

Systematic Review of the Shoulder MRI

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PAOS
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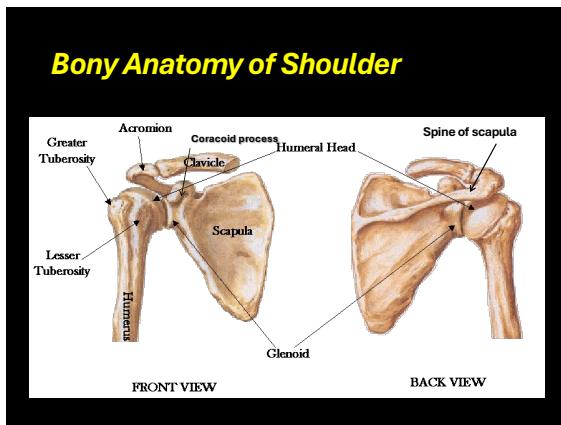
Disclosures

- I have no actual or potential conflict of interest in relation to this program/presentation.

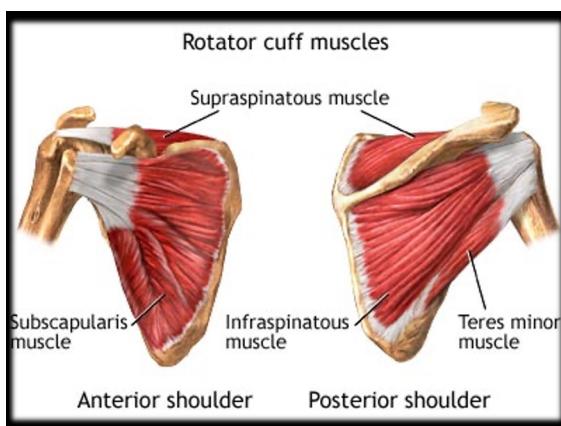
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Shoulder Anatomy

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Stabilizer of Shoulder Joint

Dynamic	Static
<ul style="list-style-type: none"> • Rotator cuff • Periscapular muscles • LHBT 	<ul style="list-style-type: none"> • Glenoid Labrum • Fibrous capsule • Glenohumeral ligament • Coracohumeral ligament

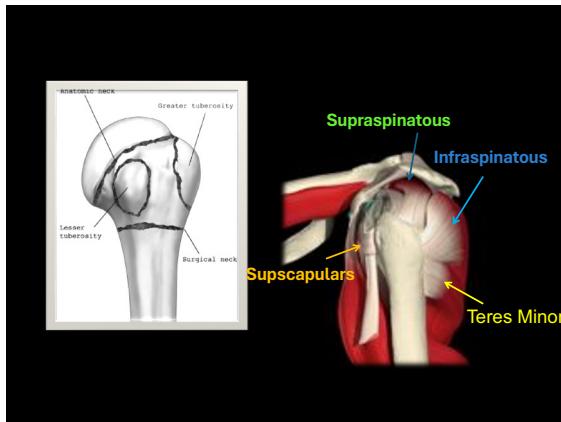
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Rotator Cuff

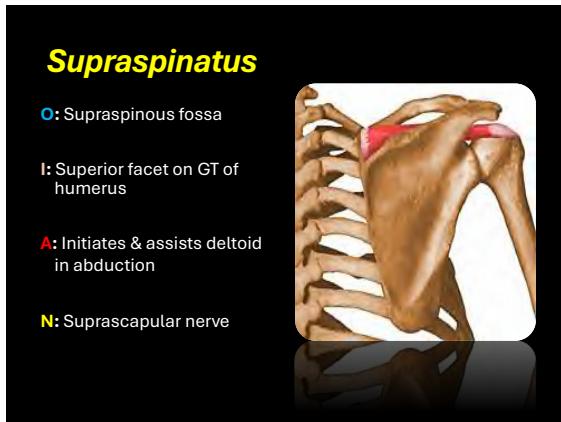
Four muscles: dynamic stabilizers of glenohumeral joint which compress the humeral head against the glenoid

- Greater Tuberosity Insertion
 - Supraspinatus muscle
 - Infraspinatus muscle
 - Teres minor muscle
- Lesser Tuberosity Insertion
 - Subscapularis muscle
 - Insert on **lesser tuberosity**

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Infraspinatus**O:** Infraspinous fossa**I:** Middle facet on GT of humerus**A:** External rotates the arm**N:** Suprascapular n.

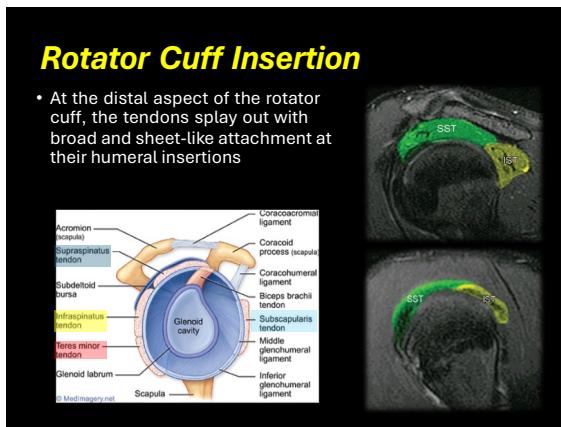
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Teres minor**O:** Middle third of the lat. scapula border**I:** Inferior facet on GT of humerus**A:** External rotates the arm**N:** Axillary nerve

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Subscapularis**O:** Subscapular fossa**I:** LT of humerus**A:** Internal rotation of arm & adduction**N:** Upper & lower subscapular

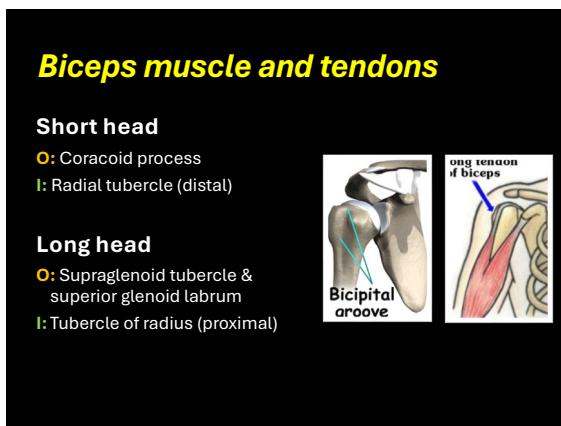
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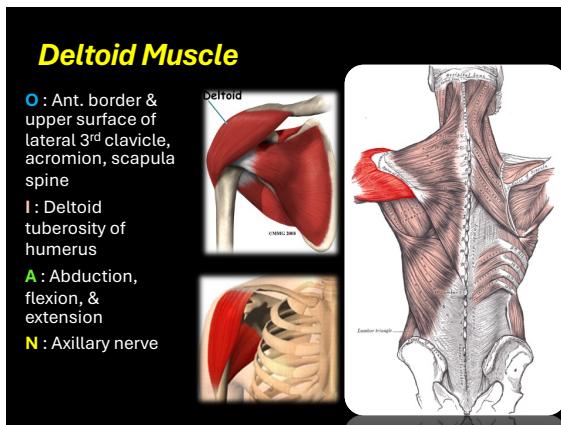
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Other shoulder muscles

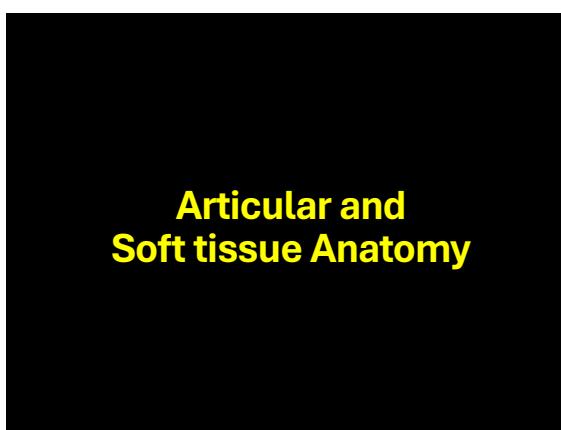
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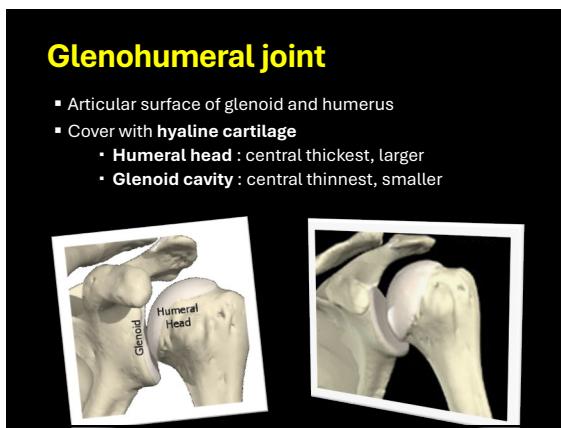
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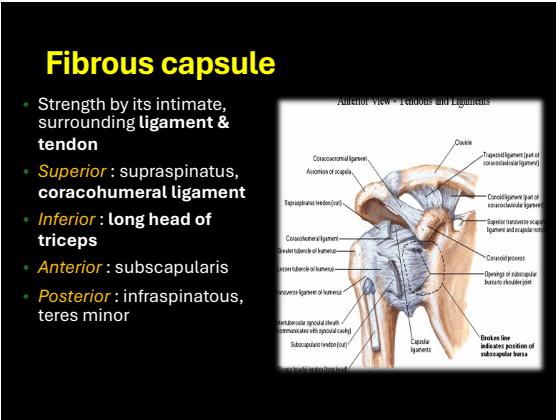
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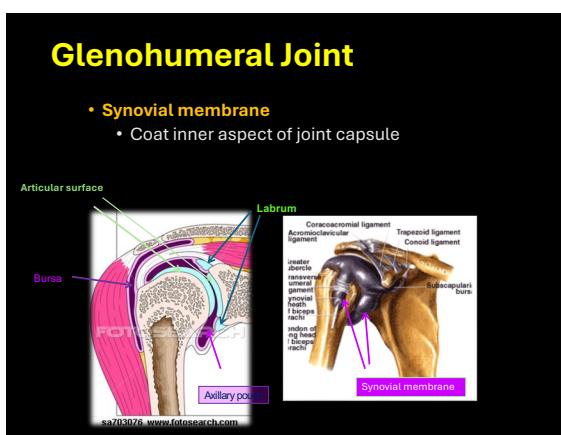
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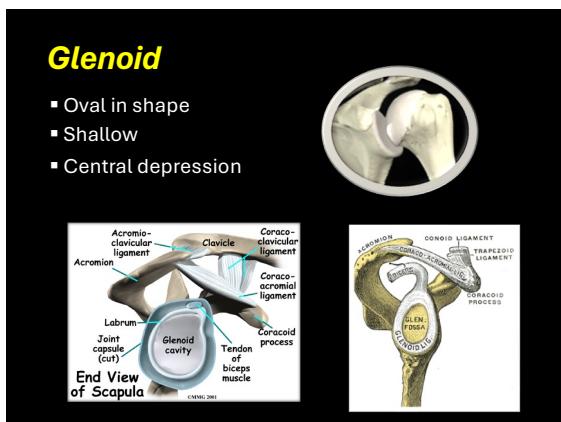
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Labrum

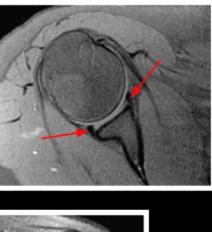
- Fibrocartilagenous structure
- Rim around the glenoid
about 3 mm
- Anterior usually larger than posterior
- Increases surface area & depth of glenoid fossa
- Add stability of glenoidhumeral articulation



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Labrum

- Most frequently **triangular** in cross-section
- Low signal intensity on all MRI sequences

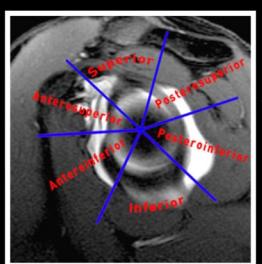
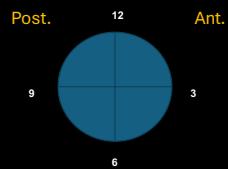



