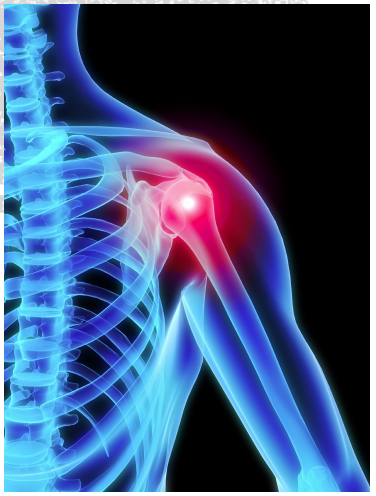
Fundamentals of Musculoskeletal Shoulder Pathologies



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DISCLOSURES

I have no personal or financial interests to declare.

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Outline

1. SLAP tears
2. Instability
3. Rotator Cuff Disease
   a. Subacromial Bursitis
   b. Impingement
   c. Rotator Cuff Tears
   d. Rotator Cuff Arthropathy
4. Adhesive Capsulitis

Introduction

SLAP tears

Empty Can test

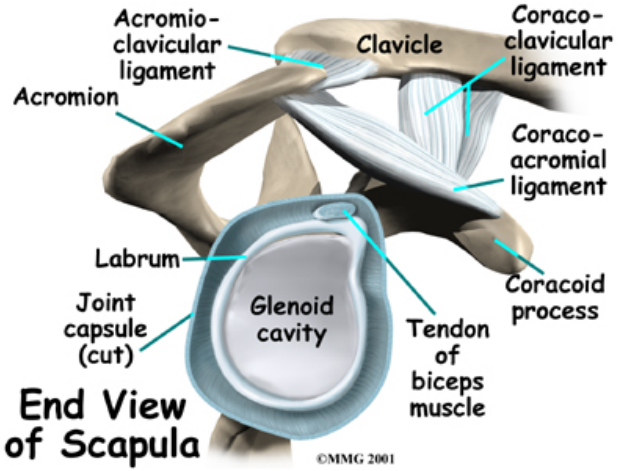
Hawkins-Kennedy test

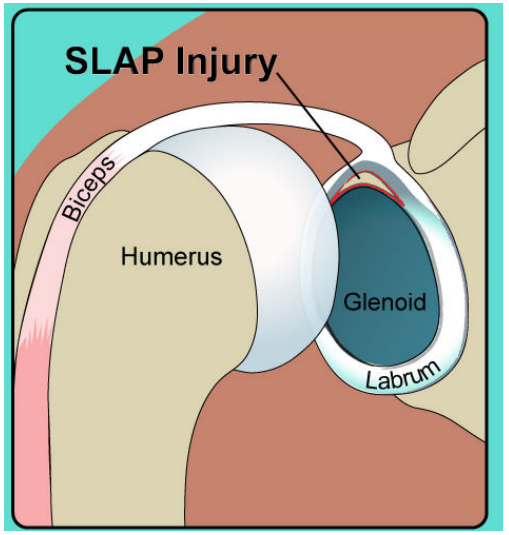
O'Brien's test

Bankart tears

SLAP Tears

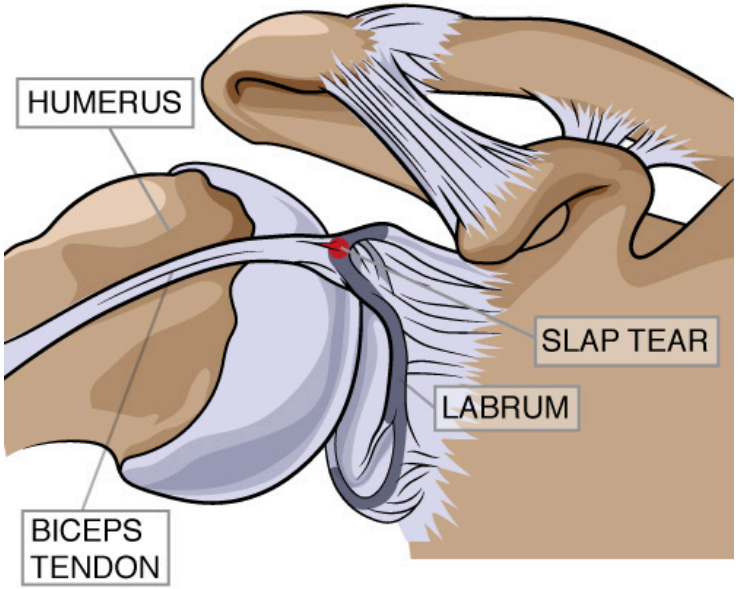
- SLAP = "superior labrum anterior to posterior"
- anatomy review
  - labrum like a "bumper" anteriorly & posteriorly
  - superior labrum is biceps anchor





SLAP Tears

- SLAP tear: a disruption of the biceps tendon anchor



SLAP Tears

Two Mechanisms of Injury

1. ***traumatic*** (acute injury)
   - from fall with arm outstretched
   - catching oneself from falling (traction injury)
2. ***degenerative*** (overuse)
   - repetitive throwing ("peelback" mechanism)

SLAP Tears

- Anterior pain
  - worse with overhead motion or throwing
- TTP in the bicipital groove
- pain/weakness with arm & forearm flexion

SLAP Tears

1. Special Test: **Speed's Test**

A. Speed's test:
To perform the "Speed's" test, the patient forward flexes the shoulder about 30 degrees against the clinician's resistance while keeping the elbow fully extended and the arm fully supinated.

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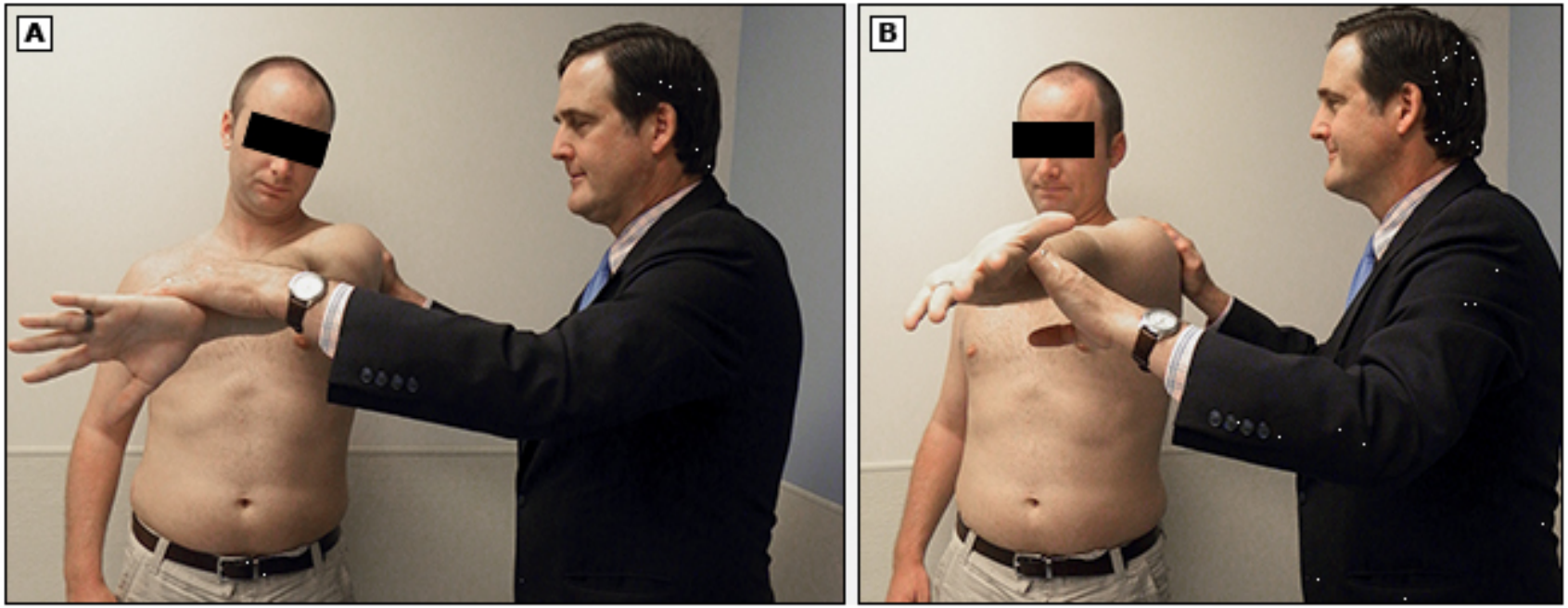
SLAP Tears

2. Special Test: **Yergason's Test**

B. Yergason's test:
To perform the "Yergason's" test, the patient holds her arm adducted with the elbow flexed to 90 degrees and the arm fully pronated. While they hold hands, the patient attempts to supinate while the examiner resists.

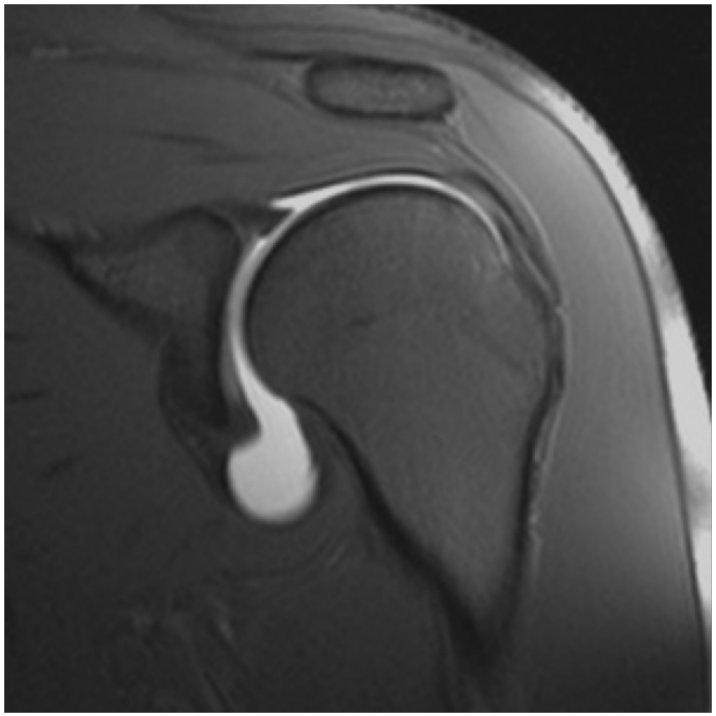
SLAP Tears

3. Special Test: **O'Brien's Test**

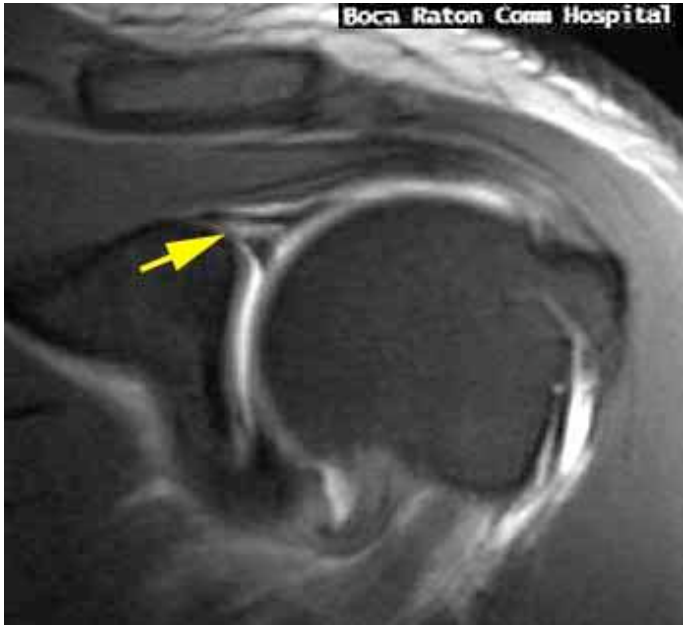


The active compression test is used to help diagnose SLAP lesions of the shoulder labrum. It is performed first with the patient's thumb pointed down (image A) and then with the thumb up (image B).

