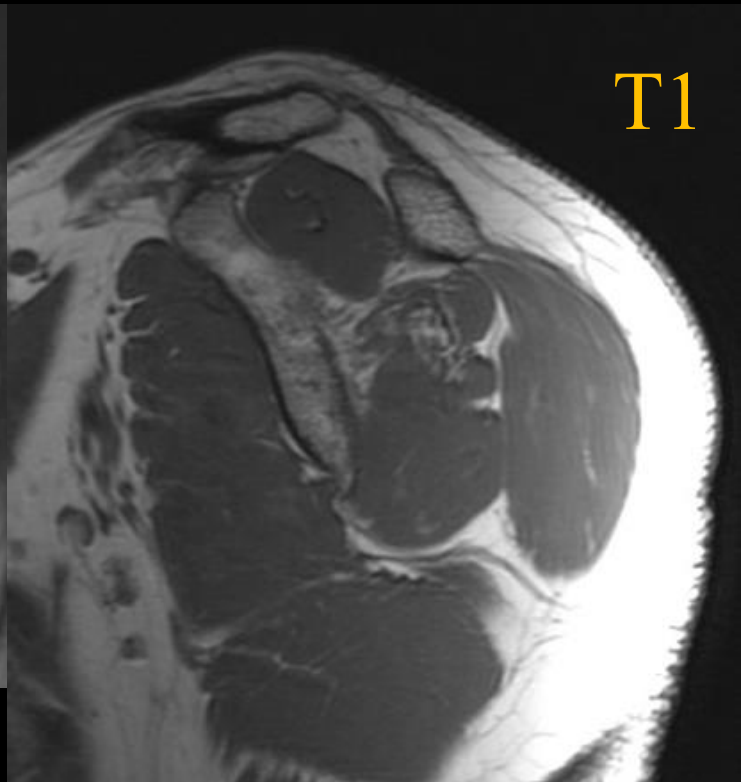
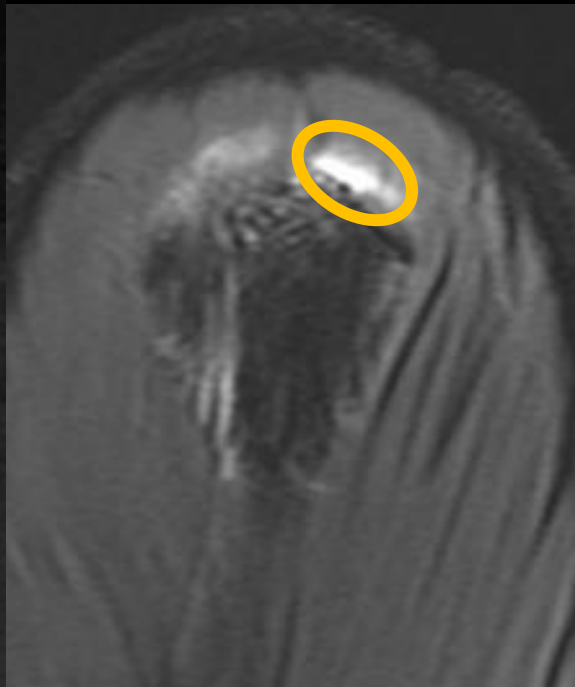
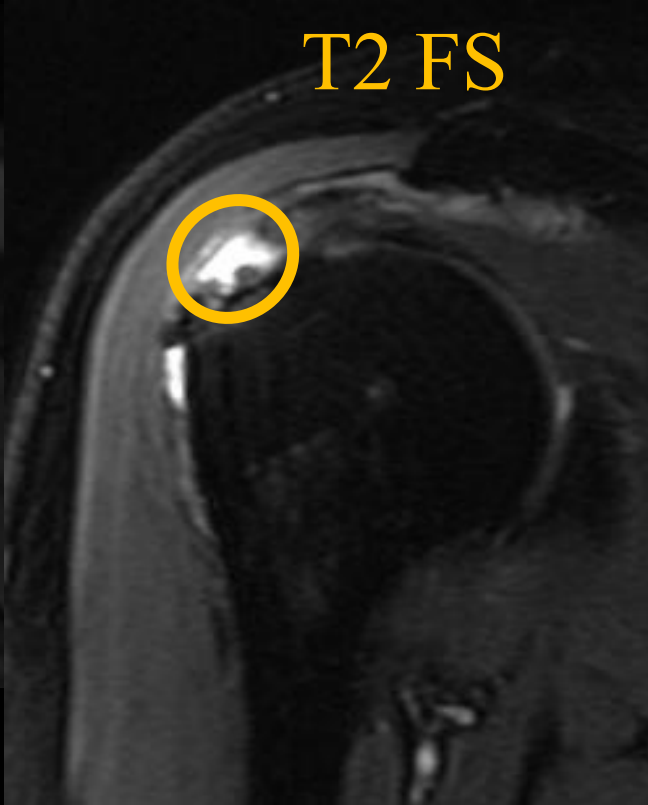
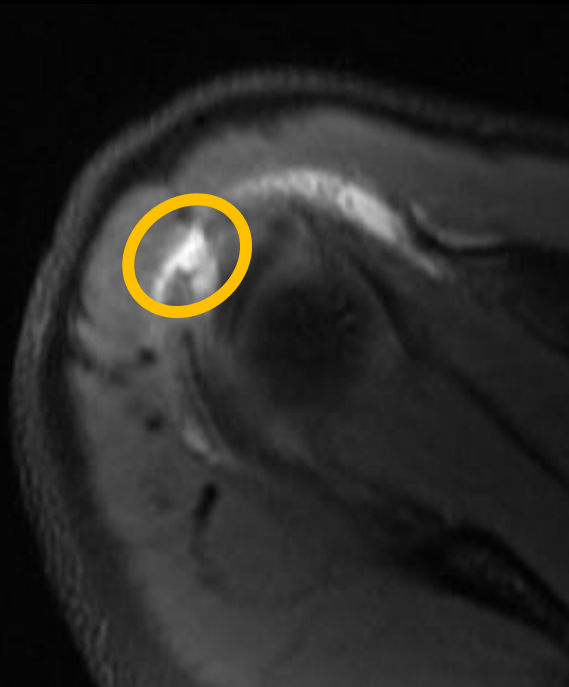


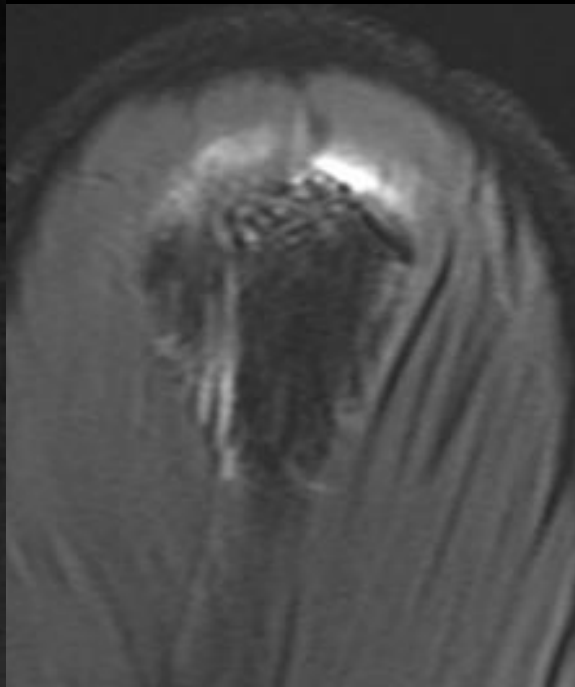
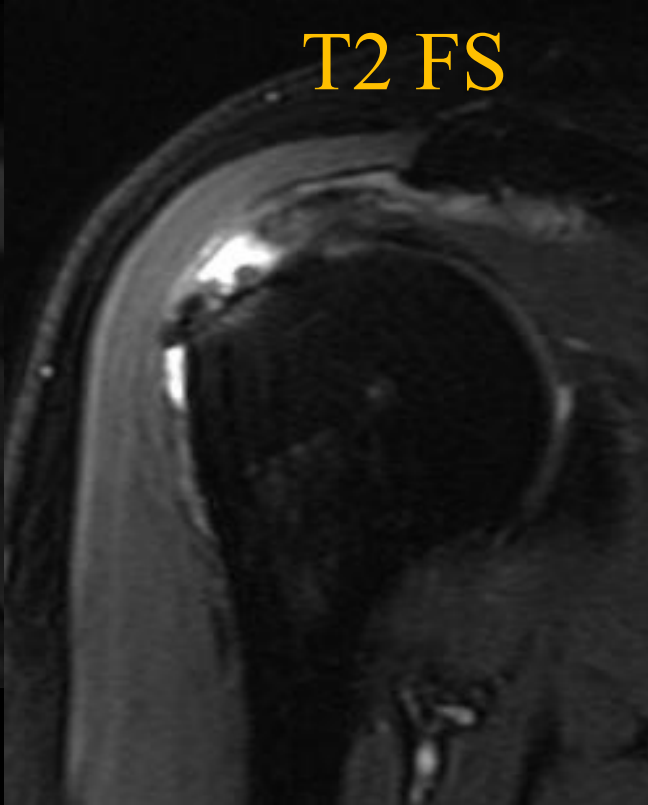
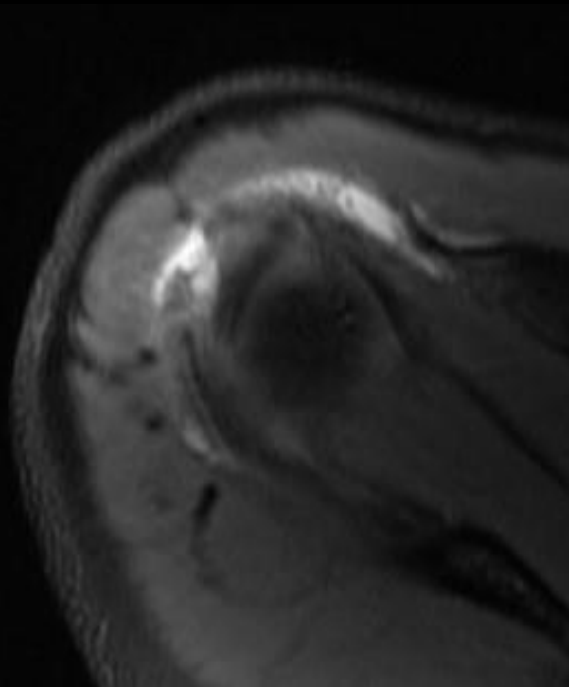
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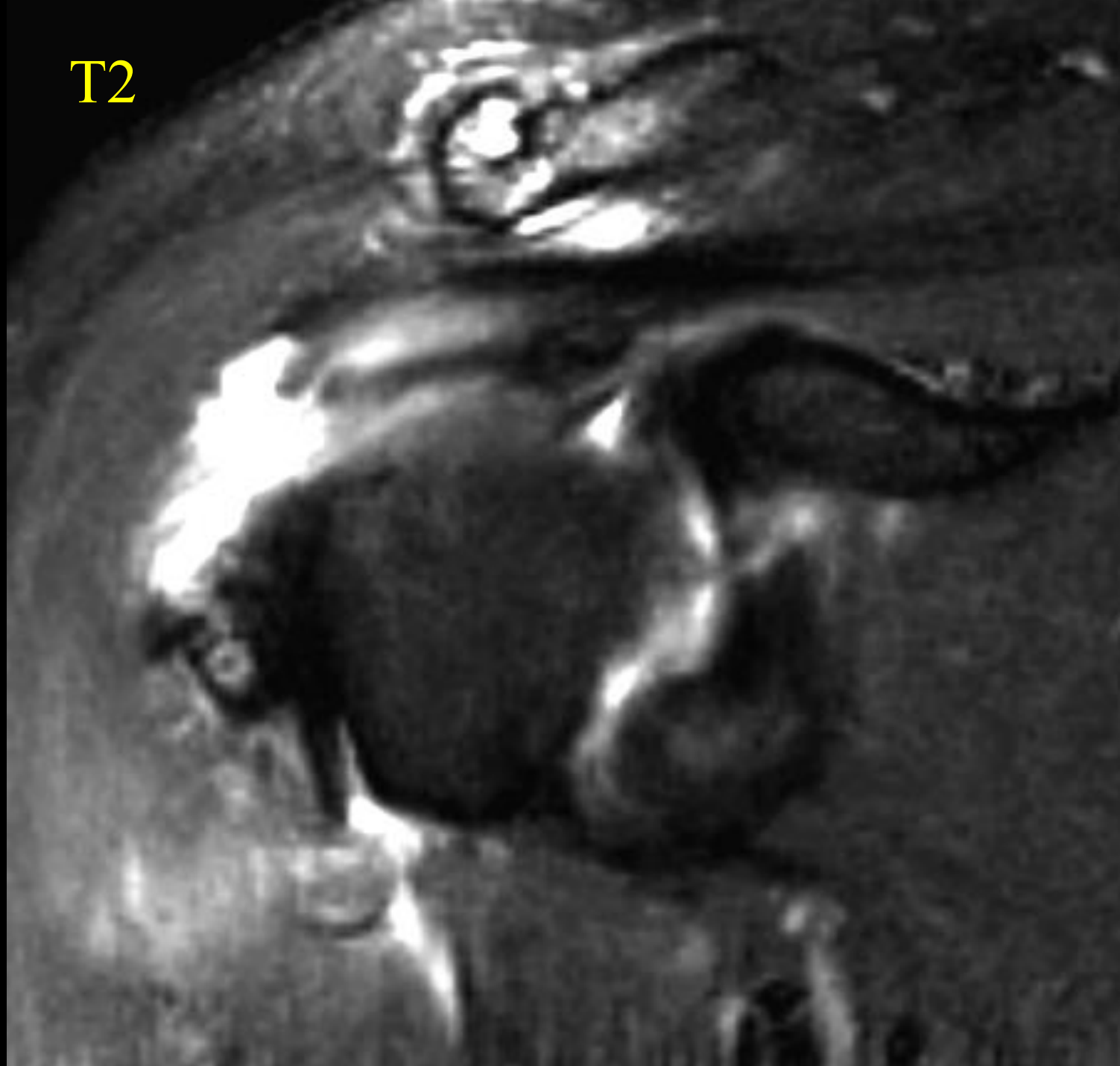
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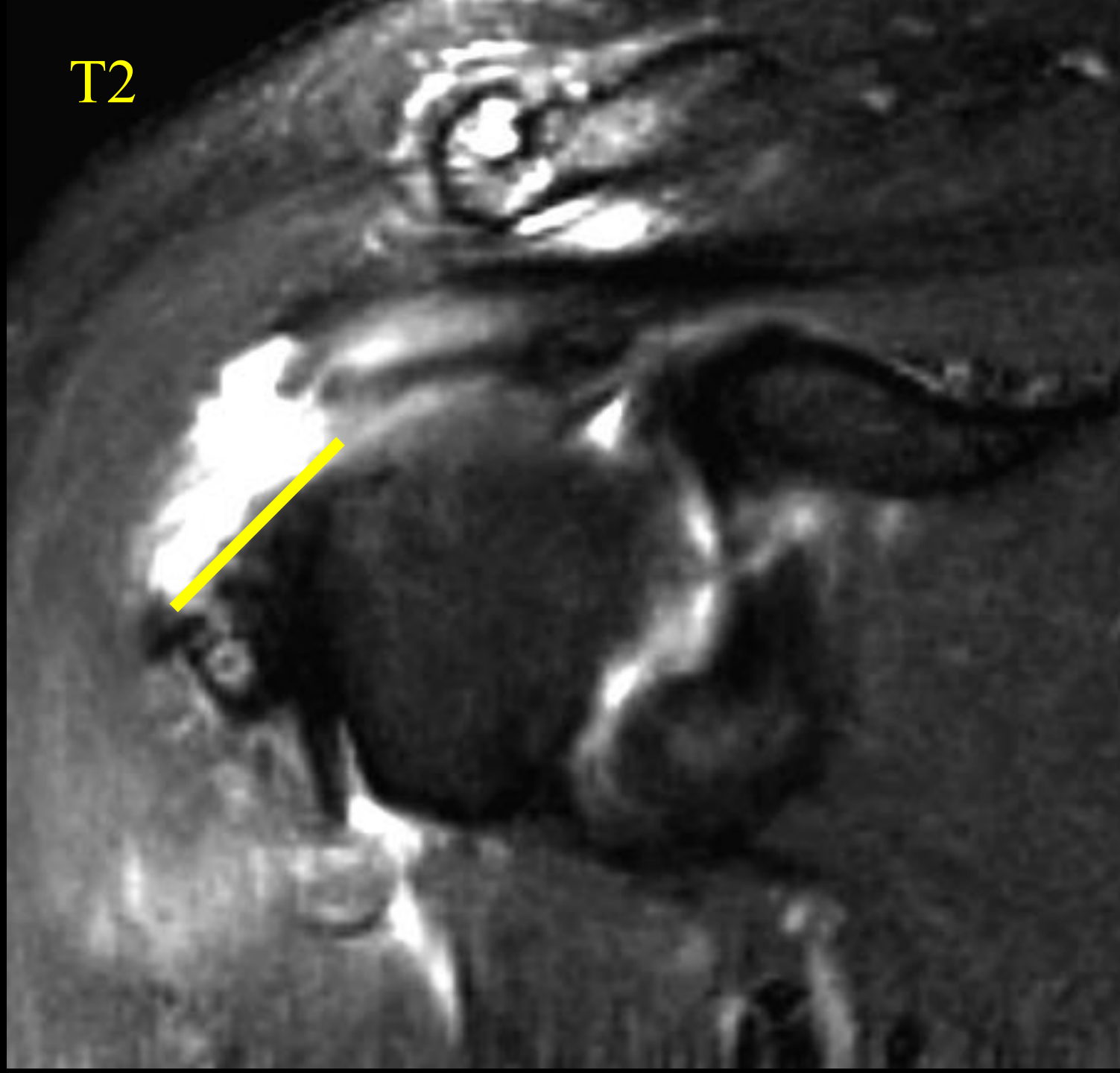




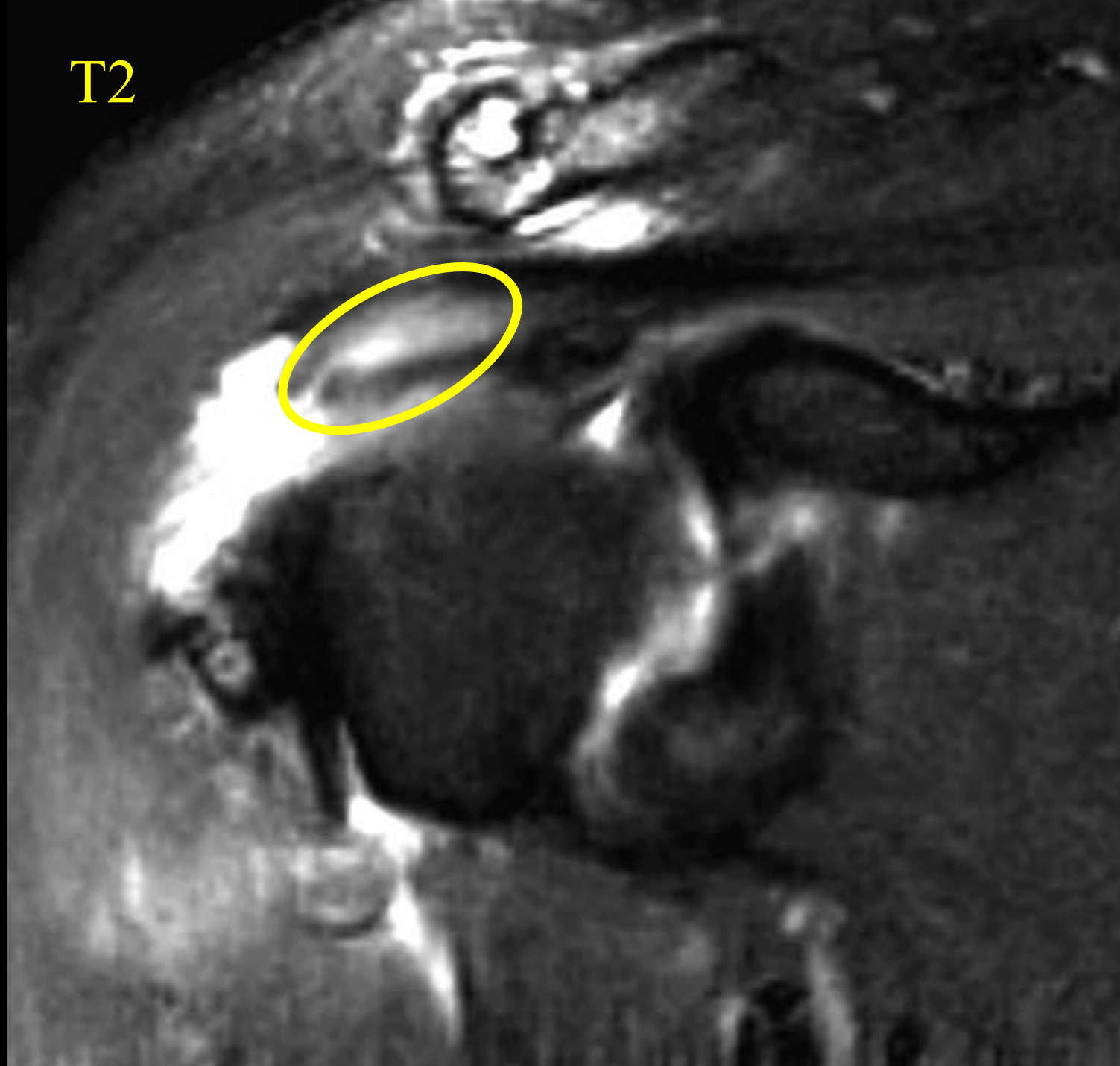
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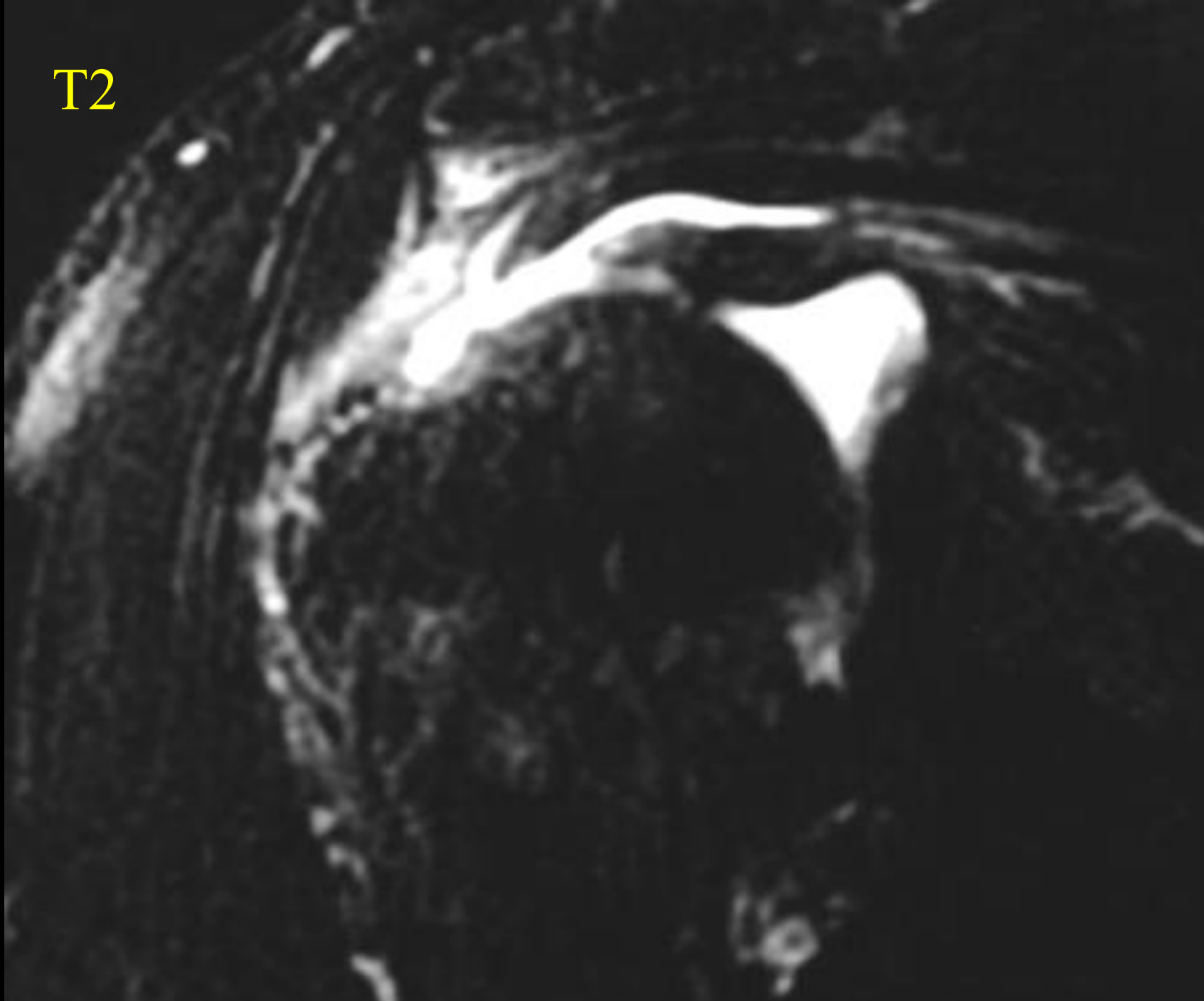
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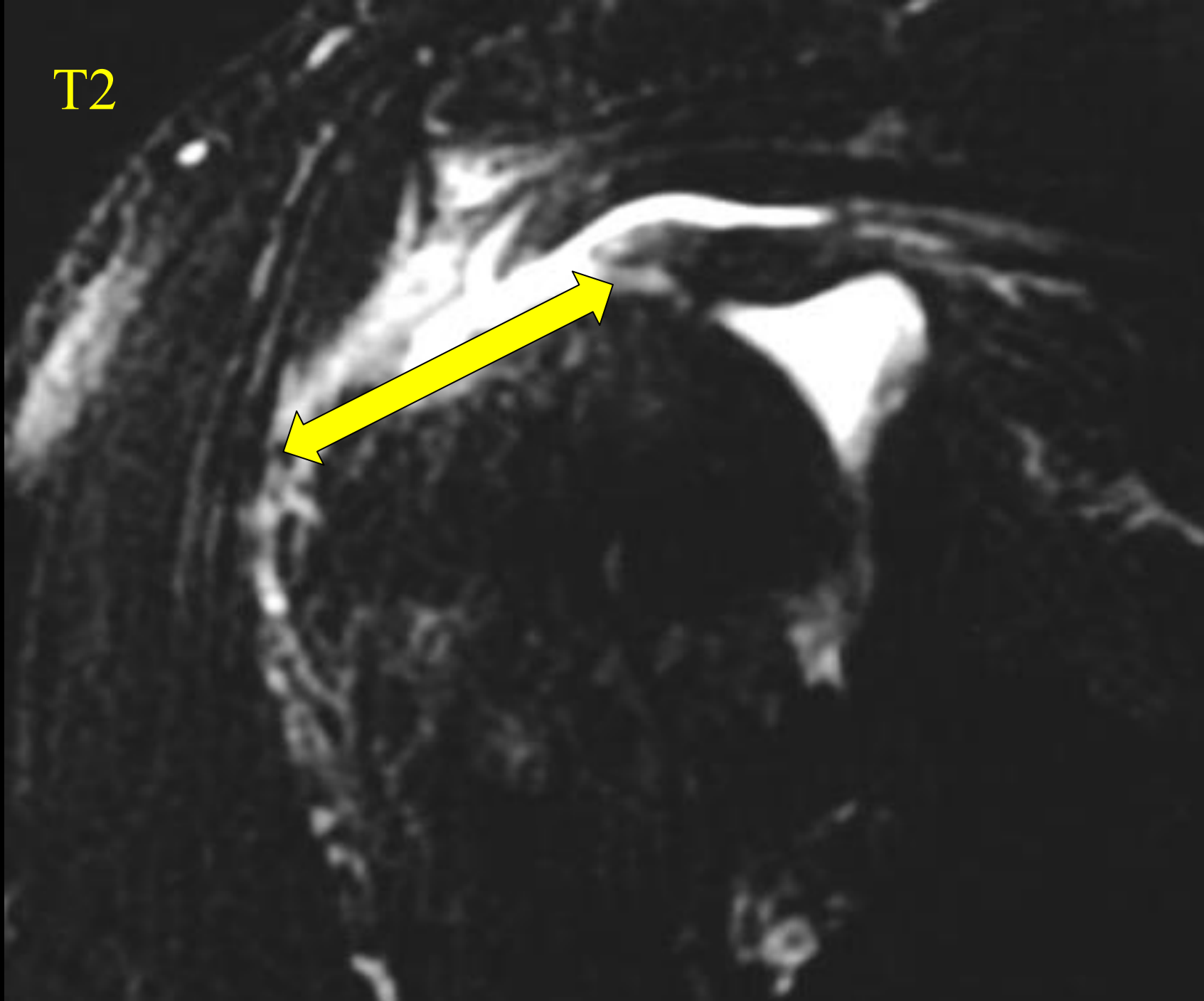
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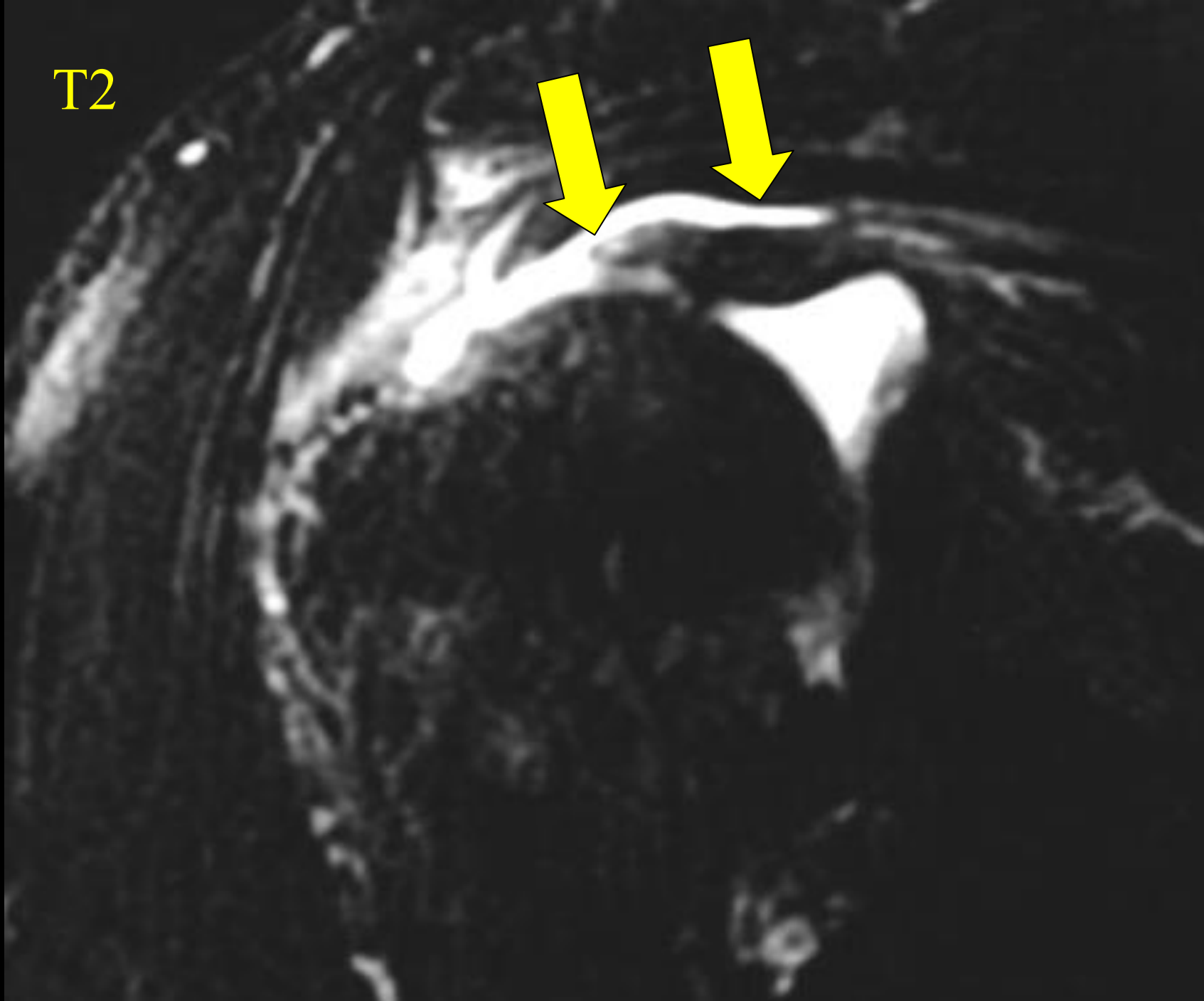
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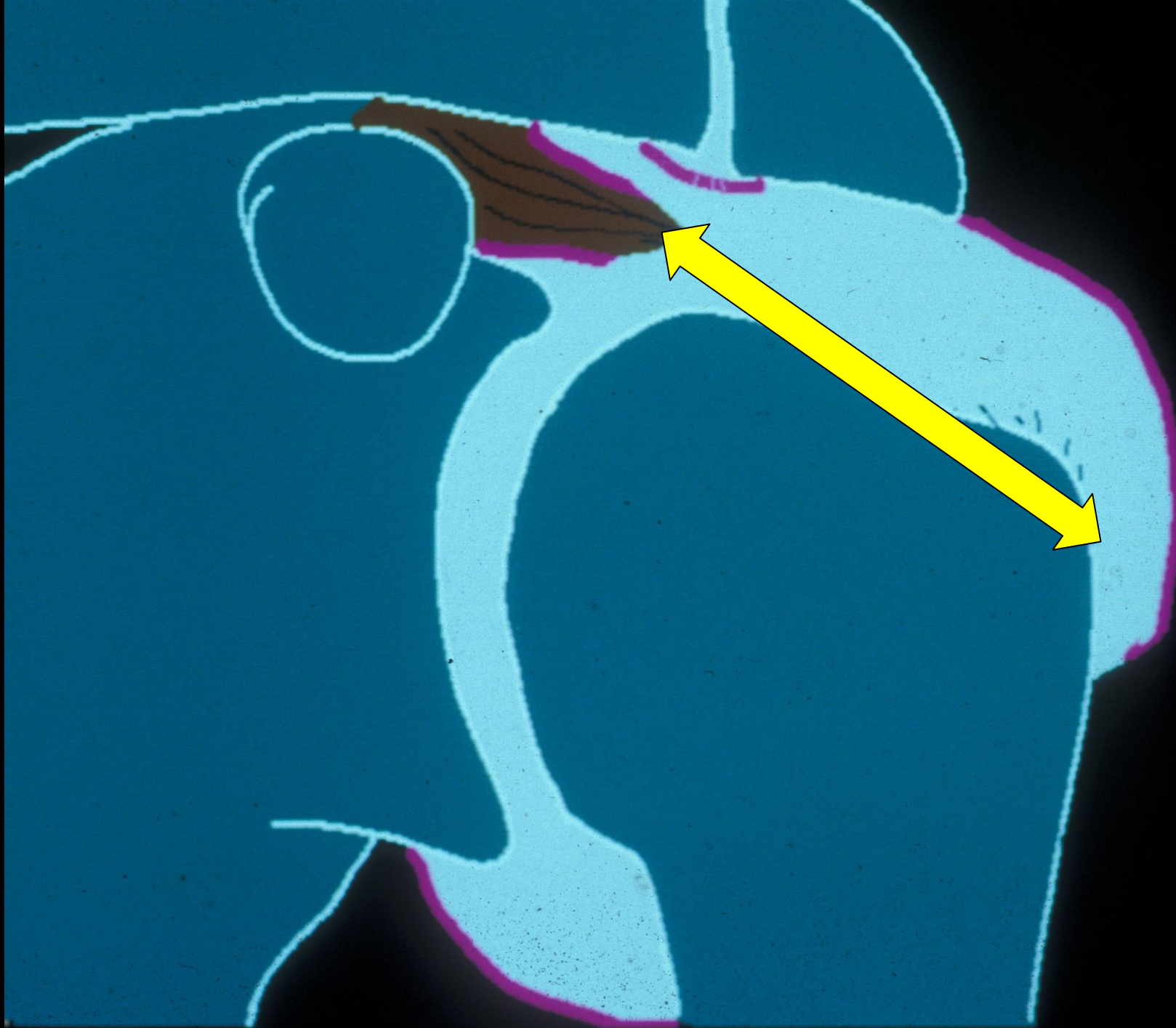
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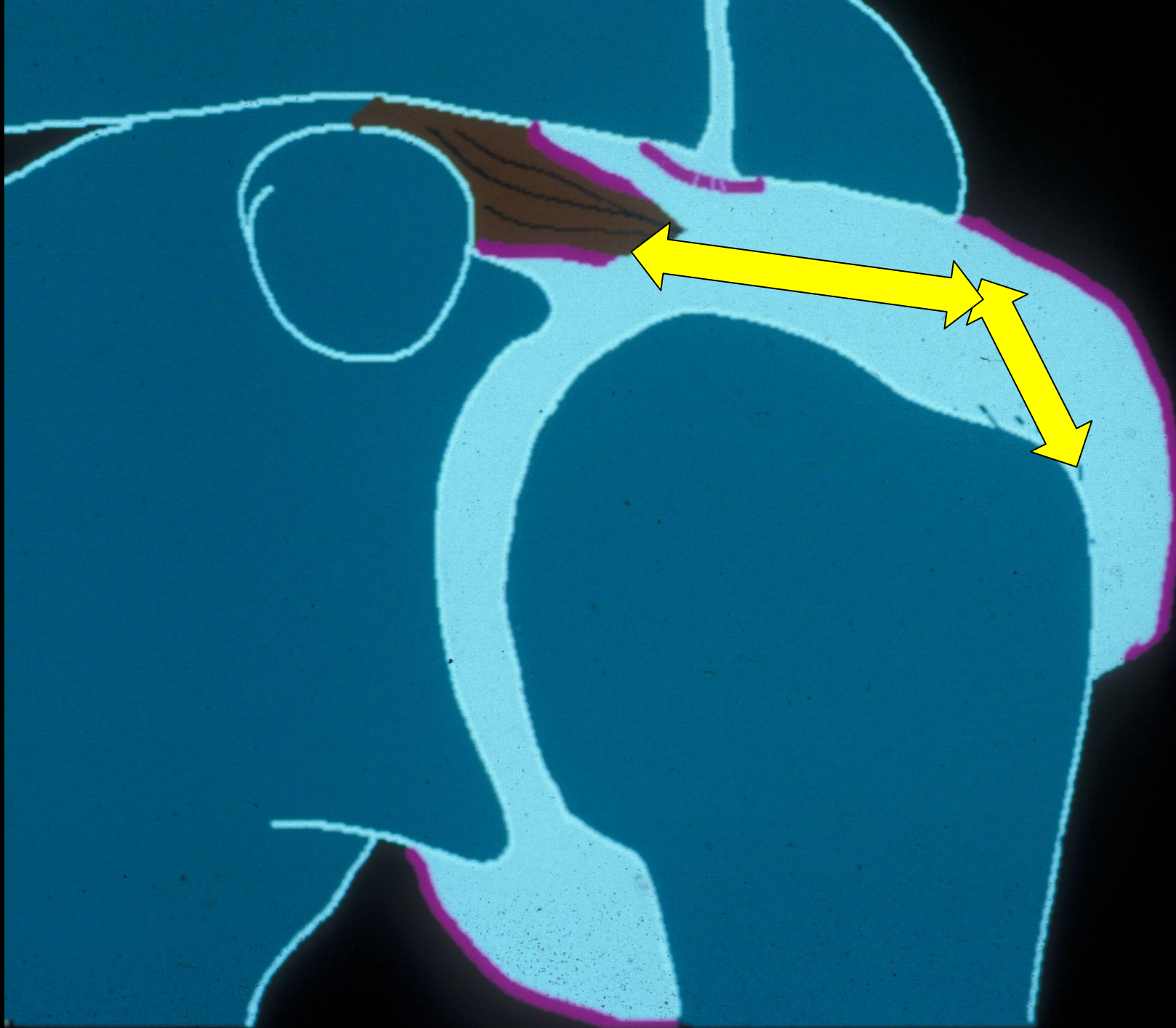


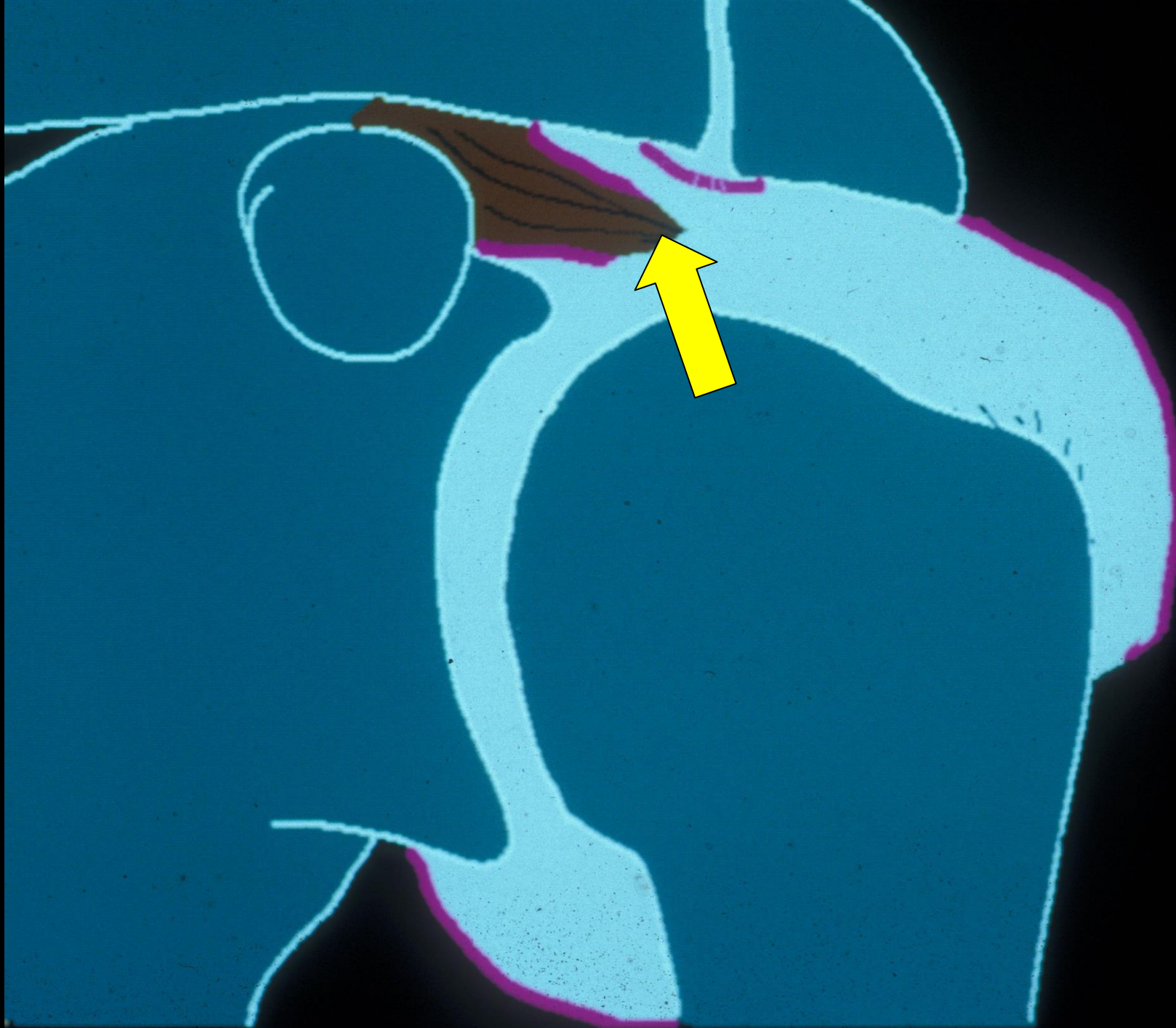
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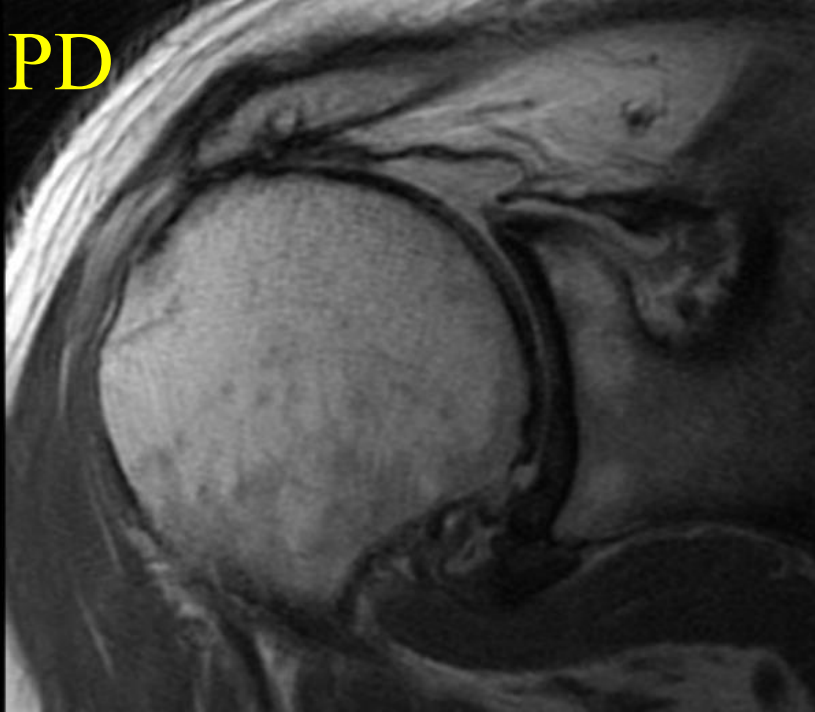




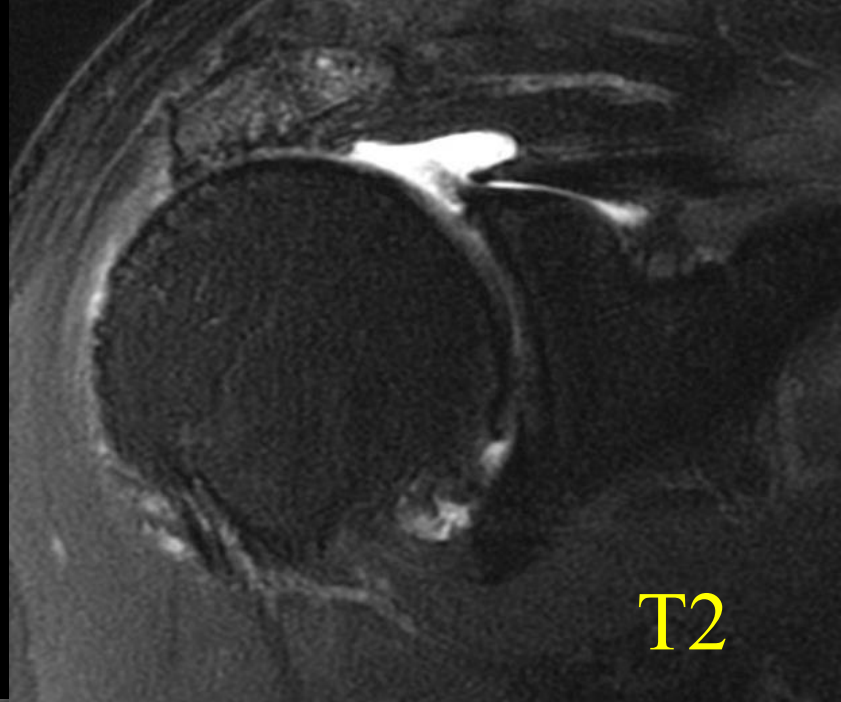




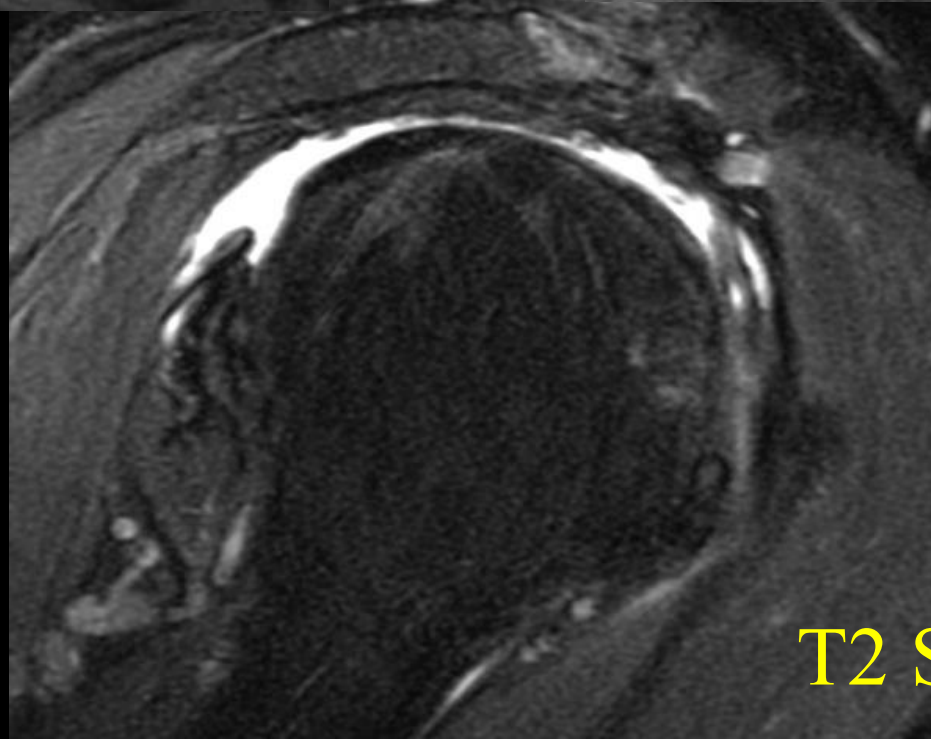
PD



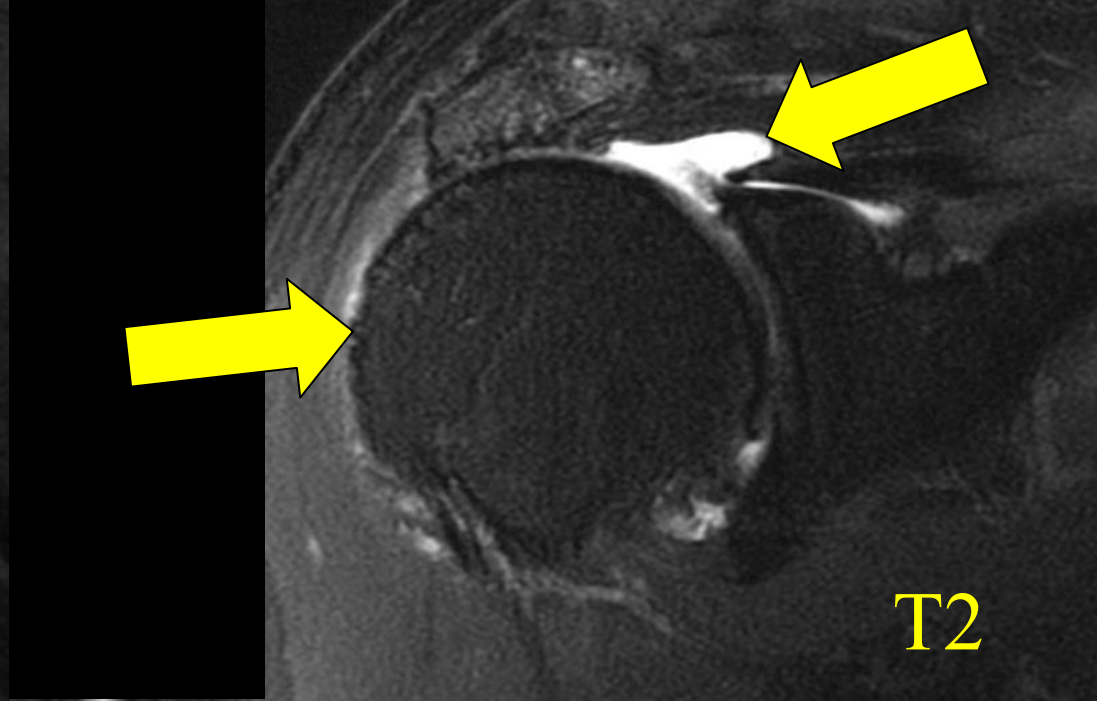
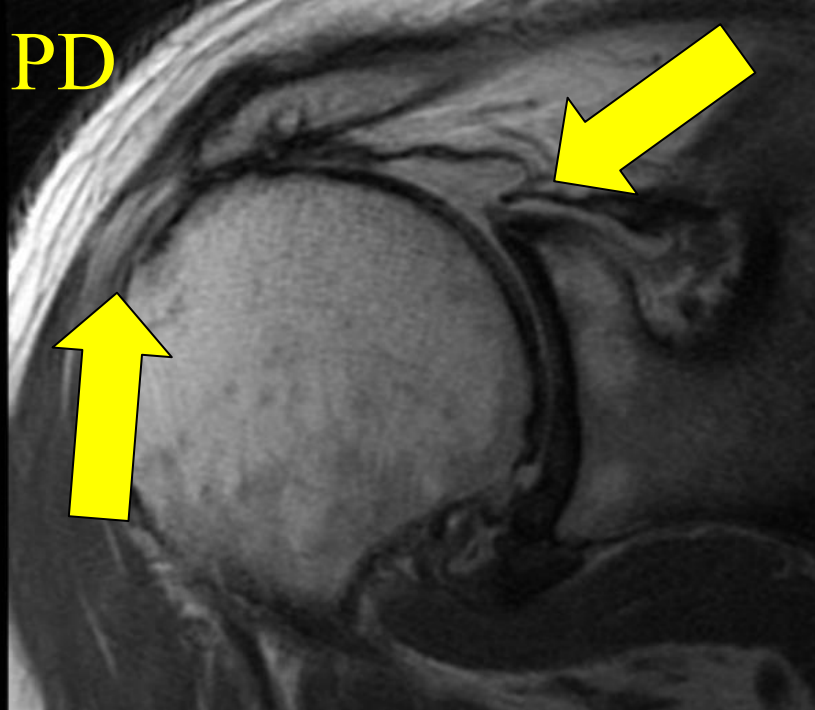
T2



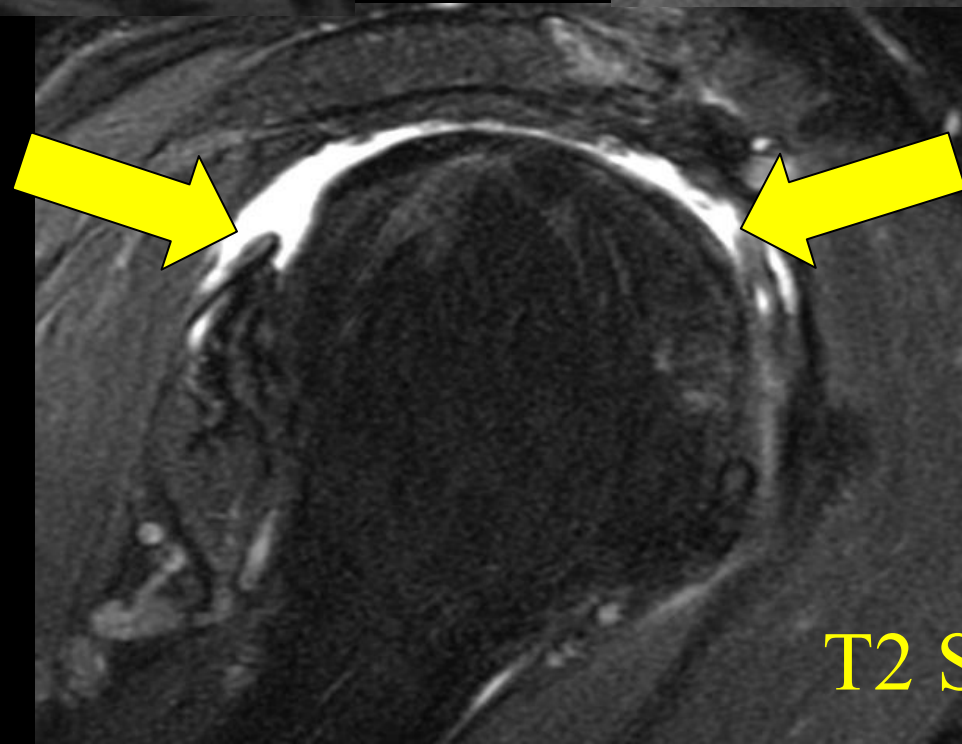
T2 SAG



PD

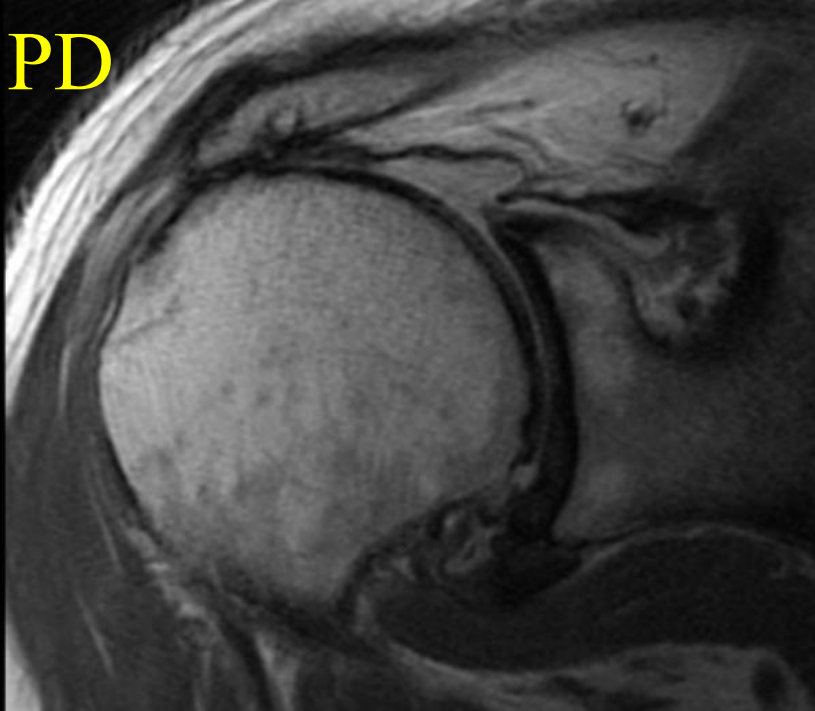


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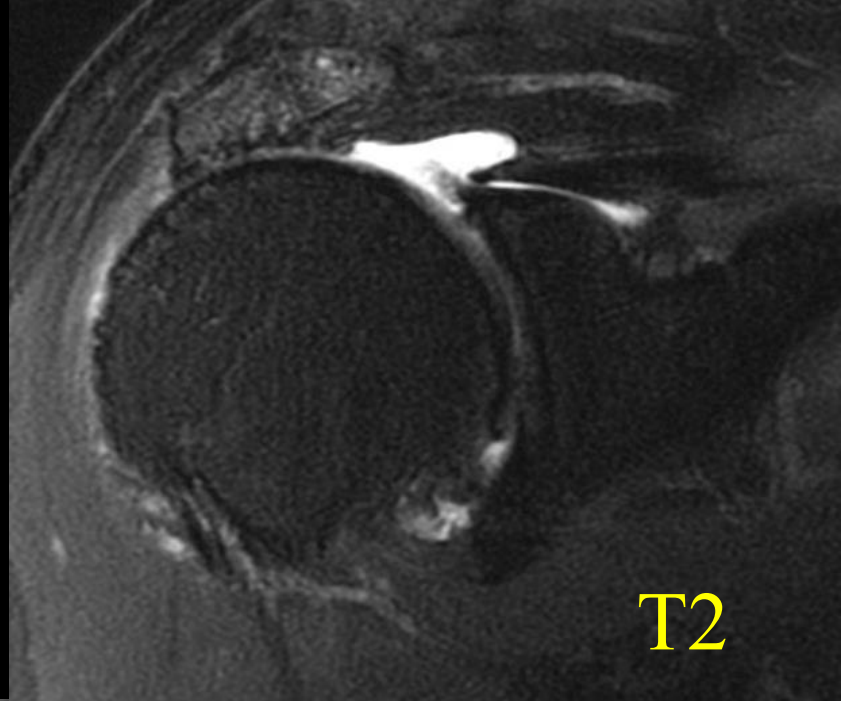