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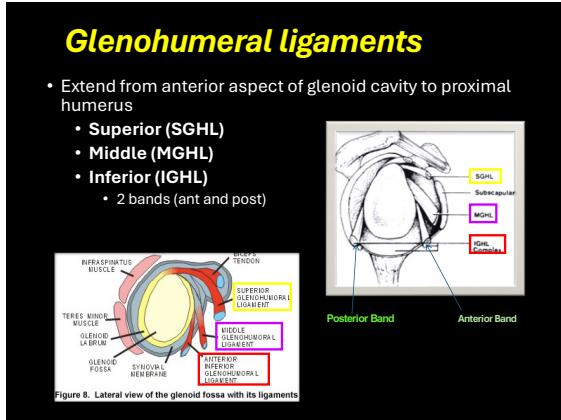
Glenoid labrum

Sagittal-oblique T1W-FS MR arthrogram :

The six labral zones of the glenoid labrum

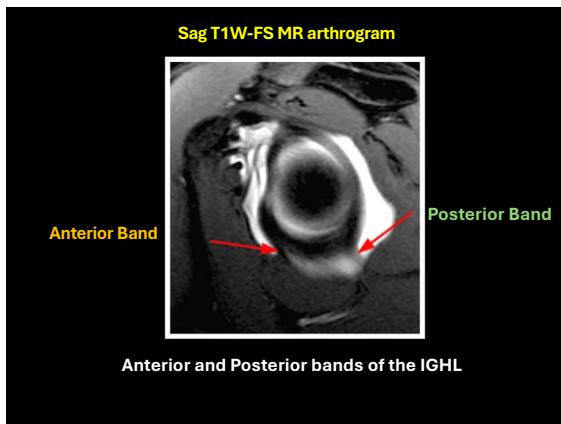
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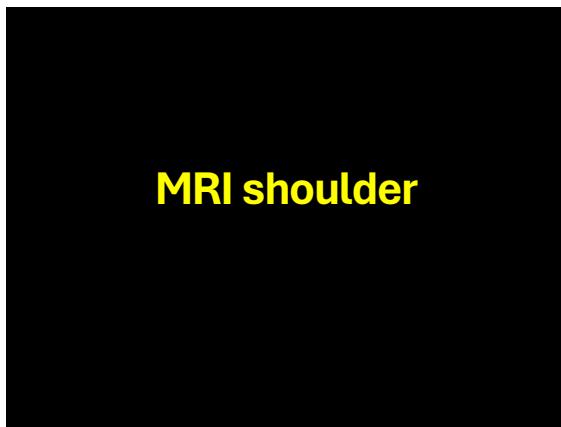
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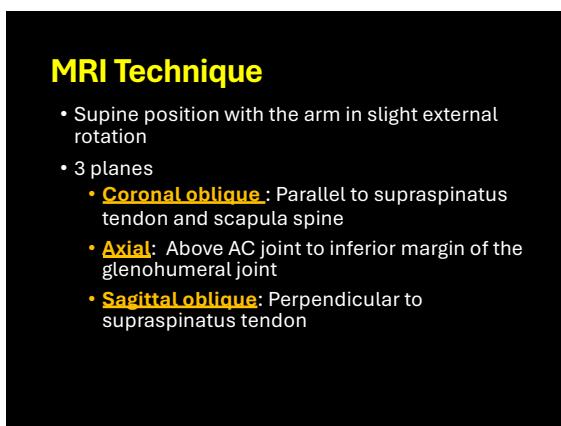
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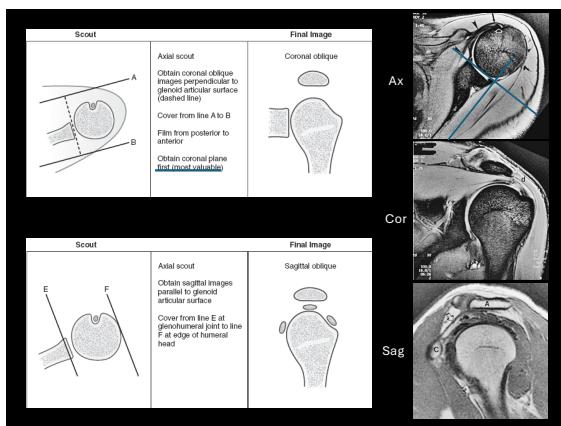
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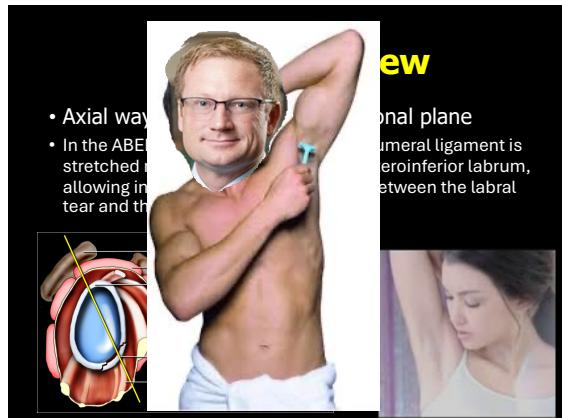
MRI Sequences

- Axial: PDW-FS
 - Sagittal oblique: T2W
 - Coronal: T1W, PDW-FS
 - ***MR arthrography*** (Intra-articular Gd.):

T1W-FS (3 planes) + ABER

(ABduction and External Rotation)

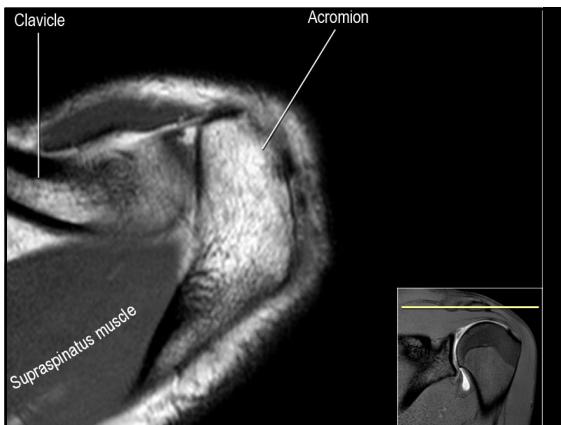
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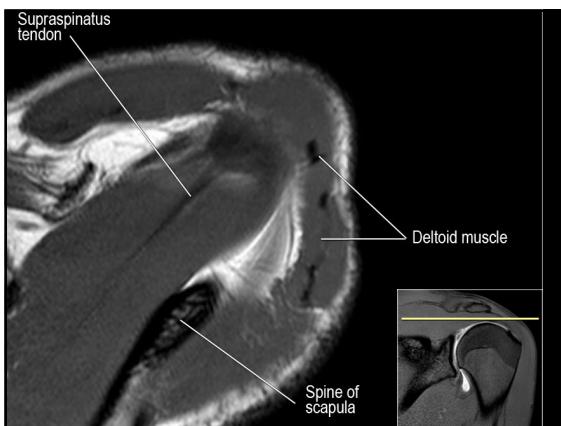
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Axial

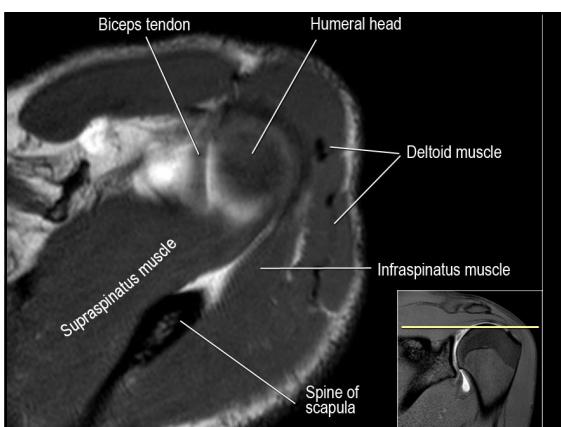
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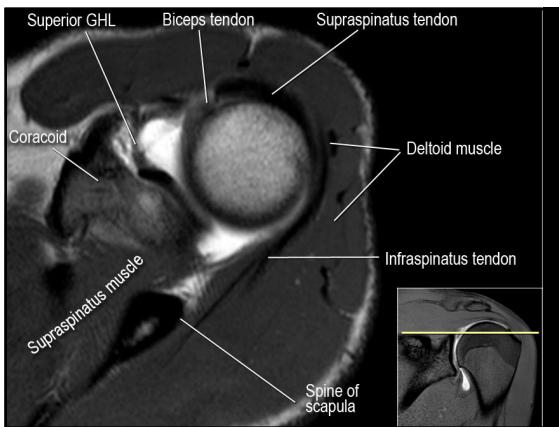
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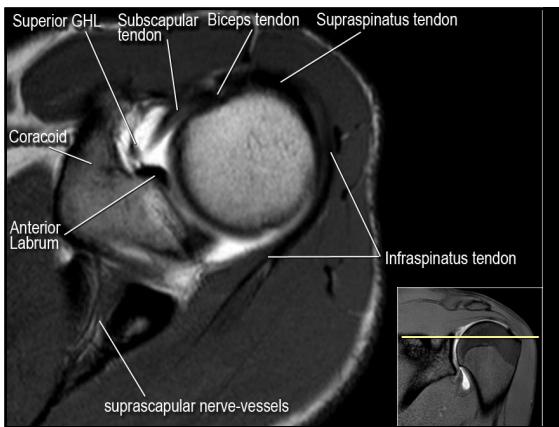
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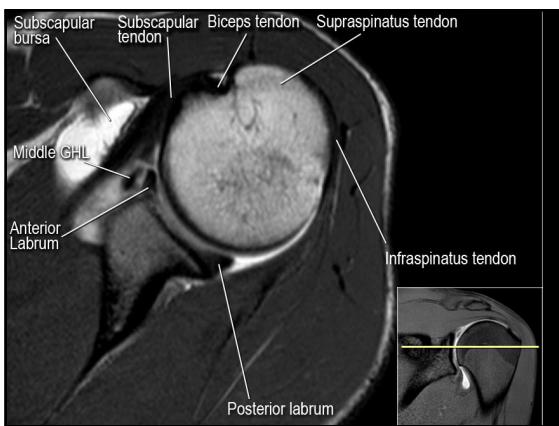
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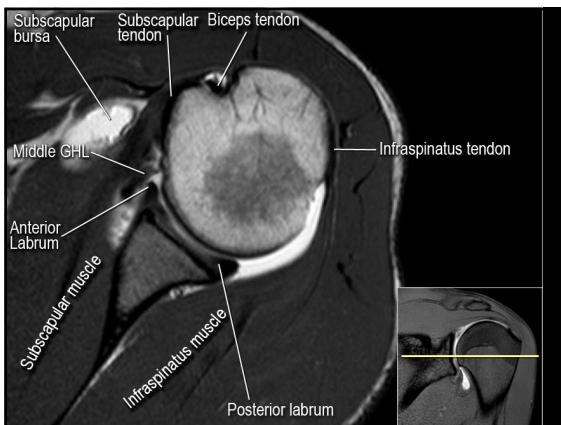
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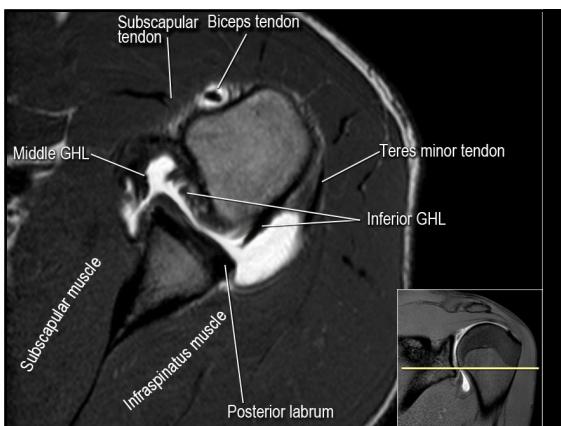
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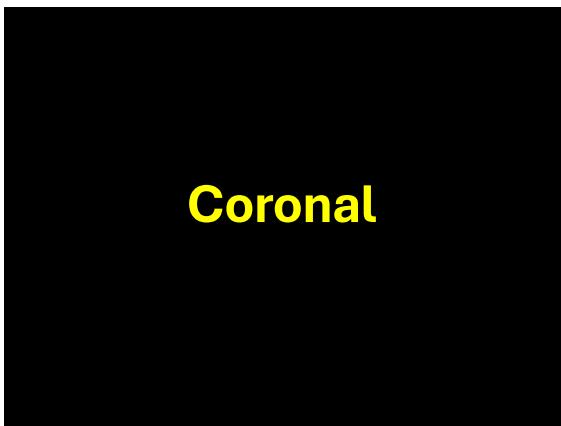
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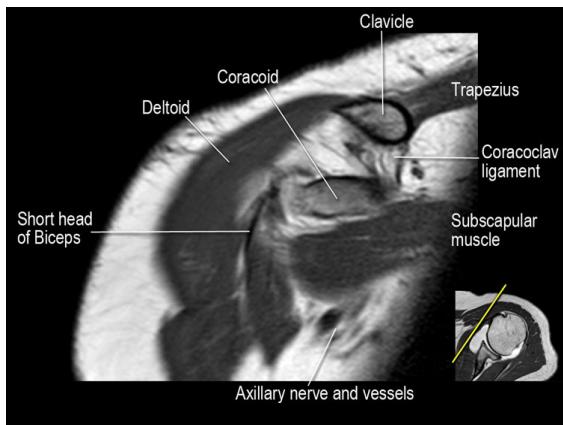


