**General Shoulder Evaluation**²³

- History
- Chief complaint
- Pain: aggravating factors
- Functional deficits
- Mechanism of injury (if applicable)
- Special tests

**The Simple Shoulder Test (SST)**

- High test-retest reliability
- Quick to complete
- Easy to score
- Sensitive to variety of disorders
- Sensitive to change in function

**Palpation of Bursa and Rotator Cuff**

*Be structure specific

**Source of Pain**

- Forward head/rounded shoulder posture
- Brings scapula into protraction and anterior tilt; humerus into IR
- Narrows subacromial space and can be a predisposing factor to impingement
- ANT Pelvic tilt
Typical Position of Poor Posture

Muscles generally weak
- Levator scapulae
- Rhomboids
- Lower trapezius
- Serratus anterior

Muscles often tight
- Deltoid minor
- Latissimus dorsi posterior major

Observation of Scapula Position

• Compare position bilaterally: superior-inferior, abduction-adduction, rotation

Observation of Scapula Position

• "Winging"
  - Vertebral border is pulled away from chest wall
  - Clinical pearl: Typically present with weak SA

Observation of Scapula Position

• Inferior angle is pulled away from chest wall: mistaken for winging
  - Clinical pearl: these presentations are typically present with tight pec minor and elongated MT and LT

Range of Motion

• AROM
  - Observe quality of movement
  - Scapulo-humeral rhythm
  - Note excessive movement at one joint if restriction at another — may give the appearance of "normal" motion
  - Note if painful arc of motion is present

Range of Motion

• PROM
  - Note irritability and end feel
  - Pay attention to substitution at surrounding joints
  - Specific patterns of restriction
    - Adhesive capsulitis: ER>ABD>IR
    - Tight posterior capsule: limited IR and CBA
    - Tight subscapularis: ER limited more at 0° vs. 45°-90°
    - Tight MGHL and IGHL: ER limited more at 45°-90° vs. 0°
    - Tight inferiorly: decreases elevation
MMT/Resisted Testing

- MMT positions are often painful or difficult for patient to achieve
- Assessment of pain and strength to detect lesion
- Isometric test at safe position
- Abduction, adduction, flexion, extension, ER, IR, elbow flexion and extension
- Test at 0°, 45°, 90° as able

Grading/Interpretation Of Resisted Tests

- Strong/painless:
  - normal
- Strong/painful:
  - Lesion within muscle or tendon
  - Can range from tendonitis to partial or small full thickness tear
- Weak/painful:
  - Significant injury to muscle or tendon
  - Large RTC tear would present with weak/painful shoulder abd and ER
- Weak/painless:
  - muscle or tendon rupture

Special Tests

- Hawkins-Kennedy Impingement Test
- Neer Impingement Test
- Yokum Test: impingement
- Patte Test: loss of Teres Minor
- Painful Arc Test: impingement
- Cross-Over Impingement Test
- Lock Test: Impingement Supraspinatus
- Drop Arm Test: Full thickness RC tear
- Clunk Test: Labral Tear

- Crank Test: Labral Tear
- Speeds Test: Labral Tear/Bicipital Tendonitis
- Yergason’s Test: Bicipital Tendon Disorders
- O’Brien’s Test: Labral Abnormality
- Anterior Slide Test: Superior Labral Tears
- Sulcus Sign: Inferior Instability
- Apprehension Test: Instability
- Rockwood Test: Ant Instability

Impingement

- Pressure of the supraspinatus and/or long head of the biceps tendon in the subacromial space with elevation of the arm
  - Subdeltoid bursa
  - Supraspinatus/Infraspinatus insertion
  - Head of biceps

Extrinsic Factors of Impingement

- Glenohumeral muscle imbalance
  - Weak, fatigued or injured rotator cuff muscles are unable to oppose deltoid (failure of glenohumeral force couple)
  - Causes superior migration of humeral head
- Periscapular muscle imbalance
  - Failure btw muscles that rotate and protract the scapula during elevation