T2 SAG

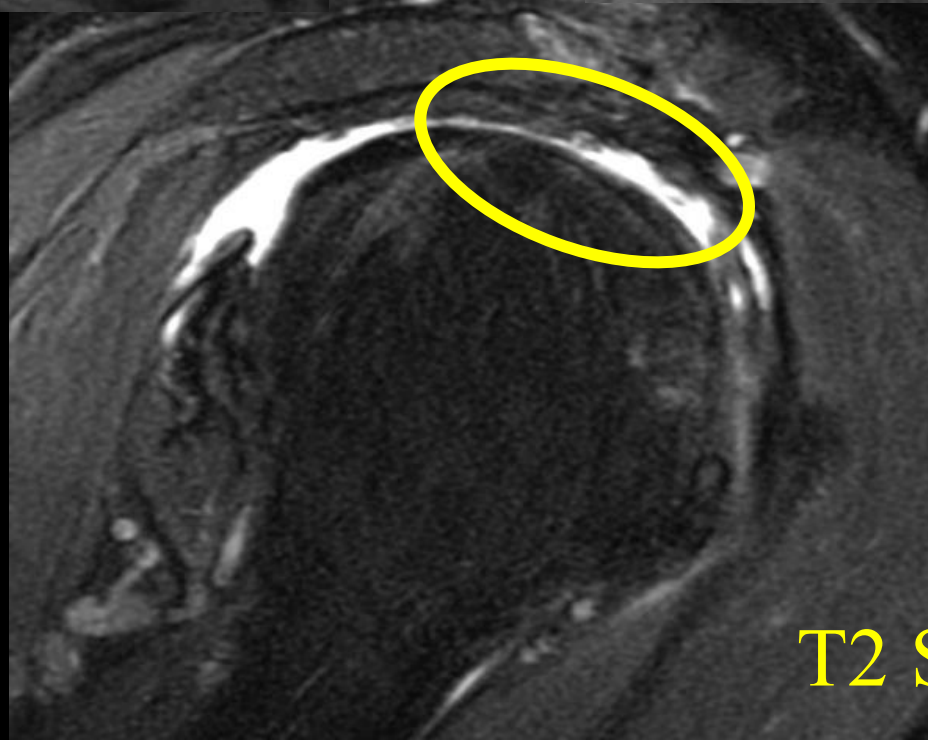
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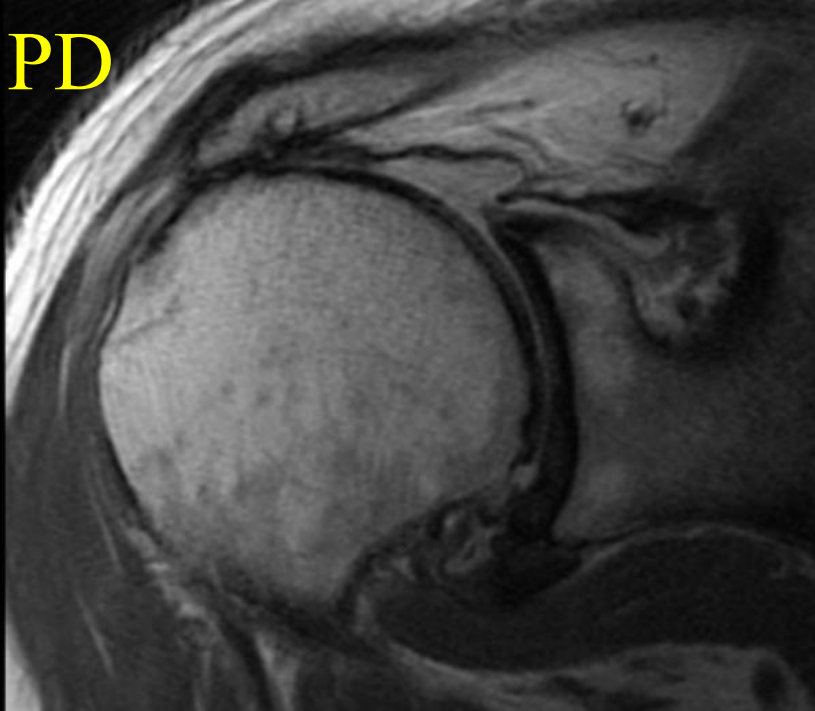
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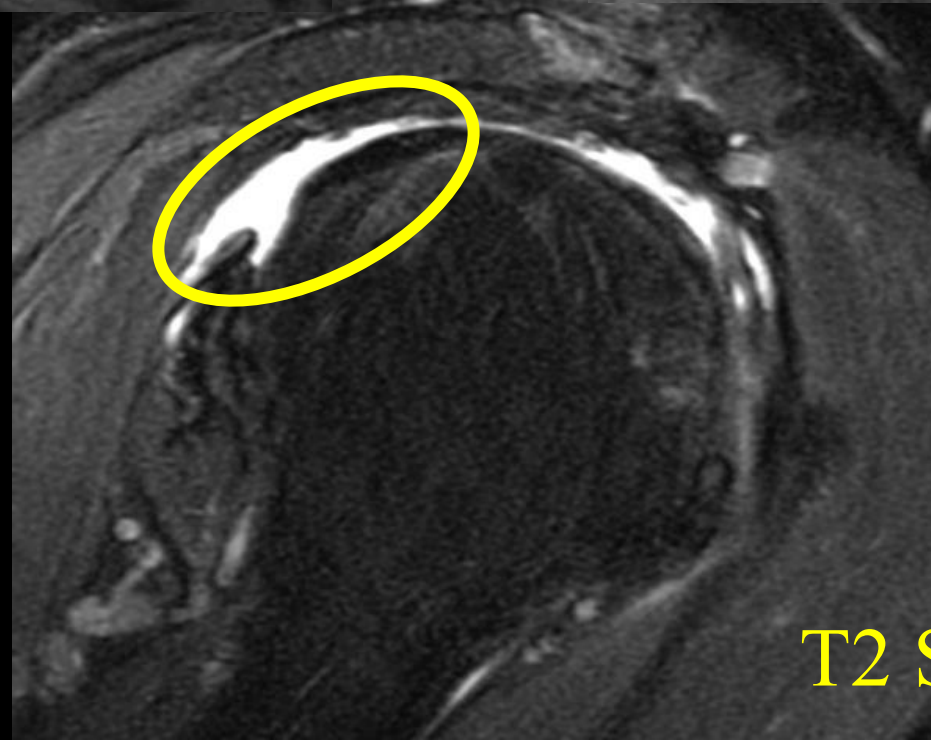
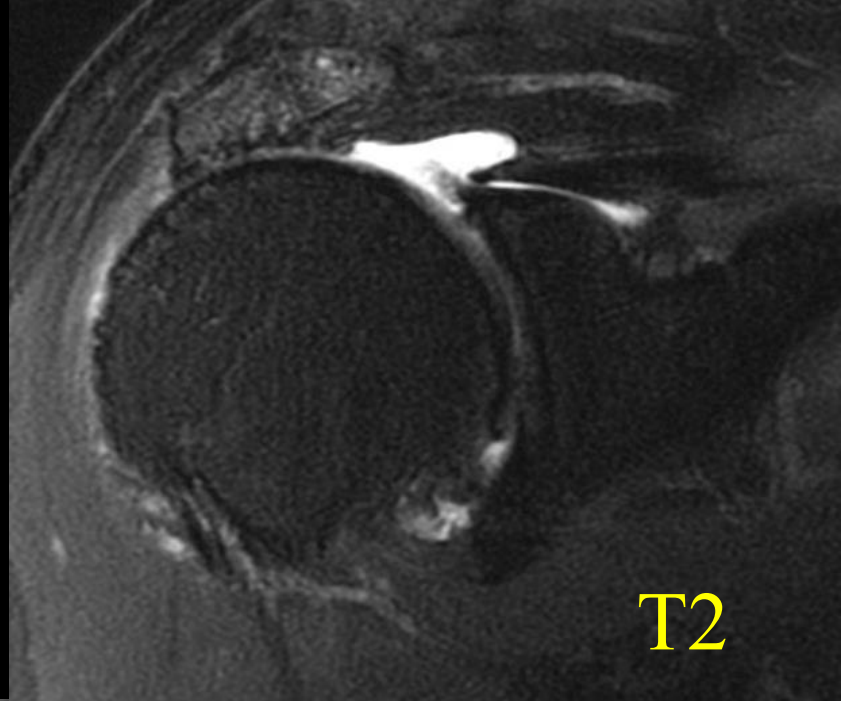
T2 SAG



PD

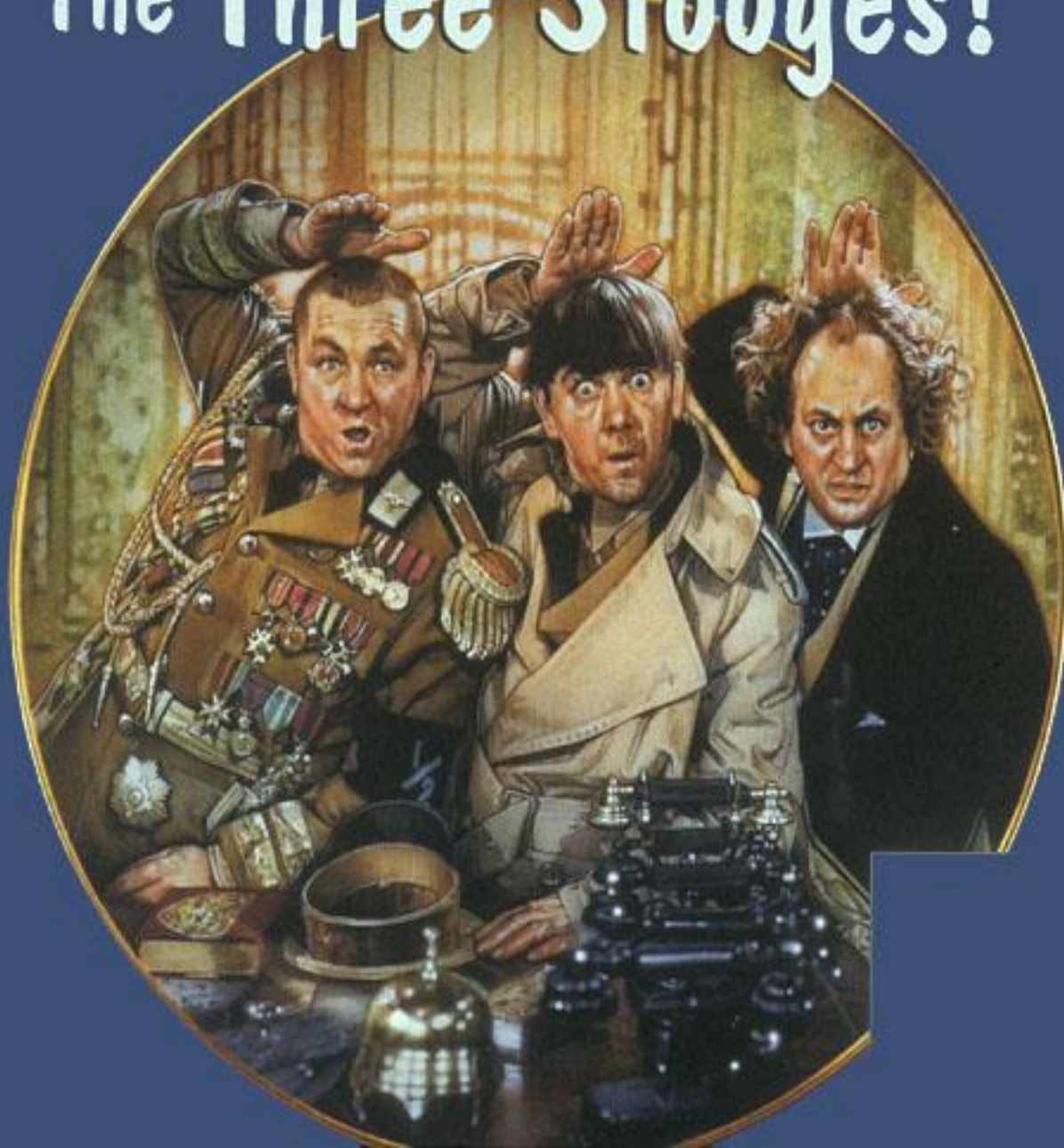


T2



T2 SAG

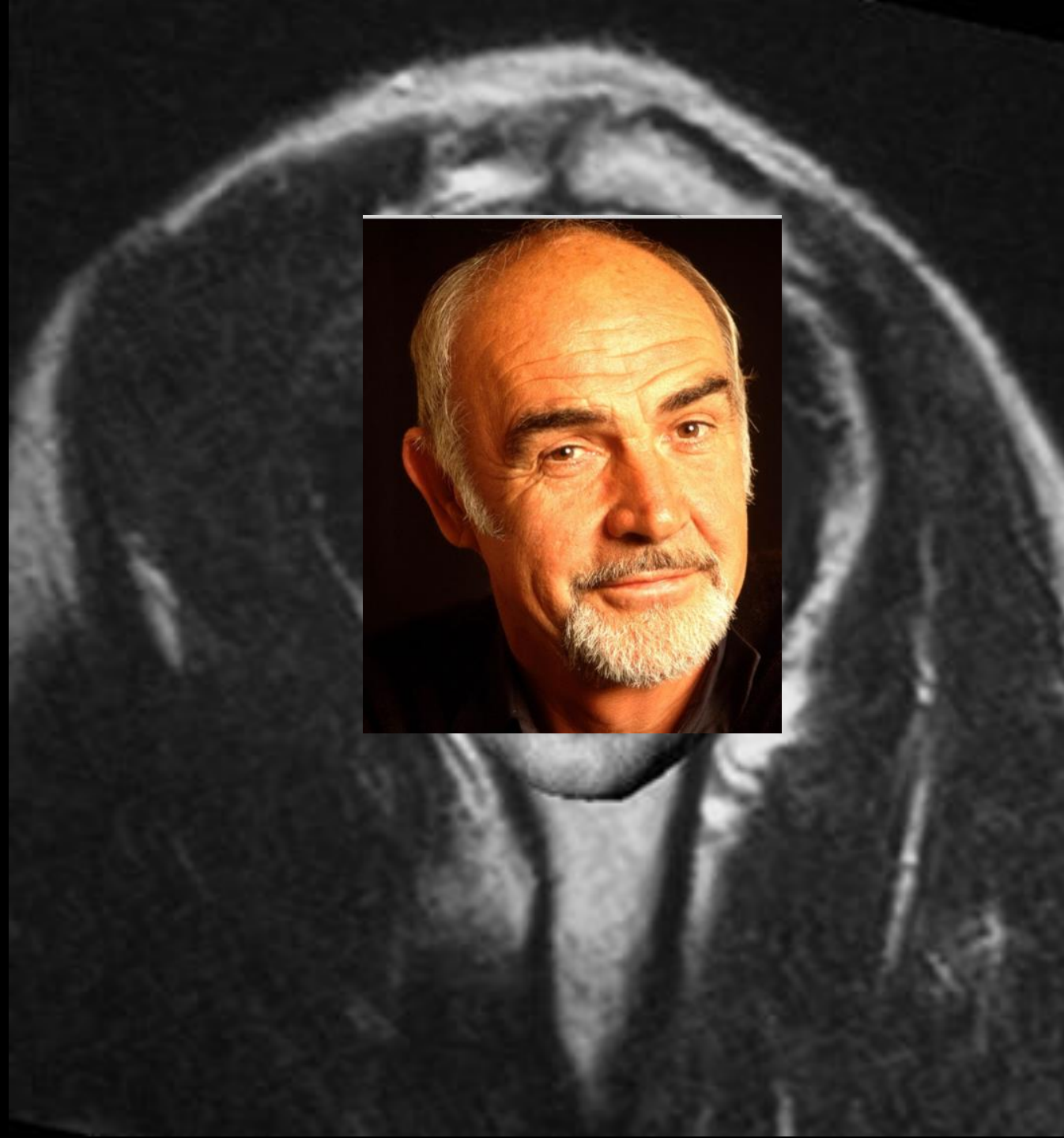
The Three Stooges!



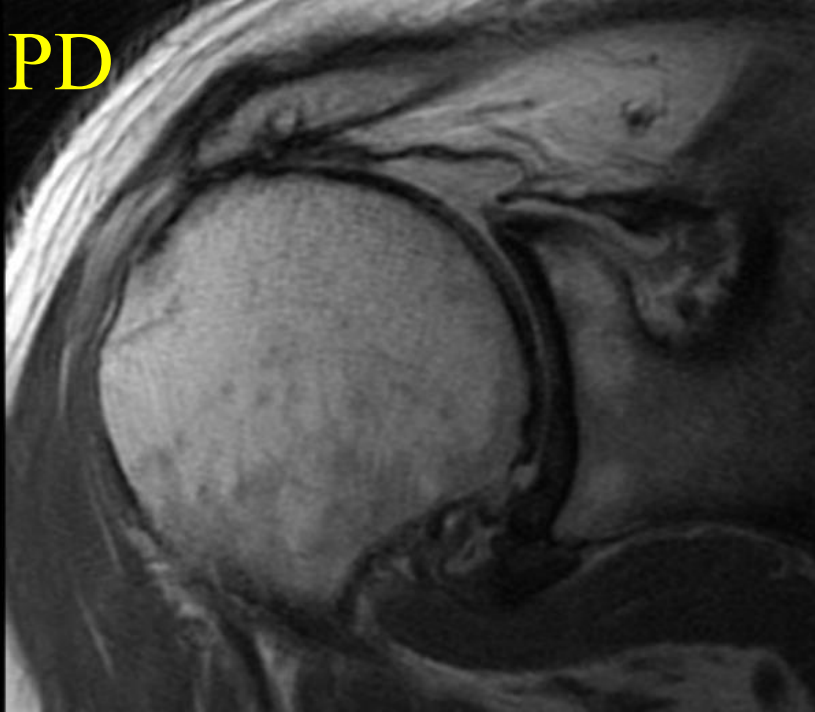
The Three Stooges!



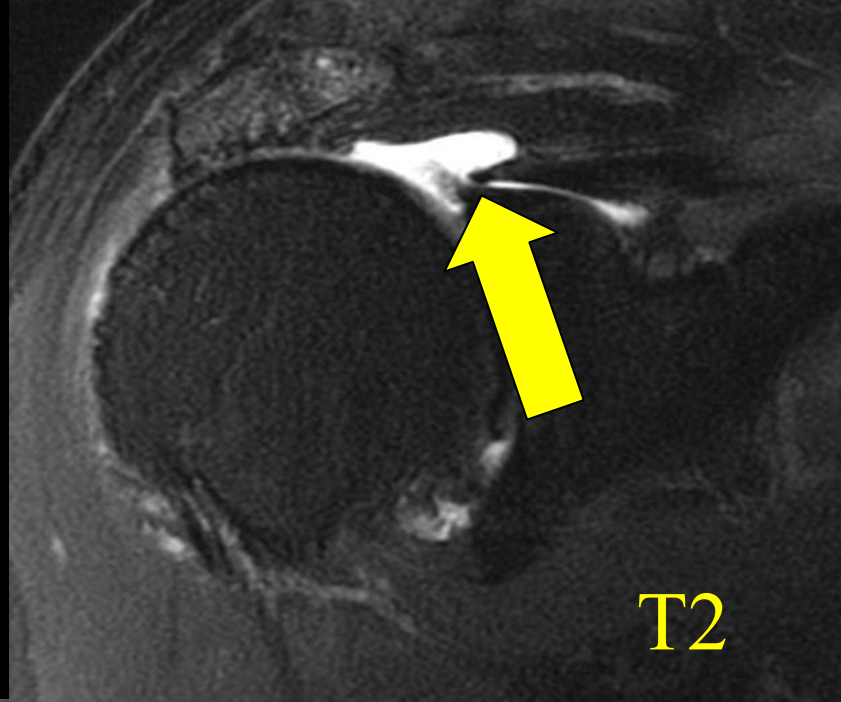




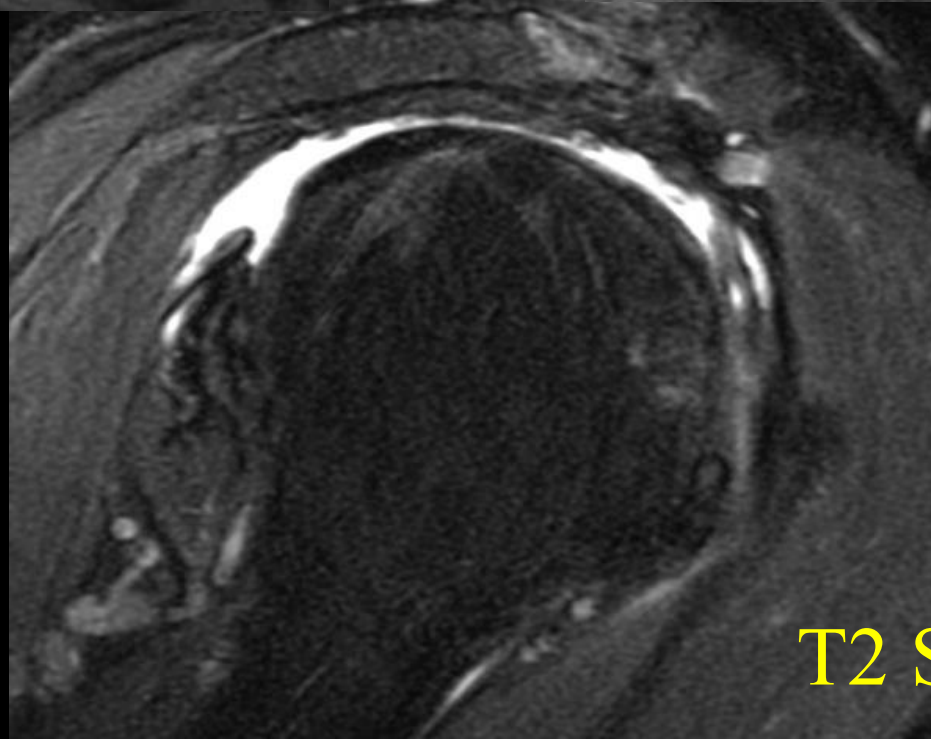
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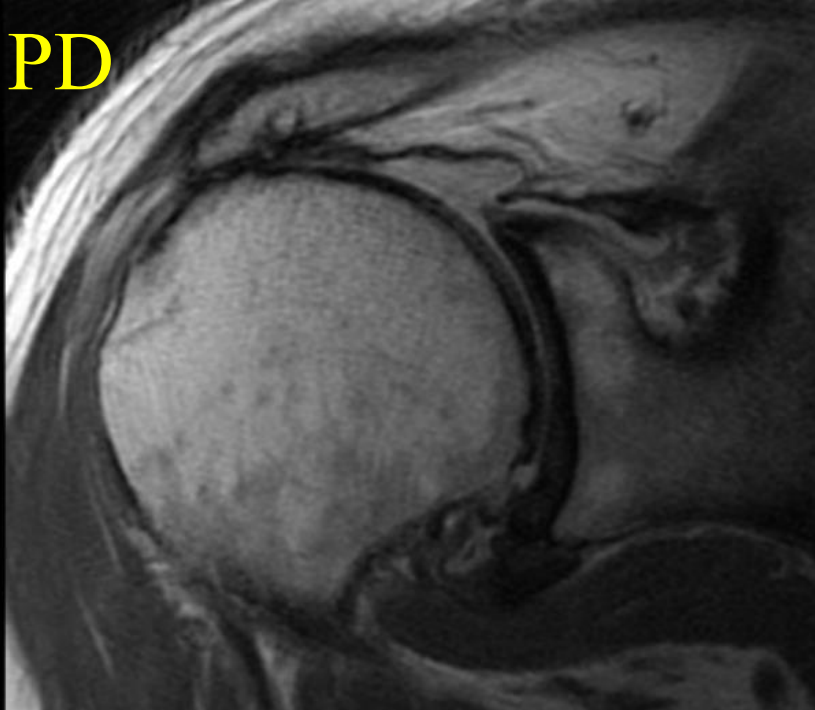
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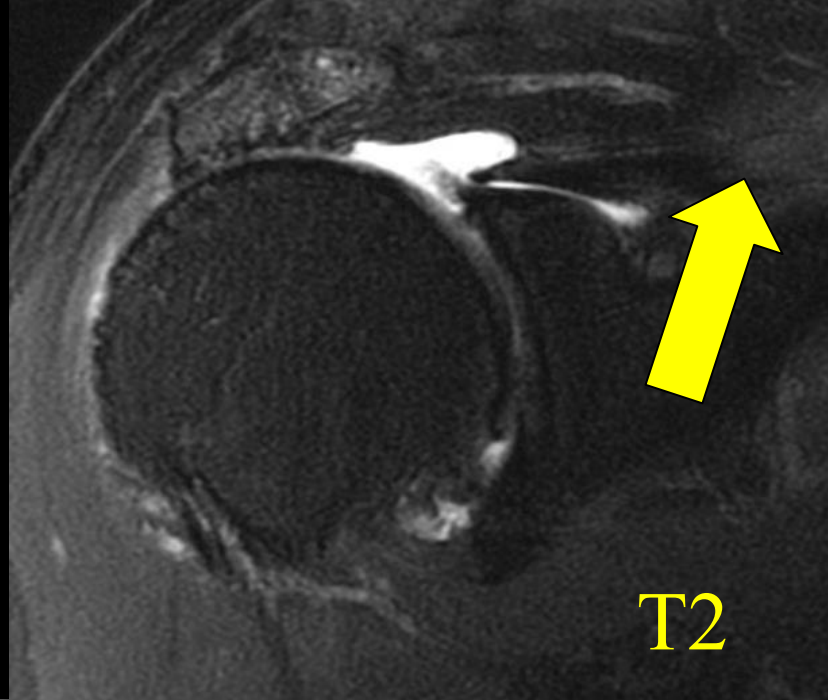
T2 SAG



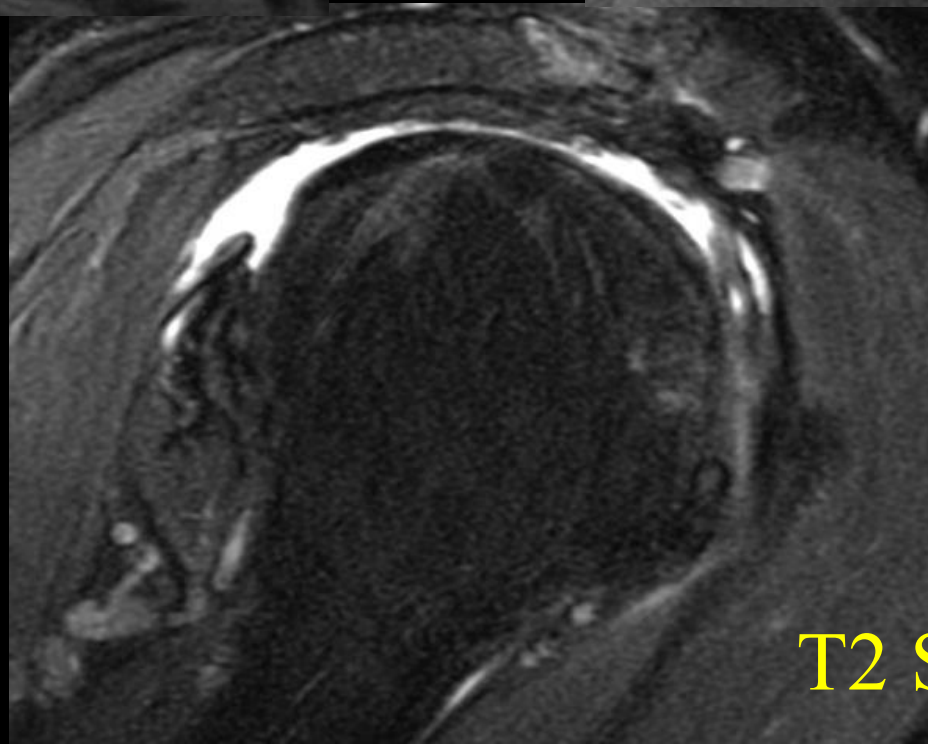
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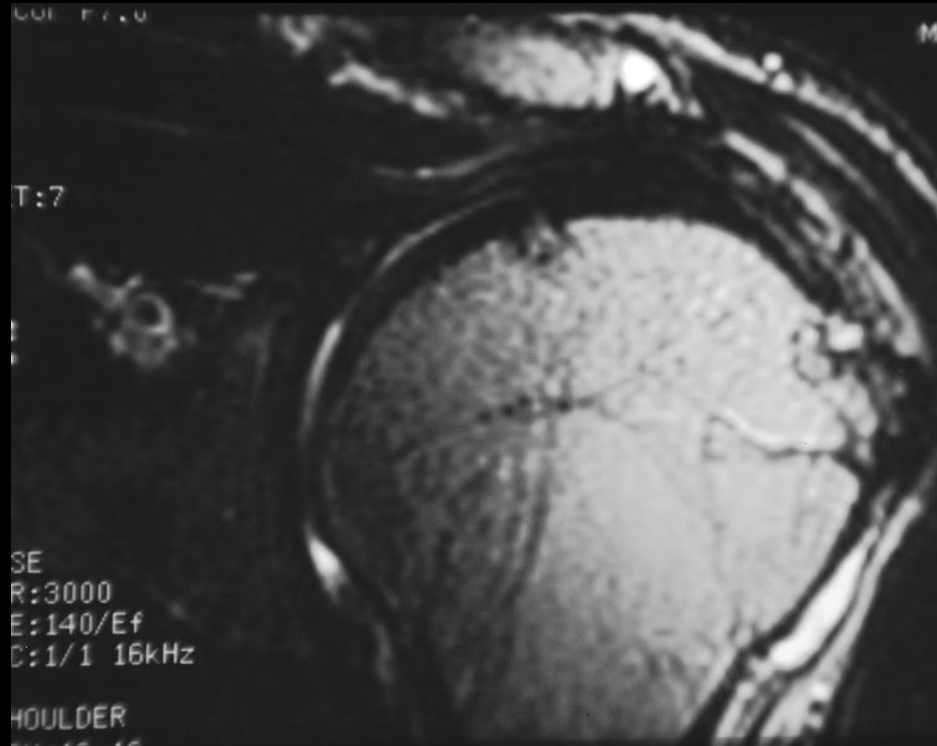
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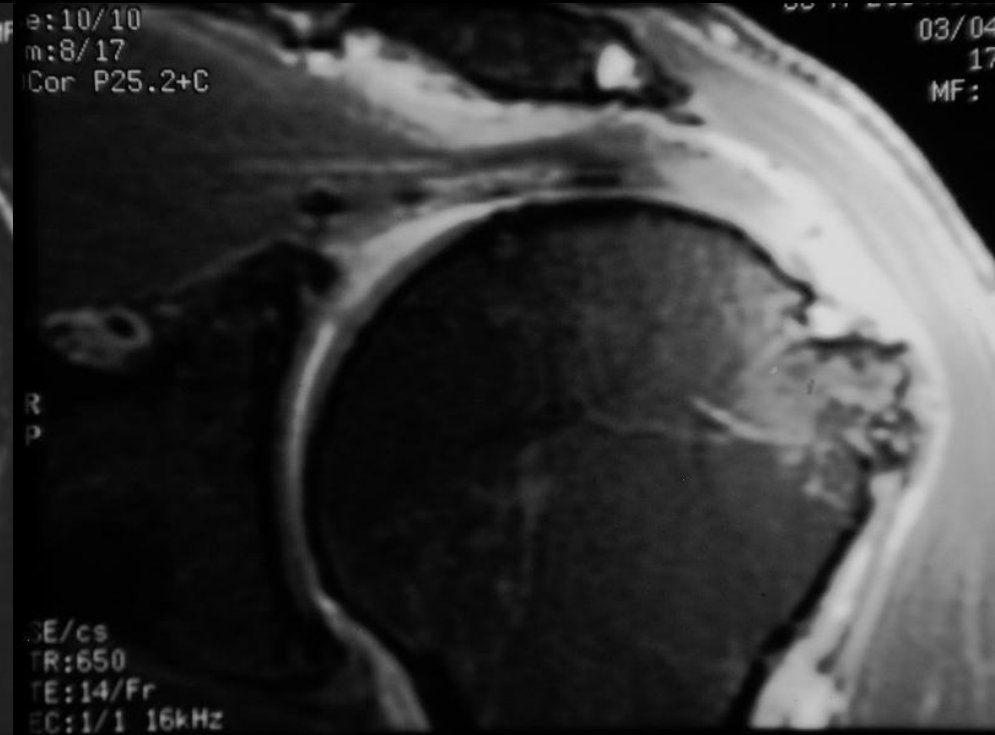
T2 SAG



Full Thickness Tear



T2

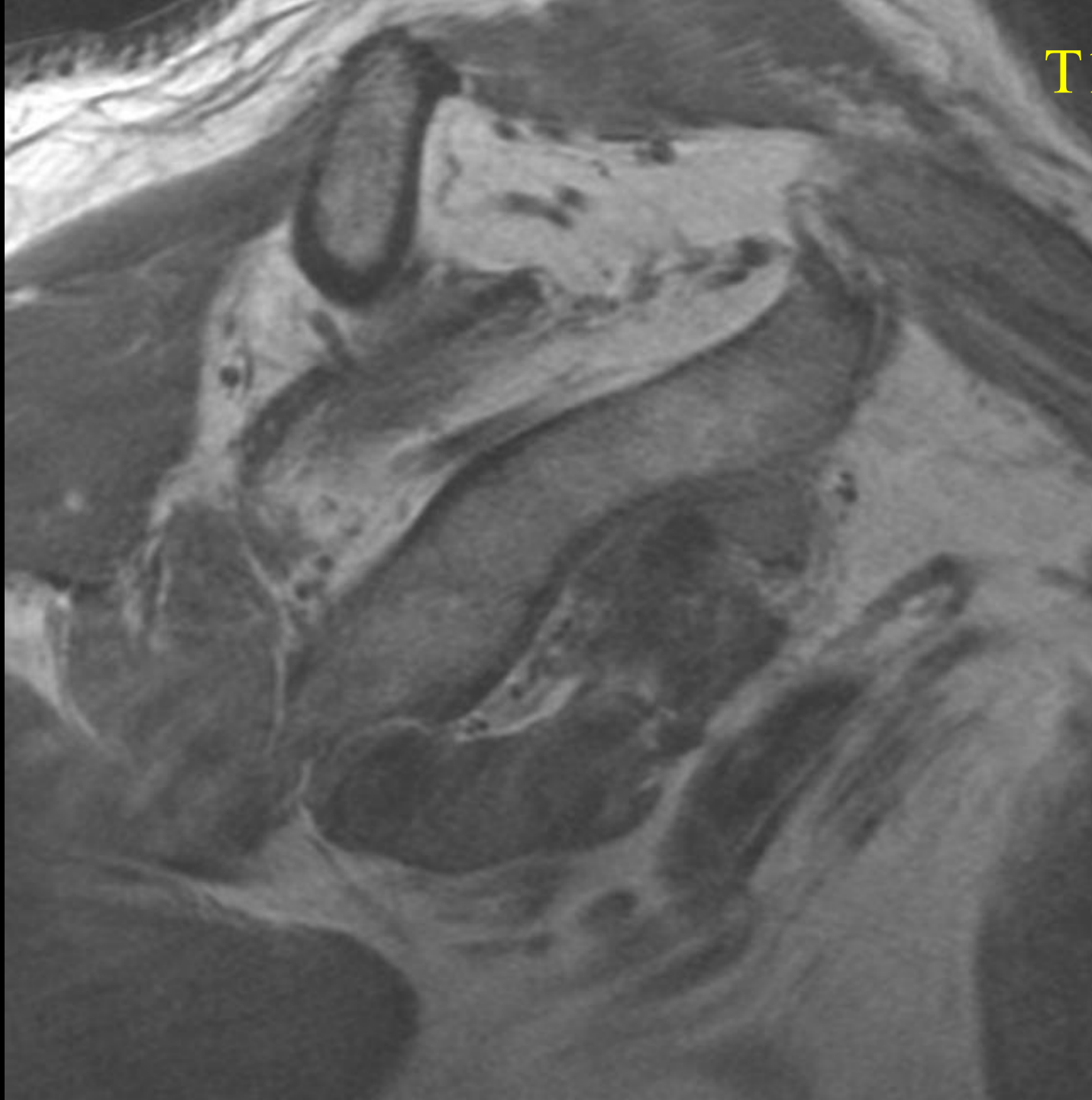


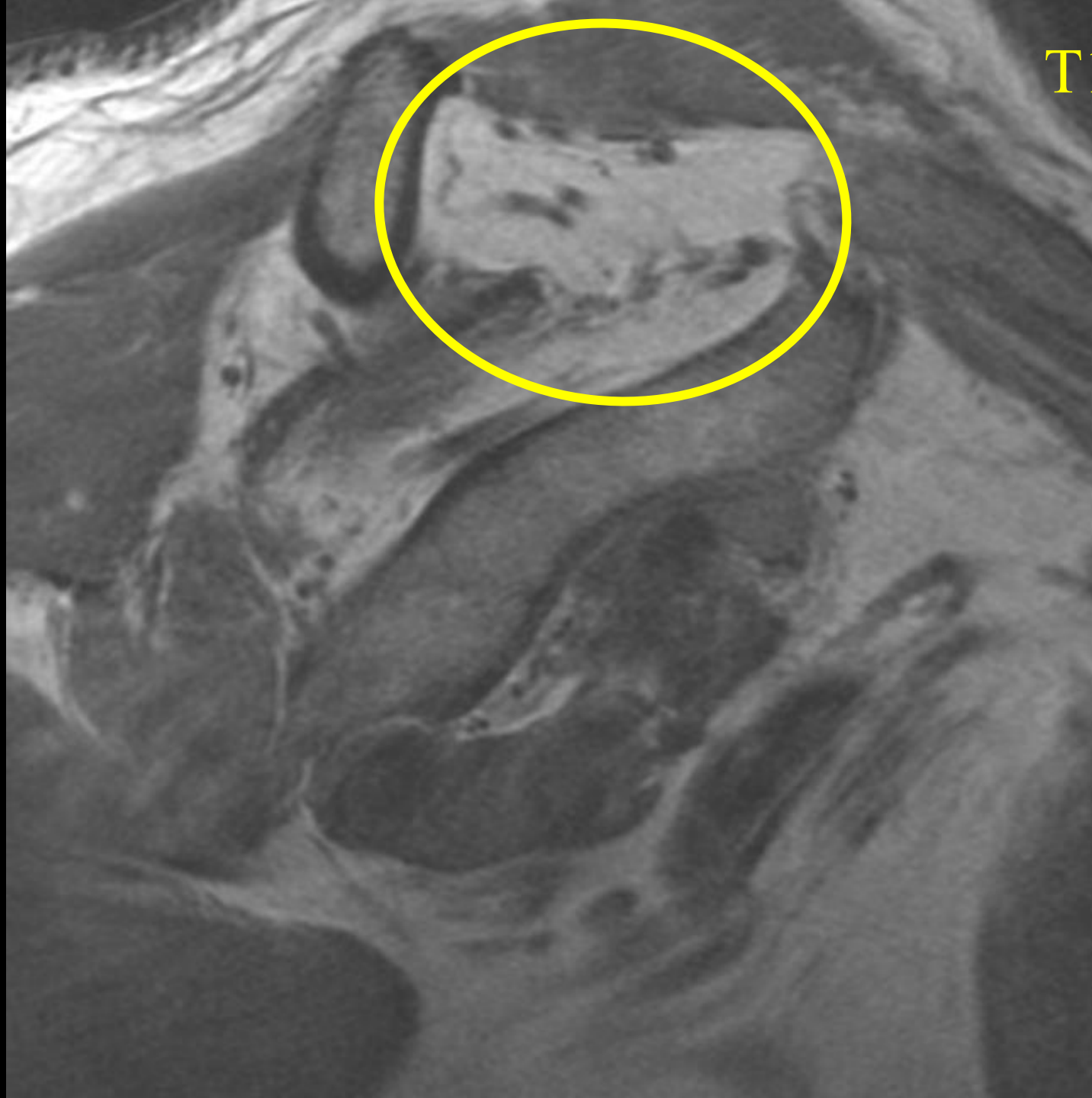
T1 GD

ROTATOR CUFF TEAR FULL THICKNESS

- Retraction of musculotendinous junction
 - Normal at 12:00
 - Retraction overcalled, in my experience
 - Defines ease of primary repair
- Muscle atrophy
 - Goutallier scale (muscle vs. fat content)
 - Volume (fill > 50%/60% supraspinatus fossa)
 - Intrinsic fat content

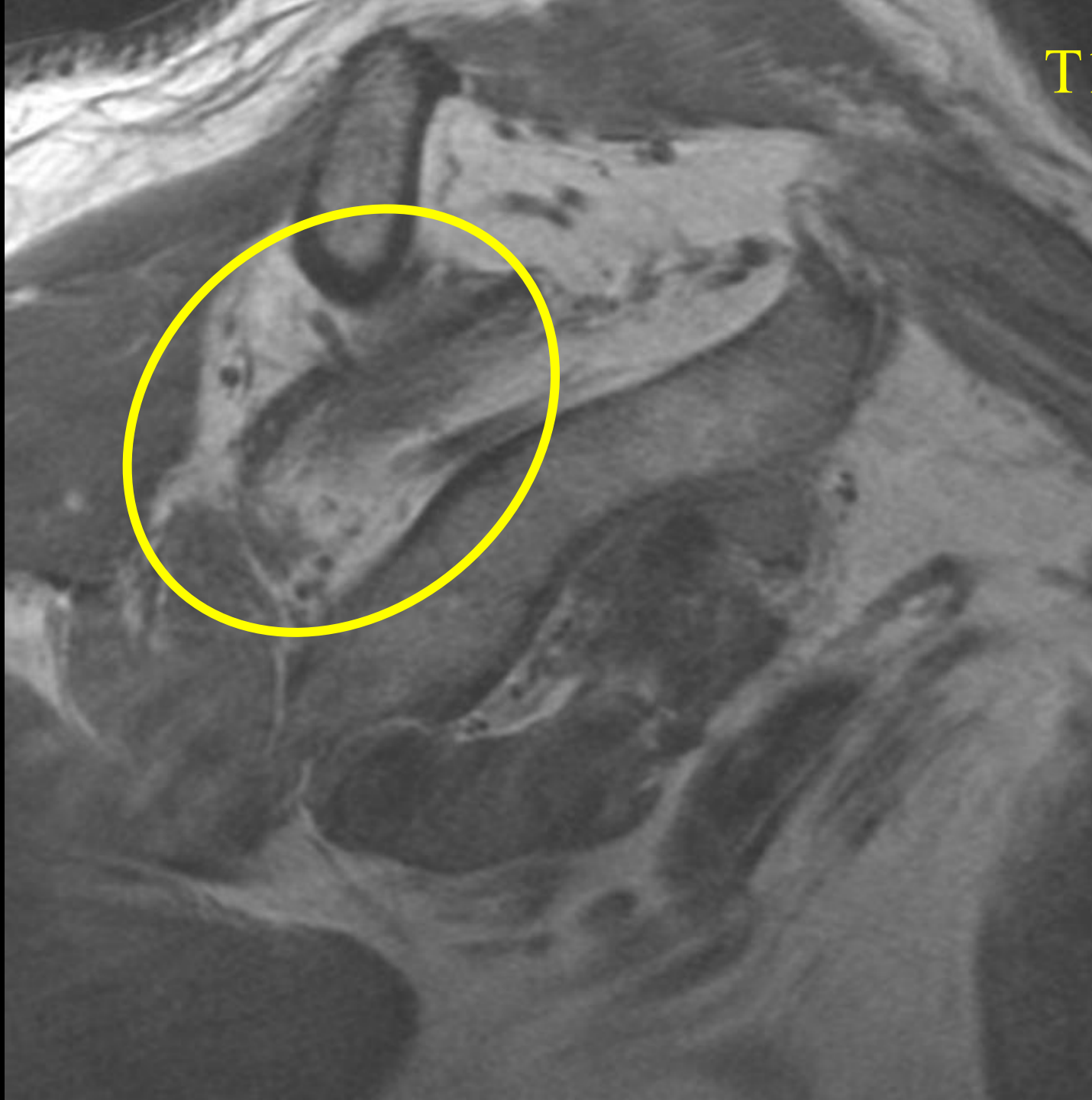
T1 SAG





T1 SAG

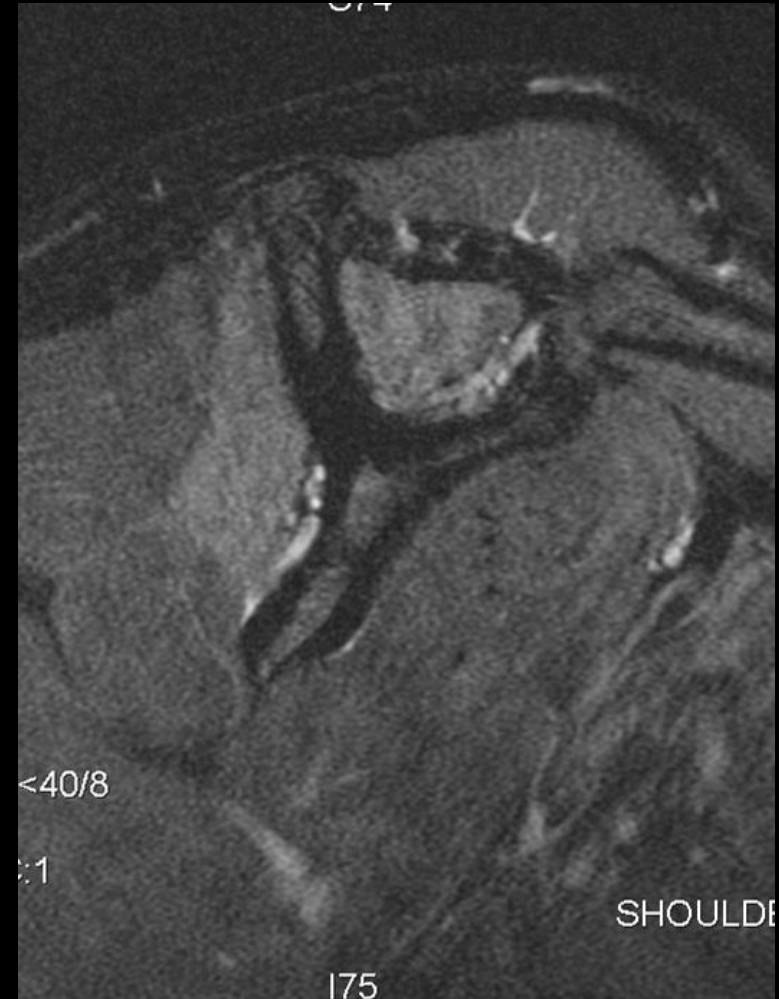
T1 SAG



ACUTE BRACHIAL NEURITIS PARSONAGE TURNER SYNDROME



T1

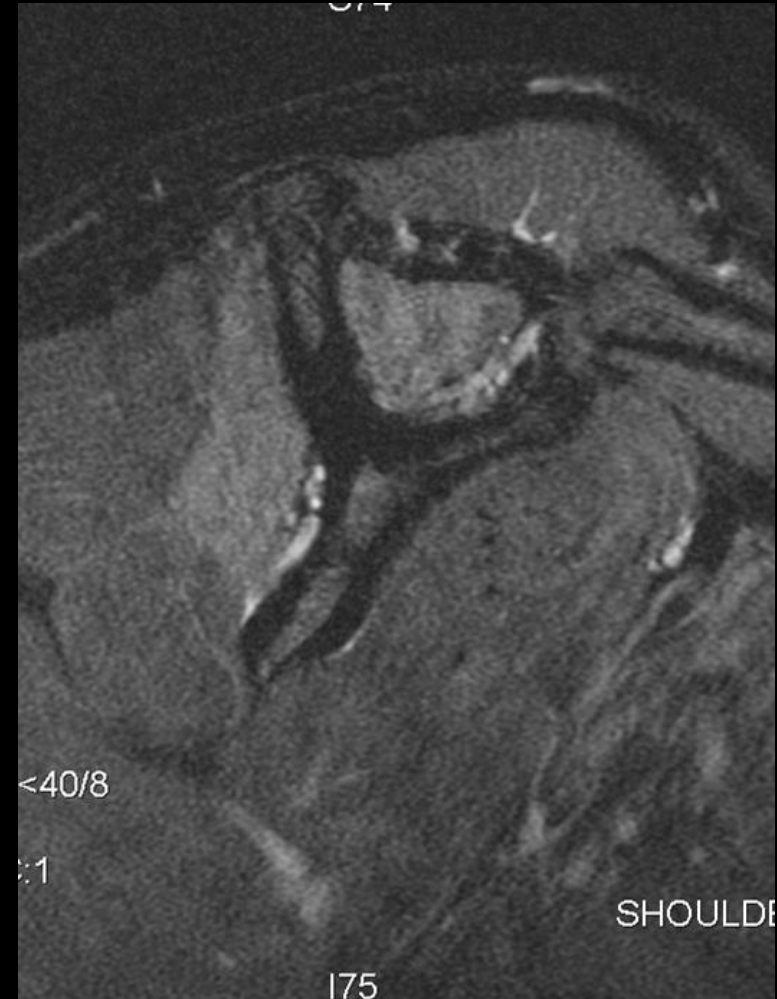


T2

ACUTE BRACHIAL NEURITIS PARSONAGE TURNER SYNDROME



T1

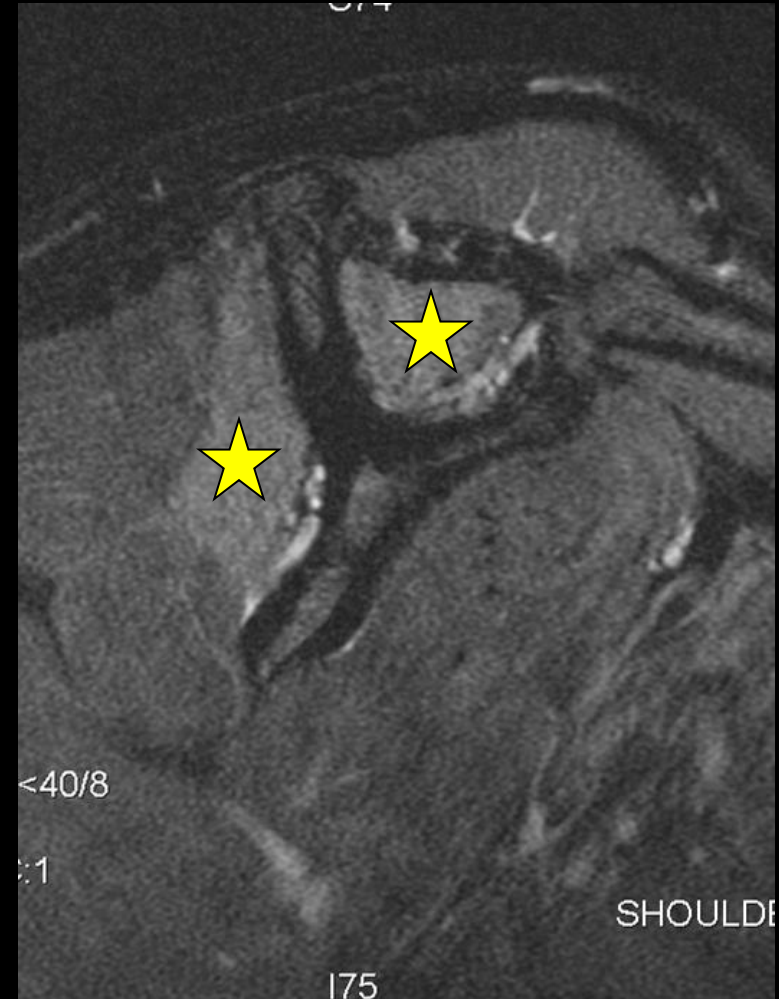


T2

ACUTE BRACHIAL NEURITIS PARSONAGE TURNER SYNDROME



T1

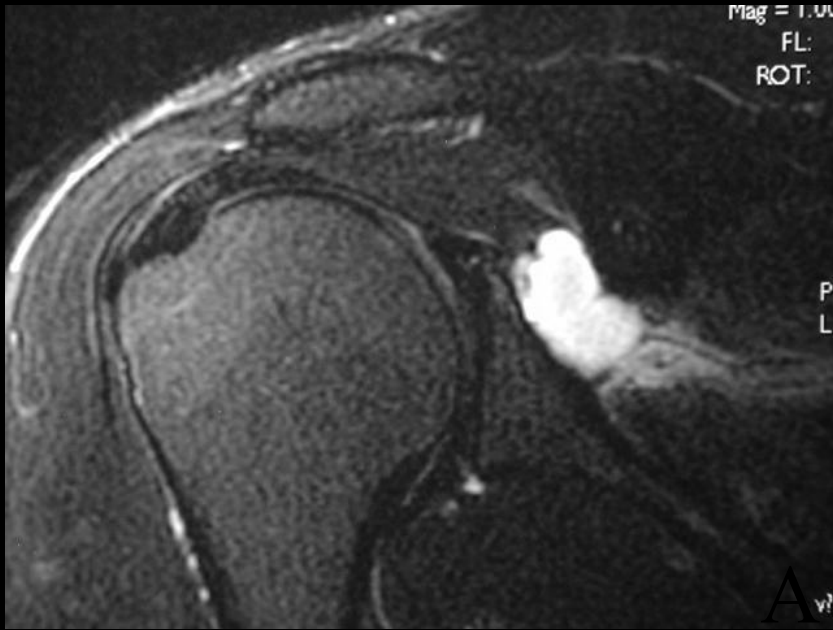


T2

SUPRASCAPULAR NERVE IMPINGEMENT

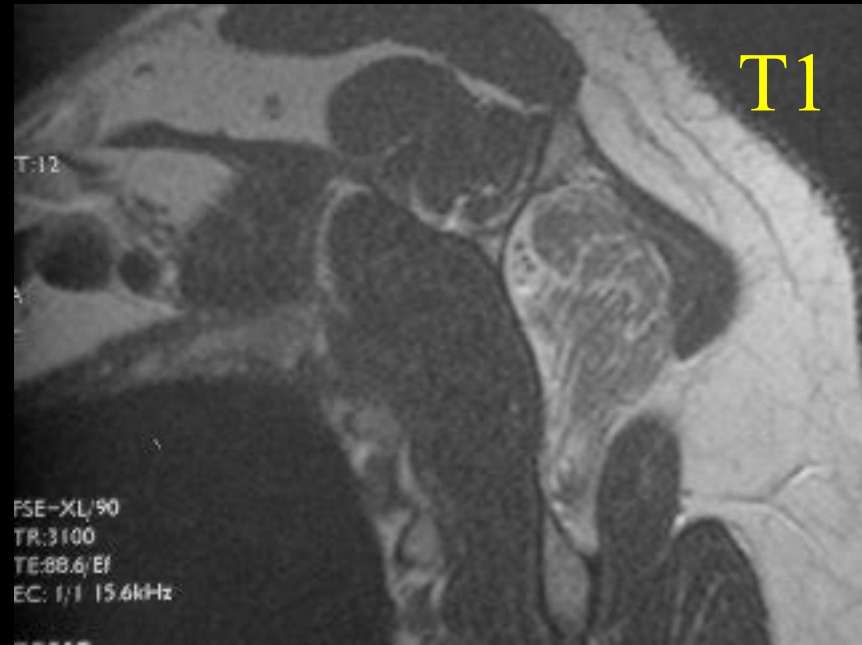
- Suprascapular Notch
 - Supraspinatus/ Infraspinatus innervation
- Spinoglenoid Notch
 - Infraspinatus innervation
- Atrophy of SSM and ISM
- Look for mass in region of suprascapular notch

Spinoglenoid Notch Entrapment



T2

Infraspinatus atrophy



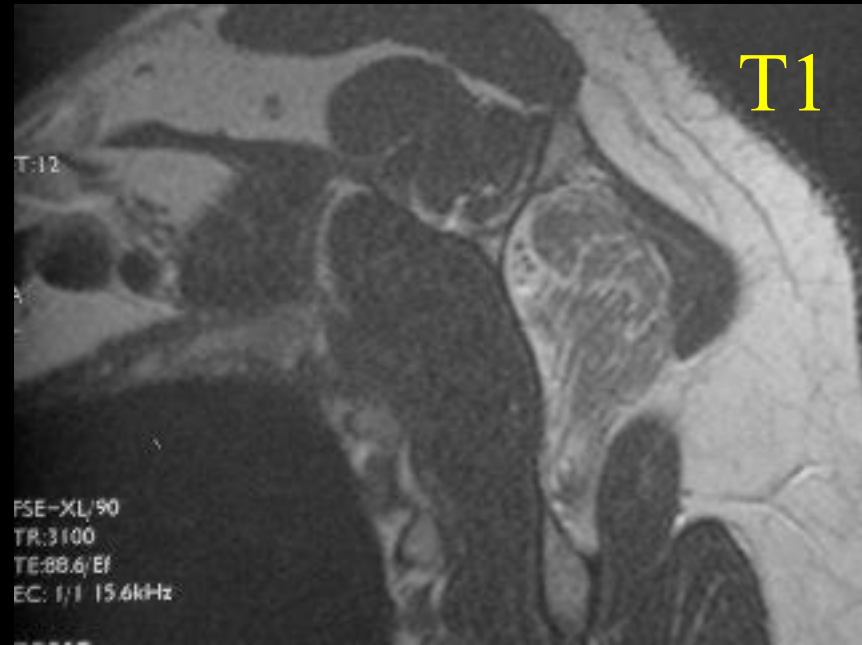
T1

Spinoglenoid Notch Entrapment

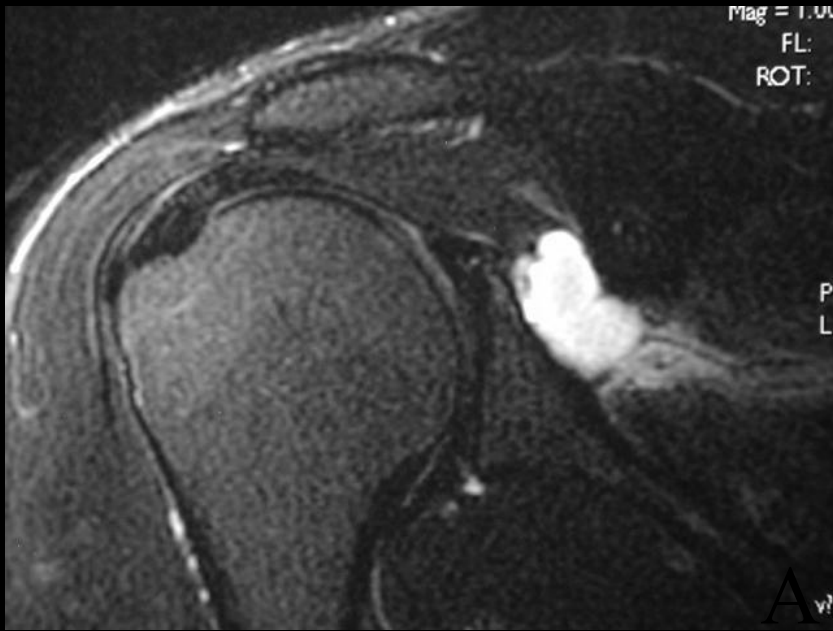


T2

Infraspinatus atrophy

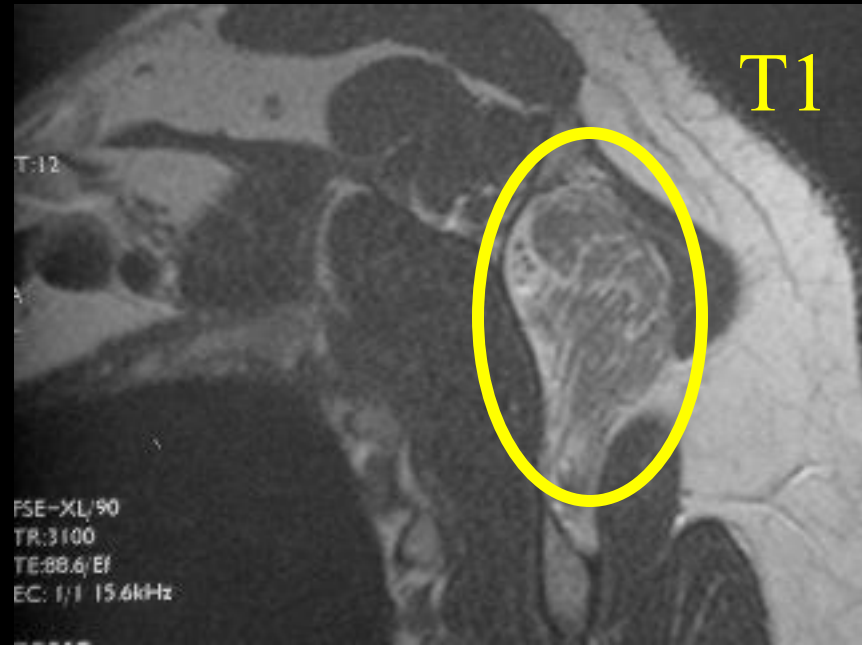


Spinoglenoid Notch Entrapment



T2

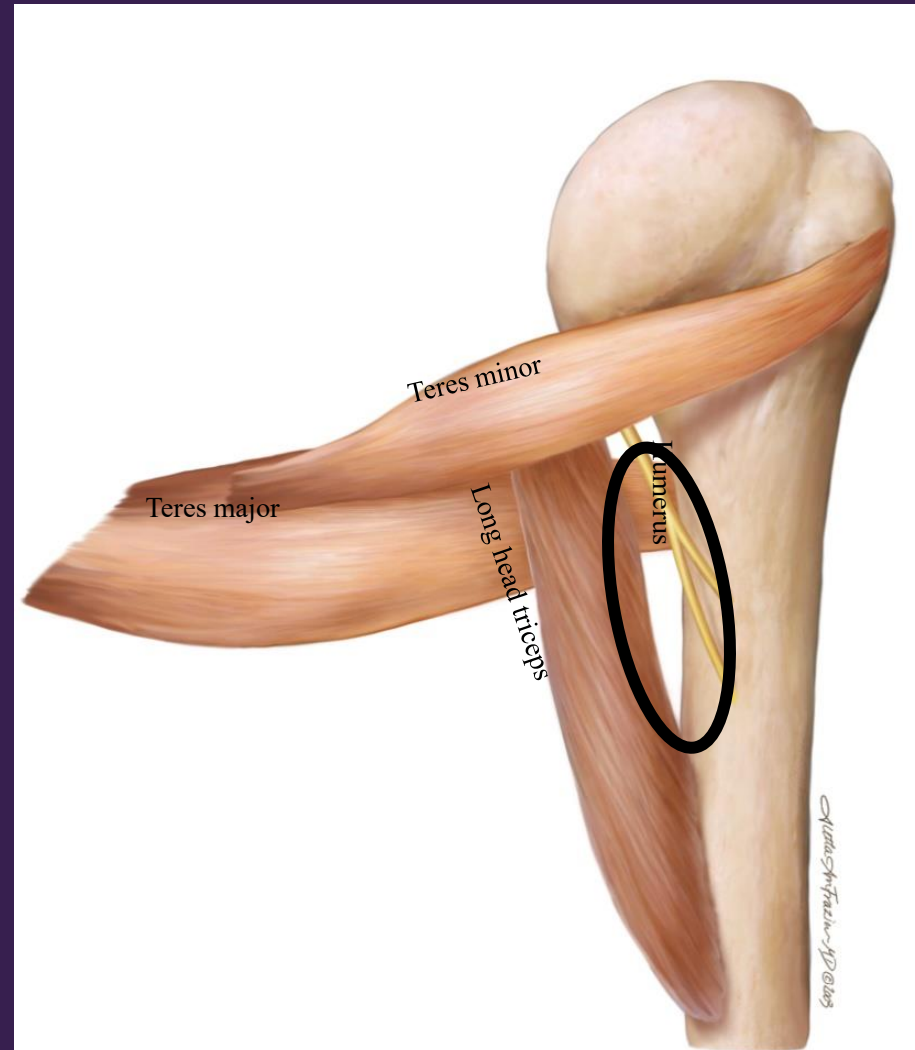
Infraspinatus atrophy



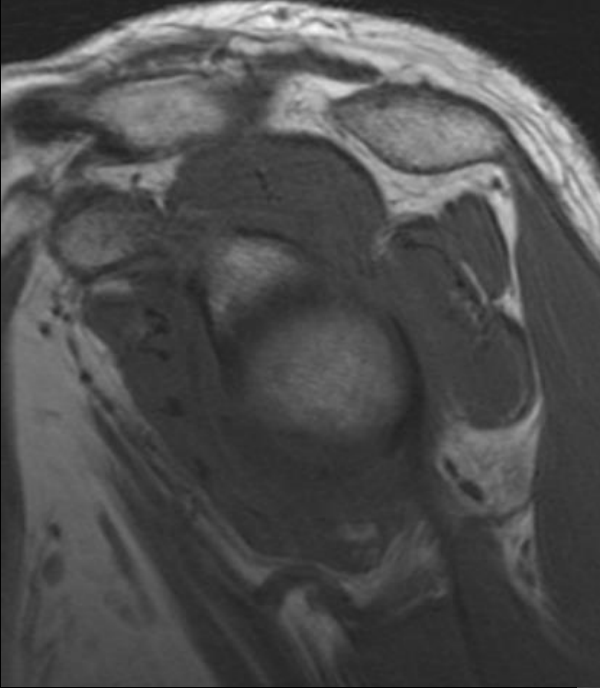
-
- An anatomical illustration of the right shoulder and upper arm from a medial view. The humerus is shown vertically, with the head at the top. The Teres minor muscle is depicted as a broad, fan-shaped muscle originating from the surgical neck of the humerus and extending laterally. The Teres major muscle is shown as a broad, fan-shaped muscle originating from the lesser tuberosity of the humerus and extending laterally. The Long head triceps muscle is shown as a long, narrow muscle originating from the inferior glenohumeral ligament and extending laterally. The Humerus is labeled with a vertical line pointing to the bone. The Teres minor is labeled with a line pointing to the muscle. The Teres major is labeled with a line pointing to the muscle. The Long head triceps is labeled with a line pointing to the muscle. The illustration is signed 'Chitambar-Farman-AP © 2013' in the bottom right corner.

