

## Shoulder Pain: How to Make the Diagnosis

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## Objectives

- Develop concepts of correlation anatomy, injury mechanism, PE and imaging to make correct diagnosis
- Show case-based examples of shoulder disorders
- Demonstrate how making the correct primary diagnosis will improve patient outcomes and management of shoulder pain patients

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### Comprehensive Shoulder Exam MAIN MENU

1. Introduction	6. Imaging
2. Rotator Cuff	7. Subscapularis
3. Biceps	8. Specific Cases
4. Labrum	9. Conditions
5. Instability	10. Conclusions

**QUIT**

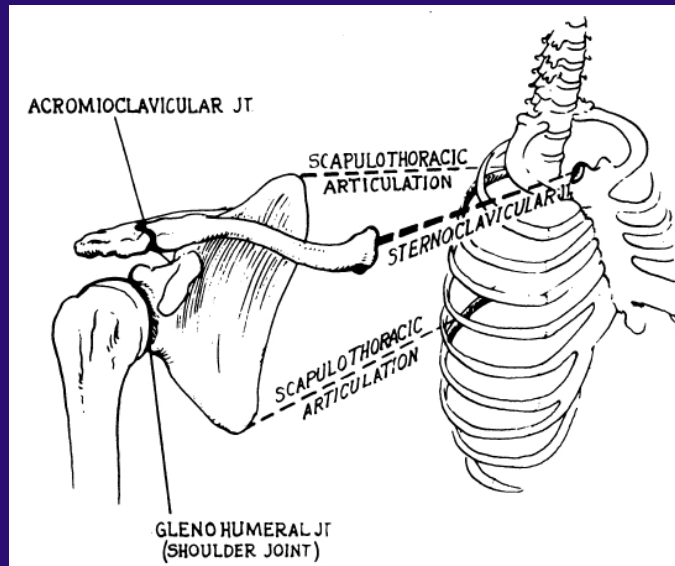
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### Differential Diagnosis

	<u>Think Joint</u>	<u>Mechanism</u>
Joints (3)	Glenohumeral SC AC	One Event
Spaces (2)	Subacromial Scapulothoracic	Repetitive
Referred	Neck Scapula Lung Ribs	Repetitive - No event

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## FUNCTIONAL ANATOMY: Joints



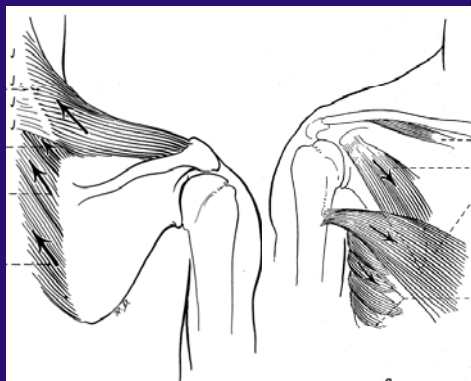
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## Primary Diagnosis

- **Involved Structure**
- **Age Group**
  - Younger - Instability (<30 yrs)
  - Older - Rotator cuff (>40 yrs)
- **Diagnosis**
  - Inflammation
  - Tear
  - Sprain
  - Instability

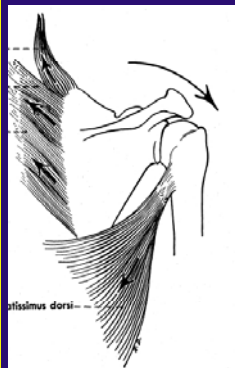
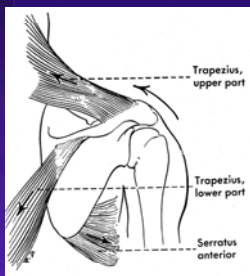
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### Elevation/Depression of the Scapula

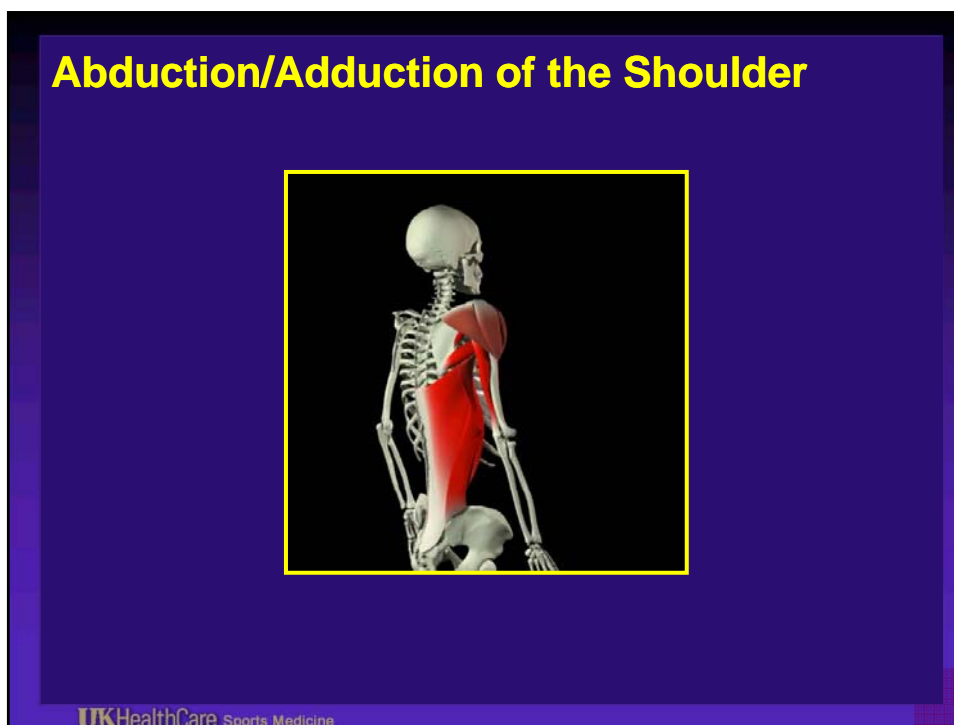
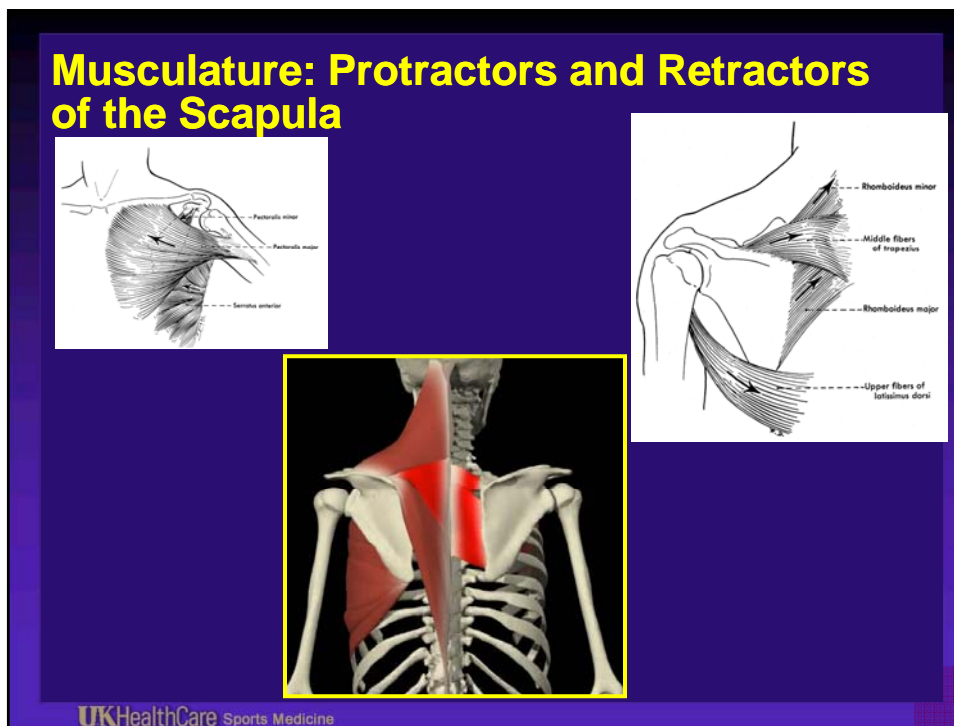


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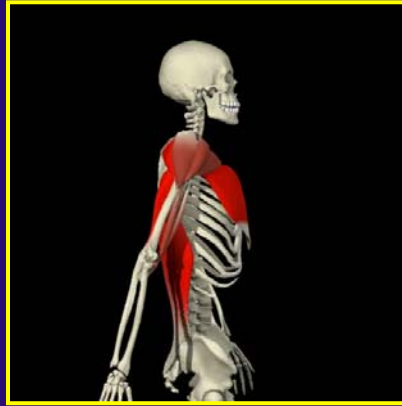
### Upward/Downward Rotation of the Scapula



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## Flexion/Extension of the Shoulder



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## Scapular Winging



- Scapular winging indicates weakness of the serratus anterior muscle
- Evident when the patient does a push-up or pushes against the wall

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## Remember to Examine Scapular Position

- Have patient reproduce symptoms
- If scapula is unstable, shoulder problems will result
- An unstable scapula is similar to firing a cannon out of a canoe

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## Scapular Dysfunction

- If exists, shoulder function is like *firing a cannon out of a canoe!*
- Remember the scapula!
  - Tightness anterior
  - Forward head
  - Overdeveloped pectoralis
    - Scapular movements
  - Touch medial borders
  - Elbows to back pocket
  - Shrugs
  - Clockwise/counterclockwise

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## Scapular Winging



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## Like Firing a Cannon Out of a Canoe . . .



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## Is the Pain Referred?

- Neck
- Scapula
- Lung
- Ribs
- Tumor

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## Neurologic Stretch Injury from Lifting Heavy Dumbbells, Suprascapular (C5) Nerve Involved



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## Muscle Testing

**Table 39-1.** Shoulder Muscle Testing Chart

MUSCLE	INNERVATION	MYOTOMES	TECHNIQUE FOR TESTING
Trapezius	Spinal accessory	C2-C4	Patient shrugs shoulders against resistance.
Sternomastoid	Spinal accessory	C2-C4	Patient turns head to one side with resistance over opposite temporal area.
Serratus anterior	Long thoracic	C5-C7	Patient pushes against wall with outstretched arm. Scapular winging is observed.
Latissimus dorsi	Thoracodorsal	C7-C8	Downward backward pressure of arm against resistance. Muscle palpable at Inf. angle of scapula during cough.
Rhomboids	Dorsal	(C4) C5 <sup>#</sup>	Hands on hips pushing elbows backward against resistance.
Levator scapulae	Scapular		None
Subclavius	Nerve to subclavius	C5-C6	None
Teres major	Subscapular (lower)	C5-C6	Similar to lat. dorsi; muscle palpable at lower border of scapula.
Deltoid	Axillary	C5-C6 (C7)	With arm abducted 90°, downward pressure is applied. Anterior and posterior fibers may be tested in slight flexion and extension.
Subscapularis	Subscapular (upper)	C5	Arm at side with elbow flexed to 90°. Examiner resists internal rotation.
Supraspinatus	Suprascapular	C5 (C6)	Arm abducted against resistance (not isolated). With arm pronated and elevated 90° in plane of scapula, downward pressure is applied.
Infraspinatus	Suprascapular	C5 (C6)	Arm at side with elbow flexed 90°. Examiner resists external rotation.
Teres minor	Axillary	C5-C6 (C7)	Same as for infraspinatus
Pectoralis major	Medial and lateral pectoral	C5-T1	With arm flexed 30° in front of body, patient, adducts against resistance.
Pectoralis minor	Medial pectoral	C8, T1	None
Coracobrachialis	Musculocutaneous	(C4) C5-C6 (C7)	None
Biceps brachii	Musculocutaneous	(C4) C5-C6 (C7)	Flexion of the supinated forearm against resistance.
Triceps	Radial	(C5) C6-C8	Resistance to extension of elbow from varying position of flexion.