Common Shoulder Pathology

- Pressure of the supraspinatus and/or long head of the biceps tendon in the subacromial space with elevation of the arm
**Intrinsic factors of Impingement**

- Anatomic variations of the acromion
  - Type I (flat), type II (curved), type III (hooked) acromion.
  - Many rotator cuff tears are associated with type II or III

**Stage 1**

- Clinical presentation
  - Pain at anterior lateral shoulder
  - Painful arc of motion (60-120) with elevation
  - Positive impingement sign: Neers, Hawkins-Kennedy
  - Strong but painful resisted testing of RTC
  - Tenderness with palpation of subacromial space
  - Muscle spasm of upper traps, levator scapulae and subscapularis

**Treatment**

- Reduce and eliminate inflammation: ice, modalities
- Patient education: rest, functional activity below shoulder level
  - Sleep and work positioning
  - Improve periscapular muscle control
  - Dynamic strengthening of force couples once painful arc is eliminated

**Stage II Impingement**

- Fibrosis of glenohumeral capsule and subacromial bursa and tendonitis
- Typically 20-40 years old
- Clinical presentation same as stage I but also with loss of ROM typically of capsular pattern:
  \[ \text{ER} > \text{abduction} > \text{IR} \]

**Treatment**

- Stage I treatment, plus
- Restore full A/PROM: stretching and manual techniques

**Stage 1 Impingement**

- Edema and inflammation of the rotator cuff and subacromial tissue
- Typically less than 25 years old

**Stage II Impingement**

- Fibrosis of glenohumeral capsule and subacromial bursa and tendonitis
- Typically 20-40 years old
- Clinical presentation same as stage I but also with loss of ROM typically of capsular pattern:
  \[ \text{ER} > \text{abduction} > \text{IR} \]

**Treatment**

- Stage I treatment, plus
- Restore full A/PROM: stretching and manual techniques
**Stage III Impingement**

- Disruption of rotator cuff tendons
- Bone spurs are typically present
- Clinical presentation as stage II plus weak/painful resisted tests
- Treat as stage II impingement
- If not responsive to conservative treatment, surgical consideration

**Surgical treatment of Impingement**

- Acromioplasty: decompression of anterior acromion to provide additional space
- Rotator cuff debridement or repair may also be done depending on the condition

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**Rotator Cuff Tear and Repair**

**Classification**

- **Thickness**
  - Full thickness—torn compromises the entire muscle from bursal to articular surface
  - Partial thickness—can occur on bursal or articular side

- **Size**
  - Small < 1 cm.
  - Medium = 1-3 cm.
  - Large = 3-5 cm.
  - Massive = > 5 cm.

**Mechanism of failure**

- **Chronic**—degenerative, occurs insidiously
  - See causes of impingement
- **Acute**—traumatic incident
  - Fall on an outstretched hand, traction injury, tensile overload or forceful overhead activity

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**Rotator Cuff Tear and Repair**

**Better outcomes**

- <55 y/o
- Sudden traumatic onset
- Smaller tears / repairs
- No history of injections
- Good overall health

**Poorer outcomes**

- >65 y/o
- Insidious atraumatic onset
- Pain / weakness > 6 months
- Multiple injections
- Large tears

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**Classification of RTC Tears**

**MRI – CUFF TEARS**
Clinical Presentation of RTC Tears

- Pain
- Abnormal posture and scapula position
- May have pain with palpation of subacromial space
- May have limited A/PROM
  - Full thickness tears will most likely have limited active with not as much pain
  - Partial thickness may present similar to impingement
  - Observe scapular motion with movement—usually irregular

Clinical Presentation of RTC Tears

- Manual Muscle Testing/Resisted testing
  - Full thickness may be weak and painless
  - Partial thickness may be weak and painful
- Special tests
  - Empty can—supraspinatus
  - Lift off—subscapularis
  - Drop Arm—supraspinatus
  - External Rotator Lag Test—infraspinatus/teres minor