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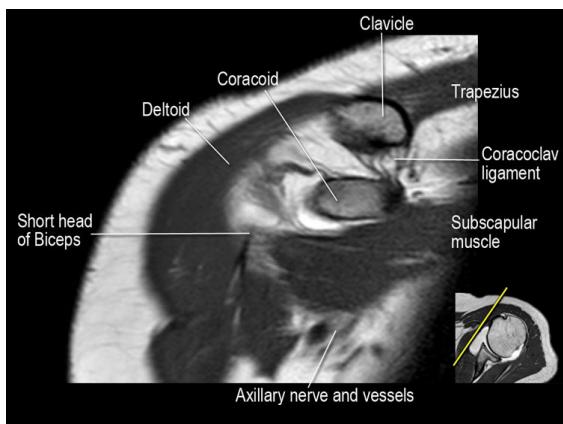


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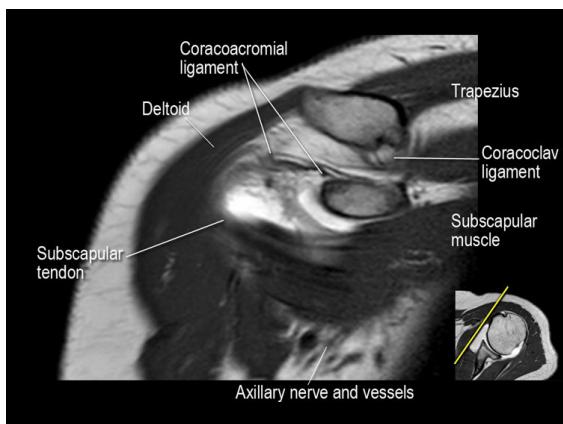
Coronal