SLAP Tears



Normal



SLAP Tear, grade II

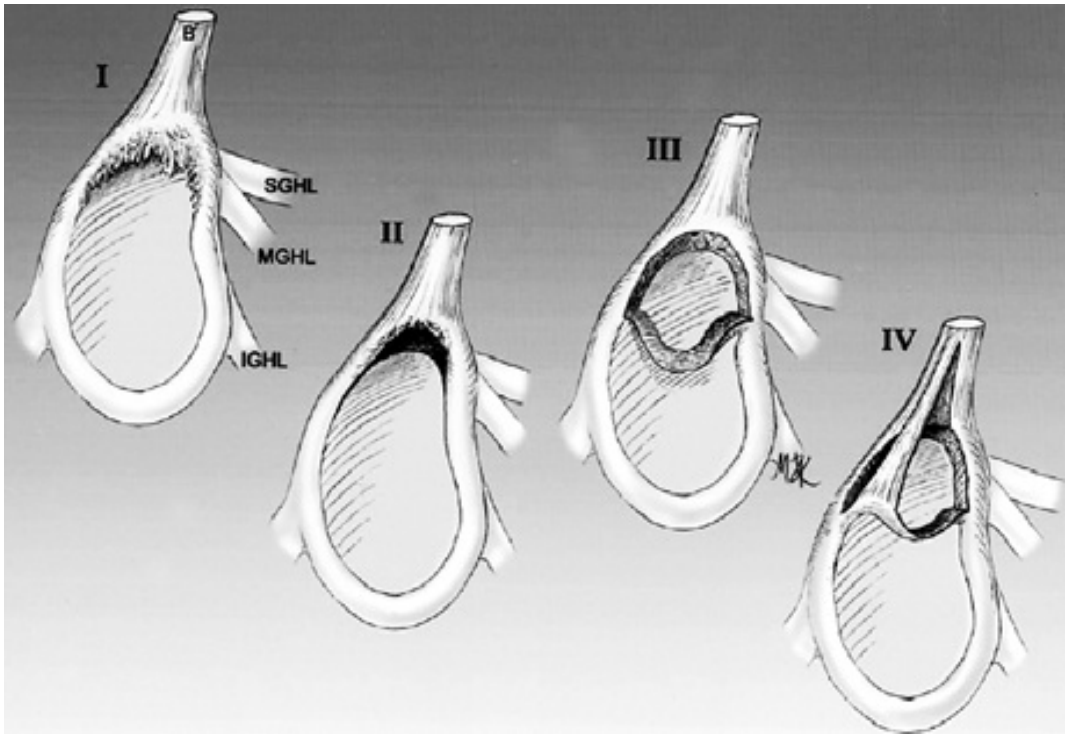
SLAP Tears

Normal

SLAP Tear, grade II

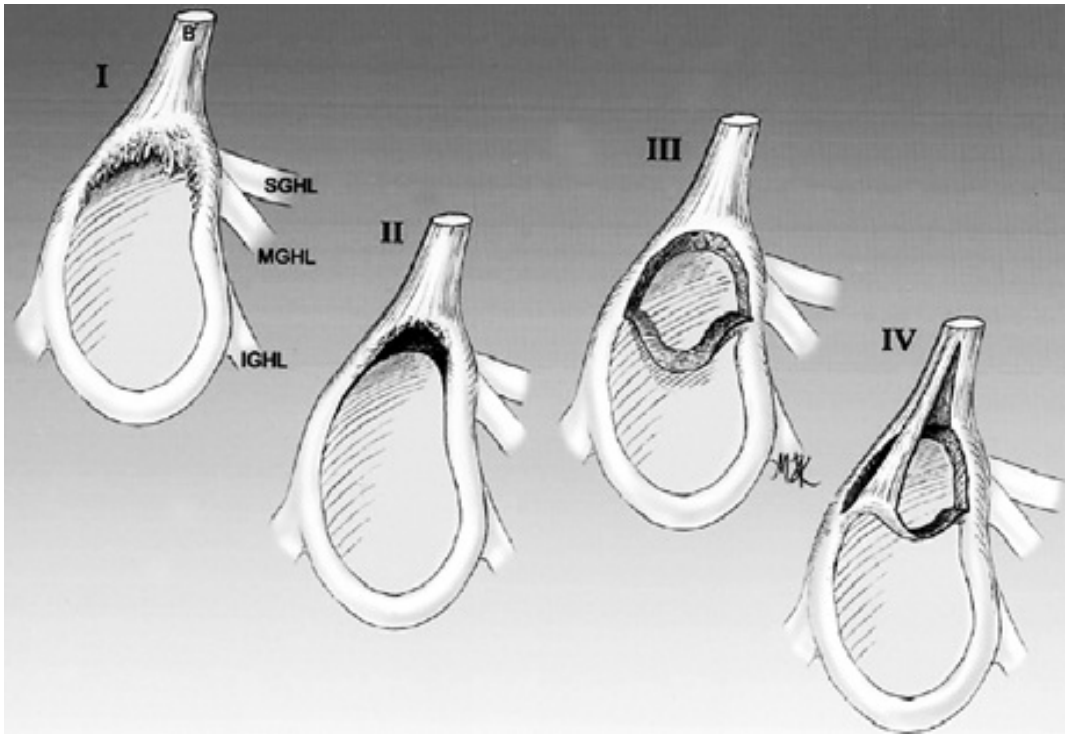
SLAP Tears

Classification
Type I: fraying of the labrum near biceps insertion
Type II: avulsion/detachment of superior labrum & biceps anchor
Type III : bucket-handle tear of superior labrum, but biceps anchor intact
Type IV: bucket-handle tear of superior labrum that extends into biceps tendon

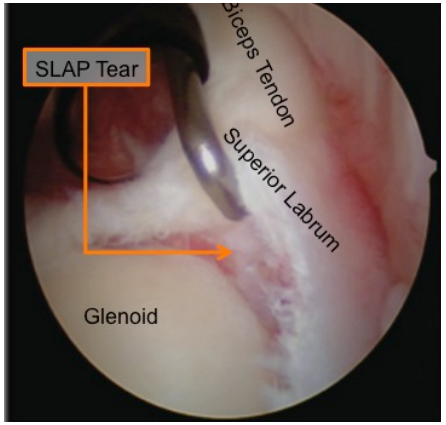


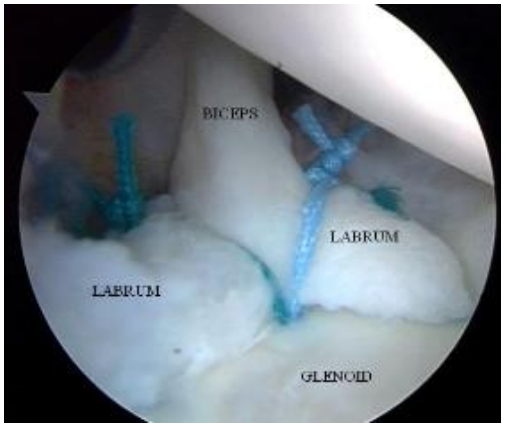
SLAP Tears

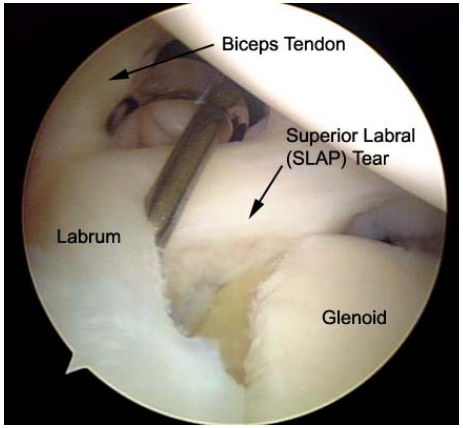
	Treatment	Recovery
Type I	Debridement	Fast (~2 weeks)
Type II	Repair (sutures/anchors)	Slow (12 weeks)
Type III	Debridement	Fast (~2 weeks)
Type IV	Repair (sutures/anchors)	Slow (12 weeks)

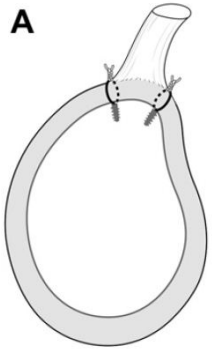


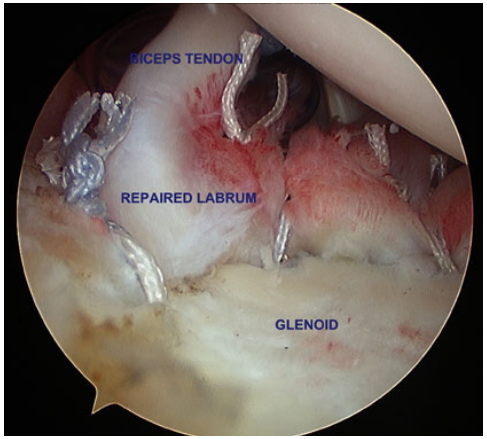
SLAP Tears


SLAP Tear
Biceps Tendon
Superior Labrum
Glenoid


BICEPS
LABRUM
LABRUM
GLENOID

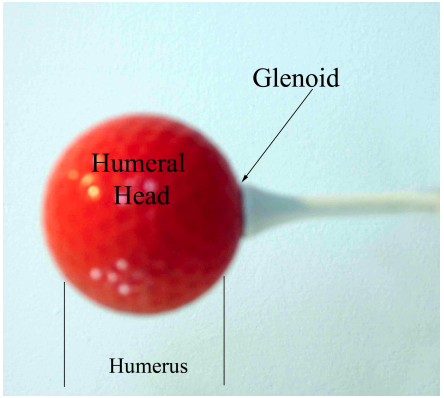

Biceps Tendon
Superior Labral
(SLAP) Tear
Labrum
Glenoid

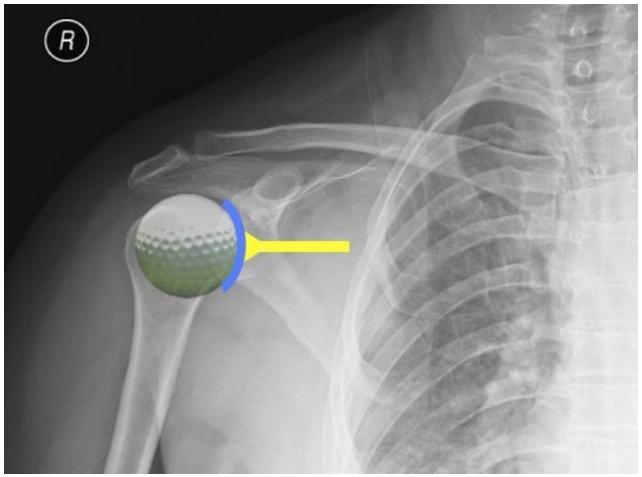

A

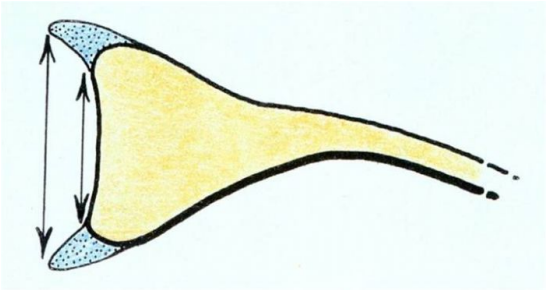

BICEPS TENDON
REPAIRED LABRUM
GLENOID

Instability

- anatomy review
  - glenoid normally shallow, the ***labrum deepens it***

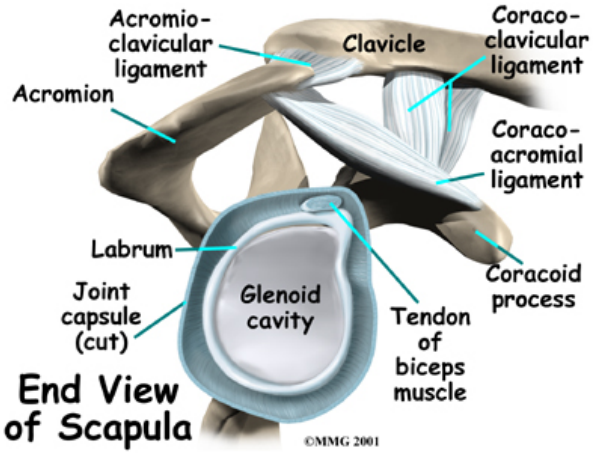


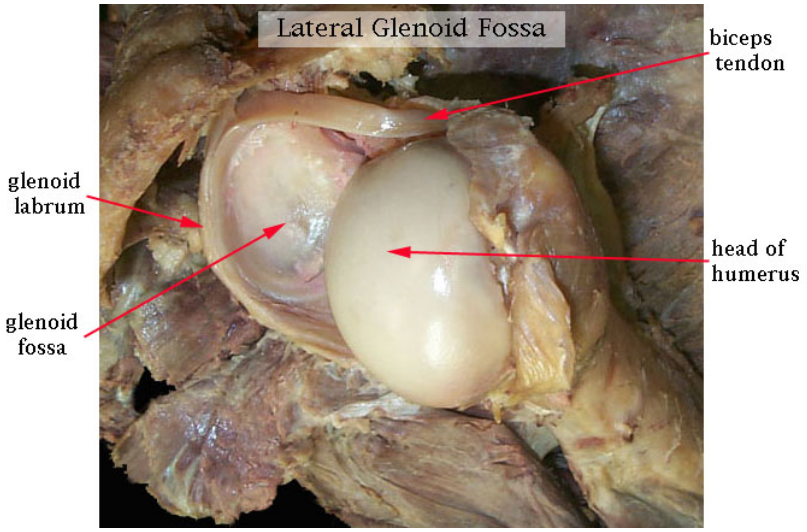


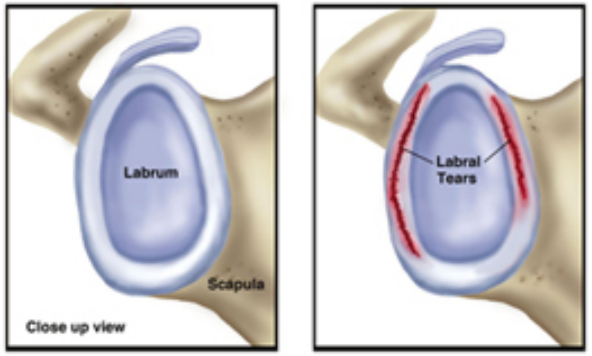


Instability

- anatomy review
  - labrum is a "bumper"

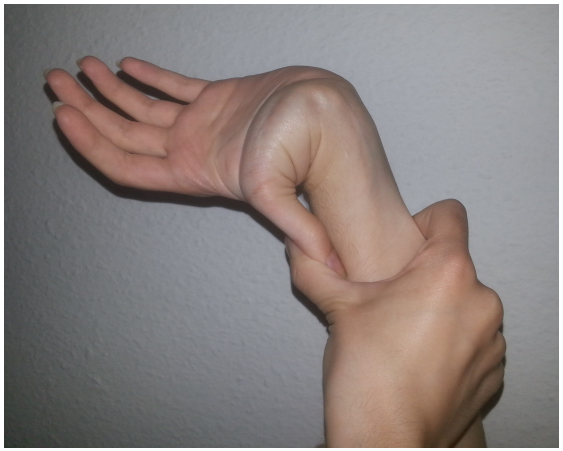


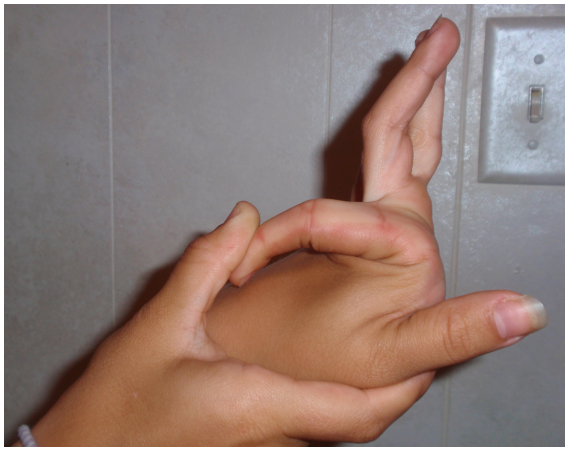




Instability

- Key point:
  - **Instability ≠ Laxity**
    - laxity: normal, physiologic "looseness" of a joint
    - instability: pathologic "looseness", ± pain





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Instability

Two overall types

1. Atraumatic/Congenital

(from inherent, excessive ligament laxity)

2. Traumatic Tear

(from glenohumeral dislocation/subluxation)

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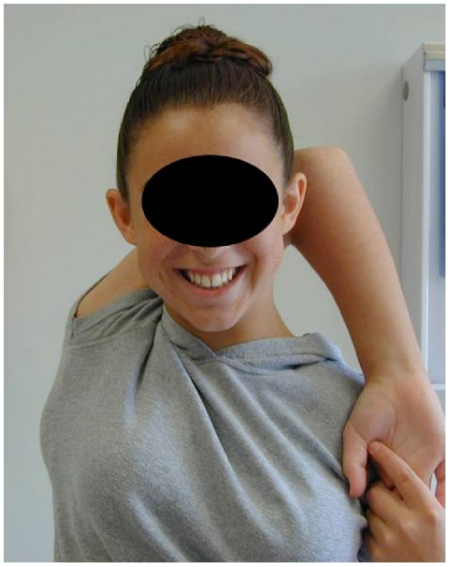
Instability: Atraumatic/Congenital

- aka ***multi-directional instability***

- predisposition:
  - Ehlers-Danlos
  - Marfan
  - swimmers?