Conservative Treatment of RTC Tears

- Reduction of pain and inflammation
- Restore full PROM
- Restore mm strength and balance
  - Pain will guide progression

Unrepaired RTC Tears

- Can progress and become irreparable
  - Tear grows larger
  - Tear tissue degenerates
  - Muscle belly of the tendon shortens and loses elasticity and eventually has atrophy and fatty infiltration of the muscle
  - The shortened tendon becomes scarred down in contracted position
  - Torn edges of tendon have collagen degradation and cannot hold suture to repair

Surgical Treatment of RTC Tear

- Open repair—indicated with muscle retraction, poor tissue quality and/or weak bones
  - 2 or 3 inch incision
  - Deltoid is reflected from acromion
  - RTC repaired
  - Acromioplasty is usually performed
  - Deltoid is re-attached
  - Therapy is usually slower and pain levels are usually higher
Surgical Treatment of RTC Tear

- Mini-open
  - Shoulder is assessed arthroscopically and acromioplasty is usually performed; edges of RTC are shaved
  - ¾ to 1 inch incision is made and deltoid is split longitudinally
  - RTC repaired
  - Tends to be more stiffness but less pain than open repair
  - Rehab progresses faster because deltoid is split rather than detached.

Surgical treatment of RTC Tear

- Arthroscopic
  - Acromioplasty and RTC repair done arthroscopically
  - Least painful
  - Requires highly skilled surgeon
  - Rate of re-tear with large to massive tears tend to be higher

ARTHROSCOPIC Repair

- Better visualization—other pathology seen
- Avoids deltoid injury
- Cosmesis better and less scar tenderness
- Improved pain control
- Improved rehab
- Principals Remain the SAME
- More Difficult

CUFF REPAIR

Cuff Repair
Rehabilitation after RTC Repair Protocols

• General principles
  • Shoulder is rested in sling or abduction pillow for 4 weeks to allow for tendon to heal
  • ROM
    • Minor tears (<3cm): PROM first 4 weeks p/o, AAROM 4-6 weeks p/o, AROM 8 weeks p/o
    • 3cm to <5cm: PROM first 8 weeks p/o, AAROM 8-10 weeks p/o, AROM 12 weeks p/o
    • Massive tears (>5cm): PROM first 12 weeks, AAROM 12-14 weeks p/o, AROM 14-16 weeks p/o.

Rehabilitation after RTC Repair

Phase I: 0-6(8) or 0-12 weeks
• Sling or abduction pillow
• Pendulum / Codman’s
• Scapular squeezes
• PROM ER limited to 30-45, full elevation
• Advance to gentle submax isometrics

Phase II: 6(8)-12(16) weeks
• AA/Active motion initiated – pain free
• Promote normal scapular motion
• Avoid improper movement patterns (shrugging)
• Advance to isotonic strengthening and PNF
Phase III: 12(16+)+ weeks
• Maximize strength including sports specific or work specific strengthening

Adhesive Capsulitis

• Definition: thickening and contracture of the glenohumeral joint capsule causing loss of the axillary fold of the capsule and adhesion of the associated ligaments
• Capsular pattern: PROM limited in ER>abds>IR

Loose Packed Position

• Minimal Joint Surface Congruity
• Minimal Joint Surface Contact
• Maximal Joint Volume
• Minimal Stability of the Joint
• Stiffening of the Major Ligaments of the Joint

Close-Packed Position

• Maximal Joint Congruity
• Maximal Tautness of Major Ligaments
• Minimal Joint Volume
• Minimal Stability of the Joint