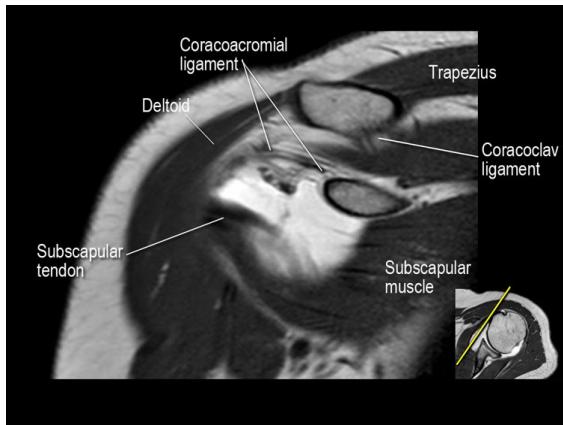
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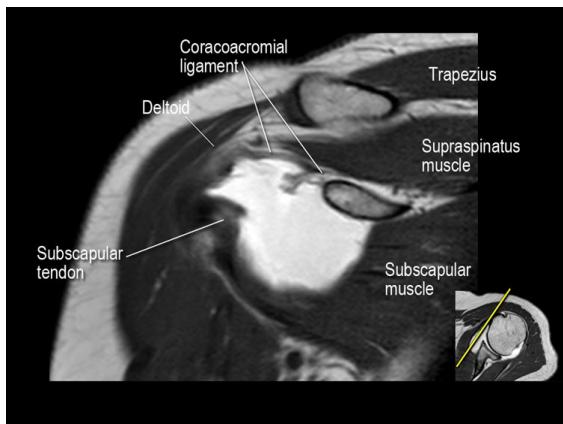
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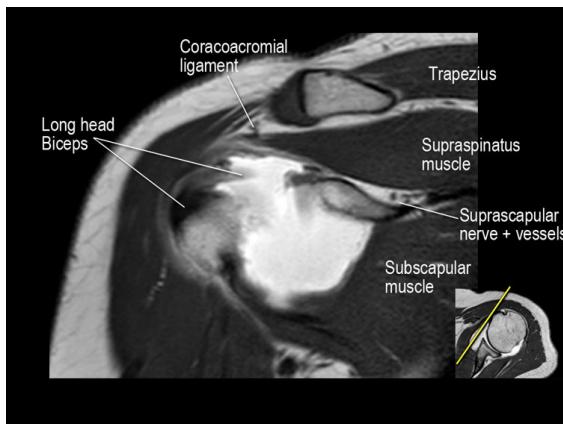
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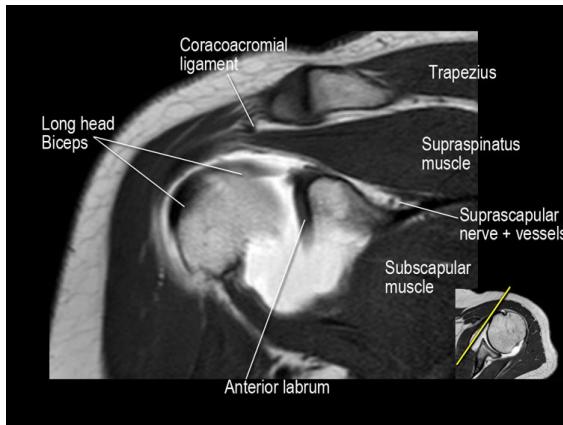
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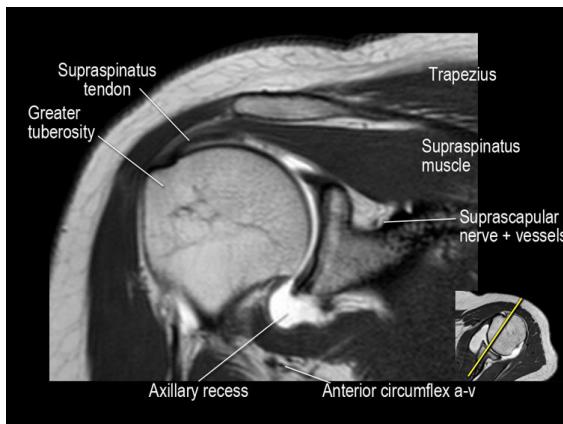
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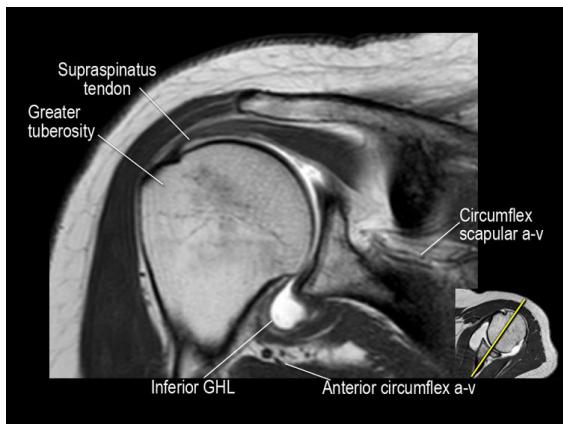
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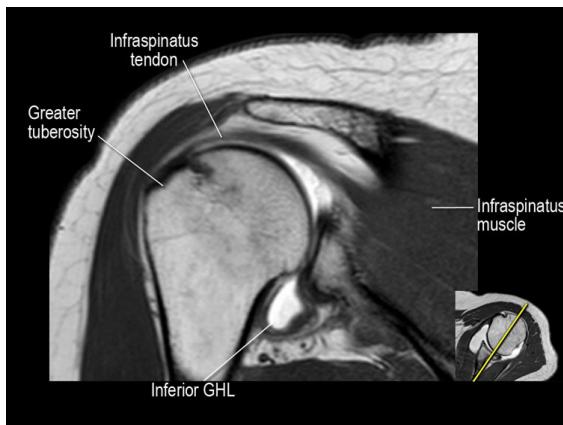
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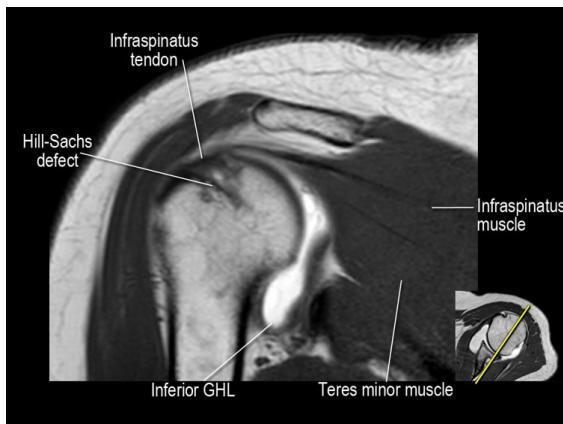
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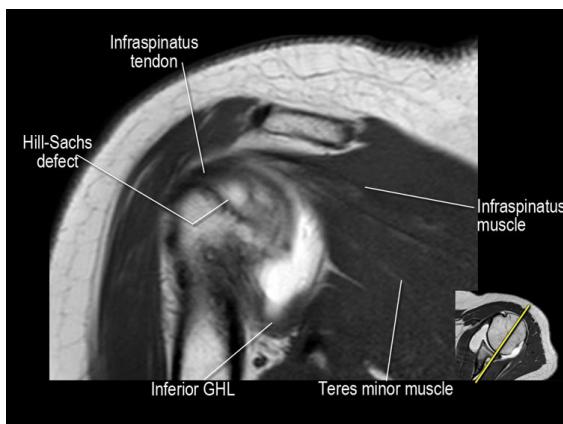
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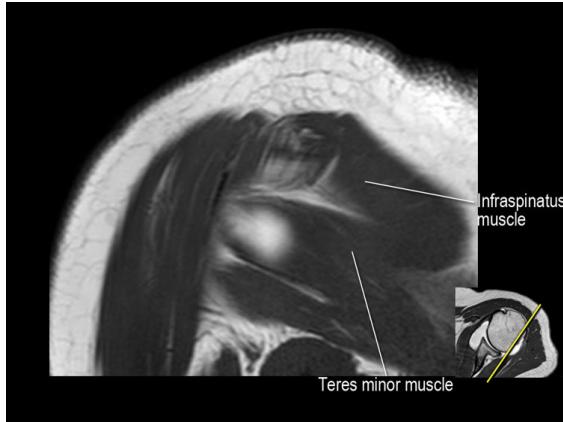
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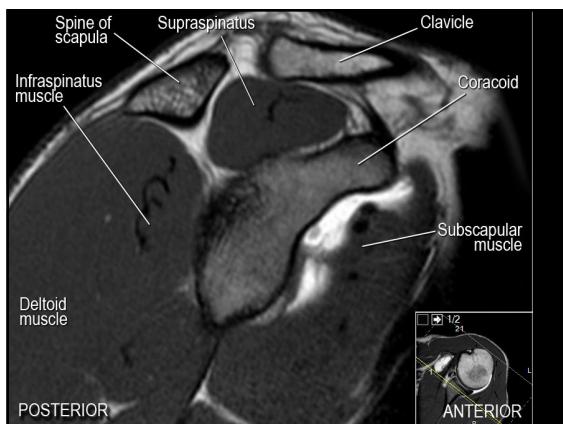
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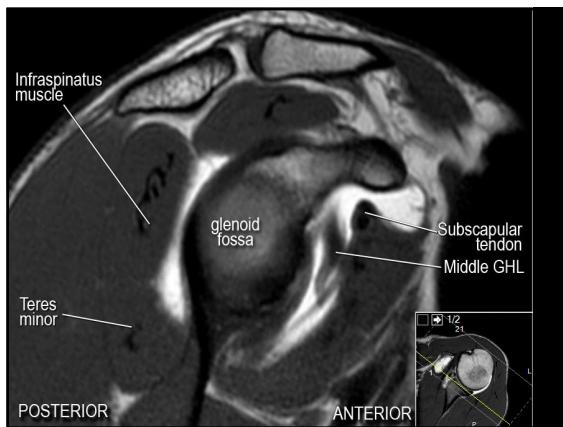
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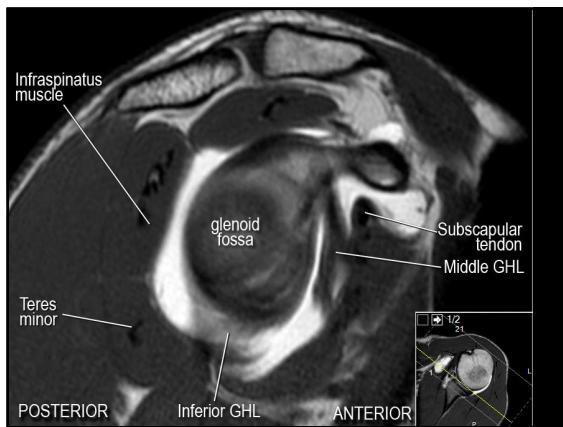
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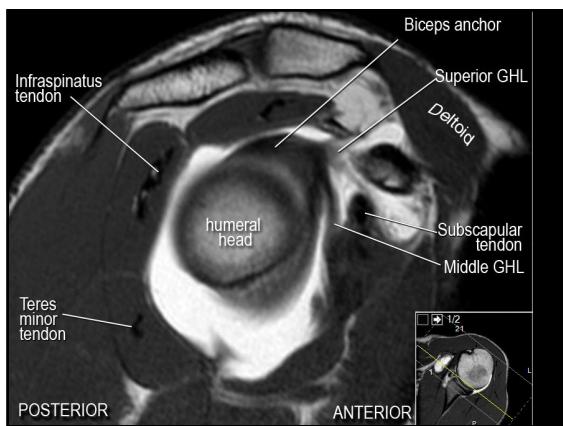
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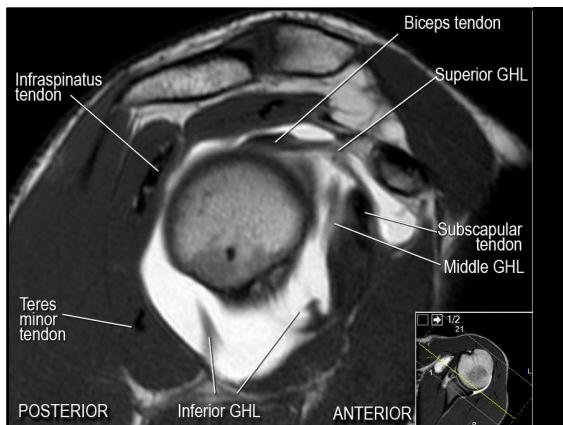
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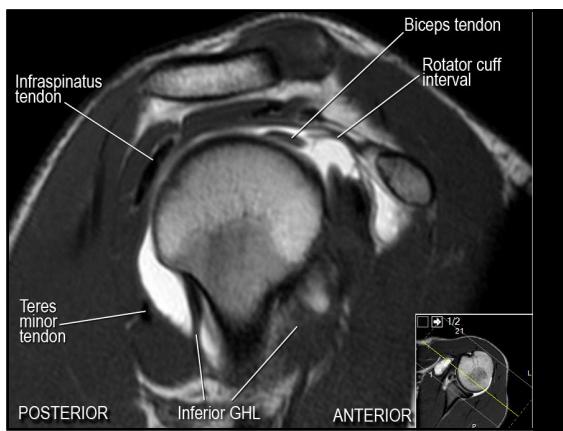
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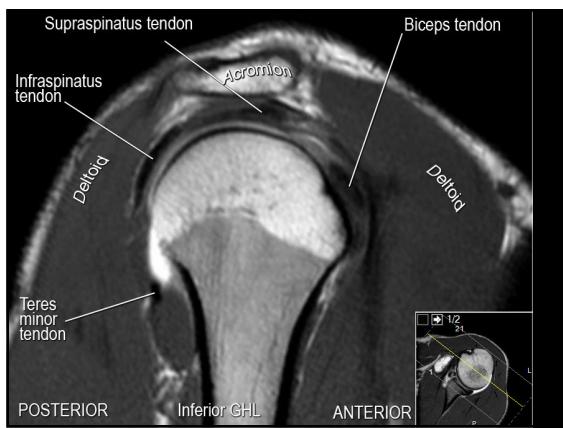
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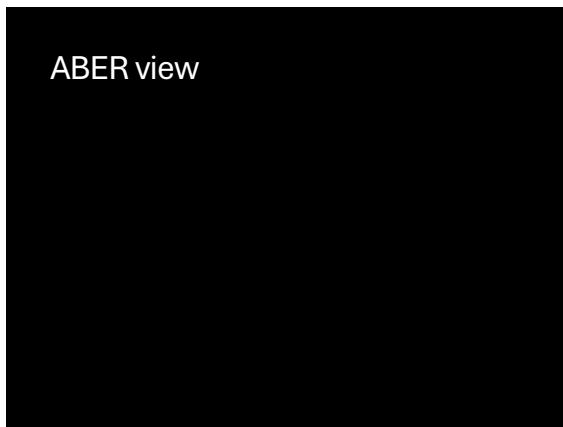
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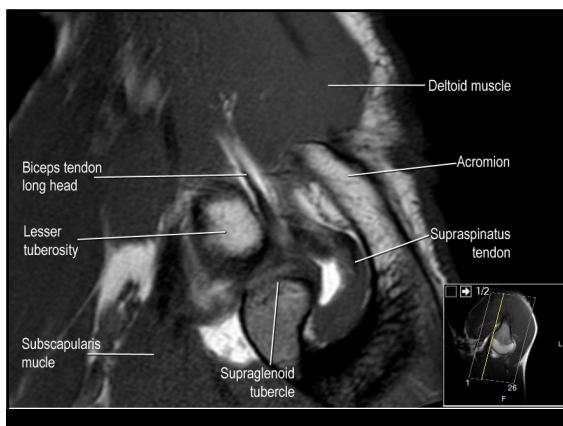
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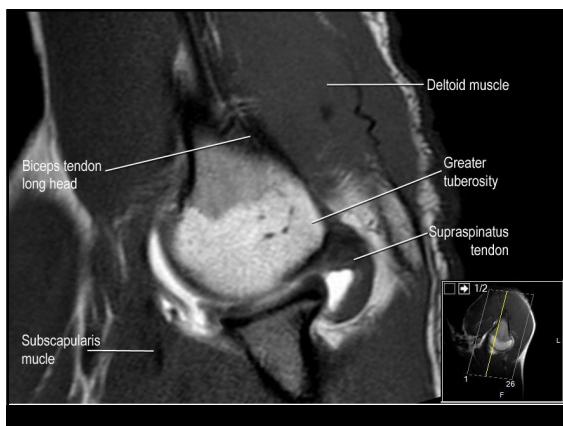
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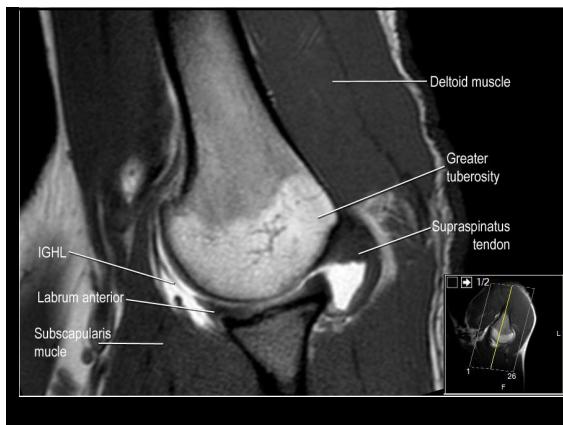
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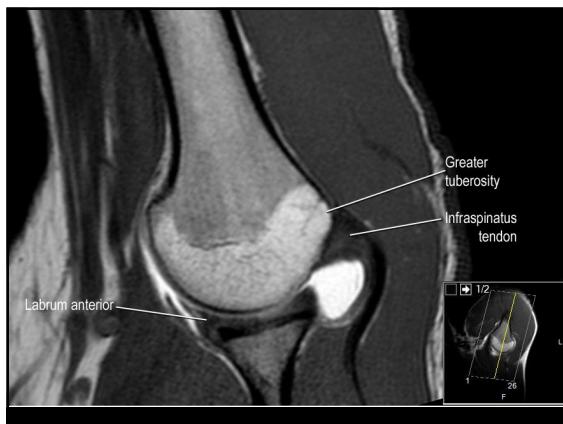
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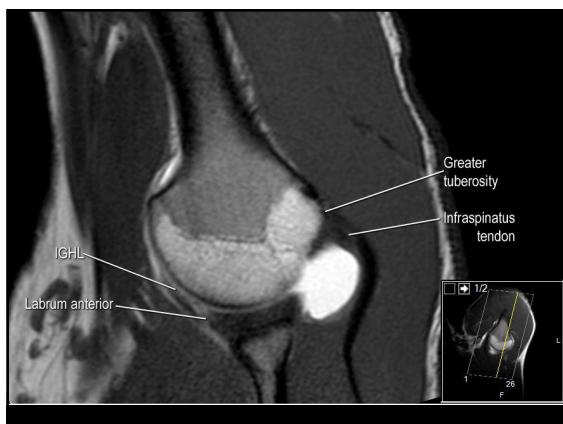
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ROTATOR CUFF

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ROTATOR CUFF TEAR

Classification

- Full-thickness tear
 - Articular-bursal surface
 - Complete/incomplete
- Partial-thickness tear
 - Articular/bursal/Intratendinous
- Massive tear: full-thickness tears involving multiple tendons of the rotator cuff

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ROTATOR CUFF TEAR

Prevalence

- Partial-thickness tear > full-thickness tear
- Articular side > bursal side > Intratendinous

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ROTATOR CUFF TEAR

Cause & pathogenesis

- Repetitive microtrauma > acute trauma
- **Full-thickness** tear occurred by combination of
 - Age
 - Repetitive stress/impingement syndrome
 - Corticosteroid injection
 - Hypovascularity
 - DM

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ROTATOR CUFF TEAR

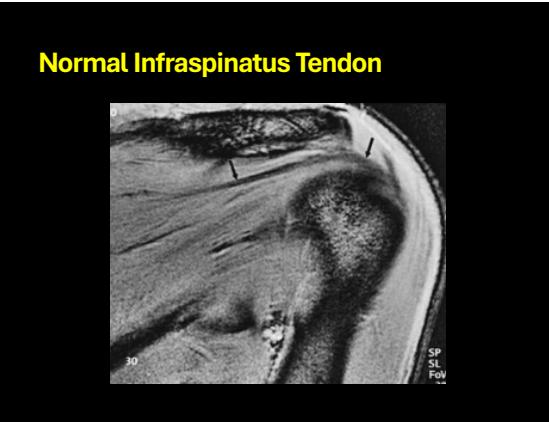
- Men
- > 40 years
- Dominant arm
- Partial-thickness: pain
- Full-thickness: pain, limited ROM

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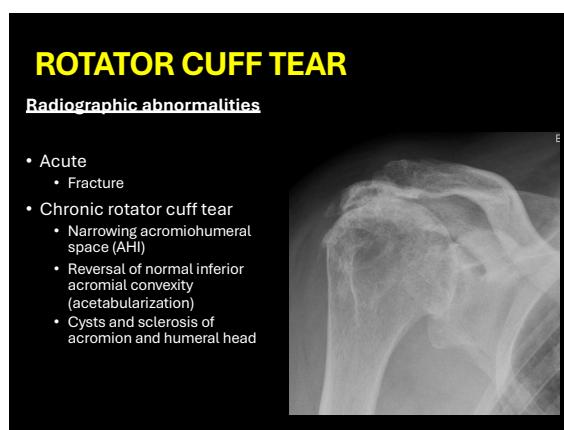
Normal Supraspinatus Tendon



