

Rotator Cuff Repair and Rehabilitation

Surgical Indications and Considerations

Anatomical Considerations: The rotator cuff “complex” is comprised of four tendons from four muscles: supraspinatus, infraspinatus, teres minor, and subscapularis, all originating from the scapula and attaching to the tuberosities of the humerus. The supraspinatus tendon lies superiorly along the scapula and under the coracoacromial arch of the scapula and has a hypovascular zone near its insertion. The primary function of the rotator cuff is to rotate and stabilize the humeral head in the glenoid socket against the upward pull of the deltoid with overhead activities.

Pathogenesis: The supraspinatus tendon is the most commonly affected tendon in rotator cuff tears. An acute tear may occur in the case of a traumatic event to the shoulder, but more typically the tear occurs in progressive stages arising from glenohumeral instability and scapulothoracic dysfunction. Also playing a role is the natural aging process of gradual deterioration of tendon strength and flexibility, decreased use and vascularization, along with postural changes. A combination of any of these factors leads to an impingement problem in which the tendon is compressed between the acromion and the humeral head. These are generally classified as chronic tears, referring to repetitive microtrauma to the tendon which leads to inflammation, tendonitis, fibrosis, bone spurs, and eventually a partial thickness to complete tear. Complete tears are classified based on their size in square centimeters: small (0 - 1 cm²), medium (1 – 3 cm²), large (3 – 5 cm²), or massive (>5 cm²).

Congenital bony abnormalities in which the acromion, coracoid, or greater tuberosity is thicker or protrudes into the subacromial space will also predispose a person to an impingement problem that eventually follows the same progressive course to a tear.

Epidemiology: Rotator cuff tears are more often seen in individuals who perform frequent overhead lifting or reaching activities as well as athletes such as pitchers, swimmers, and tennis players who perform repetitive overhead activities. These activities cause fatigue and subsequent weakness in the rotator cuff muscles allowing superior and anterior migration of the humeral head, and also weakness of the scapular stabilizers creating a secondary cause of an impingement.

A spontaneous tear may occur after a sudden movement or impact, and is seen in 80% of patients older than 60 years when a humeral head dislocation is involved.

Diagnosis:

- Some evidence of atrophy may be seen in the supraspinatus fossa.
- Possible atrophy in the infraspinatus fossa also, depending on size of tear
- Passive motion usually maintained, but may be associated with subacromial crepitus. However, if the injury is chronic, and the patient has been avoiding using the shoulder, adhesive capsulitis may be present
- Active motion is diminished, particularly abduction, and symptoms are reproduced when the arm is lowered from an overhead position. Loss of active external rotation present in

massive tears

- Muscle weakness is related to the size of the tear and muscles involved
- Neer and Hawkins Impingement Signs may be positive, but are nonspecific because they may be positive with other conditions as well (such as rotator cuff tendonitis or bursitis)
- A subacromial injection of lidocaine would improve pain, but weakness would still be present
- It is important to rule out other potential etiologies such as patients with C5-6 radiculopathy as these patients may also have an insidious onset of shoulder pain, rotator cuff weakness, and similar muscular atrophy
- A “trauma shoulder series” of plain radiographs may show superior humeral migration and degenerative conditions or bone collapse.
- An MRI may help demonstrate the size and degree of retraction of a tear.

Non-operative versus Operative Management: Surgical repair is indicated for patients who do not respond well to conservative treatment, active patients younger than 50 years with a full-thickness tear, or who have an acute tearing of a chronic injury. Conservative management will include nonsteroidal anti-inflammatory drugs (NSAIDs), cortisone injections, heat, ice, rest, and rehabilitation programs. The goals are to first restore normal range of motion, then strengthen the rotator cuff initially below shoulder level and gradually increase resistance to all functional planes and range of motion without aggravating symptoms. Normalizing scapulothoracic and glenohumeral rhythm may also be included. Approximately 50% of patients with rotator cuff tears improve to their satisfaction within 4 to 6 months of this treatment, but these results can deteriorate with time. Patients who do not progress, have pain even after regaining strength, or have significant weakness or posterior cuff involvement may also benefit from earlier surgery rather than waiting through the 4 to 6 month period of conservative treatment. This is particularly the case with younger patients with higher functional demands.

Surgical Procedure: The primary goal of surgery is elimination or significant reduction of pain. Other goals are to improve shoulder range of motion, strength, and function. Surgical repair can be performed arthroscopically, partially open, or completely open. The type of procedure will depend on the size, type, and pattern of the tear as well as the surgeon’s preference. Generally the larger tears (3 to 5 cm) require more open techniques than the smaller tears (3 cm or less). Along with repair of the rotator cuff operative procedures also typically include an anteroinferior acromioplasty to decompress the subacromial space. The cuff tear is repaired using permanent sutures to the greater tuberosity with the goal of having minimal tension with the arm positioned at the side. A double layer fixation technique has been shown to provide greater initial fixation strength than single layer fixation. This is critical as the occurrence of rotator cuff repair failure is highest in the early postoperative phase before there has been time for sufficient tendon-to-bone healing.

