Rotator Cuff Tear
See also Rotator Cuff Injuries
See also Shoulder Physical Exam
See also Shoulder Rehabilitation

Background
1. Impingement: shoulder pain caused by:
   o Inflammation of acromion
   o Coracoacromial ligament
   o Acromioclavicular joint
   o Coracoid process
     • May lead to rotator cuff tear
2. Rotator cuff tear
   o Injury to:
     • Supraspinatus
     • Infraspinatus
     • Subscapularis
     • And/or teres minor muscles
       • Supraspinatus tendon most commonly affected

Pathophysiology
1. Gross anatomy/ function:
   o Glenohumeral joint
     • Diarthrodial, ball-socket joint
     • Allows motion in multiple planes
   o Rotator cuff
     • Subscapularis:
       • Internal rotation
     • Supraspinatus
       • Abduction
     • Infraspinatus
       • External rotation
     • Teres minor
       • External rotation
     • Rotator cuff stabilizes humeral head in glenoid during ROM
2. Micro-anatomy
   o Connective tissues are composed of collagen
   o Collagen is thinner, less uniform, decr vascularity near articular surfaces
3. Impingement
   o Compression of rotator cuff between humerus and coracoacromial arch/glenoid rim from throwing motion
   o Causes micro-trauma, tendon tissue degeneration, tear
4. Mechanics
   o Muscle imbalance causes micro-trauma
   o Repeated/ freq throwing activity may not allow proper tissue repair
5. Incidence
   o Shoulder injury accounts for 4-8% of injuries in physically active population
6. Risk factors
   o Sports w/ overhead activity:
     - Baseball
     - Softball
     - Volleyball
     - Tennis
     - Swimming
   o Age > 40 yrs
   o Poor posture (slouching)
   o Falls/ accidents
   o Lifting overhead
   o Improper rehabilitation from previous injury

7. Morbidity
   o 4% of full rotator cuff tears develop cuff arthropathy

Diagnostics
1. History
   o Age
   o Sport
   o Activity
   o Pain- acute/ chronic
   o Location/ radiation
     - Pain: anterior-lateral, superior
     - Radiation to elbow
     - Full-thickness tears: pain referred to deltoid insertion
   o Duration of symptoms
   o Limitations
     - Overhead activities (60-120°)
     - Pain at rest

2. Symptoms
   o Onset- may be acute, following trauma, or insidious
   o Incr pain w/ overhead activity
   o Night pain: difficulty sleeping on affected side
   o Weakness, catching, stiffness, crepitus/ clicking are common

3. Physical examination
   o Atrophy: top/ back of shoulder
   o Palpation: bone, muscle, bursae for tenderness
   o ROM: passive ROM normal, active ROM limited
   o Strength: assess external rotation, internal rotation, abduction
     - Supraspinatus ("empty can" test)
       - Elbow extended, arms abducted, thumbs pointing down
       - Apply downward force against arms
       - Positive if pt cannot keep arms abducted
     - Infraspinatus/ teres minor
       - Arms at sides, elbow flexed at 90°
       - Apply force w/ internal rotation
       - Pt attempts to externally rotate against resistance
       - Positive if external rotation is unsuccessful
     - Subscapularis (lift-off test)
- Place dorsum of hand behind back in lumbar area
- Positive if unable to lift hand off back
- If pt cannot complete behind back motion, place palm of hand on umbilicus
- Apply external rotation to arm
- Positive if pt cannot resist external rotation

- AFP The Painful Shoulder
  - [http://www.aafp.org/afp/20000515/3079.html](http://www.aafp.org/afp/20000515/3079.html)

  o Provocative testing: proceed if any of strength tests are positive
    - Neer's test: shoulder impingement
    - Hawkins: shoulder impingement
      - Elevate arm forward to 90°, internally rotate shoulder
      - Pain indicates positive test
    - Hornblower: tests external rotation (teres minor)
      - Examiner places both forearms in 90° flexion w/max external rotation
      - Release both forearms
      - Positive if pt cannot remain in external rotation
    - Apley scratch test: positive if decr ROM
      - Abduction and external rotation
        - Reach behind head, over shoulder and touch opposite superior scapula
      - Adduction and internal rotation
        - Reach behind back, under shoulder and touch opposite inferior scapula
    - Drop arm test
      - Abduct pts shoulder
      - Observe as pt slowly lowers arm to waist
      - Positive if arm suddenly drops to side

  o Combination of supraspinatus weakness, external rotation weakness, impingement in internal/external rotation
    - 98% have rotator cuff tear