QUADRILATERAL SPACE SYNDROME

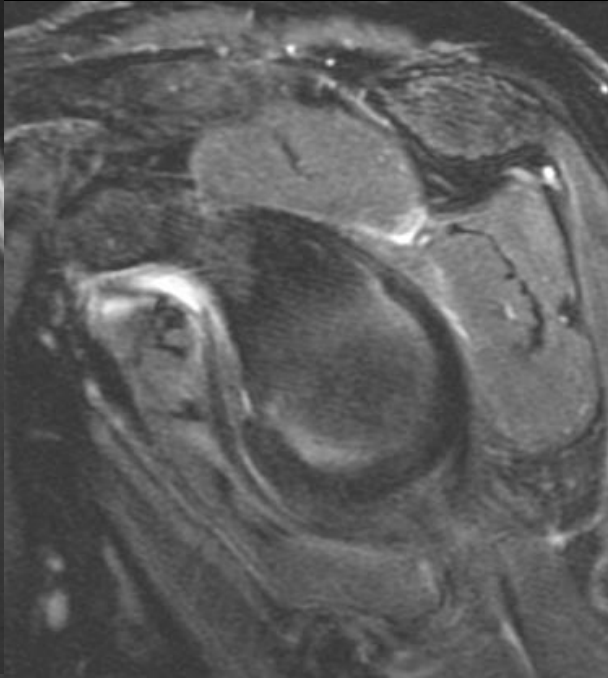
- Axillary nerve compression
- Fibrous band
- Pain, paresthesia
- Atrophy of deltoid and teres minor
- Weightlifters



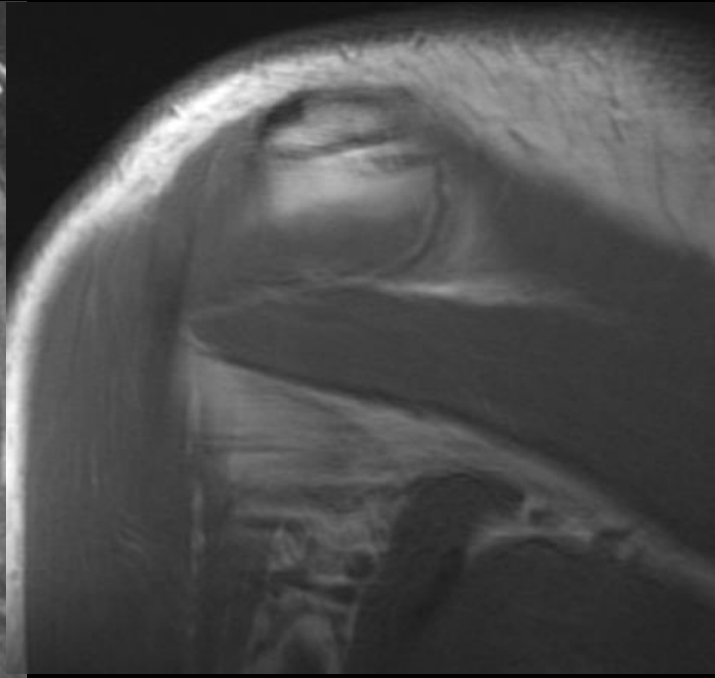
ISOLATED TERES MINOR ATROPHY



T1

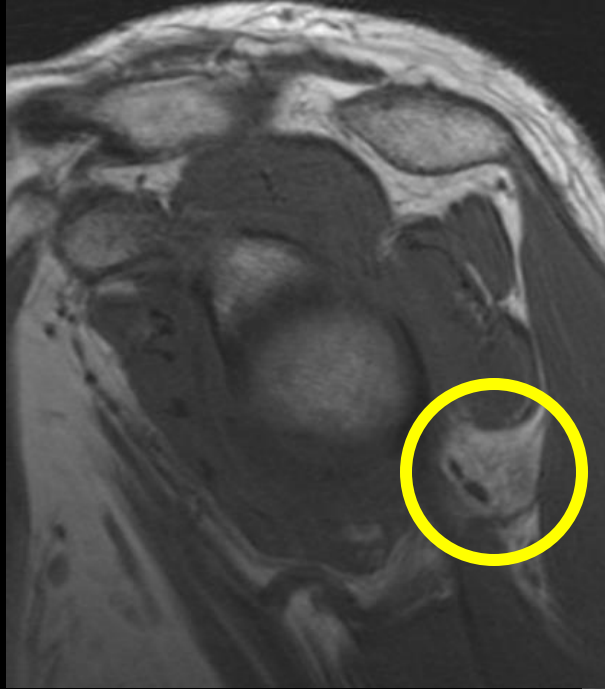


T2



T1

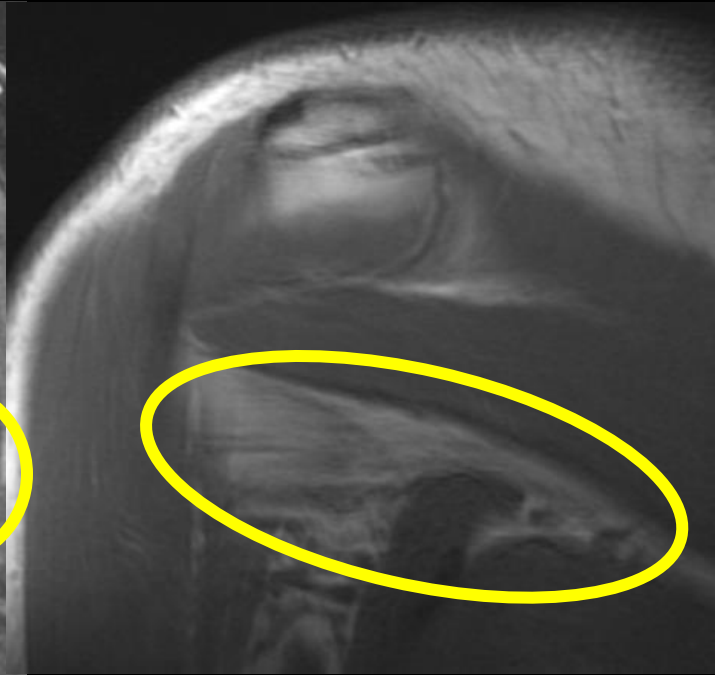
ISOLATED TERES MINOR ATROPHY



T1



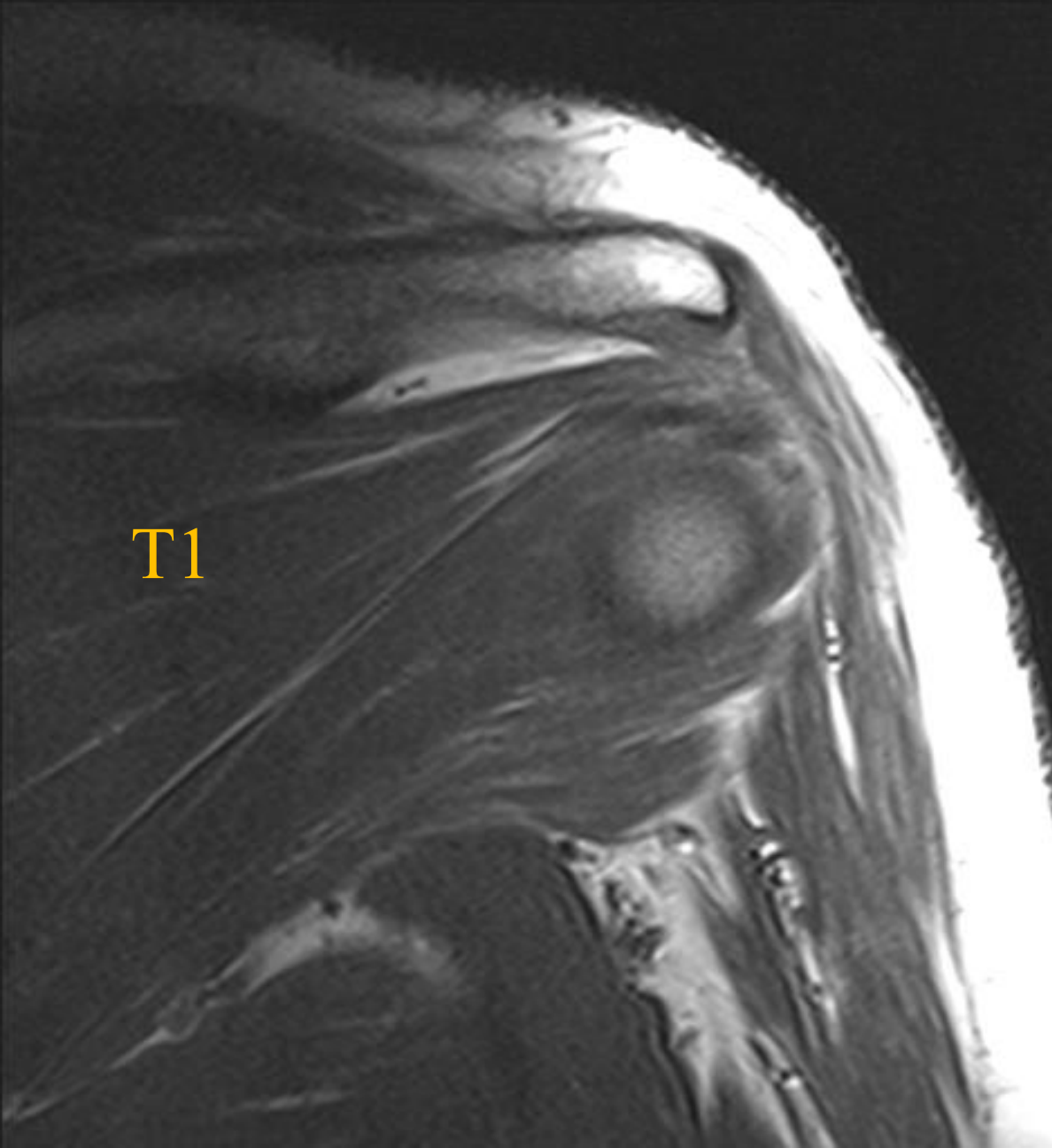
T2



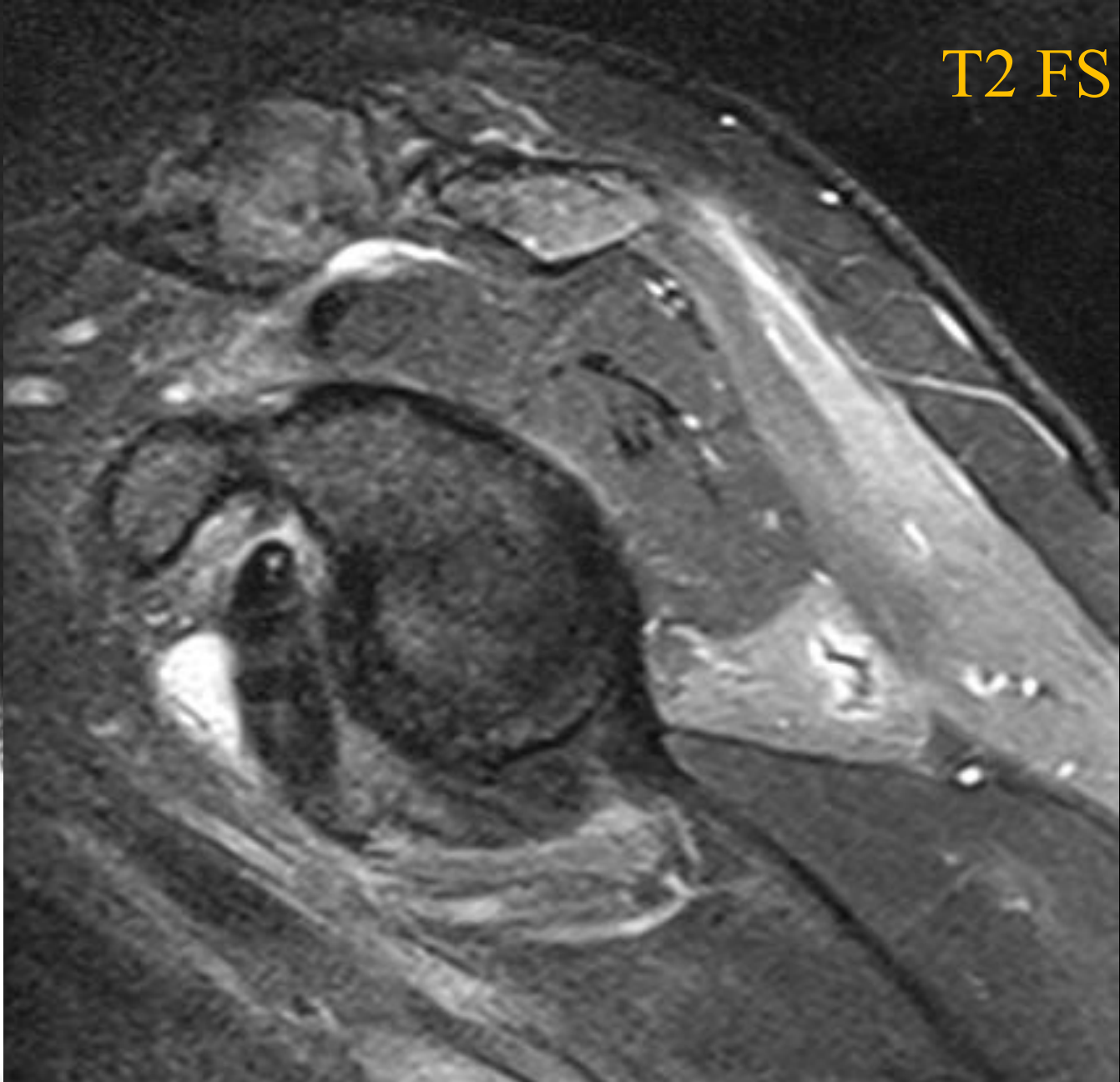
T1

QUADRILATERAL SPACE SYNDROME

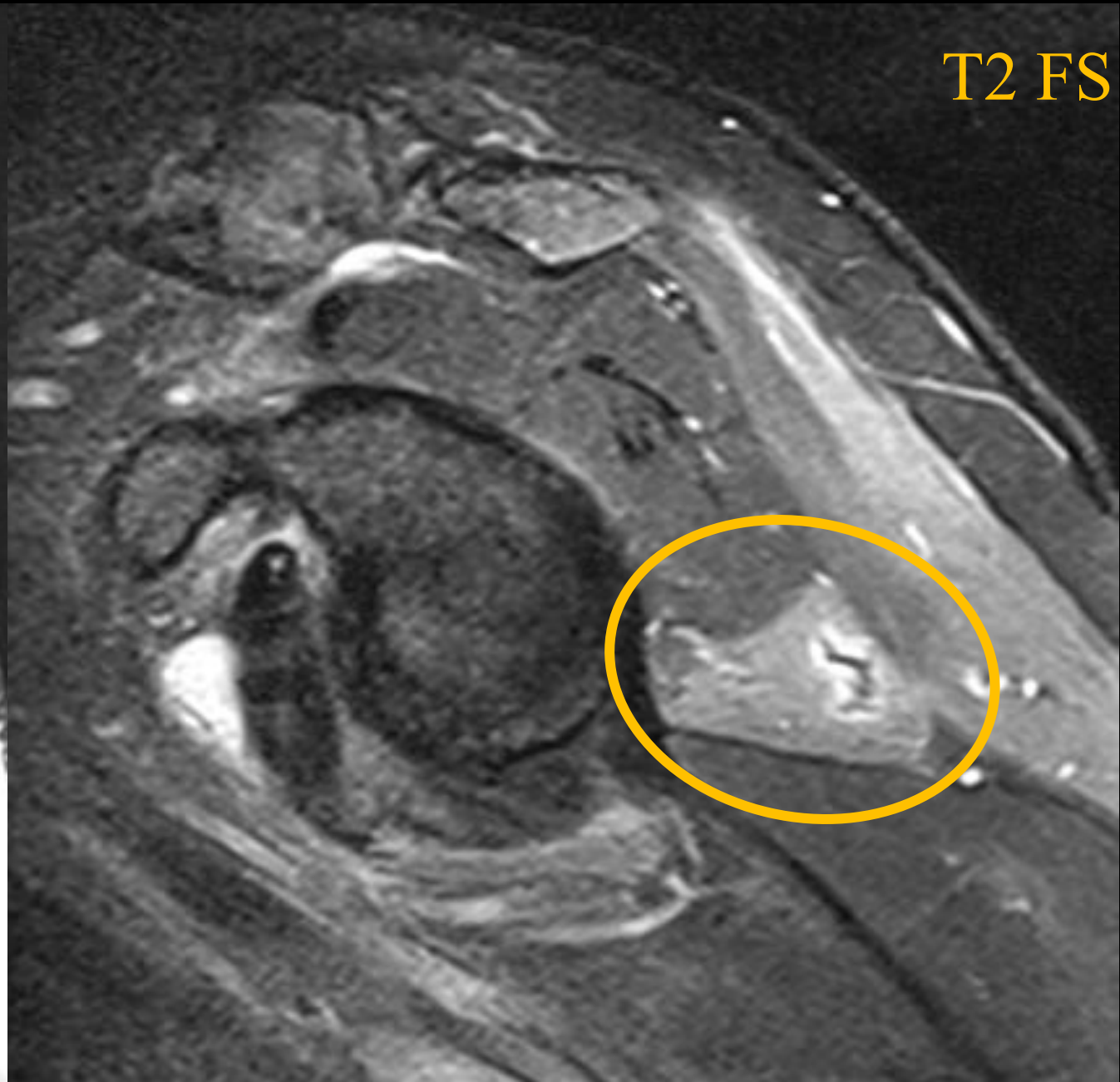
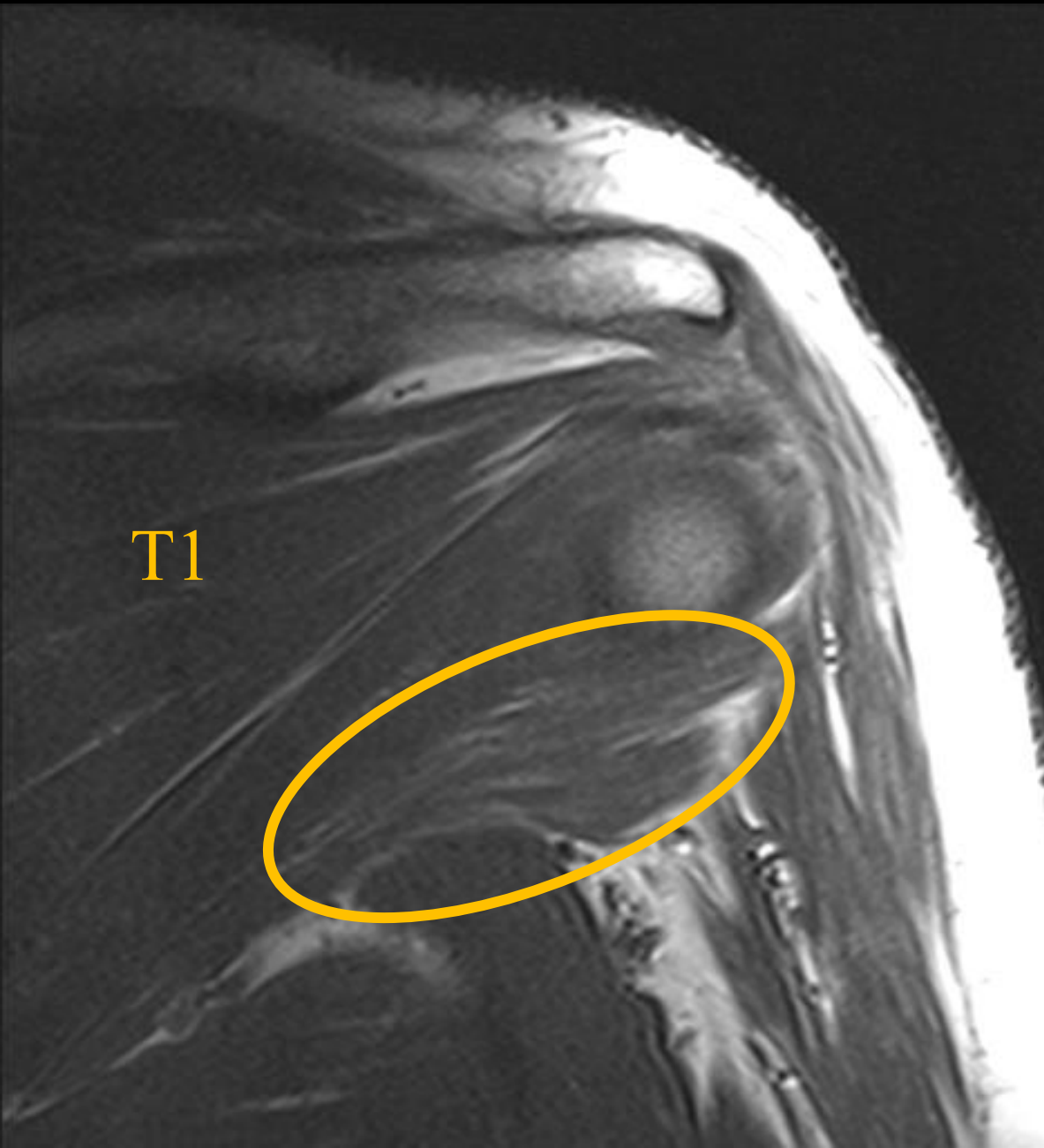
T1



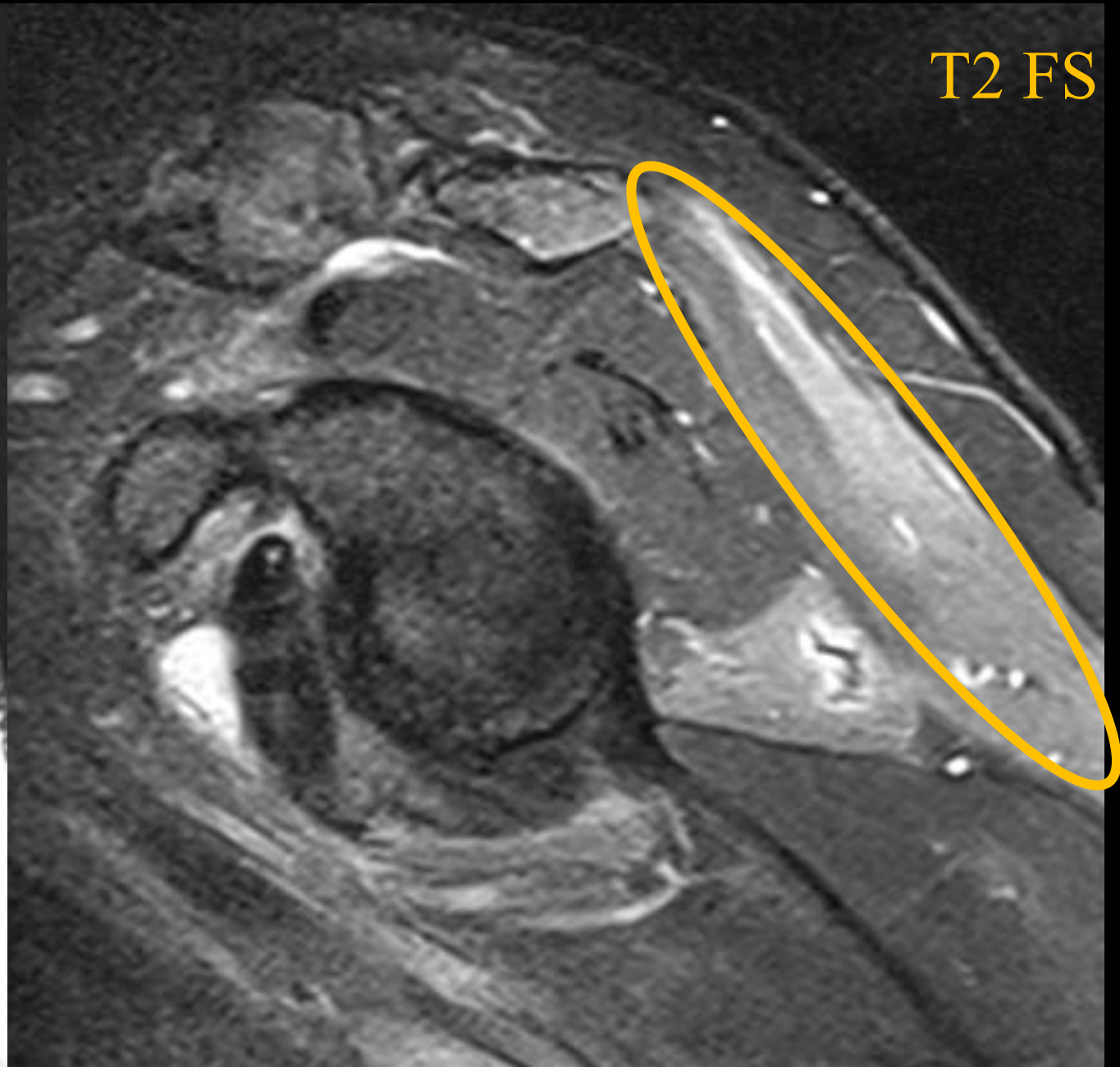
T2 FS



QUADRILATERAL SPACE SYNDROME

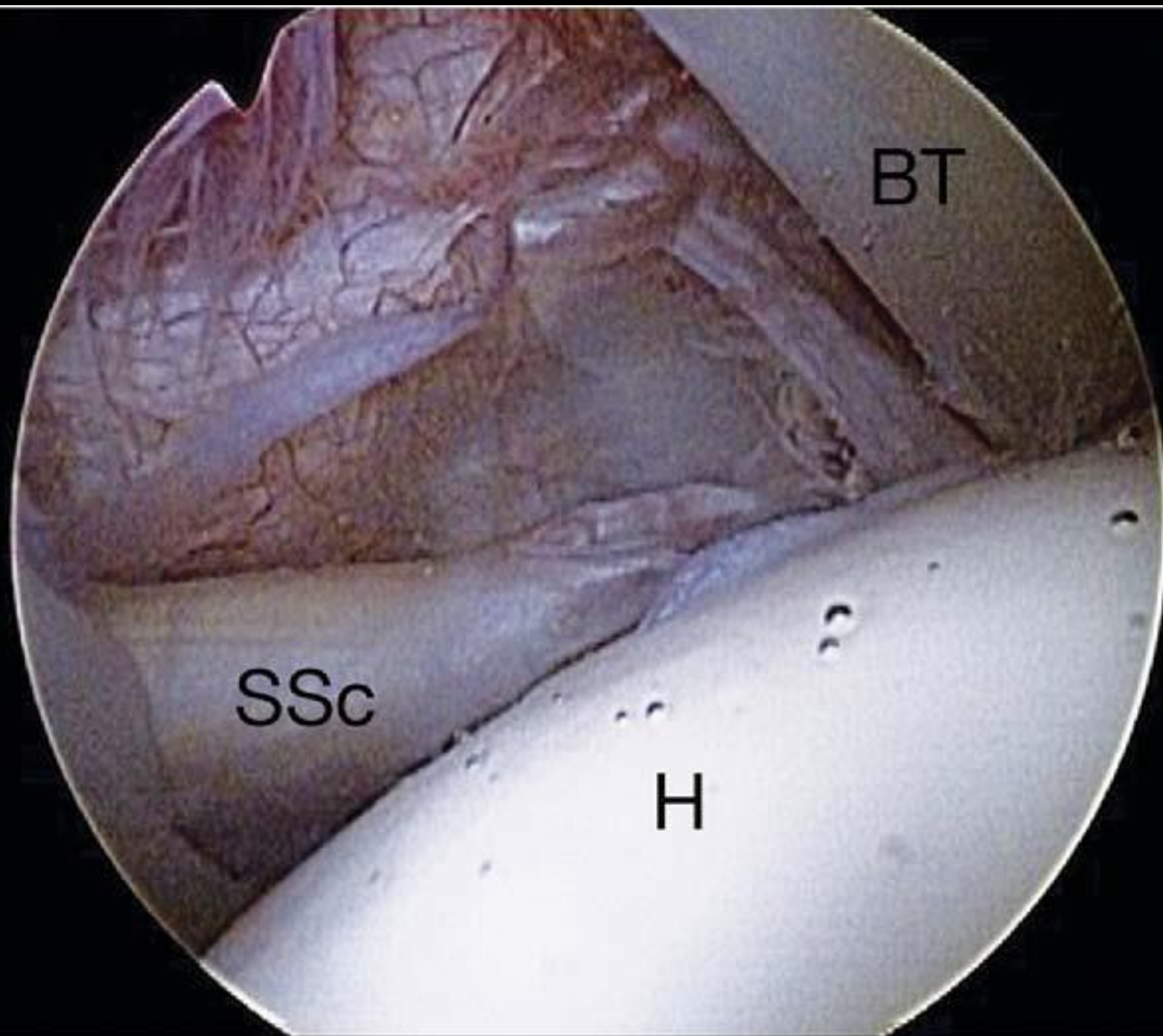


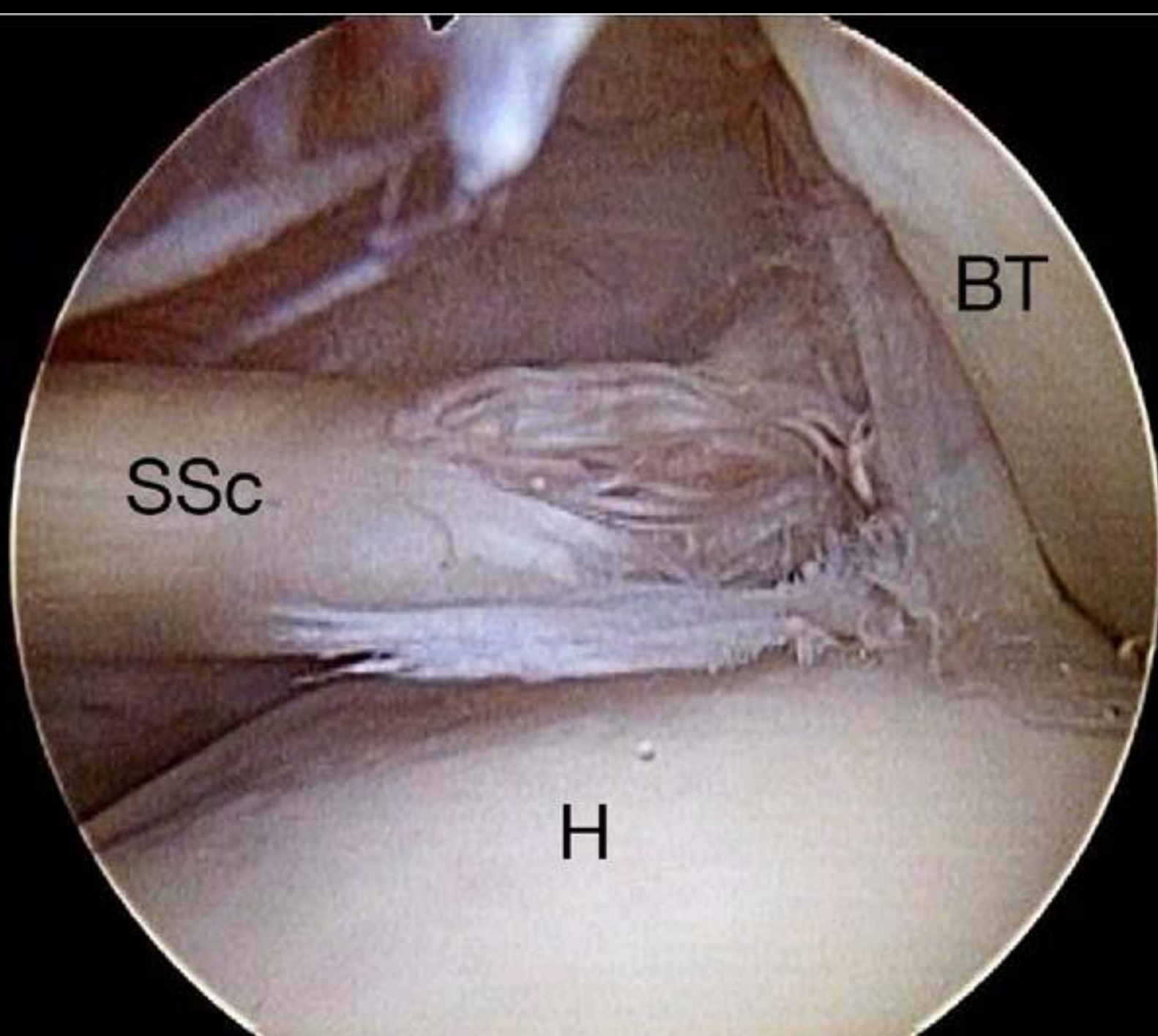
QUADRILATERAL SPACE SYNDROME

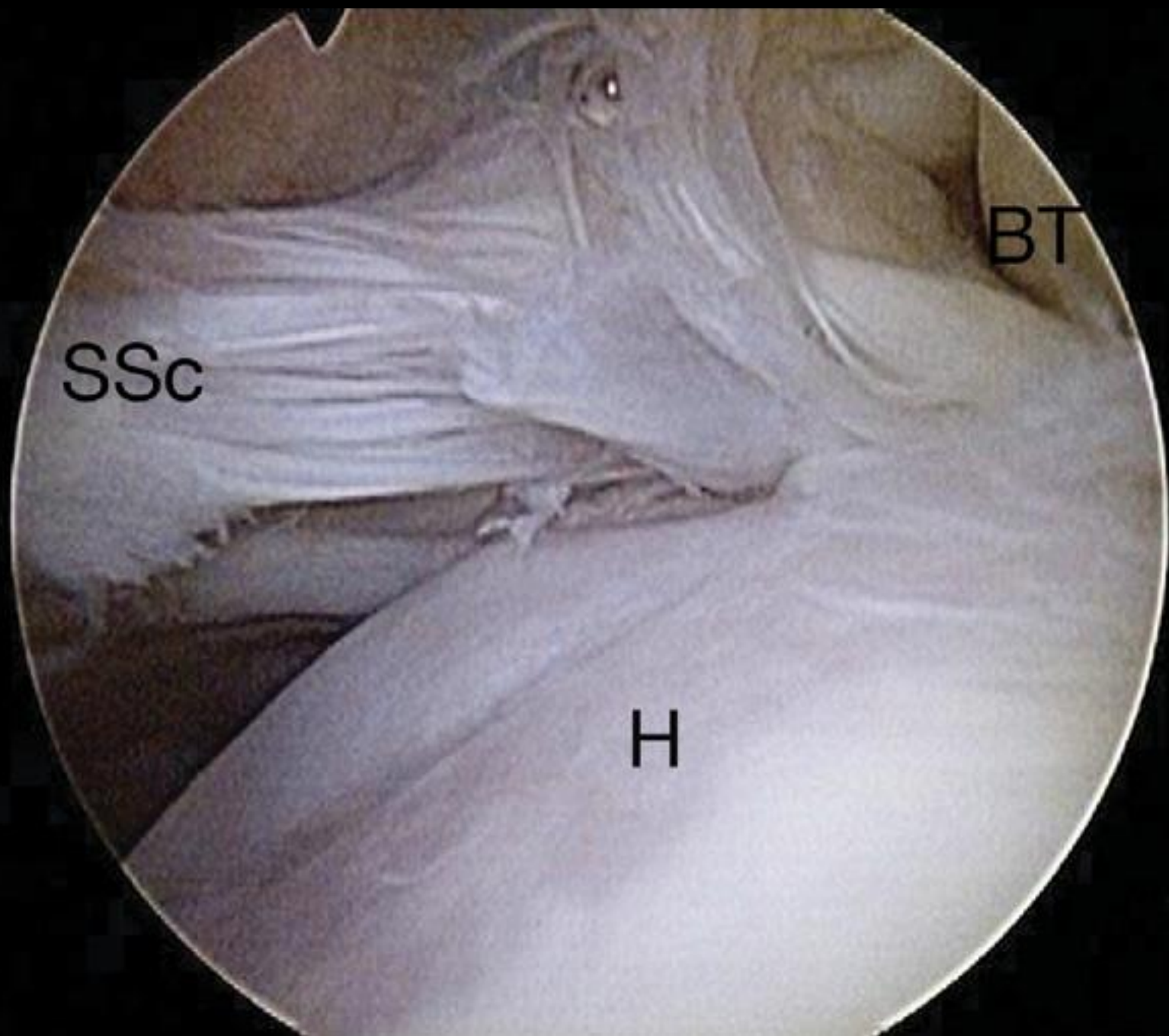


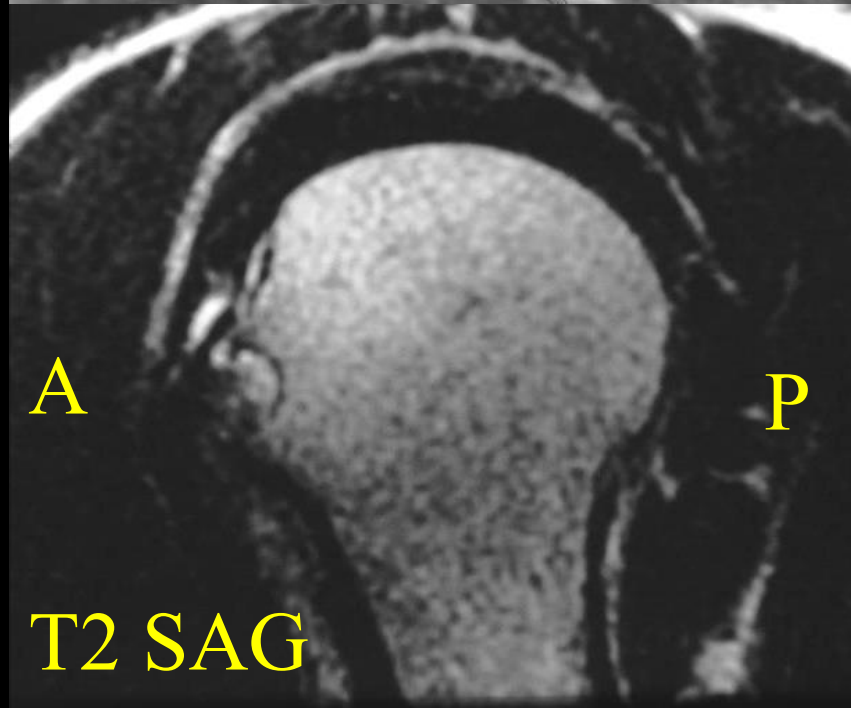
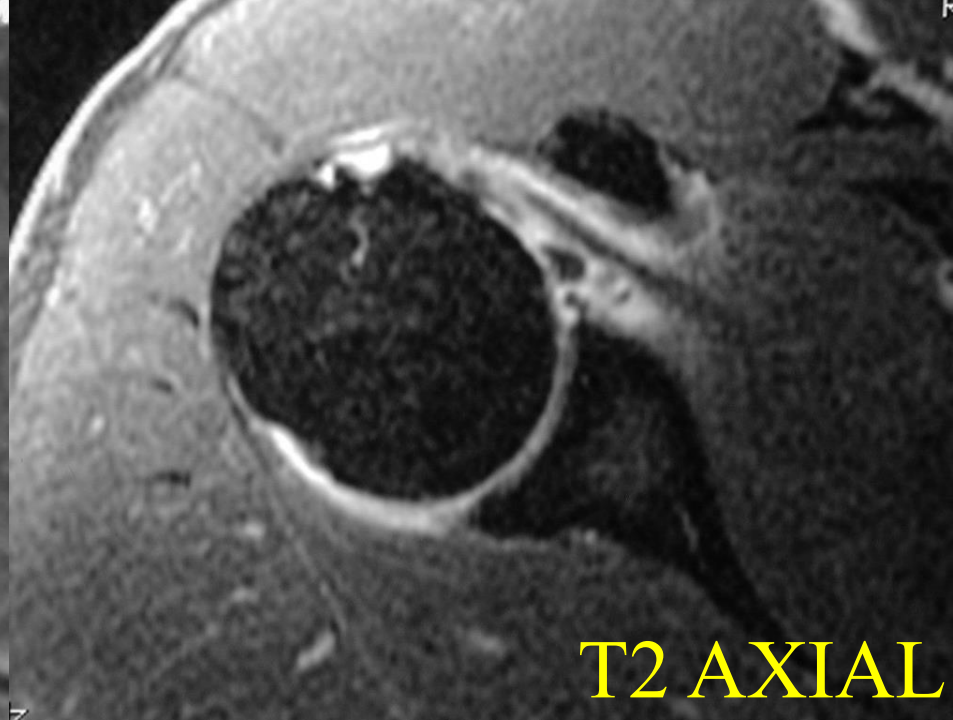
SUBSCAPULARIS TEAR

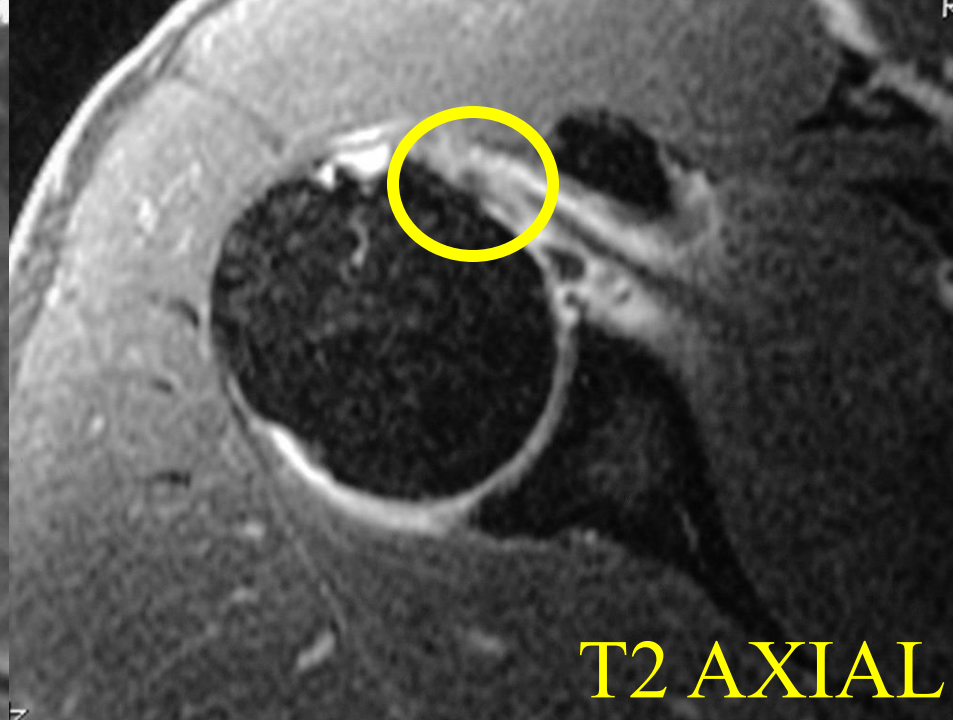
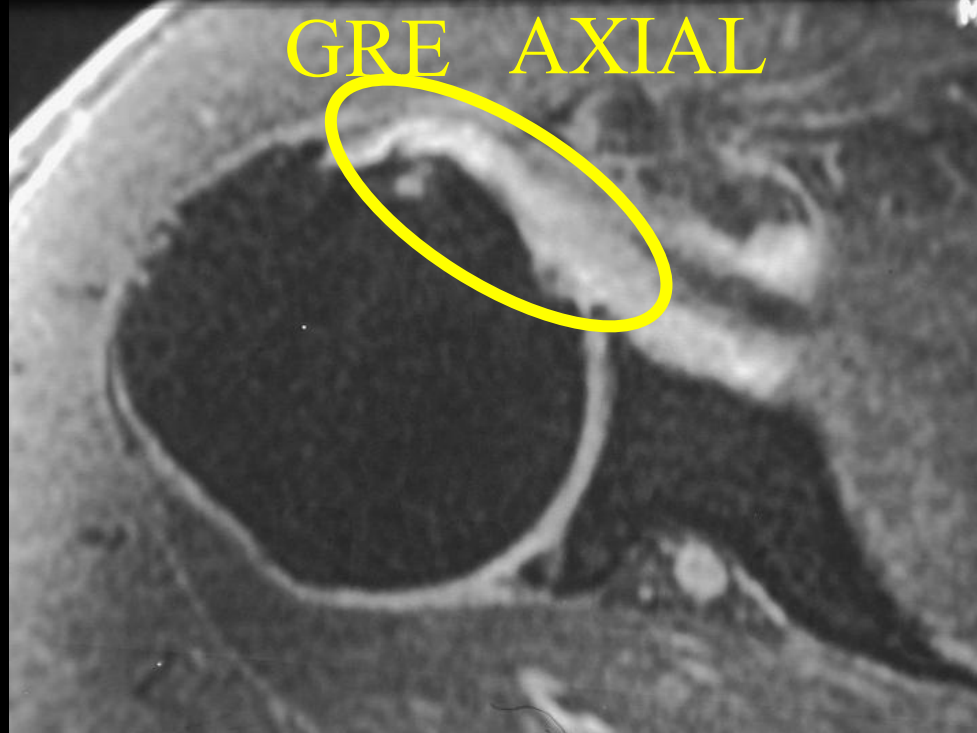
- Abnormal lift-off test on physical examination
- Look for abnormalities of lesser tuberosity
- Uncommon (under-recognized) – 5%-27% of all tears
 - LHBT dislocation (49%)
- Look for on axial and sagittal planes
 - Coronals anteriorly also helpful
- Devastating to surgeon if missed
- Easy to miss on arthroscopy (Only superior 25% of tendon visible on routine arthroscopy)

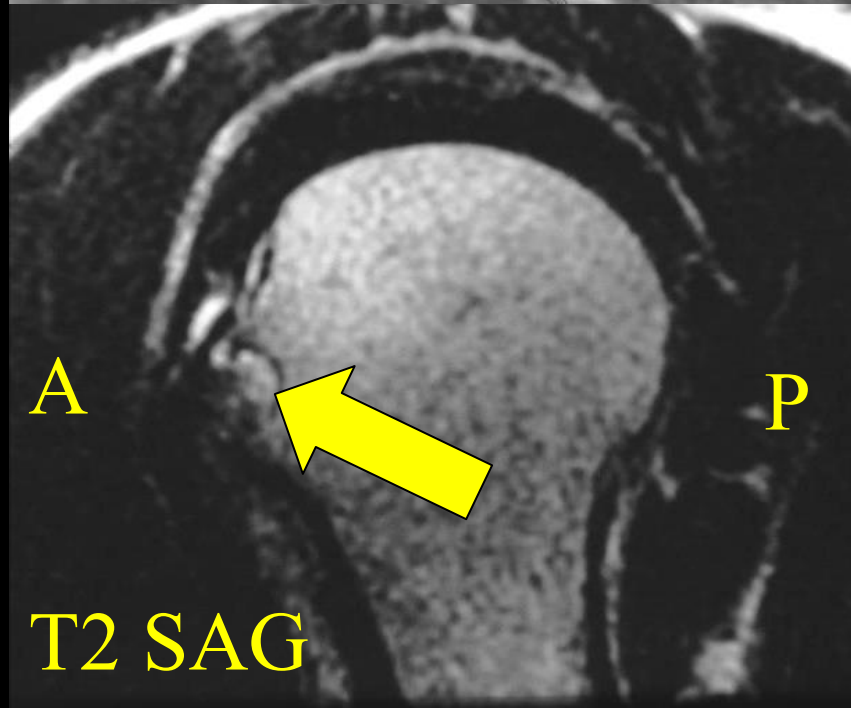
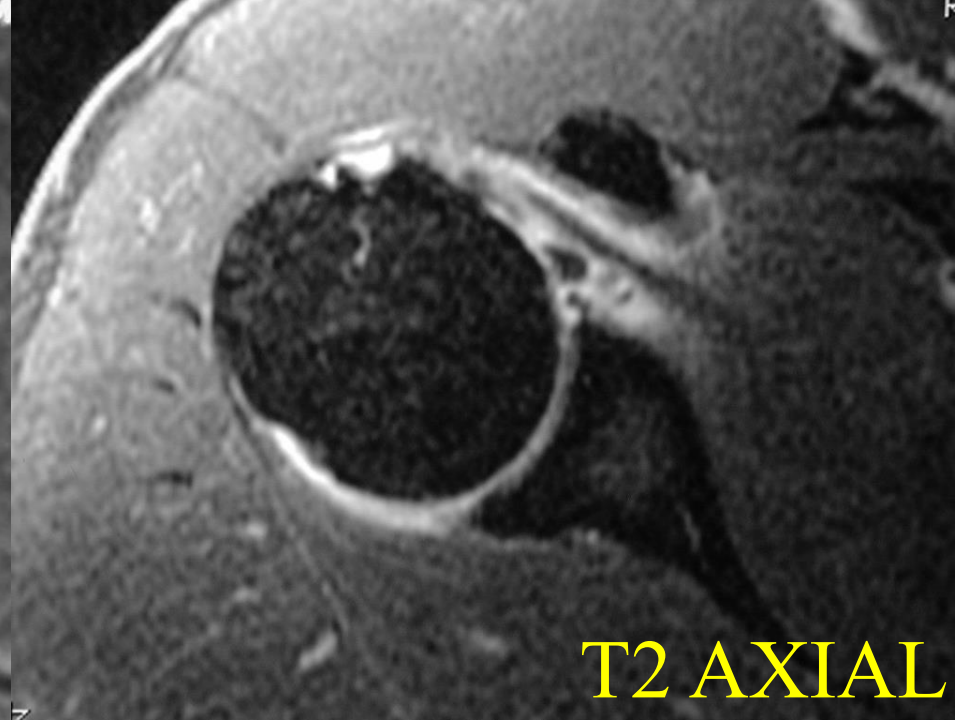
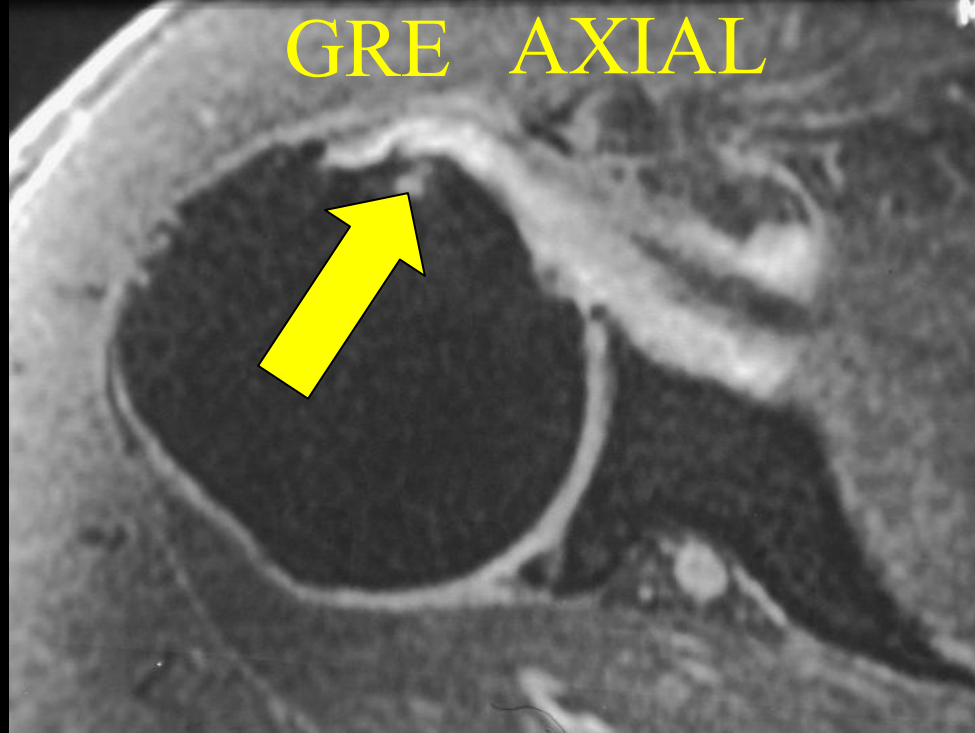