<sup>#</sup>Numbers in parentheses indicate a variable but not rare contribution. From Rockwood CA, Matsen FA III (eds): The Shoulder, Vol I. Philadelphia, WB Saunders, 1990, with permission.

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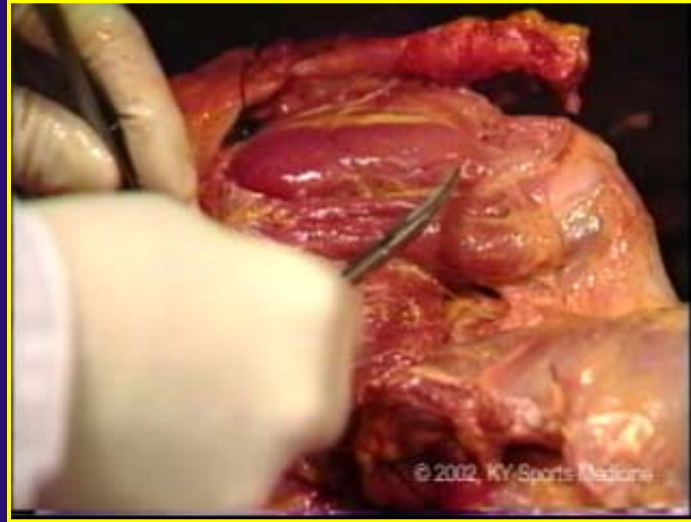
## Abnormal Shoulder Differential Diagnosis

**Table 39-4.** Abnormal Shoulder Exam: Differential Diagnosis — Make the Primary Diagnosis

INVOLVED JOINT	DIAGNOSIS	PATHOMECHANICS	MOST COMMON SPORTS
<i>Glenohumeral</i>	Instability		
	Direction	Contact	Collision—Football, Gymnastics, cheerleading, swimming
	Unidirectional	Noncontact	
<i>Subacromial</i>	Multidirectional		
	Labral tear	Distraction/compression	Throwing, weight lifting
	Articular side	Distraction	Throwing, baseball
	Rotator cuff tear		
<i>Acromioclavicular</i>	Bursal-sided rotator	Microtraumatic	Tennis, golf
	Cuff involvement from bony impingement	Compression	
	Subacromial arch		
<i>Scapulothoracic</i>	AC Joint	Compression	Weight lifting
	Arthrosis/osteolysis		Older age
<i>Acromioclavicular</i>	Arthrosis	Macro and micro contact	Weight lifting
	Instability, sprain	Loading	
<i>Scapulothoracic</i>		Macro contact	Rugby, ice hockey, equestrian
	Neurologic	Serratus anterior weakness	Baseball, archery
	Long thoracic nerve involvement		
<i>Scapulothoracic</i>	Physiologic dysfunction	Underlying lack of strength	Swimming, tennis

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## Rotator Cuff



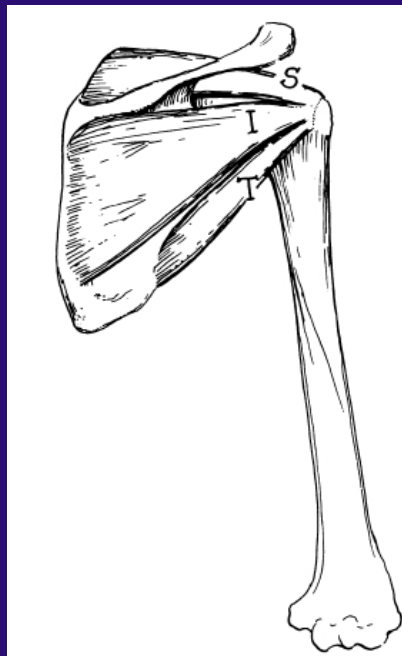
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## Rotator Cuff

Supraspinatus  
Infraspinatus  
Teres minor

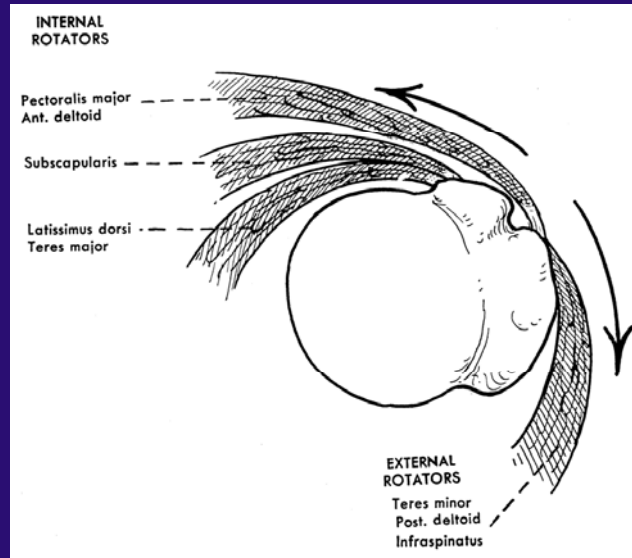
The "SIT"  
Muscles

Palpate and manual  
muscle test arm in  
varying degrees of  
abduction and  
rotation



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## Internal and External Rotators



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## Rotator Cuff Testing

- Empty can position
- Weakness in external rotation



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## Be Specific

The diagnosis should define the structure that is injured and the condition

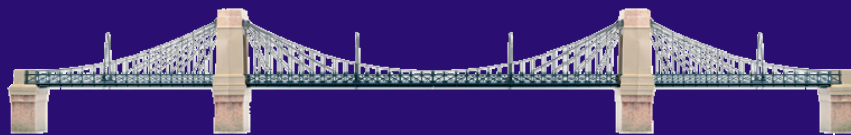
### Diagnosis Rotator Cuff

- Inflammation
- Tear
  - Partial vs. Complete
  - Articular side vs. Bursal side

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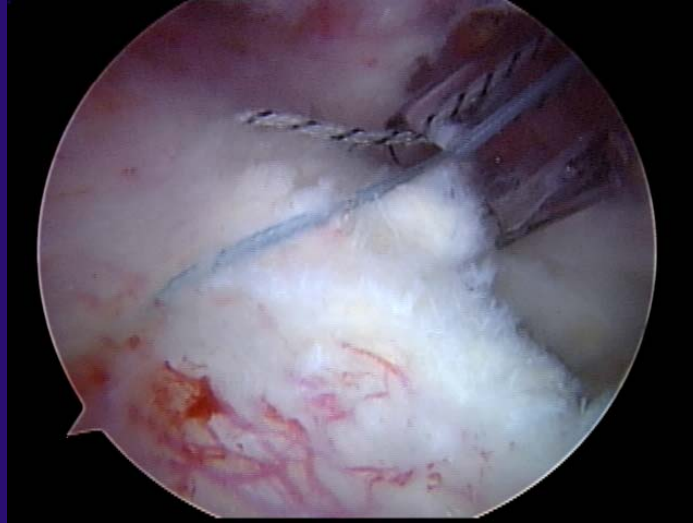
## Complete Tear

- Suspension bridge
  - Free side of tear (cable)
  - Attachments of tear or (supports at each end)



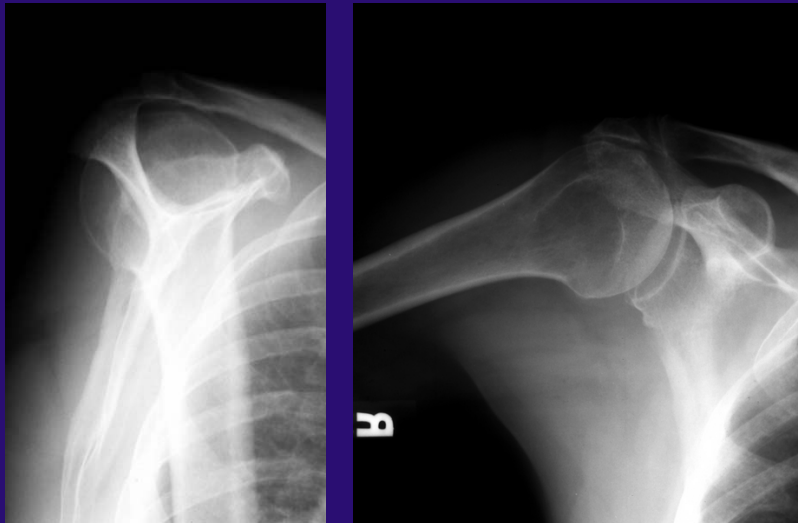
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**Mobilization of Cuff and View of Sutures Pulling Cuff Back to Greater Tuberosity**