Adhesive Capsulitis: 3 Stages

• Painful or freezing (10-36 weeks)
  • Spontaneous onset of severe pain
  • Disrupts sleep
  • Tendency is to rest arm which contributes to stiffness
• Stiffening or frozen (4-12 months): restricted ROM in capsular pattern
• Thawing (5-26 months)
  • Gradual recovery of ROM
  • Time in this phase is directly related to time in painful stage
  • May not achieve full ROM
Adhesive Capsulitis
Non-Operative Treatment

• Therapy
  • Modalities to decrease pain
  • A/AA/PROM exercise to include scapula/trunk
  • Low load, prolonged stretch yields the greatest results
  • Restoration of scapulo-humeral rhythm; strengthening of scapular stabilizers. Need significant neuro-re-education of scapular motion.
  • Joint mobilization
    • Grade 1-2 oscillation in early stages to decrease pain
    • Progress to grade 3-4 for capsular stretch, increase ROM
  • Soft tissue mobilization: Upper trap, levator scapulae, peri-scapular musculature
    • Progress to progressive resistive exercise once motion is restored

Adhesive Capsulitis
Operative Treatment

• Manipulation under anesthesia (MUA)
• Arthroscopic release
  • Removal of scar tissue from the anterior capsule
  • Often combined with gentle MUA

Shoulder Instability
Clinical Presentation

• Definition: Inability to maintain the humeral head centered in the glenoid cavity
• A component of the stabilizing matrix has become dysfunctional (usually labrum)
• Direction of Instability
  • Anterior
  • Posterior
  • Inferior
  • Multidirectional
  • Anterior-inferior is most common (Bankart)

Shoulder Instability
Clinical Presentation

History
• TUBS: traumatic, unilateral, bankart, surgery
  • Specific traumatic event causing dislocation
  • Usually labroligamentous complex lesion (Bankart)
  • Require surgery: only 14% rehab successfully
  • Bankart repair

History
• AMBRI: atraumatic, multidirectional, bilateral, rehabilitation, inferior shift
  • No clear cut history of dislocation
  • Multiple planes of instability in both shoulders
  • Rehab: 85% successful
  • If rehab is not successful require inferior capsular shift (tightening of the inferior capsule)
  • Can typically dislocate voluntarily

• Special tests
  • Apprehension test (AB with ER)—anterior instability
  • Jobe relocation test (posterior glide before pushing into ER — symptom relief)—anterior instability
  • Load and shift test (stabilize scap – push forward / pull back)—anterior and posterior instability
  • Sulcus test — (pull downward) — inferior instability
Shoulder Instability - Non-operative

- Decrease pain and inflammation
- Restore normal ROM while avoiding excessive ER/ABD
  - Pay special attention to the posterior capsule especially in the patient with a long-standing history of instability
- Establish normal scapulo-humeral rhythm by re-establishing scapular mm control
- Increase strength of RTC, deltoid and scapular mm
  - Start in non-provocative positions and slowly progress to overhead positions
  - Slowly progress to RTC and scapular mm control at ER/ABD

Shoulder Instability Operative Treatment

- Bankart
  - Bankart Lesion: Tear of the labrum and the capsule at the anterior, inferior glenohumeral joint
  - Surgery requires repair of the defect

Shoulder Instability: Bankart Repair

- May be open or arthroscopic
- Capsule is revealed through the Subscapularis
  - Split longitudinally (usually arthroscopic)
  - Tenotomy (open)
    - Capsule is split to expose labral lesion
    - Lesion is repairable with anchors
    - Capsule is repaired
Bony Bankart

- Bony Bankart = fracture of the anteroinferior glenoid
- If >25% of the glenoid is involved in a bony-Bankart lesion the joint will be unstable without ORIF of the bony lesion, or bone grafting the defect.