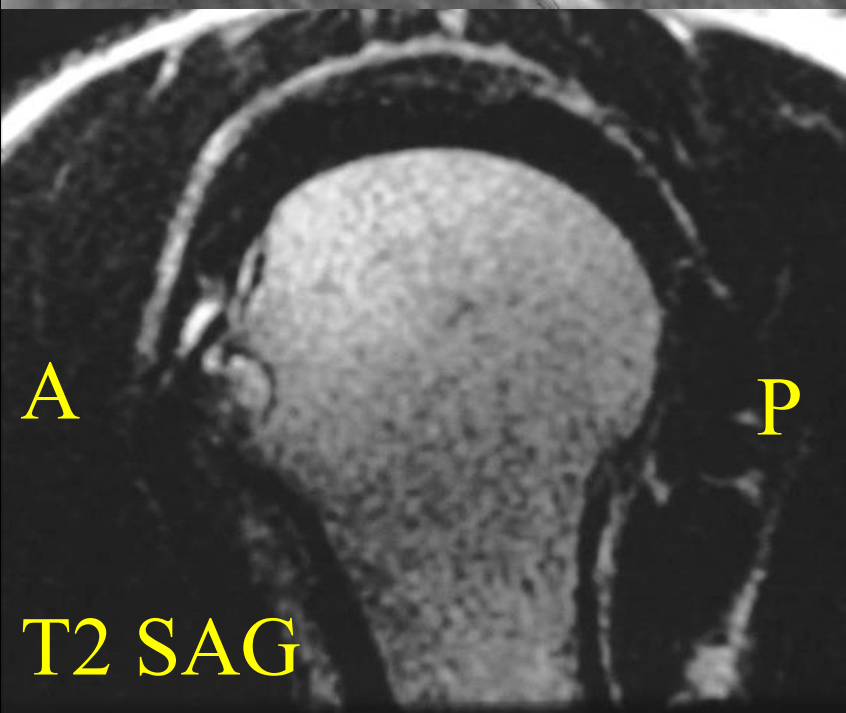
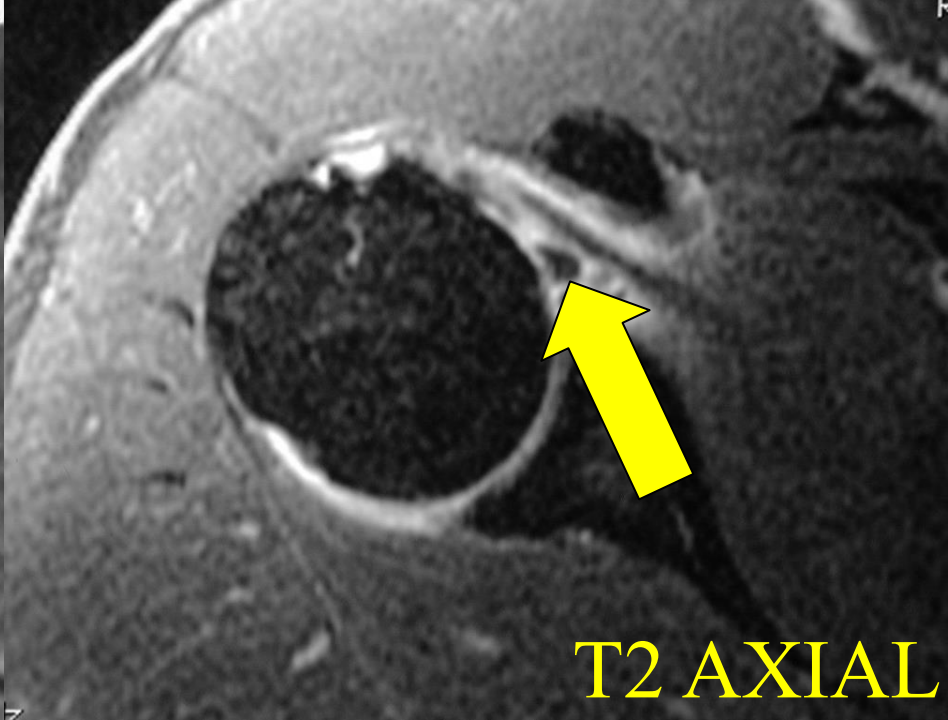








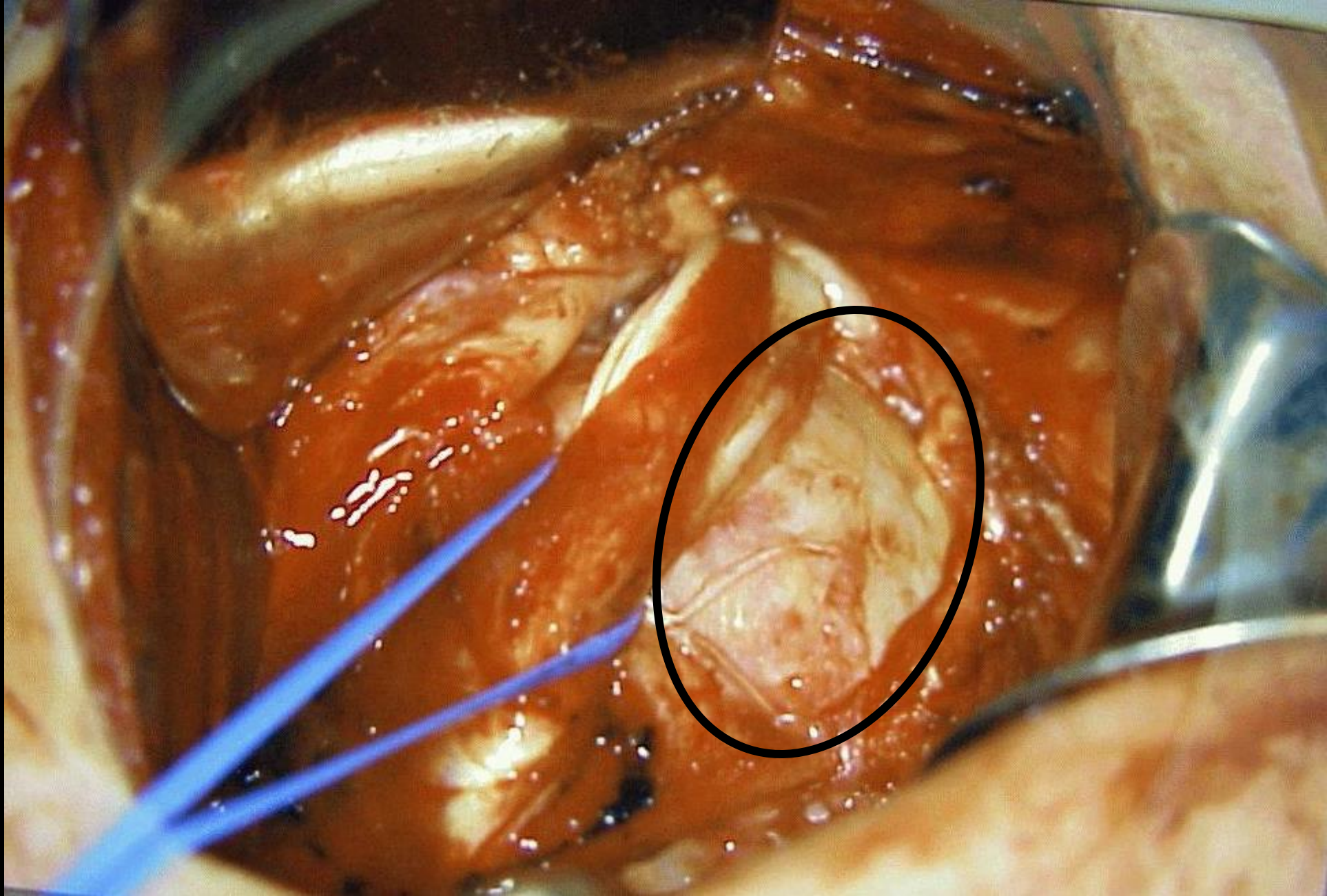




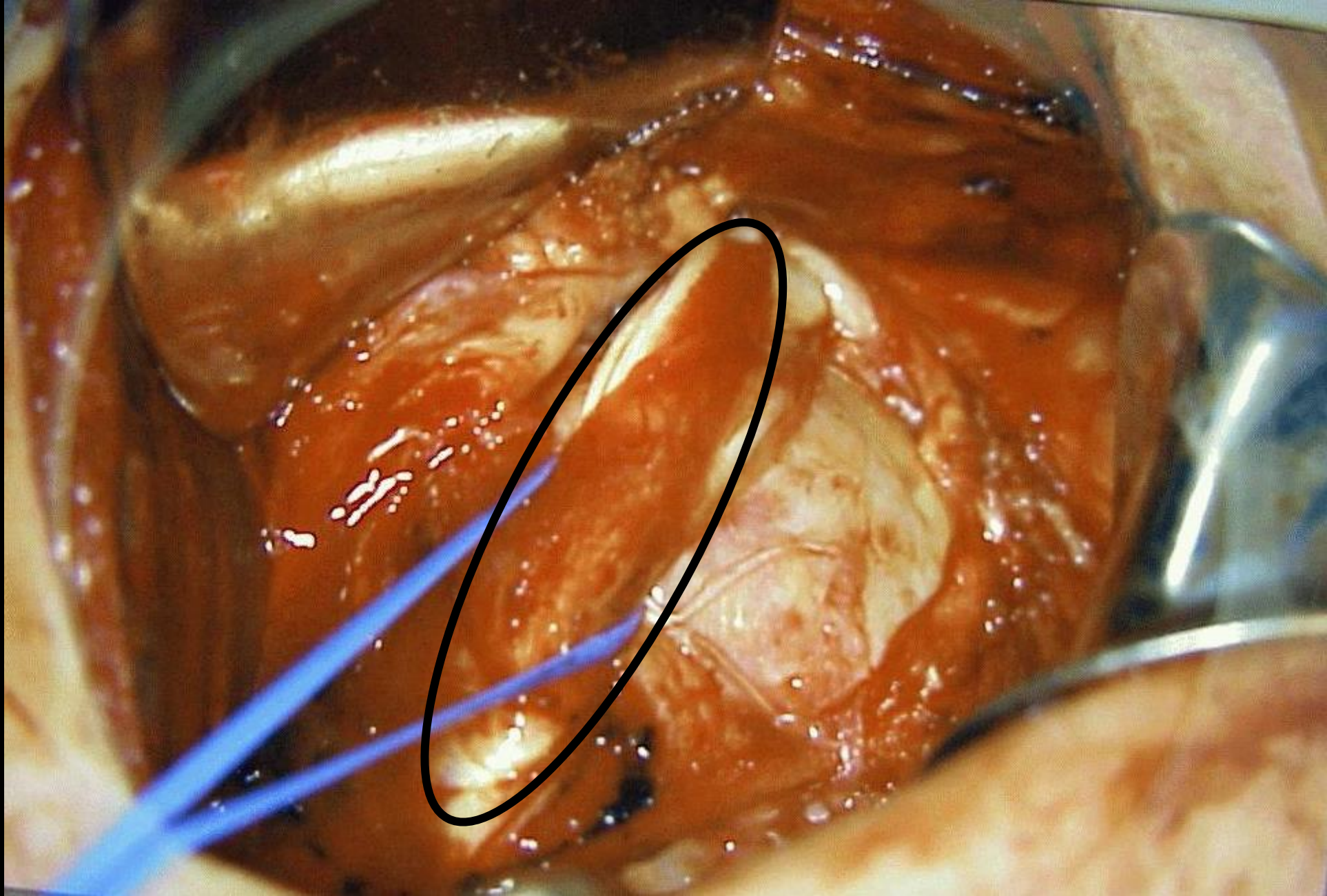
SUBSCAPULARIS TEARS

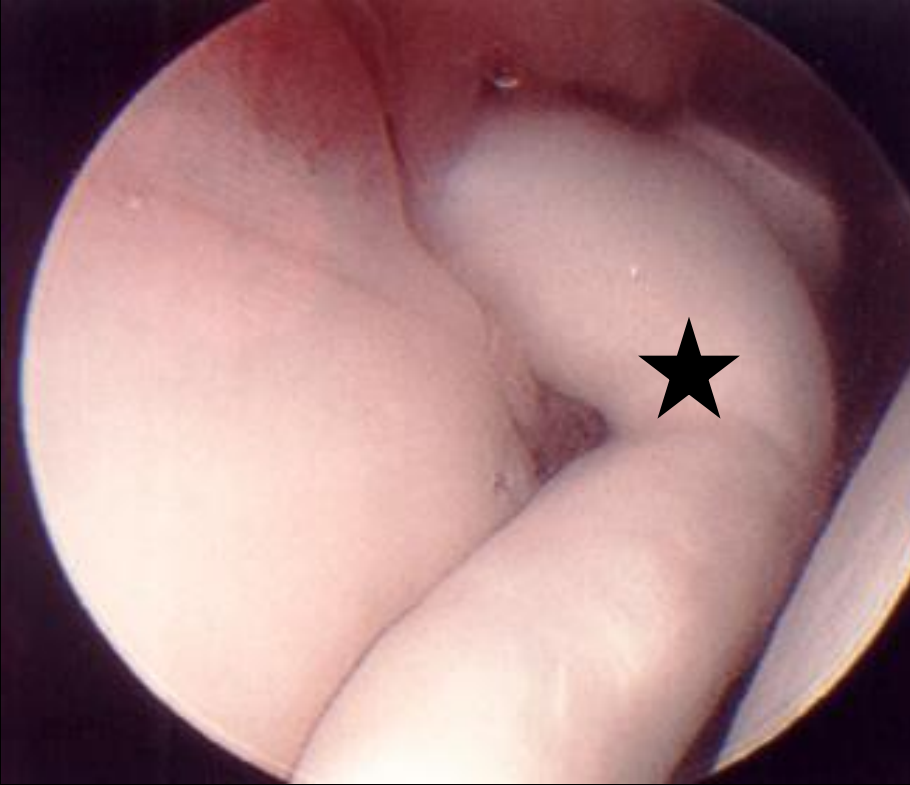


SUBSCAPULARIS TEARS



SUBSCAPULARIS TEARS

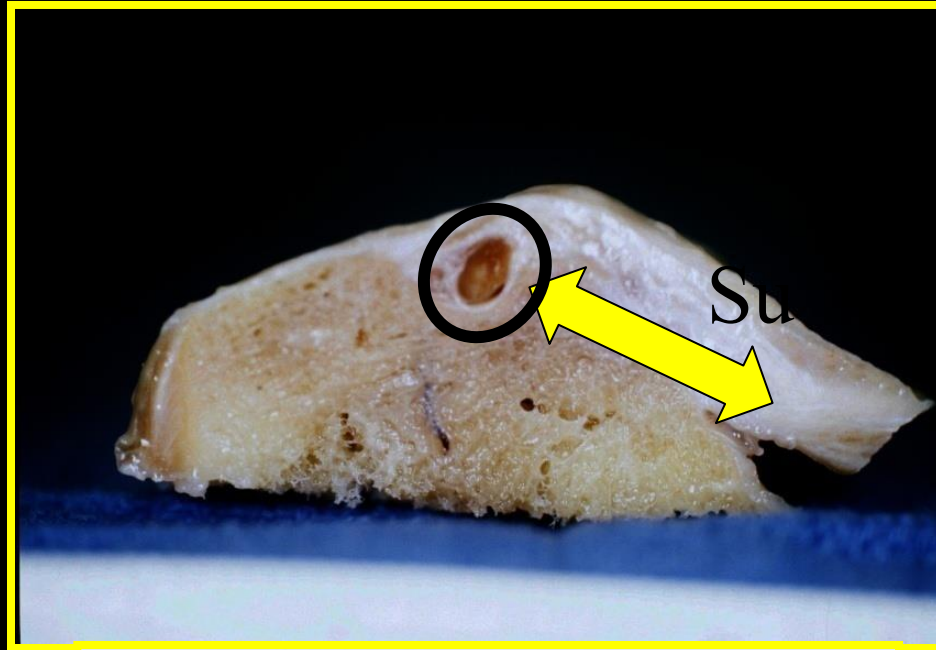




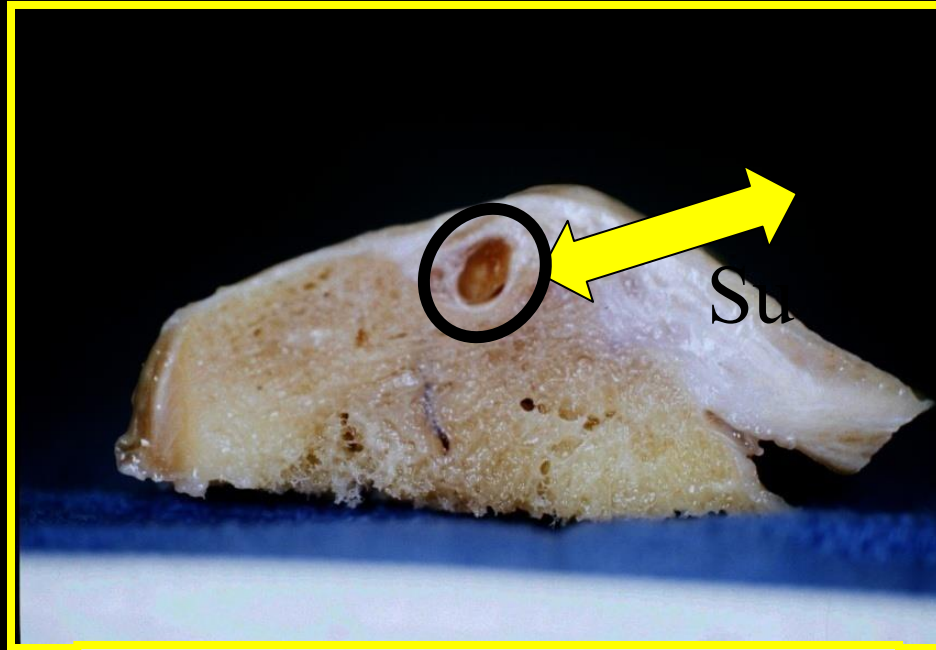
SUBSCAPULARIS TEAR



SUBSCAPULARIS TEAR



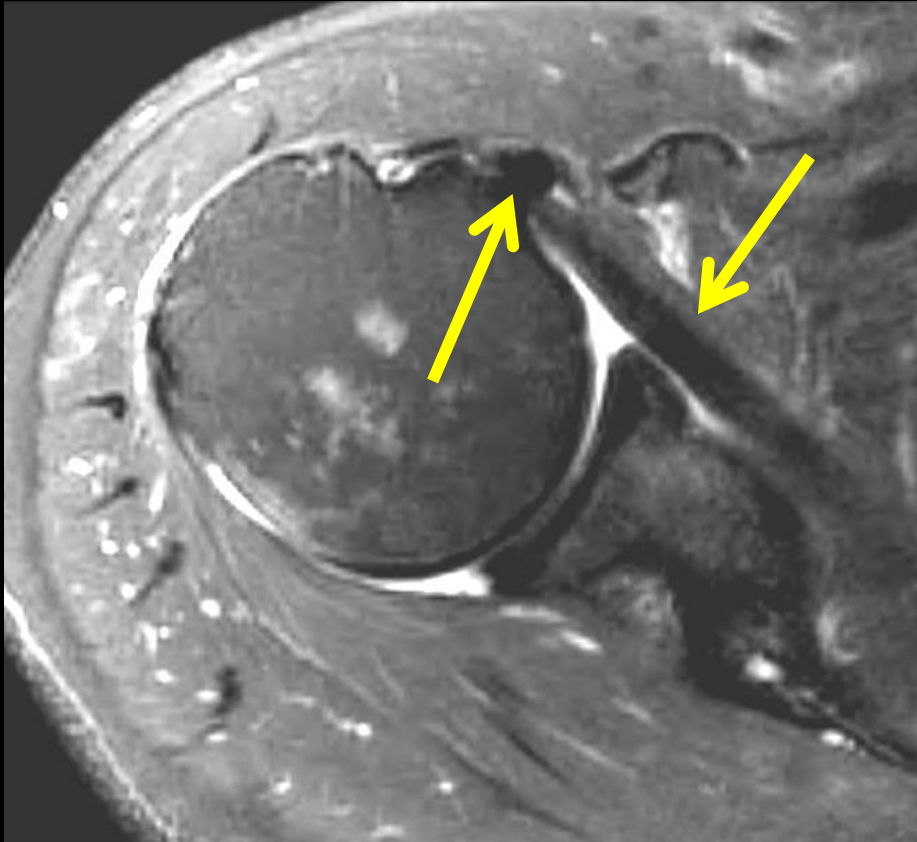
SUBSCAPULARIS TEAR



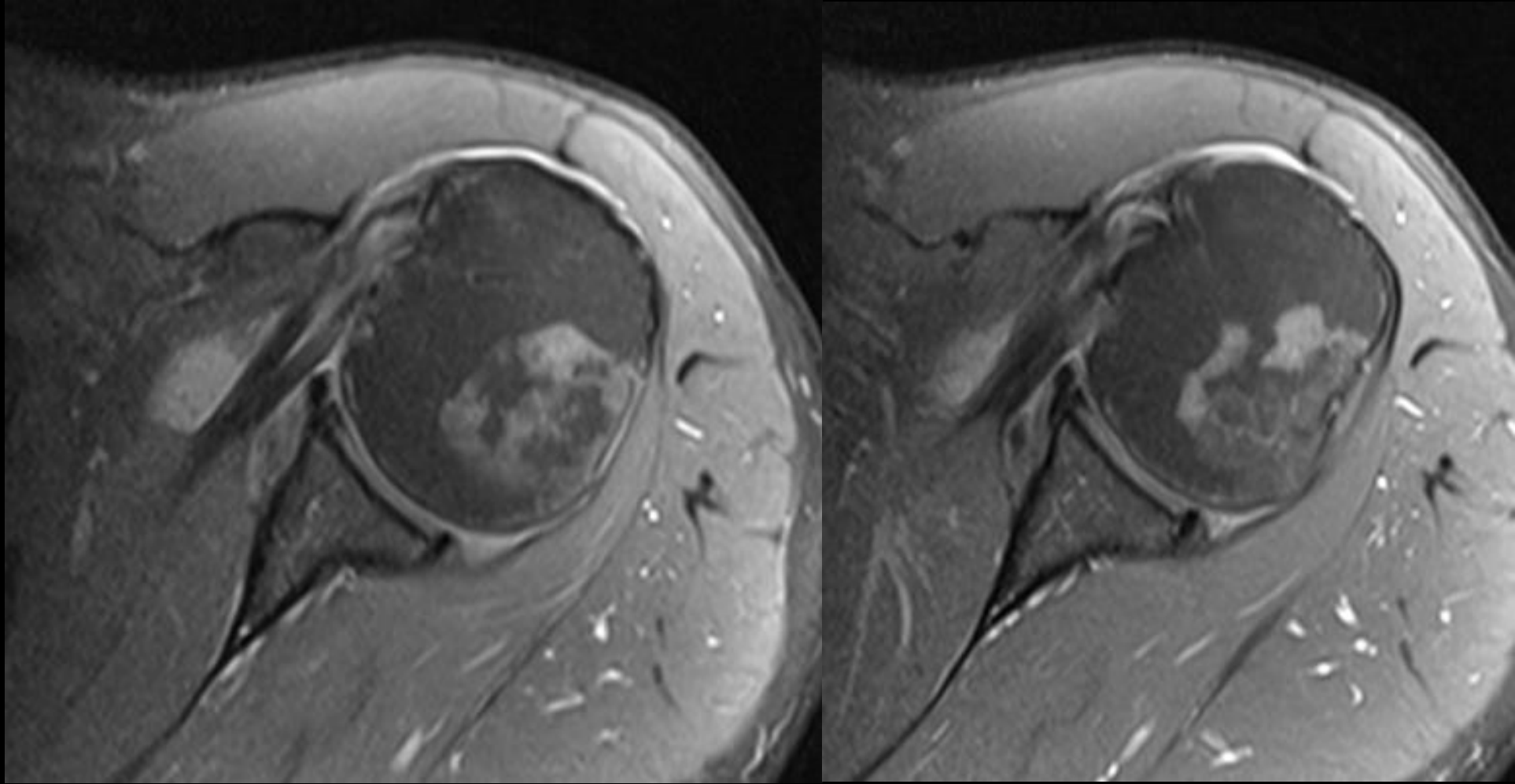
EXTRAARTICULAR BICEPS DISLOCATION



EXTRAARTICULAR BICEPS DISLOCATION

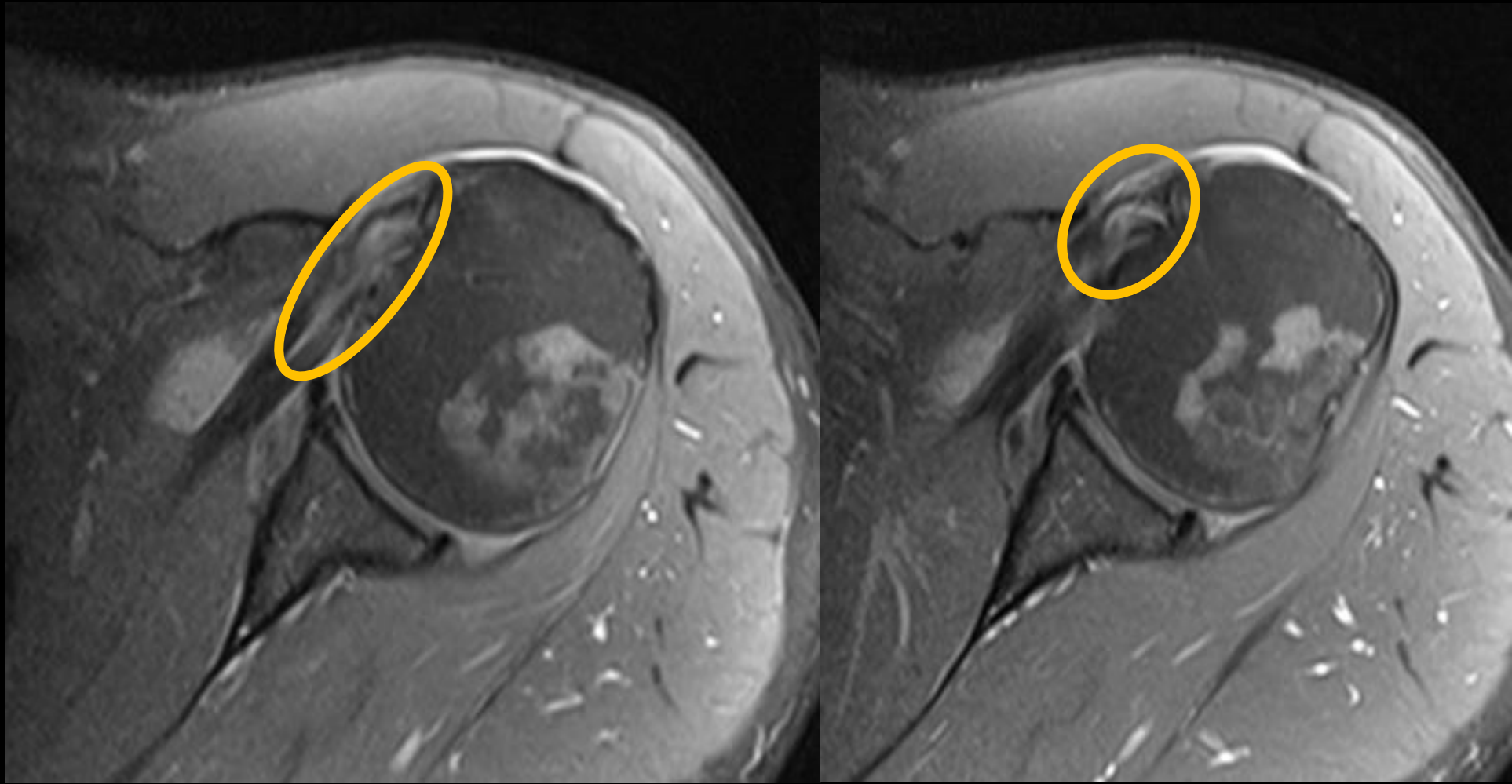


Subscapularis Tear

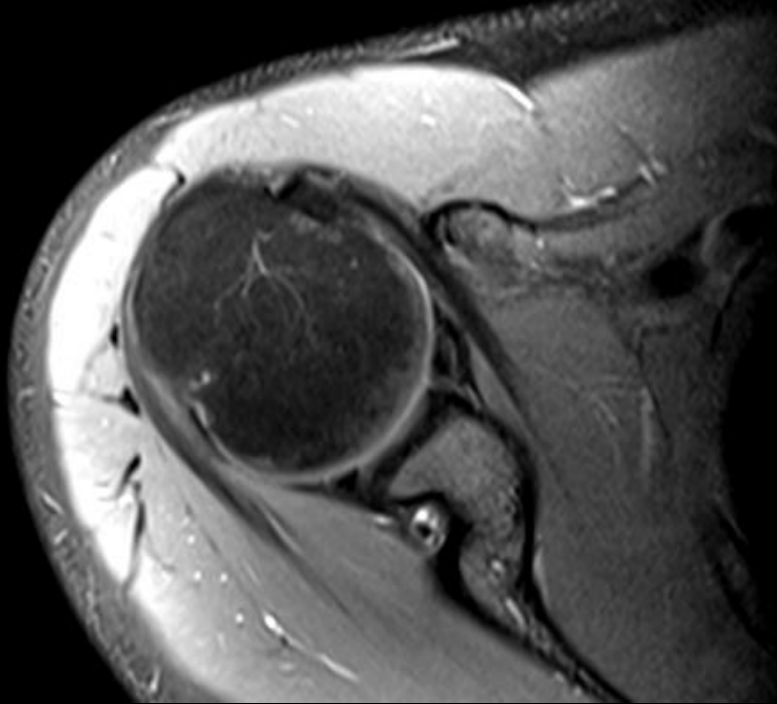


LHBT into delamination of subscapularis

Subscapularis Tear



LHBT into delamination of subscapularis

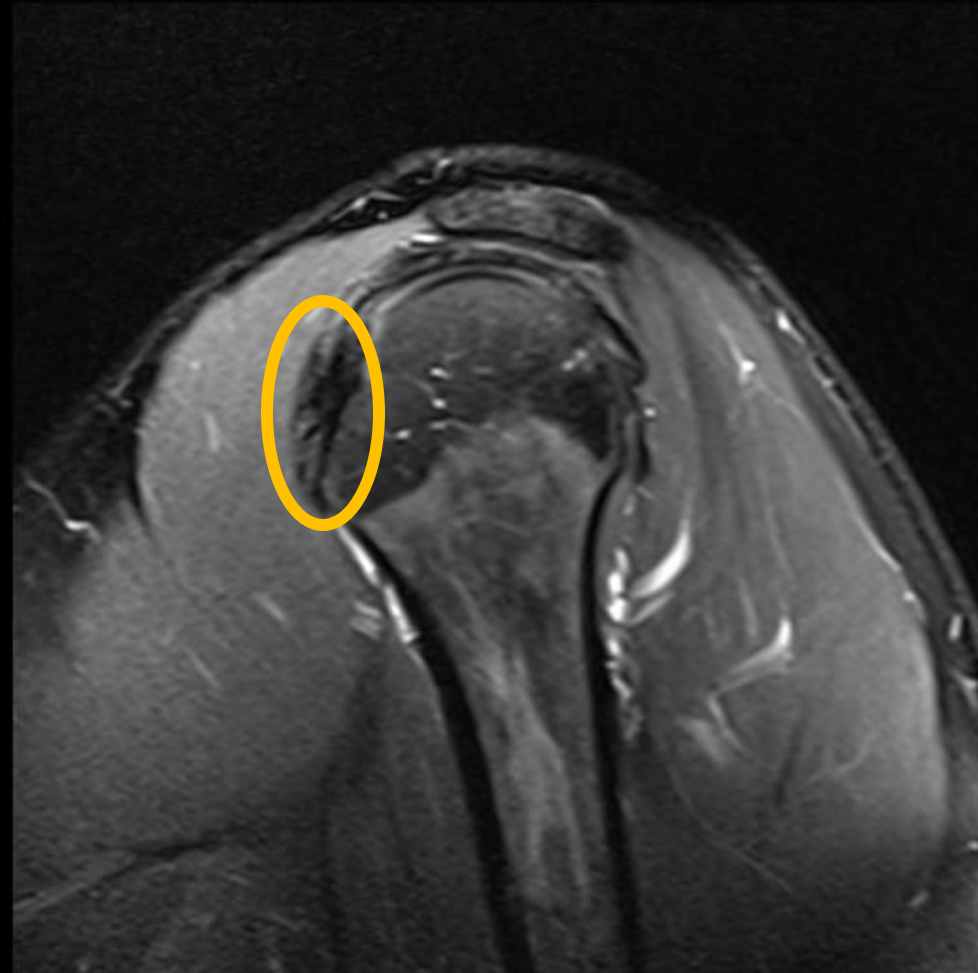


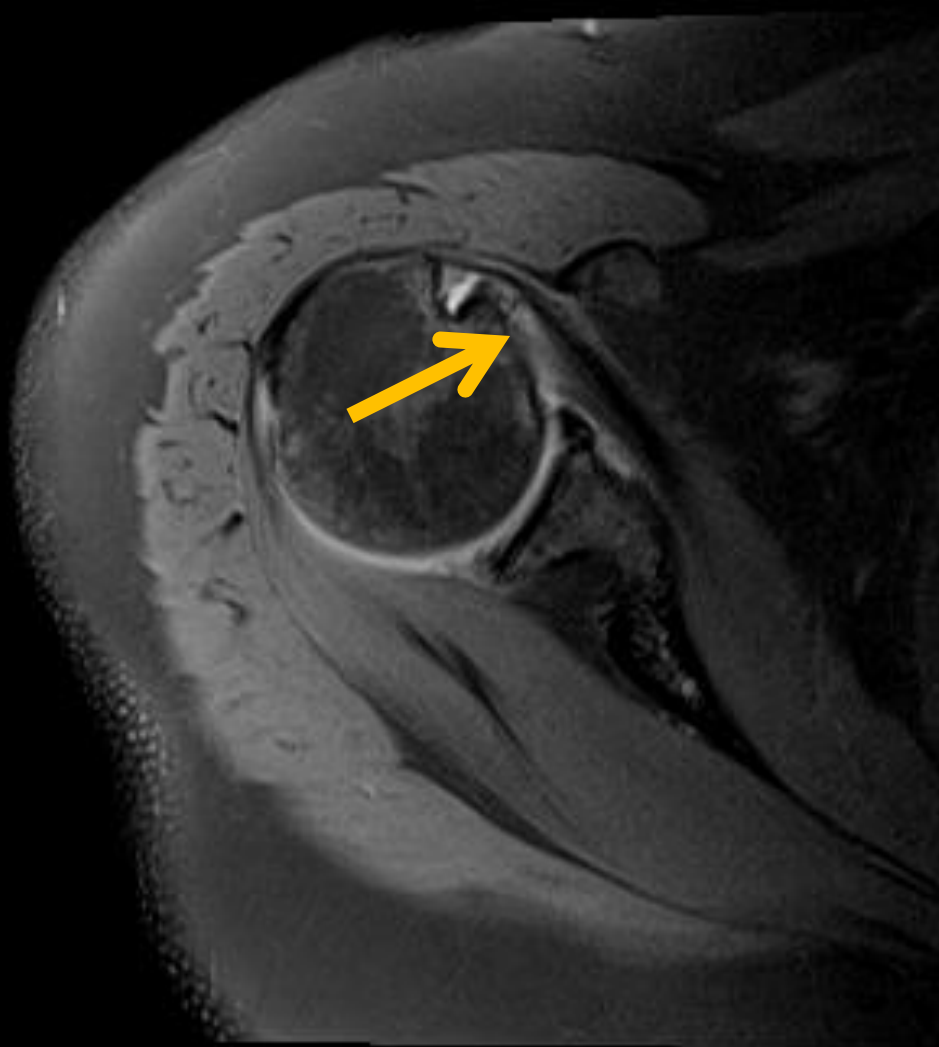
Normal Subscapularis

- Multipennate tendon
- Inferior 1/3rd muscular

Look at sagittals!!

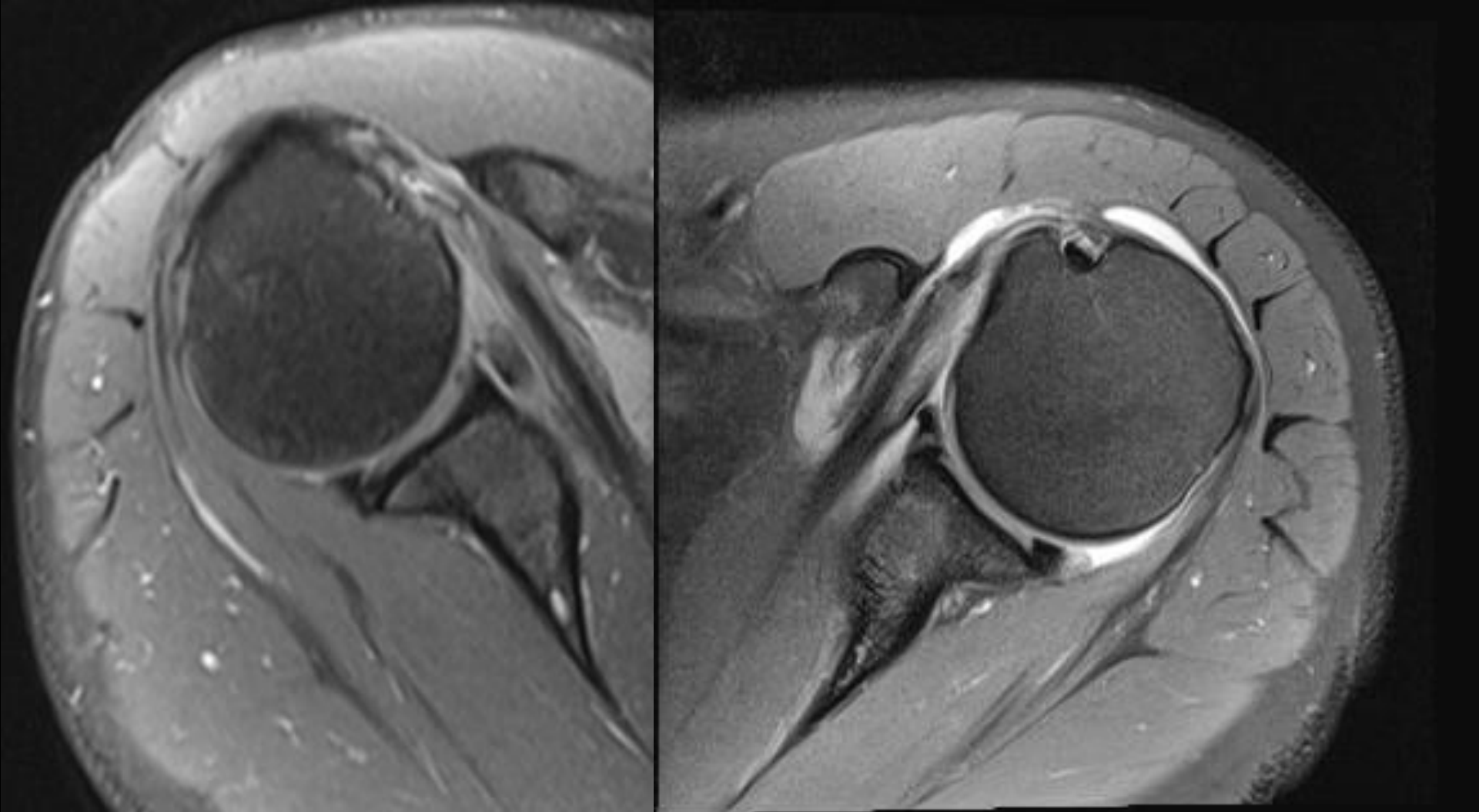
- Medial to LHBT groove
- Oval black tendon



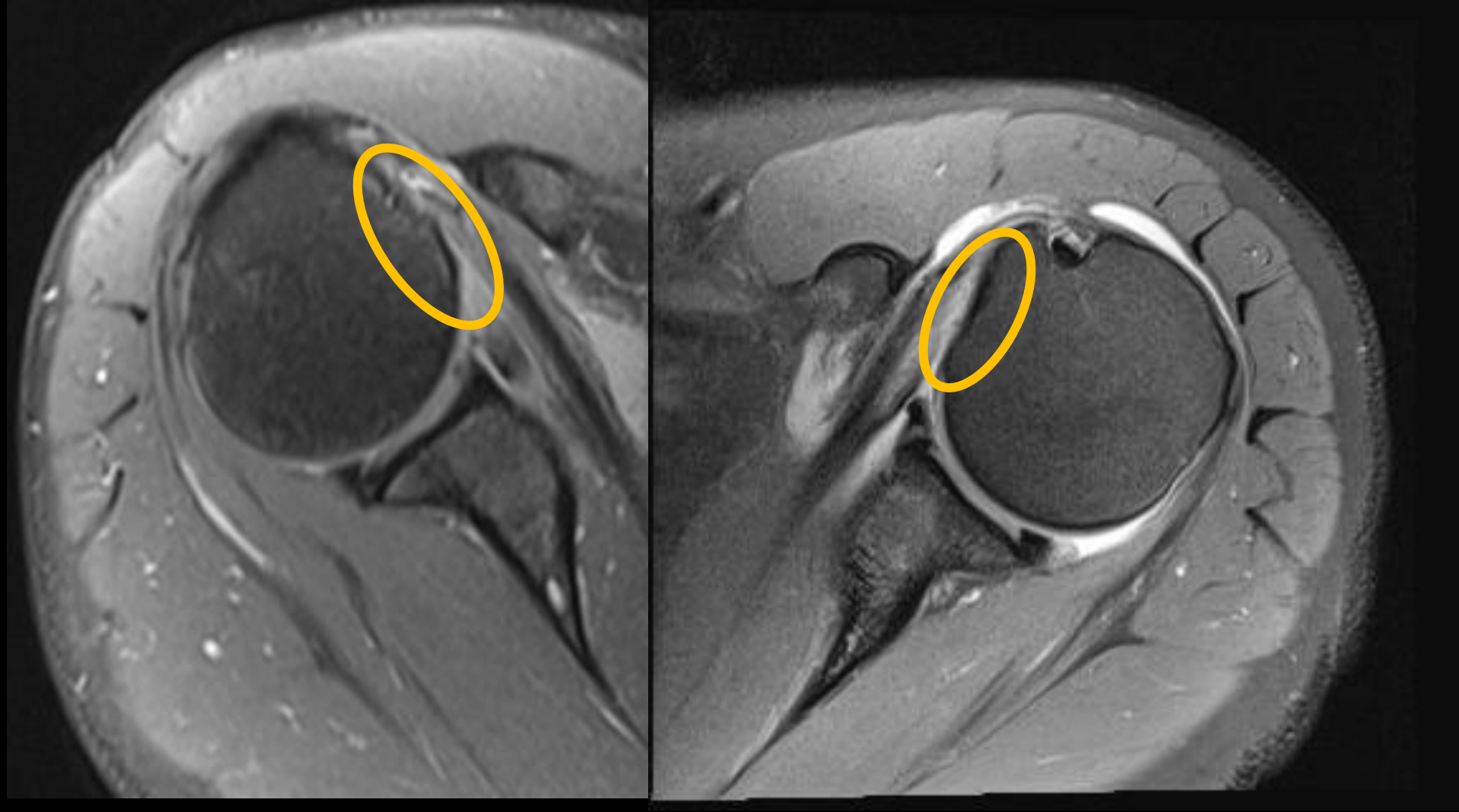


Subscapularis tears are commonly missed
Look for high signal in footprint medial to LHBT groove

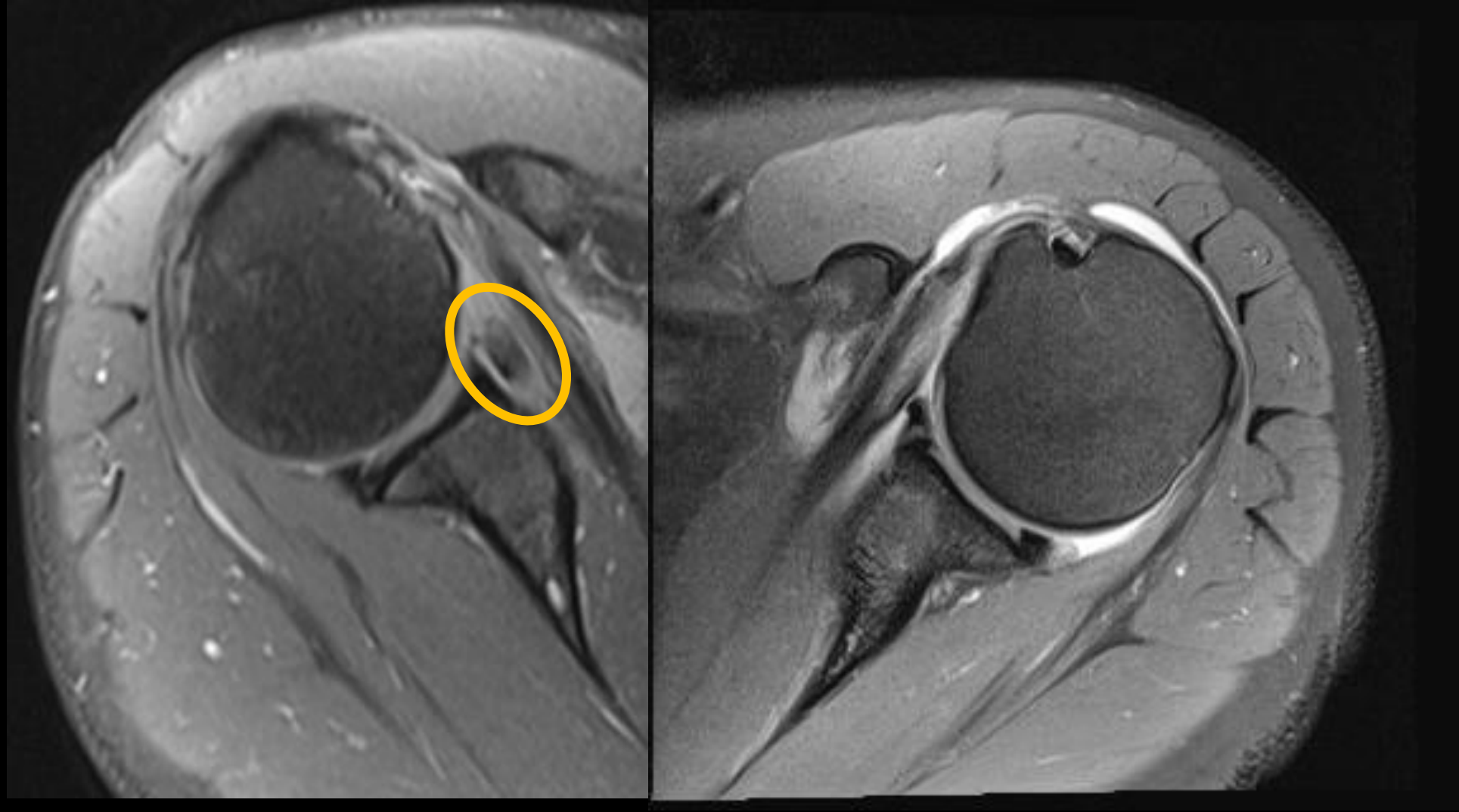
Skeletal Radiol (2013)



SUBSCAPULARIS TEAR



SUBSCAPULARIS TEAR

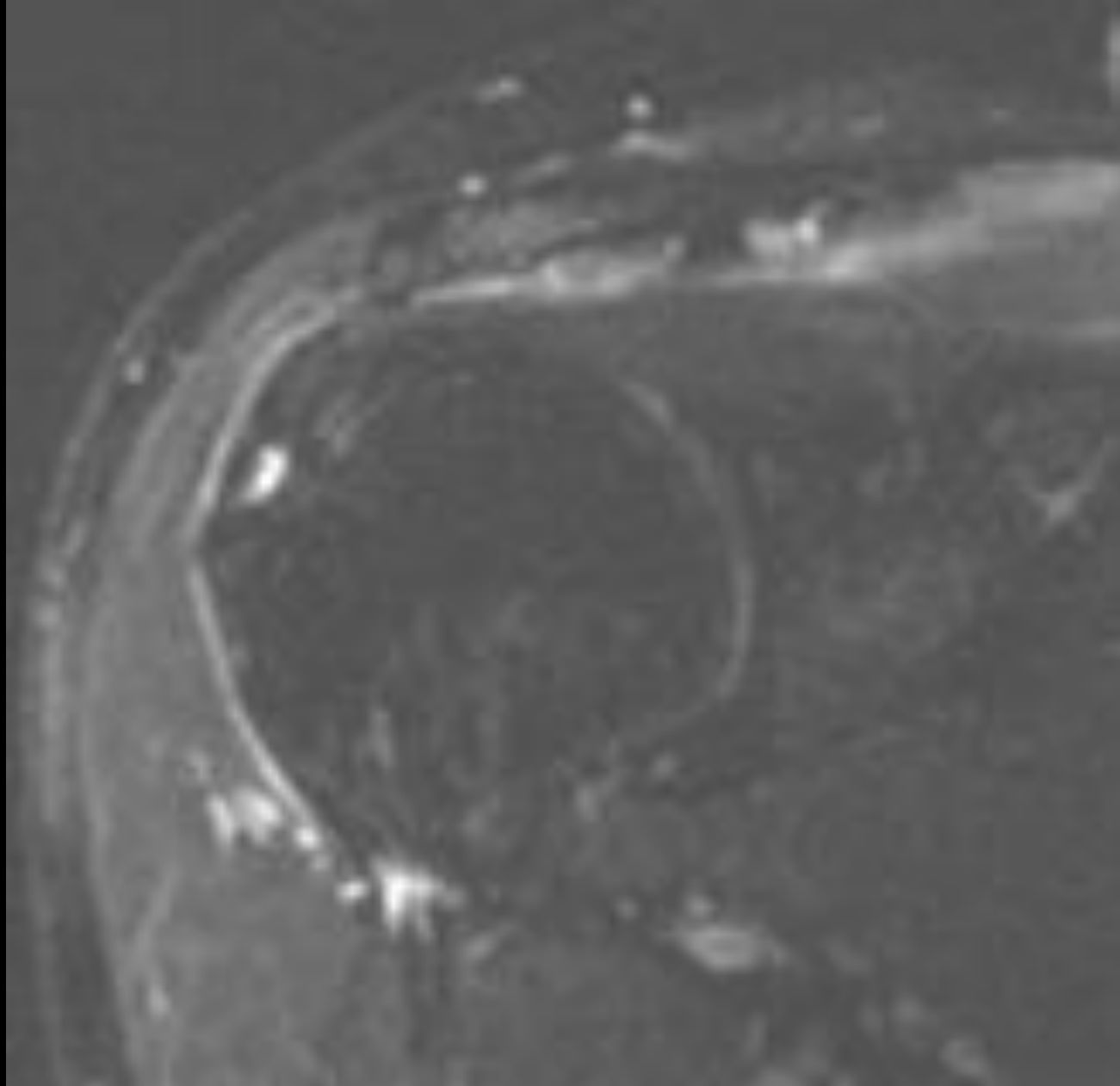


SUBSCAPULARIS TEAR

ROTATOR CUFF TEAR PARTIAL THICKNESS

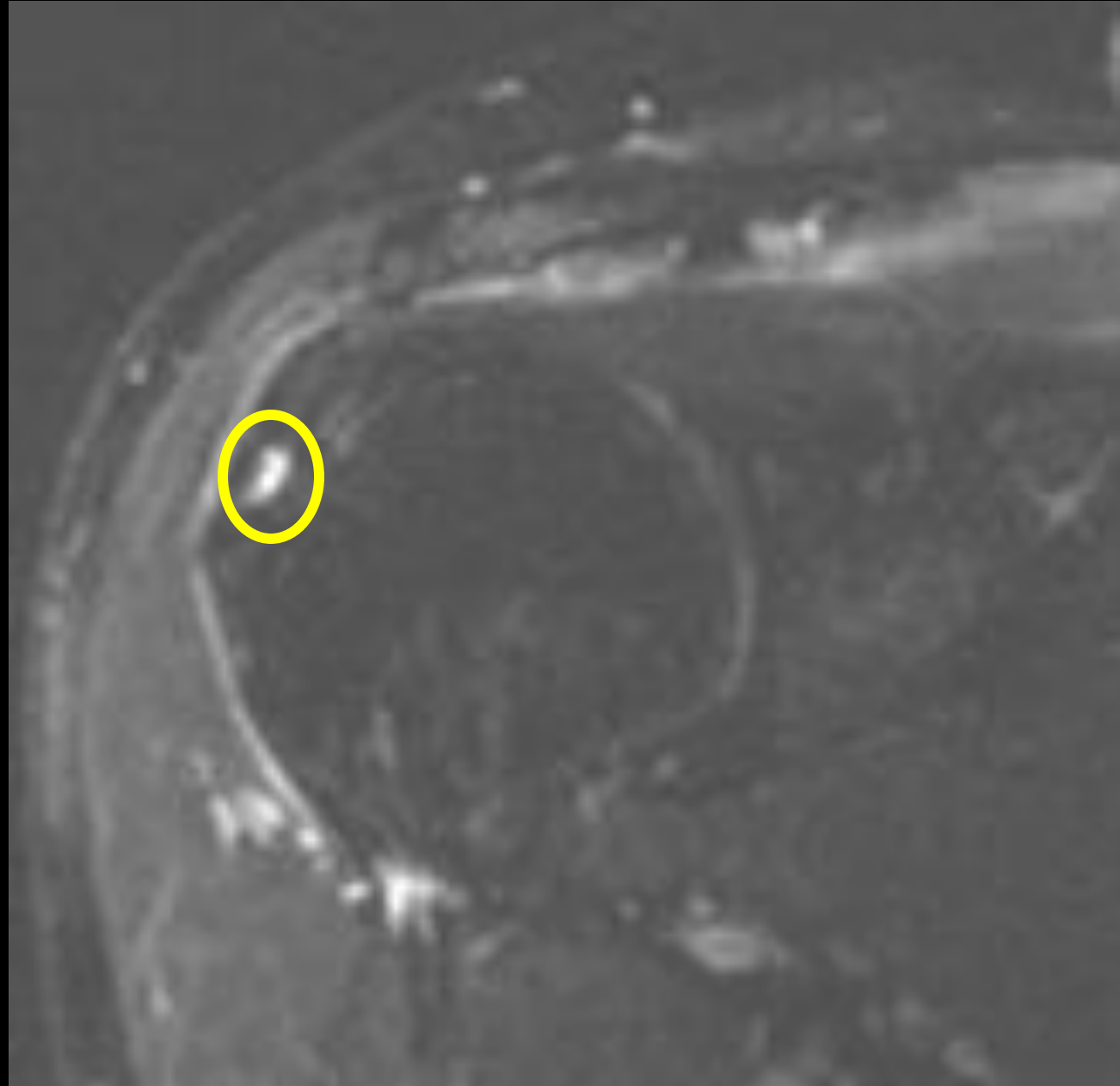
- Twice as common as full thickness
- Intr substance - most common but not seen on arthroscopy
- Articular side - more common (3-4 to 50X)
- Bursal Side - least common
 - Poor response to conservative treatment
- Increased detection
 - Contrast
 - ABER
- Significant if >50% of tendon thickness