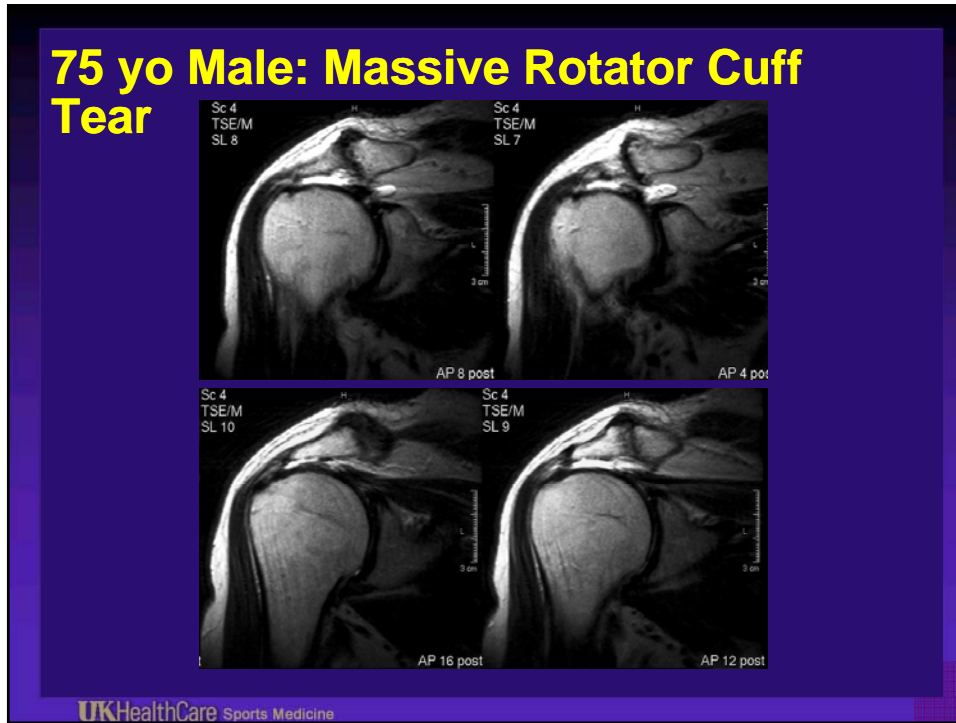


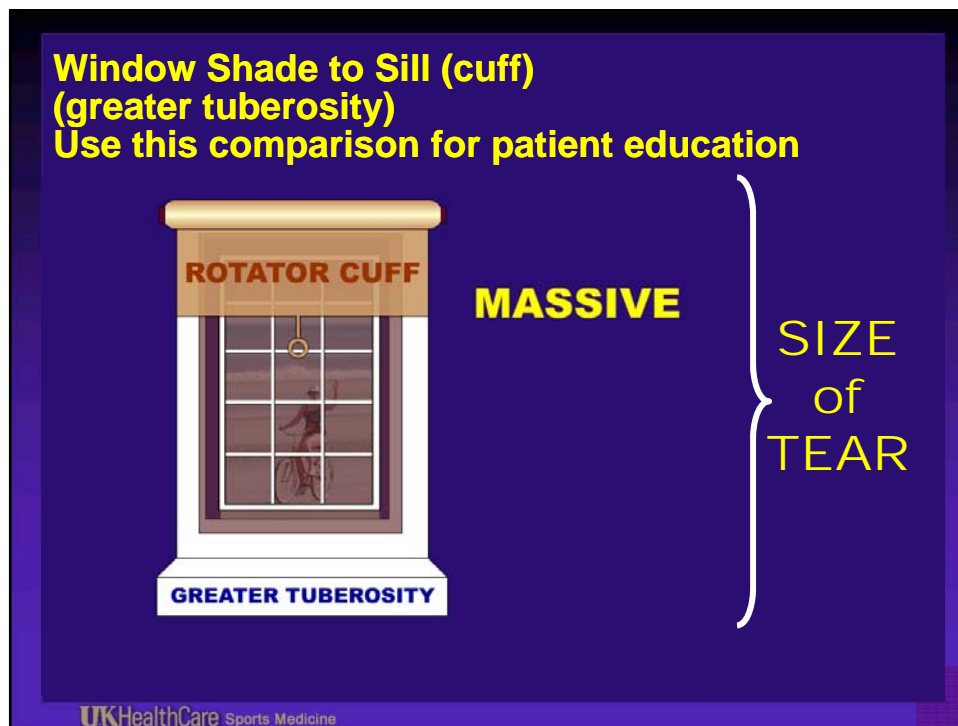
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**75 yo Male: Massive Rotator Cuff Tear**



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**There are Many Clinical Tests Named After Someone. Instead of Description By Name:**

- Think of the motion of joint and forces you apply
  - Is it labral?
    - (Axial loading like McMurray's)
  - Is it the rotator cuff?
    - (compressing or impinging)
  - Is it instability?
    - (distraction of joint capsule subluxing the humeral head)

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## Named Tests vs. Movement Description

- Many tests for biceps tendon disorders
- Think about patient history, anatomy and move the arm, load the joint to reproduce patient's symptoms

**Do the most painful part of the exam LAST**

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## Tests for Proximal Biceps Tendon Dysfunction – Long Head

- Ludington's
  - Yergason's
  - Abbott and Saunders'
  - DeAnquin's
  - Matsen's
  - Speed's
- 
- Include these for complete exam
  - Rarely isolated biceps problem
  - Think associated tear subscap/labrum/RC

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**Abbott and Saunders' test**

**DeAnquin's test**

**Matsen's test**

from - Burkhead WZ, Arcand MA, Zeman C, Habermeyer P, Walch G, *The Biceps Tendon*, In: The Shoulder, Rockwood CA, Matsen FA (Saunders, Philadelphia, 1998), 1036.

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**Speed's test**

**Speed's Test** © 2005 Ky. Sports Medicine

The biceps resistance test is performed with the patient flexing the shoulder against resistance, with the elbow extended and the forearm supinated.

Pain referred to the biceps tendon area constitutes a positive result.

from - Burkhead WZ, Arcand MA, Zeman C, Habermeyer P, Walch G, *The Biceps Tendon*, In: The Shoulder, Rockwood CA, Matsen FA (Saunders, Philadelphia, 1998), 1035.

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## Yergason's test



With the arm flexed, the patient is asked to forcefully supinate against resistance from the examiner's hand.

Pain referred to the anterior aspect of the shoulder in the region of the bicipital groove constitutes a positive result.

from - Burkhead WZ, Arcand MA, Zeman C, Habermeyer P, Walch G, *The Biceps Tendon*, In: The Shoulder, Rockwood CA, Matsen FA (Saunders, Philadelphia, 1998), 1036.

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## Ludington's test



The patient is asked to put his or her hands behind the head and flex the biceps. The examiner's finger can be in the bicipital groove at the time of the test.

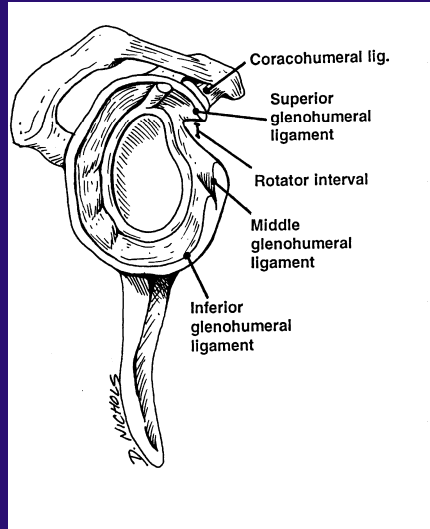
Subtle differences in the contour of the biceps are best noted with this maneuver. In this illustration the patient has a ruptured biceps at the left shoulder.

from - Burkhead WZ, Arcand MA, Zeman C, Habermeyer P, Walch G, *The Biceps Tendon*, In: The Shoulder, Rockwood CA, Matsen FA (Saunders, Philadelphia, 1998), 1037.

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## Labrum & Capsule

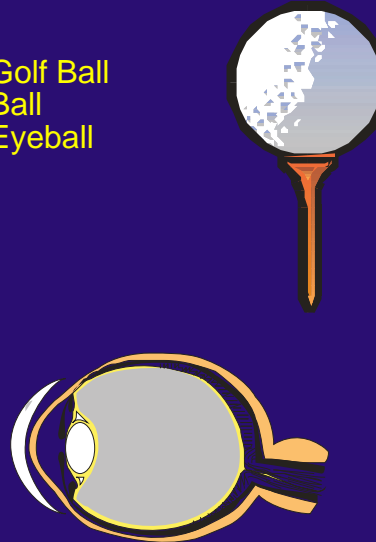
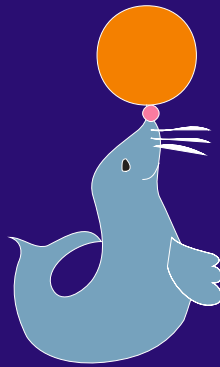
- Labral Function
- Stability
- Bumper
- Biceps attachment
- Shock absorber



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## Glenoid : Labrum

Tee : Golf Ball  
Seal : Ball  
Contact Lens : Eyeball



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- Prospective study
- 61 shoulders, 62 patients
- Tests Used
  - Jobe relocation test
  - O'Brien test
  - Anterior apprehension test
  - Bicipital groove tenderness
  - Crank test
  - Speed test
  - Yergason test
- Only O'Brien and Jobe relocation test were statistically correlated with presence of labrum tear, including SLAP
  - Other five not found useful for labral tears
  - None of the tests or combinations statistically valid for SLAP lesion only

Guanche CA and Jones DC, "Clinical Testing for Tears of the Glenoid Labrum," in *Arthroscopy: The Journal of Arthroscopic and Related Surgery*, vol 19, no 5 (May-June 2003), 517-523.

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## O'Brien's Test

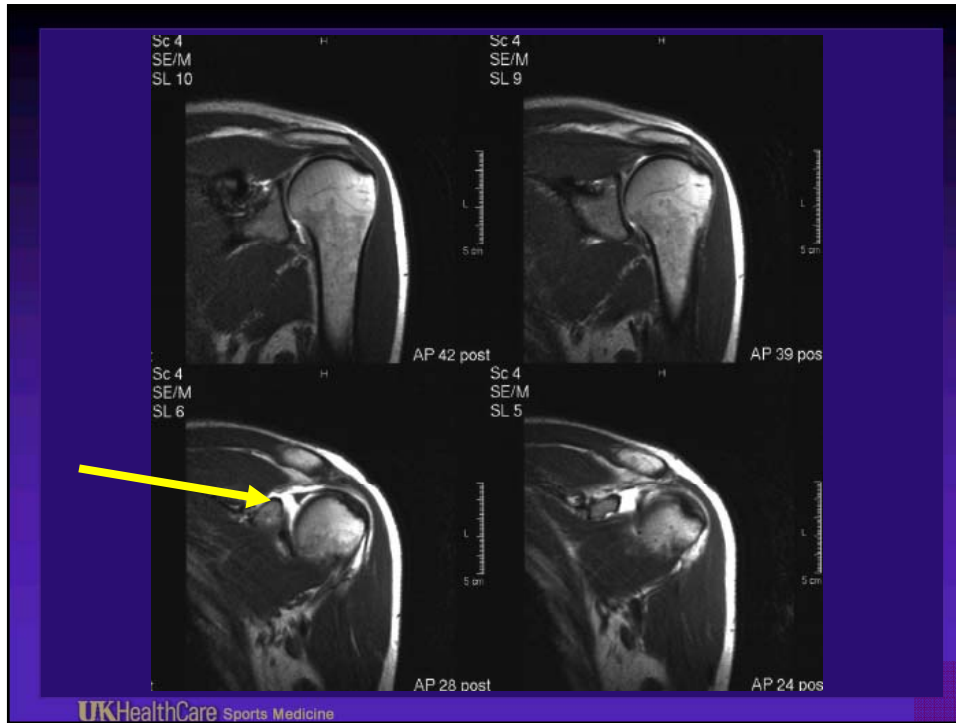


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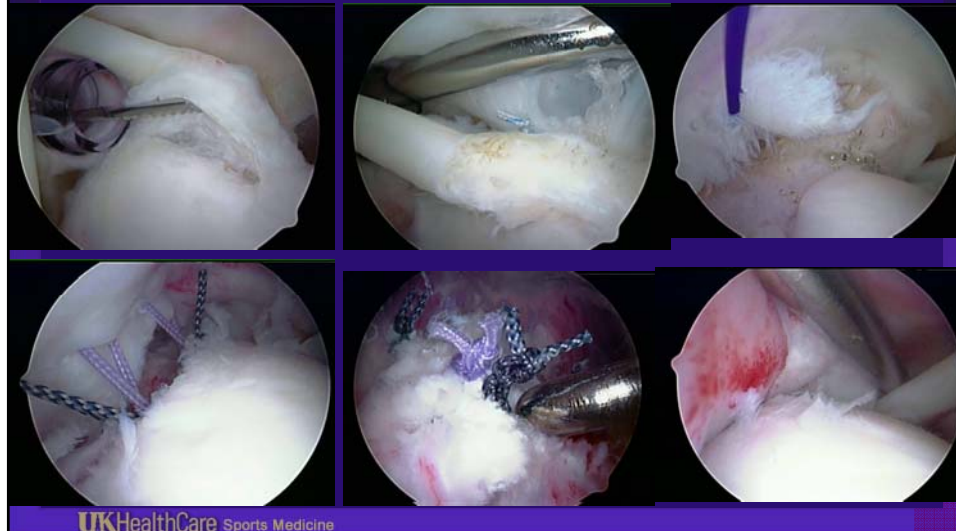
## Shoulder: Peel-back Sign