Clinical results for pain relief are satisfactory 85% to 95% of the time. This appears to correlate with the sufficiency of the acromioplasty and subacromial decompression. The integrity of the cuff repair, preoperative size of the tear, and quality of the tendon tissue influence the functional outcome. Acute tears with early repair may have a slightly greater susceptibility to develop stiffness, but it has also been noted that these patients progress with rehabilitation more rapidly than those with late repair.

Preoperative Rehabilitation: The primary concerns preoperatively are to prevent loss of range of motion and further damage to the glenohumeral joint and rotator cuff tendons. This can be accomplished with passive range of motion and avoiding aggravating activities and positions. A sling may be provided briefly for pain management if needed, but caution must be taken to avoid adhesive capsulitis.

POSTOPERATIVE REHABILITATION

Please note: Exercise progression is dependent upon the size of the tear and achievement of goals in previous phases of the rehabilitation protocol. Post-operative weeks indicated for each phase are guidelines. Larger tears will require longer healing and protection time, and therefore, delayed AROM and resistance exercises generally by 2 to 4 weeks. Small tears may be able to progress more rapidly and follow an accelerated protocol if the surgeon agrees.

Precautions:

- Keep incision clean and dry
- For at least the first 6 to 8 weeks:
 - Avoid shoulder adduction behind the back, extension, and horizontal adduction
 - No lifting objects
 - No excessive stretching or sudden jerking movements
 - No supporting body weight by hands and arms

Phase I: Post-operative weeks 0 – 4

Goals: Decrease pain, including improved sleep patterns

Manage edema

Well-healed incision

Improve passive ROM and tolerance to movement

Maintain ROM of cervical spine, elbow, wrist and hand

Increase quality of muscle recruitment

Intervention:

- Immobilization of shoulder in sling or airplane splint except during exercise
- Cryotherapy - 4 to 8 times/day during the first 1 to 2 weeks as needed for pain control
- Pendulum exercises
- Passive range of motion (PROM)
- Elbow, wrist, and cervical spine active range of motion (AROM)
- Submaximal isometrics (pain free) at 1 to 3 weeks
- Rhythmic stabilization drills in balanced position (100° to 110° of elevation and 10° of horizontal abduction) at 10 days to 3 weeks
- Hand gripping with putty
- Joint mobilizations – grades I and II to glenohumeral (GH) joint

Phase II: Post-operative weeks 5 – 8

Goals: Passive ROM shoulder flexion/abduction = 140° – 165° , ext rot = 70° , int rot = 55°
 Active-Assisted ROM (A/AROM) to reach above head height
 Pain management
 Re-establish dynamic shoulder stability (humeral head control)
 Improve scar mobility
 Improve fitness level

Intervention:

- Continue phase 1 exercises and progress as indicated
- May use heat prior to exercises
- May use pool for light AROM exercises
- Shoulder proprioceptive neuromuscular facilitation (PNF) D1 and D2 patterns
- Initiate AROM shoulder flexion in scapular plane and shoulder abduction up to 90° as able without scapular hiking
- Pulleys and wand exercises
- AROM external and internal rotation at 0° abduction progressing from gravity-eliminated to gravity-resisted positions to resistance tubing
- Prone rowing and horizontal abduction
- Bicep curls
- Soft tissue mobilization
- GH joint mobilizations as needed – Grades III- to III and IV
- Cardiovascular conditioning (walking or stationary bicycle program)

Phase III: Post-operative weeks 8 – 12

Goals: Full AROM and PROM
 Dynamic shoulder stability
 Gradual return to shoulder strength and power
 Gradual return to functional activities
 Minimal pain associated with overhead activities
 Increase exercises for performance at home (HEP)

Intervention:

- Continue exercises and mobilizations from phases 1 and 2 as indicated
- Progress AROM to full range, still avoiding scapular hiking with elevation movements
- Progressive shoulder and elbow resistance exercises with tubing and light dumbbells
- Manual resistance added to PNF patterns
- Prone external rotation at 90° abduction
- Modified military press
- Body Blade exercises
- Lower extremity and trunk strengthening if needed for preparation to return to strenuous work or sport activities

Phase IV: Post-operative weeks 13 – 16

Goals: Independent/self-management of HEP

Self-management of pain associated with overhead activities

Able to reach in front and to the side with elbow extension for light-weight objects

Carry light weight objects for short periods (e.g., groceries)

Improve muscular strength and power

Maintain full AROM

Intervention:

- Continue mobilizations and progress exercises from previous stages as indicated
- Corner (anterior chest) and hand behind back stretches
- Plyometrics if appropriate
- Shoulder girdle depressions
- Closed chain exercises
- Self-capsular stretches
- Joint mobilization to cervical and thoracic spine as appropriate

Phase V: Post-operative weeks 17 – 26

Goals: Pain-free with overhead activity

Gradual return to strenuous work activity or previous level of functioning

Gradual return to recreational sport activity

Intervention:

- Continue mobilizations and progress Phase IV exercises as appropriate
- Fundamental shoulder exercise program at least 4 times per week to include rotator cuff and scapular stabilization exercises, bicep strengthening, and shoulder and chest stretches
- Strengthen for sport-specific activities as appropriate

- Initiate sport activity when appropriate

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