Rotator Cuff or Rotator Cup: A rational approach to common shoulder problems

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ABC Primary Care Sports Medicine 2015

Anatomy of the Shoulder

Rotator Cuff (dynamic stabilizers)

- Supraspinatus
- Infraspinatus
- Teres Minor
- Subscapularis

- Motion and stability
- Originate scapula and terminate as short, flat tendons fusing with capsule
- Balance deltoid pull
- Active and passive restraint

Long Head Biceps

- Supraglenoid / superior labral origin
- Stabilizer when shoulder rotating AND elbow flexing
Long Head Biceps

- One-third of a sphere
- Head-shaft angle 130°
- Anatomic neck (capsule)
- Surgical neck (fractures)
- 3 Tuberosities
  - Greater
  - Lesser
  - Deltoid

Glenohumeral joint (static stabilizer)

- One-third of a sphere
- Head-shaft angle 130°
- Anatomic neck (capsule)
- Surgical neck (fractures)
- 3 Tuberosities
  - Greater
  - Lesser
  - Deltoid

Glenoid Fossa (static stabilizer)

- Small, pear-shaped, bony depression
- Surface area 33% humeral head
- Overall, bony contact minimal

Glenoid Labrum (static stabilizer)

- Triangular in cross-section
- Increases humeral contact area
- Increases glenoid depth 50%
- Anchors the capsule
- Added stability without compromising motion
- Biceps origin
**Approach to shoulder problems**

**Differential Diagnosis**
- Rotator Cuff Tears (45%)
- Shoulder arthritis (15%)
- Frozen shoulder (15%)
- Biceps problems (15%)
- Dislocations (5%)
- Fractures (5%)
- Bruise (5%)
- Cervical spine problems (25%)

**Approach to shoulder problems**

**Differential Diagnosis**
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- Fractures (5%)
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- Cervical spine problems (25%)
Good history + Complete physical exam = Correct diagnosis in 95% of cases

2 steps
• Patient history
• Physical examination
  • (Radiographs)
  • (Advanced imaging)

HISTORY
Key questions to ask
1. Was there an acute injury?
2. Are you losing strength?
3. Are you losing range of motion?

Physical Examination-3 minute office exam
• Visual inspection
• Palpation
• Motion
• Cuff-Specific testing
• Biceps Testing

Shoulder examination
• Inspection
  – Patient in gown
  – Biceps
  – IRM
  – Strength
    • Supraspinatus
    • Infraspinatus & Teres Minor
    • Subscapularis
  – Other tests

http://meded.ucsd.edu/clinicalmed/joints2.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


Visual Inspection

• Remove shirt
• Systematic
  – Deltoid
  – Supraspinatus
  – Infraspinatus
  – Biceps
  – AC joint
  – Skin changes
  – Scars

Shoulder examination

• Inspection
• Palpation
  – Weak
  – Strength
  – Supraspinatus
  – Subscapularis
  – Infraspinatus
  – Biceps
  – Other areas

Press where it hurts

<table>
<thead>
<tr>
<th>Location</th>
<th>Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clavicle</td>
<td>Clavicle fracture</td>
</tr>
<tr>
<td>AC joint</td>
<td>AC joint arthritis</td>
</tr>
<tr>
<td>Trapezius/Neck</td>
<td>Muscle strain</td>
</tr>
<tr>
<td>Front of shoulder</td>
<td>Biceps pathology</td>
</tr>
<tr>
<td>Back of shoulder</td>
<td>Arthritis</td>
</tr>
</tbody>
</table>

Palpation

What is he pressing on?
RANGE OF MOTION

No problem With AROM

No arthritis No cuff tear No frozen shoulder

Active Range of Motion “What can you do?”