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## If SLAP Tear in Young Pitcher, Assess RC for Tear



## Shoulder Palpation Crank Tests



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## Shoulder Stability



Shoulder Stability Tests

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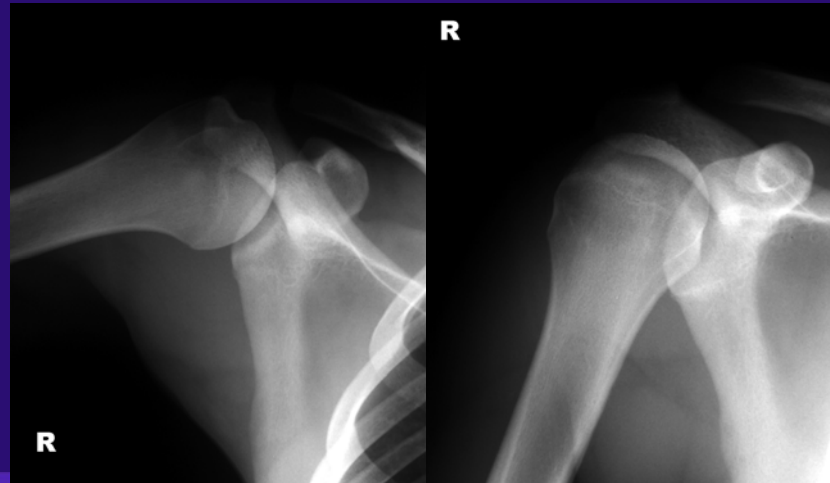
## 18 yo Freshman Football Athlete

- 18 yo Freshman RB for ECU w/dominant right shoulder injury
- Opening game - 8/31/2000
- No previous H/O injury
- Dead Arm Complaints
- Mechanism of Injury thought to be a lateral blow to the shoulder while being tackled

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### Clinic Radiographs

- Confirm humeral head radiolucency consistent with Hill-Sachs lesion



### Axillary views


Regular



Modified



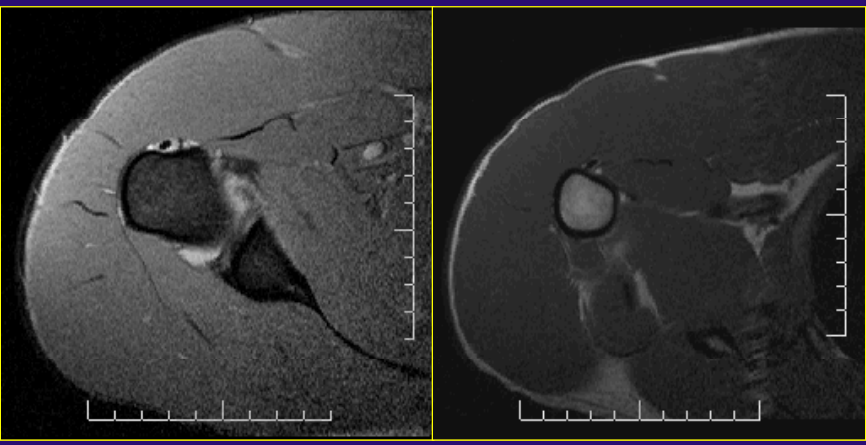
# MRI



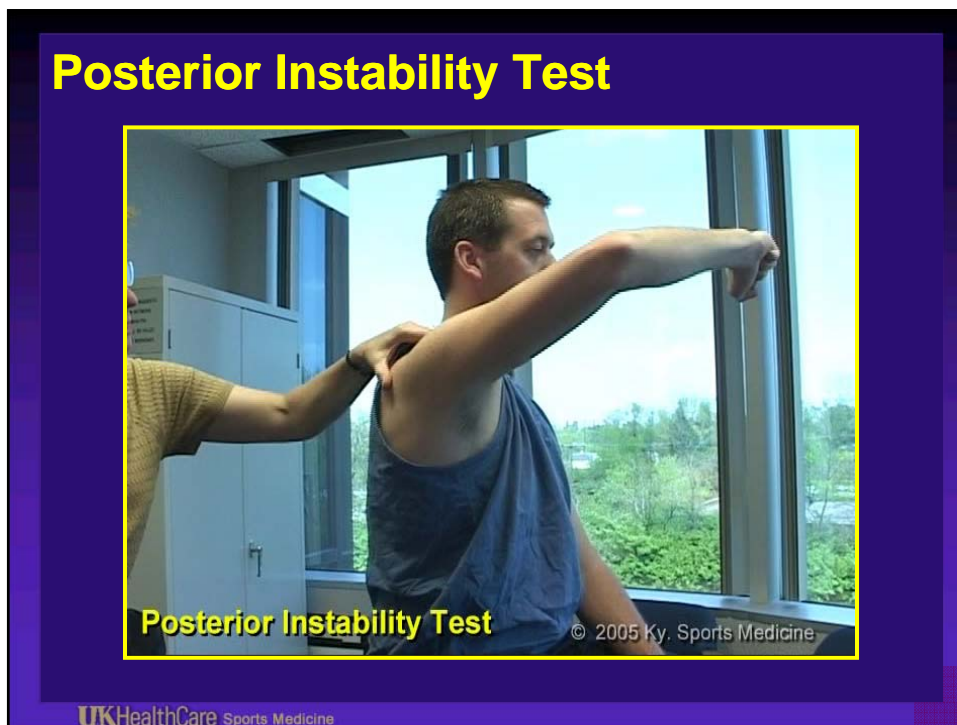
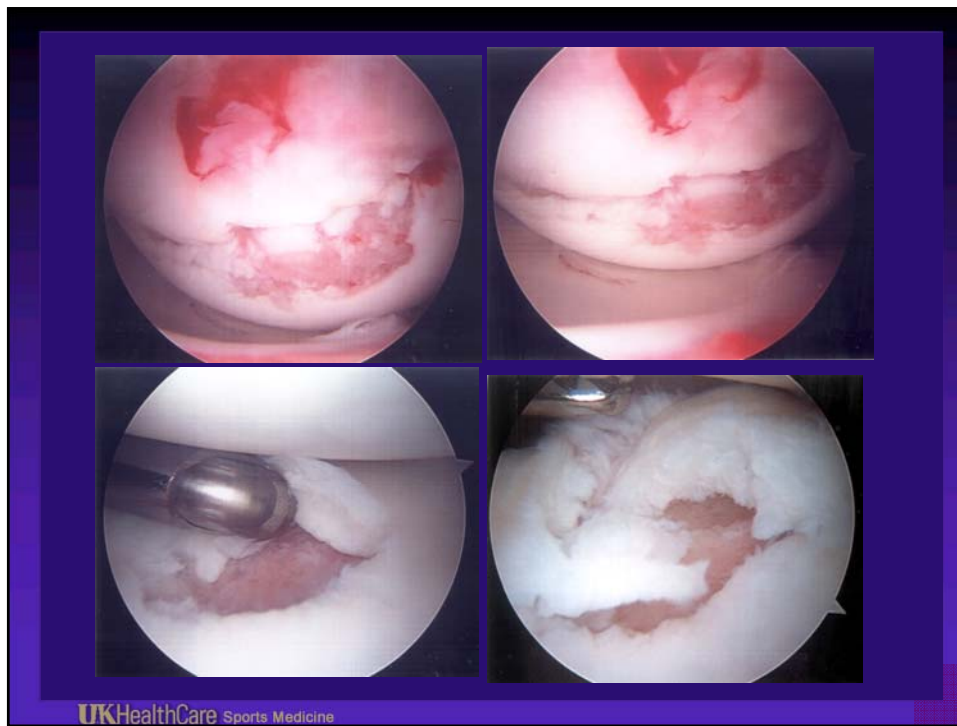
Sc 10 SE/M SL 12 AP 35 post  
Sc 10 SE/M SL 11 AP 31 post  
Sc 10 SE/M SL 10 AP 27 post

- Hill-Sachs lesion approx. 20%
- Anteroinferior Labral Detachment
- Anterosuperior Labral Detachment

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## Prone Posterior Instability Test



Prone Posterior Instability Test © 2005 Ky. Sports Medicine

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## Vicious Cycle: Laxity to Instability

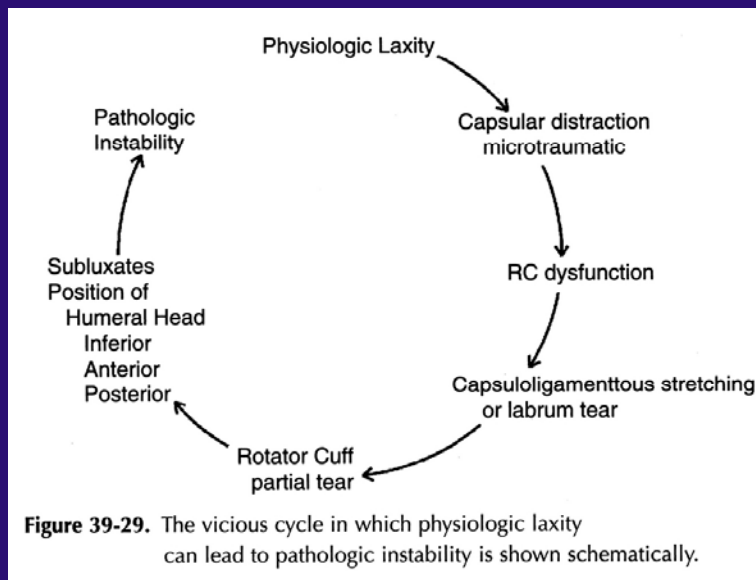


Figure 39-29. The vicious cycle in which physiologic laxity can lead to pathologic instability is shown schematically.