Intrasubstance Tear



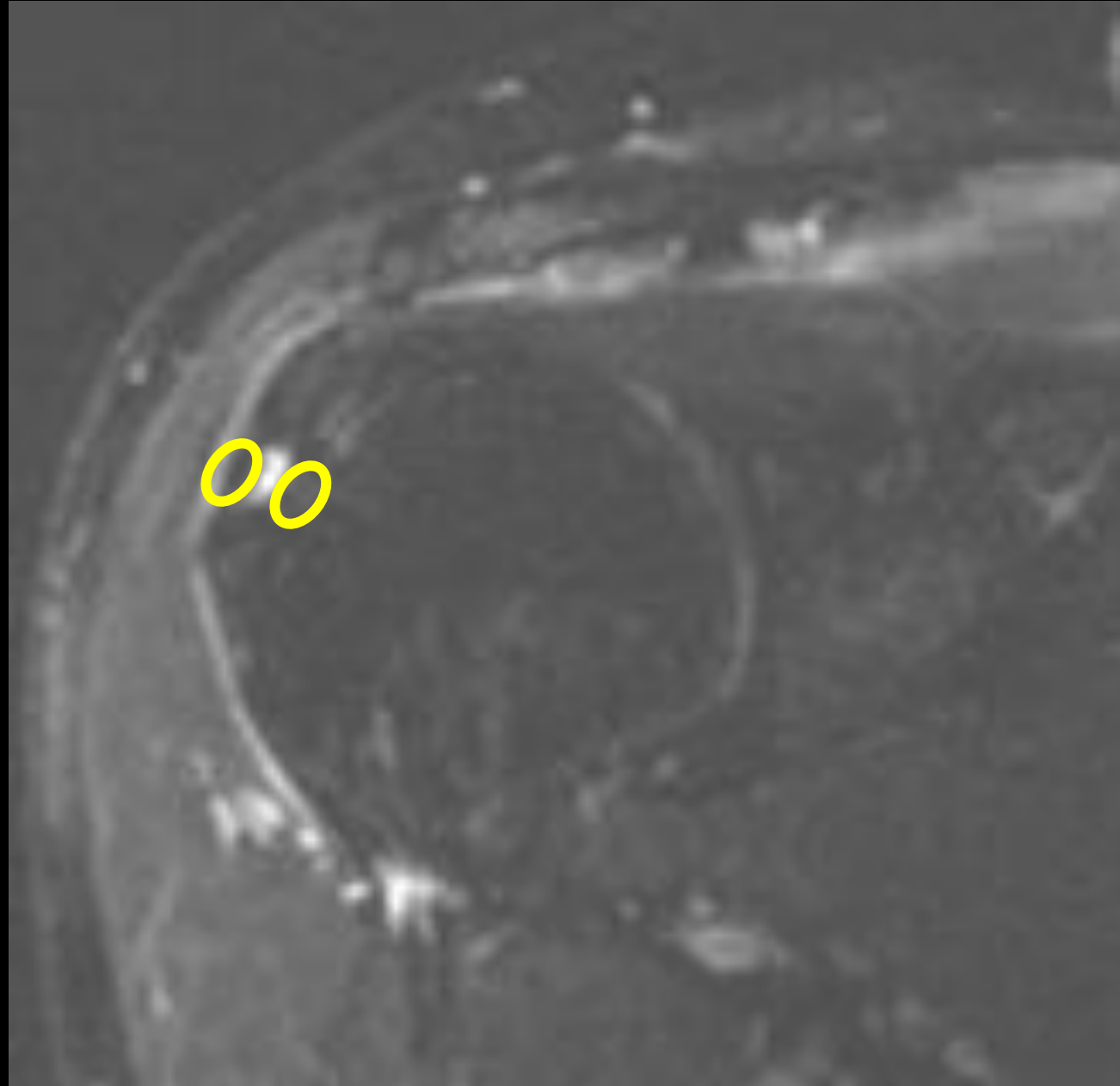
T2

Intrasubstance Tear



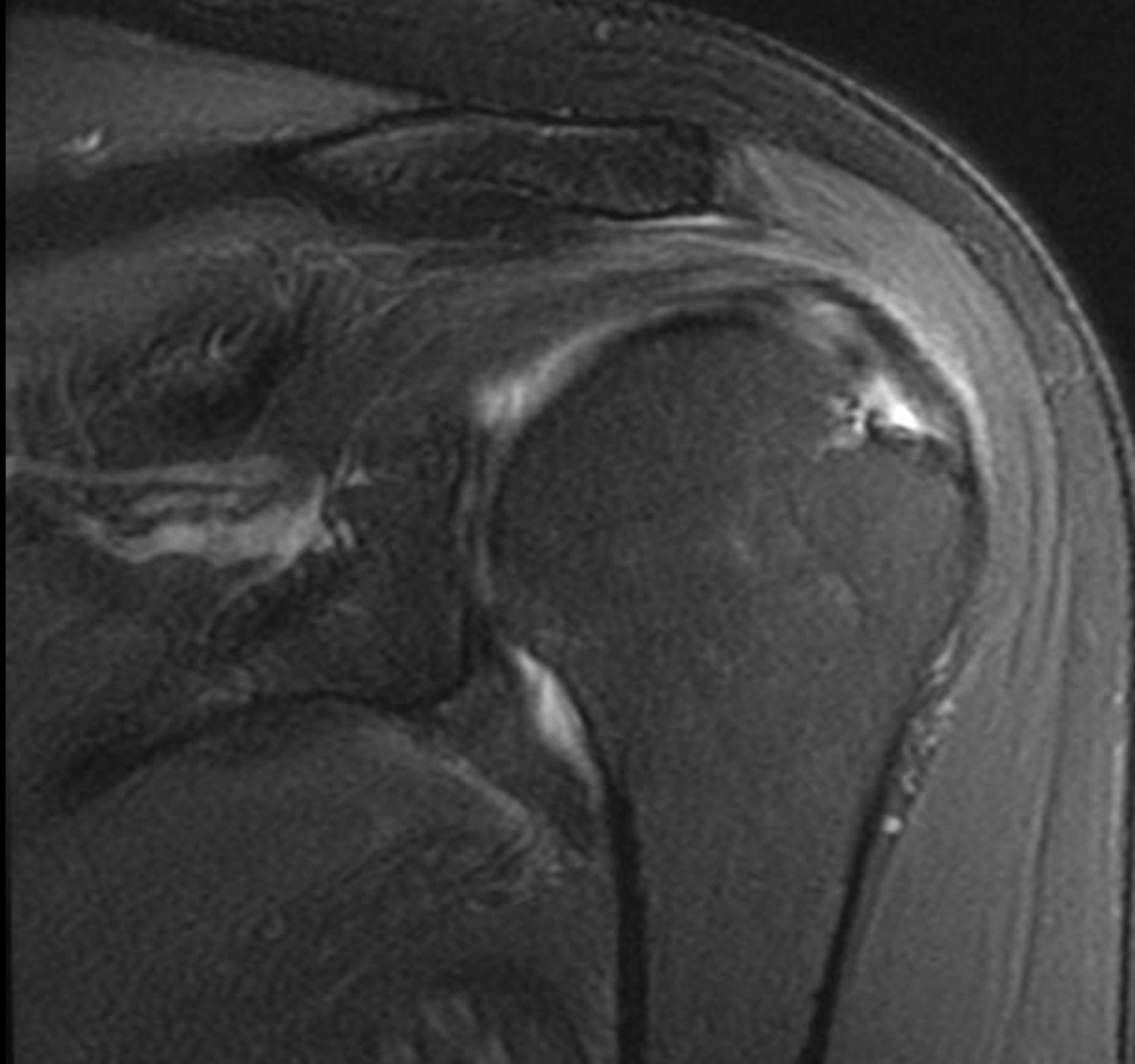
T2

Intrasubstance Tear



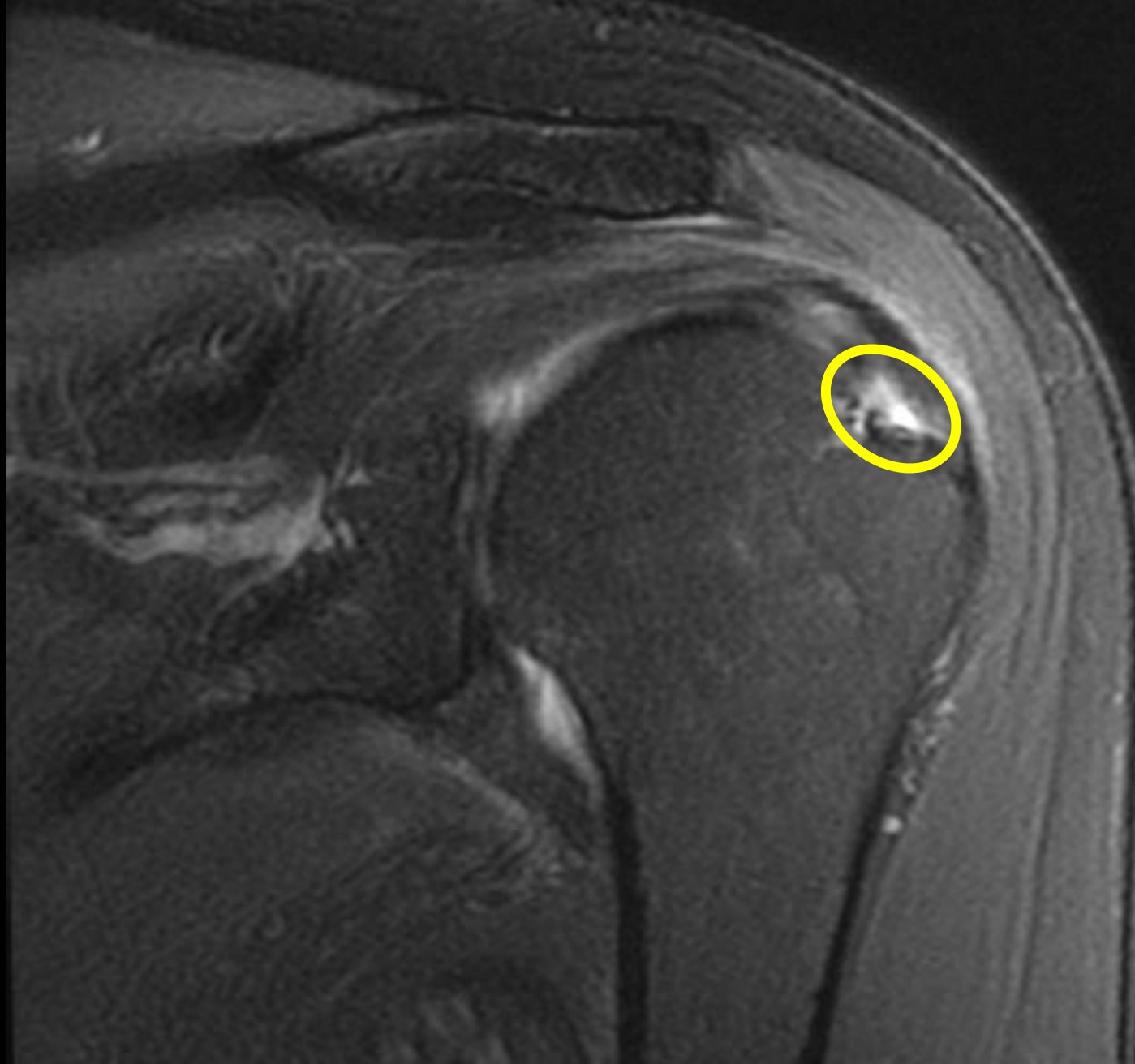
T2

Small Partial Undersurface Tear



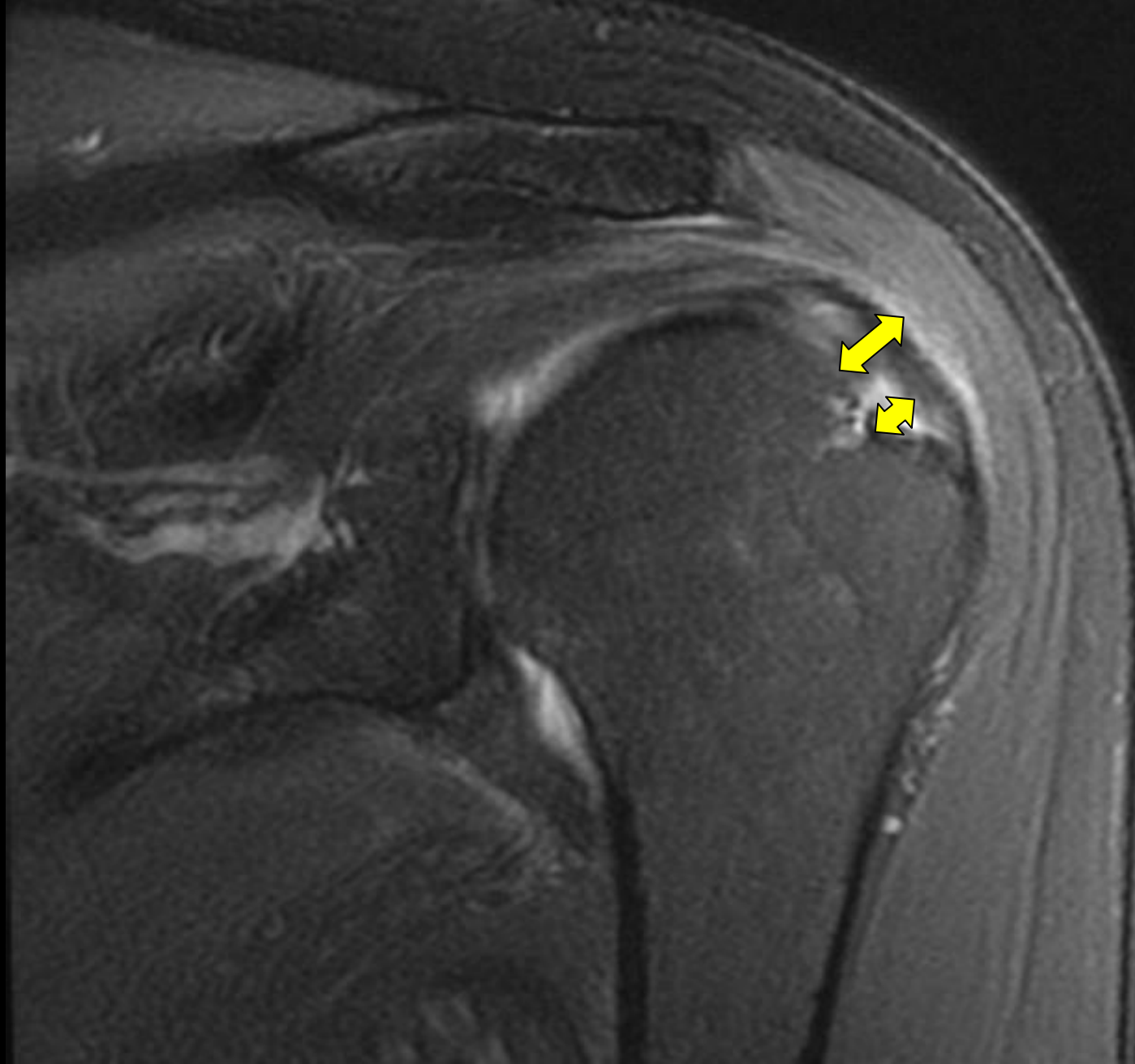
T2

Small Partial Undersurface Tear

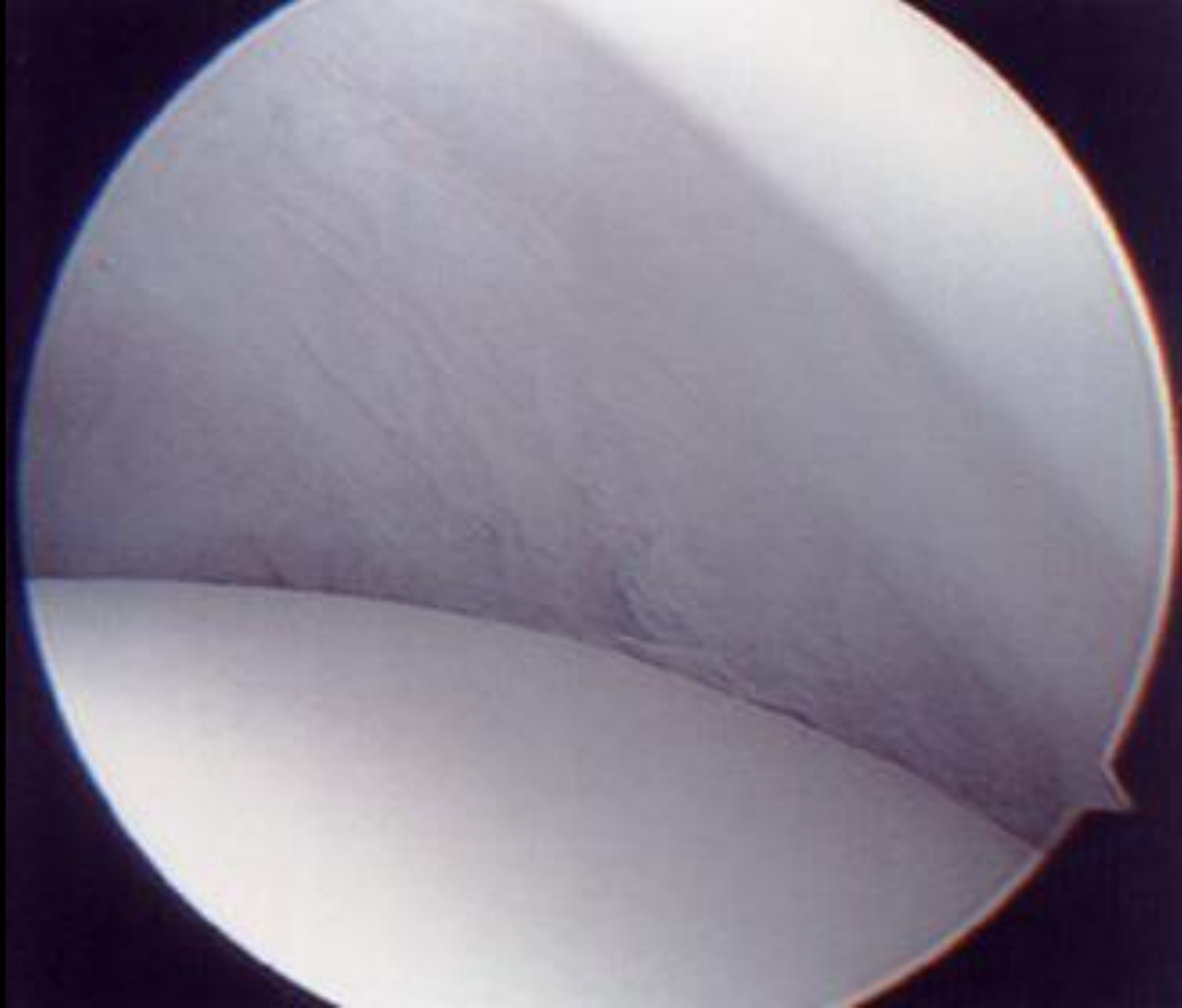


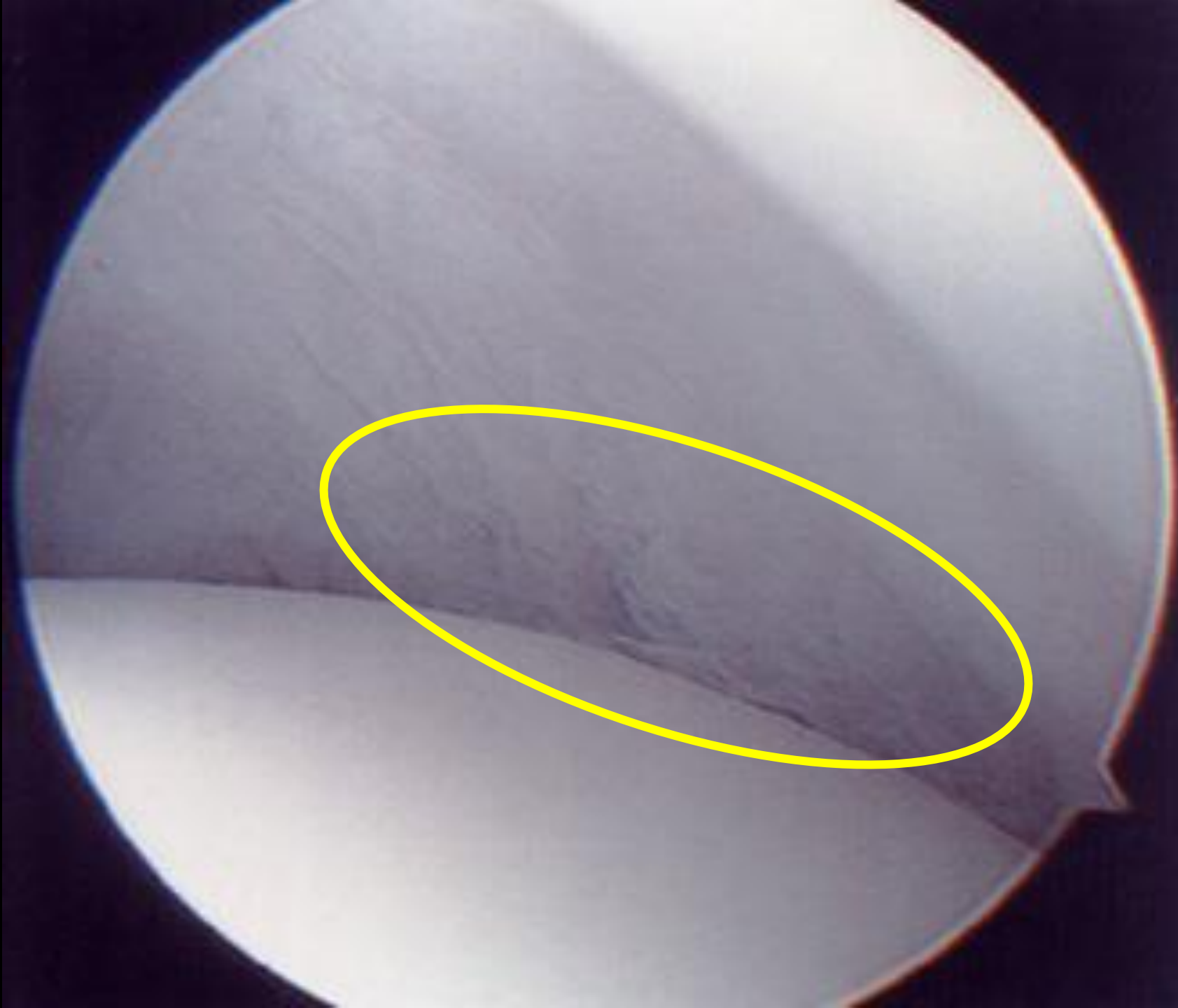
T2

Small Partial Undersurface Tear

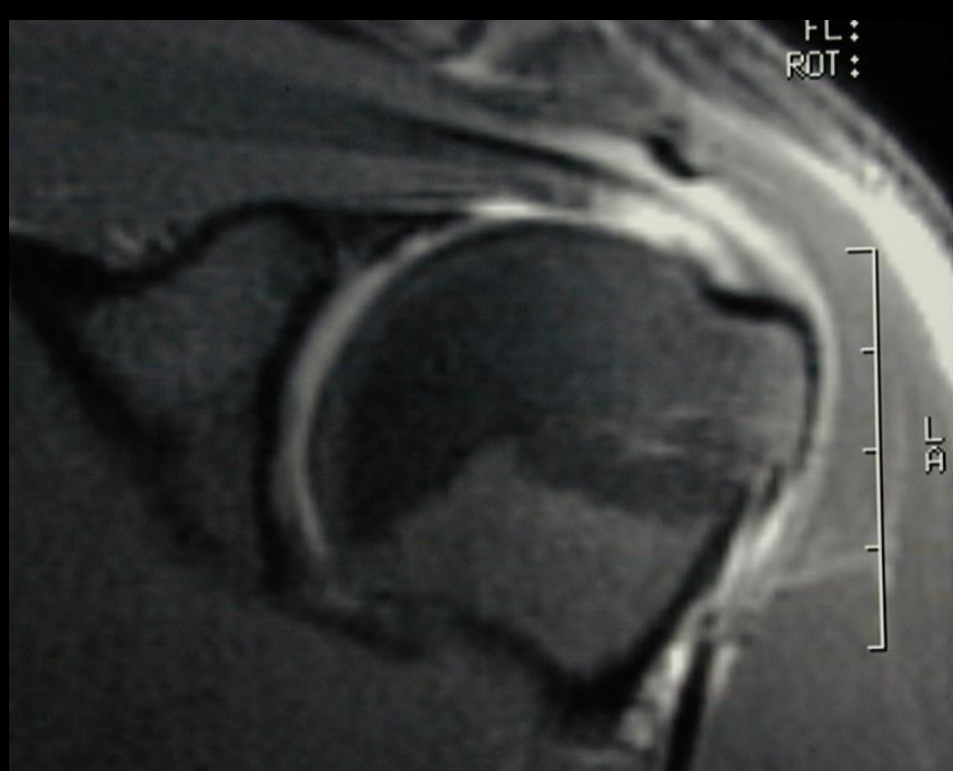


T2





Large Partial Undersurface Tear

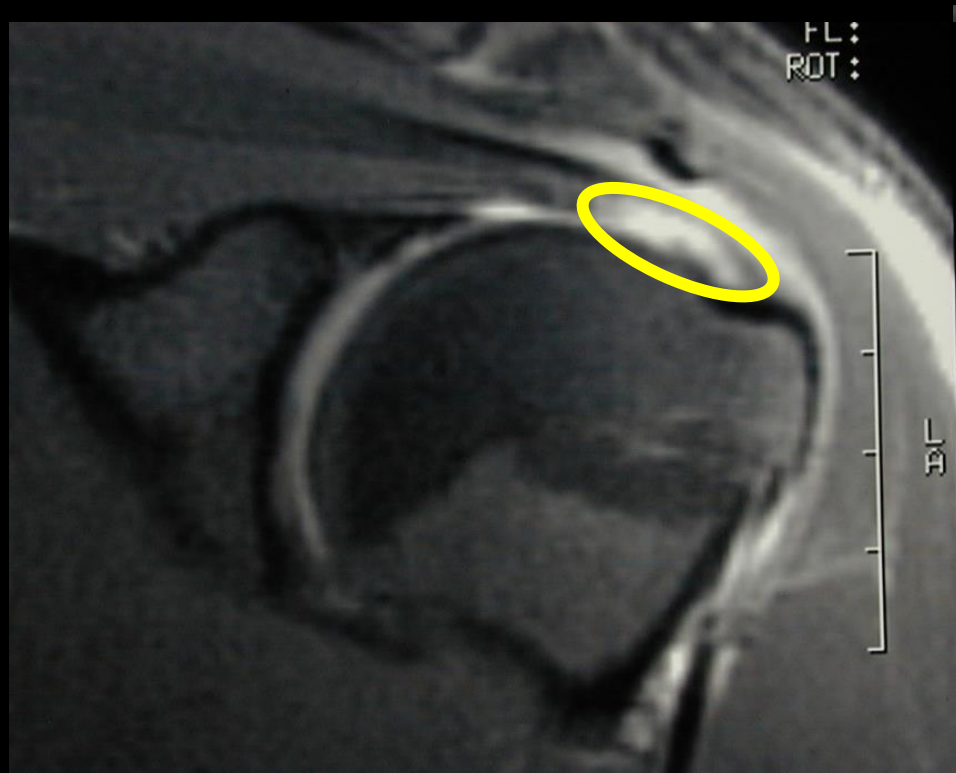


T1 GD CORONAL

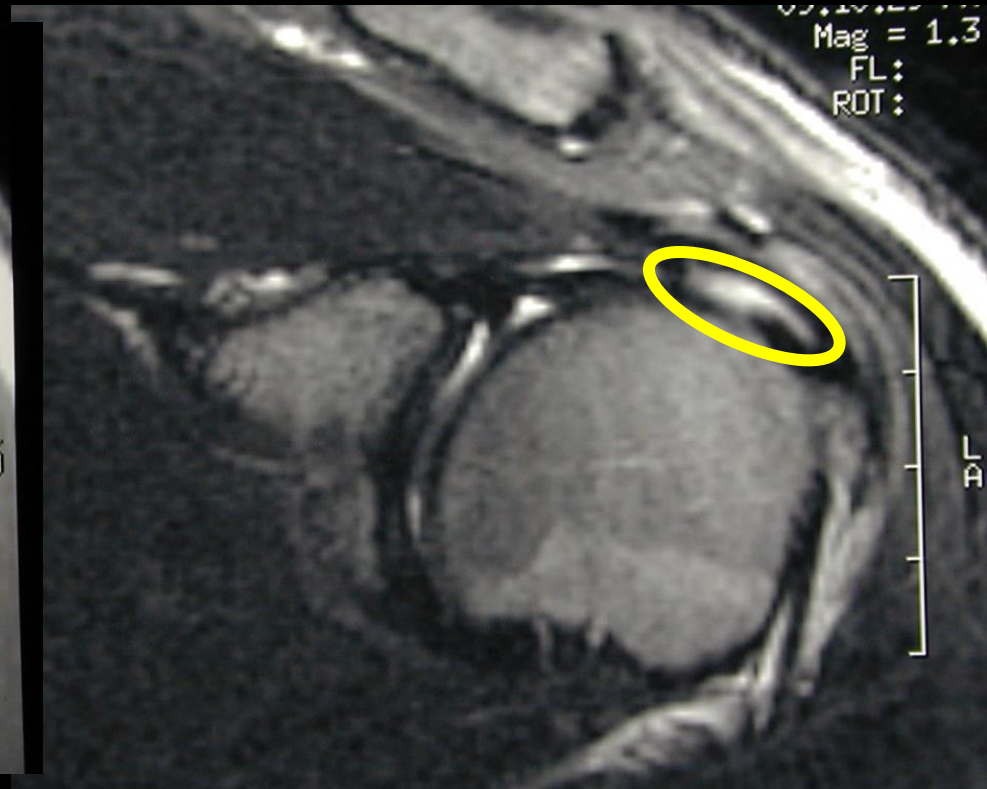


T2 CORONAL

Large Partial Undersurface Tear

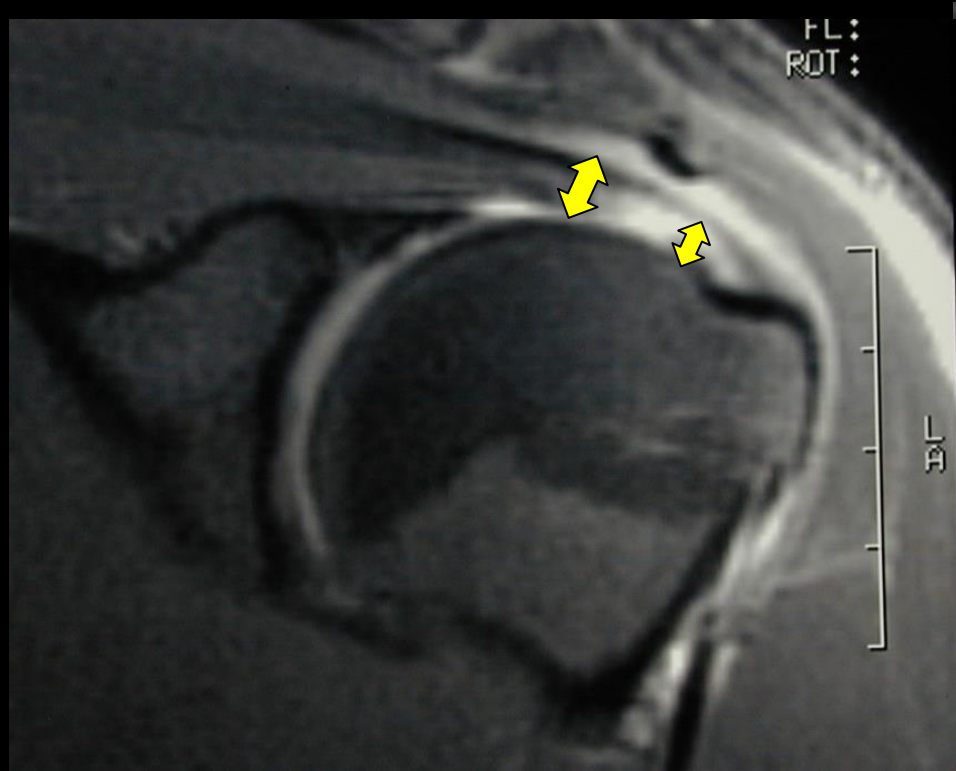


T1 GD CORONAL

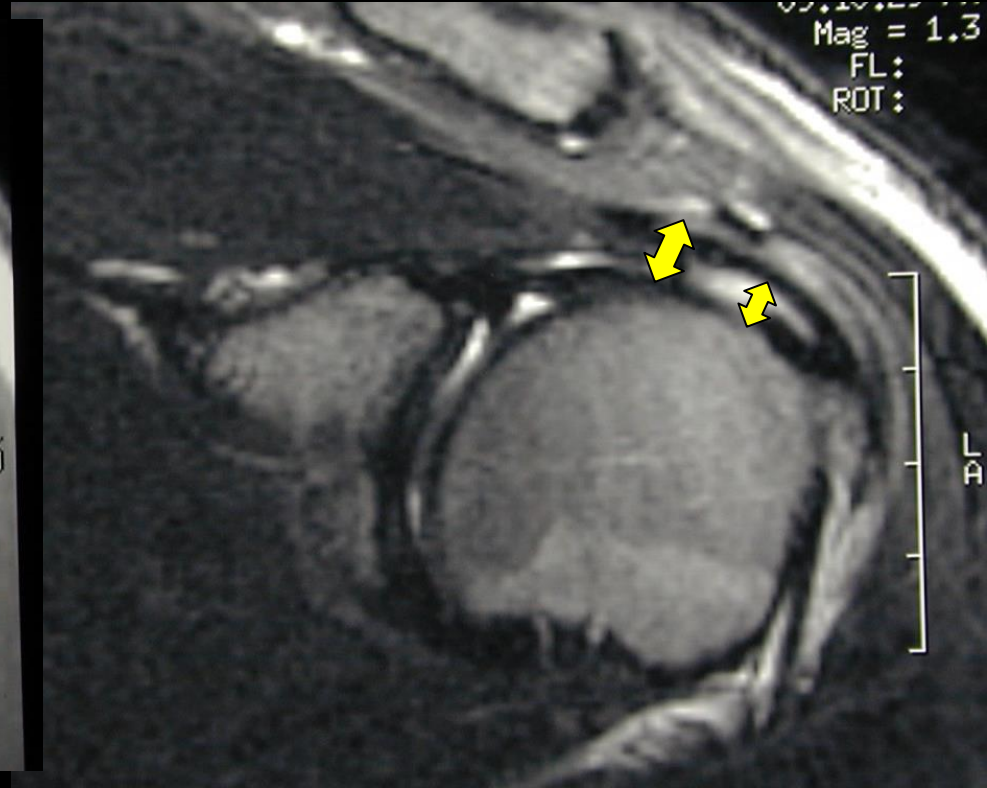


T2 CORONAL

Large Partial Undersurface Tear

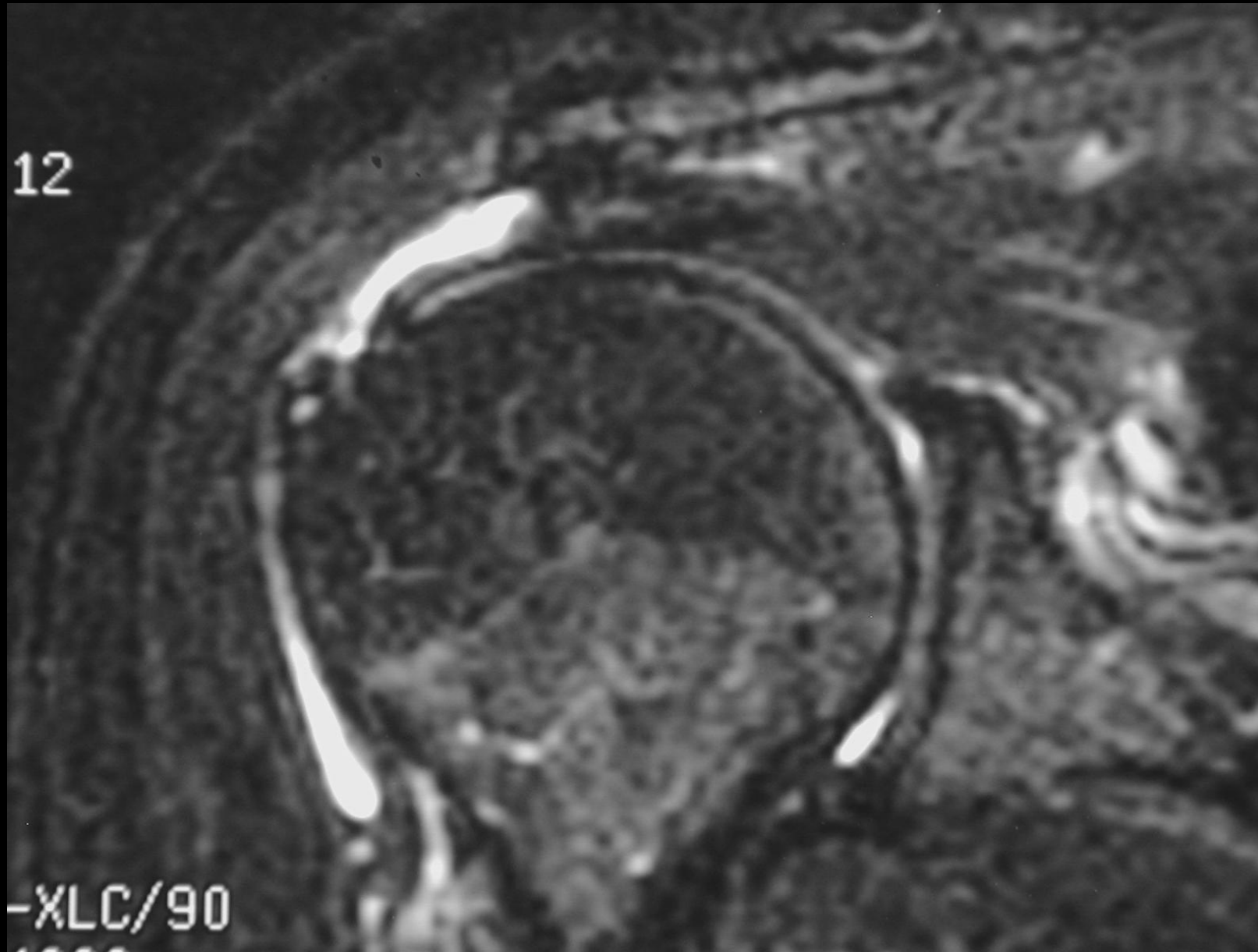


T1 GD CORONAL

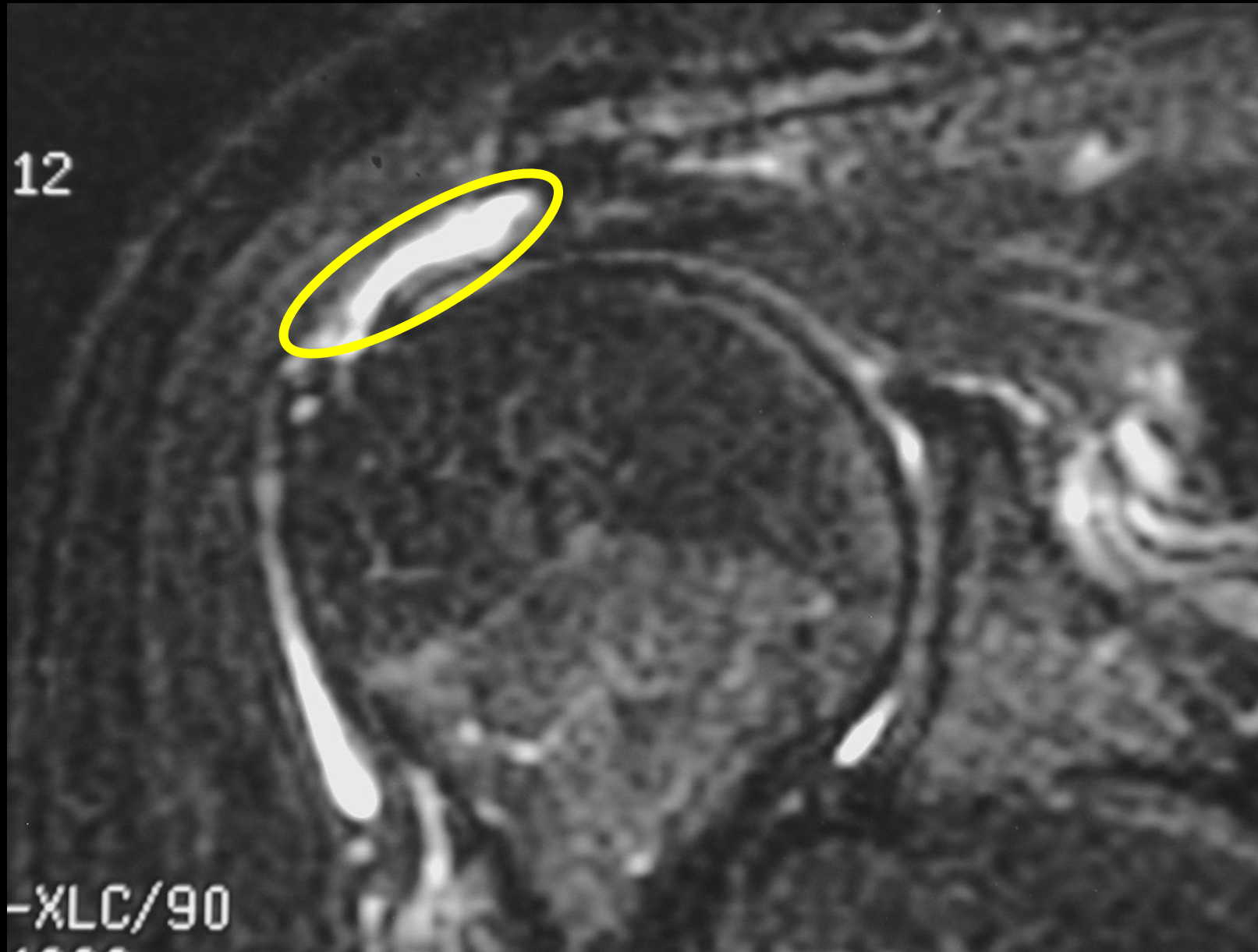


T2 CORONAL

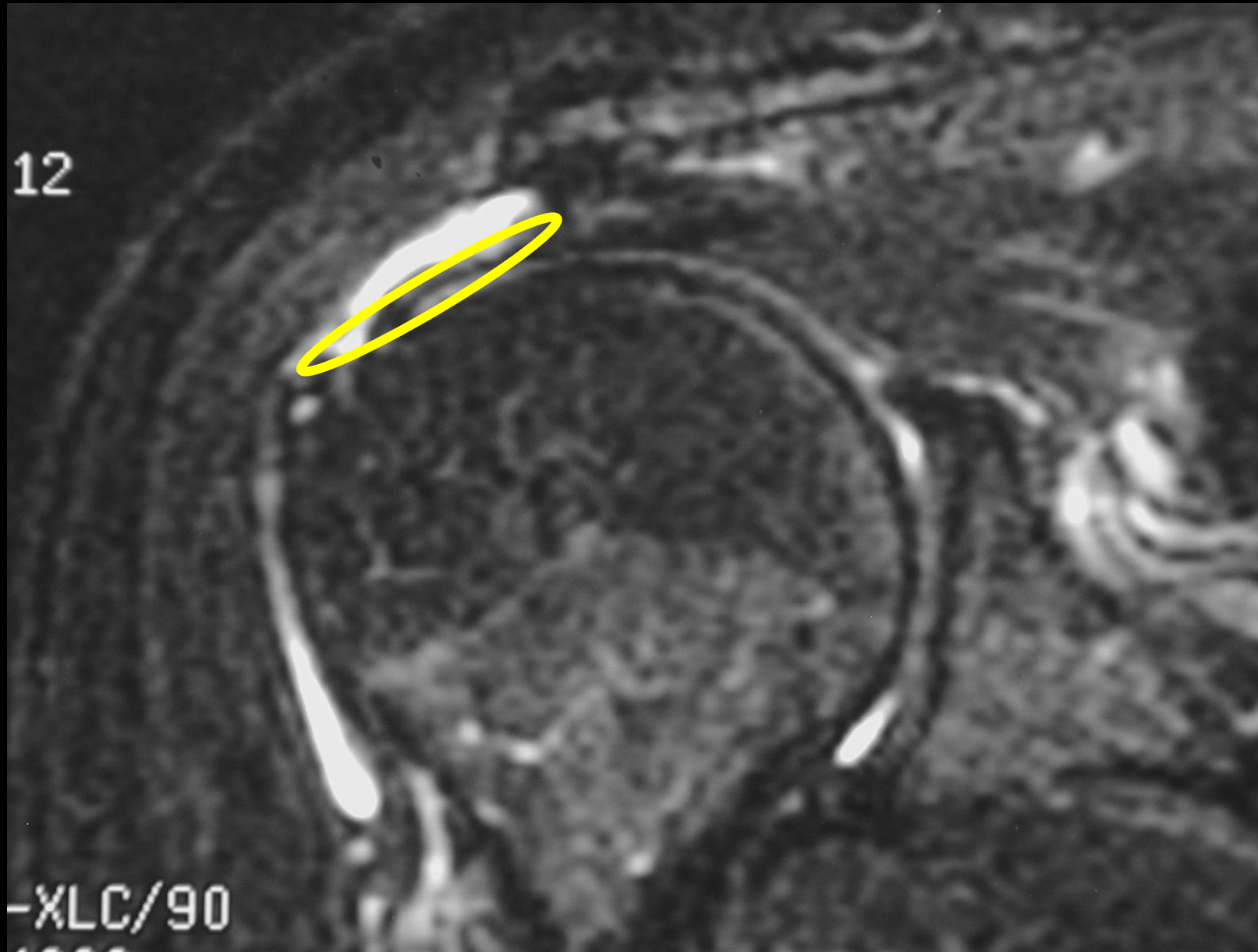
Large Partial Bursal Tear



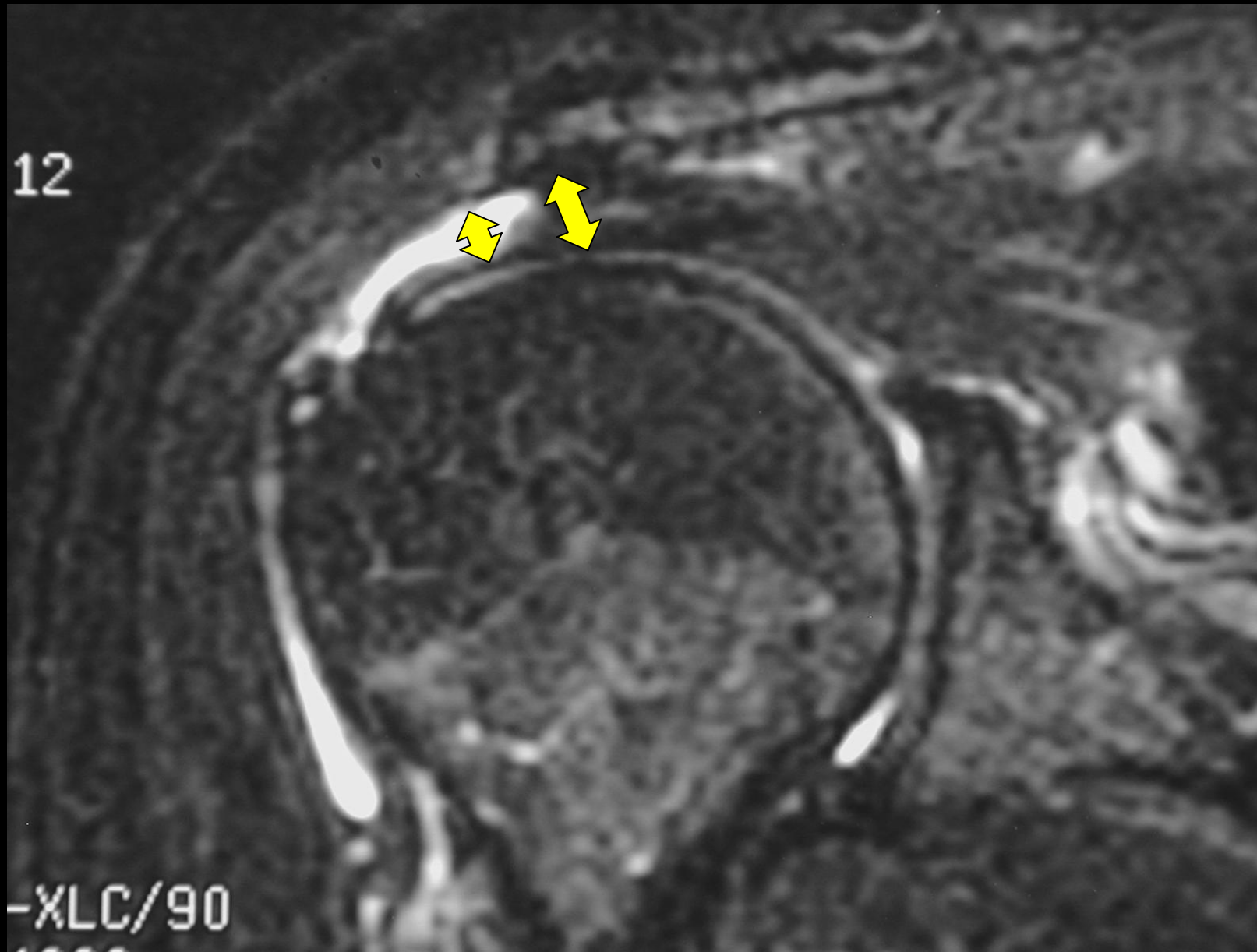
Large Partial Bursal Tear



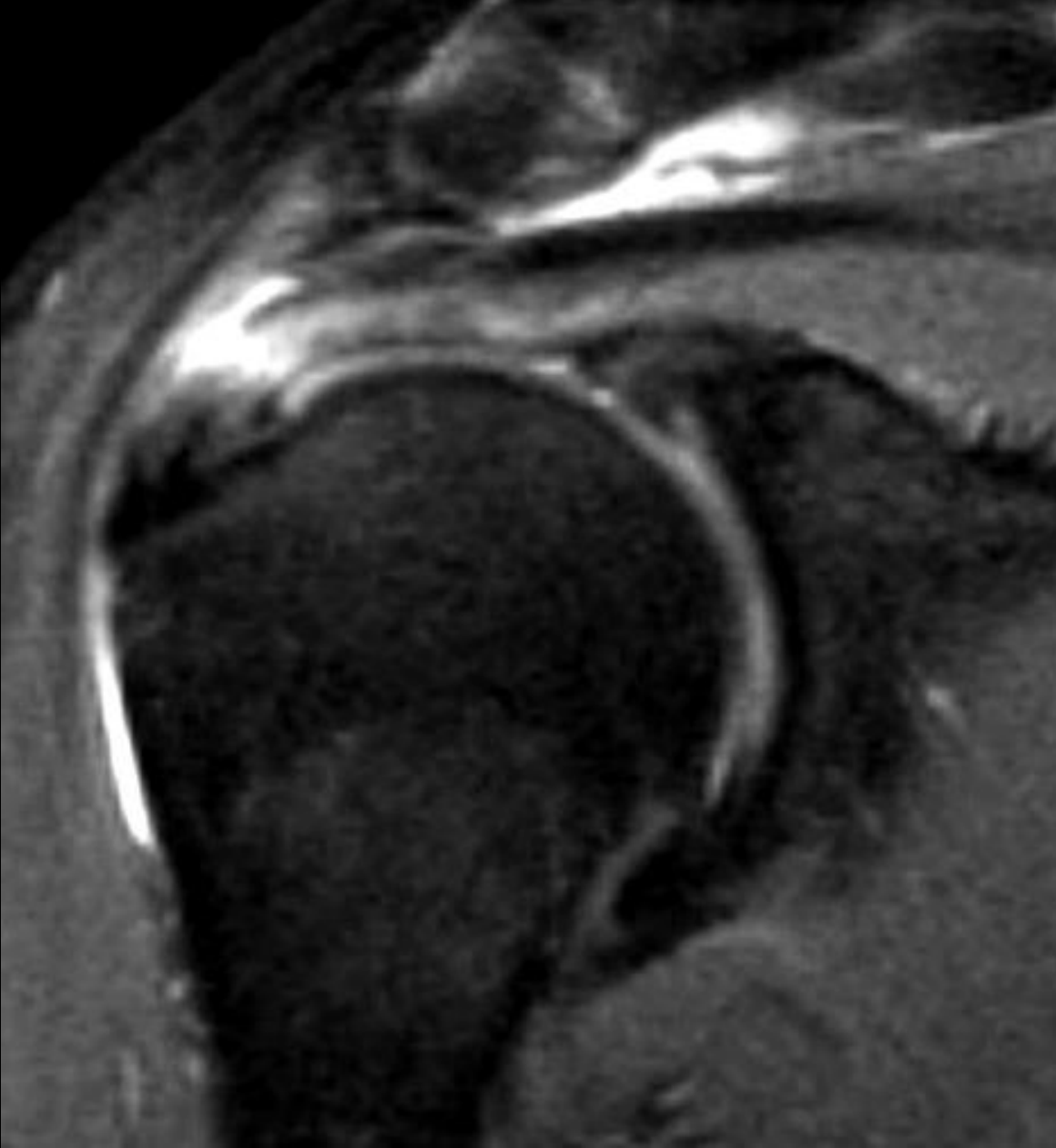
Large Partial Bursal Tear



Large Partial Bursal Tear



Large Partial Bursal Tear



T2 CORONAL

Large Partial Bursal Tear



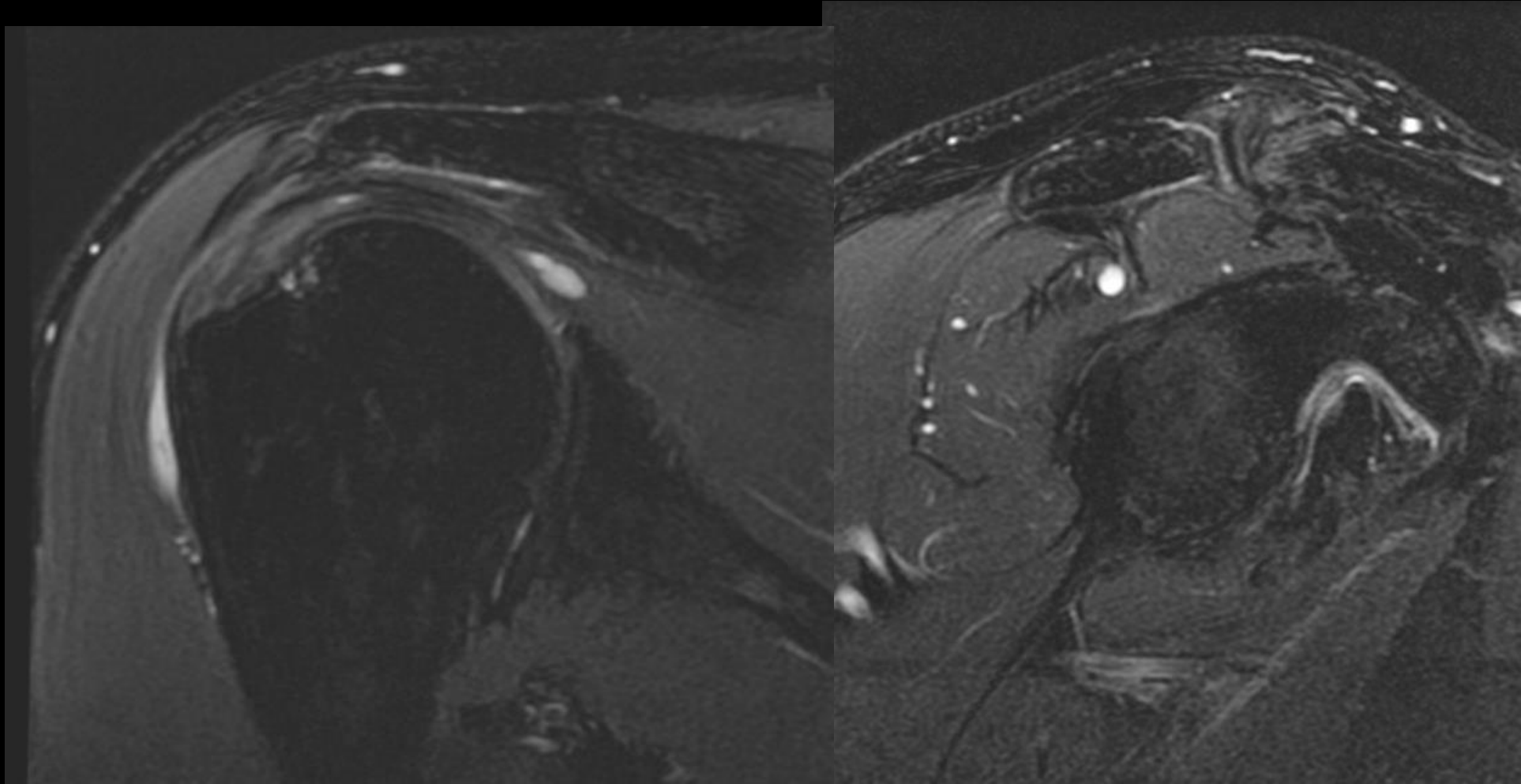
T2 CORONAL

Large Partial Bursal Tear

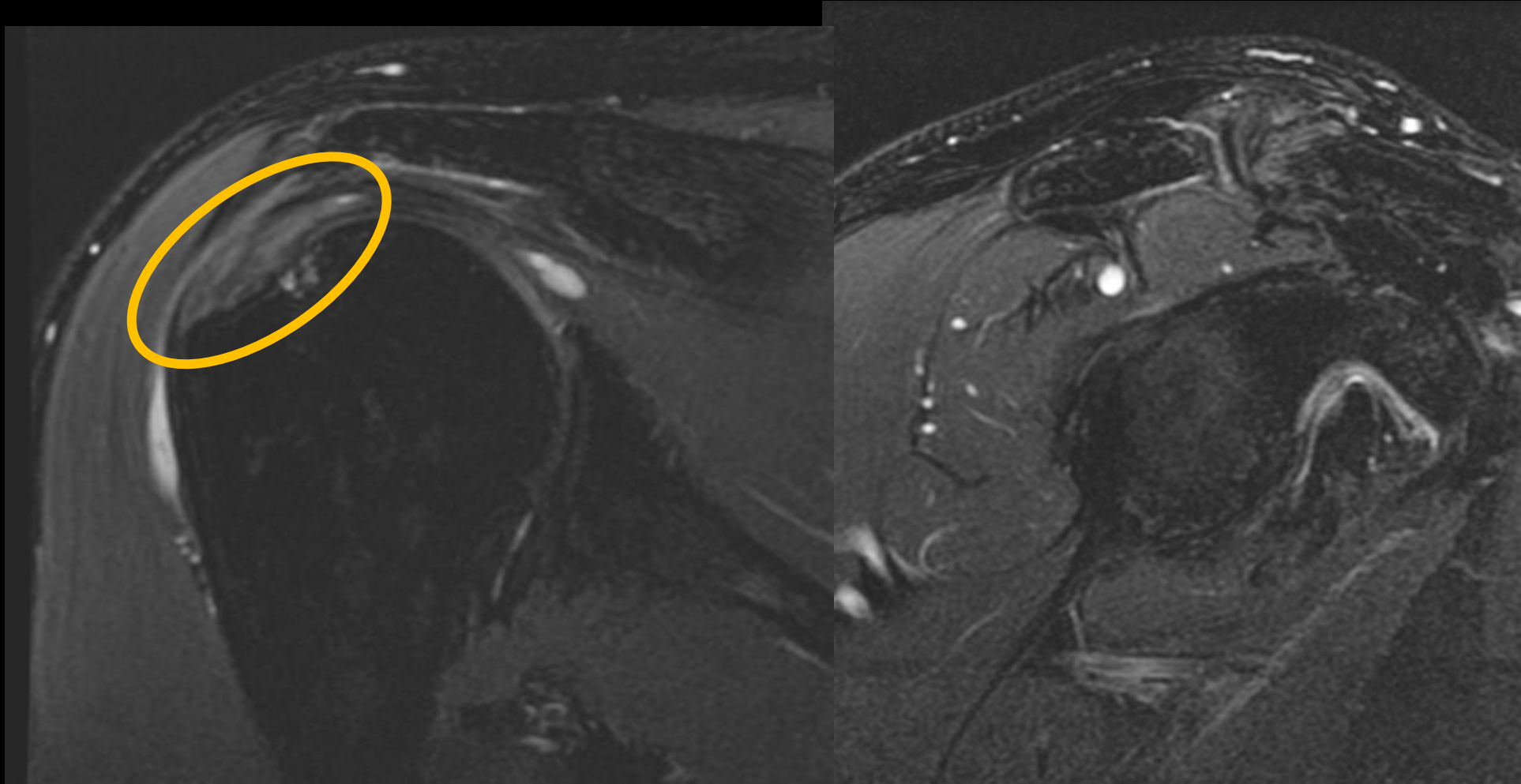


T2 CORONAL

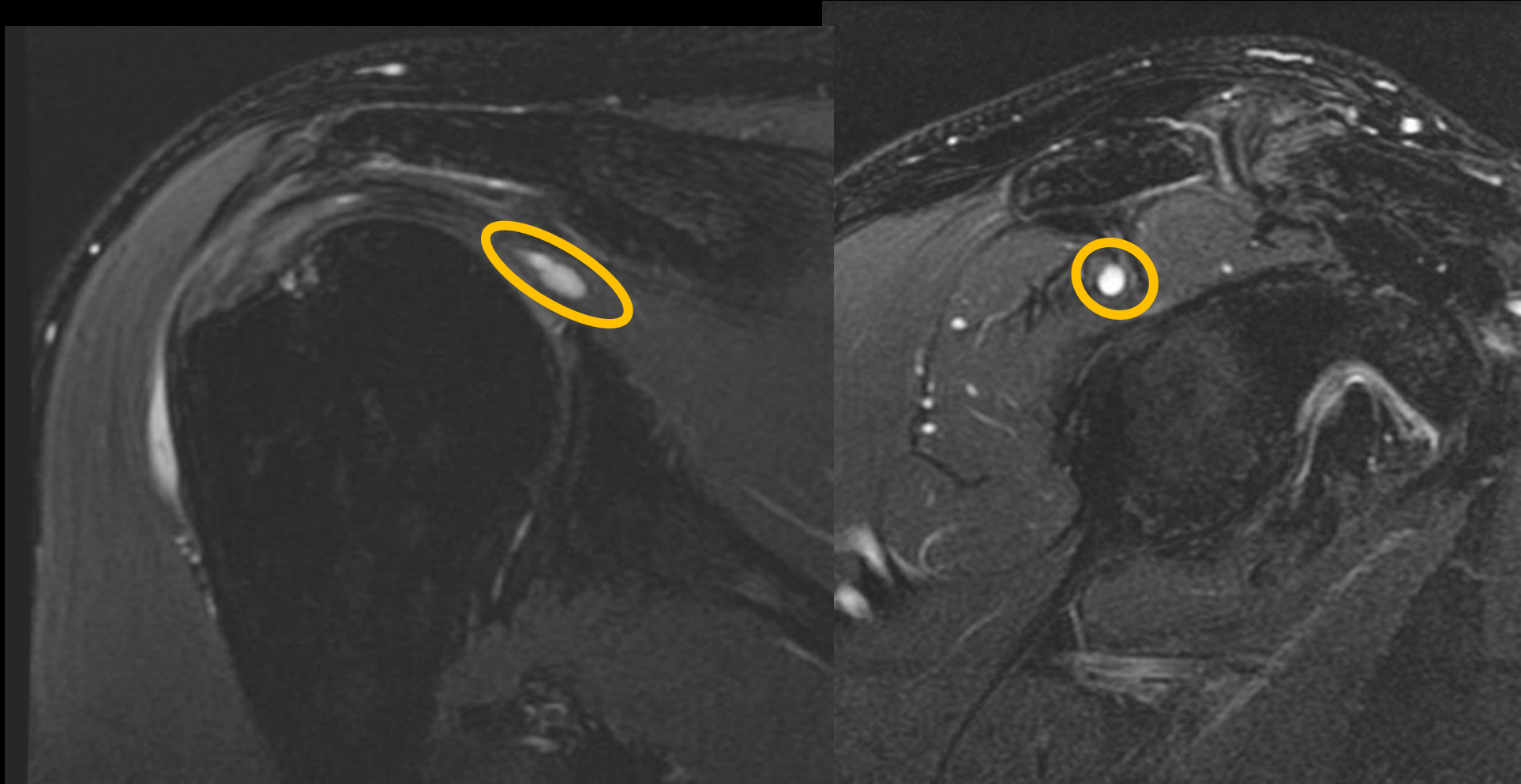
Intratendinous Ganglion/Cyst



Intratendinous Ganglion/Cyst

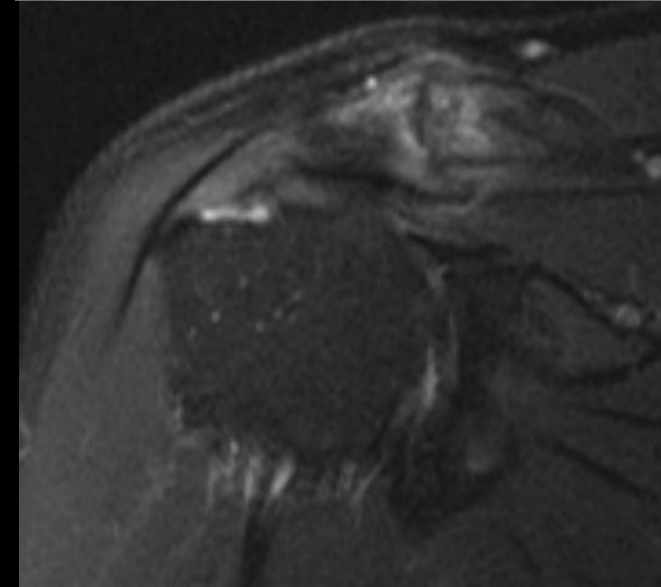
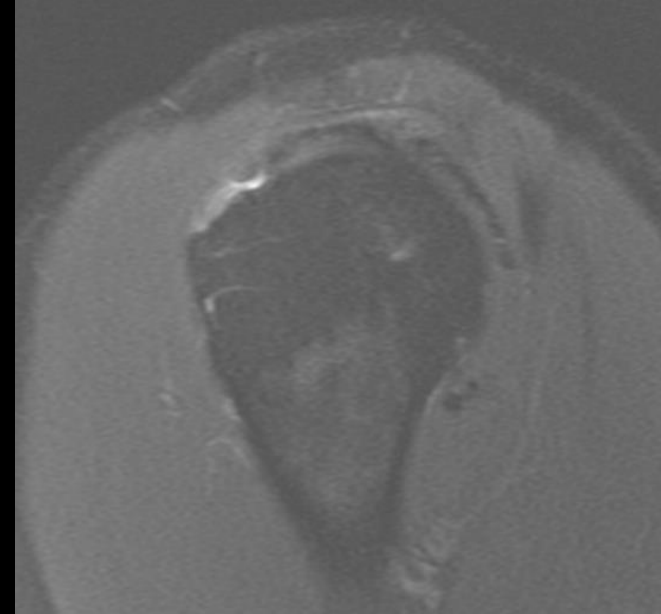