4. Diagnostic imaging
  - X-ray: 1st imaging study
    - AP: internal, external humeral rotation; axillary lateral and/or scapular
      - Cystic and sclerosing changes in greater tuberosity
      - Reduction of acromiohumeral distance (<7mm)
      - If present: 78% sensitive/ 98% specific for rotator cuff tear
      - Must rule out fractures and dislocations
      - AP view only recommended for sub-acute shoulder pain (3 months)

  o Reserve advanced imaging for suspected rotator cuff tear w/2 or more of following
    - >50% loss of mid-arc abduction/ external rotation
    - Age >62
    - Fall onto an outstretched arm/ direct blow to shoulder
    - Hx of recurrent shoulder tendonitis
    - Narrowed subacromial space on x-ray
Ultrasound (U/S): 4 criteria for rotator cuff pathology
- Non-visualization of cuff
- Localized absence or focal non-visualization
- Discontinuity
- Focal abnormal echogenicity
  - Sensitivity/ specificity operator dependent, can be >90% for full cuff tears
  - Not recommended for low likelihood of cuff dz

MRI/ MRA: recommended if full rotator cuff tear is suspected; study of choice for shoulder fx and soft tissue injuries
- MRA recommended to distinguish full vs. partial tears
- Considered more accurate than U/S
- American College of Radiology Guidelines

Arthrogram: use if MRI/ MRA or U/S unavailable/ contraindicated
- More specific than MRI
- Cannot detect partial cuff tears or associated soft tissue injury
- Invasive procedure
- Contraindicated in pts w/dye allergy

CT: procedure of choice if MRI is contraindicated or not available
- May change in future w/evolving CT technology

Differential Diagnosis
1. Key DDx
   - Shoulder impingement
   - Biceps tendon rupture
   - Acute calcific tendinitis
   - Adhesive capsulitis
   - Acromioclavicular arthritis
   - Glenohumeral arthritis
   - Suprascapular neuropathy
   - Shoulder instability

2. Extensive DDx
   - Septic arthritis
   - Rheumatoid arthritis
   - Gout
   - Lyme disease
   - Lupus
   - Spondyloarthopathy
   - Avascular necrosis
   - Cervical radiculopathy
   - Pancoast's tumor
   - Thoracic outlet syndrome

Therapeutics
1. Acute Tx
   - Rest: limit painful/ overhead activities for 2 days
     - Shoulder sling discouraged (frozen shoulder)
Ice:
- 5-20 mins, up to q2h, for 2 days

Heat:
- After 2 days if symptoms improve, limit to 20 mins

NSAIDs:
- All equally effective

Rehabilitation-Link:
- Rotator cuff exercises
- Office handout
- Physical therapy/ athletic trainer

2. Further management
- Corticosteroid inj
  - Pain relief only
  - Limit to 3 inj w/6 wk intervals
- Physical therapy referral: shoulder rehabilitation

Follow-Up
1. Return to office
- Re-eval in 2-4 wks
- Recommendations for earlier follow-up
  - Worsening pain
  - Decr ROM
  - Sensory/ motor abnormalities

2. Refer to specialist
- Orthopedic consult
  - Conservative Tx for small to medium tears shows no improvement in 3-6 wks
- Immediate referral for
  - Medium to large tears in pts <25 yrs

Prognosis
1. Conservative tx: 33-90% successful
2. Surgery improves fxn in all ages: 77-86%
3. Return to play
   - Must have full ROM
   - Greater or equal: 90% strength compared to uninjured shoulder
   - Able to do sport specific exercises

Prevention
1. Rotator cuff specific exercises
2. Biomechanics: proper technique & coaching

References

Evidence-Based Inquiry
1. What is the initial approach to the treatment of shoulder pain?
2. What is the best way to diagnose a suspected rotator cuff tear?
3. Which history and physical findings are most useful in identifying rotator cuff tears?

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