Bankart Rehabilitation

Multiple protocols exist—check with physician

- General guidelines
  - Immobilization in sling 3-4 weeks for open repairs and 1-2 weeks for arthroscopic repairs to allow for healing of repaired structures
  - ROM
    - Avoid abduction/extension at 90/90 for 4-6 weeks; do not want to overstress repaired structures
    - Respect anterior structures
    - Typically this is not the patient population that lacks motion
  - Strengthening: initiated at 6-8 weeks
  - Neuromuscular control of the scapular stabilizers is very important with this population

Hills Sachs

SLAP Lesions

Superior labrum anterior TO posterior

- Tear at the superior labrum
- Involves anchor of the biceps tendon to the labrum

SLAP Lesions

- 4 types
  - Type I: degenerative fraying of the superior labrum with the edge firmly attached to the glenoid rim
  - Type II: detachment of the superior labrum and biceps tendon from the glenoid with destabilization of the biceps anchor—most common: 55% of labral tears
  - Type III: bucket-handle tear of the superior labrum
  - Type IV: bucket-handle tear of the superior labrum with extension into the biceps tendon
SLAP Lesions

Clinical presentation

• **History**
  - Traumatic event
  - Compressive force applied to shoulder, e.g., fall on an outstretched arm that is abducted and slightly flexed (most common)
  - Traction injuries
  - May also occur in the presence of shoulder instability; very common with overhead athletes especially throwing athletes
  - Subjectively c/o deep pain, popping, and clicking

• **Special tests**
  - O'Brien's test
  - Load and Shift test
  - Kibbler test
  - Pain at biceps groove

• **Treatment**
  - Conservative
    - Rest, physical therapy, NSAIDs
  - No data is available regarding efficacy of conservative management
  - Most are treated surgically

SLAP Lesions

Surgical Treatment

• **Type I and III:** arthroscopic debridement of the frayed portion
• **Type II:** frayed tissue is debrided and detached biceps-labral complex is reattached to the superior glenoid with suture anchors or biodegradable tacks
• **Type IV:** depends on the extent of biceps involvement whether the frayed portion is debrided or repaired. Detached portion is reattached with suture anchors or biodegradable tacks.

SLAP Rehabilitation

Type II- most common

• Usually immobilized for 3-4 weeks to allow healing of repaired structures
• Initiate A/AA/PROM; 90/90 position is contraindicated for 8 weeks
• Strengthening initiated at 6-8 weeks; respect the biceps tendon

Fractures of the Humerus

• **Lesser tuberosity**
  - Rare; often seen with posterior dislocation
  - Closed reduction

• **Greater tuberosity**
  - Usually the result of a fall on the shoulder
  - Common in elderly individuals
  - Non-displaced: begin active exercise ASAP to avoid stiffness
  - Displaced and/or avulsed: usually requires surgical fixation with post-op immobilization 2-3 weeks
Fractures of the Humerus

- **Neck of the humerus**
  - Fall on outstretched arm or elbow (elderly, osteoporotic women)
  - 3 categories: unimpacted, angulated impacted and comminuted
  - Hemiarthroplasty often need for older individuals with angulation greater than 45
  - May require ORIF

- **Shaft of the humerus**
  - Direct blow or twisting force causing spiral fracture in the middle one-third
  - Early motion is desirable
  - Again, immobilization varies depending on stability
  - May require surgical fixation; watch for radial nerve palsies

Fractures of the Humerus Rehabilitation

- Early mobilization is essential once safe to avoid stiffness:
  - A/AAROM
  - PROM if fracture is stable (pain dictates)
  - Immobilization in a sling lends itself to capsular pattern
  - Grade I and II oscillatory mobilizations for pain and relaxation
  - Grade III and IV for ROM once pain levels are low
  - Initiate strengthening once fracture is stable, pain is low and patient has 50% of ROM

Glenohumeral Arthritis

- **Causes**
  - OA
  - Avascular necrosis
  - Dislocation arthropathy
  - RA
  - Post-traumatic arthritis
  - Septic arthritis
  - Cuff tear arthropathy
  - Malunion or nonunion of proximal humerus fracture