No problem with passive
Think CUFF TEAR

Difficult with active -check passive

Problem with passive
Think Shoulder OA or Frozen Shoulder

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

Rotator Cuff Testing

Impingement
--Neer’s/Hawkins tests

Muscle Strength
--Teres Minor
--Infraspinatus
--Supraspinatus
--Subscapularis

Rotator cuff disease exam

• Pain provocation tests
• Pain and strength tests
• Often the pain radiates to lateral shoulder/proximal arm (“deltoid”)

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.
Pain test: Painful arc

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

Pain test: Impingement signs

Hawkin’s

Neer’s

Rotator Cuff Impingement

- **Hawkins’ Test**
  - 75% sensitive
  - 49% specific

- **Neer’s Test**
  - 85% sensitive
  - 44% specific

Supraspinatus

- **Jobe’s test**
  - 90° abduction
  - 30° anterior flexion
  - Internal rotation (palms down)
  - Pain/weakness
  - 53% sensitive/82% specific
  - (Park, et al. JBJS 12)
Infraspinatus

- External rotation strength
- 0° abduction & 45° ER

Pain/strength test: Drop arm test

Positive LR 3.3, negative LR 0.82 for rotator cuff disease.

My favorite test for rotator cuff, pre and post op

Subscapularis

Lift off test
About 70% reliable (JAMA 2013)

Bear Hug test
About 70% reliable (JAMA 2013)

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

Positive LR 5.6, negative LR 0.04 for full thickness rotator cuff tear.

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

- **Bicipital Tendonitis**
  - TTP at biceps groove
  - Compare to other side

**Case 1**

54 year old woman presents with 4 months of shoulder pain that occurred after taking her jacket off. She now has trouble getting things off high shelves and can’t put her belt on.

**Case 1—Key points in the history**

- Was there an acute injury?
  - Yes, but not really

- Are you losing strength?
  - No

- Are you losing range of motion?
  - YES, OH YES!

**Physical Examination**

- **Visual inspection**
- **Palpation**
- **Motion**
- **Specific testing**
Frozen Shoulder = Adhesive Capsulitis

- Key points in the history and physical
  - No ‘real’ trauma
  - Pain all the time
  - Limited ROM

Frozen Shoulder Mimics All Other Processes!

Causes

- 2nd most common cause of shoulder pain in US in patients 40-60
- Mostly unknown
  - Associated with Diabetes, Thyroid Problems

Natural History

Intensity

Frozen Shoulder Pathology

Thickening of capsule with Inflammatory cells and fibrosis
100 patients, 5 year follow up (no treatment)
- Average duration of symptoms: 1.6 years
- 91% return to full/near full function

**Treatment Options**

- Do Nothing
- Physical Therapy
- Injections
- Surgery

- Injections done blindly vs. injections done under ultrasound
  - Patients with less pain at the time of injection
  - More likely to get better after UTZ injection
**State of the Art: Frozen Shoulder**

- 1976: May be auto-immune
- 2010-2013:
  - Everyone will get better
  - Injections may quicken improvement
    - UTZ injections are more effective
    - Use a low dose steroid
  - Surgery only for those that fail all other treatment

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**Optimal Dose of Intra-articular Corticosteroids for Adhesive Capsulitis**

- 53 patients randomized to steroid (low or high dose) vs placebo
- Both steroid injection groups got better faster than placebo group
- No side effects

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**Surgery for Adhesive Capsulitis**

- Only for people who fail non-operative
  - 6 months PT, injections

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**Loss of motion**

- X-rays: OA
- X-rays: no OA = Frozen Shoulder
- Considerable pain, limited ADL
- Mild limitations in daily activities
- PT/Injection
  - Surgery only if fail non-op
- Less than 3 months: Injection
- Less than 3 months: PT for ROM
- More than 3 months: 6 months PT/ROM program
- More than 3 months: 6 months PT/ROM program
Case 2

- 43 year old male, 6 months of shoulder pain, hurts at night, pain with overhead activity, no weakness. He says that he can’t lift at the gym as well.