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## Multi-Directional Instability

• Voluntary posterior direction - symptomatic



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## S/P Open Anterior Shoulder Reconstruction Multi-Directional Instability, Bilateral Shoulders



More symptomatic on operated right side

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## 18 yo Right-Hand-Dominant Discus Thrower

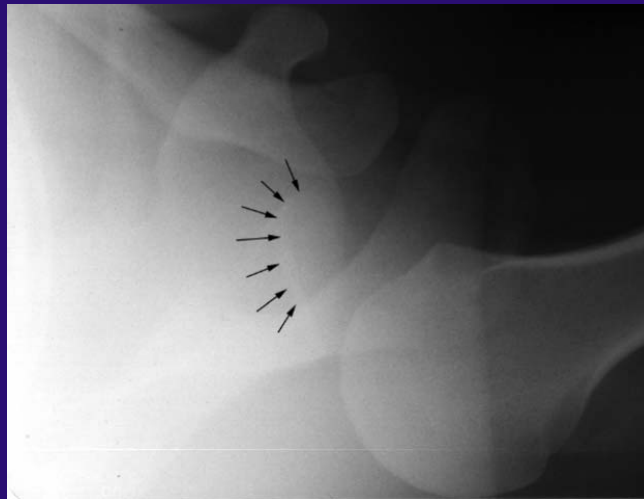
- Threw the discus
- Felt pop, pain, inability to move her arm
- Went to the emergency room

### Posterior Dislocation

- X-rays showed humeral head posteriorly dislocated on axillary view
- This direction of dislocation still is missed in emergency rooms

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### Posterior Dislocation



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## EUA Severe Posterior Instability



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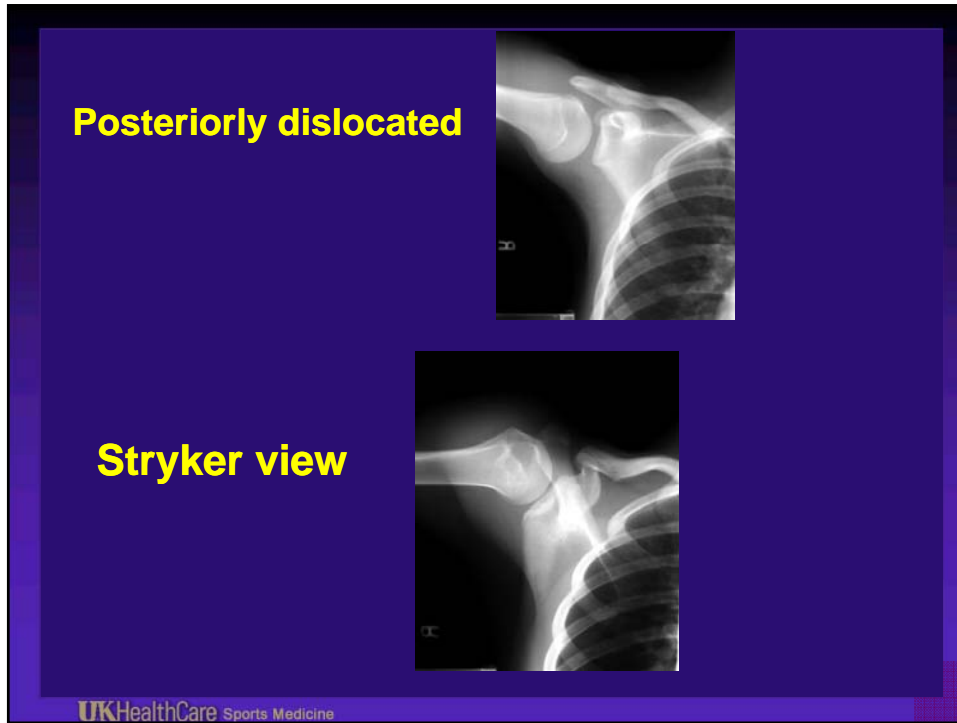
## ER view Axillary

## Posteriorly Dislocated



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**Shoulder Pain Algorithm:** AAOS Clinical Guideline on Shoulder Pain, in *Orthopaedic Knowledge Update: Shoulder and Elbow 2* (AAOS, 2002), p. 448-455.

[more]

[more]

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## Imaging

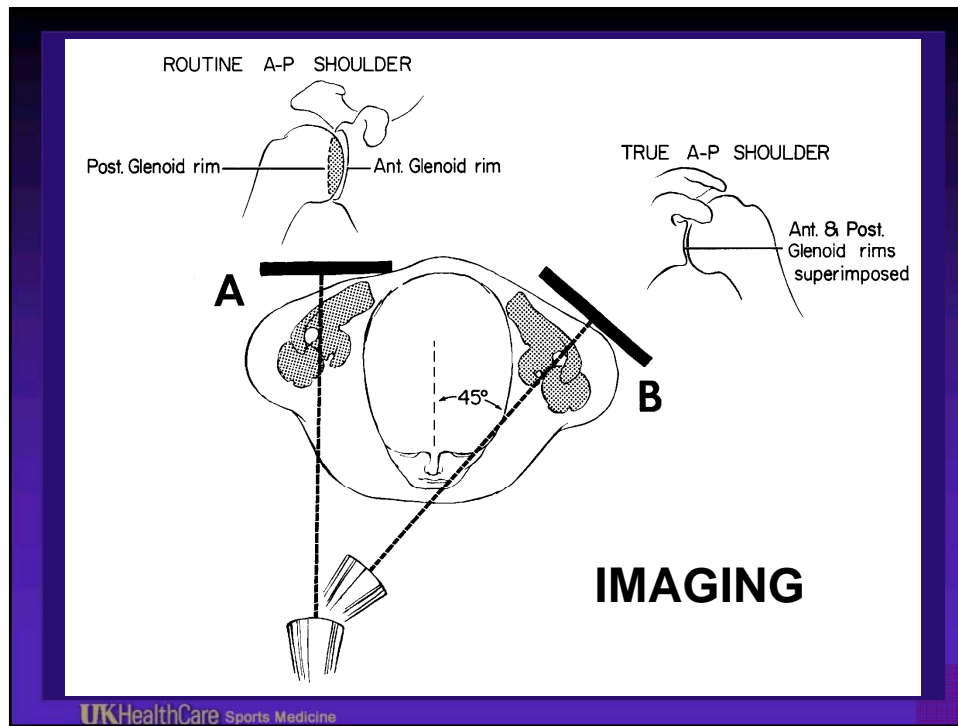
- Plain films
- Make the diagnosis by history and physical and plain films
- Institute treatment
- Re-examine
- Then special Imaging Studies

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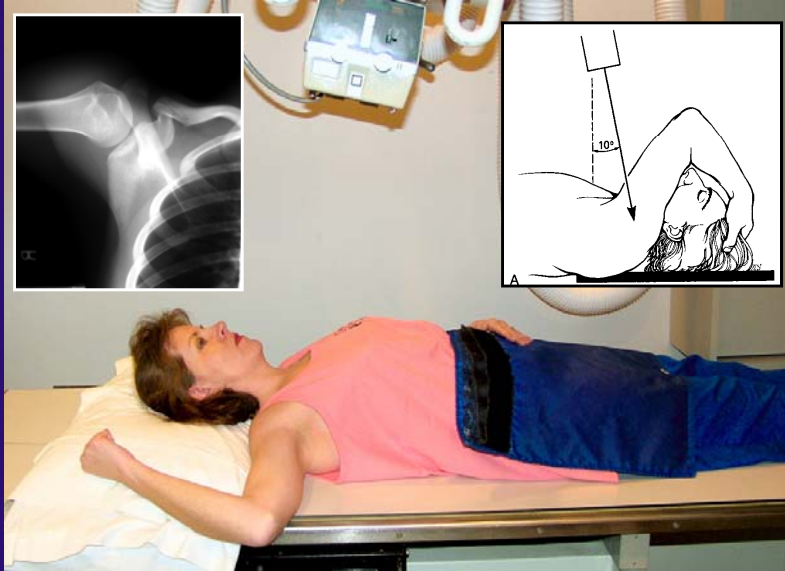
**Shoulder Pain Algorithm:** AAOS Clinical Guideline on Shoulder Pain, in *Orthopaedic Knowledge Update: Shoulder and Elbow 2* (AAOS, 2002), p. 448-455.

- Initial Imaging
  - True AP in 0° external rotation
  - Lateral in scapular plane
  - Axially view
    - When imaging studies are indicated during the initial evaluation and treatment of a patient with shoulder pain, appropriate plain "x-rays" should be obtained. More sophisticated imaging studies (such as shoulder MRI, ultrasound, or arthrography) are not indicated.

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## Stryker Notch View



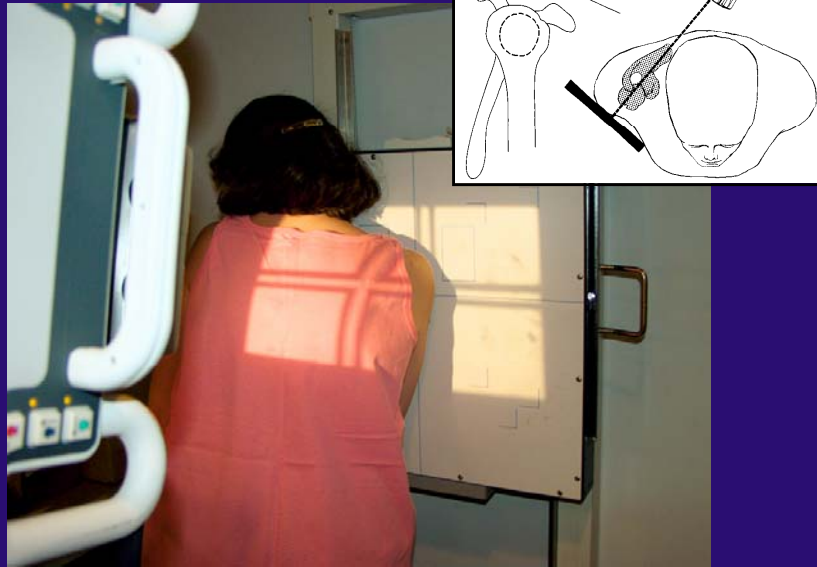
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## Outlet View



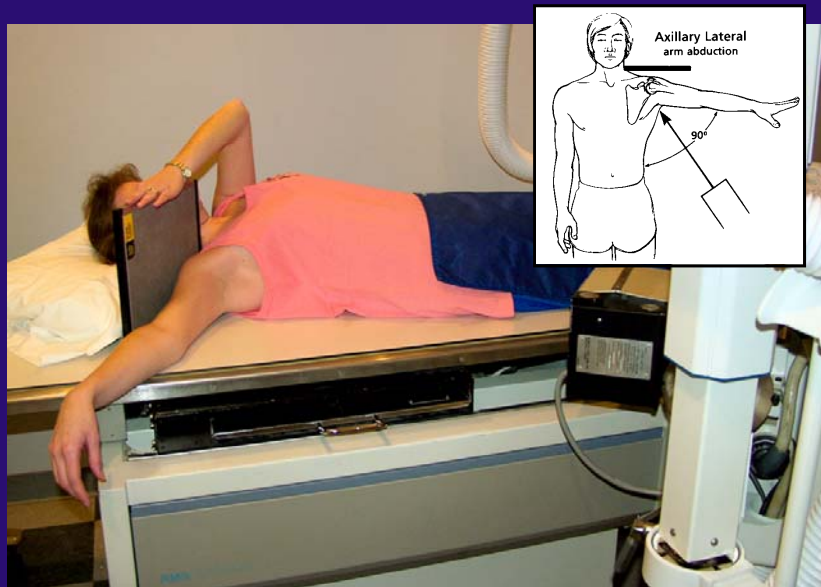
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### Outlet Upright View