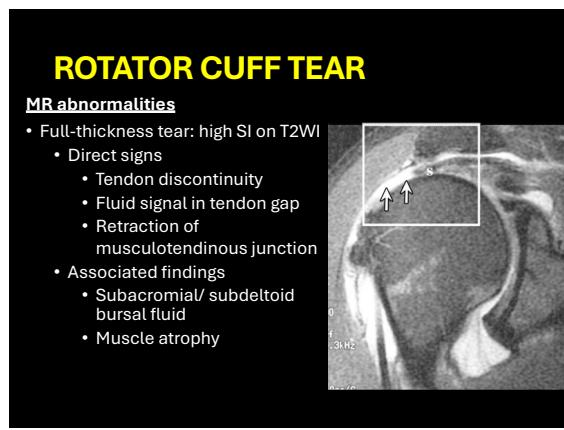
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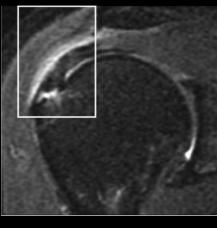


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ROTATOR CUFF TEAR

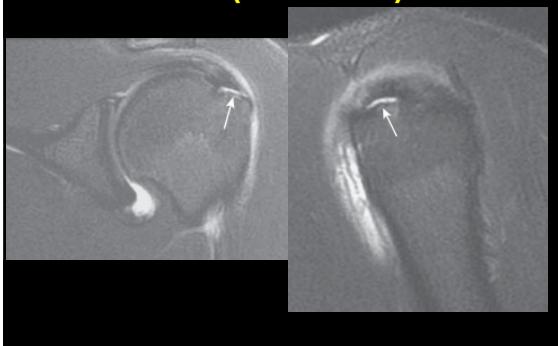
MR abnormalities

- Partial-thickness tear
 - Increased SI on T1 & T2
 - Higher signal than muscle on T2 (similar to joint fluid)
 - Tear on joint surface fills with Gd on MR arthrogram
 - Degeneration
 - Intrasubstance increased SI T1 & T2
 - Not as high signal as joint fluid



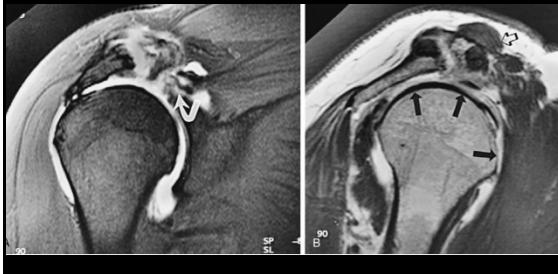
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Rim rent tear (aka PASTA)



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Massive cuff tear



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MR Information

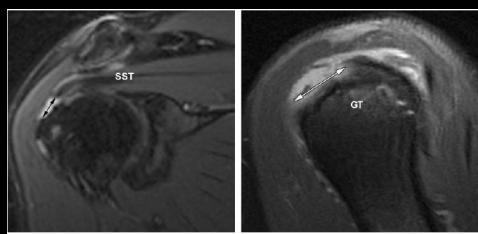
- Tear depth/thickness
- Tear shape
- Tendon retraction
- Tear extension to adjacent structures
- Muscle atrophy/fatty degeneration
- Coracoacromial arch and impingement

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Dimensions of a Full-Thickness Tear

- DeOrio & Cofield classification

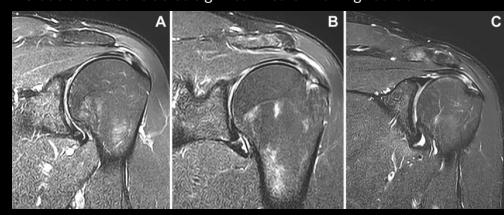
• Small	1 cm
• Medium	1–3 cm
• Large	3–5 cm
• Massive	>5 cm



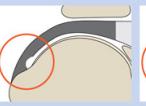
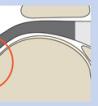
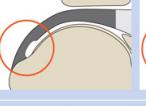
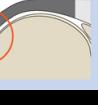
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Depth of a Partial-Thickness Tear

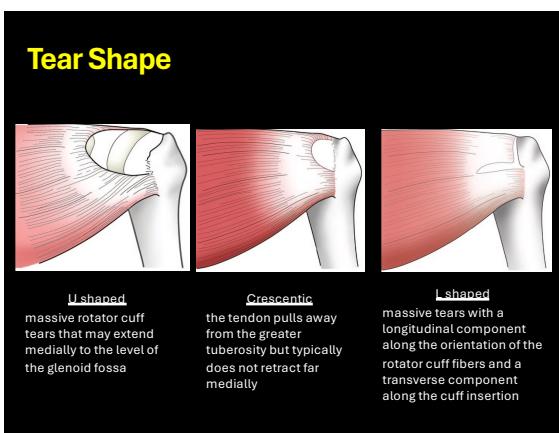
- Ellman Classification
 - Grade 1 (3 mm)
 - Grade 2 (3–6 mm)
 - Grade 3 (6 mm)
- The normal rotator cuff is 10–12 mm thick
- Grade 3 tears considered significant tears involving >50% of cuff



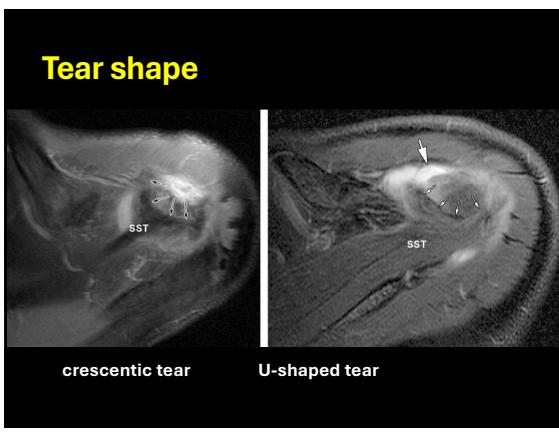
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Grade	Description	Articular side	Bursal side
1	Depth of tear <3 mm (or < $\frac{1}{4}$ of tendon diameter)		
2	Depth of tear 3–6 mm (or < $\frac{1}{2}$ of tendon diameter)		
3	Depth of tear >6 mm (or > $\frac{1}{2}$ of tendon diameter)		

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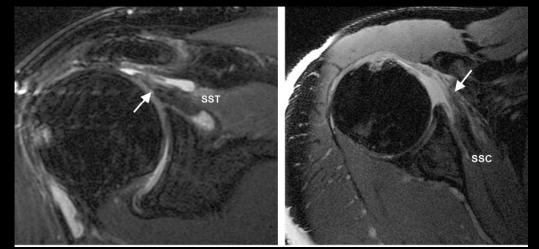
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Tendon Retraction

- Suggestive to be irreparable : retraction of tendon edge medial to glenoid fossa



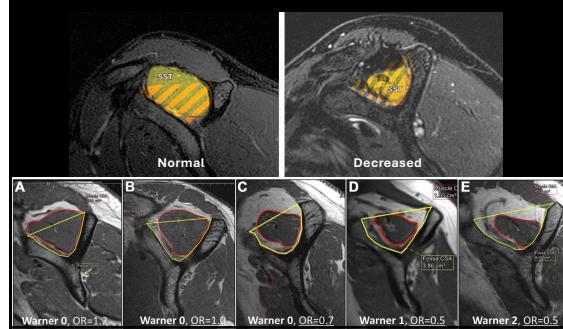
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Muscle Atrophy and Fatty Degeneration

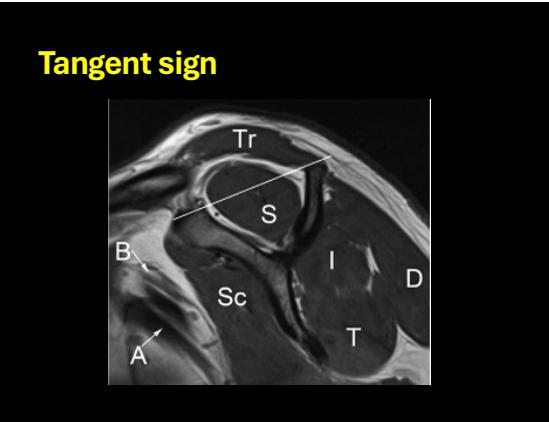
- Supraspinatus muscle atrophy
 - Function
 - Associated with tear recurrence after repair
- Occupation ratio
 - Tangent sign

95

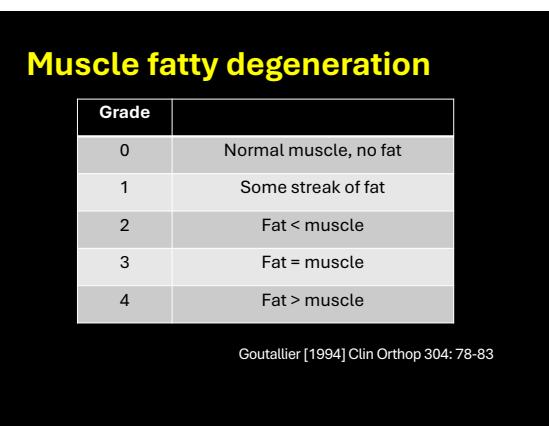
Occupation Ratio (Warner Classification)



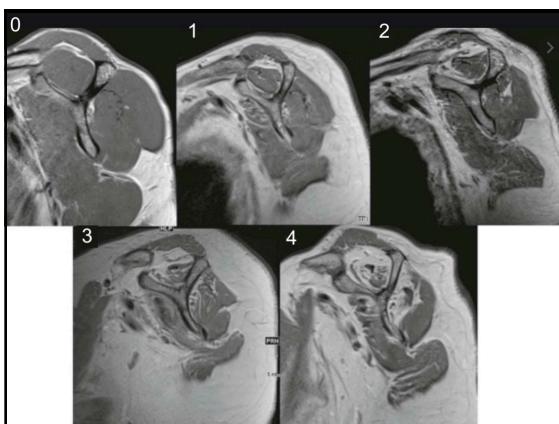
96



97



98



99

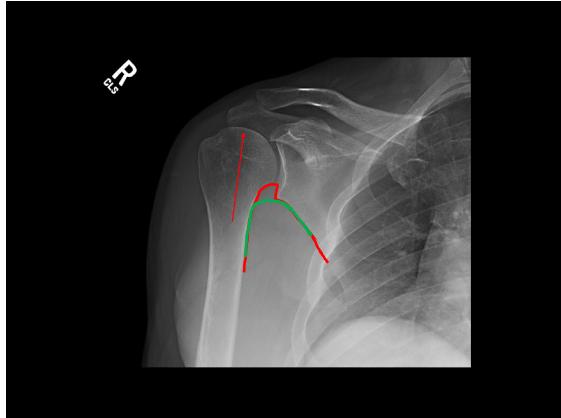
Right 3-Tendon Massive Cuff Tear

52 yo RHD male with lawnmower rollover 1 month prior
465289

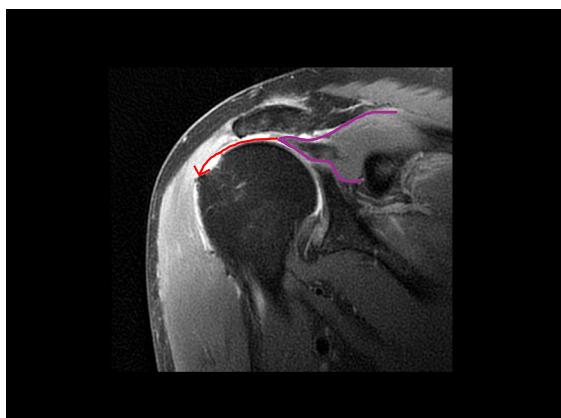
Courtesy of Dr. Teske (last presenter between you and adult beverages)