Intratendinous Ganglion/Cyst



RIM RENT TEAR

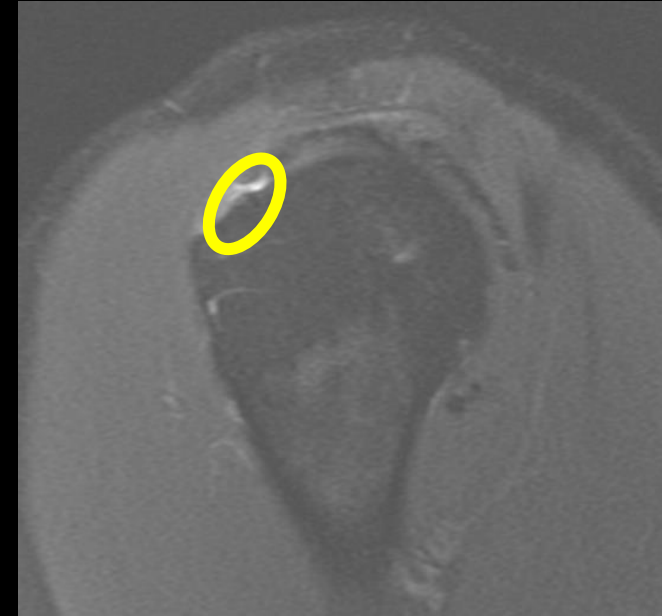
- Seen in young patients
- Usually anterior
- Intrastubstance vs partial undersurface
- PASTA (partial articular side tendon avulsion)/PAINT (posterior articular surface intratendinous tear)



T2

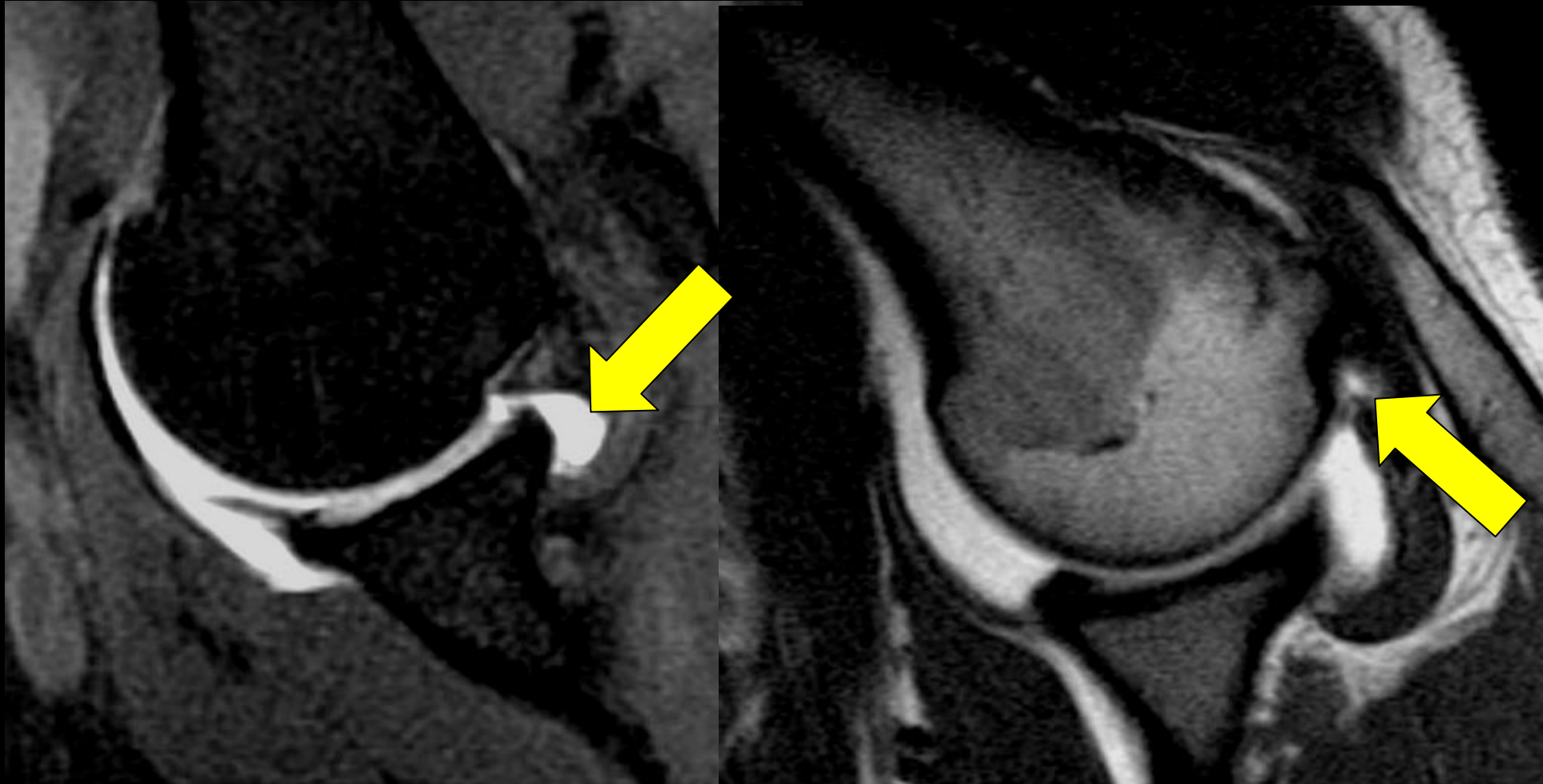
RIM RENT TEAR

- Seen in young patients
- Usually anterior
- Intrastubstance vs partial undersurface
- PASTA (partial articular side tendon avulsion)/PAINT (posterior articular surface intratendinous tear)



T2

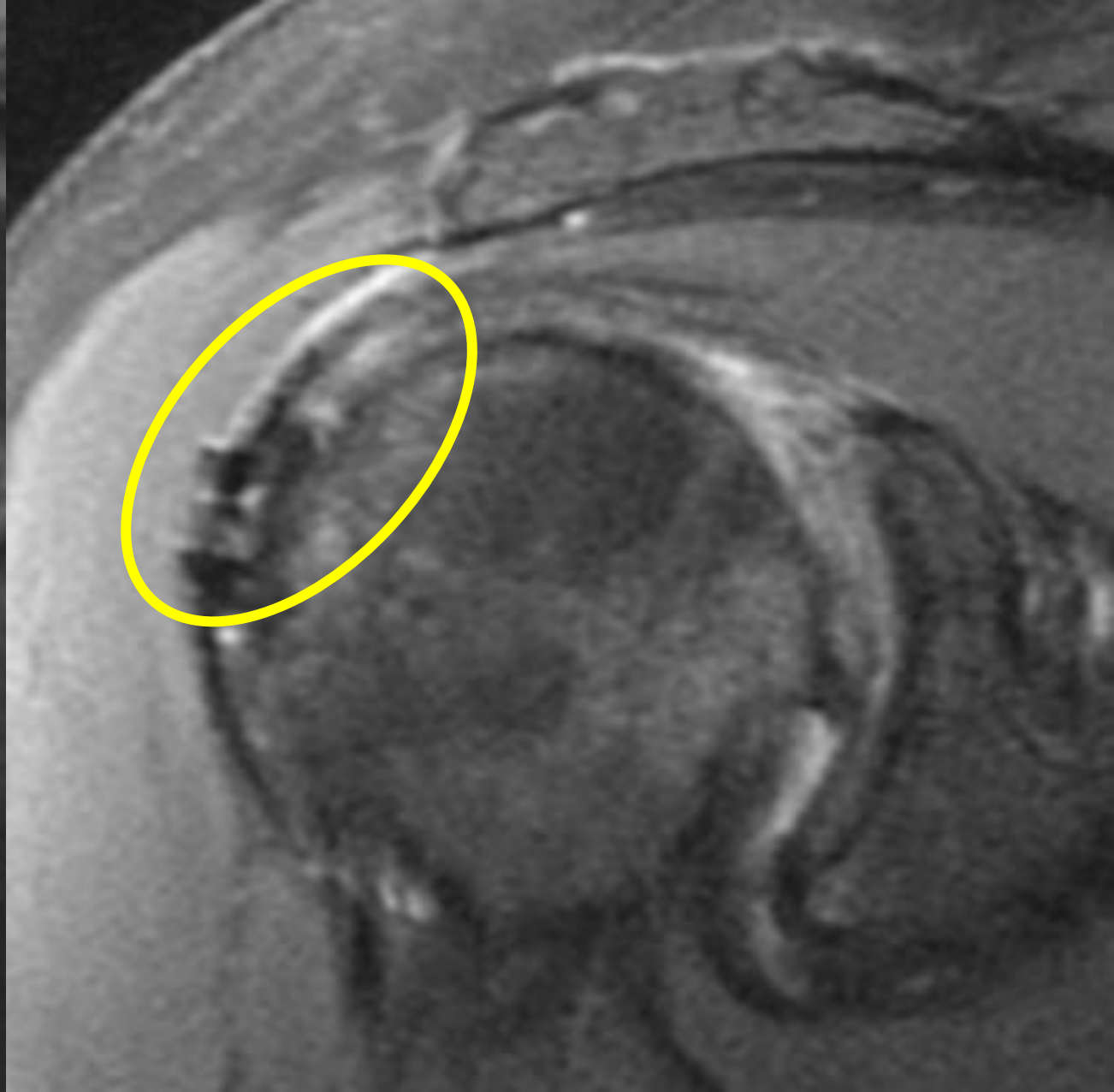
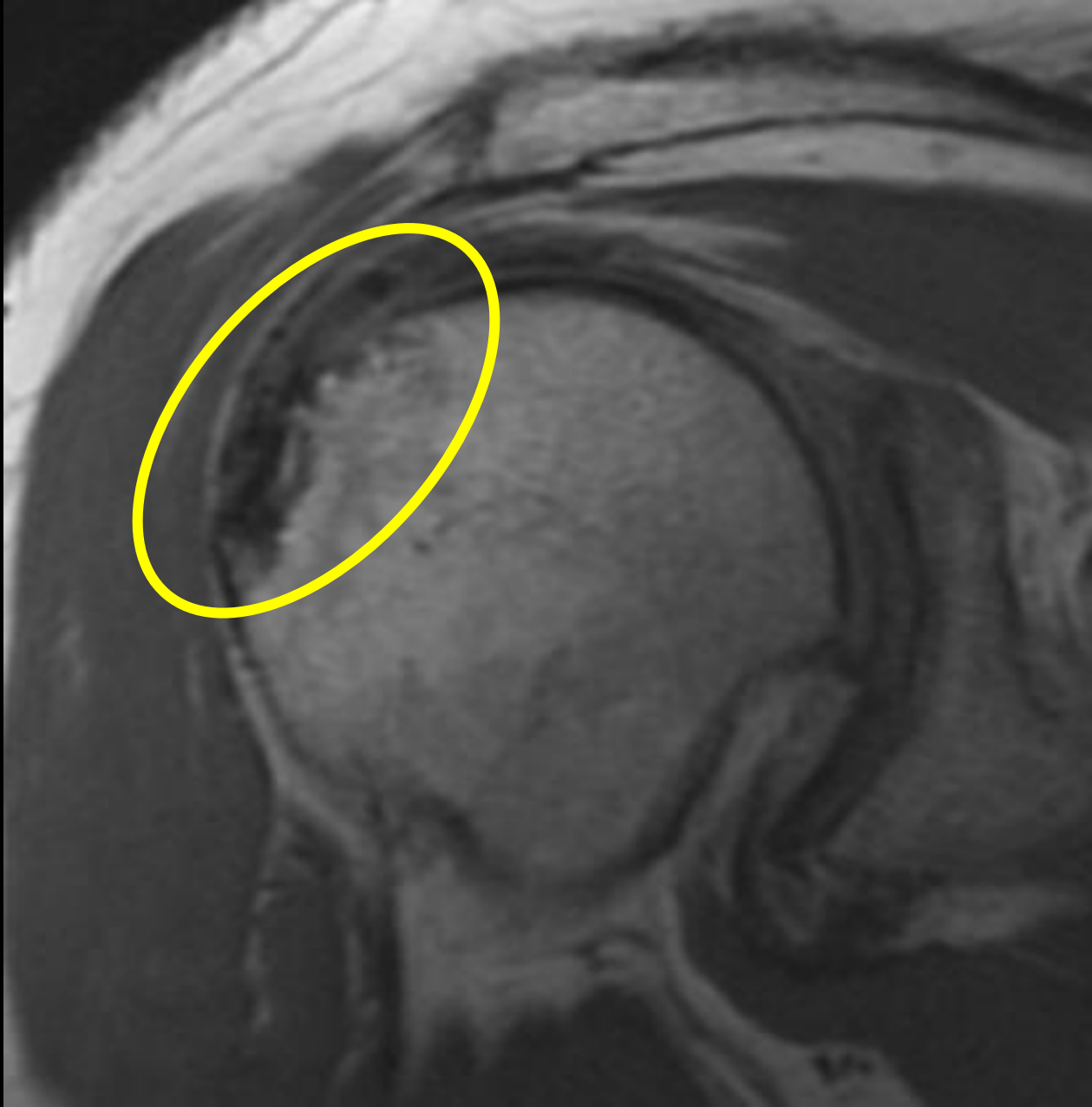
Intrasubstance vs Partial US Value of ABER



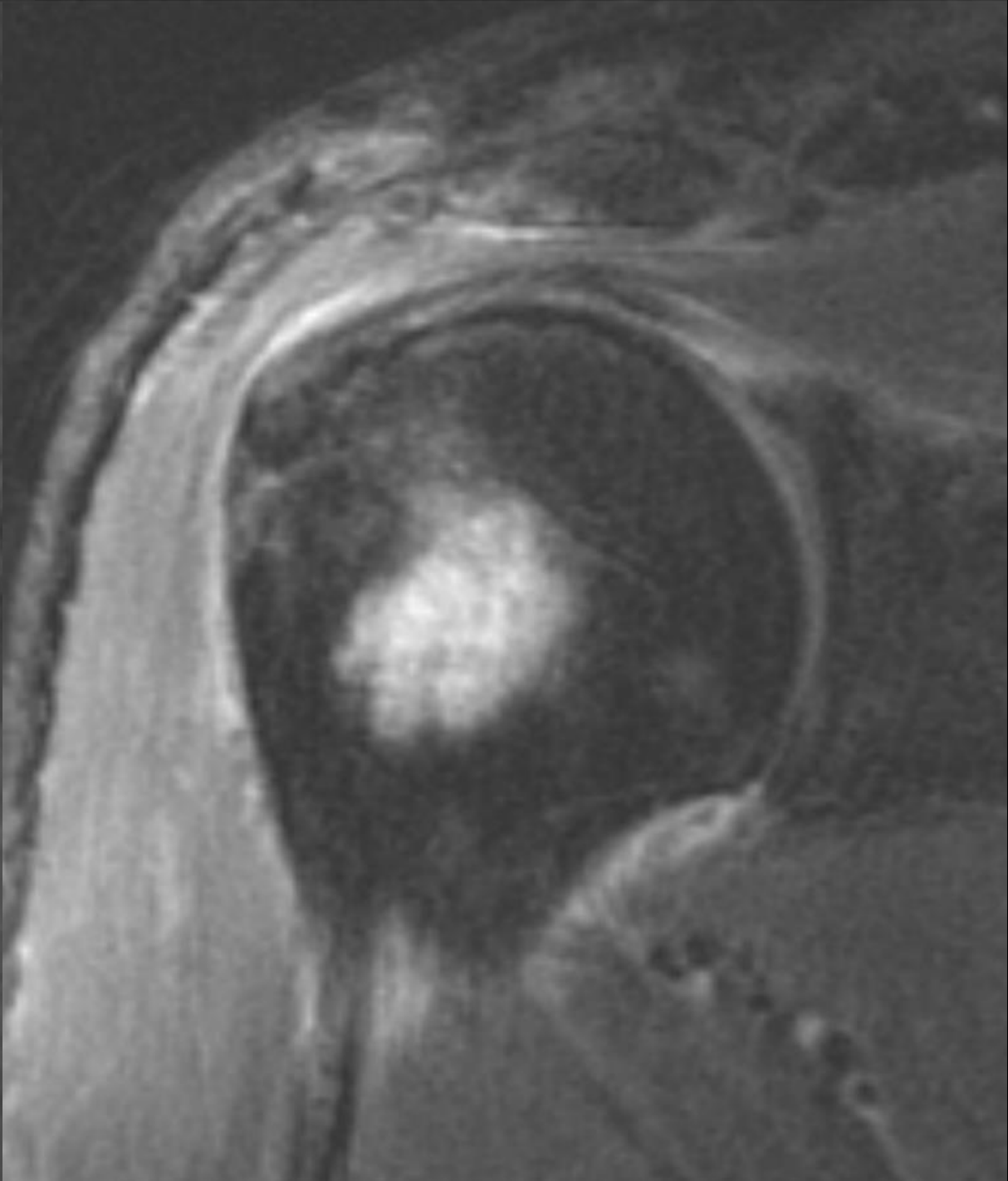
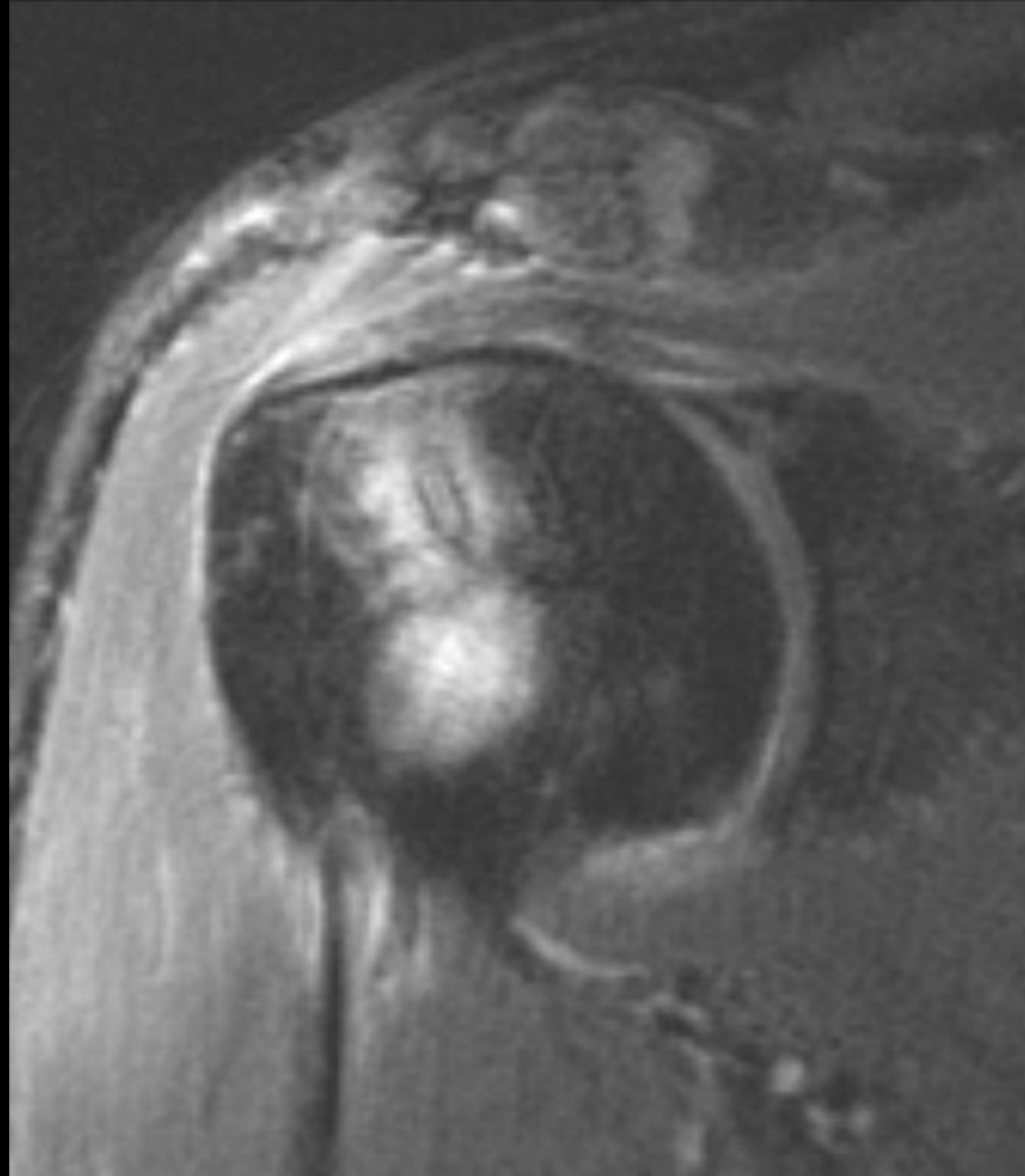
MR ARTHROGRAPHY

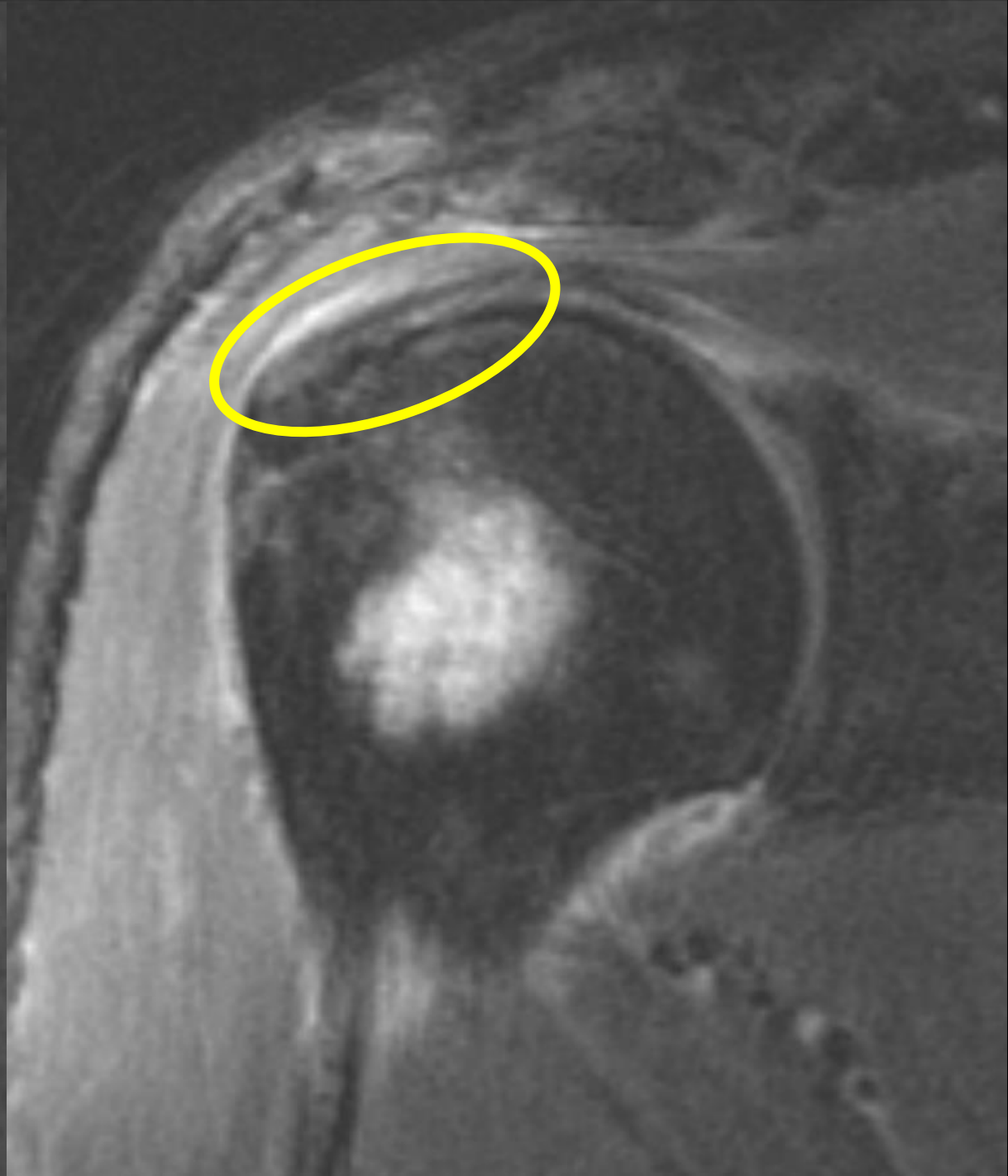
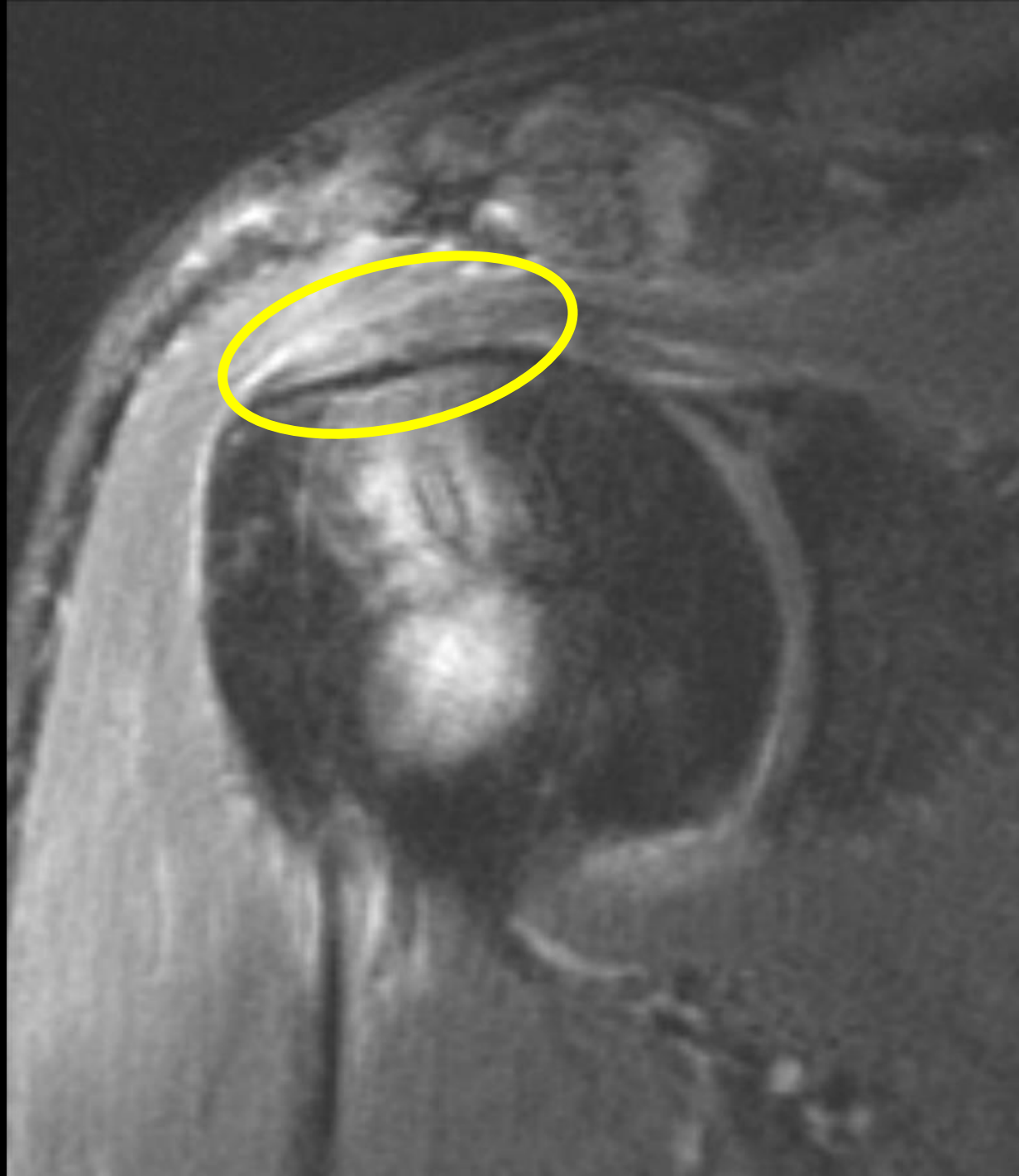
POST-OPERATIVE SHOULDER MR IMAGING

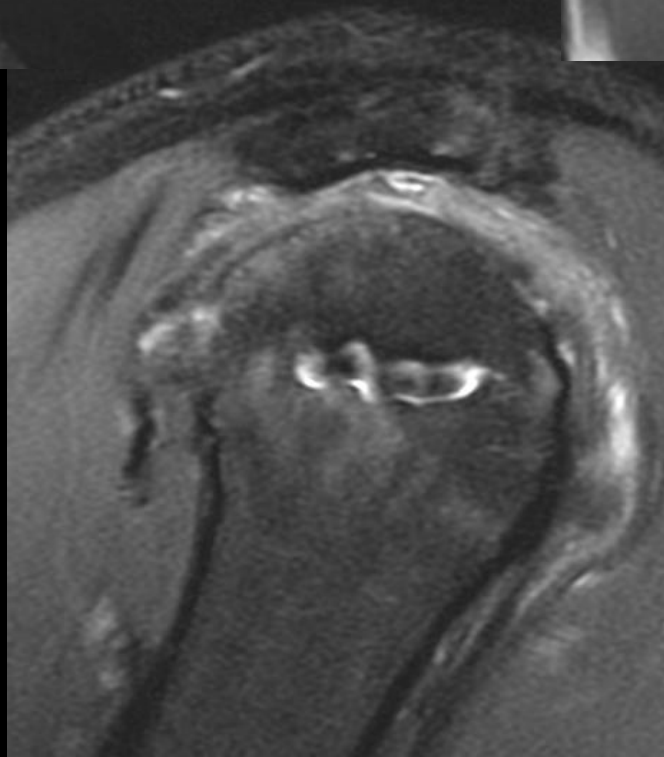
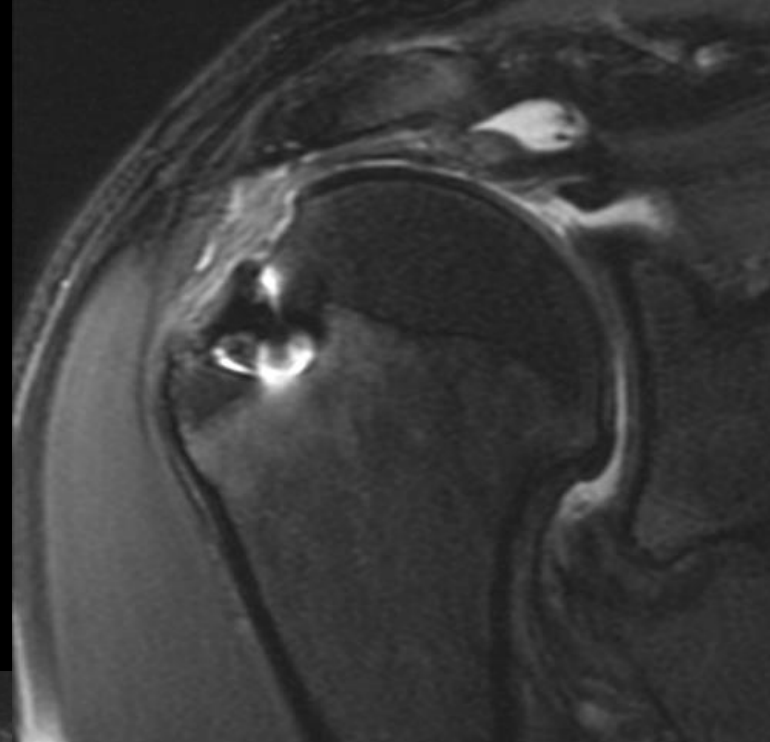
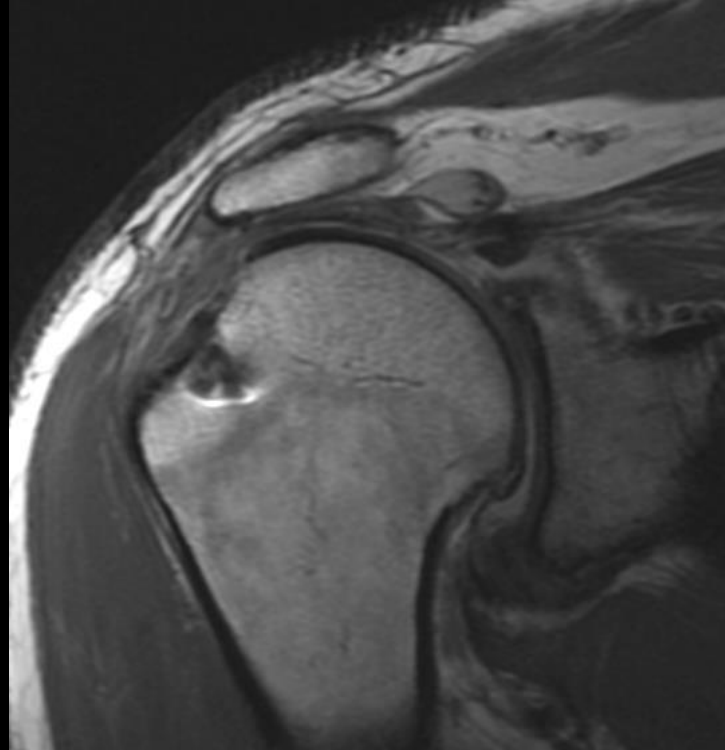
- Metal artifact decreased with STIR and increased bandwidth
- Surgical repair does not create a watertight seal
- Full thickness retear discontinuity with high signal/gad (arthrogram) particularly if $>10\text{mm}$
- Partial thickness tear fluid/gad (arthro)
- Other complications: deltoid tear/dehiscence, osteonecrosis (AVN), anchor displacement

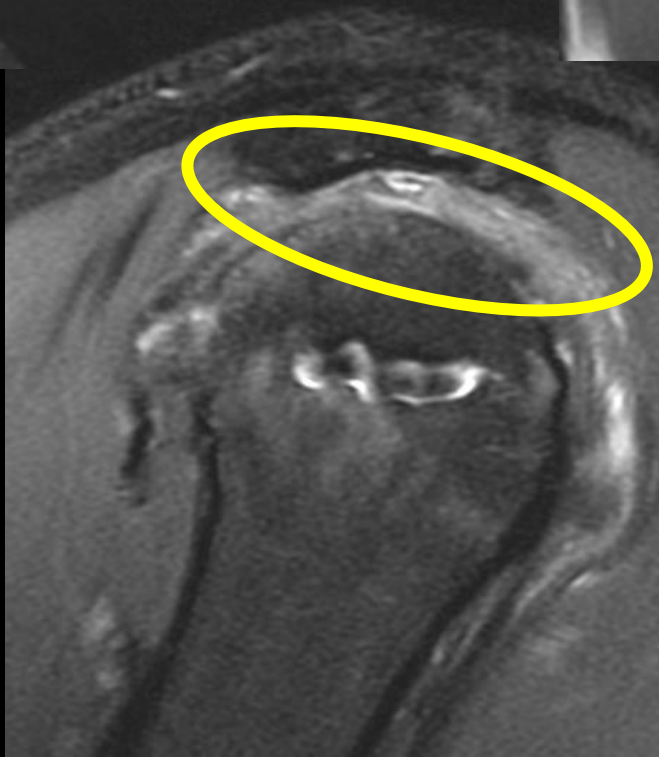
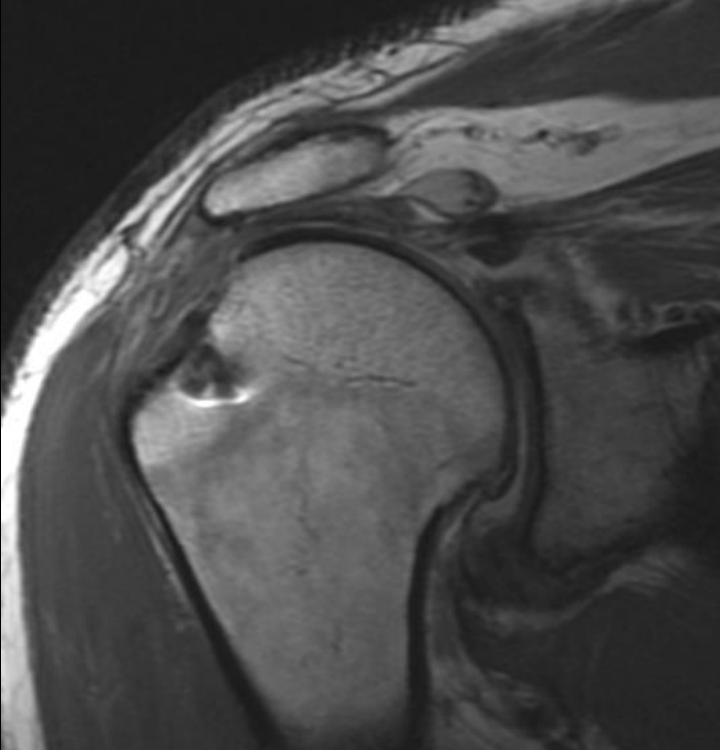


Normal post-operative rotator cuff

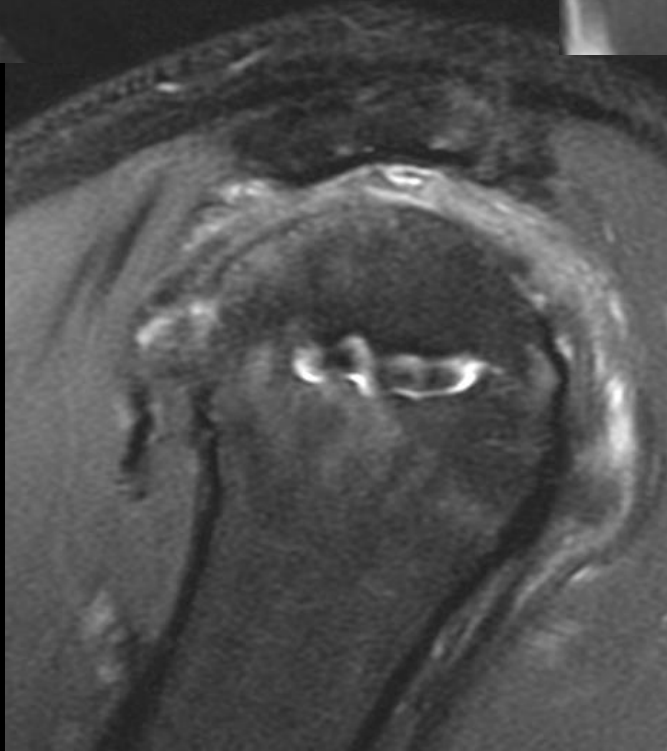
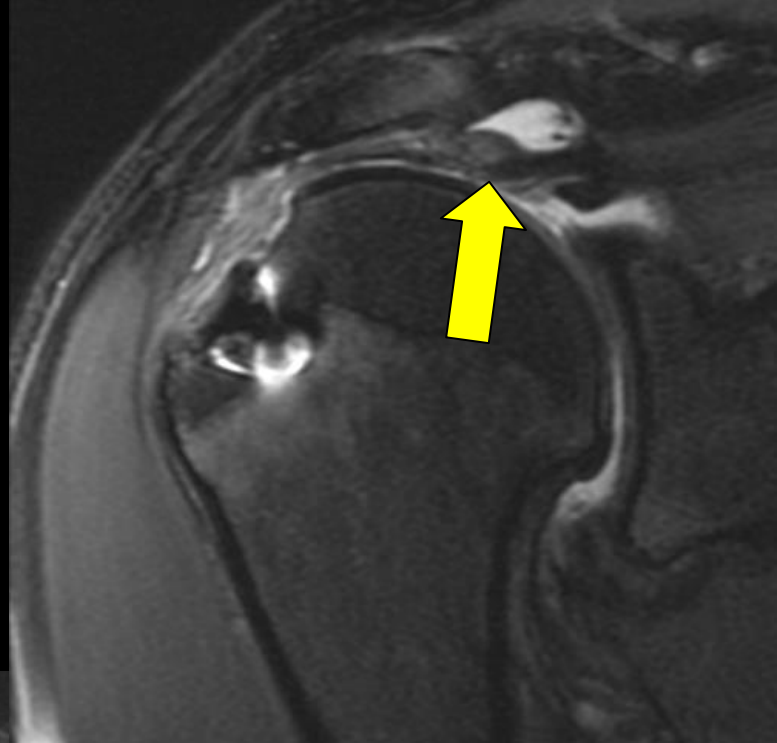
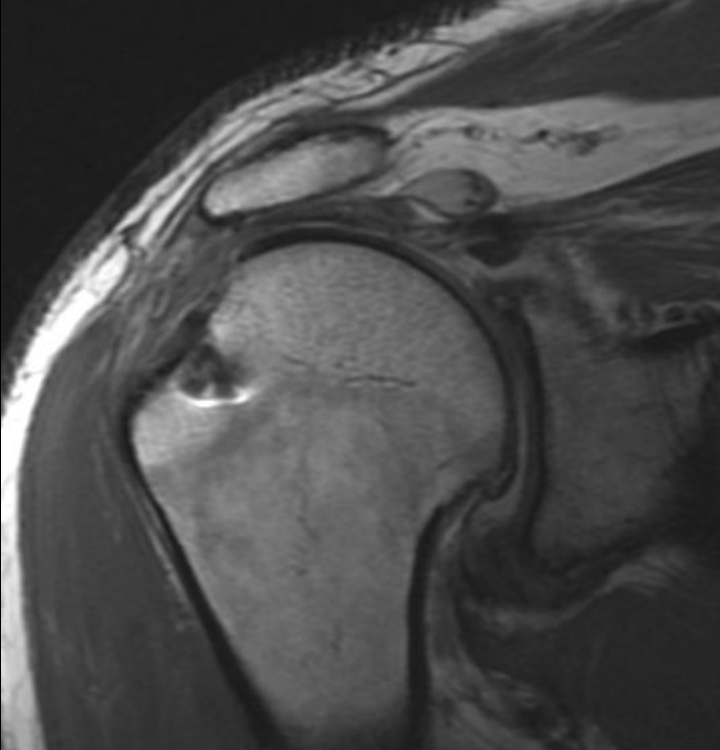


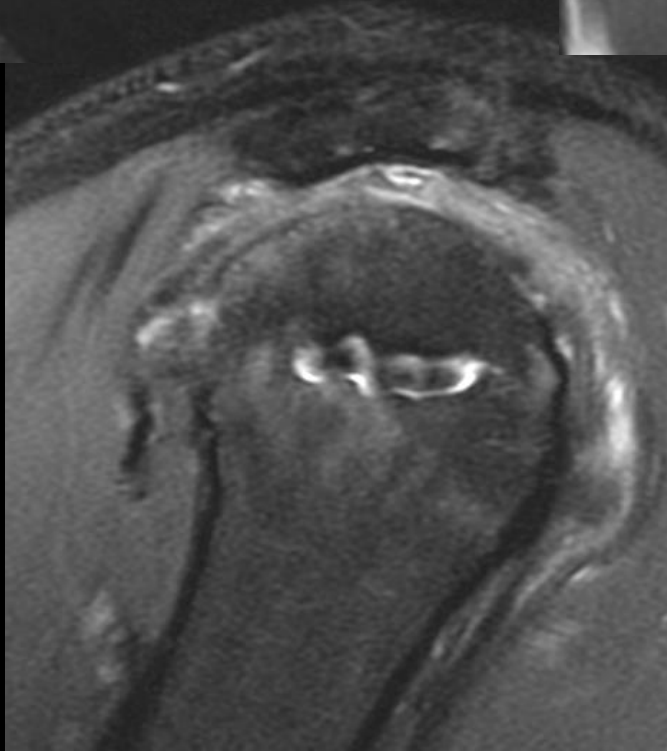
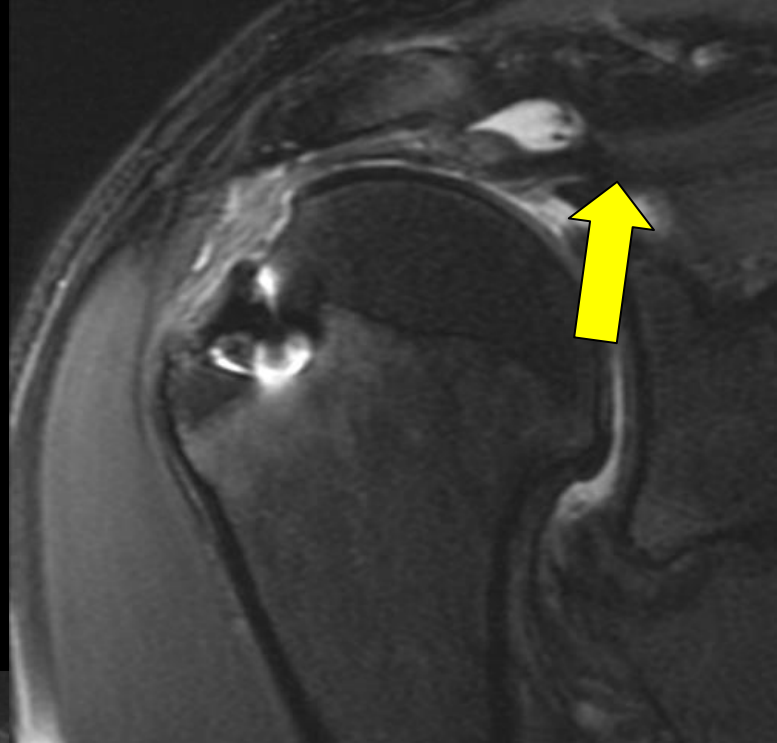
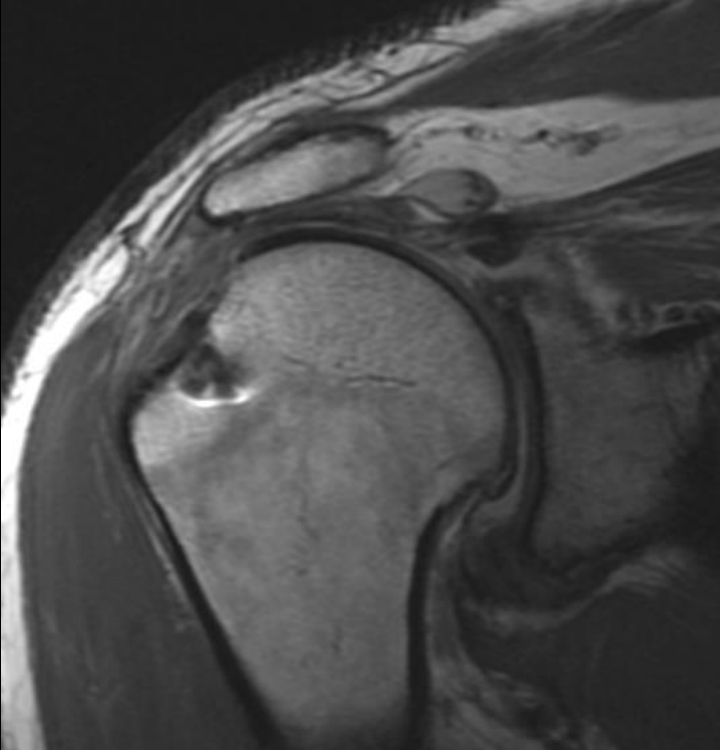


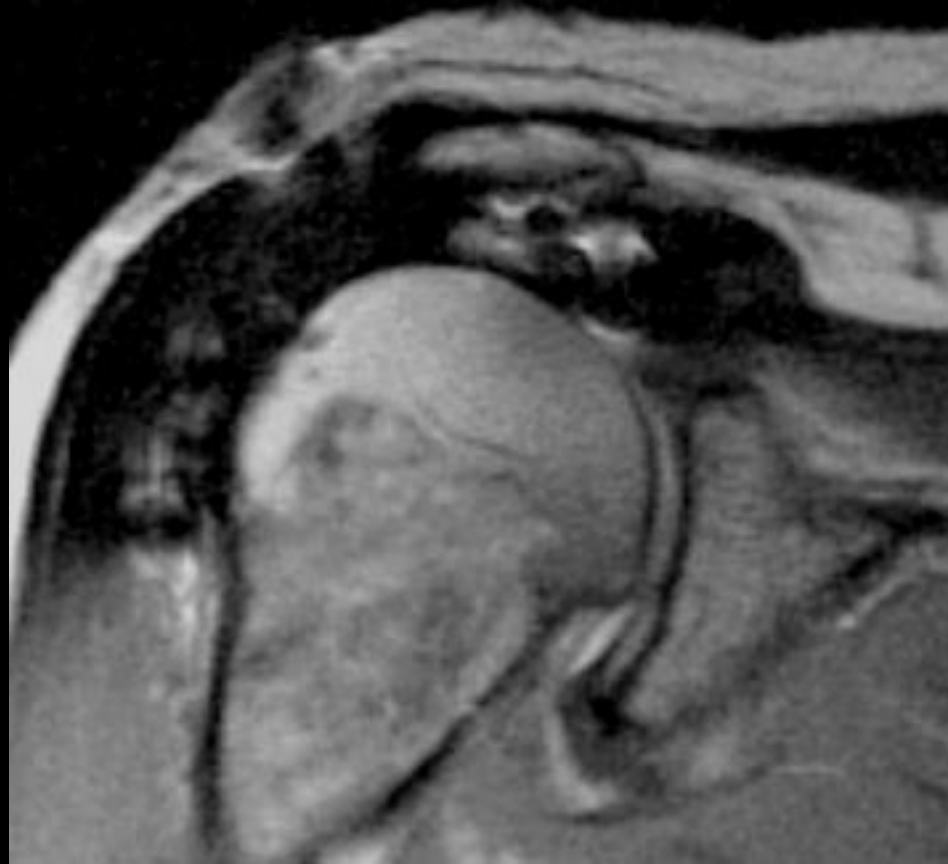




Post-operative
rotator cuff re-tear



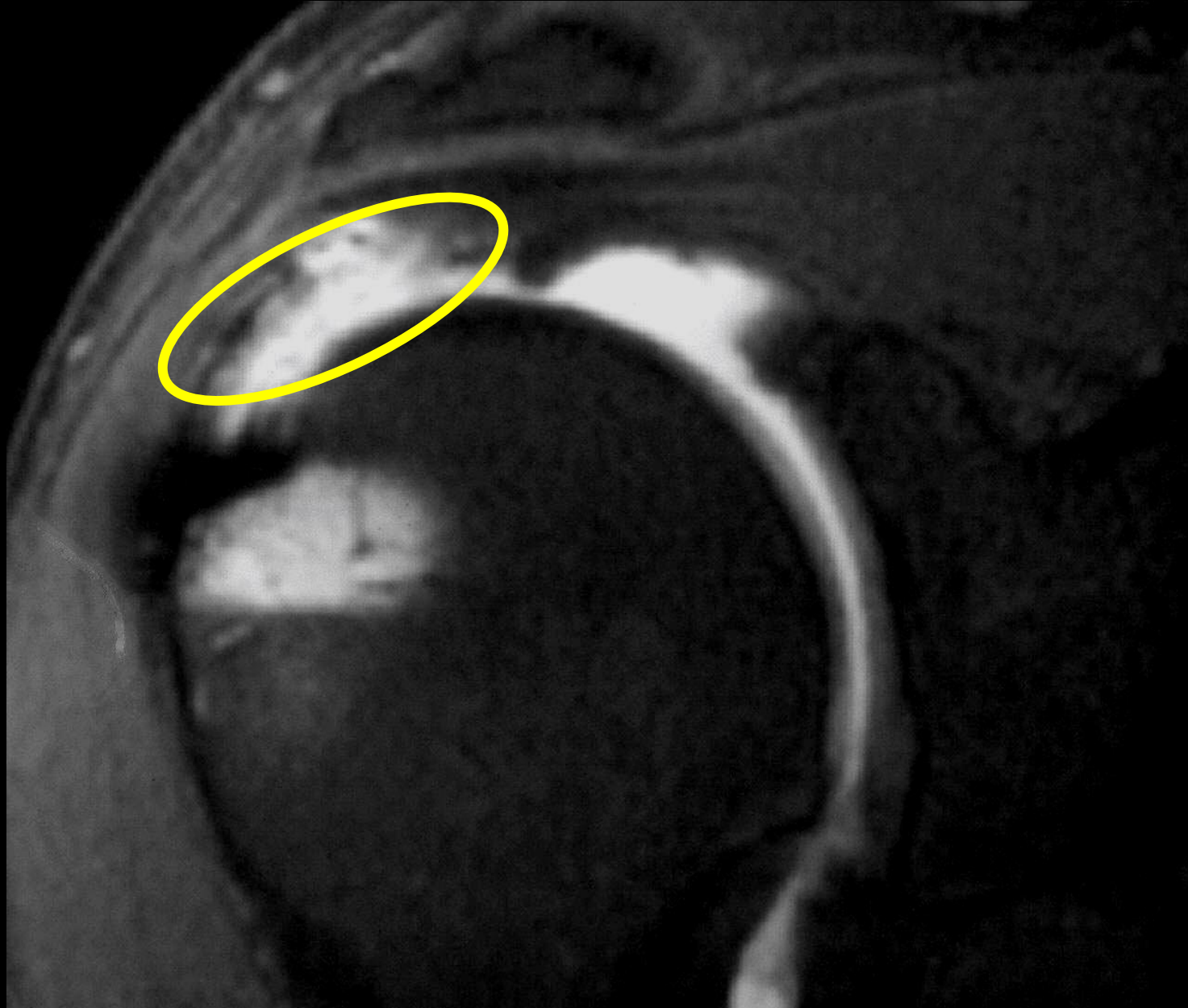




Recurrent Partial RCT



Recurrent Partial RCT



Recurrent Partial RCT

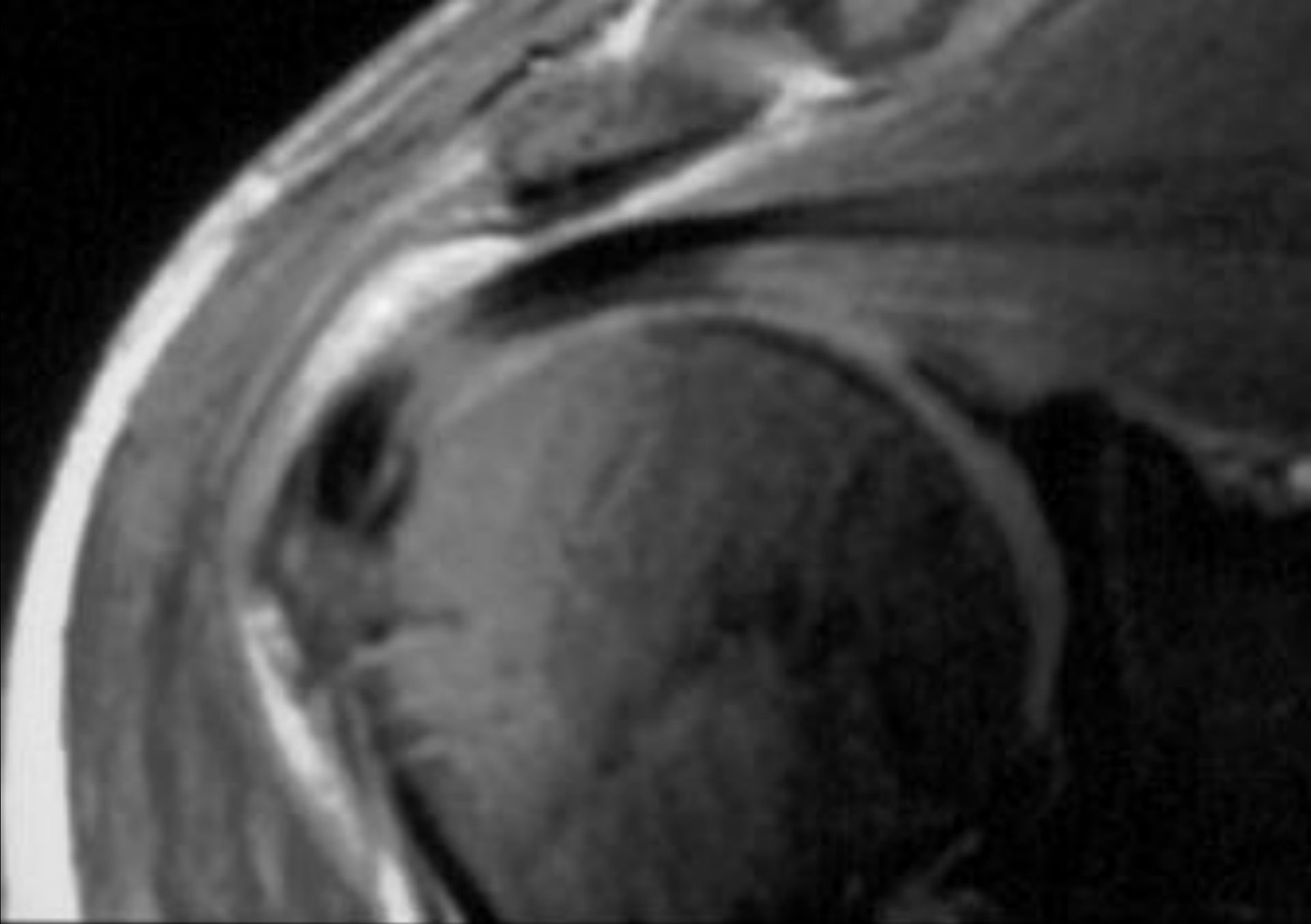


ABNORMALITIES THAT CAN MIMIC ROTATOR CUFF TEAR

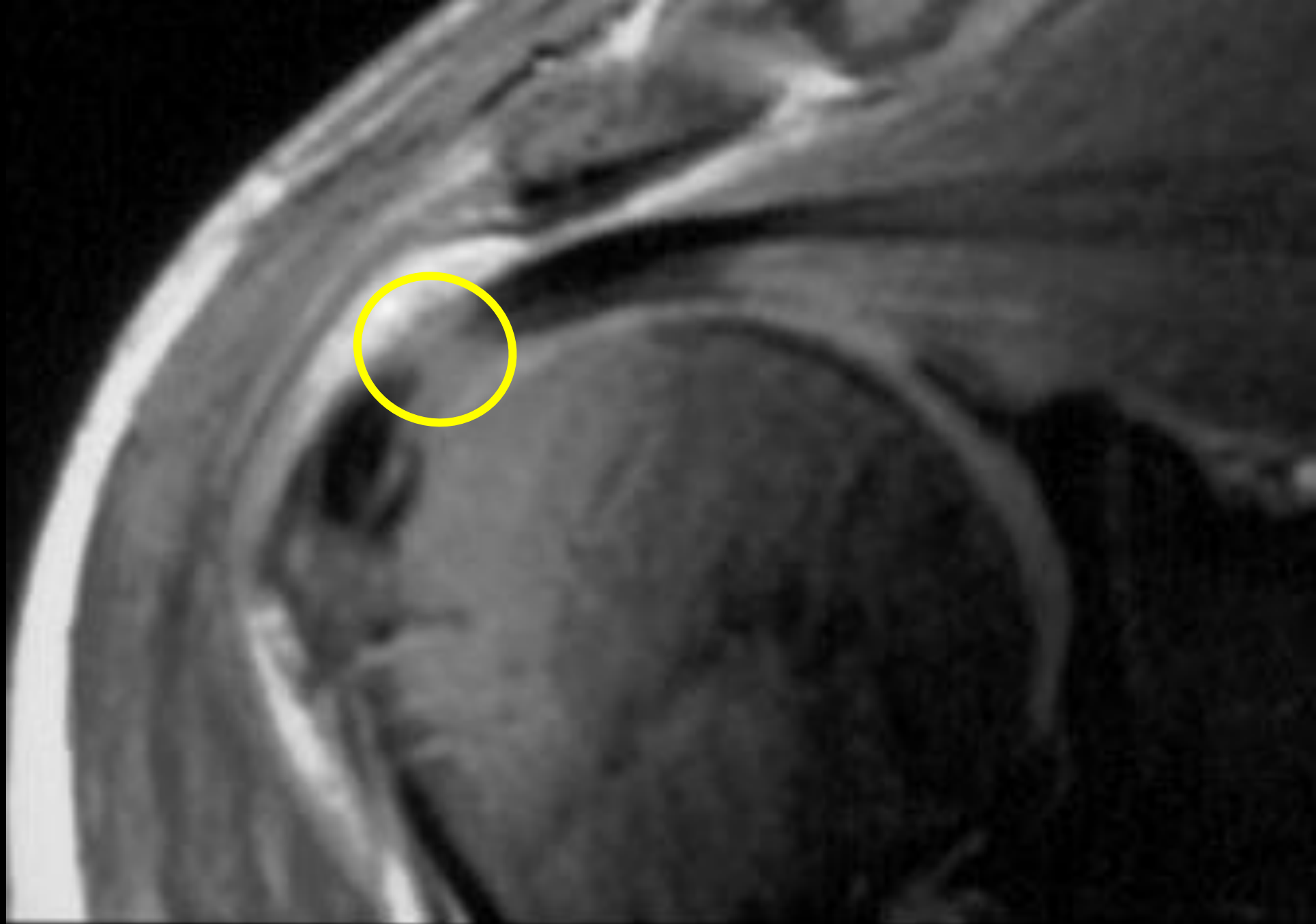
- Tendinosis/Magic angle
- Calcific tendonitis
- Adhesive capsulitis
- Subacromial bursitis

