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
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

Differential Diagnosis

Think Joint  Mechanism

Joints (3)  Glenohumeral  One Event
SC
AC
Spaces (2)  Subacromial  Repetitive
Scapulothoracic
Referred  Neck  Repetitive - No event
Scapula
Lung
Ribs

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FUNCTIONAL ANATOMY: Joints

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

Primary Diagnosis
Elevation/Depression of the Scapula

Upward/Downward Rotation of the Scapula
Musculature: Protractors and Retractors of the Scapula

Abduction/Adduction of the Shoulder
Flexion/Extension of the Shoulder

Scapular Winging

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

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
  - Shrigs
  - Clockwise/counterclockwise
Scapular Winging

Like Firing a Cannon Out of a Canoe . . .
Is the Pain Referred?

- Neck
- Scapula
- Lung
- Ribs
- Tumor

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

Table 39-1. Shoulder Muscle Testing Chart

<table>
<thead>
<tr>
<th>MUSCLE</th>
<th>INNERVATION</th>
<th>MYOTOMES</th>
<th>TECHNIQUE FOR TESTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trapezius</td>
<td>Spinal accessory</td>
<td>C2-C4</td>
<td>Patient slopes shoulders against resistance.</td>
</tr>
<tr>
<td>Sternocostalis</td>
<td>Spinal accessory</td>
<td>C2-C4</td>
<td>Patient stands with one hand on posterior shoulder, contralateral arm extended.</td>
</tr>
<tr>
<td>Scapularis anterior</td>
<td>Long thoracic</td>
<td>C5-C7</td>
<td>Patient stands with arm extended, palm facing down.</td>
</tr>
<tr>
<td>Latissimus dorsi</td>
<td>Thoracodorsal</td>
<td>C7-C8</td>
<td>Patient stands with arm extended, hand on posterior shoulder.</td>
</tr>
<tr>
<td>Rhomboids</td>
<td>Dorsal</td>
<td>C4-C5</td>
<td>Arms bent at 90°, elbows flexed, hands on posterior shoulder.</td>
</tr>
<tr>
<td>Levator scapulae</td>
<td>Scapular</td>
<td>C5-C6</td>
<td>Arms bent at 90°, elbows flexed, hands on posterior shoulder.</td>
</tr>
<tr>
<td>Subscapularis</td>
<td>Medial</td>
<td>C5-C6</td>
<td>Arms bent at 90°, elbows flexed, hands on posterior shoulder.</td>
</tr>
<tr>
<td>Teres major</td>
<td>Axillary</td>
<td>C5-C6</td>
<td>Arms bent at 90°, elbows flexed, hands on posterior shoulder.</td>
</tr>
<tr>
<td>Subscapularis (upper)</td>
<td>C5</td>
<td></td>
<td>Arm at side with elbow flexed to 90°. Examine for internal rotation.</td>
</tr>
<tr>
<td>Supraspinatus</td>
<td>C5-C6</td>
<td></td>
<td>Arm at side with elbow flexed to 90°. Examine for external rotation.</td>
</tr>
<tr>
<td>Infraspinatus</td>
<td>C5-C6</td>
<td></td>
<td>Arm at side with elbow flexed to 90°. Examine for external rotation.</td>
</tr>
<tr>
<td>Teres minor</td>
<td>Axillary</td>
<td>C5-C6</td>
<td>Same as for infraspinatus.</td>
</tr>
<tr>
<td>Pectoralis major</td>
<td>Medial and lateral pectoral</td>
<td>C5-T1</td>
<td>Arm at side with elbow flexed to 90°. Examine for external rotation.</td>
</tr>
<tr>
<td>Pectoralis minor</td>
<td>Medial</td>
<td>C6-T1</td>
<td>Arm at side with elbow flexed to 90°. Examine for external rotation.</td>
</tr>
<tr>
<td>Contercocubitalis</td>
<td>C6-T1</td>
<td>None</td>
<td>Arm at side with elbow flexed to 90°. Examine for external rotation.</td>
</tr>
<tr>
<td>Biceps brachii</td>
<td>Medial</td>
<td>C1-C6</td>
<td>Flexion of the upper arm with elbows flexed to 90°.</td>
</tr>
<tr>
<td>Triceps</td>
<td>Radial</td>
<td>C5-C6-C8</td>
<td>Resistance to extension of elbow from varying position of flexion.</td>
</tr>
</tbody>
</table>

*Numbers in parentheses indicate a variable but rare contribution.