Instability: Atraumatic/Congenital

- Excessive ROM
  - loose in all directions
- Strength typically unaffected
- Special test: Sulcus sign
- Treatment: conservative!
  - ***Rotator cuff strengthening***

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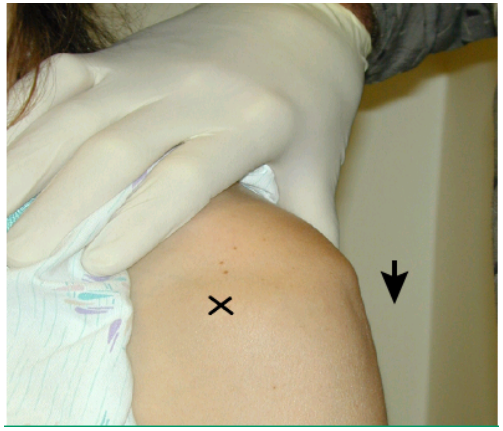
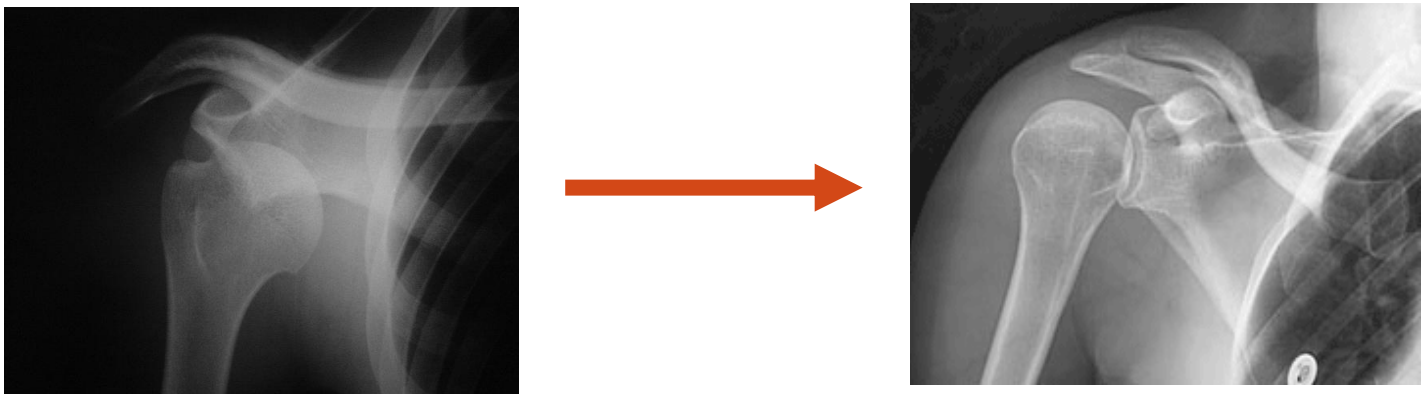
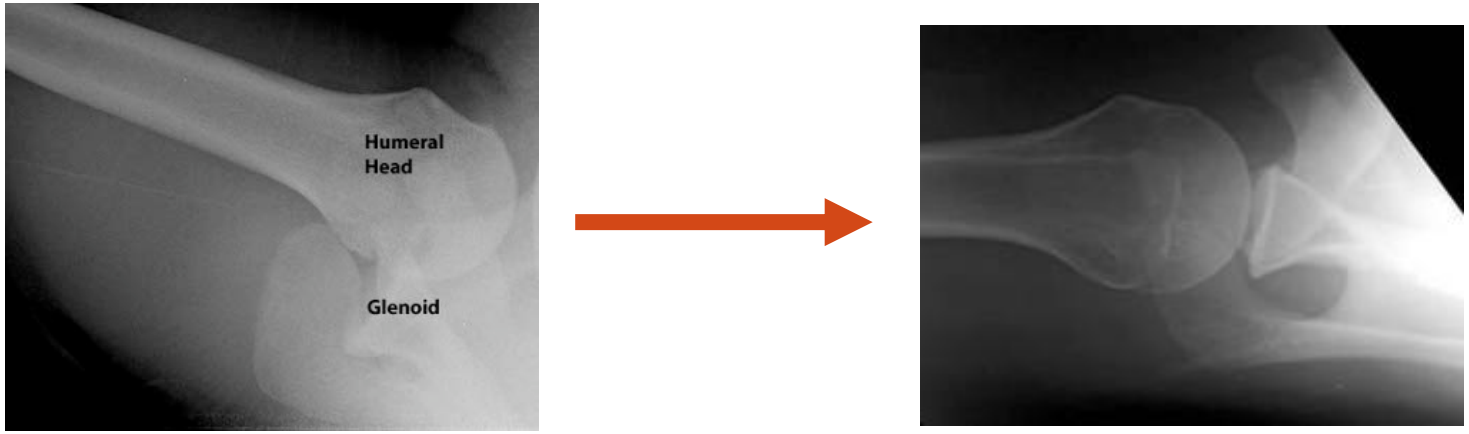


Instability: Traumatic Tear

- X-rays pre and post reduction



- Acute treatment: reduction!!



Instability: Traumatic Tear

- Likelihood of repeated dislocation?

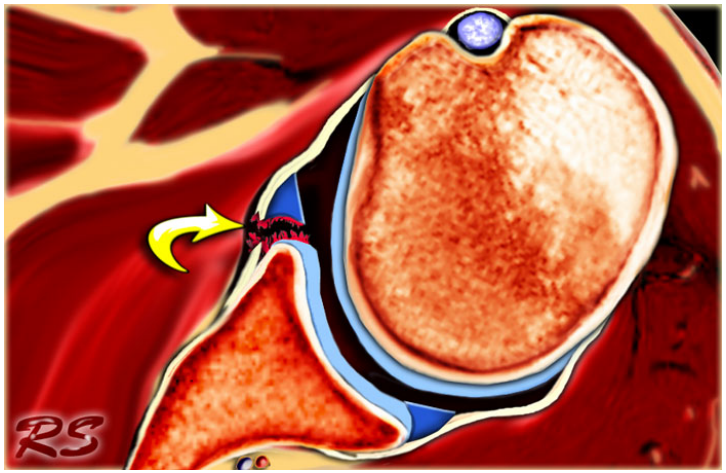
  (in first time dislocator)
  - age <20: recurrence rate 75-100%
  - age >40: recurrence rate <10%

Image from WikiMedia Commons

Instability: Traumatic Tear

- History of ***anterior*** dislocation/subluxation?
  - likely tore ***anterior*** labrum
  - "Bankart tear"

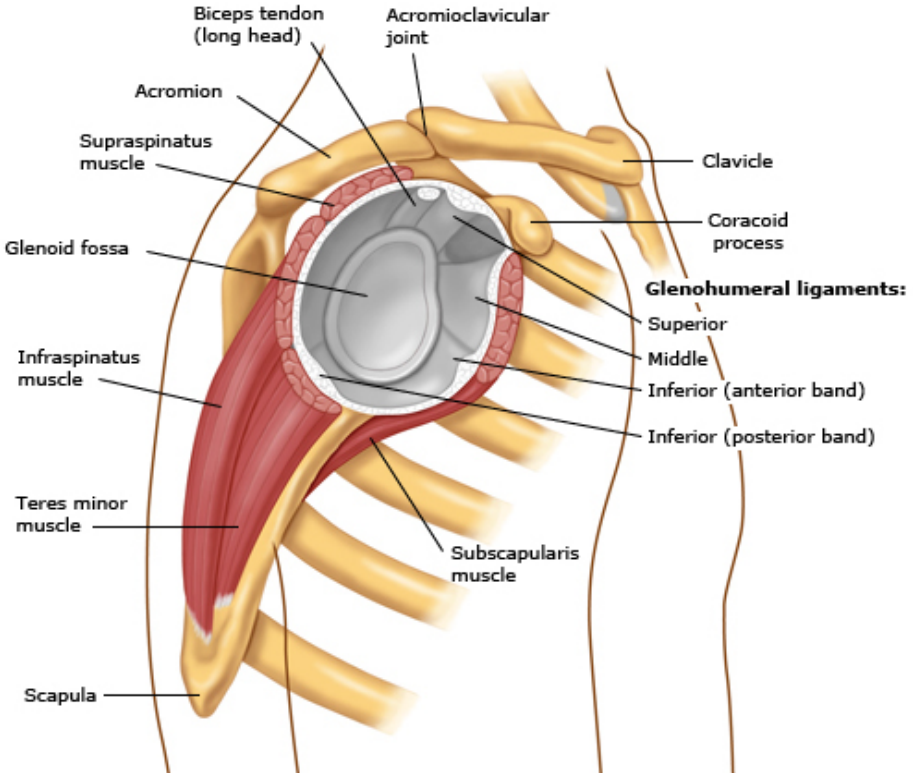
- History of ***posterior*** dislocation/subluxation?
  - likely tore ***posterior*** labrum
  - "reverse Bankart tear"



Instability: Traumatic Tear

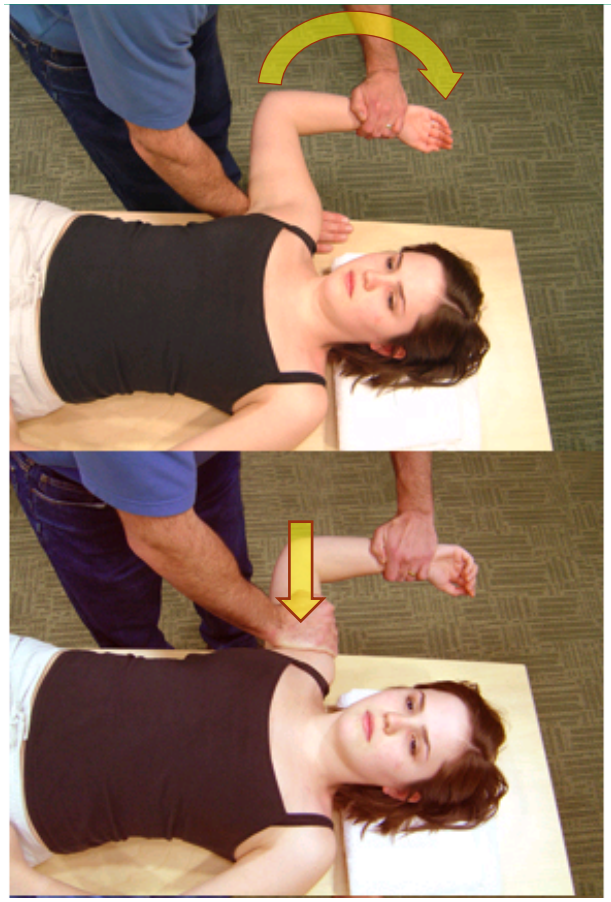
- History
  - c/o "going out of place"
  - mechanical symptoms? (clicking/catching)

- Physical Exam
  - Range of motion?
  - Strength?



Instability: Traumatic Tear

- Special Tests (for anterior instability)
  - Anterior Apprehension Test
  - (Jobe) Relocation test

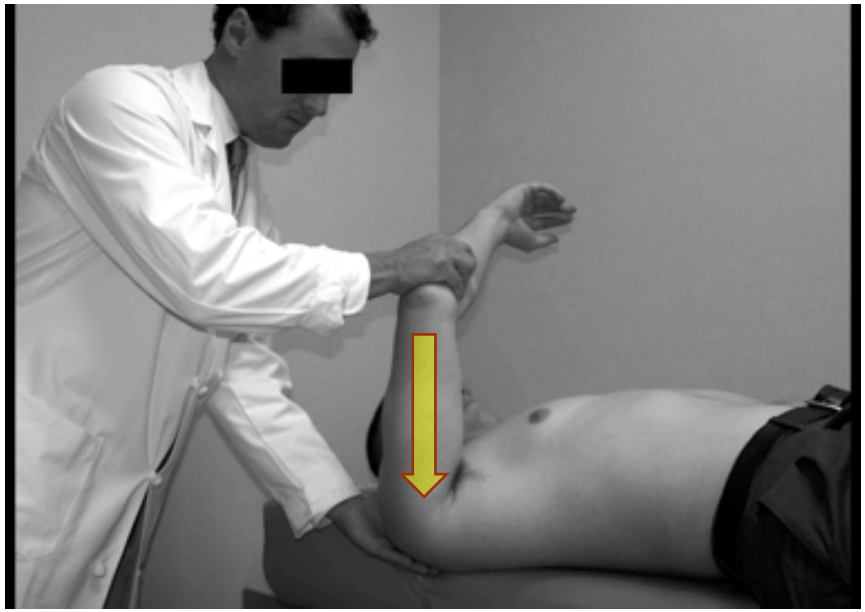


A. Apprehension test:
To perform this test, the patient places the symptomatic arm in the throwing position. Next, the clinician braces the posterior shoulder with one hand while using the other hand to push back on the wrist with steady pressure, thereby increasing the abduction and external rotation of the shoulder. Any sensation of impending dislocation at any time on the part of the patient constitutes a positive test.