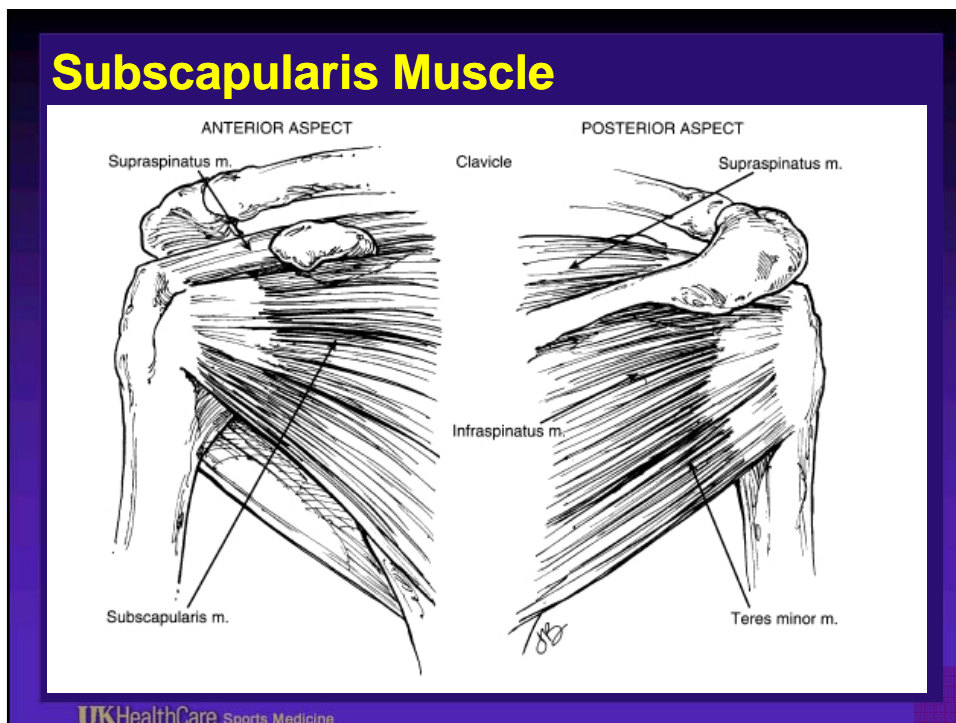
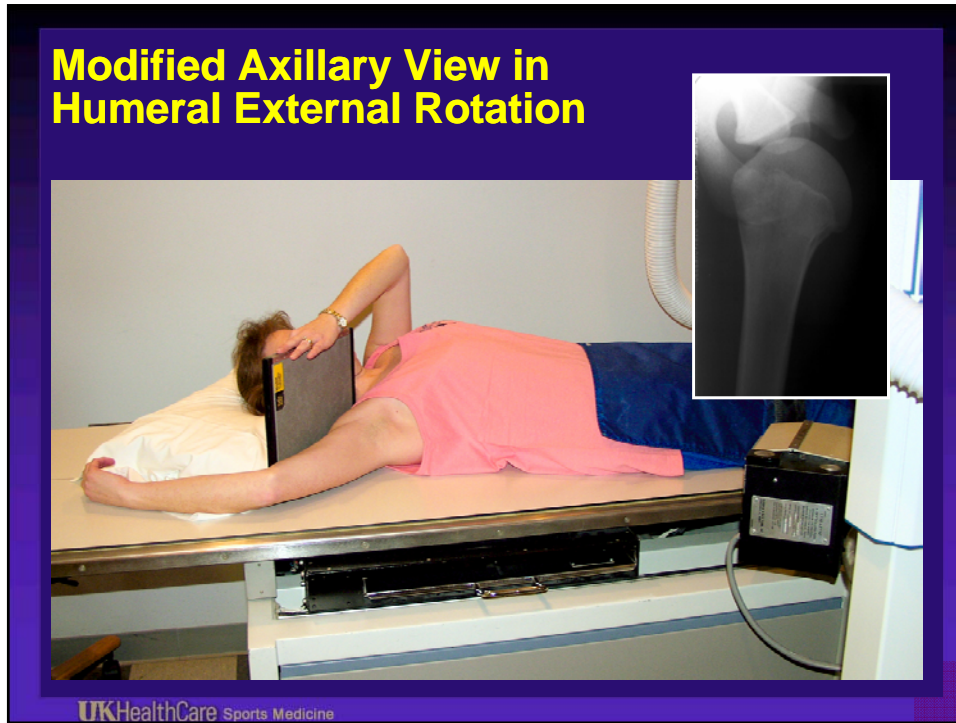


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### Axillary Lateral View



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## Subscapularis Tears

- Lift Off (75% tear 5-30)
  - Hand or back L spine
  - Maximum LR
- Napoleon (50% tear)
  - Press belly, flexes wrist
- Bear Hug (Upper tear, most sensitive)
  - Hand on opposite shoulder
  - Elbow forward
  - Examiner pulls hand off shoulder

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## Initial Clinic Visit

- 46 yo right-hand dominant male fell onto an outstretched right arm after tripping over his dog
- Felt a ripping sensation in his shoulder
- Went to the emergency room, plain x-rays normal
- PE next day
  - Pain diffusely anterior shoulder
  - Weakness, IR > ER

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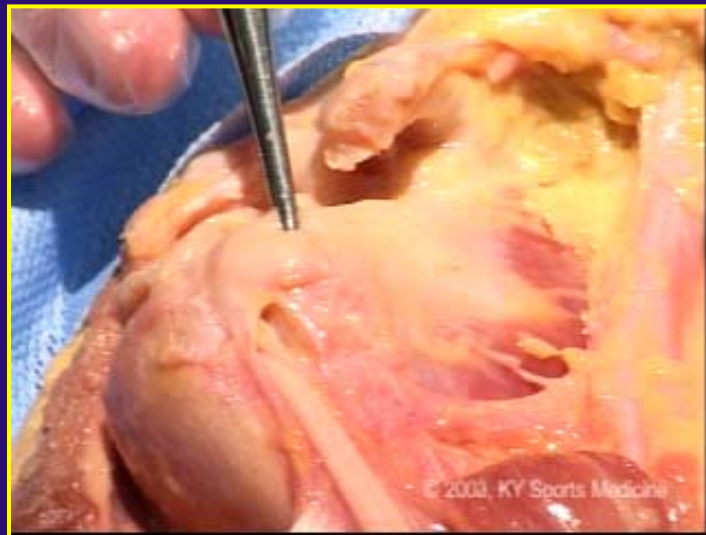
## Clinical exam: Subscapularis Tear



"I was unable to get my wallet out of my back pocket."

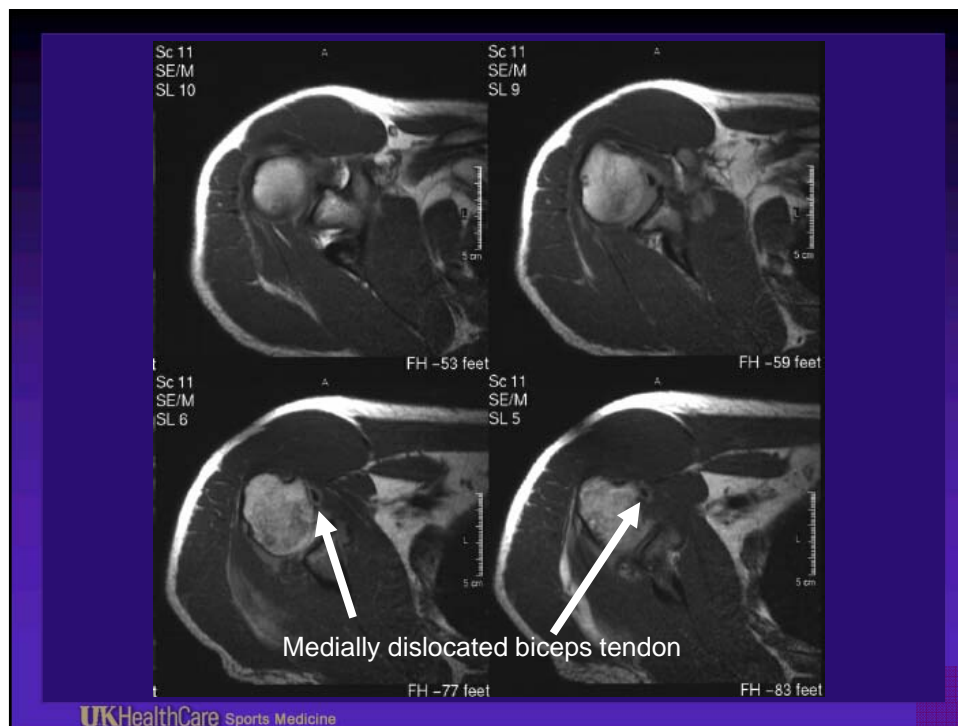
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## Subscapularis & Biceps Instability



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## Biceps Tendon

- Often associated with
  - Subscapularis tear
  - Chronic rotator cuff tears
- Presentation
  - Initial ecchymosis and pain, then feel better
- Treatment
  - Repair other associated tears
  - Tenodesis vs. tenotomy



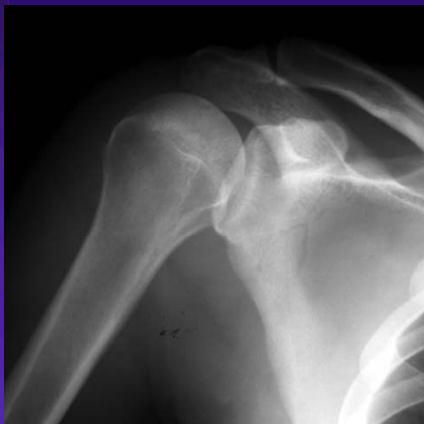
## Pectoralis Major Rupture 33 yo Male

- Bench pressing weights
- Weight amount he did ten years previously
- Felt a rip, pain, deformity, right pectoralis

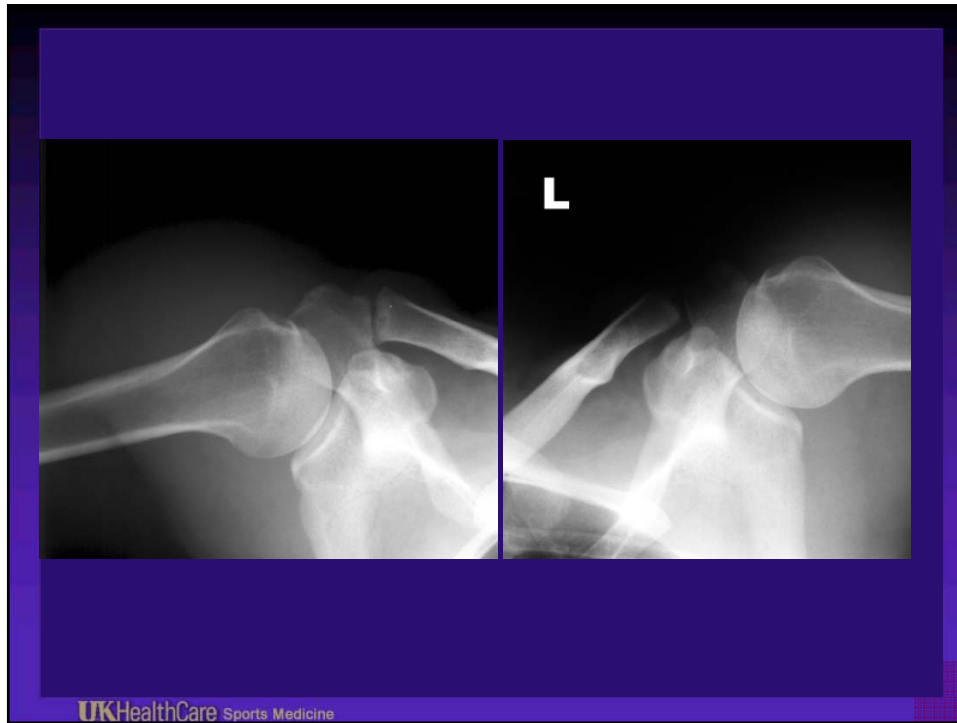


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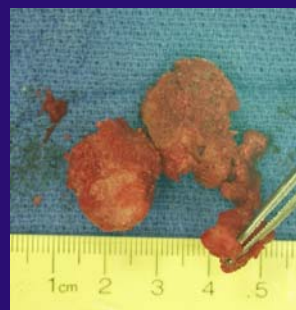
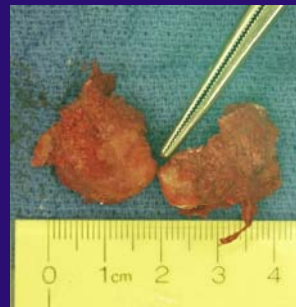
## 34 yo RHD weight-lifter Pain over AC joint s/p arthroscopy labral debridement 3 years previously Right AC osteolysis