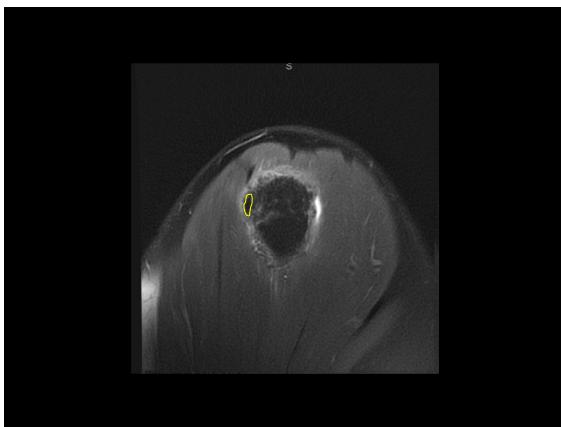
100

101

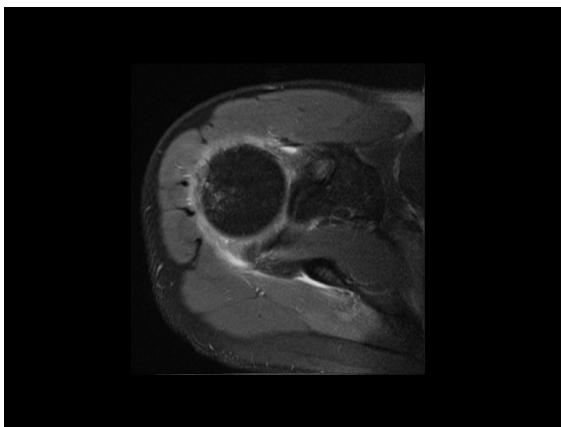


102

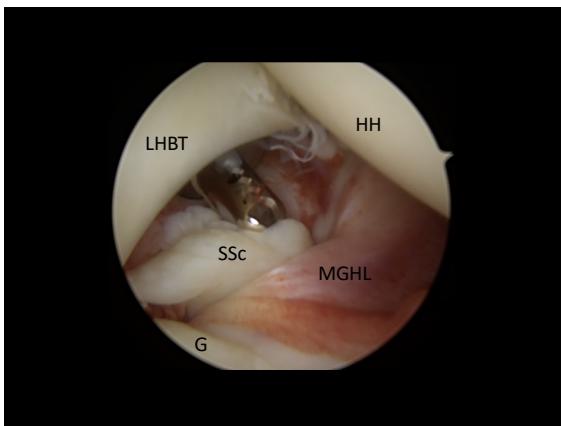




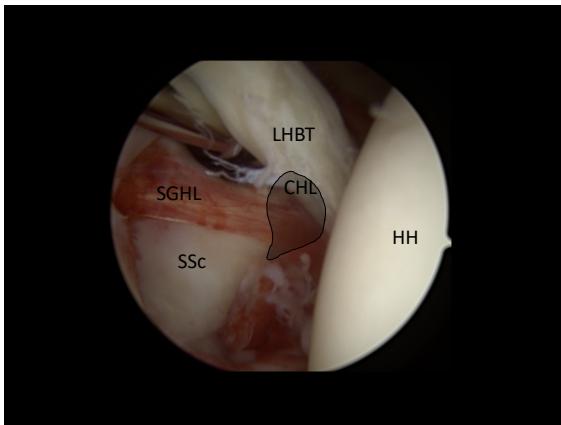
103



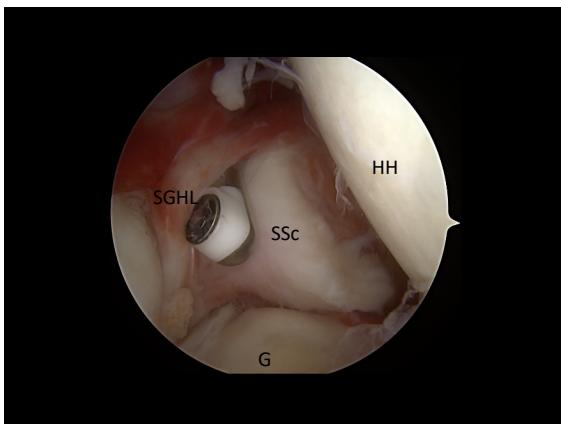
104



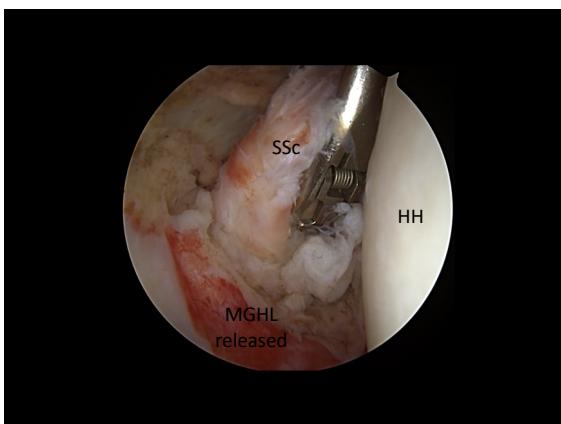
105



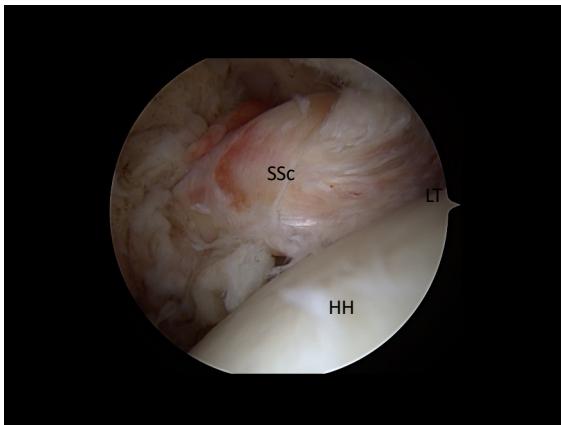
106



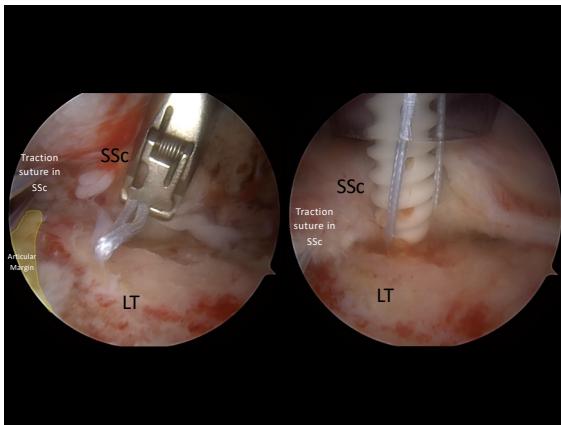
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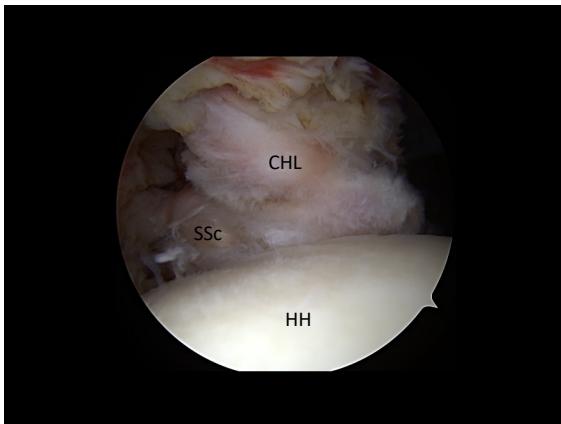
108



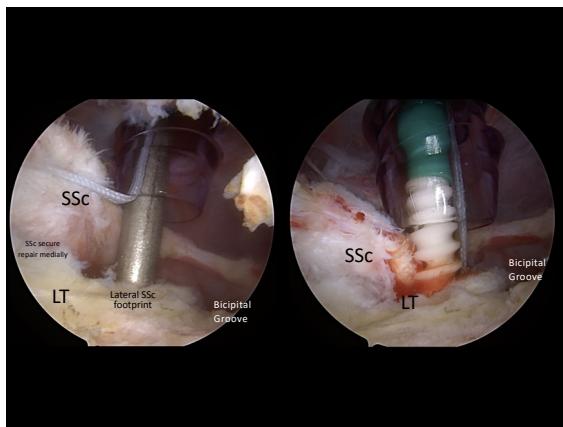
109



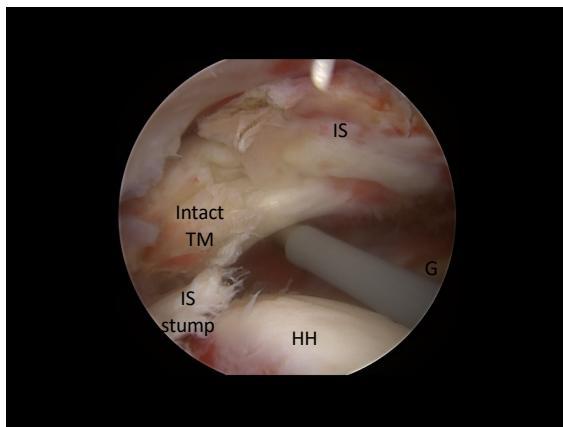
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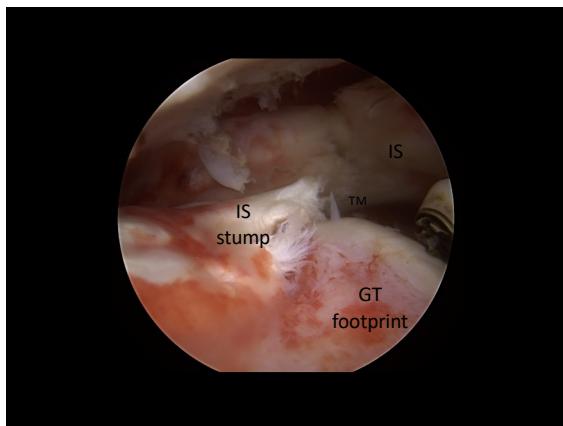
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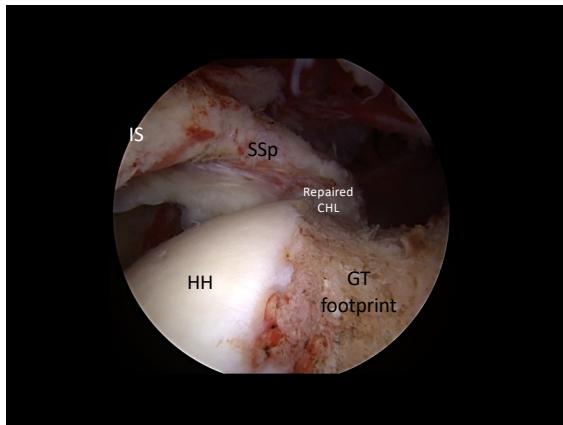
112