INCREASED TENDON SIGNAL SHORT TE SEQUENCES

- Magic angle
- Connective tissue between fascicles
- Tendon overlap (internal rotation)
- Degeneration (tendinosis)
- Tear
- Partial volume
- Injection



PD CORONAL

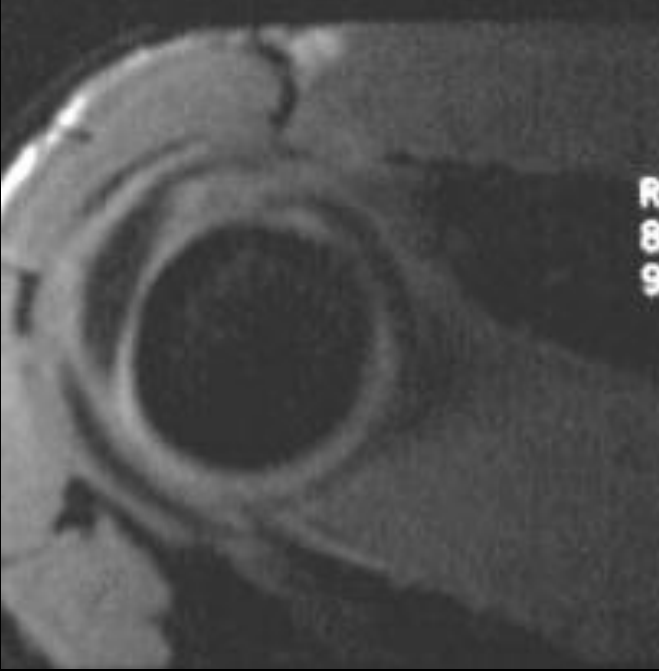


PD CORONAL

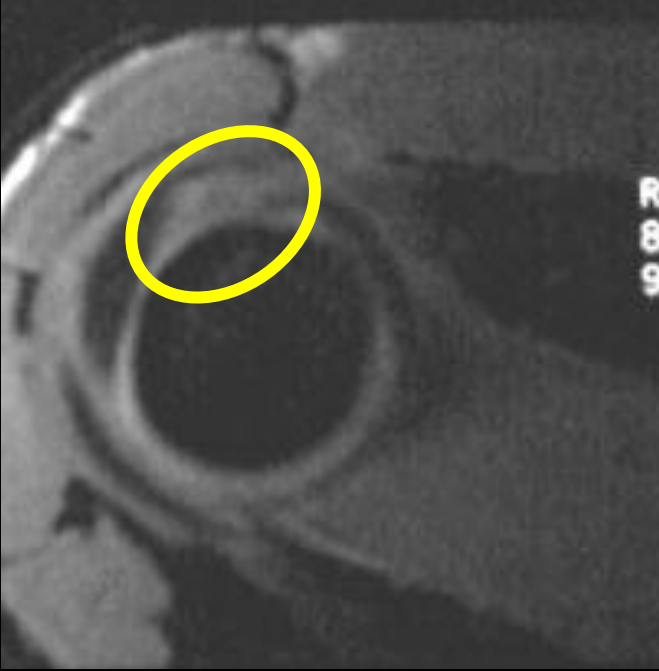


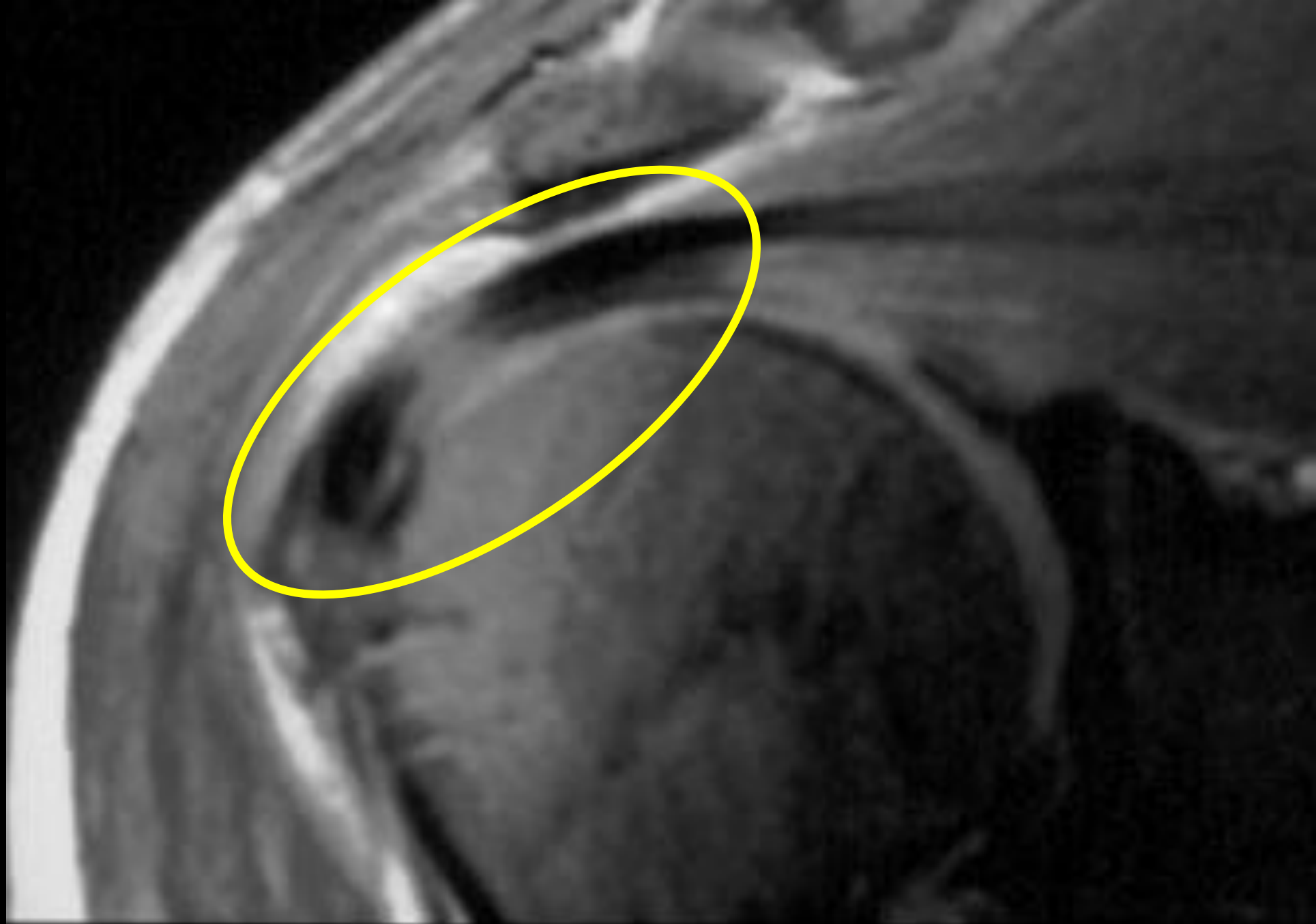


TENDON OVERLAP



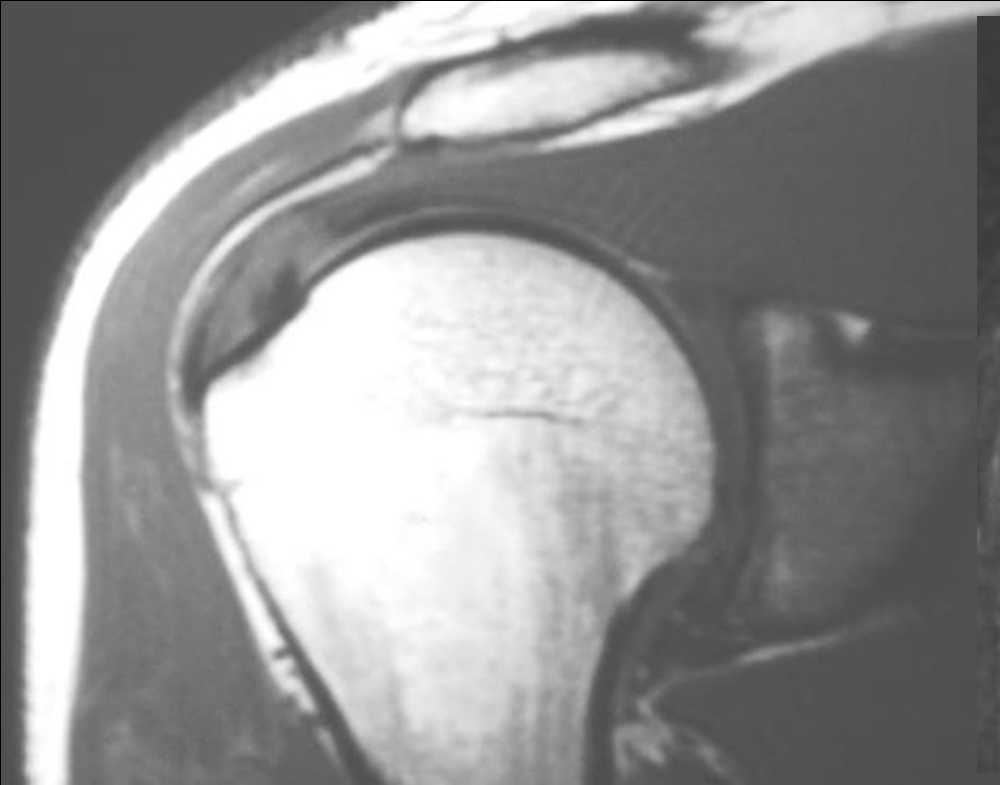
TENDON OVERLAP



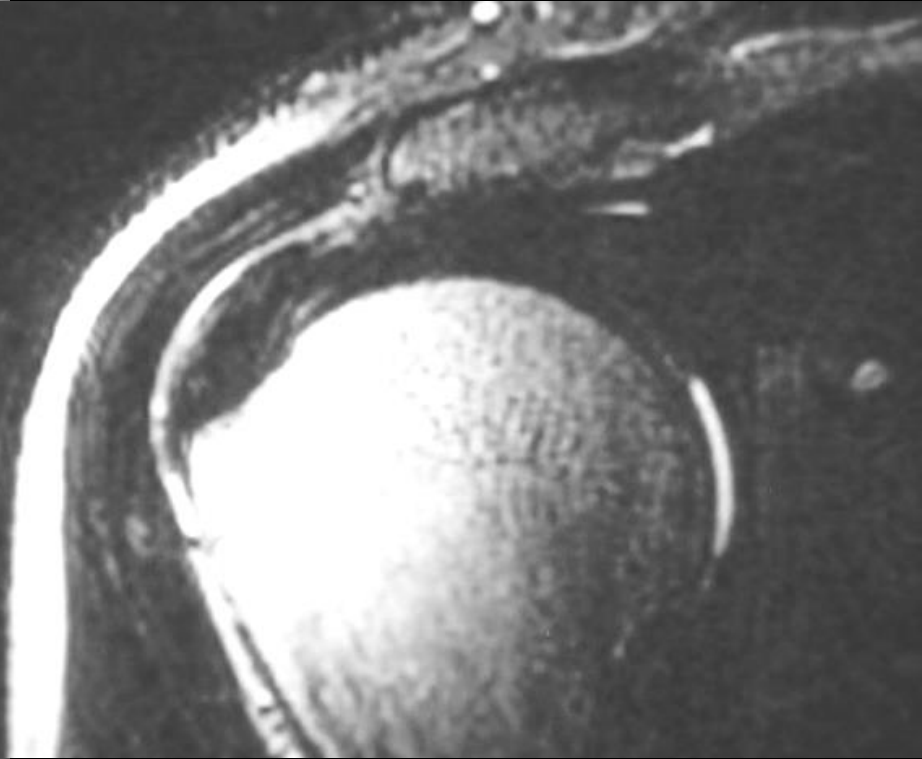


PD CORONAL

TENDINOSIS

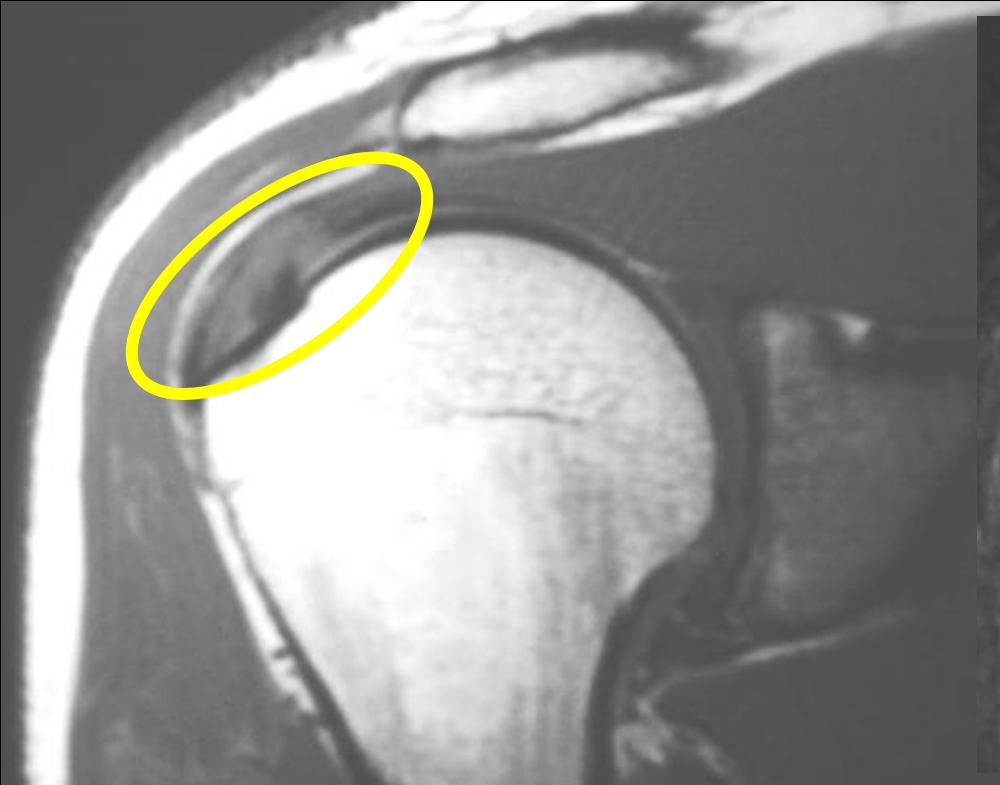


PD CORONAL

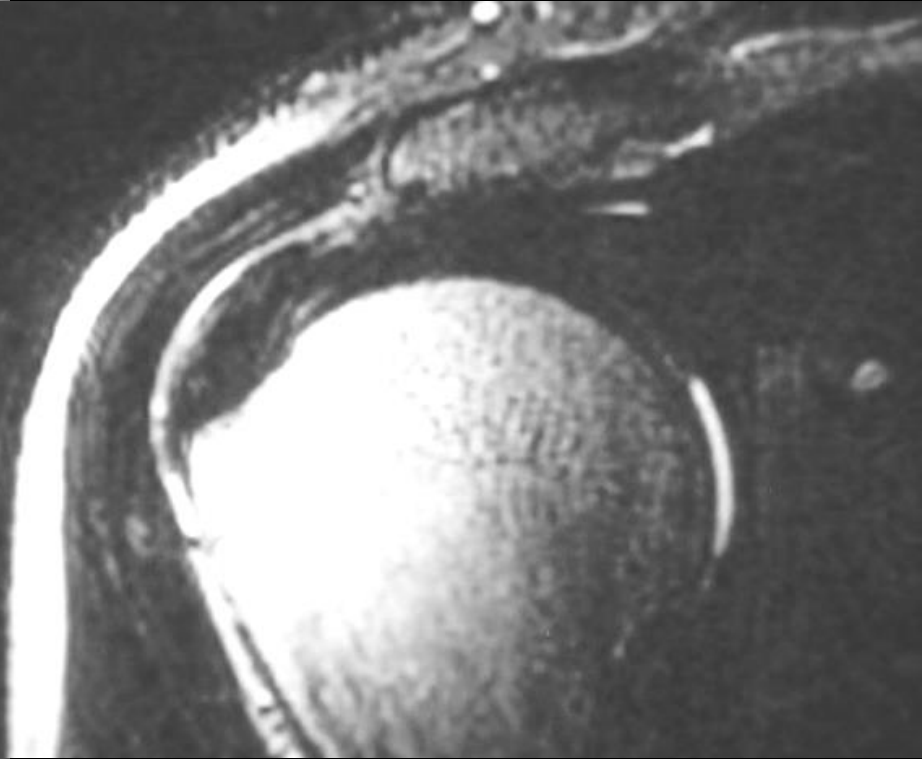


T2 CORONAL

TENDINOSIS

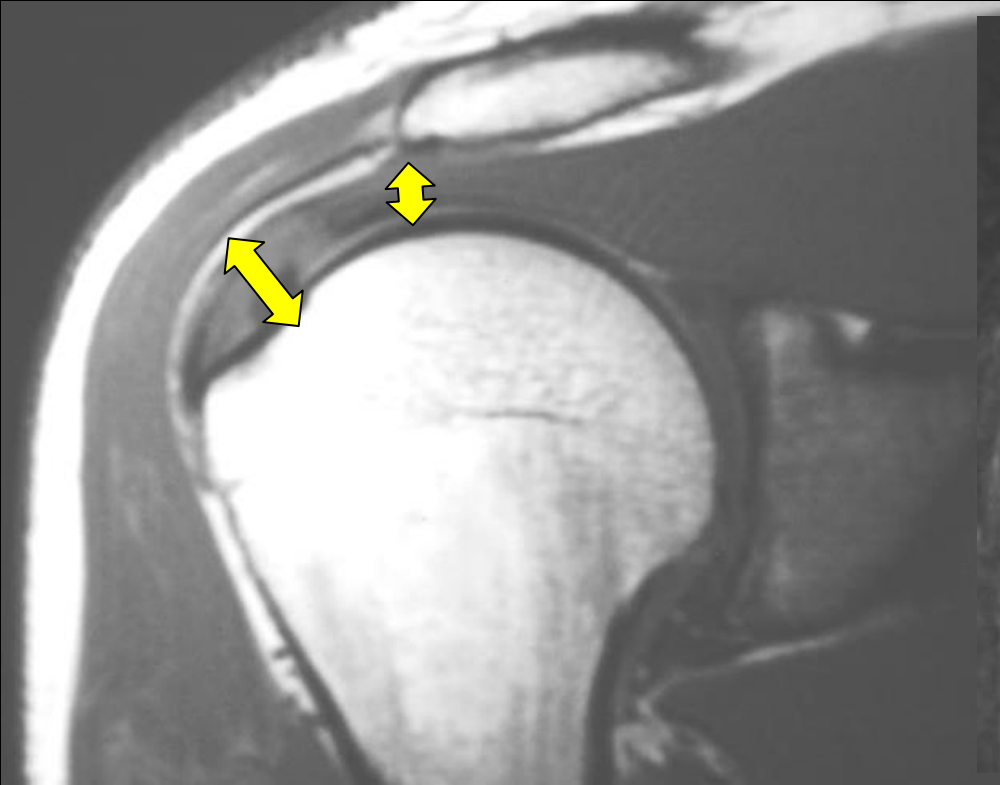


PD CORONAL

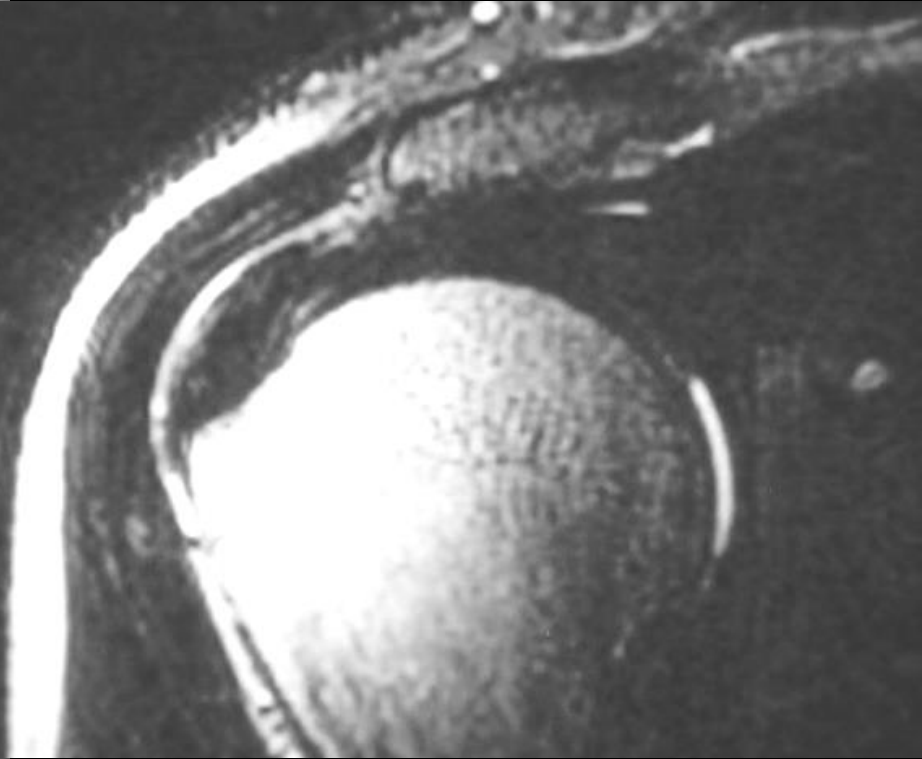


T2 CORONAL

TENDINOSIS

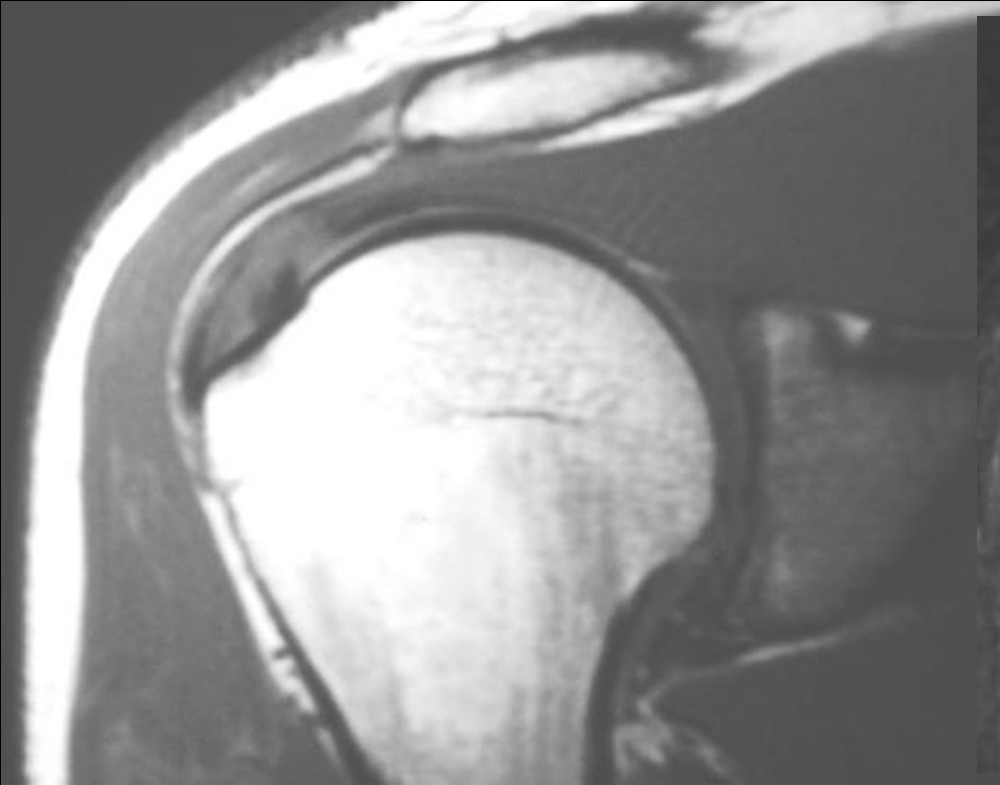


PD CORONAL

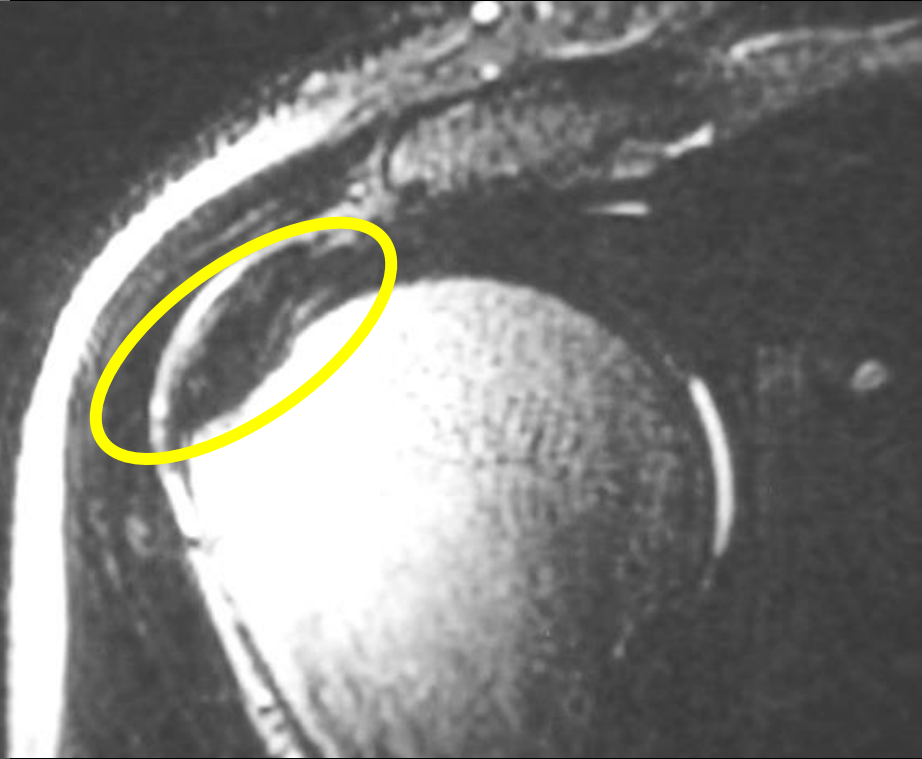


T2 CORONAL

TENDINOSIS



PD CORONAL



T2 CORONAL

Short TE	Long TE	Pathology
Grey	Black	Tendon Overlap Magic Angle No Morphologic Abnormality
Grey	Grey	Tendinopathy Morphologic Abnormality Partial tear
Grey	White	Tear

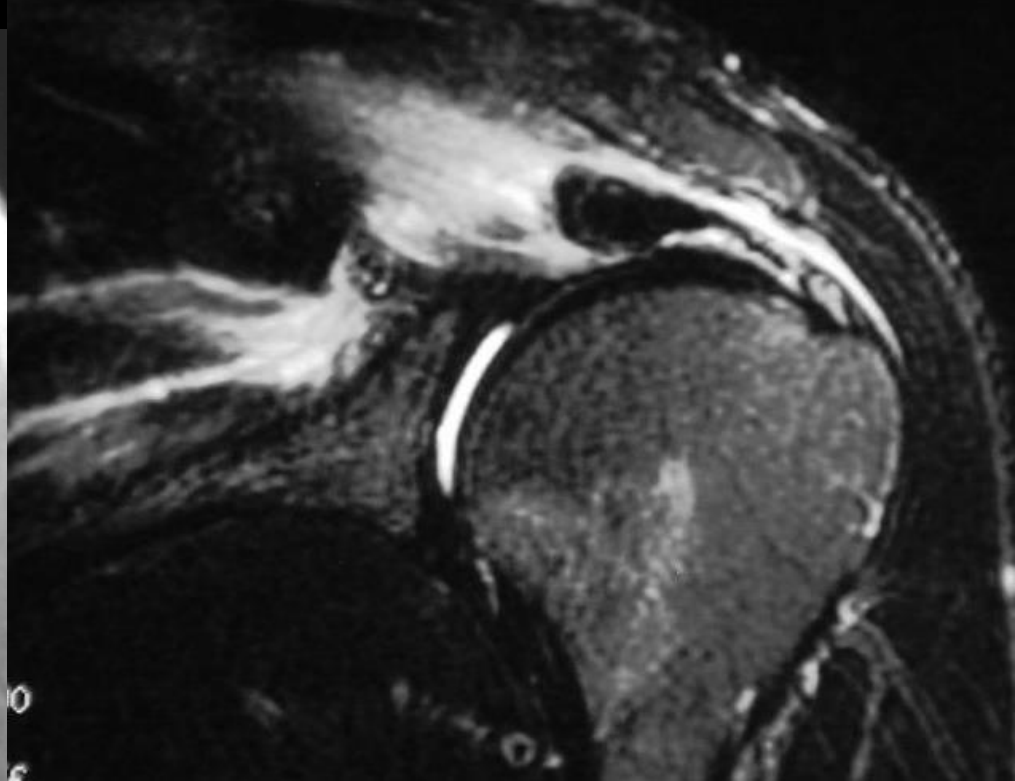
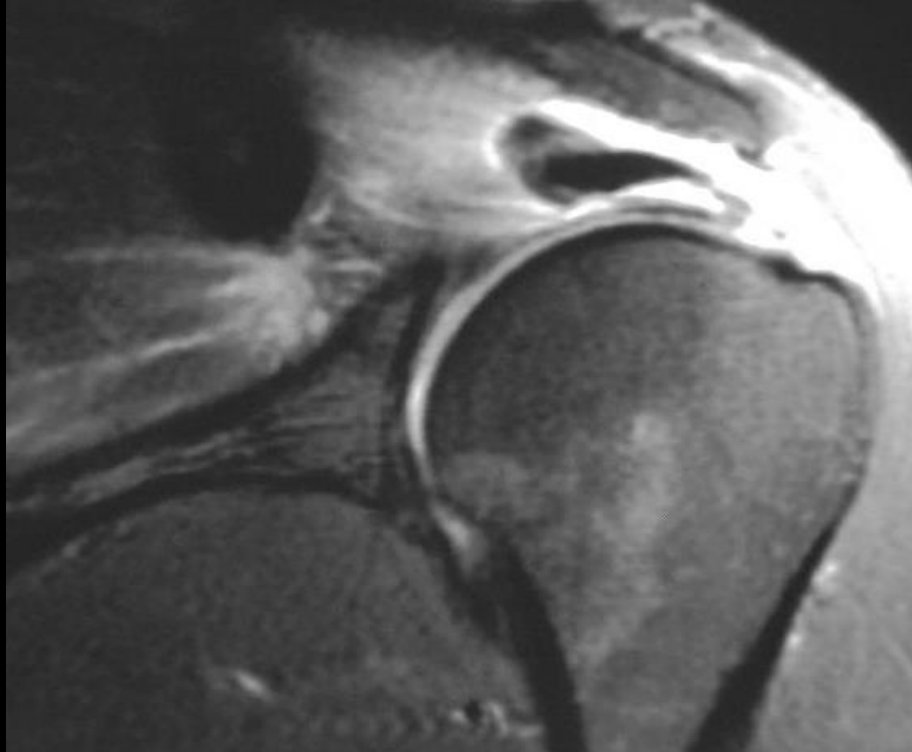
ABNORMALITIES THAT CAN MIMIC ROTATOR CUFF TEAR

- Tendinosis/Magic angle
- Calcific tendonitis
- Adhesive capsulitis
- Subacromial bursitis

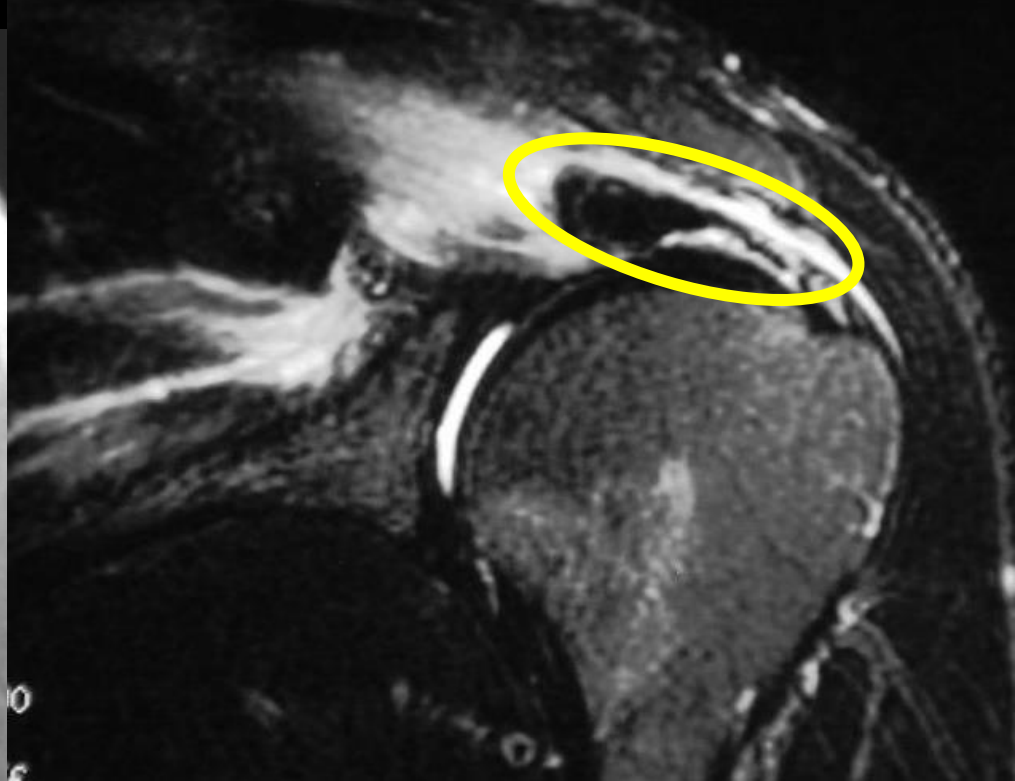
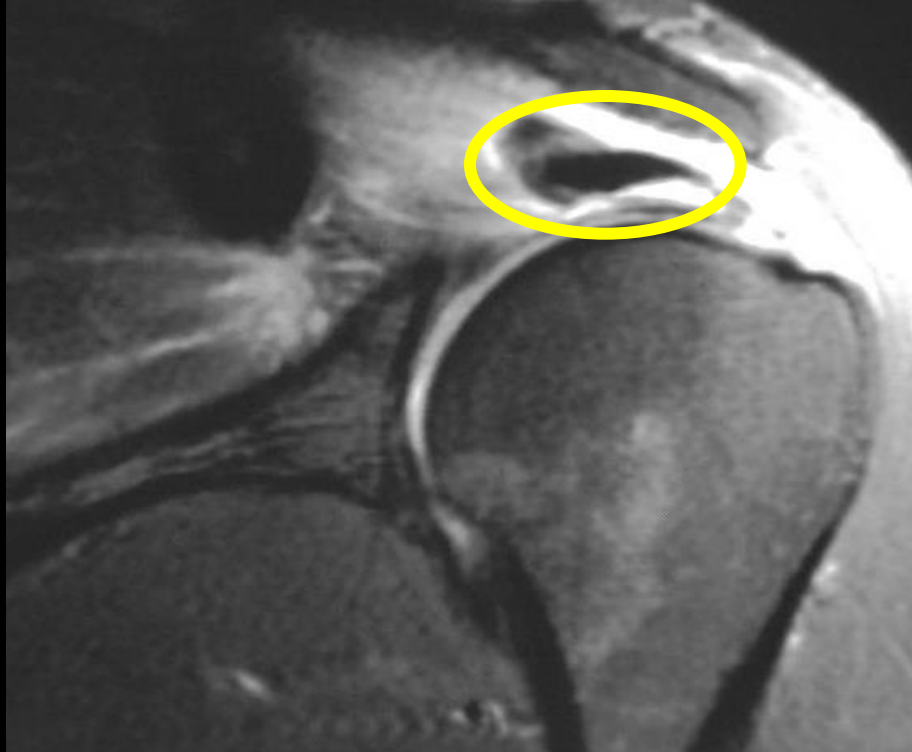
CALCIFIC TENDINITIS

- Rotator cuff most common site
- Tendinopathy
- Primary or secondary disorder?
- Calcium hydroxyapatite deposition in tendon
- Concretion - low T1 and T2 but best seen on GRE sequences
- Most common supraspinatus (95%)
- Variable surrounding edema
- May erode cortex/ invade marrow

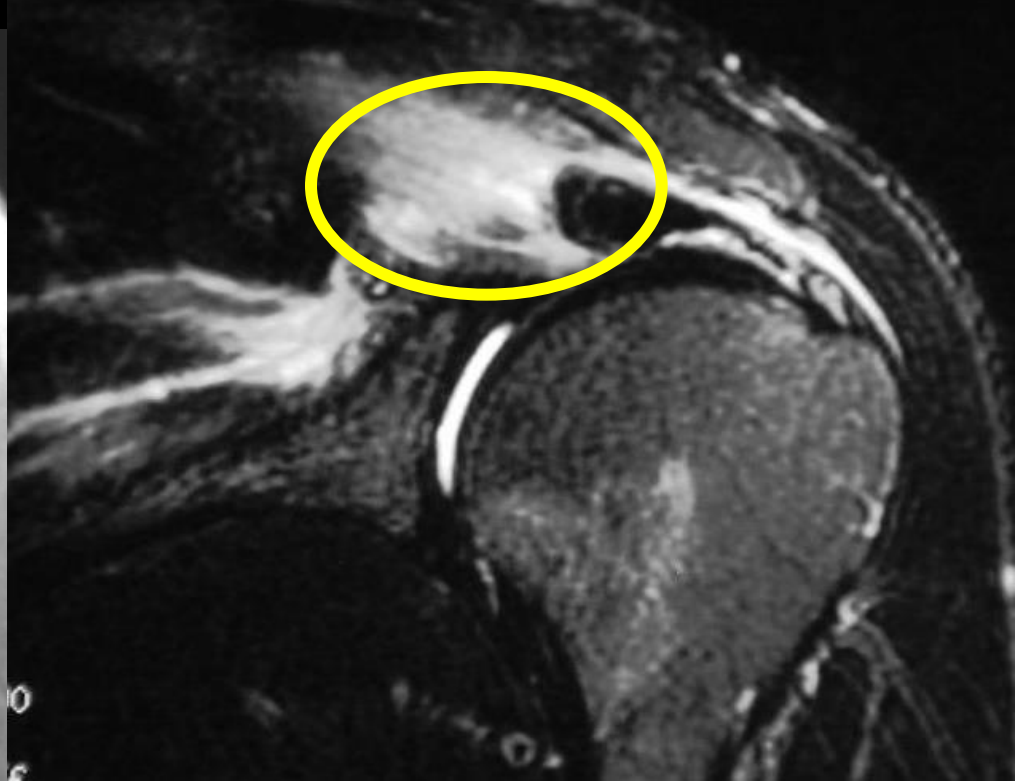
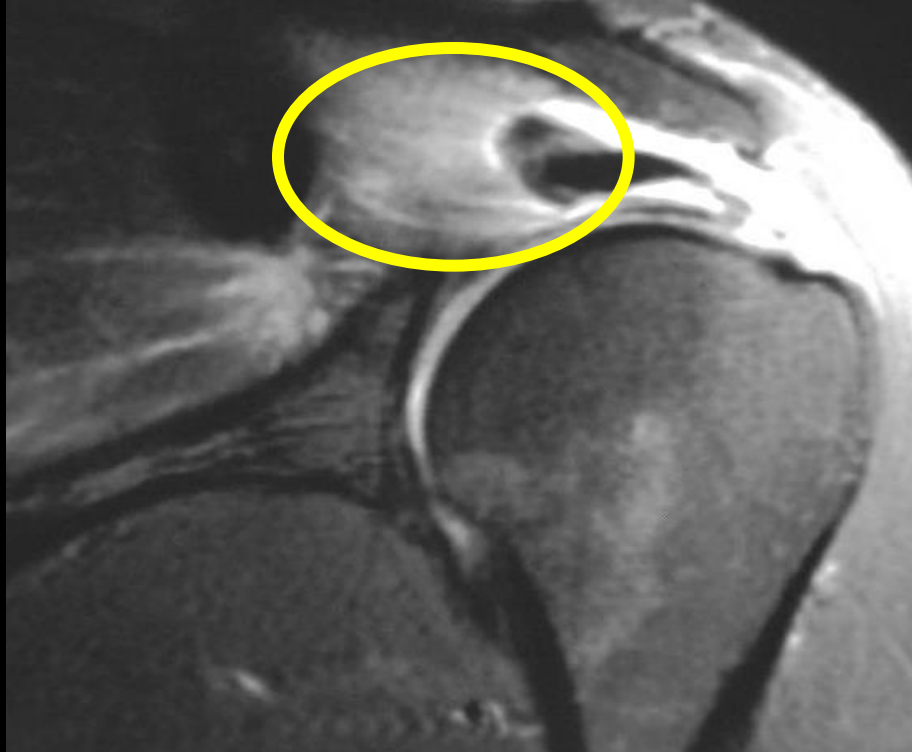
CALCIFIC TENDINITIS

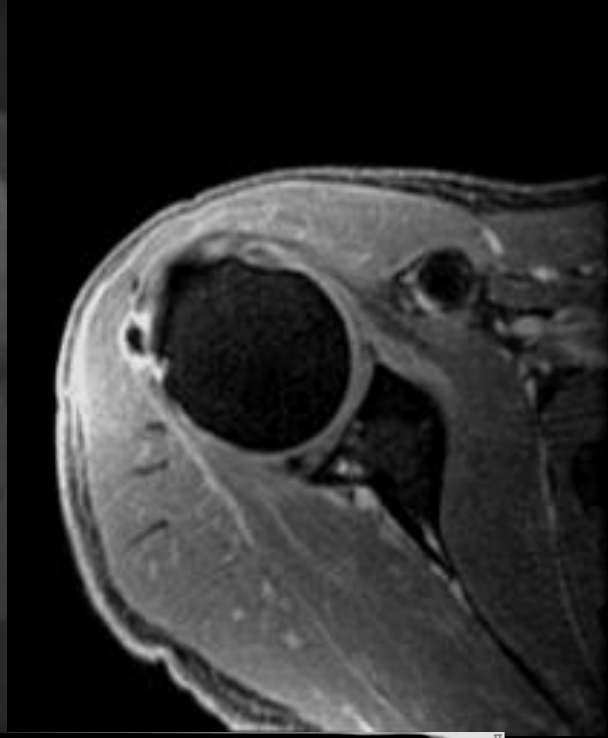
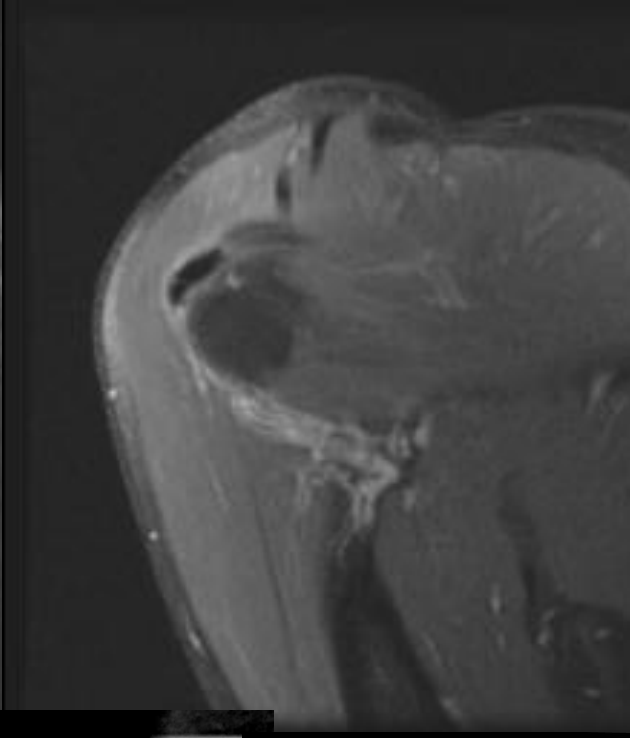
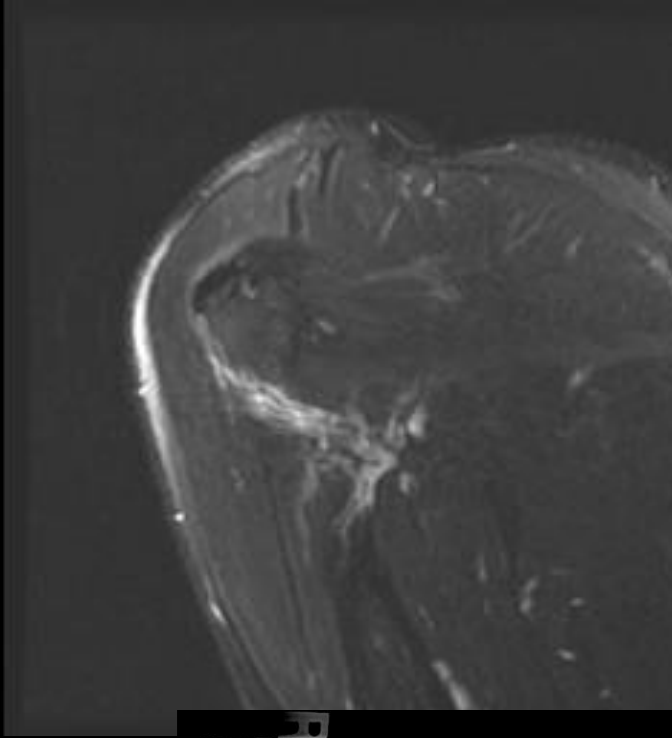


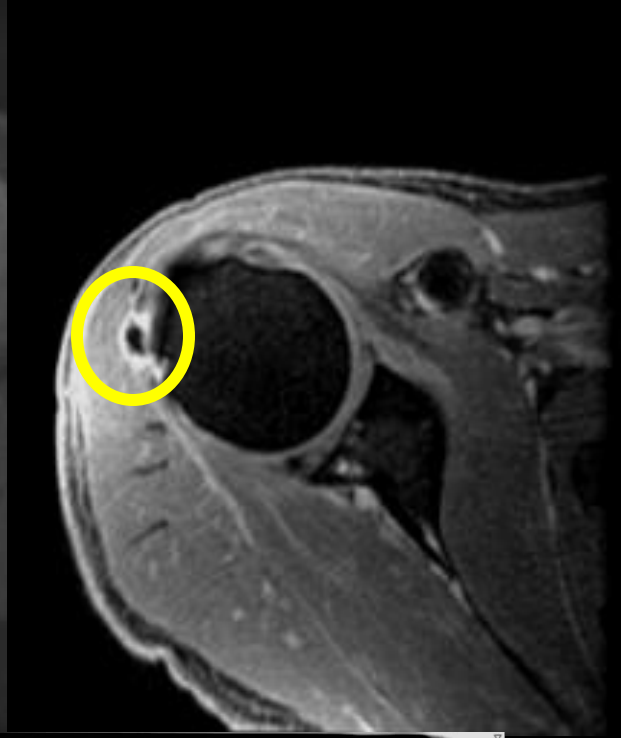
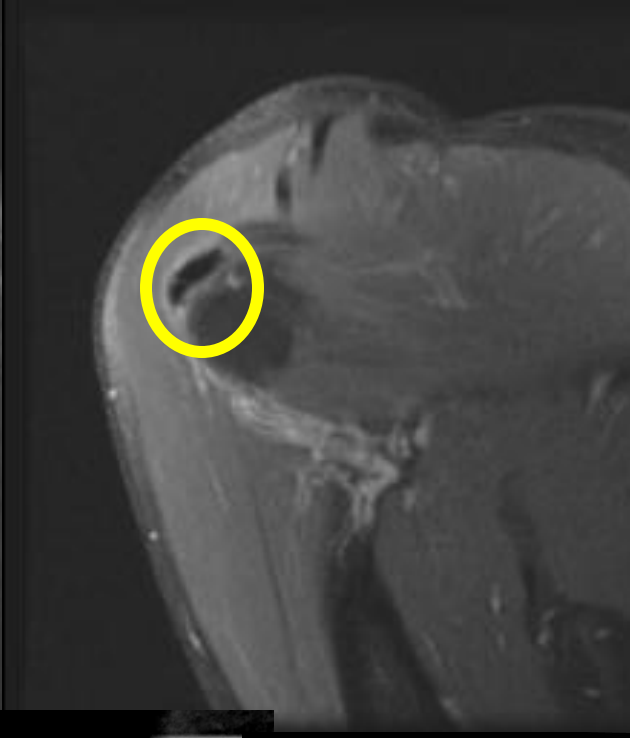
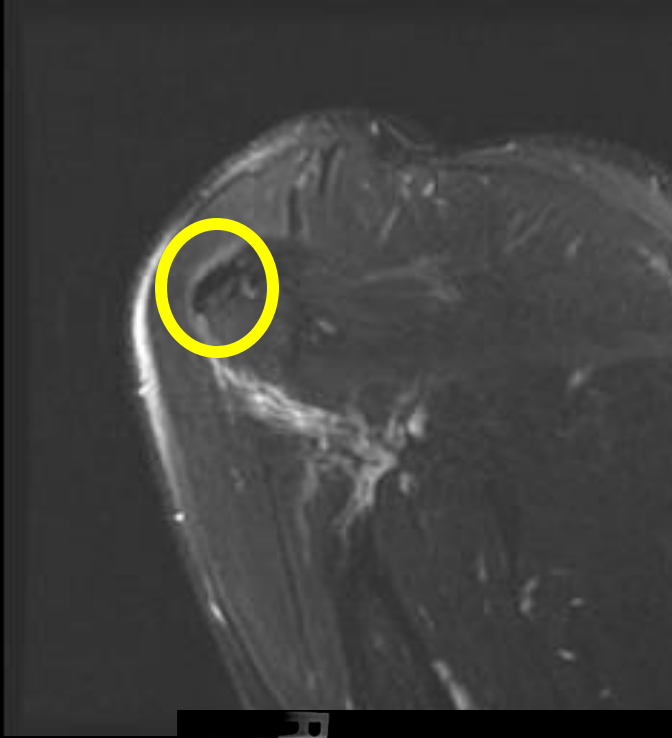
CALCIFIC TENDINITIS

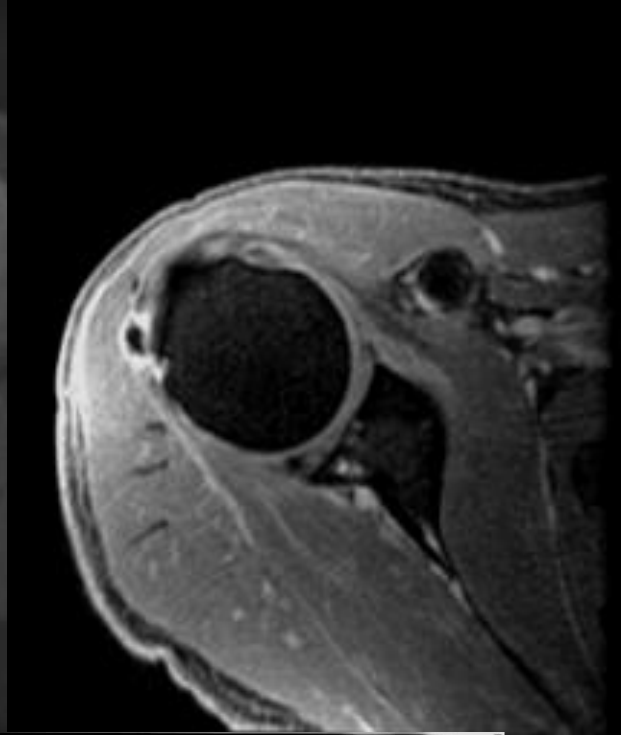
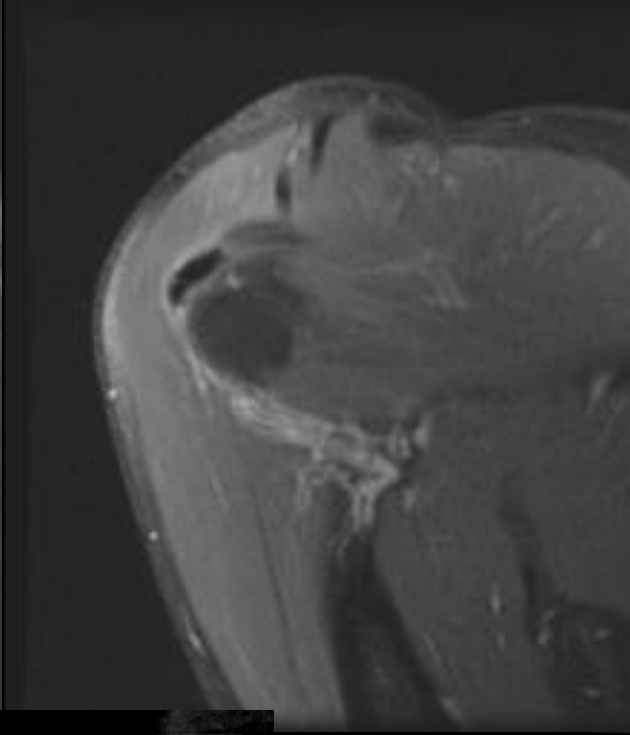
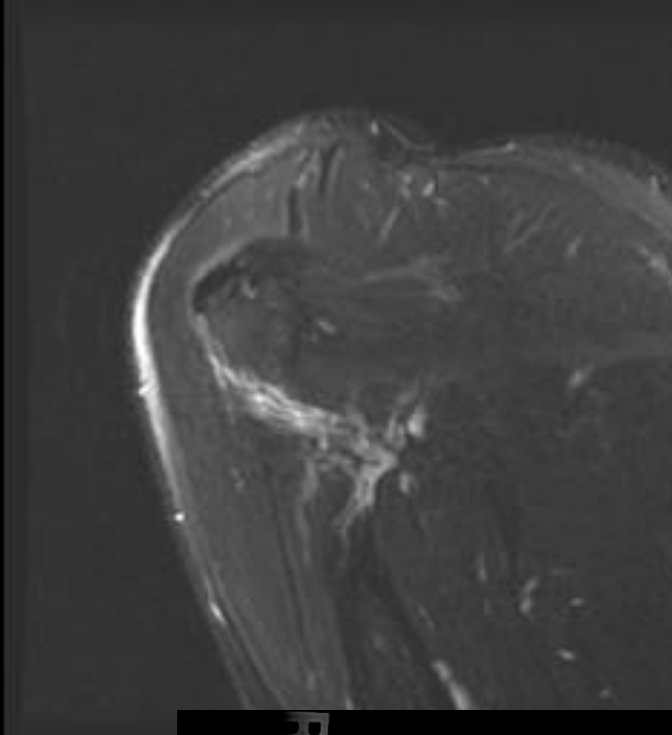


