The Diagnosis-Driven Physical Exam of the Shoulder

April 24, 2014
Carlin Senter MD, Natalie Voskanian MD, Veronica Jow MD

Carlin Senter, MD
Assistant Clinical Professor
UCSF Sports Medicine
Natalie Voskanian, MD
Assistant Clinical Professor
UCSD Sports Medicine

Veronica Jow, MD
Associate Team Physician
UC Berkeley
Small group experts: UCSF residents and faculty

Outline

• Shoulder anatomy
• Shoulder exam
• Shoulder hands on exam practice
• Cases
• Questions
Shoulder: top 3 diagnoses in primary care referrals to ortho (at UCSF)

1. Rotator cuff disease
   1. Subacromial bursitis
   2. Tendinitis or Tendinopathy
   3. Partial tear
   4. Full thickness tear
2. Frozen shoulder (aka Adhesive capsulitis)
3. Glenohumeral joint osteoarthritis

Shoulder: diagnosis driven exam
Musculoskeletal work-up

- History
- Inspection
- Palpation
- Range of motion
- Other Tests
- Strength
- Neurovascular

Shoulder key points

- History
  - Hand dominance
  - Occupation
  - Hobbies/sports (repetitive lifting or overhead activity)
  - H/o dislocation
  - H/o recent fall or injury
  - Pain that wakes patient from sleep
- Exam
  - Always perform neck exam with shoulder
  - Inspection: gown tied under arms or shirt off
  - Always include examination of unaffected side
Shoulder exam

Underlying Anatomy - Bones

- Humerus
- Scapula
  - Glenoid
  - Acromion
  - Coracoid
  - Scapular body
- Clavicle
- Sternum
The **LABRUM** is a fibrocartilaginous ring of tissue that attaches to the glenoid rim & deepens the glenoid fossa

**Labral Tear**

- Seen in young athletes from acute trauma, weight lifters
- Might feel like something is clicking or catching inside
- SLAP = superior labrum anterior-posterior is typical pattern
- MRI vs MR arthrogram (with intra-articular contrast)
- Tx = try conservative management (PT, +/- injection, time)… surgery if fails
- Older patients (50+) -> labrum degenerates, not a source of pain, is an incidental finding
The Spine of the scapula is at the level of T3.

The Bottom of the scapula is at level of T7.

The tendons of the rotator cuff muscles reinforce the capsule of the glenohumeral joint.

The Rotator Cuff Muscles (SITS)

- **Subscapularis** (Internal Rotation)
- **Lesser Tuberosity**
- **Anterior View**
Shoulder impingement

- Inflammation of the subacromial space
  - The area under the acromion and above the glenohumeral joint
  - Structures in this space
    - Supraspinatus
    - Subacromial/subdeltoid bursa
- Hurts with reaching behind car seat, brushing hair, or putting on bra
The Biceps Tendon (long head) can be a cause of shoulder pain

- #1 Supination of the elbow (screwing, twisting, gardening)
- #2 Flexion of the elbow

Pain is often in anterior/medial aspect of shoulder

Neck examination

- Inspection
- Palpate C-spine
- FF and extension
- Side rotation
- Spurlings
Cervical Spine
Spurling’s Maneuver

- Neck extended
- Head rotated toward affected shoulder
- Axial load placed on the cervical spine
- Reproduction of patient’s shoulder/arm pain indicates possible nerve root compression

Shoulder examination

- **Inspection**
  - Patient in gown
- Palpation
- ROM
- Strength
  - Supraspinatus
  - Infraspinatus & Teres minor
  - Subscapularis
  - Biceps
- Other tests

http://meded.ucsd.edu/clinicalmed/joints 2.htm, permission granted by Dr. Charles Goldberg, UCSD SOM
Inspection

- Presence of infraspinatus atrophy increases likelihood of rotator cuff disease
- Positive LR 2.0
- Negative LR 0.61