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### Open Distal Clavicle Resection

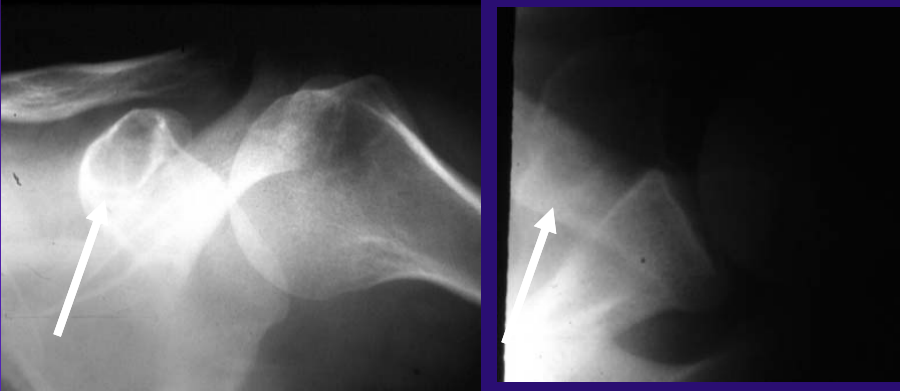


**You May Not Have Seen It,  
But It Has Seen You**



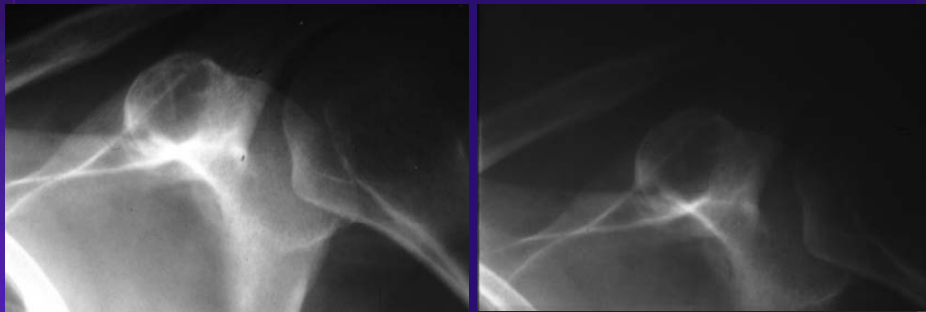
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**31 yo Female Lawyer**  
Shoulder pain; don't forget the coracoid

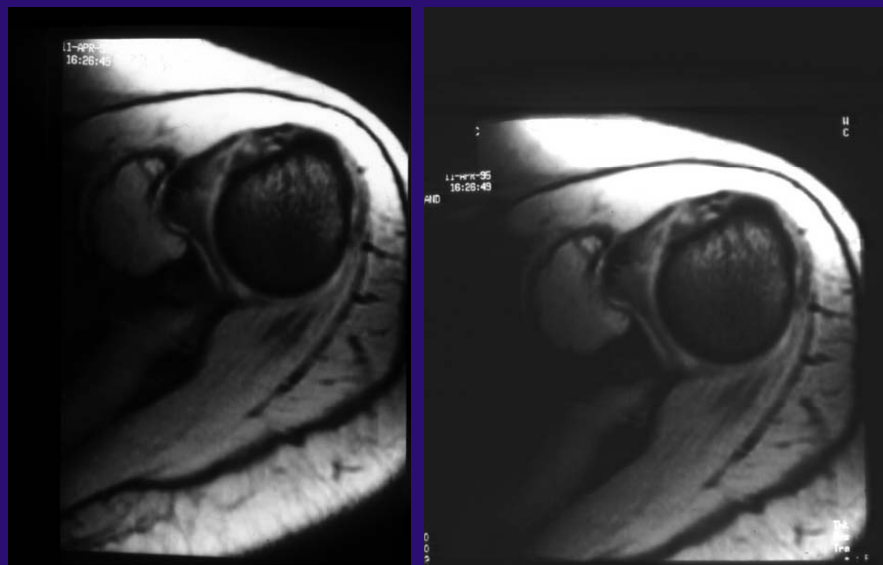


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**16 Months Later**  
Continued impingement signs  
Remember the coracoid



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### Gr. 1 Chondrosarcoma, coracoid



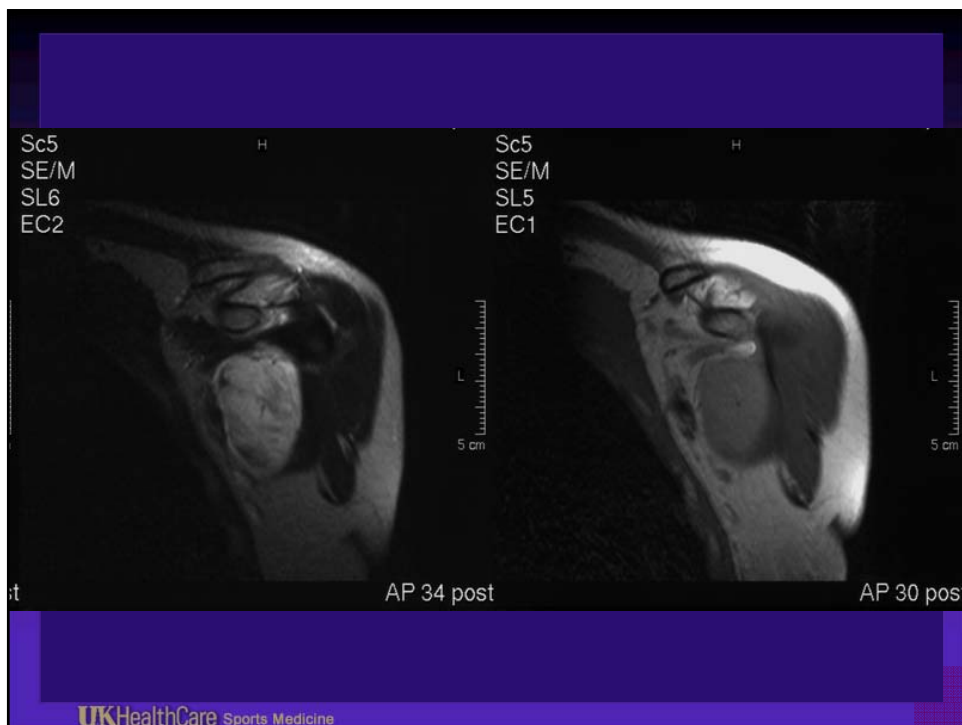
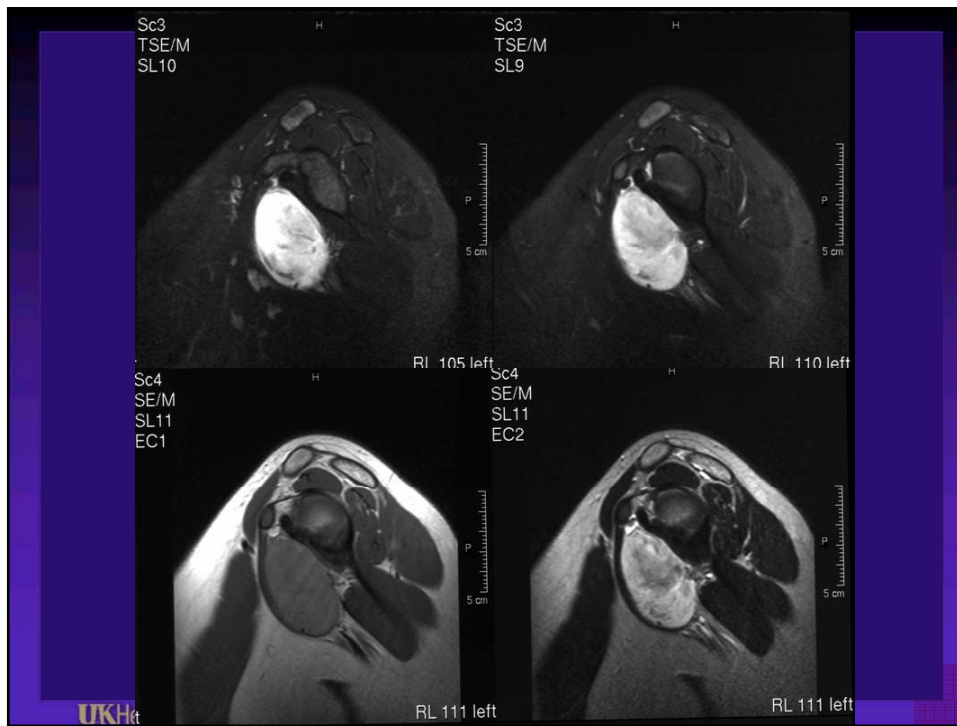
- Get preop x-rays
- Remember the coracoid!

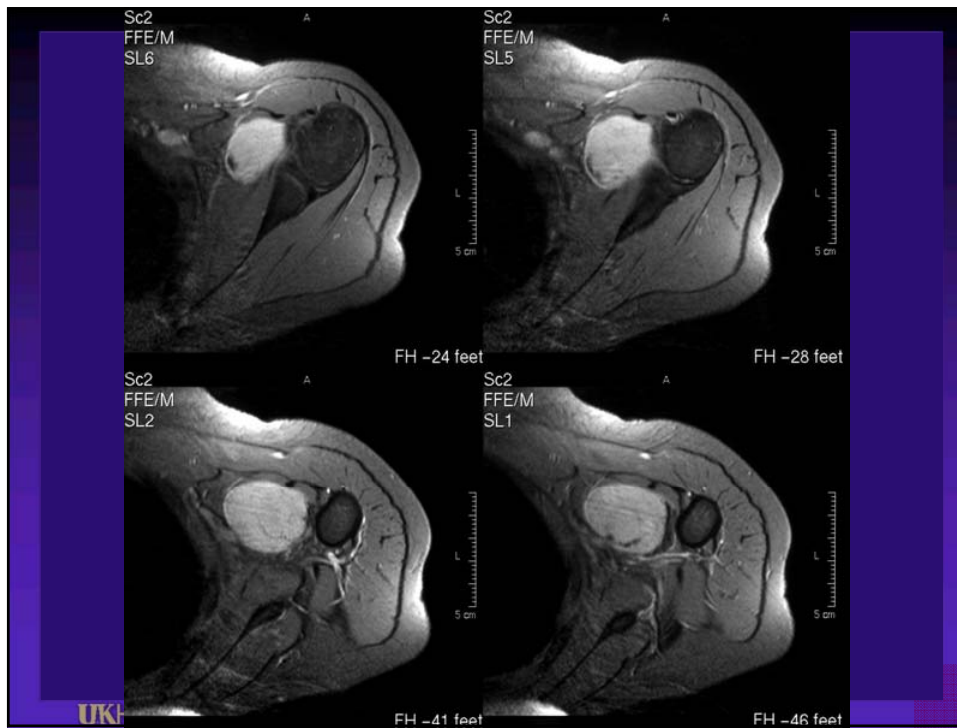
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### 12 yo Male Soccer Athlete