Case 2—Key points in the history

- Was there an acute injury? **Not really**
- Are you losing strength? **Not really**
- Are you losing range of motion? **No**

Impingement of the Shoulder

Very common in middle age people
- Insidious onset of pain
- Pain with overhead activities
- Pain at night (can’t sleep on that side)
- Difficulty doing some, but not all ADLs
- No weakness
- Positive impingement

Impingement Syndrome

**Mechanism**
- Impingement under acromion with flexion and internal rotation of the shoulder
- Rotator cuff, subacromial bursa and biceps tendon

Lateral view of shoulder
MRI

- MRI not needed for conservative treatment
- Use it to rule out significant pathology
  - Better for surgical planning, not for diagnosis

The New York Times

Sports Medicine Said to Overuse M.R.I.’s

By GINA KOLATA

Published: October 26, 2015

MRIs almost always will show something

Should be used to augment diagnosis, not make it

Patient history and physical exam are more important than MRI findings

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Modest osteophyte complex—is this cancer??!!

Small acromial spur—why is it small?

Why is the biceps groove shallow?? Can I Deepen it with exercises?

High signal intensity in the tendon with mild fraying—do I need surgery?

Minimal effusion—why is it minimal?

Treatment algorithm for impingement

Impingement

- Mild pain with activity
  - Physical Therapy
    - NSAIDS
  - Better
  - Home Exercise Program

- Moderate pain with activity
  - PT
  - NSAIDS
  - Consider injection
  - Not Better
  - MRI to evaluate for cuff tear
  - Consider injection
  - Surgery if not better
  - Home Exercise Program

-夜 pain
  - NSAIDS
  - Consider injection
  - Better
  - Home Exercise Program
Outcomes of Impingement

• Non-operative
  – Cummins, et al. JSES 2008
    • 100 consecutive patients
    • At 2 years, shoulder score 56–95
    • 80% did not require surgery, but 30% still had pain

• Operative
  – Henkus, et al. JBJS-Br 2009
    • 2.6 year follow-up
    • 93% good to excellent results

Case 3

• 56 year old male, 3 months of shoulder pain and weakness after an awkward fall while doing crossfit. Hasn’t been able to return to the gym. He has pain at night and lifting things is difficult.

Case 3—Key points in the history

– Was there an acute injury? Yes
– Are you losing strength? Yes
– Are you losing range of motion? No

Rotator Cuff Tears

Partial Cuff Tear

Full Thickness Tear

Impingement
What is a rotator cuff tear?

Common condition over age of 60
  – As high as 40% of patients over 60 will have a tear
    • Increasingly older population...who wants to stay active
Loss of attachment of the tendon to bone
  – Can be traumatic or without trauma
Usually (but not always) causes shoulder pain and weakness

Imaging of Rotator Cuff Tears

Waldt et al. Radiology 2008
95% accurate at SS tears

Natural history of Full thickness rotator cuff tears

Maman et al (JBJS 2009)

Tear Progression

- Risk factors for progression:
  - Age >60
  - Fatty infiltration on MRI
  - Larger tear

Natural History: Non Operative

- Rest, activity modification
- NSAIDS
- Physical therapy
- Injections
Non operative management

**Table VIII** Degree of rotator cuff retraction in coronal plane on MRI

<table>
<thead>
<tr>
<th>Degree of retraction</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimal</td>
<td>191 (48)</td>
</tr>
<tr>
<td>Mid humeral</td>
<td>134 (33.5)</td>
</tr>
<tr>
<td>Glenohumeral</td>
<td>52 (13)</td>
</tr>
<tr>
<td>Medial to glenoid</td>
<td>19 (5)</td>
</tr>
<tr>
<td>Unknown</td>
<td>6 (1)</td>
</tr>
</tbody>
</table>

**Summary:** OK to try non-operative management 85% success at 1 year. Early cross over if not happy.

**Outcomes of Rotator Cuff Repair**

- Rationale for early treatment of symptomatic rotator cuff tears:
  - Smaller tears do better
  - Better muscle quality
  - Lower rate of re-rupture
  - Easier rehab
  - Easier for me to do

**Algorithm for full thickness tears**

- **Suspect Cuff Tear**
  - **Acute**
    - MRI: tear
      - Weak on exam
      - Consider Surgery Eval
  - **Chronic**
    - MRI: tear
      - Weak on exam
      - PT/Injection, surgery if fails
    - MRI: tear
      - No weakness
      - PT/Injection, surgery if failed PT
      - PT/Injection, surgery only if adamant