- **Symptoms**
  - Progressive stiffness and loss of motion
  - Complain more of limited function and difficulties with ADL’s
  - Generally have restricted PROM with normal strength
  - May have night pain generally positional
Glenohumeral Arthritis

- Operative Management
- Debridement
- Capsular Release
- Resurfacing
- Hemiarthroplasty w/wo interpositional arthroplasty or stemmed hemiarthroplasty
- Total Shoulder Arthroplasty
- Reverse Total Shoulder Arthroplasty

Hemi- Arthroplasty

- Resurfacing hemiarthroplasty may be an option for you if:
  - The glenoid still has an intact cartilage surface
  - There has been no fresh fracture of the humeral neck or head
  - There is a desire to preserve humeral bone

Hemi-arthroplasty: Preparation of Head

Surface Reamer

Impact Prosthetic Head

Advantages of Surface Replacement

- Relatively simple technique
- Maintain normal anatomy
- No changes in:
  - Inclination
  - Version
  - Offset
- Avoid humeral osteotomy with potential errors in head height, version, inclination
- Post-op treatment similar to TSA
44 yo with AVN, inflam. bowel disease

Total Shoulder Arthroplasty

- Indications: osteoarthritis, rheumatoid arthritis, avascular necrosis, cuff tear arthropathy, acute fractures, posttraumatic arthritis
- May be done with a rotator cuff repair depending on soft tissue quality

Total Shoulder Arthroplasty Rehabilitation

- Normal goals
  - Good pre-op PROM
  - Good rotator cuff tissue
- Limited goals (physician will assign this category)
  - Poor cuff tissue
  - Poor pre-op PROM
  - Check with referring physician per protocol

Total Shoulder Arthroplasty Rehabilitation

- ROM
  - AA/PROM initiated post-op day 1
  - Do not exceed ER achieved in OR for first 6 weeks
  - If don’t know, do not exceed 30°

- Strengthening
  - Scapula exercise at 2-3 weeks
  - Progressive RTC strengthening at 6-8 weeks
  - Time guidelines delayed if RTC repair or limited goals

- Time guidelines will be delayed if RTC repair was performed and for the patient with limited goals
- Outcomes regarding pain relief are good
- Outcomes regarding function are based on quality of soft tissues as determined by physician
- Poor soft tissue quality: “eyes to thighs” function
Humeral Arthritis with Rotator Cuff Arthropathy

- Rotator cuff insufficiency
- Joint space narrowing
- Osteophytes
- Proximal Migration Humeral Head
- Acetabularization of Acromion
- Superior Glenoid Wear

Significant finding is lack of or limited elevation of shoulder.

Reverse Total Shoulder Arthroplasty

- Socket and metal ball are switched
- Ideal for patients with RC arthropathy because it relies on deltoid to position arm

### TABLE 16-17

<table>
<thead>
<tr>
<th>Activity</th>
<th>Starting Range of Motion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eating</td>
<td>70°–100° horizontal abduction, 45°–60° abduction</td>
</tr>
<tr>
<td>Comb your hair</td>
<td>30°–70° horizontal abduction, 110°–130° abduction, 90° axial rotation</td>
</tr>
<tr>
<td>Reach between</td>
<td>75°–90° horizontal abduction, 90° or greater internal rotation</td>
</tr>
<tr>
<td>Tuck in shirt</td>
<td>30°–60° horizontal abduction, 55°–65° abduction, 90° internal rotation</td>
</tr>
<tr>
<td>Position hand behind head</td>
<td>10°–15° horizontal abduction, 110°–125° forward flexion, 90° axial rotation</td>
</tr>
<tr>
<td>Put an item on a shelf</td>
<td>70°–90° horizontal abduction, 90°–95° forward flexion, 45° external rotation</td>
</tr>
<tr>
<td>Wash opposite shoulder</td>
<td>60°–80° forward flexion, 60°–120° horizontal abduction</td>
</tr>
</tbody>
</table>

References and Suggested Readings