B. Relocation test:
The relocation test is begun at the end of the apprehension test. Forced abduction and external rotation are stopped and the clinician moves the hand that was bracing the posterior shoulder to the anterior shoulder. The examiner pushes the humerus posteriorly. Relief of pain or of the sensation of impending dislocation on the part of the patient represents a positive test.

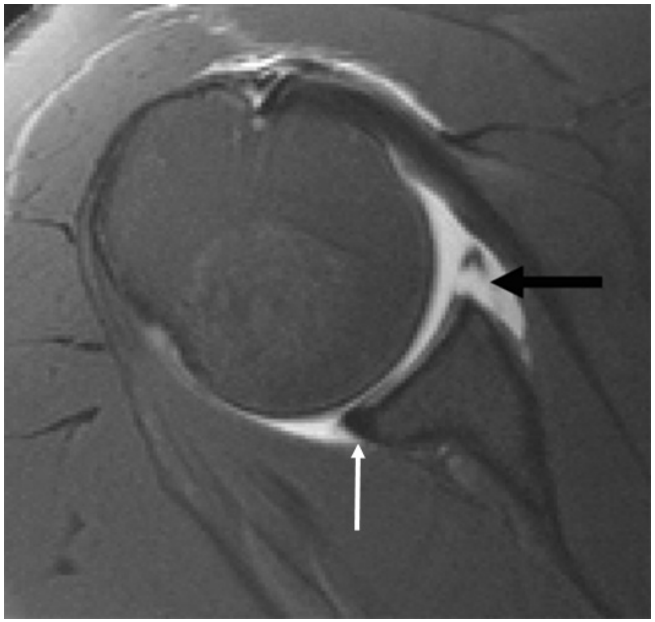
Instability: Traumatic Tear

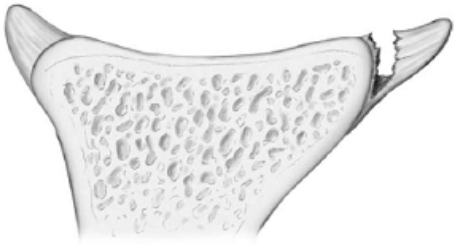
- Special Tests (for posterior instability)
  - Posterior Apprehension test



Instability: Traumatic Tear

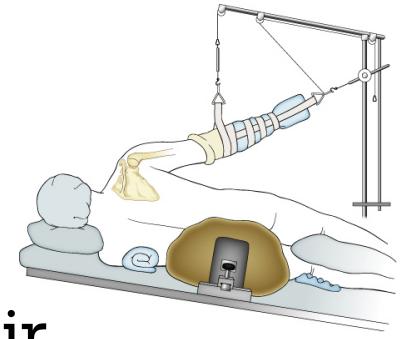
- Imaging
  - X-rays: may show "bony Bankart"
  - MRI: imaging of choice



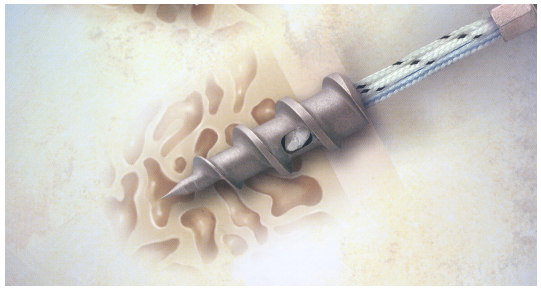


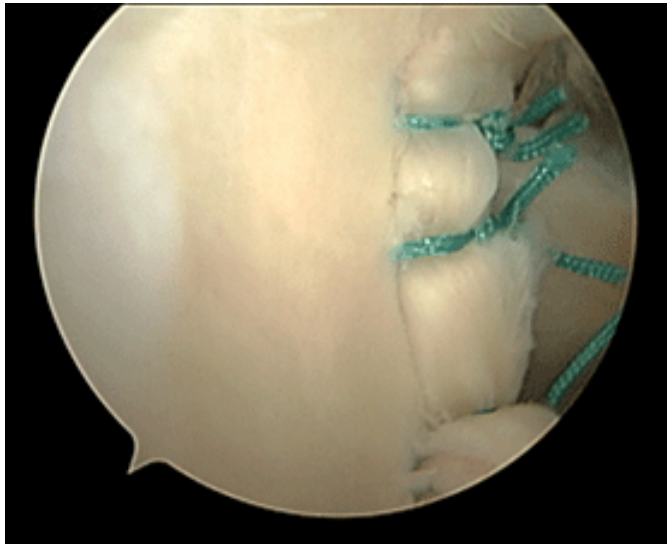
- Treatment: surgery (labral repair)

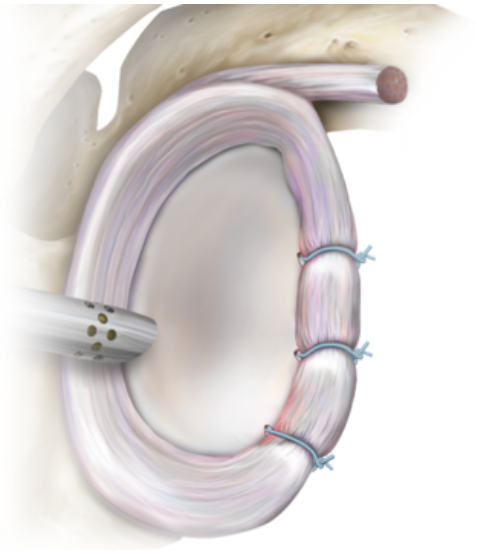
Instability: Traumatic Tear



- Surgery: labral repair
  - aka Bankart repair or reverse Bankart repair





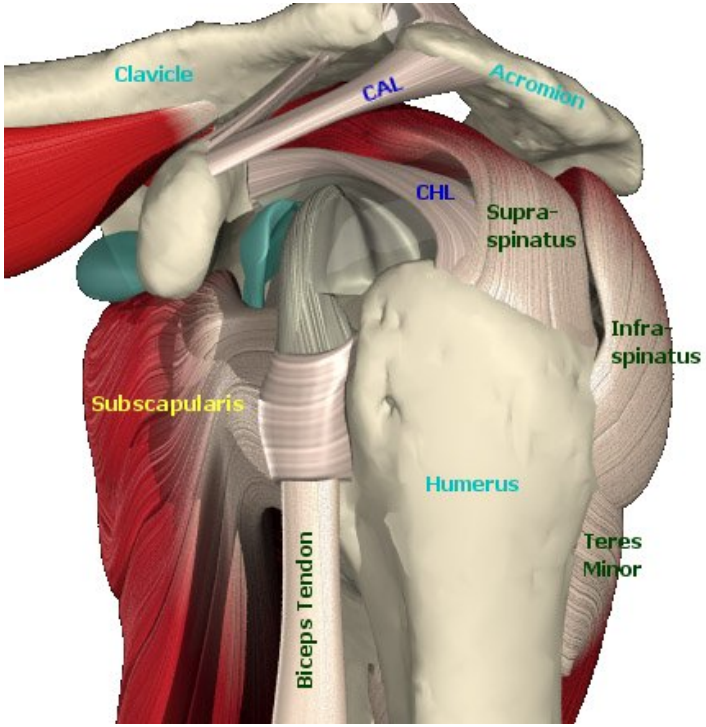


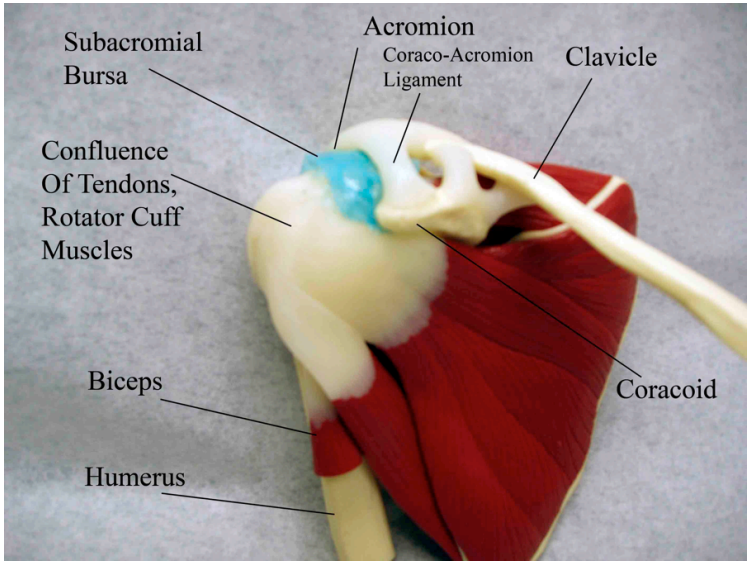
Instability: Labral Tears - SUMMARY

	SLAP Tear	Bankart & Reverse Bankart Tears
What's the chief complaint?	PAIN	INSTABILITY
What's the MOI?	trauma or repetitive stress	trauma
Surgical indication?	PAIN	INSTABILITY

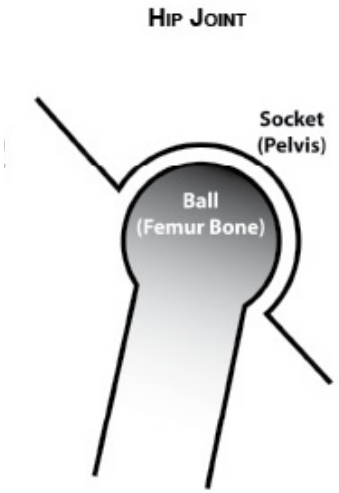
Rotator Cuff Disease

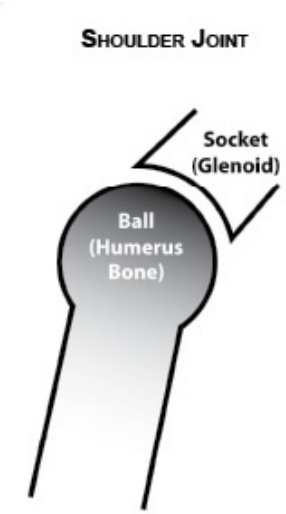
- Anatomy
  - subacromial space ⟶ subacromial bursa





Rotator Cuff Disease



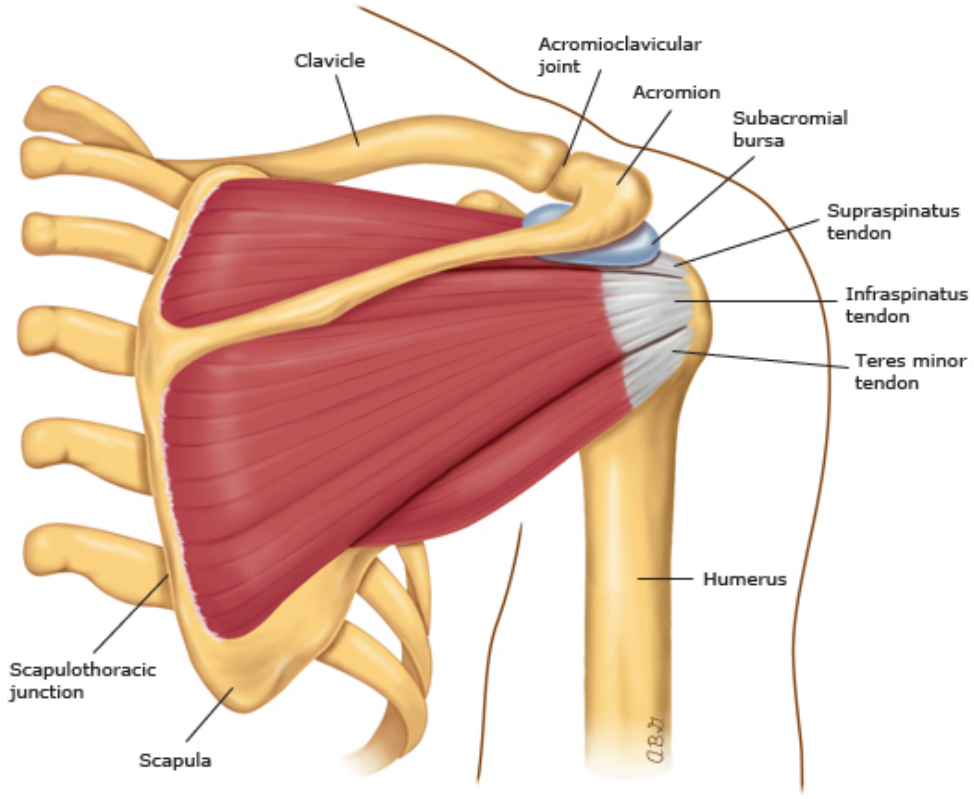


Hip joint
the "socket" (acetabulum) is deep & cup-like
femoral head is very spherical and fits snugly within acetabulum
5 large, strong surrounding ligaments
more stable joint
difficult to dislocate
less ROM available

Shoulder Joint
the "socket" (glenoid fossa) is small & shallow
humeral head is rounded, but not as ball-like as femoral head
thin, wimpy supporting ligaments
less stable joint
easy to dislocate
lots of ROM available

Rotator Cuff Disease

- Physiology - rotator cuff
  - a "cuff" of tissue
  - provides **dynamic** stabilization