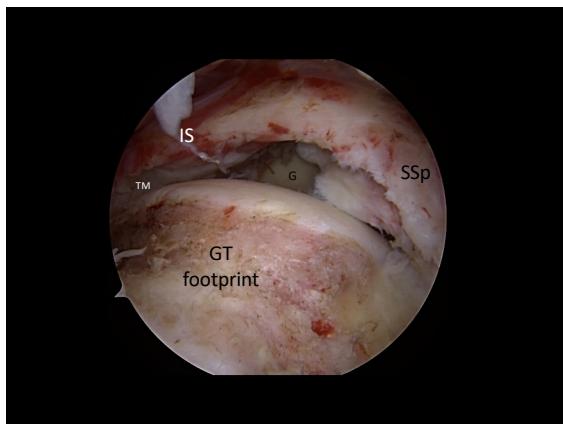
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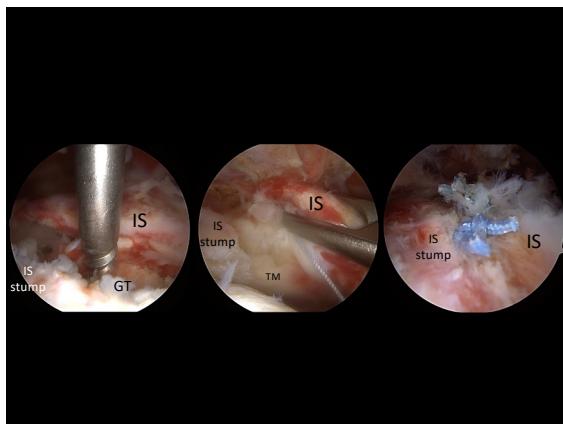
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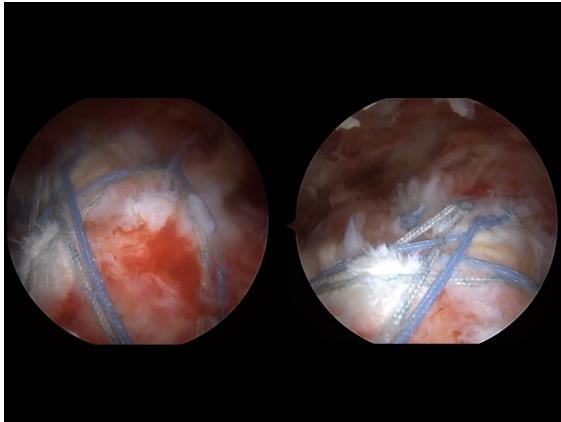
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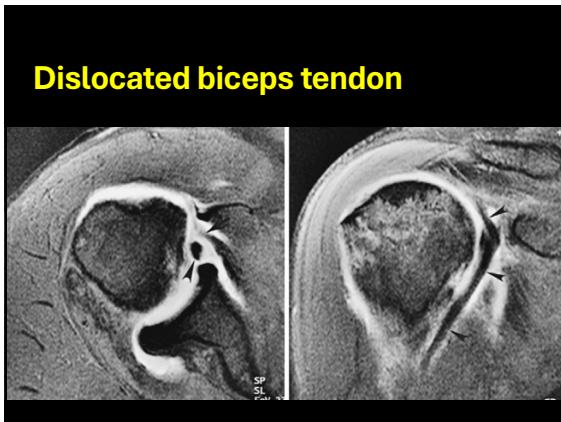
116



117



118

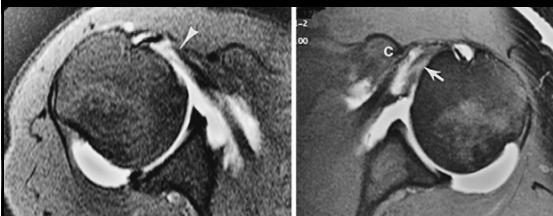


127



128

Subscapularis Tendon Tear



- MRI:
 - Detachment from lesser tuberosity
 - Increased SI, thin/thick
 - Contrast over the lesser tuberosity

129

Infraspinatus Tendon Tear

- MRI
 - Infraspinatus tendon undersurface tears
 - Posterosuperior labral tear
 - Humeral cyst adjacent to infraspinatus tendon insertion



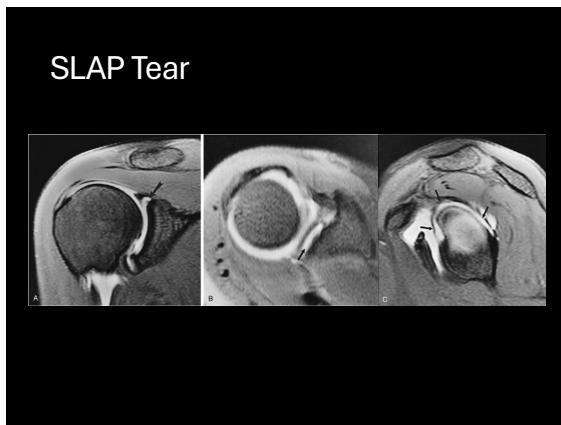
131

Posterosuperior labral lesion

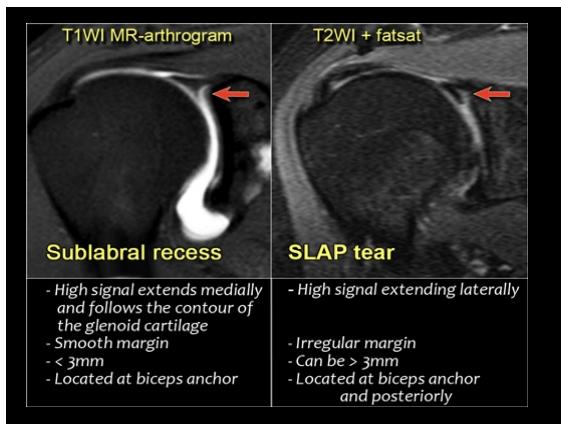
- Produces a posterior type: **superior labrum anterior and posterior (SLAP) lesion**
- Not associated with shoulder instability
- Common in falling onto out-stretched arm or in throwing sports



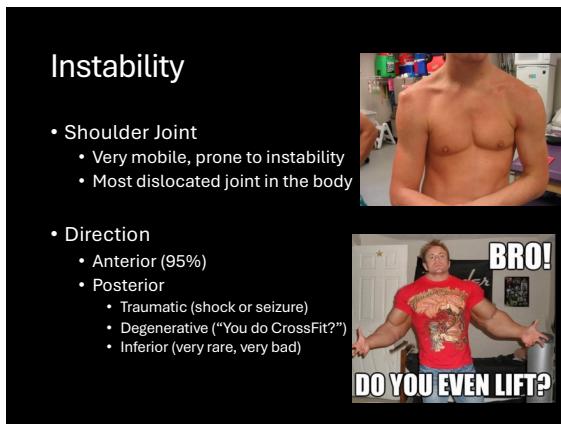
159



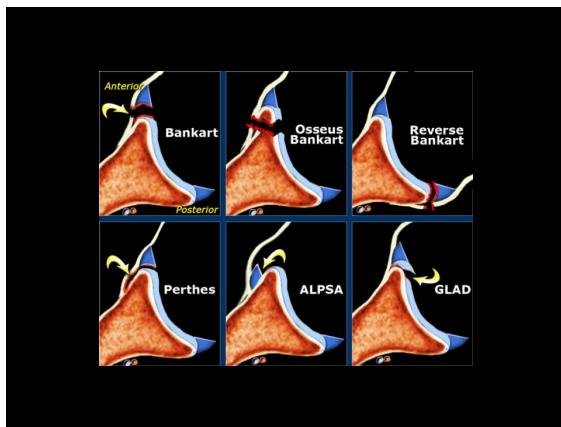
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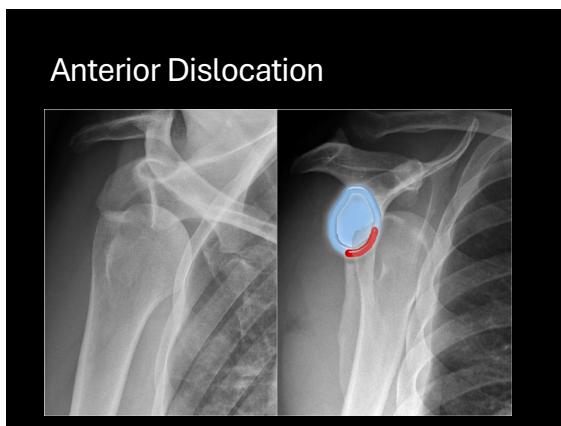
164



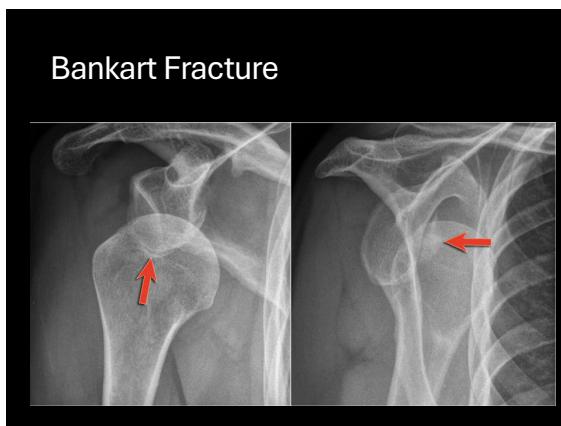
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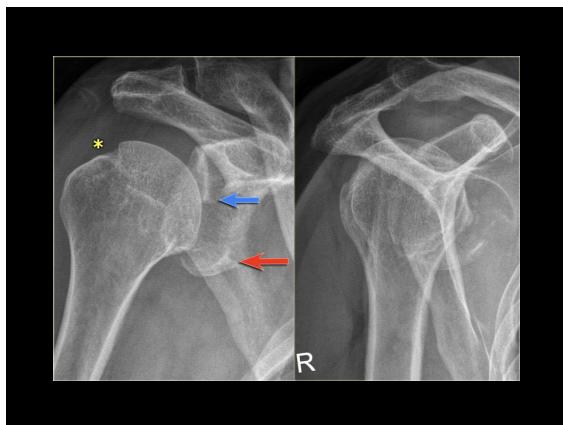
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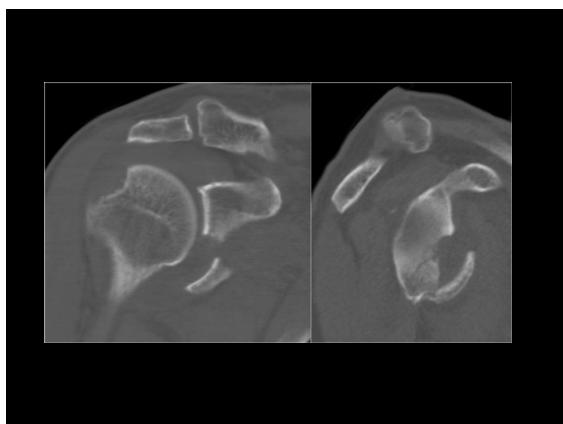
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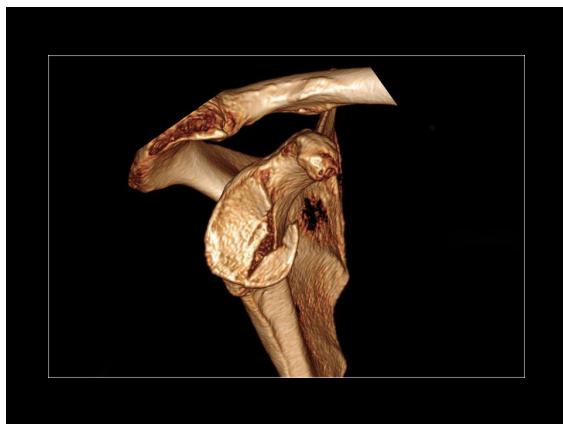
168