- Pain in left shoulder, 1-2 years
- No injury
- PE: normal stability
- Mildly tender firm axillary mass

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## Dx: Synovial Sarcoma

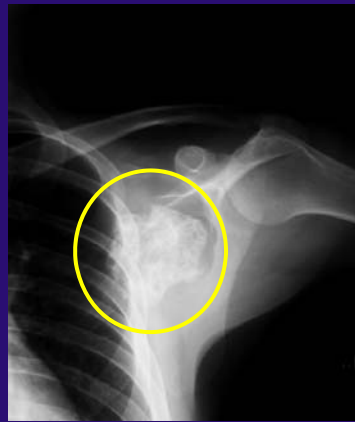
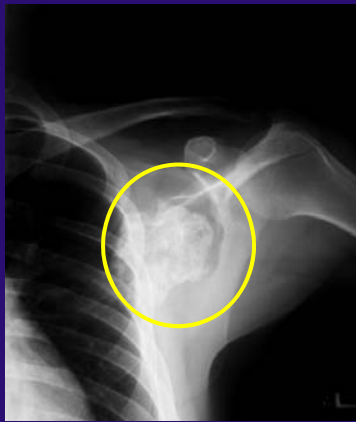
- Underwent limb salvage sarcoma resection and chemotherapy



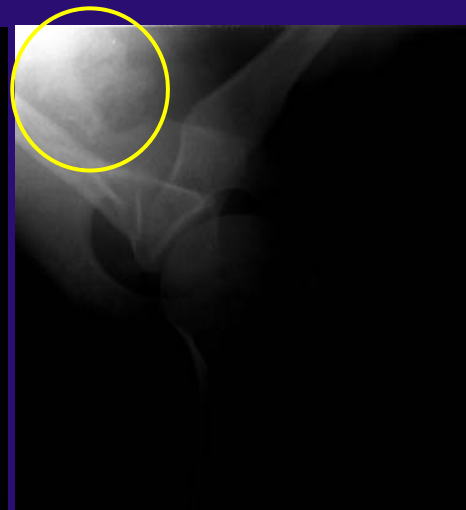
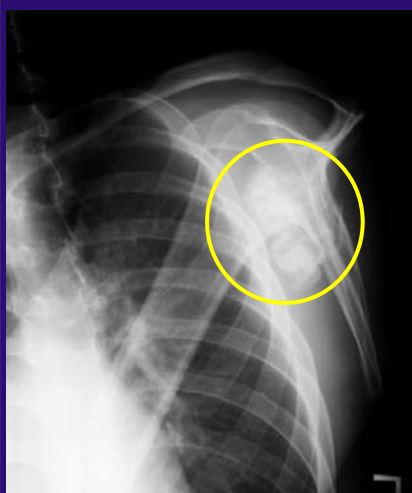


### 22 yo LHD Male

- Multiple osteochondroma
- Girlfriend noted scapular asymmetry



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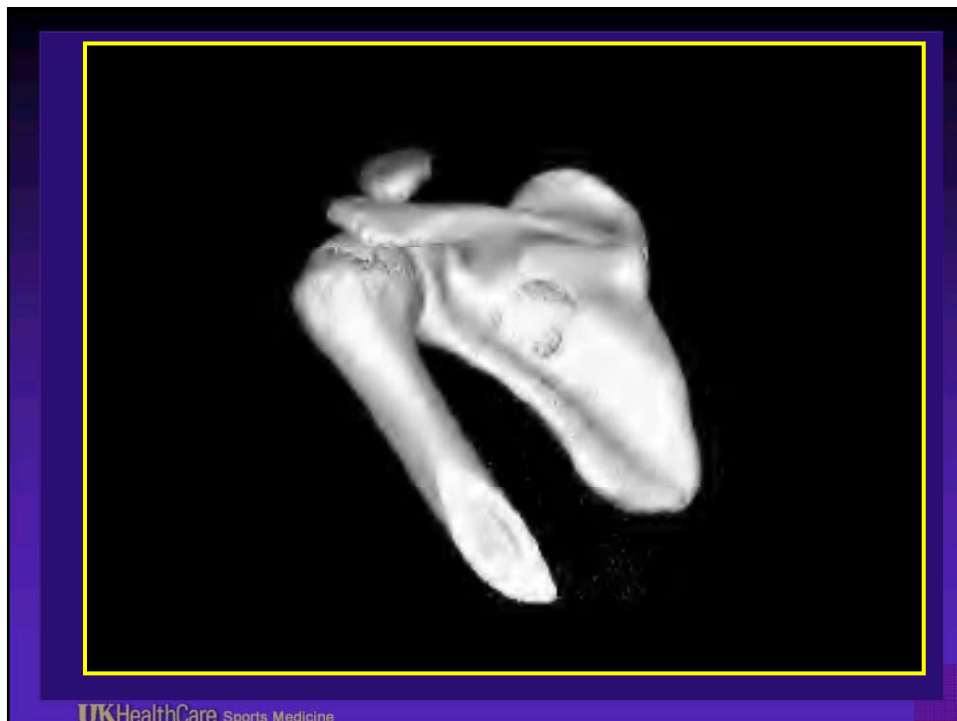


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## True Space Occupying Mass

- Causing "winging" and "snapping"
- Axial skeleton osteochondroma
- Underwent resection mass
- Diagnosis: osteochondroma, no malignant change

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**Shoulder Pain Algorithm:** AAOS Clinical Guideline on Shoulder Pain, in *Orthopaedic Knowledge Update: Shoulder and Elbow 2* (AAOS, 2002), p. 448-455.

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## Imaging

- Special Studies
  - MRI scan
    - With or without gadolinium
  - CT scan
  - Ultrasound

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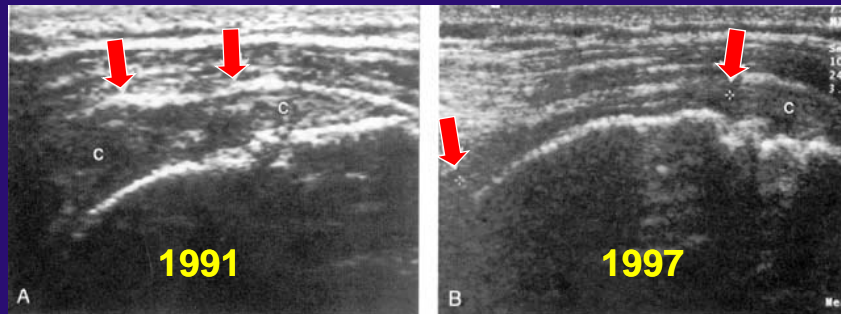
## Ultrasonography

- In office
- Accurate
- Low cost

Churchill RS, Fehringer EV, Dubinsky TJ, Matsen FA, "Rotator cuff ultrasonography: diagnostic capabilities," *J Am Acad Orthop Surg* 2004 Jan-Feb;12(1):6-11.

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## Ultrasound Showing Symptomatic Progression of Previously Asymptomatic Rotator Cuff Tear



Yamaguchi K et. al., "Natural history of asymptomatic rotator cuff tears: A longitudinal analysis of asymptomatic tears detected sonographically," *J Shoulder Elbow Surg* 2001;10:199-203.

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**Shoulder Pain Algorithm:** AAOS Clinical Guideline on Shoulder Pain, in *Orthopaedic Knowledge Update: Shoulder and Elbow 2* (AAOS, 2002), p. 448-455.

### Differential Diagnosis Categories

- Rotator Cuff Disorders
- Frozen shoulder
- GH Instability
- Arthrosis
- AC Joint Disorder
- Fibromyalgia

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**Shoulder Pain Algorithm:** AAOS Clinical Guideline on Shoulder Pain, in *Orthopaedic Knowledge Update: Shoulder and Elbow 2* (AAOS, 2002), p. 448-455.

- Needs specialized care
- ↓
- Refer to specialist
  - Definition of musculoskeletal specialist
    - Licensed physician who focuses on management of musculoskeletal conditions

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## Conclusions

- Don't order a test if you can't read it
- Communicate with the radiologist at your imaging center
- A bad scan is worse than no scan
- In Kentucky, we have many MRI scanners. Shoulder scans are notoriously bad if ordered by someone who is unable to examine a shoulder.

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# Conclusions

“Sometimes an MRI report just doesn’t help. . .”

北京医科大学第三医院放射科 CT、MRI

MRI 检查申请单

申请日期: 00年11月12日 检查日期: 00年11月12日

姓名: 刘... 性别: 男 年龄: 40岁 科室: 骨科

临床诊断: 肩周炎、肩袖损伤、肩峰下撞击、肩关节退变

检查部位与要求: 左肩关节MRI

医师: [Signature]

上海长海医院 MRI 报告单

姓名: 刘... 性别: 男 年龄: 40岁 科别: 骨科 检查部位: 左肩

病区: / 床号: / 住院号: / MRI号: 52266 报告日期: 2000.10.23

MRI 所见:

左肩关节MRI

左肩外肌: 喙肩韧带增厚+增生, 关节腔内少量积液, 关节滑膜增厚, 以外后侧为甚, 内侧面肩板后角右下见上述液性信号, 外侧面肩板后角见明显高信号线状影, 与后关节囊液相通, 局部可见小带状积液, 后交叉韧带连续性好, 信号正常, 前交叉韧带未见异常, 两组韧带亦无明显异常。

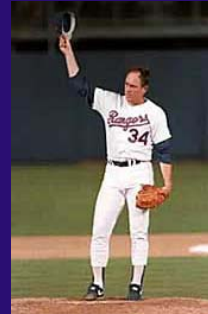
# Conclusions

- By
  - Knowing Anatomy
  - Understanding Biomechanics
  - Sport of injury
  - Mechanism
- Physical exam makes sense and specific diagnosis is made

Little League pitchers do NOT become Big League pitchers

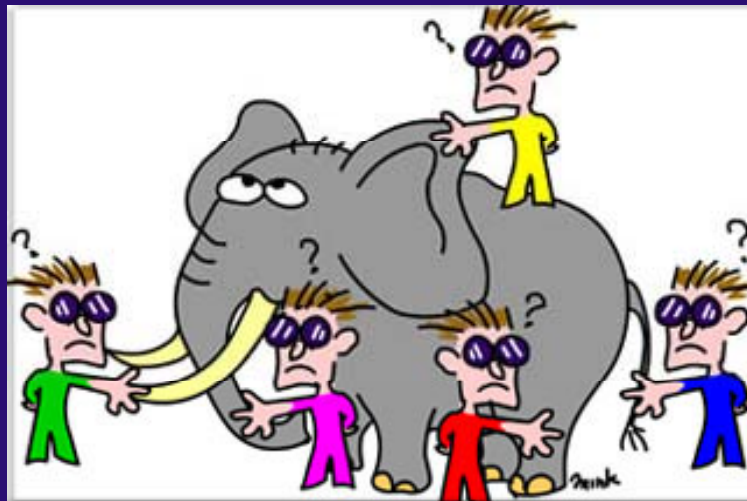


Nolan Ryan didn't start pitching until he was in high school



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Try to Put the Whole Picture Together



Treat the entire patient!

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