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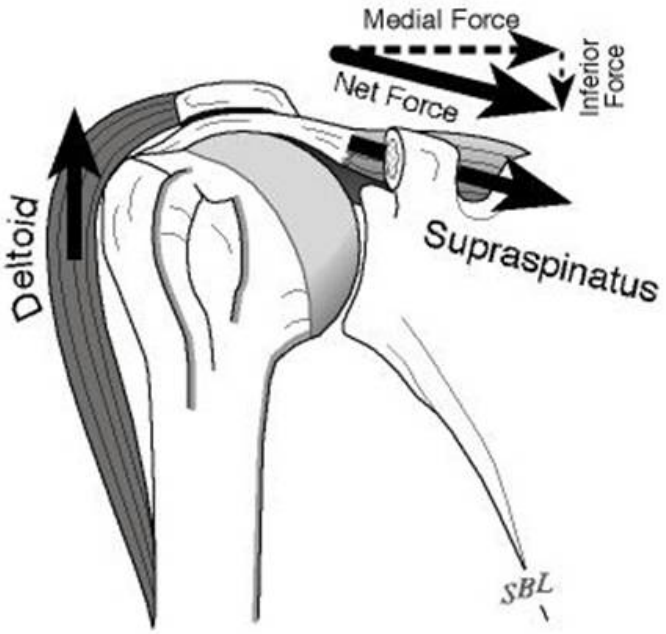
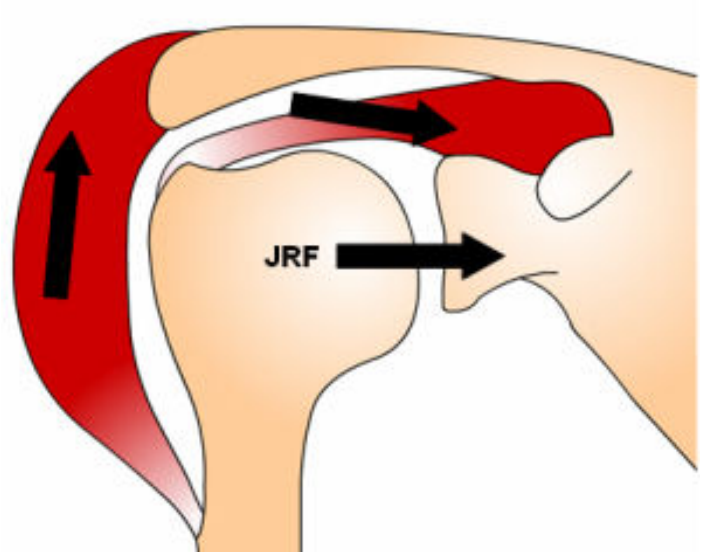
Rotator Cuff Disease

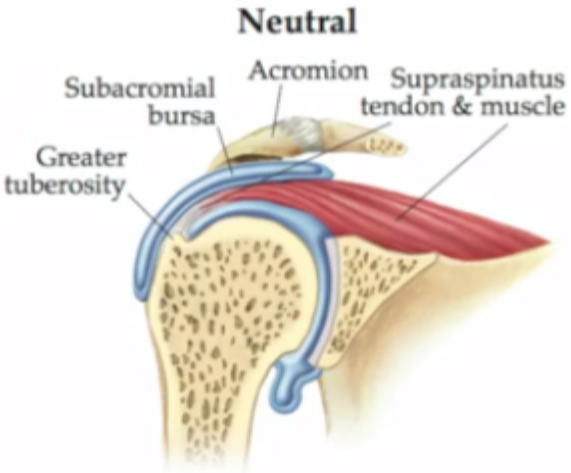
- Biomechanics

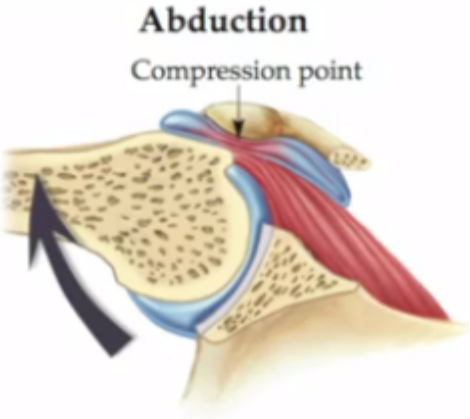


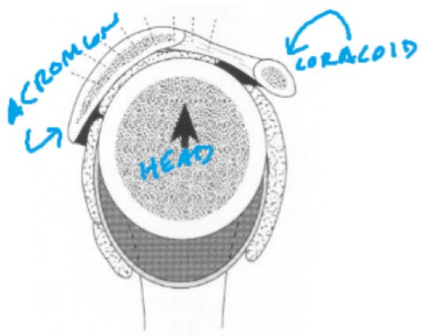


Rotator Cuff Disease

- Function of the rotator cuff??
  - stabilize the humeral head
  - without the ***dynamic stabilization*** of the RTC, we would all get "secondary impingement"
  - during abduction, RTC actually **depresses** the humeral head

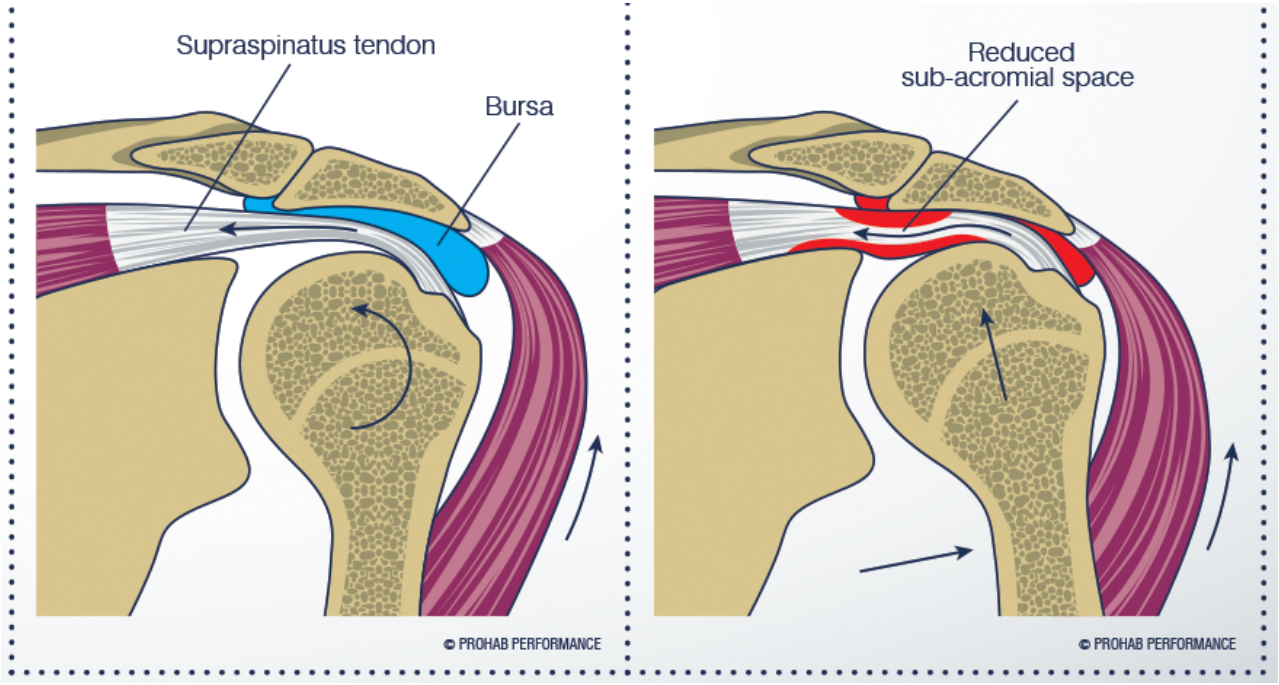






Rotator Cuff Disease

- **Secondary Impingement:** pinching of RTC (supraspinatus) due to excessive humeral head movement
  - cause: weak RTC muscles



Rotator Cuff Disease

- **Primary Impingement:** pinching of RTC (supraspinatus) due to anatomic abnormality
  - causes: acromion shape, inflamed SA bursa

Type I

Flat

Type II

Gentle

curve

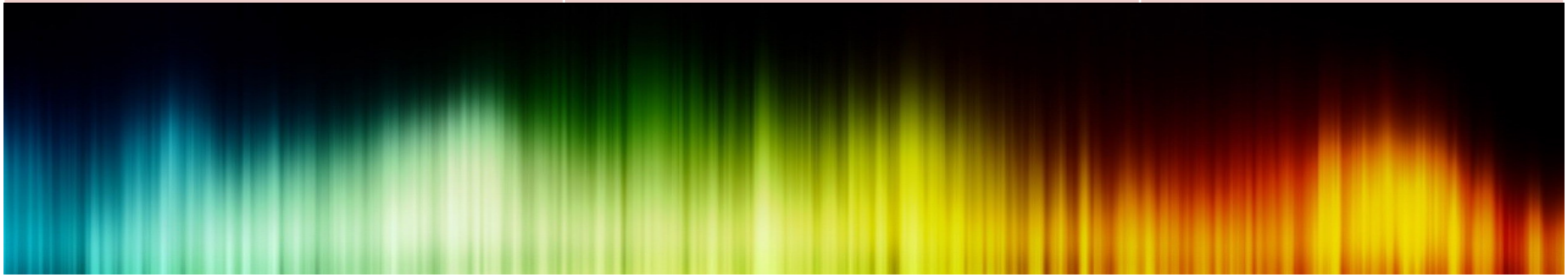
Type III

Sharply

beaked/hooked

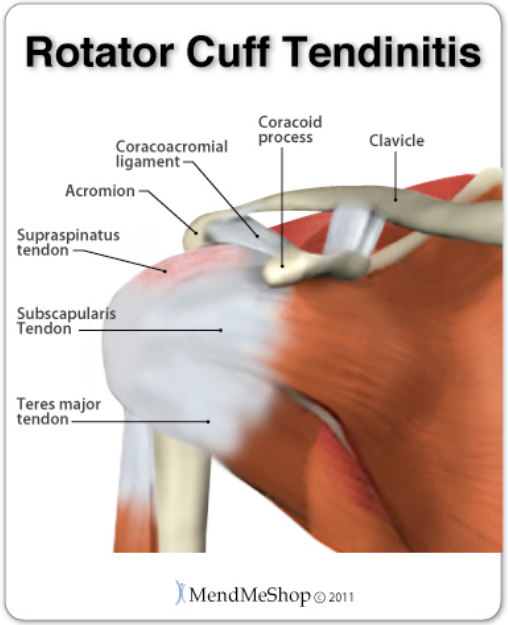
Rotator Cuff Disease

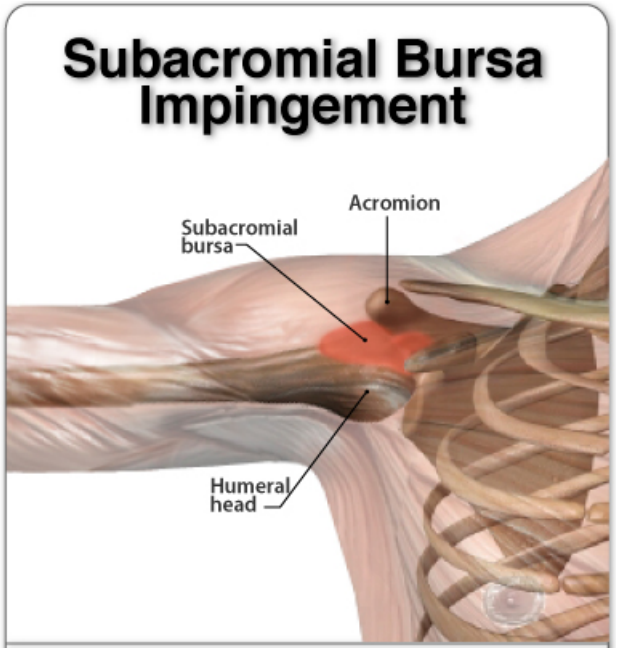
Early (may never progress)	**Progressed**	**End Stage**
1) Subacromial Bursitis 2) RTC Tendonitis 3) Impingement a) Primary b) Secondary	1) Partial RTC Tear a) bursal sided b) articular sided 2) Complete RTC Tear	RTC Arthropathy



Rotator Cuff Disease

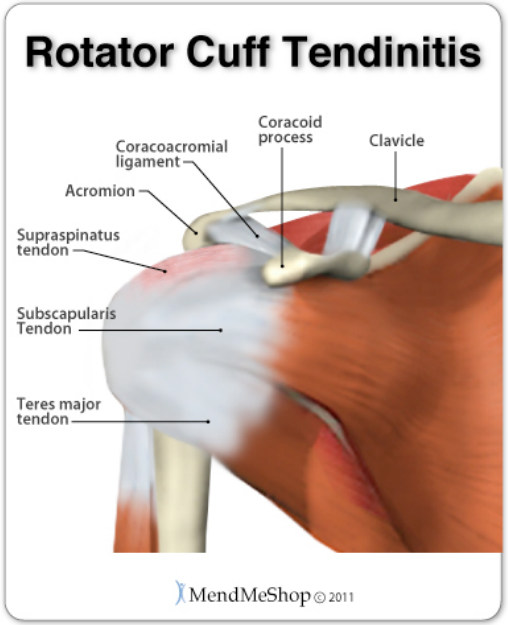
- Impingement/Subacromial Bursitis/RTC Tendonitis
  - ***inflammation*** of the subacromial bursa/RTC tendons