**Case 4**

- 76 year old male with 4 years of worsening pain and weakness with golf. He has some pain at night and describes pain as a toothache in his shoulder. He notes he has lost some range of motion.
Case 4—Key points in the history

- Was there an acute injury?  
  - No

- Are you losing strength?  
  - No

- Are you losing range of motion?  
  - Yes

Shoulder OA Radiographs

Loss of motion

<table>
<thead>
<tr>
<th>Considerable pain, limited ADL</th>
<th>Surgery vs. PT/Injection</th>
</tr>
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<tbody>
<tr>
<td>Xrays: OA</td>
<td></td>
</tr>
<tr>
<td>Loss of passive range of motion</td>
<td></td>
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<tr>
<th>Mild limitations in daily activities</th>
<th>PT/Injection Surgery only if fail non-op</th>
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<td>Xrays: no OA</td>
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| Less than 3 months: PT for ROM 6 months PT/ROM program |  |
|---------------------------------------------------------|
| Xrays: no OA Frozen Shoulder                         |

| More than 3 months: Injection 6 months PT/ROM program |  |
|-------------------------------------------------------|

Non operative treatment for shoulder OA

- NSAIDS-No good data in last 8 years
- Physical Therapy-mild to moderate relief (Cochrane)
- Injections-Merolla et al 2011, steroid 1-2 month improvement, viscosuppl 6 month improvement
Surgical Treatment for OA

• Shoulder replacement
  – 2-3 night stay
  – Sling 6 weeks
  – 80-90% recovery
    • Excellent pain relief
    • Good motion
  – Complications
    • Infection, dislocation, loosening

Case 5

• 37 year old computer engineer has 4 months of anterior shoulder pain. He cannot complete his workouts. He is markedly tender along his anterior shoulder. He has an MRI that shows a superior labral tear.

Case 5—Key points in the history

– Was there an acute injury? No
– Are you losing strength? No
– Are you losing range of motion? No

The biceps shoulder complex

Differential for Anterior Shoulder Pain

- Biceps tendonitis
- Subscapularis Tear
- SLAP tear (usually posterior)
- AC joint arthritis
Biceps vs. SLAP tear?

**SLAP TEAR**
- Throwing/Acute injury
- Pain with O’Briens test
  - Pain is often deep and posterior
- No Pain in biceps groove
  - No improvement with injection

**BICEPS**
- Overuse/activity related (change in activity)
- Pain with O’Briens test
  - Pain is often anterior
- TTP in biceps groove
  - Improvement with injection

Treatment for SLAP tears

- If younger than 35, PT, then consider surgery for repair in non-operative management fails
- If OLDER than 35—OFTEN NORMAL FINDING ON MRI.
  - NON OP (PT/NSAIDS)
  - higher rate of failure with SLAP repair (3x higher failure rate). Biceps tenodesis

SLAP/BICEPS

- Less than 3 months: PT for ROM
- More than 3 months: PT vs Injection
- 90% improve and return to sports
- 70% improve and return to sports
- Biceps tenodesis

Rare (but not so rare) Shoulder Zebras

- Cervical Spine
- Parsonage Turner
- Flexor Wrist
- Rare tumors
Parsonage Turner Syndrome

- Seems like a severe cuff tear with no history of concordant injury
  - Pain and radicular symptoms 1st (1-2 weeks)
  - Significant weakness follows
- Axonal injury: Dx is with MRI (negative) and diagnostic EMG
- Treatment: NSAIDS, narcotics, PT, patience
- Prognosis-85% recovery (but at 3 years)

Feinberg, HSS J 2010

Summary

- Common shoulder problems:
  - Cuff, Frozen Shoulder, Biceps, OA
  - Use a rational guided approach to shoulder history and exam
  - Treatment based on patient goals and level of incapacity
    - (Nothing, NSAIDS, PT, INJECTIONS, SURGERY)
  - When all else fails, think Zebras

Thank you