# Rotator Cuff Tear

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

**Background**

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

**Pathophysiology**

1. Gross anatomy/ function:
    - Glenohumeral joint
        - Diarthrodial, ball-socket joint
        - Allows motion in multiple planes
    - 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
    - Connective tissues are composed of collagen
    - Collagen is thinner, less uniform, decr vascularity near articular surfaces
3. Impingement
    - Compression of rotator cuff between humerus and coracoacromial arch/glenoid rim from throwing motion
    - Causes micro-trauma, tendon tissue degeneration, tear
4. Mechanics
    - Muscle imbalance causes micro-trauma
    - Repeated/ freq throwing activity may not allow proper tissue repair
5. Incidence
    - Shoulder injury accounts for 4-8% of injuries in physically active population

6. Risk factors
    - Sports w/overhead activity:
        - Baseball
        - Softball
        - Volleyball
        - Tennis
        - Swimming
    - Age >40 yrs
    - Poor posture (slouching)
    - Falls/ accidents
    - Lifting overhead
    - Improper rehabilitation from previous injury
7. Morbidity
    - 4% of full rotator cuff tears develop cuff arthropathy

**Diagnostics**

1. History
    - Age
    - Sport
    - Activity
    - Pain-acute/ chronic
    - Location/ radiation
        - Pain: anterior-lateral, superior
        - Radiation to elbow
        - Full-thickness tears: pain referred to deltoid insertion
    - Duration of symptoms
    - Limitations
        - Overhead activities (60-120°)
        - Pain at rest
2. Symptoms
    - Onset-may be acute, following trauma, or insidious
    - Incr pain w/overhead activity
    - Night pain: difficulty sleeping on affected side
    - Weakness, catching, stiffness, crepitus/clicking are common
3. Physical examination
    - Atrophy: top/ back of shoulder
    - Palpation: bone, muscle, bursae for tenderness
    - ROM: passive ROM normal, active ROM limited
    - 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

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
o X-ray: 1st imaging study
▪ AP: internal, external humeral rotation; axillary lateral and/or scapular Y
- 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
    - http://www.guideline.gov/summary/summary.aspx?ss=15&;doc_id=8300&string
- 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
   - Spondyloarthropathy
   - 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**


1. Rotator Cuff Injury. http://www.mayoclinic.com/health/rotator-cuff-injury/DS00192/DSECTION=7
2. Quintana, EC, Sinert, R. Rotator Cuff Injuries. http://www.emedicine.com/emerg/topic512.htm.
3. Mahaffey, BL, Smith, PA. Shoulder Instability in Young Athletes. American Family Physicians. 1999 May 15;59(10):2773-82, 2787

4. Fongemie AE, Buss DD, Rolnick SJ. Management of shoulder impingement syndrome and rotator cuff tears. American Family Physicians. 1998 Feb 15; 57(4):667-74, 680-2.
5. Weinstein, SL, Buckwalter, JA. Turek's Orthopaedics- Principles and Their Application, 6th Ed. Lippincott Williams & Wilkins. 2005; 368-79.
6. Rotator Cuff Exercises. http://familydoctor.org/online/famdocen/home/healthy/physical/injuries/265.html.
7. Snider, RK. Essentials of Musculoskeletal Care. American Academy of Orthopaedic Surgeons. 1997; 108-16.
8. Rotator Cuff Strain Rehabilitation Exercises. http://www.med.umich.edu/1libr/sma/sma_rotcuff_rex.htm
9. Anderson, BC, Martin T, Martin S. Rotator Cuff Tear. UpToDate® http://www.utdol.com/utd/store/index.do
10. Woodward TW, Best TM. The painful shoulder: part I. Clinical evaluation. American Family Physicians. 2000 May 15;61(10):3079-88.
11. National Guideline Clearinghouse- Shoulder Trauma http://www.guideline.gov/summary/summary.aspx?ss=15&;doc_id=8300&string

**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?

**Authors: Tom Lin, MD, & Benjamin Fredrick, MD,** *Penn State Hershey Medical Center, PA*

**Editor: Carol Scott, MD,** *University of Nevada Reno FPRP*