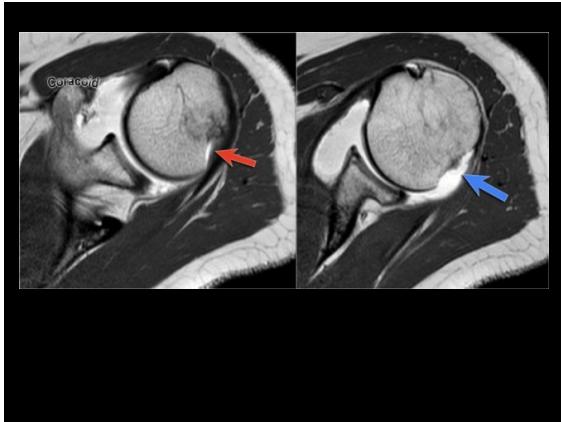
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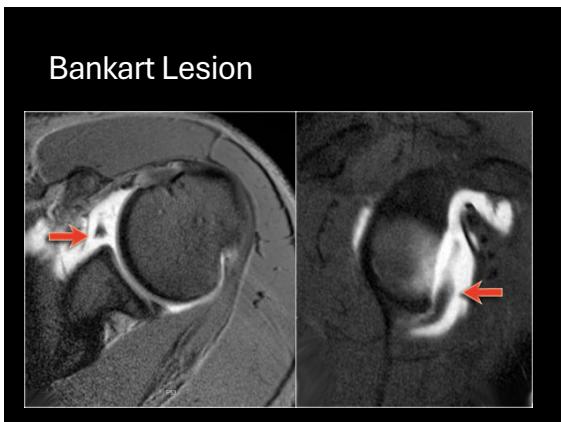
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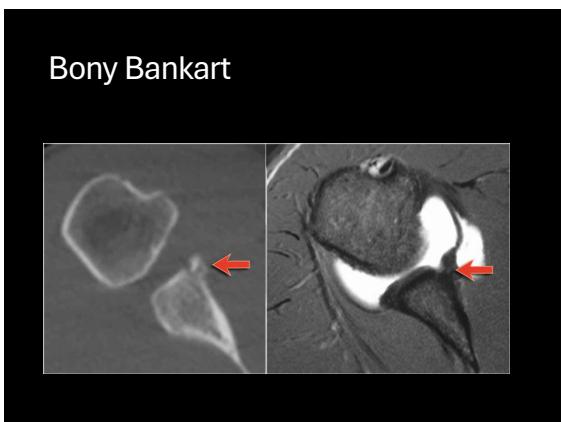
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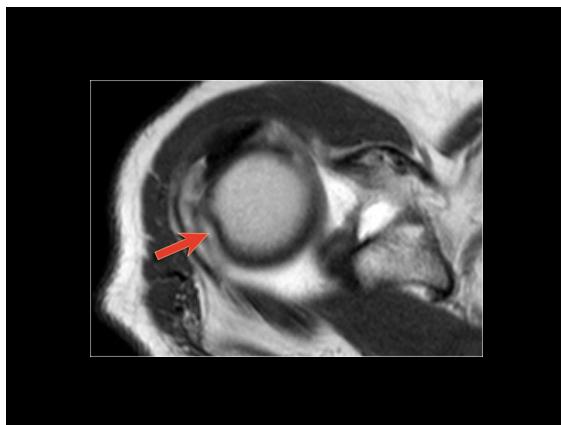
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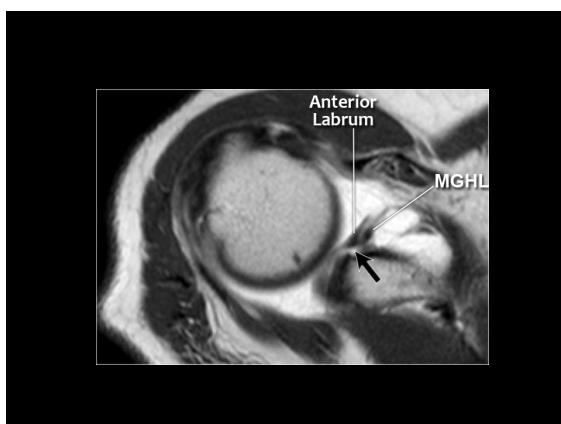
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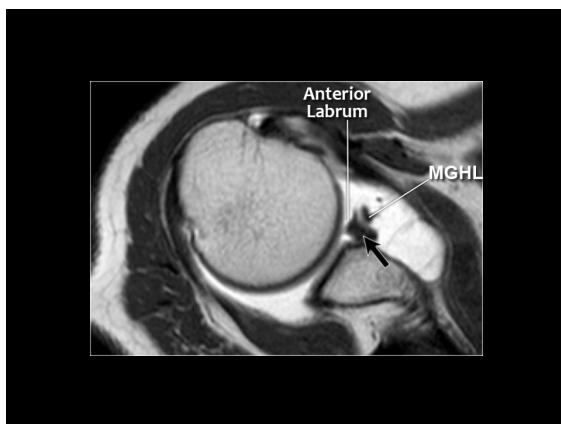
174



175



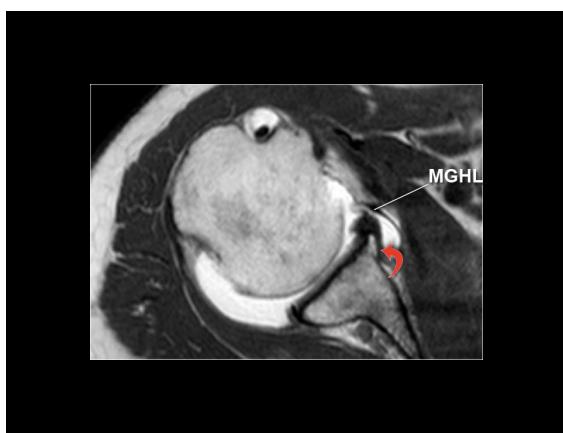
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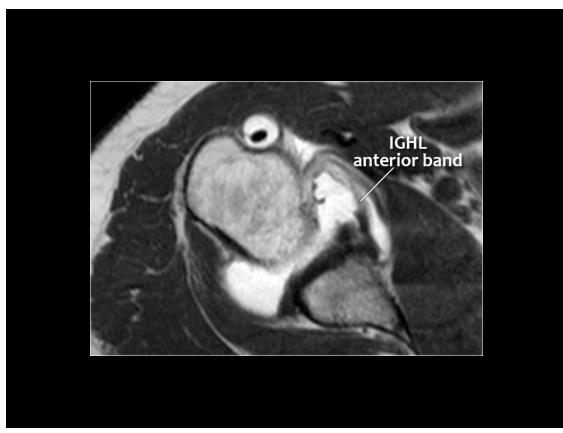
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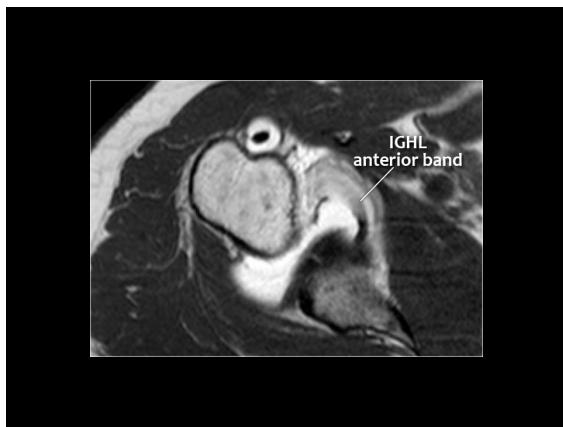
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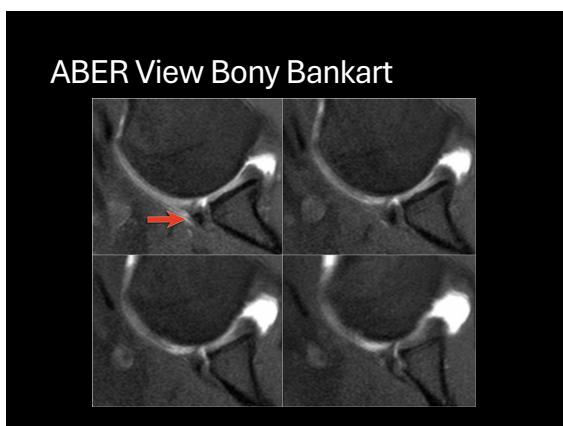
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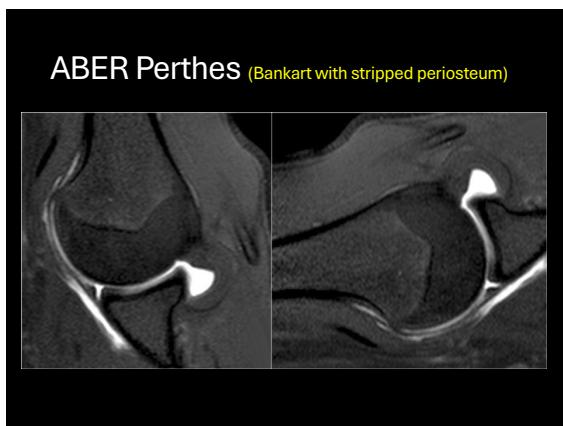
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181



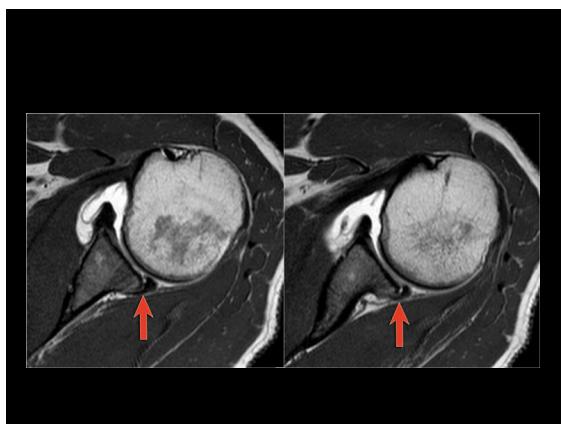
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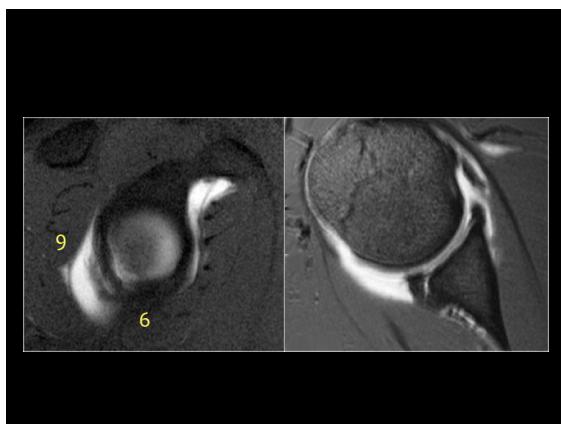
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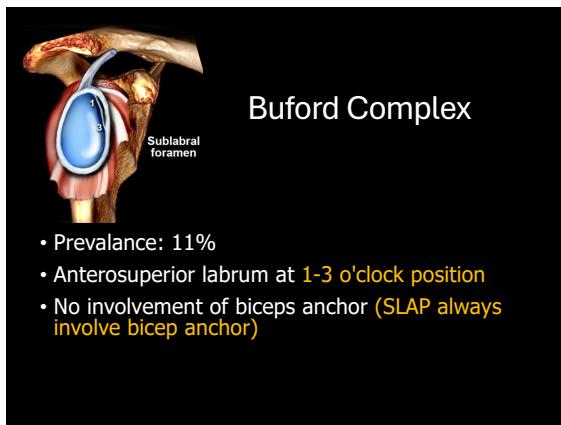
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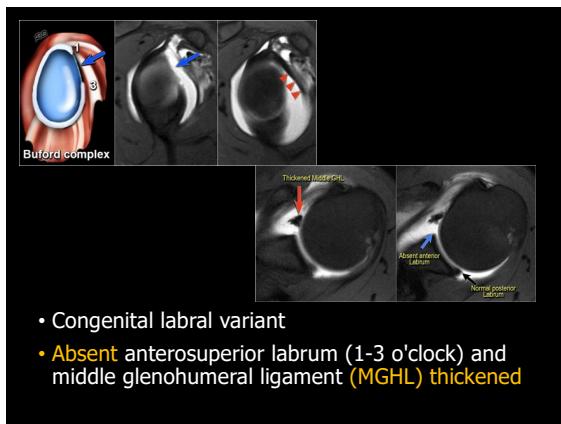
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186



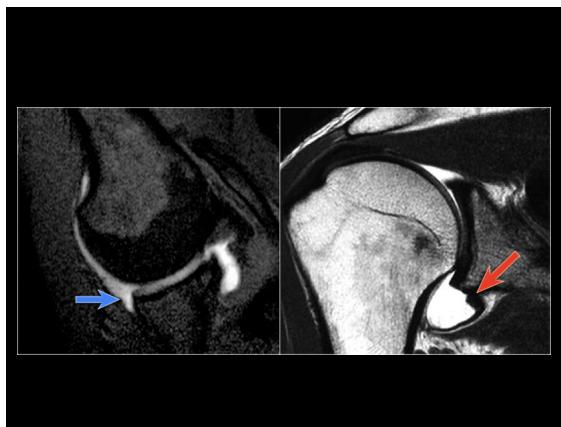
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189



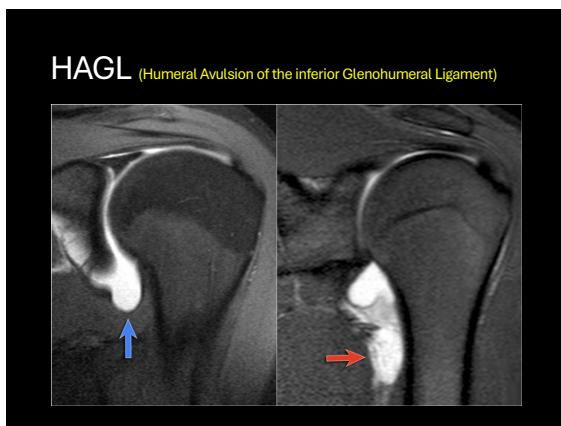
190



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192



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Thank You



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