Shoulder examination

- Inspection
- **Palpation**
- ROM
- Strength
  - Supraspinatus
  - Infraspinatus & Teres minor
  - Subscapularis
  - Biceps
- Other tests

http://meded.ucsd.edu/clinic/almed/joints2.htm, permission granted by Dr. Charles Goldberg, UCSD SOM
Range of motion

Abduction

Flexion

Range of motion

External rotation

Internal rotation
Supine shoulder PROM

Active ROM
- Normal
- Decreased

Passive ROM
- Normal
- Decreased

Frozen shoulder
- Normal
- Abnormal

X-ray
- Normal
- Abnormal

GH joint OA
- Normal
- Abnormal

Shoulder: diagnosis driven exam

Rotator cuff dz
Labral tear
Biceps tendinitis
AC joint OA
Other tests

- Rotator cuff disease (RCD)
  - Bursitis or impingement
  - Tendinitis/tendinopathy
  - Partial tear
  - Full thickness tear
- Biceps tendinitis/tendinopathy
- Labral tear
- AC joint osteoarthritis

What’s the best way for PCPs to examine the shoulder for RCD?

We concluded that there is insufficient evidence upon which to base selection of physical tests for shoulder impingement, and potentially related conditions, in primary care.
Rotator cuff disease exam

- Pain provocation tests
- Pain and strength tests
- Often the pain radiates to lateral shoulder/proximal arm ("deltoid")

Pain test: Impingement signs

Hawkin’s

Neer’s

Photos from Dr. Christina Allen
Pain test: Painful arc

If painful, positive LR 3.7 for RCD.
If not painful, negative LR 0.36 for RCD.

JAMA. Rational clinical exam: Does this patient have rotator cuff disease? Aug 2013.

Pain/strength test: Drop arm test

Positive LR 3.3 for rotator cuff disease.

JAMA. Rational clinical exam: Does this patient have rotator cuff disease? Aug 2013.
Pain & Strength test:
Supraspinatus = abduction

Empty can
(aka Jobe’s)

Photos from Dr. Christina Allen

Pain & Strength test
Infraspinatus and teres minor = resisted external rotation

Photos from Dr. Christina Allen
**Strength test:**
External rotation lag test

**Positive LR 7.2 for full thickness rotator cuff tear**

JAMA. Rational clinical exam: Does this patient have rotator cuff disease? Aug 2013.

---

**Pain & Strength test:**
Subscapularis = internal rotation lag test aka ‘lift off’

**Positive LR 5.6 for full thickness rotator cuff tear.**
Negative LR 0.04.

JAMA. Rational clinical exam: Does this patient have rotator cuff disease? Aug 2013.
Biceps Tests: Speeds

Tests for biceps pathology (tendinitis, tendinopathy, tear)

Palms up, patient pushes up against resistance (resisted elbow flexion)

+Test is pain at proximal biceps tendon

Sens = 54%, Spec = 81%

Biceps Tests: Yergasons

Tests for biceps pathology (tendinitis, tendinopathy, tear)

Patient supinates (twists out) against resistance

+Test is pain at proximal biceps tendon
Also tests for biceps strength

Sens = 41%, Spec = 79%
O'Brien's Test
To r/o Labral Tear

• Arm forward flexed to 90°
• Elbow fully extended
• Arm adducted 10° to 15° with thumb down
• Downward pressure
• Repeat with thumb up
• Suggestive of labral tear if more pain with thumb down
• Sens = 59-94%,
• Spec = 28-92%

Testing the AC Joint:
AC Crossover

• Tests for AC joint osteoarthritis or sprain
• Can be done passively by patient or physician
• +Test is pain at AC joint
Shoulder Exam Hands On

Key Components of the Shoulder Exam:
- Inspection
- Palpation
- Range of Motion:
  abduction, flexion, ER, IR
- Strength
- Neurovascular
- Special tests