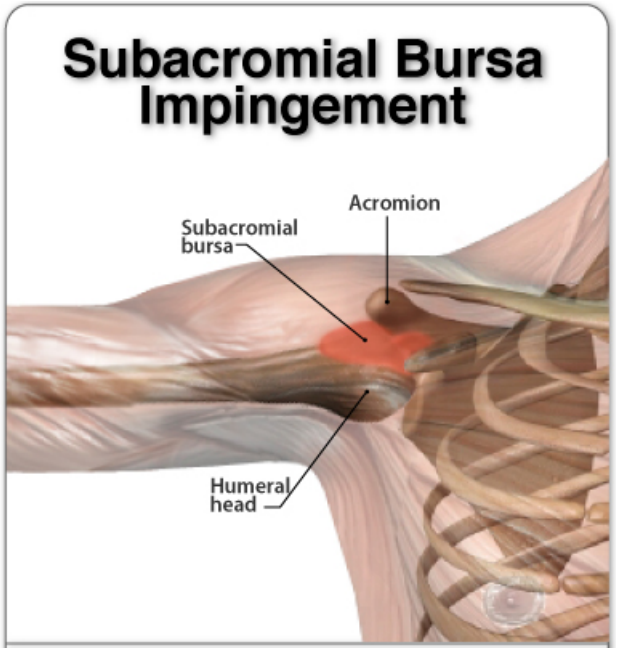




Rotator Cuff Disease

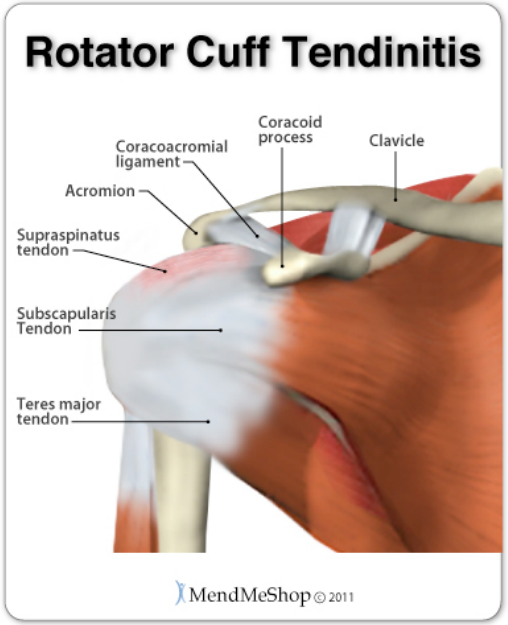
- Impingement/Subacromial Bursitis/RTC Tendonitis
  - ***insidious*** onset
  - anterior/lateral pain
  - worse with ***overhead*** movements (occupation/sport?)

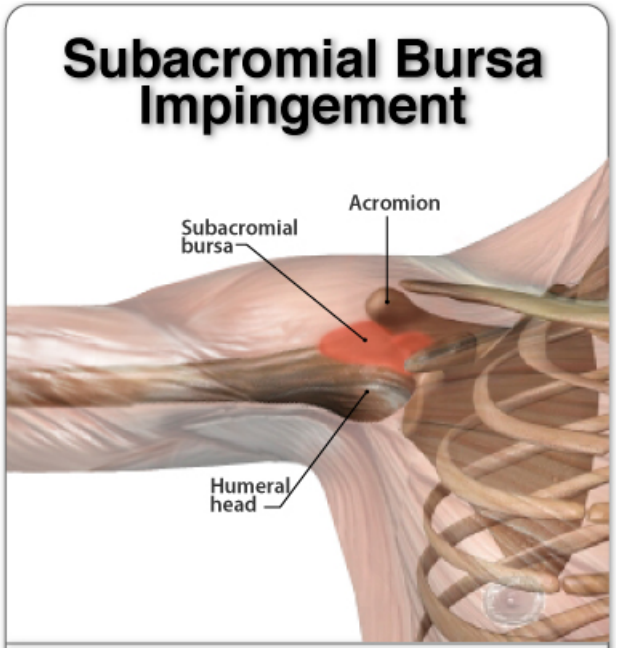




Rotator Cuff Disease

- Impingement/Subacromial Bursitis/RTC Tendonitis
  - physical exam: positive ***impingement*** signs
  - physical exam: no ***strength*** deficits





Rotator Cuff Disease

- Treatment
  - analgesics/NSAIDS
  - no sling - relative rest
  - therapeutic exercises – RTC strengthening!
  - ***subacromial*** corticosteroid injection

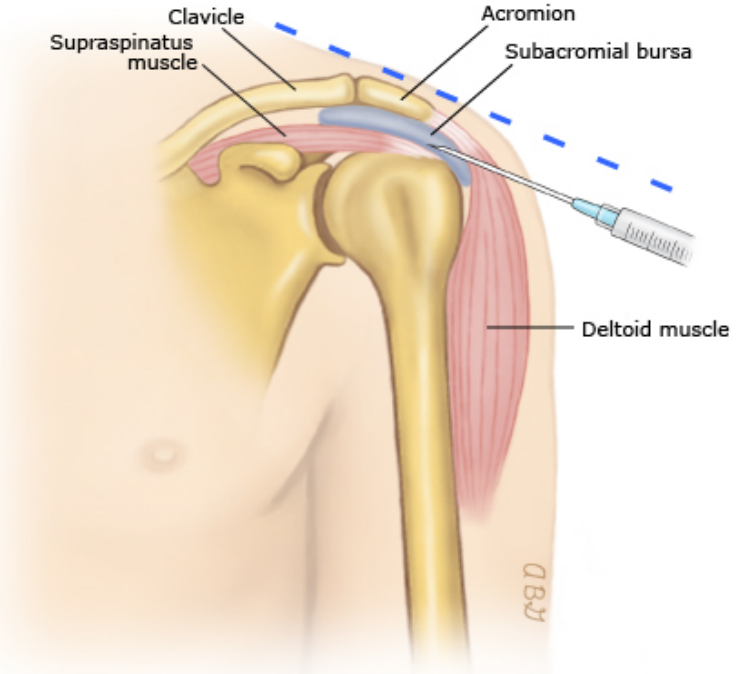
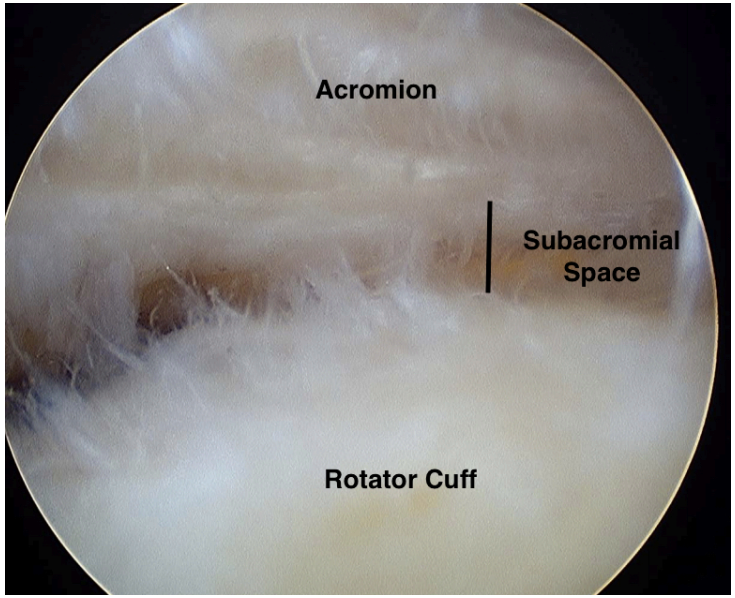


Image from UpToDate © 2019

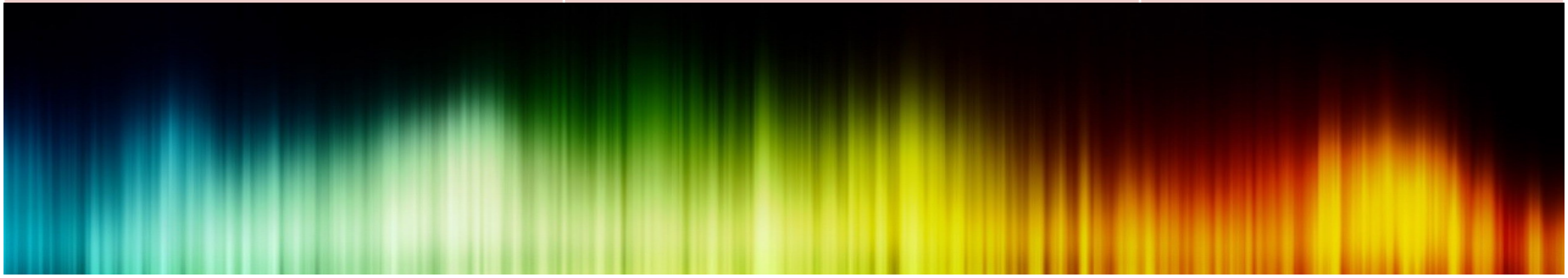
Rotator Cuff Disease

- Treatment:
  - ***Acromioplasty*** for primary impingement



Rotator Cuff Disease

Early (may never progress)	**Progressed**	**End Stage**
1) Subacromial Bursitis 2) RTC Tendonitis 3) Impingement a) Primary b) Secondary	1) Partial RTC Tear a) bursal sided b) articular sided 2) Complete RTC Tear	RTC Arthropathy



Rotator Cuff Disease

Rotator Cuff Tears

- Two possible MOIs:
  - Acute
  - ***Degenerative/Insidious****

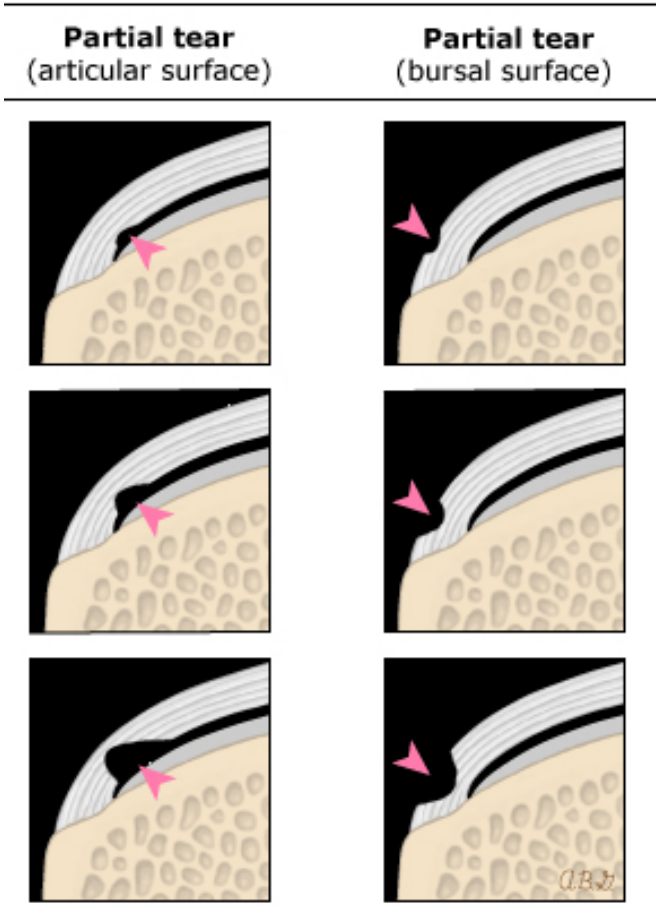
- dull, achey pain
- night pain – *wakes from sleep*

Rotator Cuff Disease

Rotator Cuff Tears

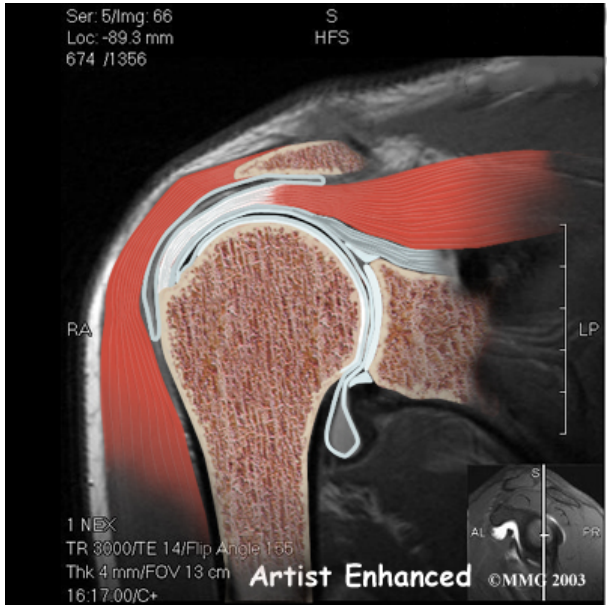
Types:

1. Partial-thickness tear
   - articular sided
   - bursal sided
2. Complete (full-thickness) tear
3. Massive

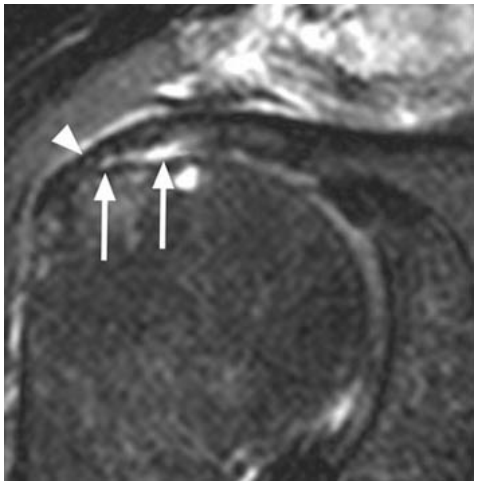


Rotator Cuff Disease

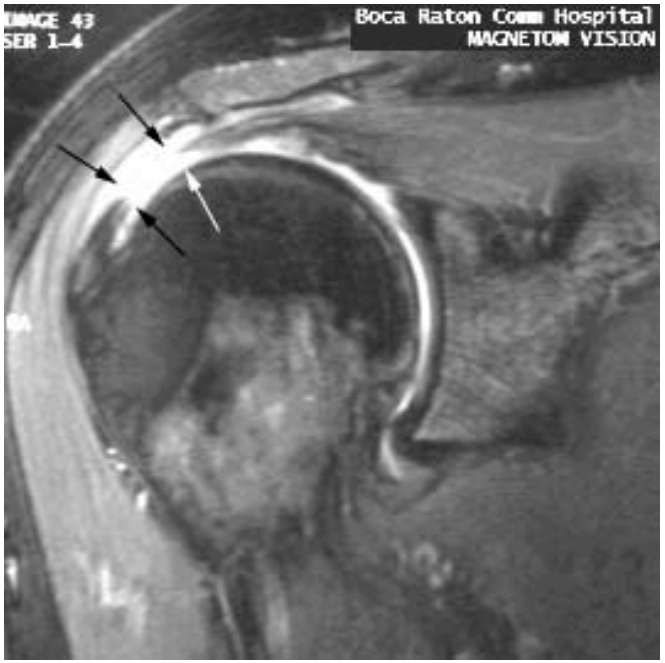
- Imaging:
  - X-rays
    - helpful to show morphology of acromion
  - MRI arthrogram (enhanced with gadolinium)
    - to assess for actual RTC tear