CALCIFIC TENDINITIS

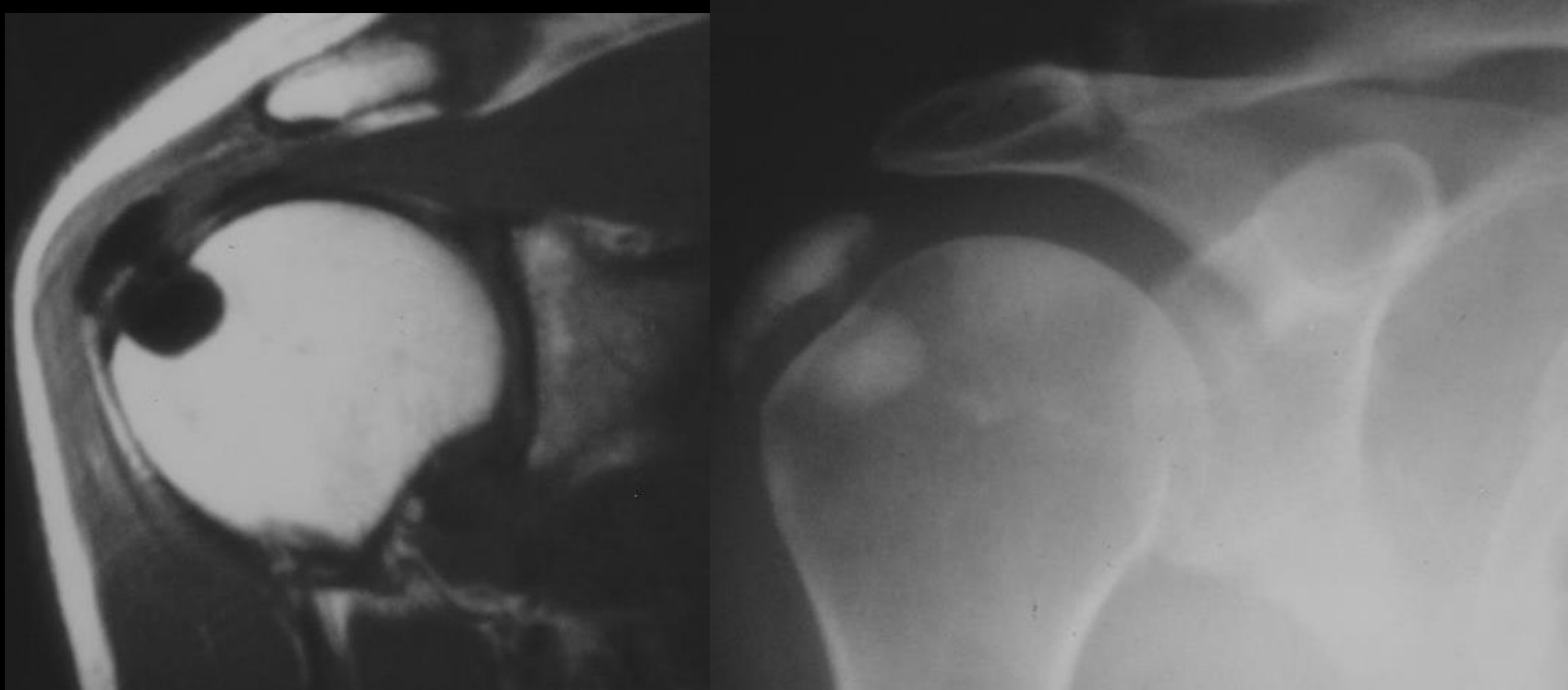




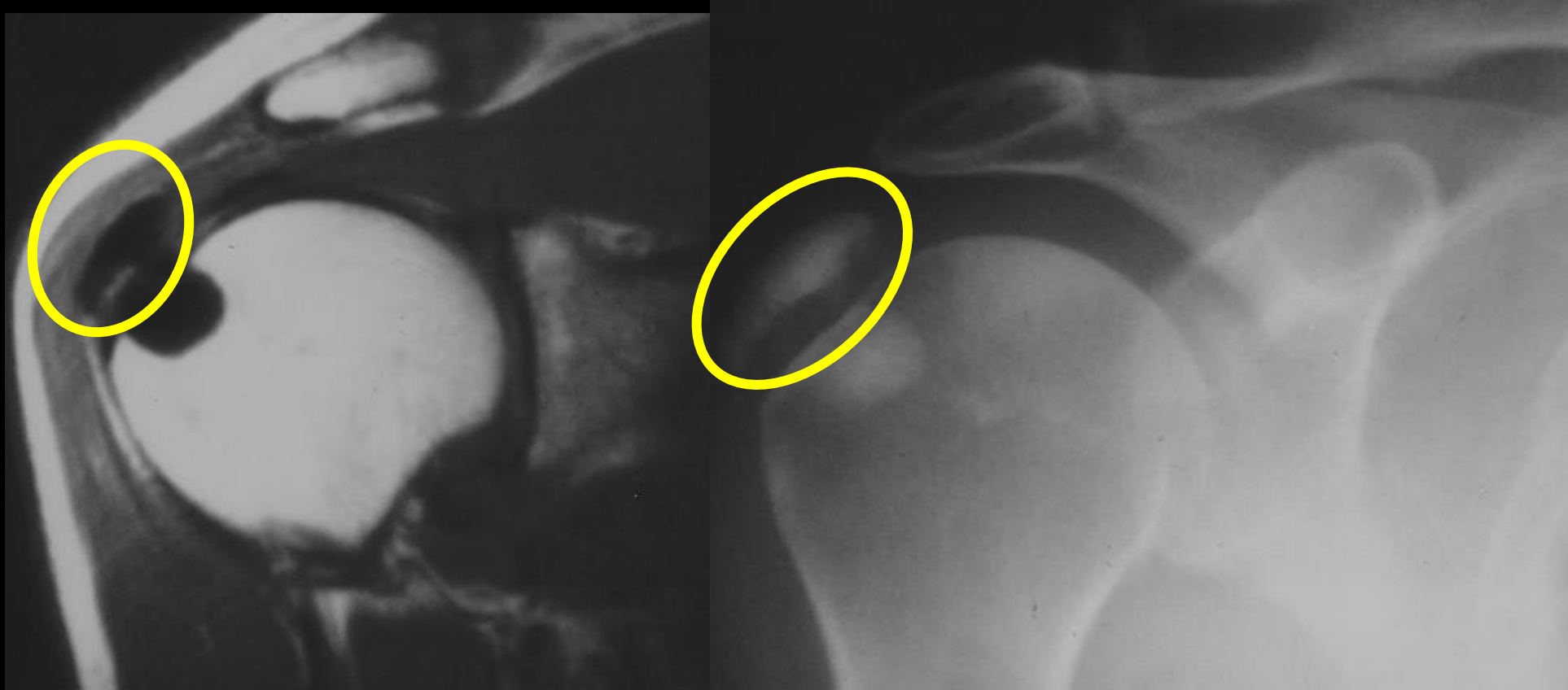




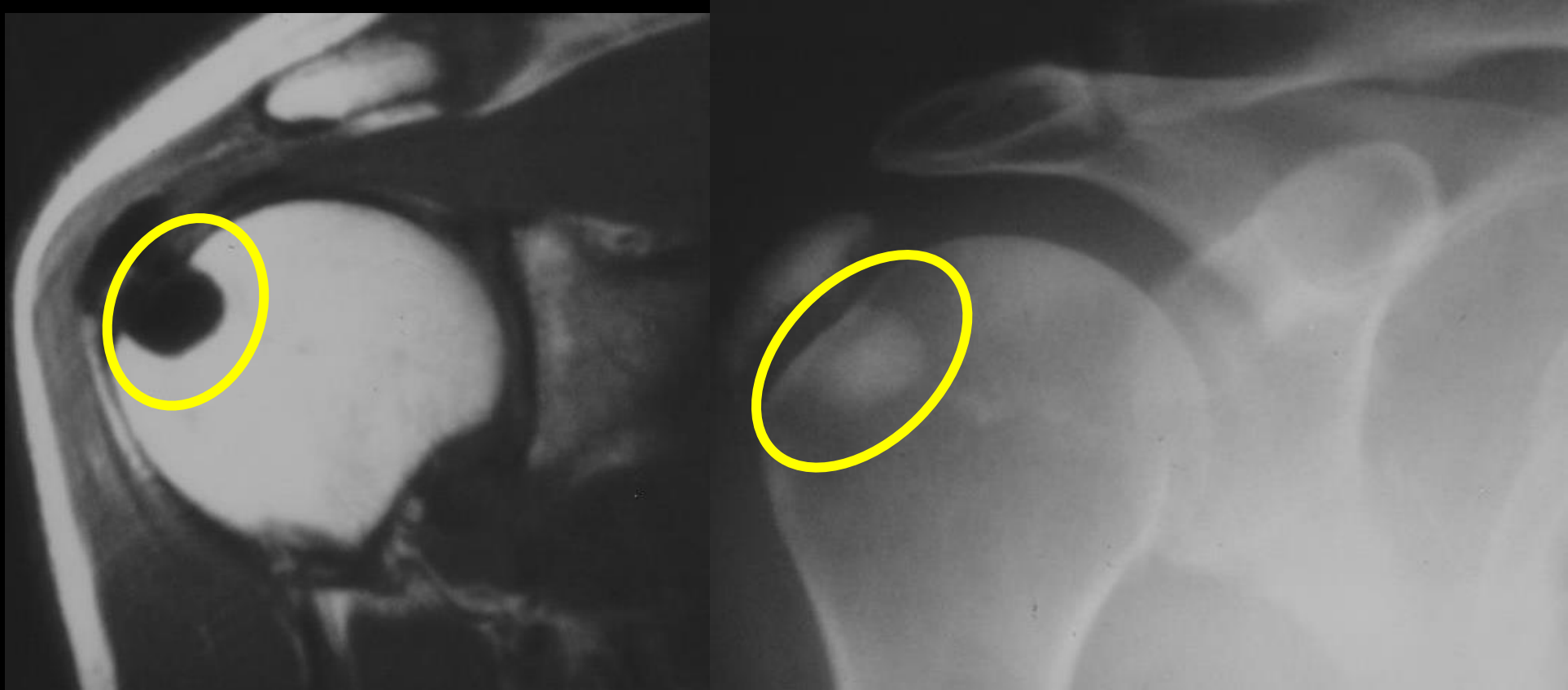
CALCIFIC TENDINITIS



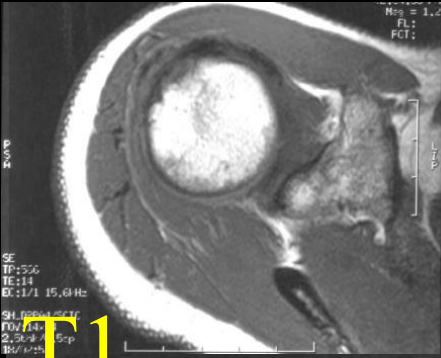
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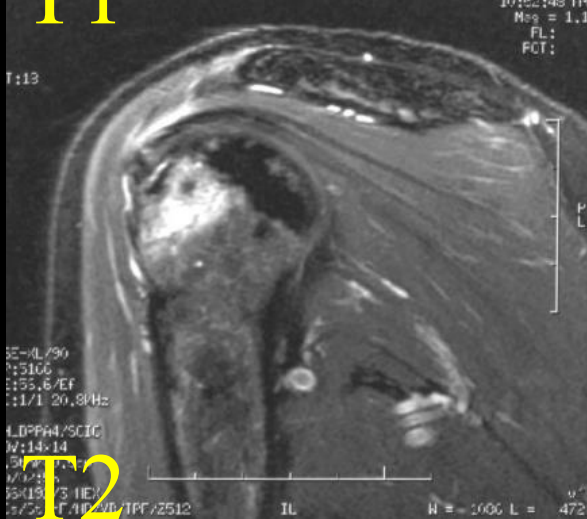
CALCIFIC TENDINITIS



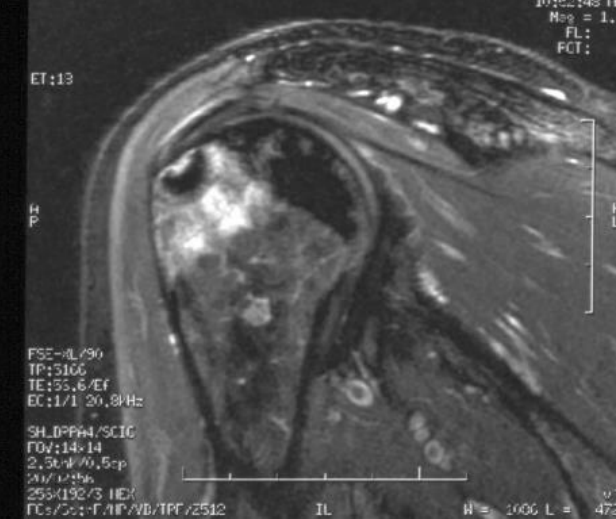
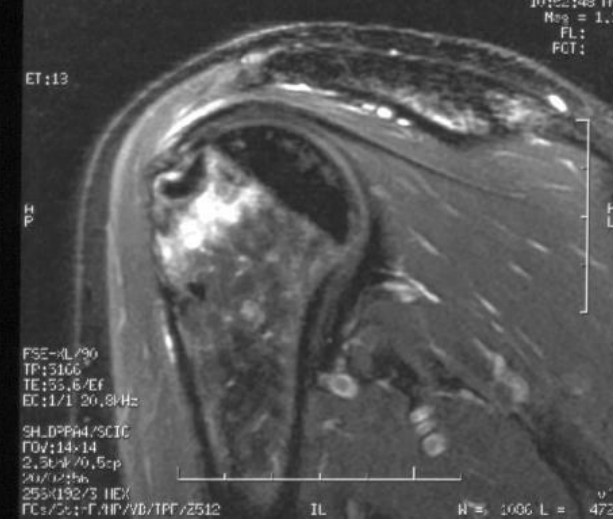
CALCIFIC TENDINITIS



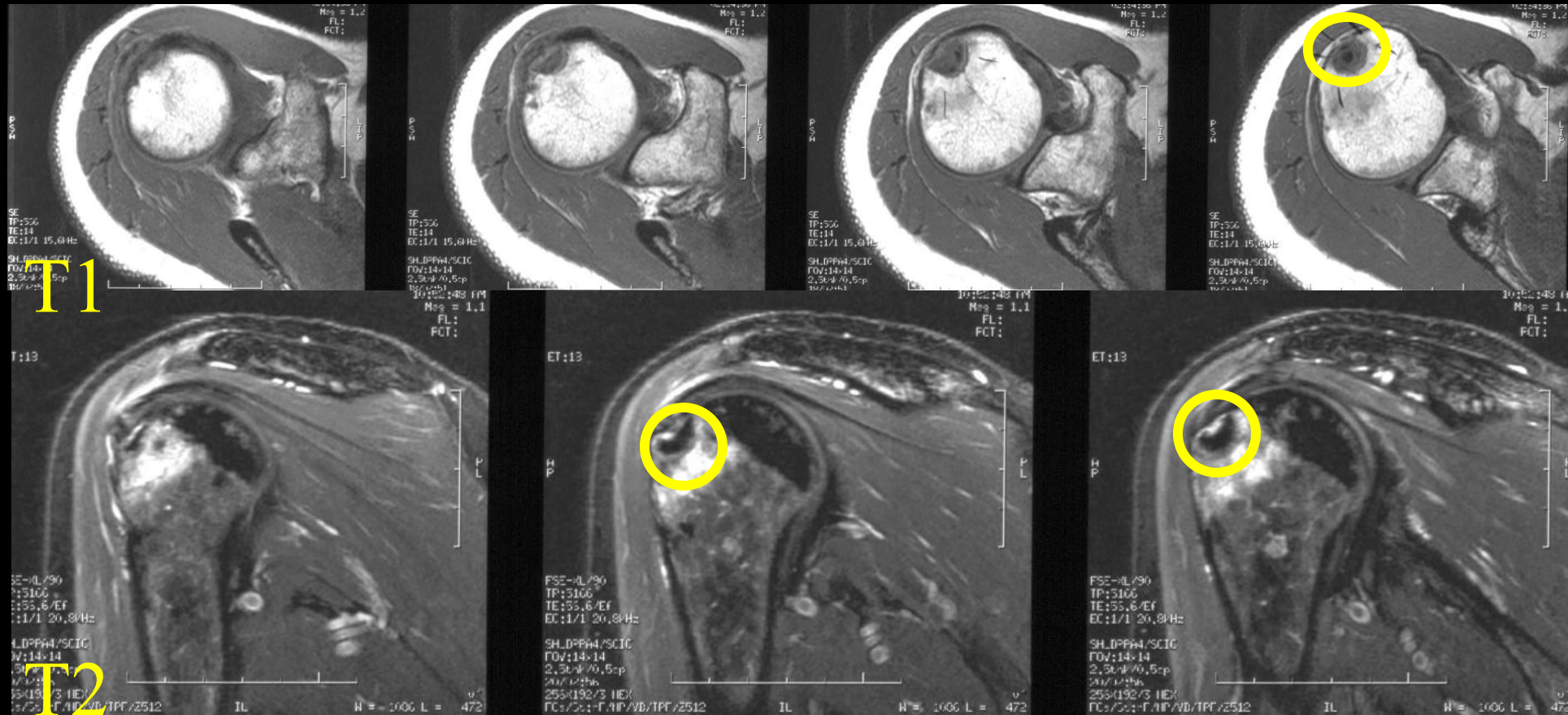
T1



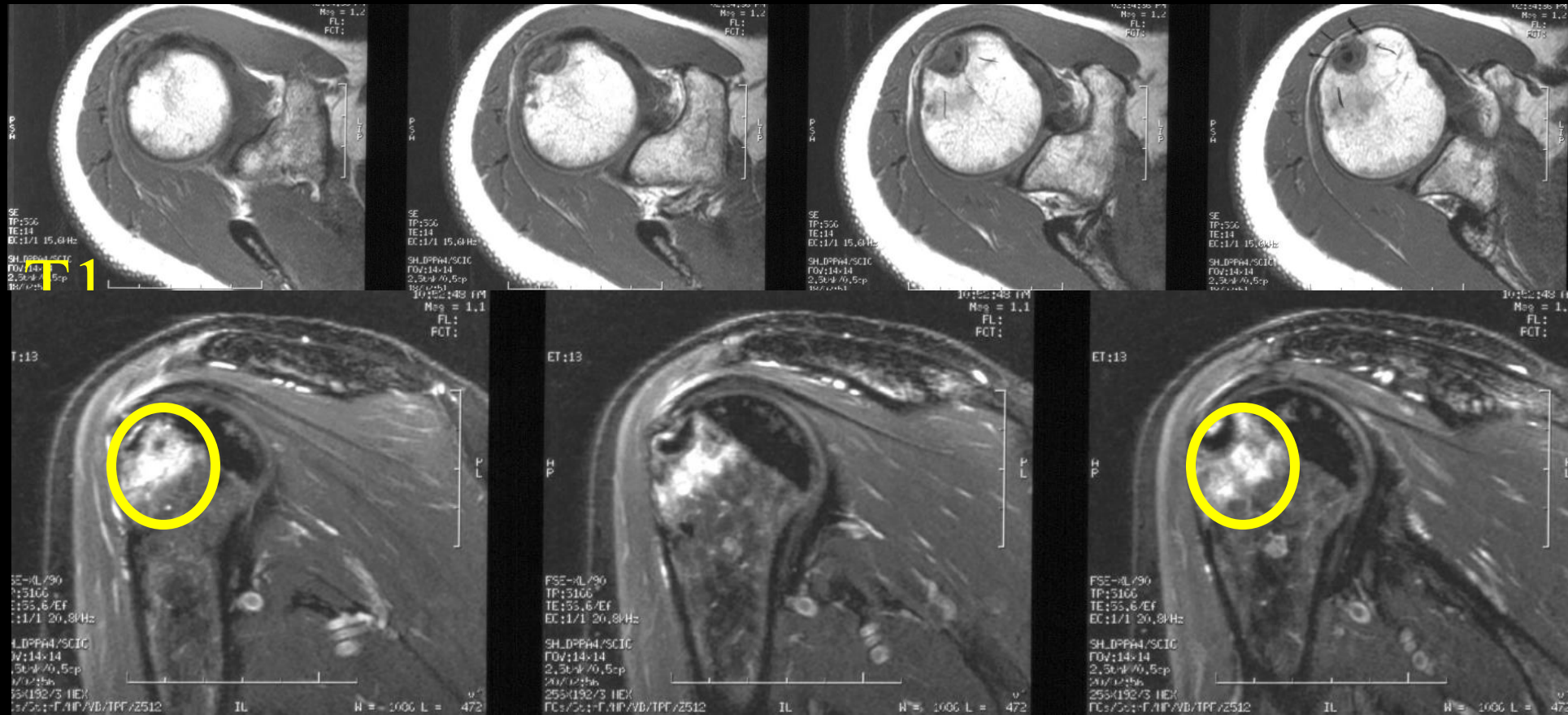
T2



CALCIFIC TENDINITIS



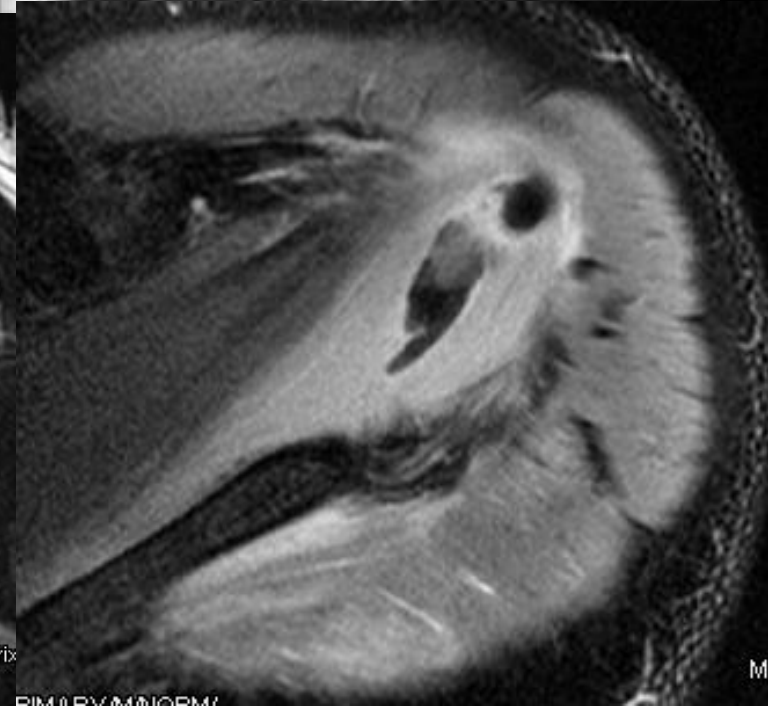
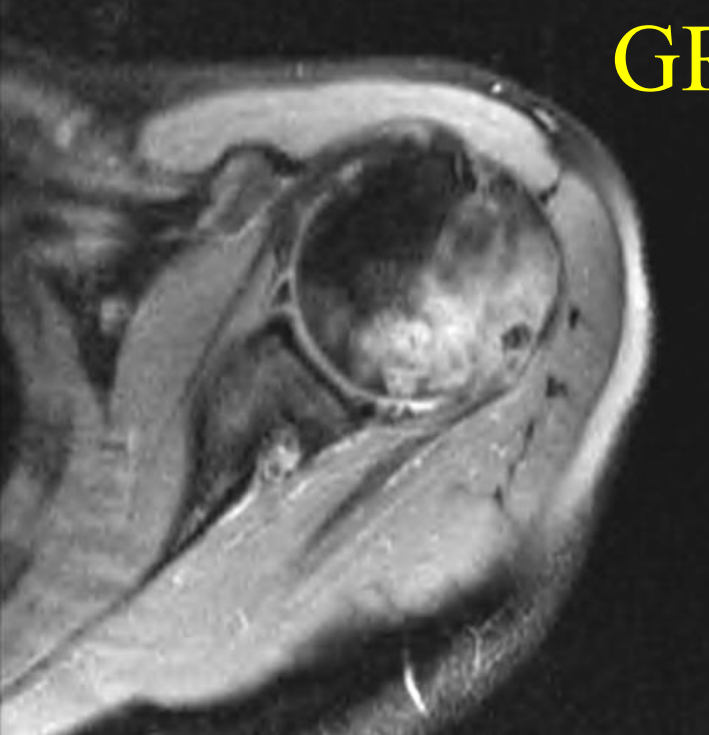
CALCIFIC TENDINITIS



T2



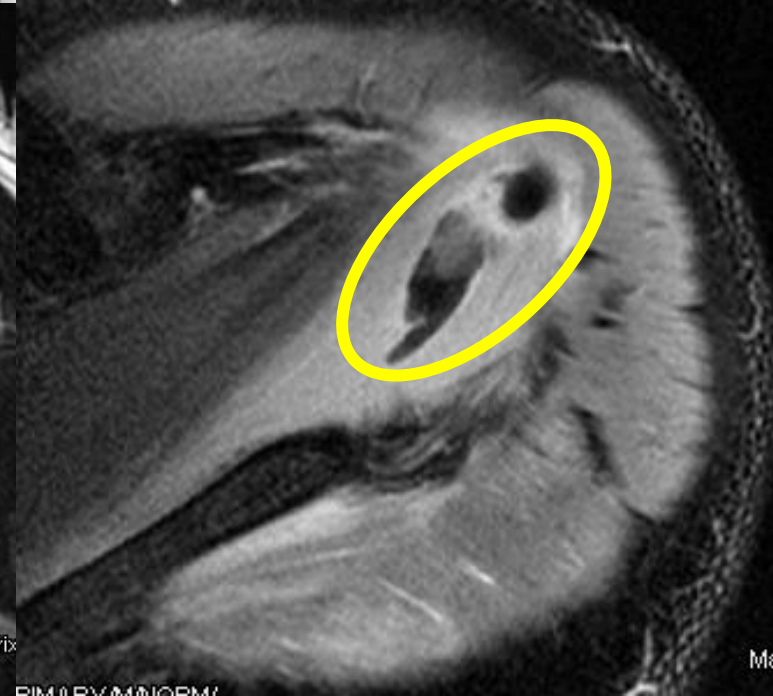
GRE



T2



GRE



mNORM/DIS2D

Matrix

BIM0BYM/NORM/

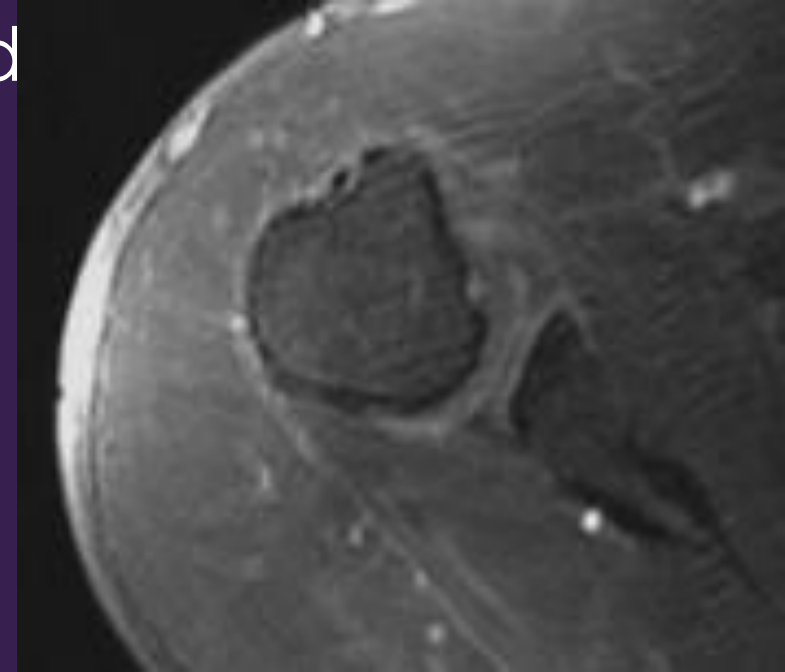
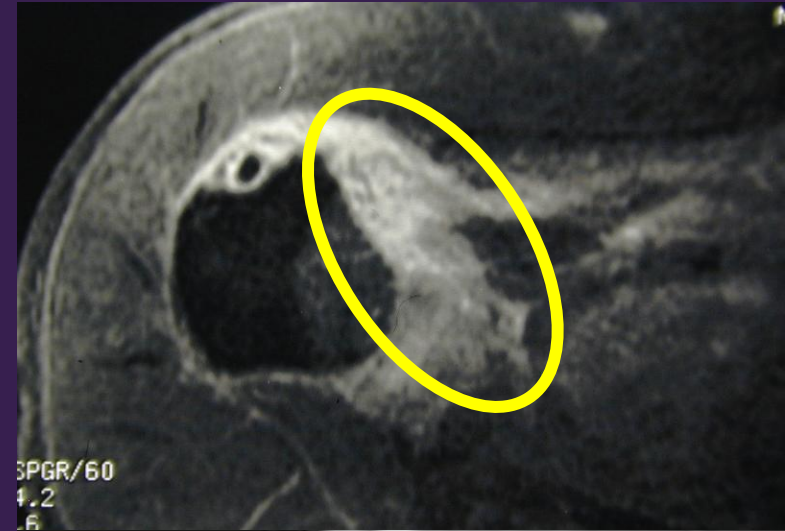
Me

ABNORMALITIES THAT CAN MIMIC ROTATOR CUFF TEAR

- Tendinosis/Magic angle
- Calcific tendonitis
- Adhesive capsulitis
- Subacromial bursitis

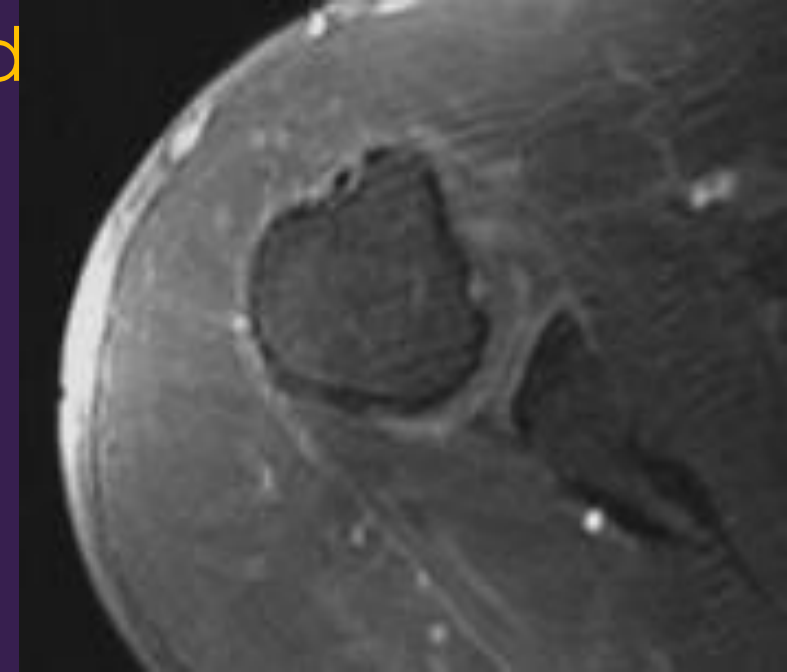
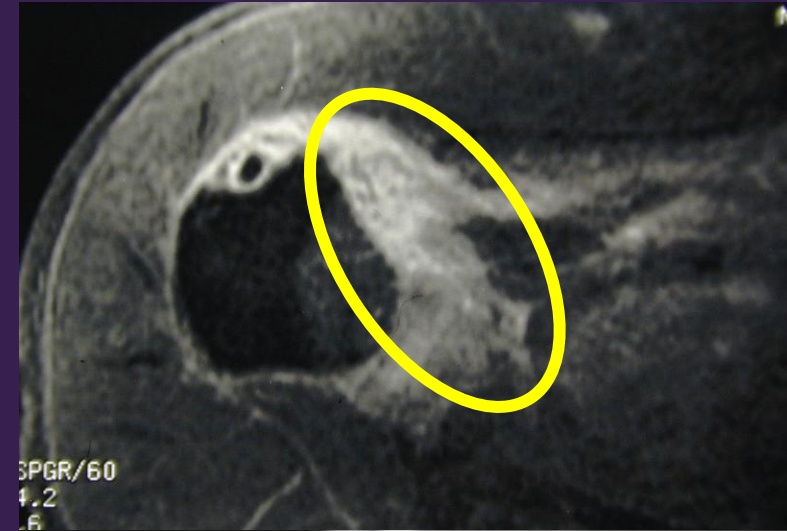
ADHESIVE CAPSULITIS

- Clinical mimic of cuff tear
- Associated with diabetes
- Capsule thickened
- Thickened coracohumeral ligament
- Replacement anterior interval fat and thickened coracohumeral ligament
- Thickened axillary region
- Abnormal enhancement

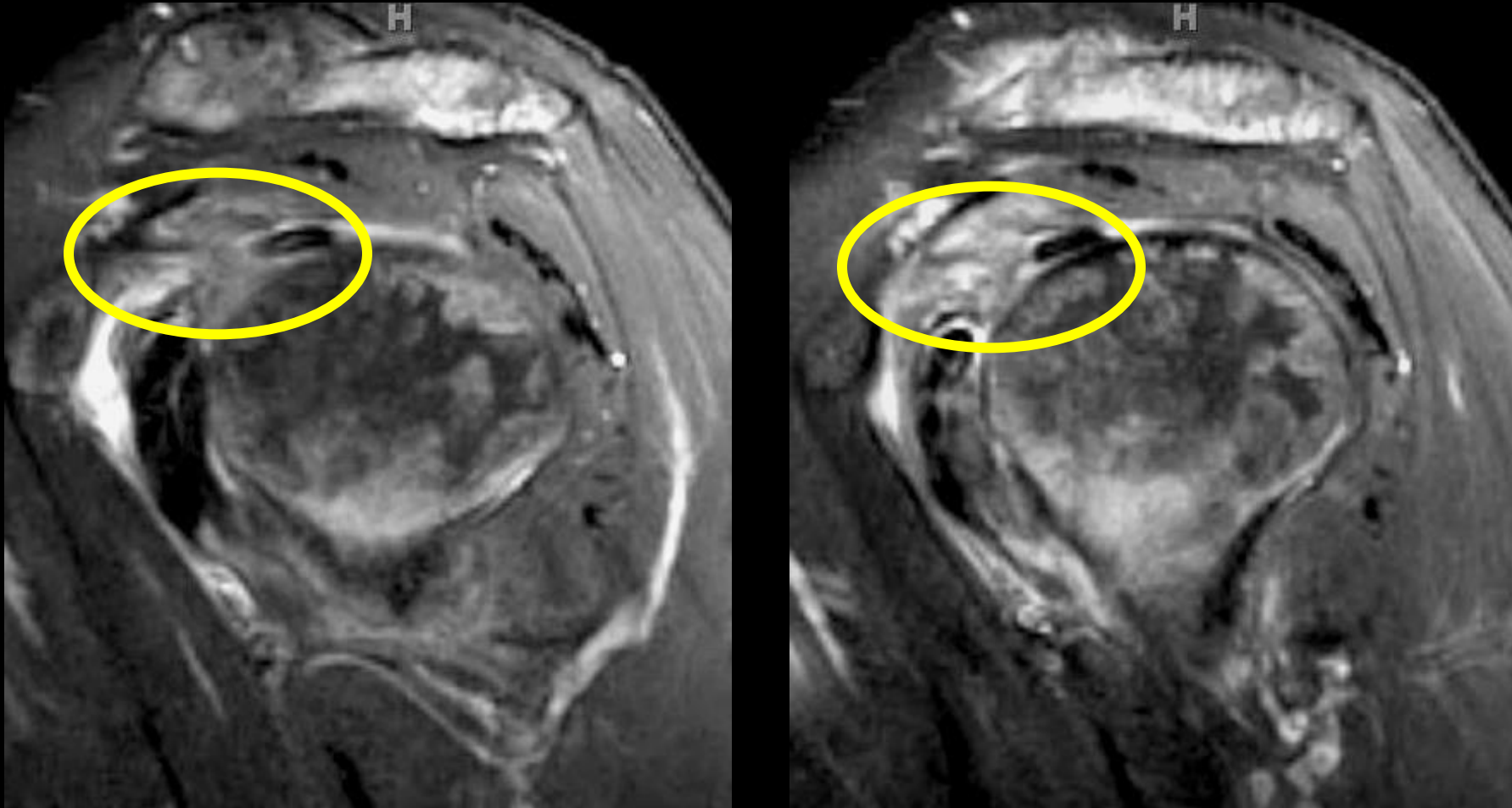


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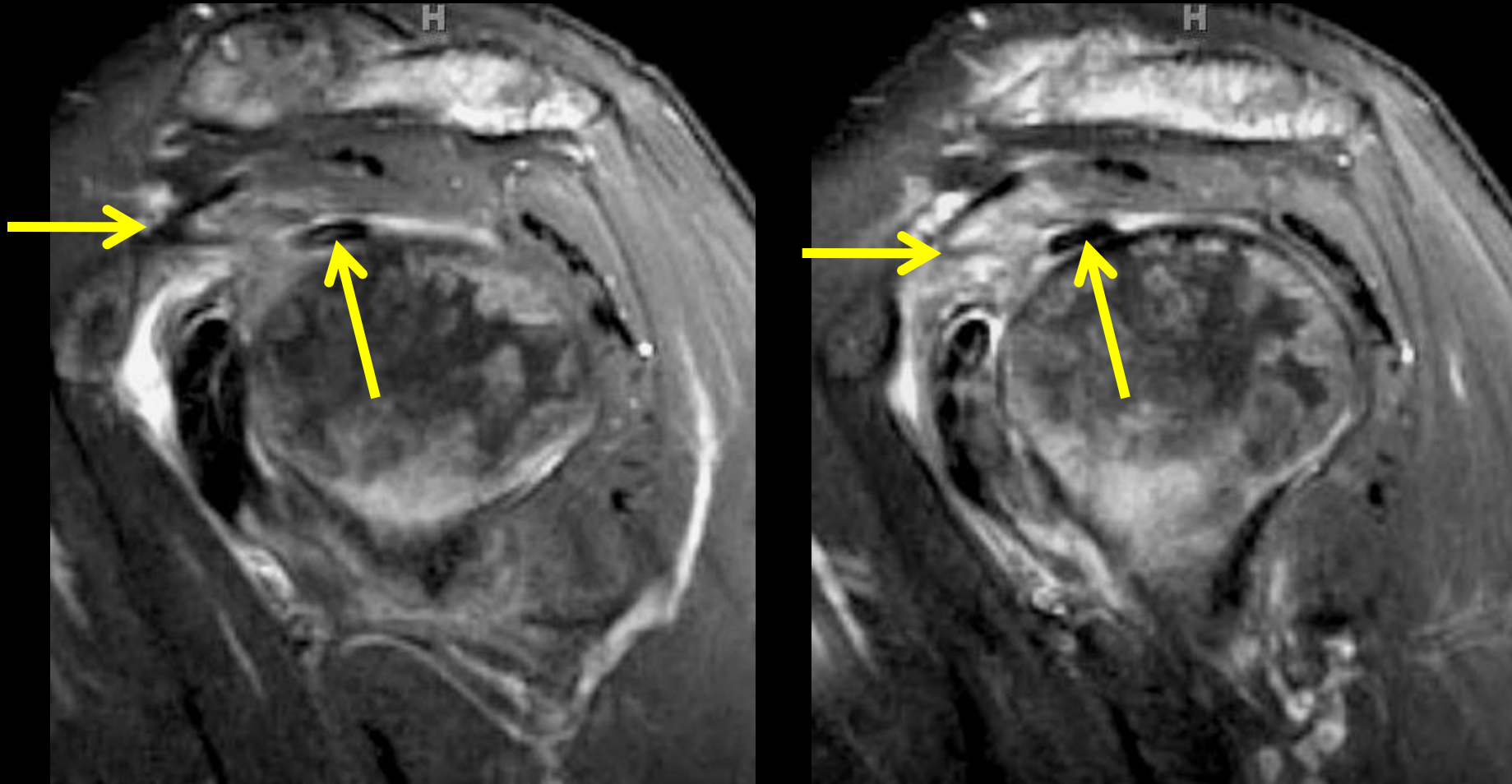


ADHESIVE CAPSULITIS



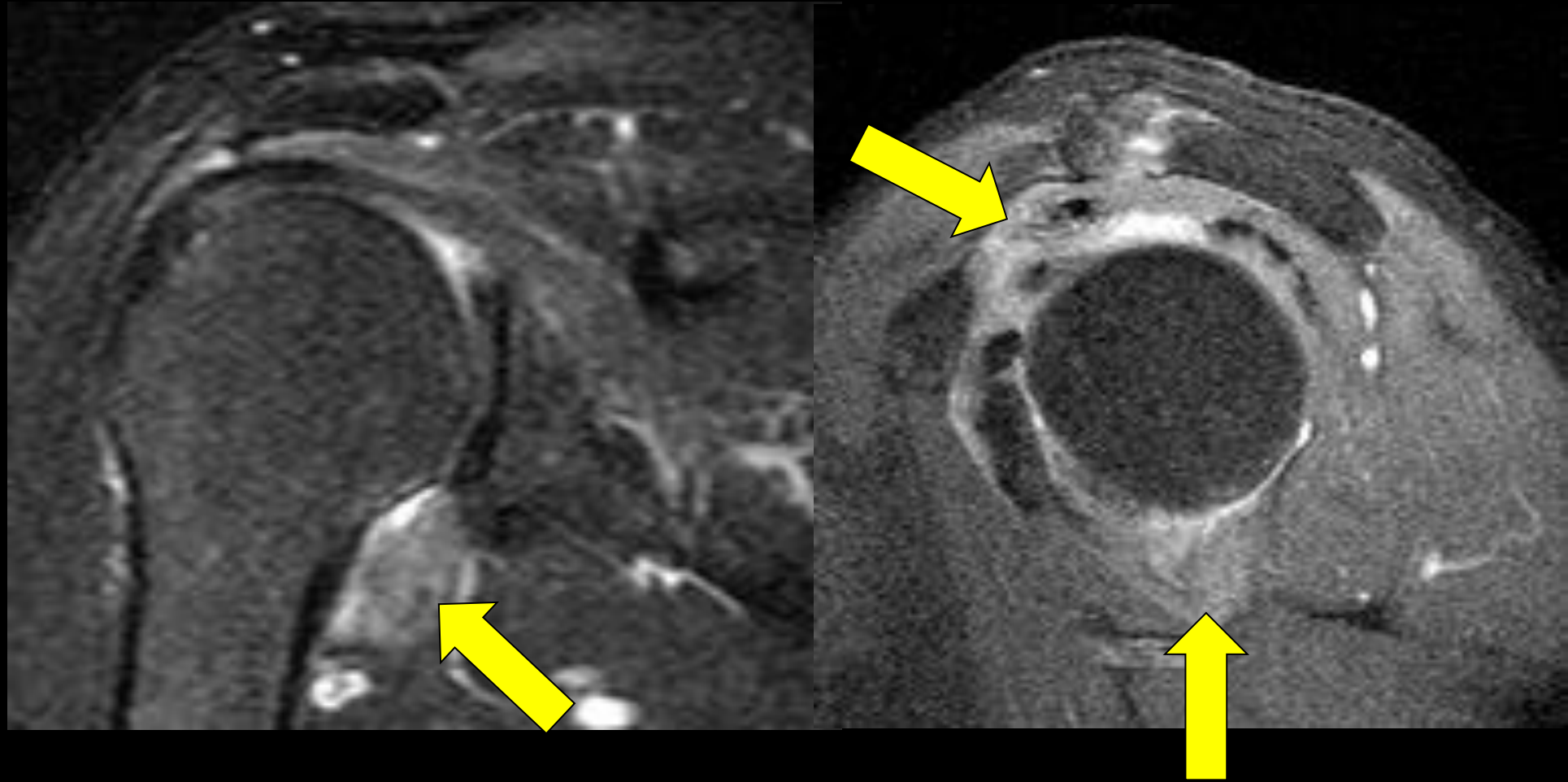
T2

ADHESIVE CAPSULITIS



T2

ADHESIVE CAPSULITIS

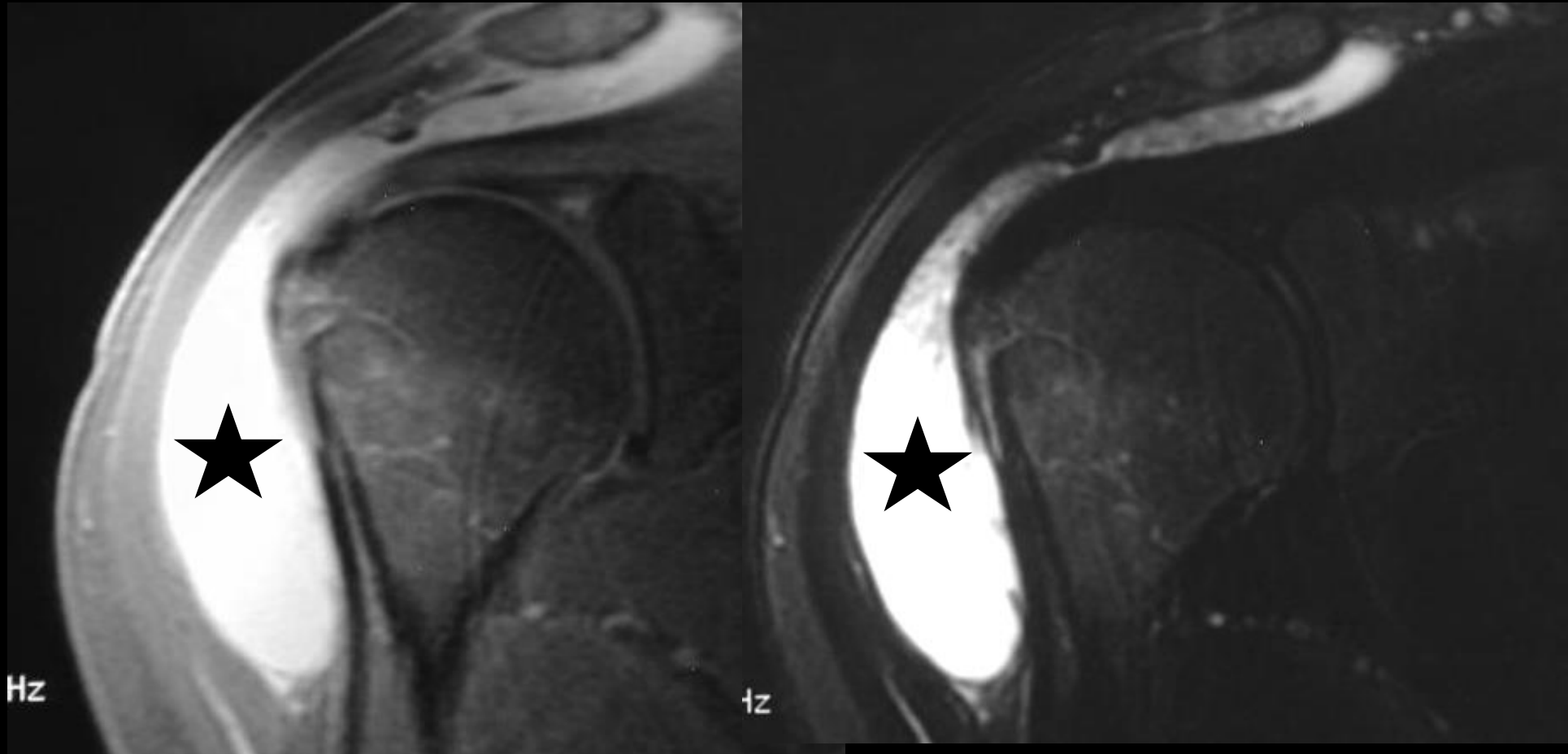


T1GD

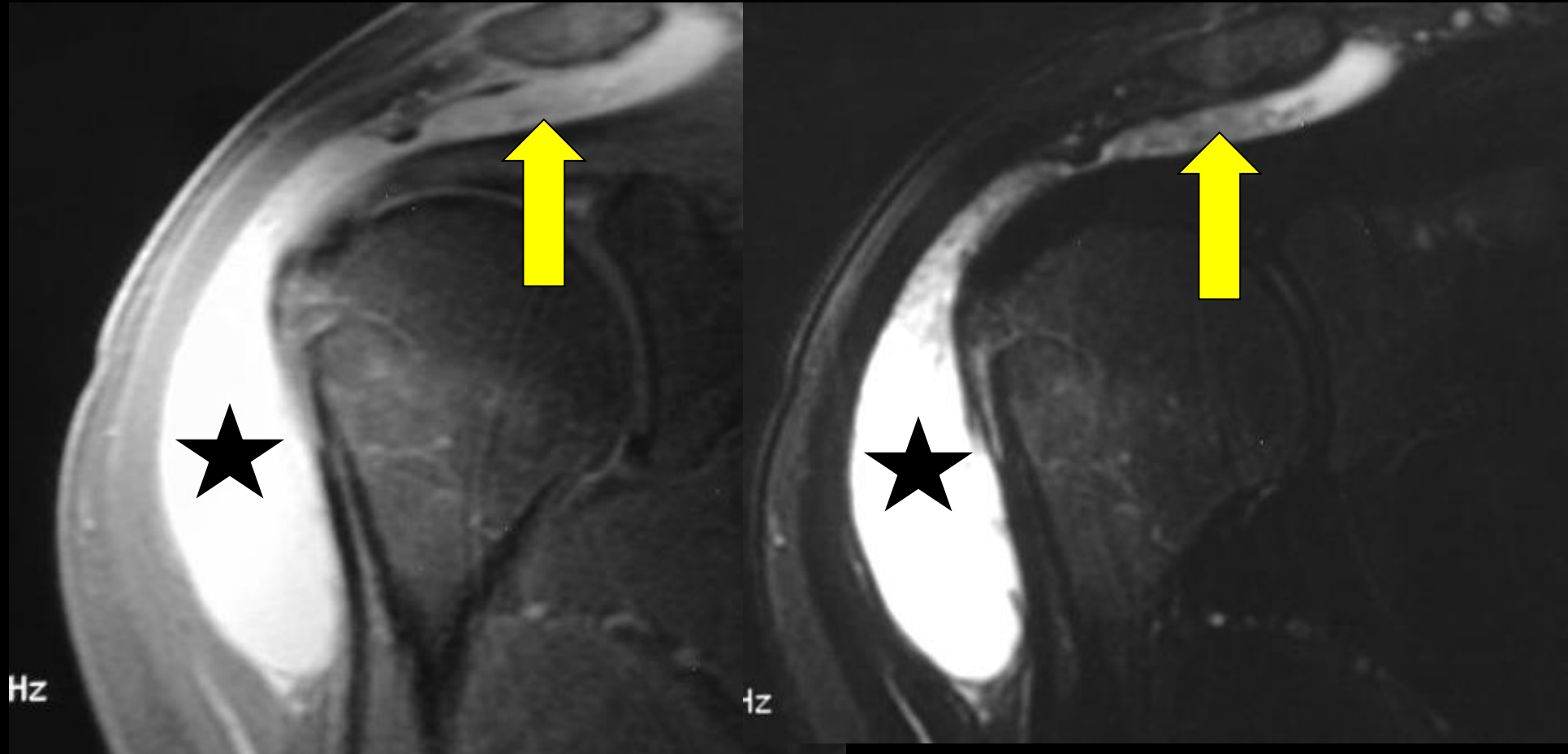
ABNORMALITIES THAT CAN MIMIC ROTATOR CUFF TEAR

- Tendinosis/Magic angle
- Calcific tendonitis
- Adhesive capsulitis
- Subacromial bursitis

SUBACROMIAL/SUBDELTOID BURSITIS



SUBACROMIAL/SUBDELTOID BURSITIS



WHAT THE SURGEON WANTS TO KNOW: RADIOLOGY REPORT

- Rotator cuff tear full thickness
 - Location/size (**Superior Cuff**) (0-2cm mild; 2-3cm moderate; 3-4cm; large; >4cm massive); **Subscapularis tears easy to miss**
 - Retraction musculotendinous junction (overcalled and NOT the defect)
 - Quality of the remainder of the cuff
 - Muscle atrophy and how severe
- Partial thickness tear
 - Location and size (> or < 50% thickness of tendon)

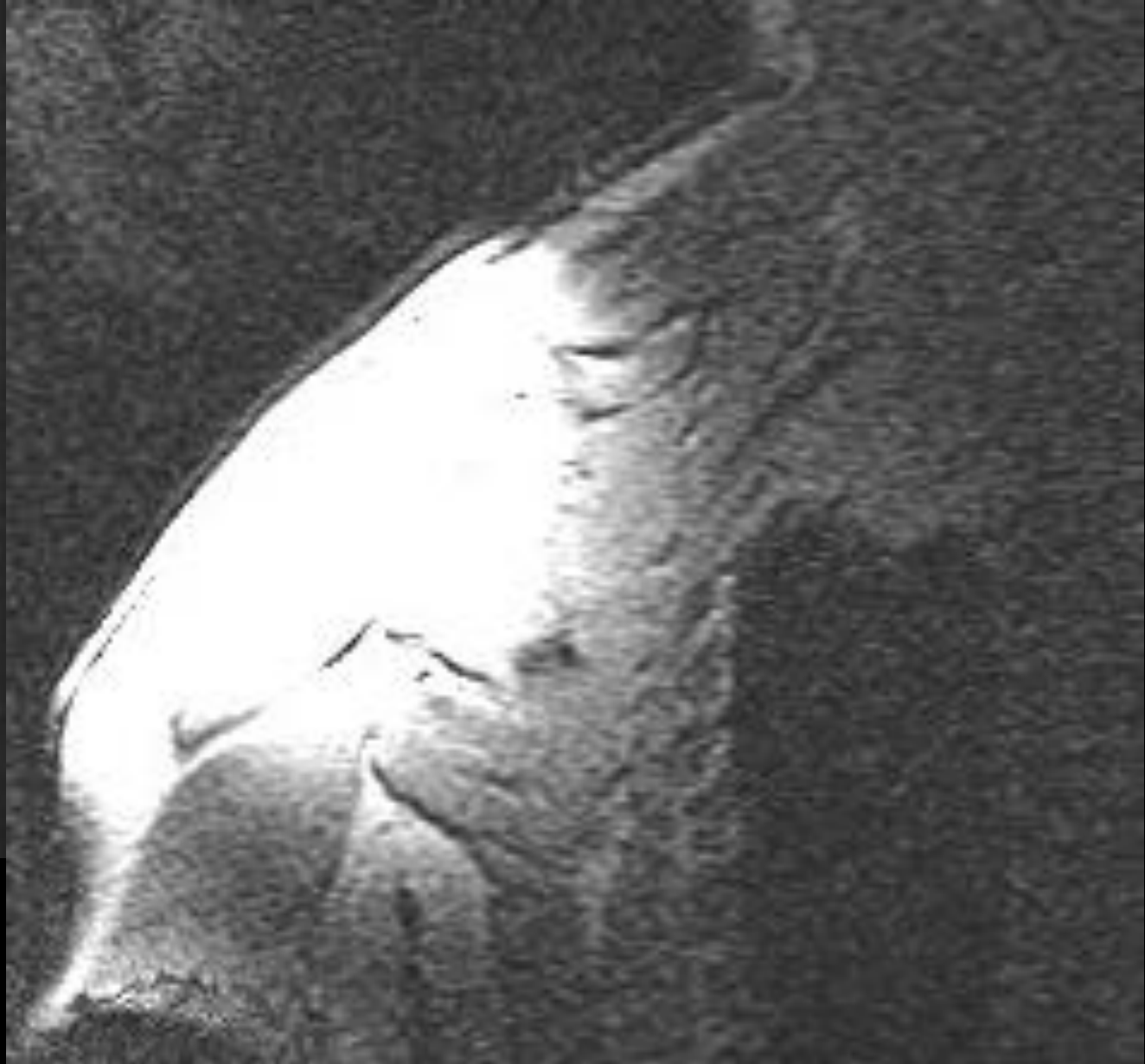
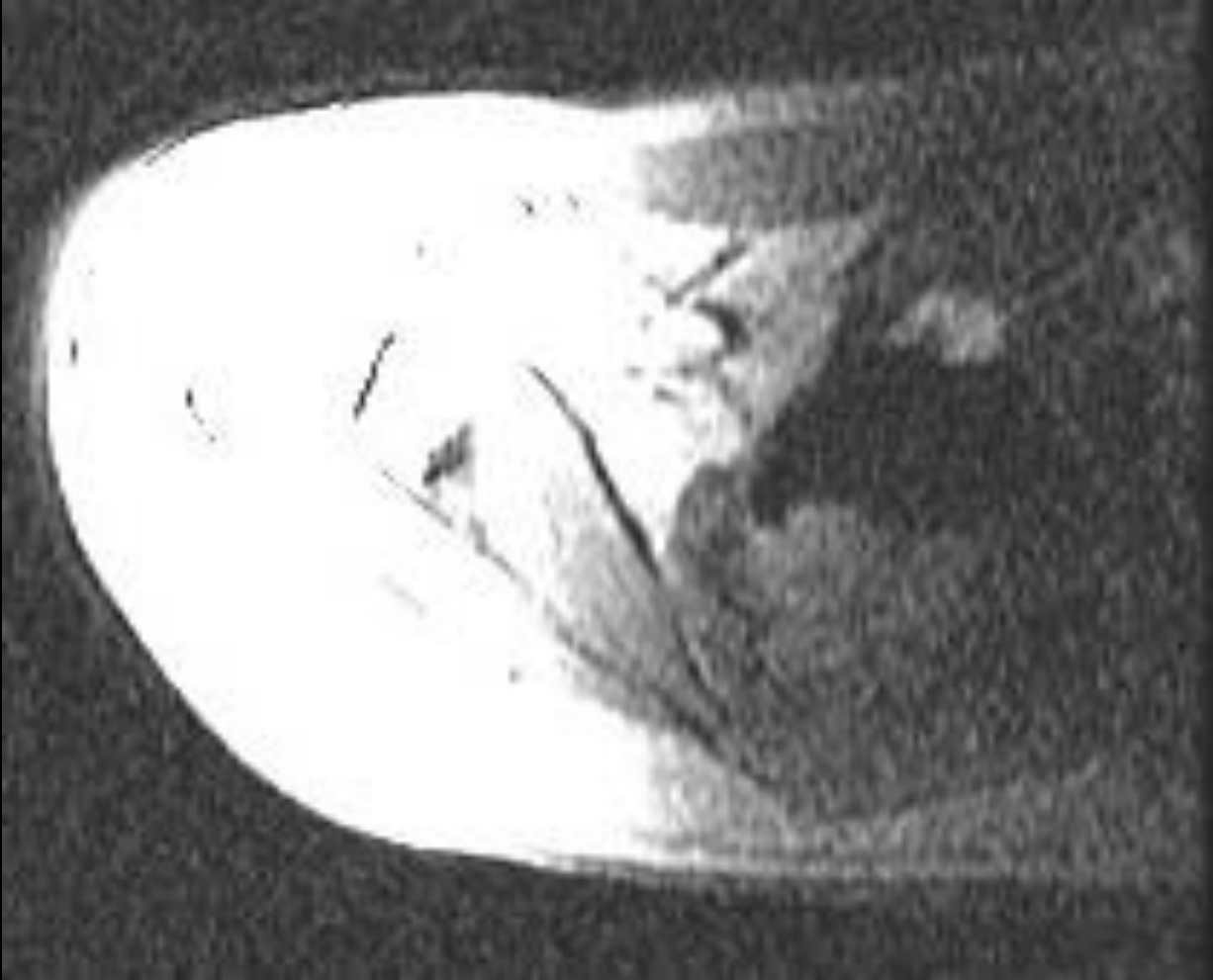
WHAT THE SURGEON WANTS TO KNOW: RADIOLOGY REPORT

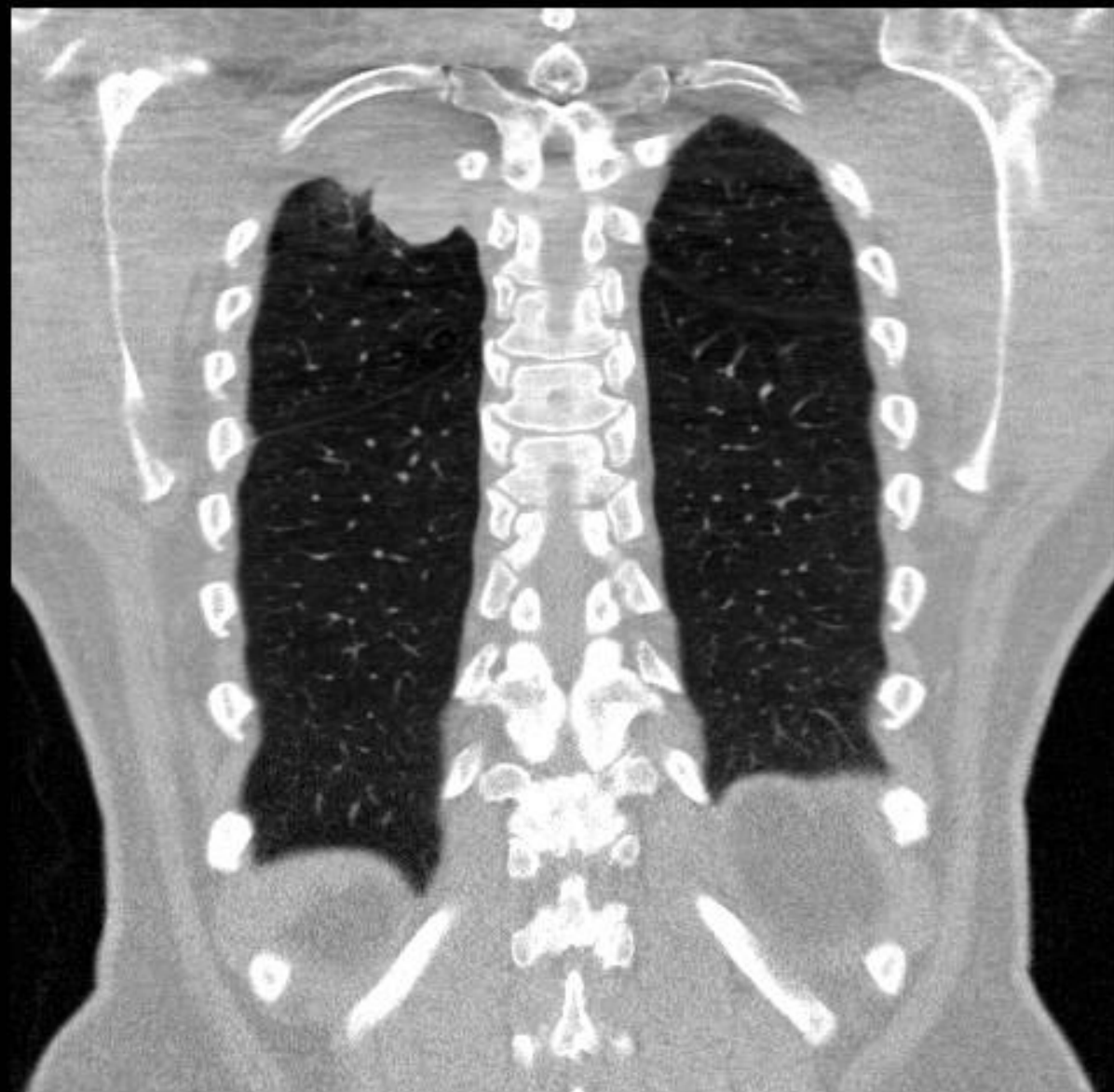
- Associated abnormalities/causes of similar symptoms
 - Os acromiale
 - Tendinopathy
 - Calcific tendinosis
 - Adhesive capsulitis
 - Subacromial/subdeltoid bursitis

MR IMAGING OF THE ROTATOR CUFF

Mark D. Murphey MD, FACR

Physician-in-Chief, Chief, Musculoskeletal Imaging AIRP
Professor of Radiology Uniformed Services University of the Health Sciences
Staff Radiologist Musculoskeletal Section,
Walter Reed National Military Medical Center, Bethesda, Maryland





SPECIAL THANK YOU

- Mark Anderson MD
- Donald Flemming MD
- Mark Kransdorf MD





MR IMAGING OF THE ROTATOR CUFF

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PHYSICIAN-IN-CHIEF, AIRP

CHIEF, MUSCULOSKELETAL RADIOLOGY