Special Tests:
- Spurling’s (cervical spine radiculopathy)
- Hawkins impingement sign
- Neers impingement sign
- Painful arc
- Drop arm test
- Jobe’s, aka Empty-can (supraspinatus)
- Resisted external rotation (infraspinatus)
- External rotation lag test
- Internal rotation lag test aka Lift-off test (subscapularis)
- Speeds (biceps)
- Yergason’s (biceps)
- O’briens (SLAP tear)
- AC crossover (AC joint OA or sprain)

Knee
http://meded.ucsd.edu/clinicalmed/knee_exam.htm
Shoulder
http://meded.ucsd.edu/clinicalmed/shoulder_exam.htm

Case #1

50 y/o RHD woman with DM2 and hypothyroidism presenting with R shoulder pain. No injury. Waking up at night during sleep. Shoulder feels very stiff, having trouble reaching behind and raising above head. Has tried ice and ibuprofen without relief. Pain level ranges 5-9/10.
Case #1 exam

- Inspection: no muscle atrophy
- Palpation: nontender
- ROM testing: very limited on the right both actively and passively
- Strength: painful on R so mildly decreased d/t pain/guarding (5-/5)

Shoulder: diagnosis driven exam
Ddx 50 y/o woman with severe R shoulder pain and limited active + passive ROM

- Adhesive capsulitis

- Glenohumeral joint arthritis
  - Inflammatory
  - Osteoarthritis

*Need XR to differentiate*

The key exam maneuver...
Case #2

57 y/o RHD man presents with R shoulder pain that started after he fell 3 months ago. Pain at R “deltoid area” (points to lateral arm).

Waking at night from sleep due to pain. 3/10 pain at rest, 8/10 pain with any arm use. He tried physical therapy for 6 weeks without benefit. Also tried heating pad and advil w/o relief.

Case #2 Exam

• I: no atrophy
• P: mild +TTP subacromial space, nontender biceps, nontender AC joint
• ROM: Unable to actively abduct past 120 degrees 2/2 pain. Full PROM.
Shoulder: diagnosis driven exam

- Active ROM
  - Normal
  - Decreased

- Passive ROM
  - Normal
  - Decreased

- X-ray
  - Normal
  - Abnormal

- Rotator cuff dz
- Labral tear
- Biceps tendinitis
- AC joint OA

Case #2 exam, continued

- Other tests:
  - (+) Painful arc
  - (+) Neers and Hawkins
  - 4/5 strength on Empty can with (+)pain.
  - 5/5 resisted external rotation with (+)pain.
  - 5/5 strength on Lift-off with (+)pain
  - (-) External rotation lag test
  - (-) Speeds
  - (-) Yergasons
  - (-) AC crossover
Diagnosis

A. Adhesive capsulitis
B. Rotator cuff tear
C. Impingement syndrome
D. Glenohumeral joint osteoarthritis

Rotator cuff tear more likely if...

- Older patient, 50s+
- Traumatic mechanism
- Weak on rotator cuff strength testing
  - Lift off test (subscapularis)
  - External rotation lag test (infraspinatus)
  - Empty can test (supraspinatus)
Treatment

A. Order MRI, confirm tear, refer for arthroscopic RCT repair
B. Repeat trial of physical therapy, f/u 3 months.
C. NSAIDs and activity modification, f/u 3 months
D. Subacromial injection, f/u 3 months

Rotator cuff disease spectrum

• Stage I: < 25 y/o. Bursitis
• Stage II: 25-40 y/o. Tendinitis and fibrosis of rotator cuff
• Stage III: > 40 y/o. Partial to complete tearing of rotator cuff
Rotator cuff tear algorithm

• If weak on testing of rotator cuff → order x-rays and MRI → if (+) full thickness rotator cuff tear → refer to orthopedic surgeon
• Greater likelihood tear if >40 y/o
• Surgical outcomes better if cuff tears fixed earlier than later (months, not urgent)
  – Smaller tear
  – Less fatty infiltration
  – Less muscle atrophy
  – Less retraction