Rotator Cuff Disease

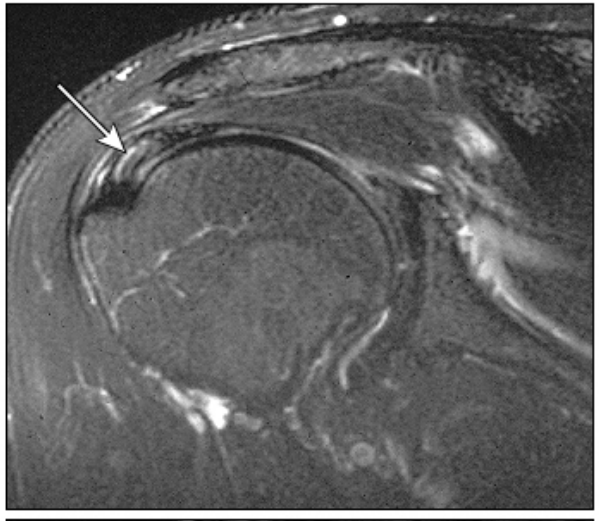


Rotator Cuff Disease

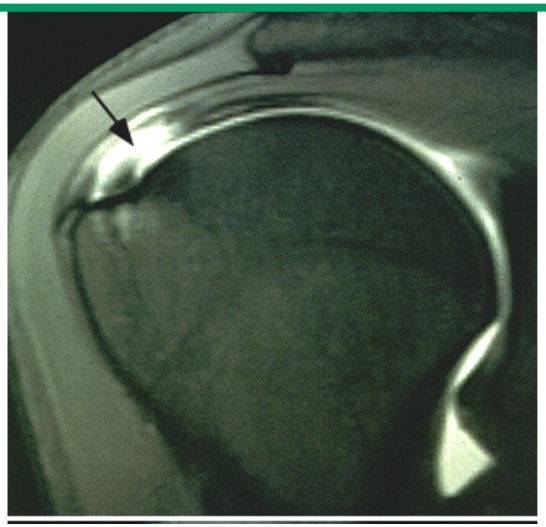


Rotator Cuff Disease

Partial rotator cuff tear on magnetic resonance imaging



Full thickness rotator cuff tear on magnetic resonance arthrography



Rotator Cuff Disease

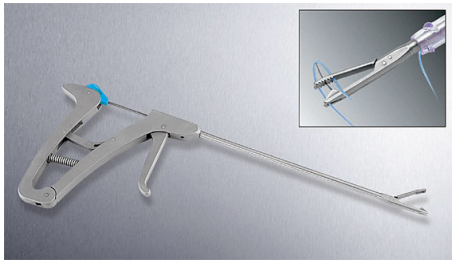
Treatment

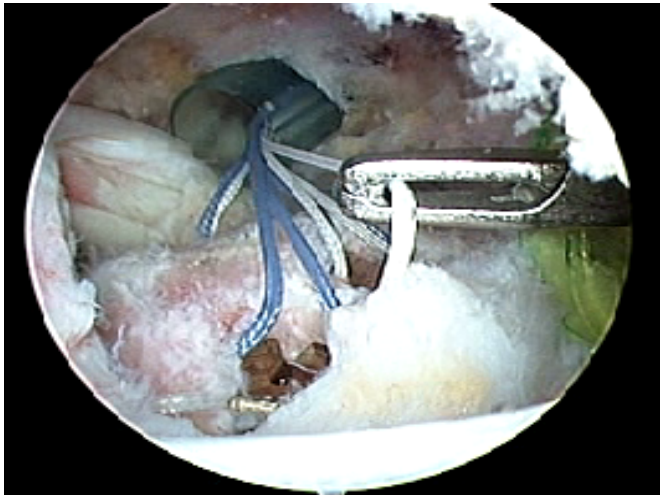
- ***Partial*** RTC tears: conservative measures
  - analgesics/NSAIDS
  - no sling - relative rest
  - therapeutic exercises – RTC strengthening!
  - subacromial corticosteroid injection
- (i.e., treat like subacromial bursitis/impingement)

Rotator Cuff Disease

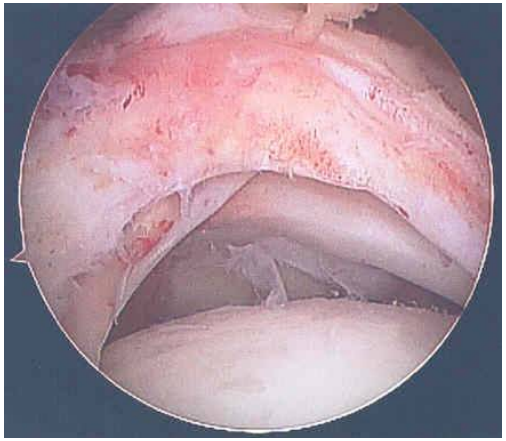
Treatment

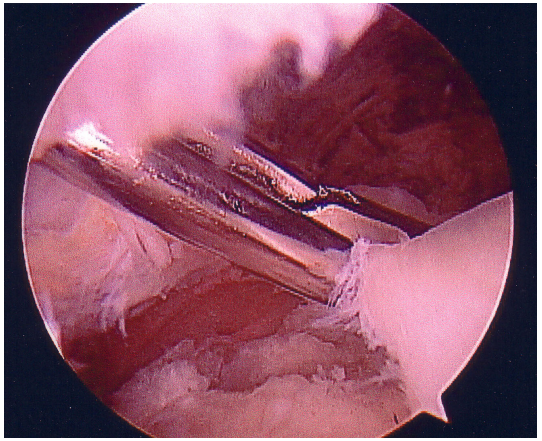
- ***Full*** RTC Tears
  - Surgery: RTC Repair (open vs ***arthroscopic)***
  - also for partial tears that have failed conservative Tx

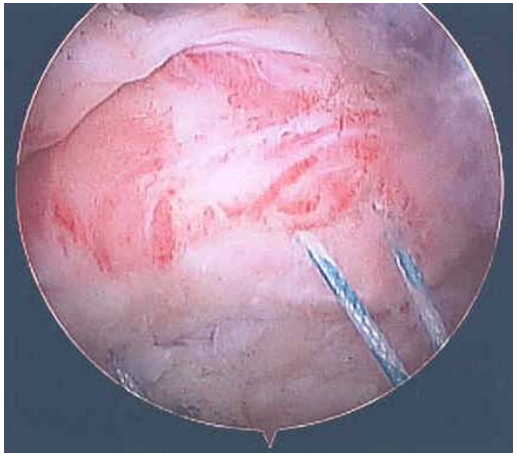


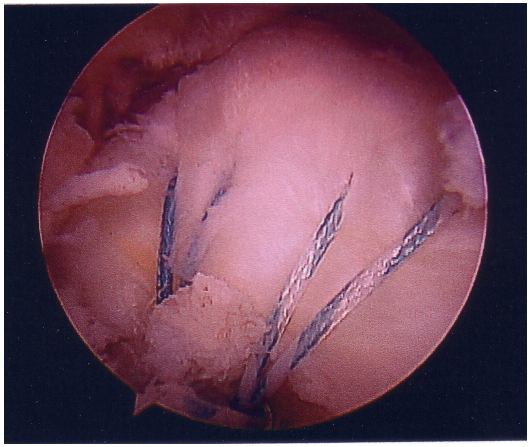


Rotator Cuff Disease



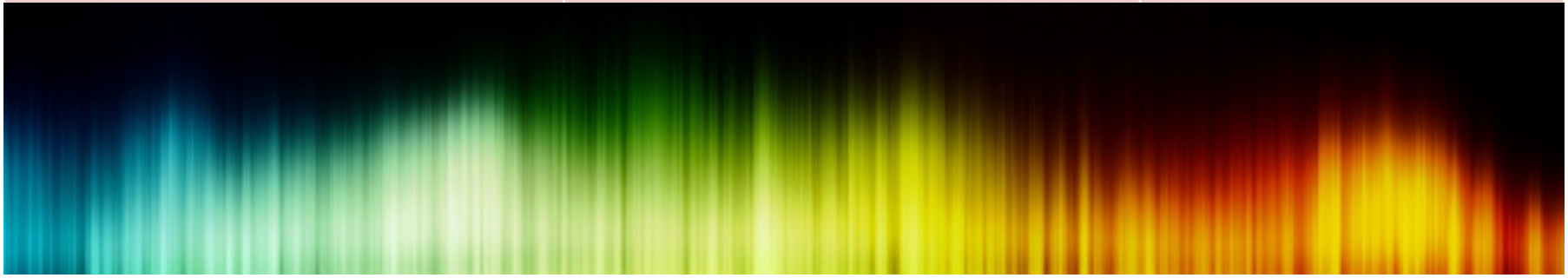






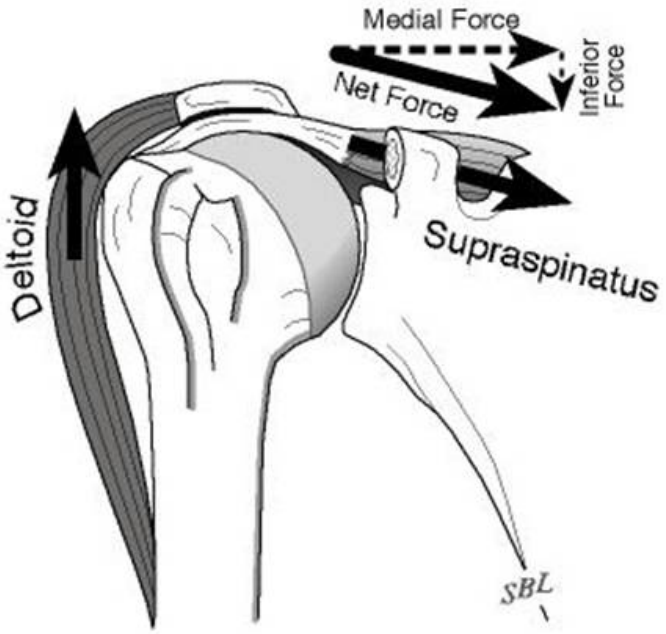
Rotator Cuff Disease

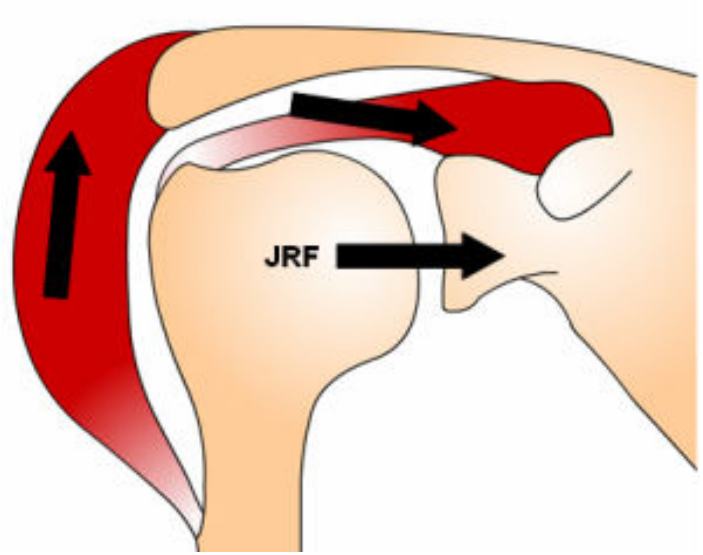
Early (may never progress)	**Progressed**	**End Stage**
1) Subacromial Bursitis 2) RTC Tendonitis 3) Impingement a) Primary b) Secondary	1) Partial RTC Tear a) bursal sided b) articular sided 2) Complete RTC Tear	RTC Arthropathy



Rotator Cuff Disease

- Remember…



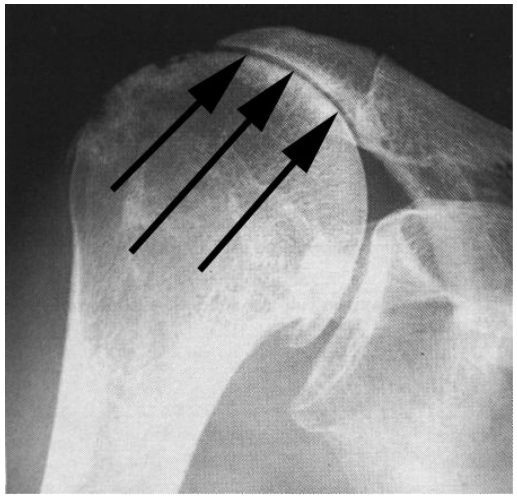


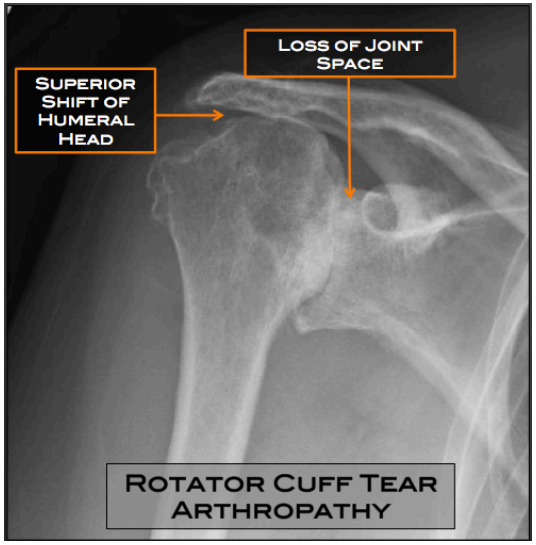
Rotator Cuff Disease

- Rotator cuff arthropathy
  - the result of a chronic rotator cuff tear

Rotator Cuff Disease

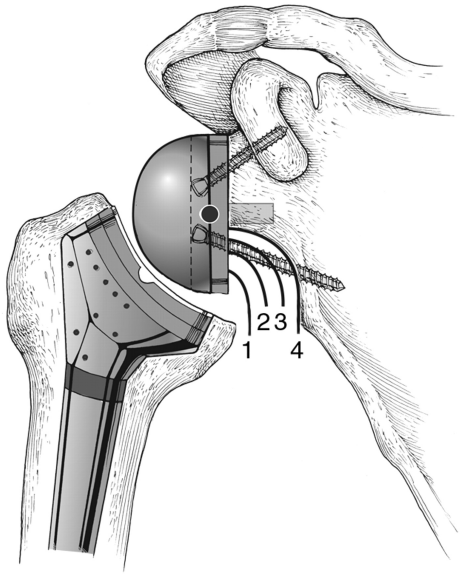
- Rotator cuff arthropathy
  - the result of a chronic rotator cuff tear