Abnormal Shoulder Differential Diagnosis

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

<table>
<thead>
<tr>
<th>INVOLVED JOINT</th>
<th>DIAGNOSIS</th>
<th>PATHOMECHANICS</th>
<th>MOST COMMON SPORTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glenohumeral</td>
<td>Instability</td>
<td>Contact</td>
<td>Collision—Football, Swimming, Gymnastics, cheerleading, gymnastics.</td>
</tr>
<tr>
<td></td>
<td>Direction</td>
<td>Noncontact</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Multidirectional</td>
<td>Distraction/compression</td>
<td>Throwing.</td>
</tr>
<tr>
<td></td>
<td>Labral tear</td>
<td>Distraction</td>
<td>Throwing.</td>
</tr>
<tr>
<td></td>
<td>Articular side</td>
<td></td>
<td>Throwing.</td>
</tr>
<tr>
<td></td>
<td>Rotator cuff tear</td>
<td></td>
<td>Throwing.</td>
</tr>
<tr>
<td></td>
<td>Bursal-sided rotator</td>
<td>Microtraumatic</td>
<td>Tennis, golf.</td>
</tr>
<tr>
<td></td>
<td>Cuff involvement from bony impingement</td>
<td>Compression</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Subscapular arch</td>
<td>Compression</td>
<td>Weight lifting.</td>
</tr>
<tr>
<td></td>
<td>AC Joint</td>
<td>Macro and micro contact</td>
<td>Weight lifting.</td>
</tr>
<tr>
<td></td>
<td>Arthrosis osteolysis</td>
<td>Macro contact</td>
<td>Old age.</td>
</tr>
<tr>
<td>Subacromial</td>
<td>Inability, sprain</td>
<td>Macro contact</td>
<td>Weight lifting.</td>
</tr>
<tr>
<td>Acromioclavicular</td>
<td>Instability</td>
<td>Macro contact</td>
<td>Swimming, tennis, tennis, golf, water sports.</td>
</tr>
<tr>
<td></td>
<td>Neurologic</td>
<td>Serratus anterior weakness</td>
<td>Swimming, tennis, tennis, golf, water sports.</td>
</tr>
<tr>
<td>Scapulothoracic</td>
<td>Physiologic dysfunction</td>
<td>Underlying lack of strength</td>
<td>Swimming, tennis, tennis, golf, water sports.</td>
</tr>
</tbody>
</table>
Rotator Cuff

Supraspinatus
Infraspinatus
Teres minor

The “SIT” Muscles

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

- Empty can position
- Weakness in external rotation

Rotator Cuff Testing
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

Complete Tear

- Suspension bridge
  - Free side of tear (cable)
  - Attachments of tear or (supports at each end)
Mobilization of Cuff and View of Sutures Pulling Cuff Back to Greater Tuberosity

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

MRI

• Full Thickness supraspinatus tear
Window Shade to Sill (cuff) (greater tuberosity)
Use this comparison for patient education

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)
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

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
Abbott and Saunders’ test

DeAnquin’s test

Matsen’s test


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.

**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.


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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.

Labrum & Capsule

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

Glenoid : Labrum

Tee : Golf Ball
Seal : Ball
Contact Lens : Eyeball
• 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

O’Brien’s Test

Shoulder: Peel-back Sign
If SLAP Tear in Young Pitcher, Assess RC for Tear
Shoulder Stability

18 yo Freshman Football Athlete

- 18 yo Freshman RB for EKU 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
Clinic Radiographs

- Confirm humeral head radiolucency consistent with Hill-Sachs lesion

Axillary views

<table>
<thead>
<tr>
<th>Regular</th>
<th>Modified</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Regular View" /></td>
<td><img src="image2.png" alt="Modified View" /></td>
</tr>
</tbody>
</table>
- Hill-Sachs lesion approx. 20%
- Anteroinferior Labral Detachment
- Anterosuperior Labral Detachment
Posterior Instability Test
Prone Posterior Instability Test

Vicious Cycle: Laxity to Instability

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

• Voluntary posterior direction - symptomatic

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

More symptomatic on operated right side
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
EUA Severe Posterior Instability

ER view
Axillary

Posteriorly Dislocated
Posteriorly dislocated

Stryker view

**Imaging**

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

**Shoulder Pain Algorithm:**

- **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.
AP Internal View
Stryker Notch View

Outlet View
Modified Axillary View in Humeral External Rotation

Subscapularis Muscle

ANTERIOR ASPECT
Supraspinatus m.
Clavicle
Infraspinatus m.
Subscapularis m.

POSTERIOR ASPECT
Supraspinatus m.
Infraspinatus m.
Teres minor m.
Subscapularis Tears

- Lift Off (75% tear 5-30)
  - Hand or back Lspine
  - 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

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
Clinical exam: Subscapularis Tear

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

Subscapularis & Biceps Instability
Medially dislocated biceps tendon

**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

34 yo RHD weight-lifter
Pain over AC joint s/p arthroscopy labral debridement 3 years previously
Right AC osteolysis
Open Distal Clavicle Resection
You May Not Have Seen It, But It Has Seen You

31 yo Female Lawyer
Shoulder pain; don’t forget the coracoid
16 Months Later
Continued impingement signs
Remember the coracoid
Gr. 1 Chondrosarcoma, coracoid

- Get preop x-rays
- Remember the coracoid!

12 yo Male Soccer Athlete

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

Mary Lloyd Ireland, MD
Dx: Synovial Sarcoma

- Underwent limb salvage sarcoma resection and chemotherapy
22 yo LHD Male

- Multiple osteochondroma
- Girlfriend noted scapular asymmetry
True Space Occupying Mass

- Causing “wining” and “snapping”
- Axial skeleton osteochondroma
- Underwent resection mass
- Diagnosis: osteochondroma, no malignant change

**Make the Primary Diagnosis!**

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**Imaging**

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

**Ultrasonography**

- In office
- Accurate
- Low cost

Ultrasound Showing Symptomatic Progression of Previously Asymptomatic Rotator Cuff Tear


Differential Diagnosis Categories

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

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

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.
Conclusions

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

• 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

Try to Put the Whole Picture Together

Treat the entire patient!