Case 3

42 year-old female tennis player complains of right shoulder pain for 4 months
  Superolateral shoulder region
  Intensity 4-7/10 with overhead activity and reaching behind her
  Hurts when she rolls onto her right side, or tries to put on her bra, or reach behind her in the car
  Better with rest
  No weakness but has been avoiding use
  Is right-handed
  Tylenol doesn’t help
Case 3 Exam

- Inspection: Symmetric, no gross abnormalities
- Palpation: +Tenderness over the subacromial space
- Range of Motion: full but painful
- Strength
  - 5/5 Supraspinatus (empty can)
  - 5/5 Subscapularis (liftoff)
  - 5/5 Infraspinatus (external rotation)
  - 5/5 Biceps (yergasons)
- Neurovascular status: Intact
- Provocative Shoulder Testing
  - (-) Drop Arm Test
  - (+) Neers, Hawkins, Empty Can, resisted ER, Lift-off
  - (-) Speed's, Yergason's, Obrien's, AC Crossover, lag tests
- The joint above and below: Neck and Elbow
  - Normal neck and elbow exam

Case 3

What's the Diagnosis?

- a. Osteoarthritis
- b. Labral Tear
- c. Rotator Cuff Tendinosis w/ Impingement
- d. Rotator Cuff Tear
- e. Biceps Tendinitis
- f. AC sprain
Case 4

- 42yo LHD midwife who presents with left shoulder pain for 3 weeks. She works 5 days a week, on 10hr shifts. She enjoys gardening on the weekends. One weekend she spent several hours digging out weeds, the next day she noticed significant anterior shoulder pain, pain has persisted.

- Shoulder really hurts with pulling, twisting, reaching, heavy lifting. Hurts to lift her baby nephew. Mildly improved w/ aleve and rest. Pain level ranges 3-6/10.

Case 4

- Inspection: Symmetric, no gross abnormalities
- Palpation: ++TTP biceps tendon, nontender AC joint, nontender subacromial space
- Range of Motion: full flexion, abduction, IR, ER
- Strength
  - 5/5 Supraspinatus (empty can)
  - 5/5 Subscapularis (liftoff)
  - 5/5 Infra spinatus (external rotation)
  - 5-5 Biceps (yergasons)
- Neurovascular status: Intact
- Provocative Shoulder Testing
  - (-) Drop Arm Test, Neers, Hawkins
  - (-) Empty Can, resisted ER, Lift-off
  - (-) AC crossover, Obriens
  - (+) Speed’s, Yergason’s
- The joint above and below: Normal neck and elbow exam
Case

What’s the Diagnosis?
1. a. Osteoarthritis
2. b. Labral Tear
3. c. Rotator Cuff Tendinosis w/ Impingement
4. d. Rotator Cuff Tear
5. e. Biceps Tendinitis
6. f. AC sprain

Case 4

• Most common finding in biceps tendinitis is +TTP over biceps tendon, along w/ hx of pain localizing to biceps tendon
• Speeds test (sens 54%) and Yergasons test (sens 41%) are not very sensitive tests (can’t rule it out if neg); but can have high specificity if + (81%, 79%)
Bonus case!

70 y/o RHD man presents complaining of posterior R shoulder pain and weakness. He has trouble raising his right hand above his head. This started 2 months ago after he was discharged from hospital where he was in the ICU for sepsis.

Ddx 70 y/o with posterior shoulder pain + stiffness or weakness

• Rotator cuff disease
  – Impingement
  – Full thickness tear
• Glenohumeral joint OA
• Nerve impingement
  – Cervical radiculopathy
  – Long thoracic nerve
  – Spinal accessory nerve
Bonus case! exam

- Inspection: thin, but no frank muscle atrophy. Medial R scapular border more prominent than L.
- Palpation: nontender AC joint, biceps tendon
- AROM: Lacks 20-30° flexion and abduction R side
- PROM: equal bilaterally (abd 90, ER 85, IR 45)
- Strength: 5/5 rotator cuff strength bilaterally, without pain

An exam maneuver was done...