Rotator Cuff Disease

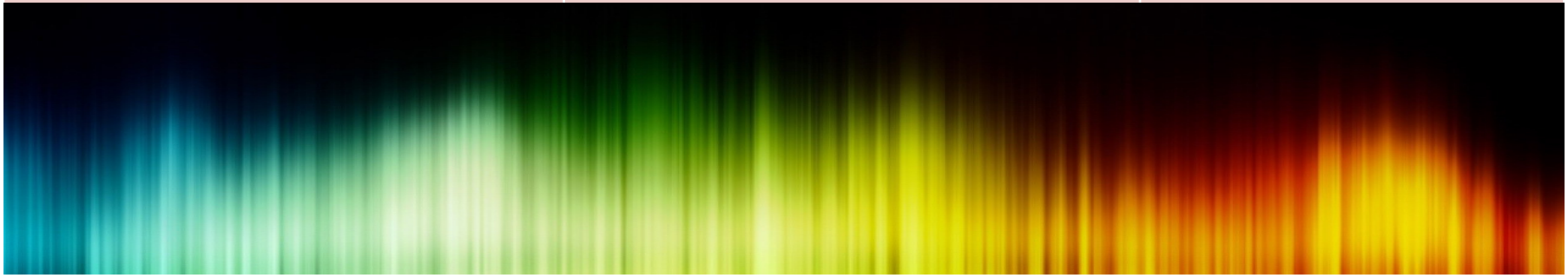
- Rotator cuff arthropathy treatment:
  - ***Reverse*** total shoulder arthroplasty



Rotator Cuff Disease

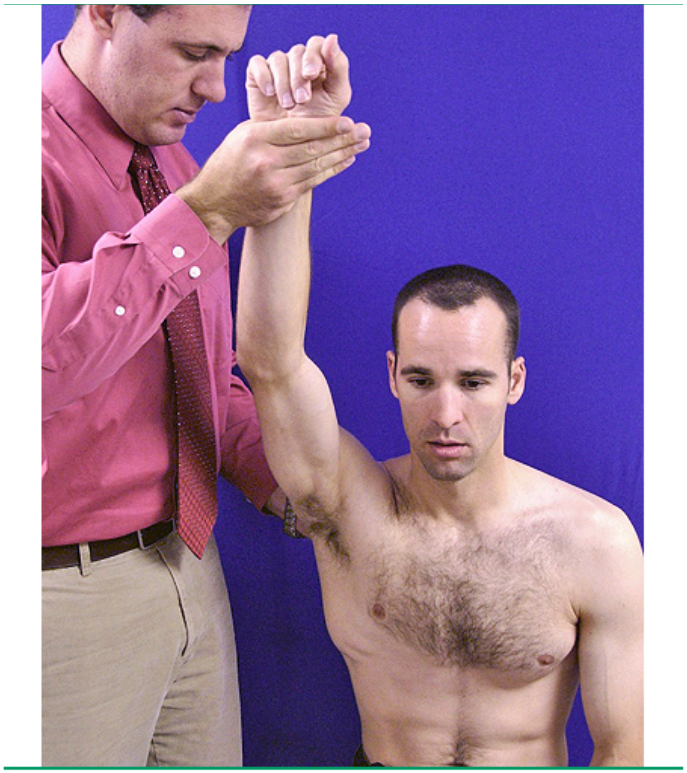
What about the ***physical exam***???

Early (may never progress)	**Progressed**	**End Stage**
1) Subacromial Bursitis 2) RTC Tendonitis 3) Impingement a) Primary b) Secondary	1) Partial RTC Tear a) bursal sided b) articular sided 2) Complete RTC Tear	RTC Arthropathy



Rotator Cuff Disease

- Special Tests
  1. ***Neer Impingement test***



The "passive painful arc maneuver" shown above involves passively flexing the glenohumeral joint while simultaneously preventing shoulder shrugging. The test is often referred to as the Neer test, and is used to assess shoulder impingement.

Rotator Cuff Disease

- Special Tests
  - ***2. Hawkins-Kennedy test***

The Hawkins Kennedy test is used to assess shoulder impingement. In this test the clinician stabilizes the shoulder with one hand and, with the patient's elbow flexed at 90 degrees, internally rotates the shoulder using the other hand. Shoulder pain elicited by internal rotation represents a positive test.

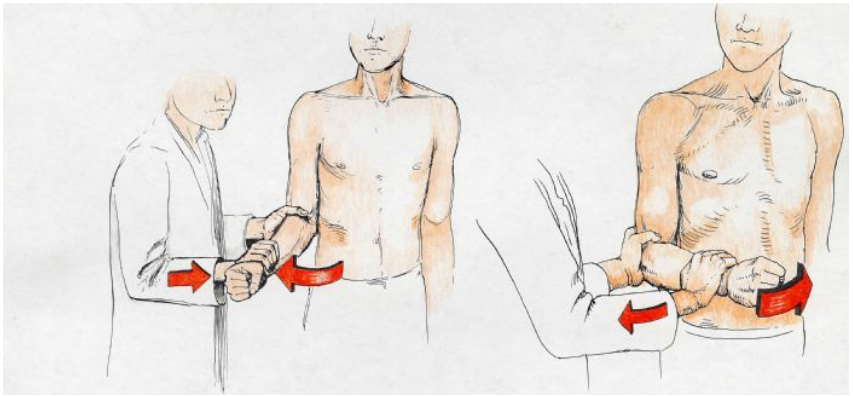
Rotator Cuff Disease

- Special Tests
  3. **"Empty can" (supraspinatus) test**

Jobe's test (or the "empty can" test) assesses supraspinatus function. The patient places a straight arm in about 90 degrees of abduction and 30 degrees of forward flexion, and then internally rotates the shoulder completely. The clinician then attempts to adduct the arm while the patient resists. Pain without weakness suggests tendinopathy; pain with weakness is consistent with tendon tear.

Rotator Cuff Disease

- Special Tests
  4. ***External rotation (infraspinatus) test***



The infraspinatus muscle is primarily responsible for external rotation of the shoulder. The muscle can be tested by having the patient attempt to externally rotate against resistance, as shown in the photograph above. The shoulder is held in adduction and the elbow bent to 90 degrees during testing.

Rotator Cuff Disease

- Special Tests
  5. ***Drop arm test***

The drop arm test assesses the ability of the patient to lower his or her arms from a fully abducted position. A positive test occurs when the patient is unable to lower the affected arm with the same smooth coordinated motion as the unaffected arm.

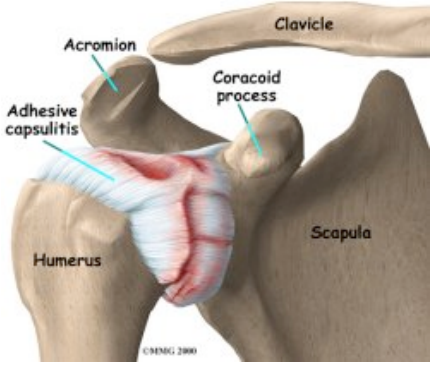
Rotator Cuff Disease

Putting it all together:

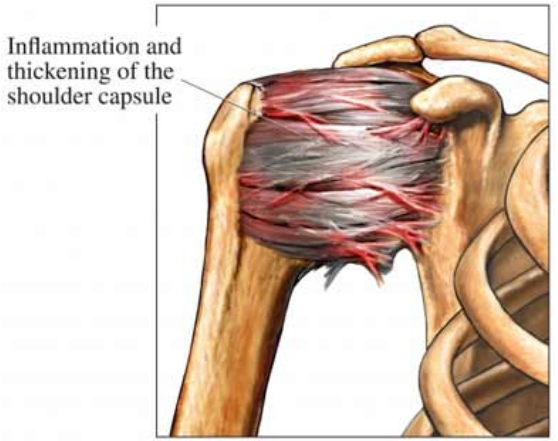
	Subacromial Bursitis RTC Tendonitis Primary/Secondary Impingement	Partial RTC Tear	Complete RTC Tear
Pain w/ overhead movement?	YES	YES	YES
Night pain?	MAYBE	YES	YES
Neer Impingement Test	YES	YES	YES
Hawkins-Kennedy Test	YES	YES	YES
Empty Can (supraspinatus) Test	NO	MAYBE	YES
ER (infraspinatus) Test	NO	MAYBE	YES
Drop Arm Test	NO	NO	MAYBE

Adhesive Capsulitis

- aka "Frozen Shoulder" syndrome
- immobilization for extended period of time
  - can be avoided: early ROM



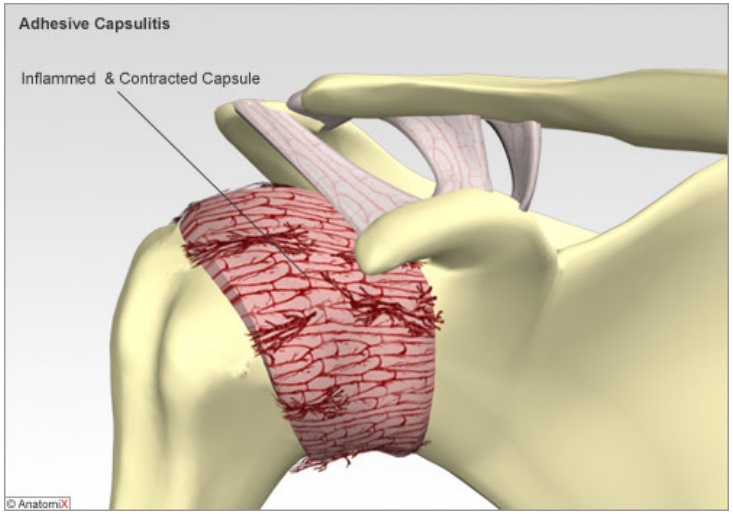
- DM2, thyroid disease
- capsule adhesions, subsequent contractures
- causes ***severe*** limitations in ROM
  - very painful!!



Adhesive Capsulitis

Treatment:

- image guided CS injection
  - followed by ***aggressive ROM***
- underlying shoulder problem?
- investigate DM2, thyroid disease
- if fail injections x2:
  - lysis of adhesions (LOA) & manipulation under anesthesia (MUA)



Shoulder SUMMARY

Special Tests	
Yergason's Test	SLAP tear
Speed's Test	
O'Brien's Test	
Anterior Apprehension Test	Anterior Labral Tear/Instability
(Jobe) Relocation test	
Posterior Apprehension test	Posterior Labral Tear/Instability
Neer Impingement test	Bursitis/Tendonitis/Impingement
Hawkins-Kennedy test	
Empty Can (supraspinatus) Test	Rotator Cuff Tear
ER (infraspinatus) Test	
Drop Arm Test	

Citations

1. Ireland, ML and Hatzenbuehler, JR. Superior labrum anterior posterior (SLAP) tears. In: UpToDate, Grayzel, J (Ed), UpToDate, Waltham, MA, 2019.
2. Maughan, KL and Boggess, BR. Achilles tendinopathy and tendon rupture. In: UpToDate, Fields, KB (Ed), UpToDate, Waltham, MA, 2019.
3. Martin, SD and Martin, TL. Management of rotator cuff tears. In: UpToDate, Grayzel, J (Ed), UpToDate, Waltham, MA, 2019.
4. Miller, MD. and Thompson, SR. Miller's review of orthopaedics. 6th ed. Philadelphia, PA: Elsevier; 2012.
5. Rynders, SD, Hart JA. Orthopedics for physician assistants. Philadelphia, PA: Elsevier; 2013.
6. Simons, SM and Dixon, JB. Physical examination of the shoulder. In: UpToDate, Grayzel, J (Ed), UpToDate, Waltham, MA, 2019.
7. Simons, SM, Dixon, JB, and Kruse, D. Presentation and diagnosis of rotator cuff tears. In: UpToDate, Grayzel, J (Ed), UpToDate, Waltham, MA, 2019.
8. Simons, SM, Kruse, D, and Dixon, JB. Shoulder impingement syndrome. In: UpToDate, Grayzel, J (Ed), UpToDate, Waltham, MA, 2019.
9. Stovitz, SD. Evaluation of the adult with shoulder complaints. In: UpToDate, Grayzel, J (Ed), UpToDate, Waltham, MA, 2019.
10. Toy, EC., Rosenbaum, AJ., Roberts, TT., and Dines, JS. Case files: Orthopedic surgery. New York, NY: McGraw-Hill Education; 2013.
11. Young, C. Throwing injuries of the upper extremity: clinical presentation and diagnostic approach. In: UpToDate, Grayzel, J (Ed), UpToDate, Waltham, MA, 2019.