# Rotator Cuff Injuries

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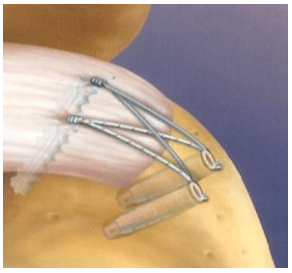
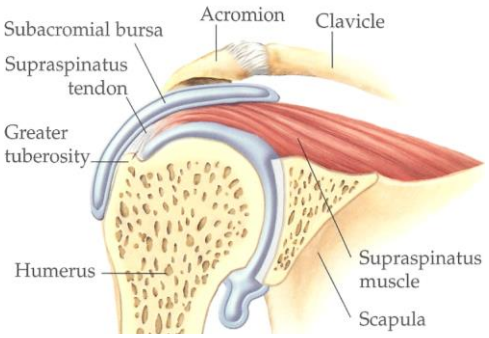


The rotator cuff is a sling of four shoulder muscles that act as a functional unit to move the arm and maintain the ball of the shoulder (humeral head) centered within the socket (glenoid). The rotator cuff muscles merge into a fibrous cord or tendon which then inserts into bone. Contracting the various muscles of the rotator cuff activates and assists in the large degree of shoulder rotation and elevation.

The supraspinatus muscle and tendon have the most difficult task of elevating the arm overhead. To complicate its duties, the supraspinatus lays underneath a bony roof called the acromion. Chronic abrasion or "impingement" of the supraspinatus tendon on the edge of the acromion can cause fraying and tearing of the tendon. This injury pattern occurs on the outer or "bursal" side of the tendon.

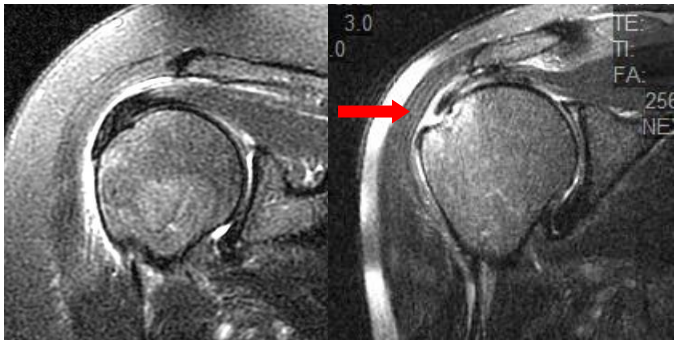
The rotator cuff can also have "internal impingement" as the deeper, or "articular", surface of the tendon gets strained across the rim of the socket. Internal impingement is common in baseball players and other overhead athletes.

Partial thickness tears vary in thickness until they extend through the entire tendon, making a full thickness tear. Often, full thickness rotator cuff tears result from a sudden injury such as a fall on the arm. Traumatic crushing or violent contraction of the rotator cuff tears the tendon. The rotator cuff can also tear more insidiously with progressive tearing of the tendon fibers. Rotator cuff tears occur in many shapes and sizes. The patient presents with pain in the upper arm, night pain, and a variable degree of weakness and loss of motion.




**Normal Shoulder Anatomy**

When a rotator cuff tear occurs there is great risk for progressive shoulder dysfunction. No tears decrease in size and many progressively increase in size. They do not reattach themselves. Rotator cuff tears are rare before 40 years of age and are common after age 60. When a patient older than 65 presents with a rotator cuff tear there is a 50% chance of having a tear in the other shoulder. Smoking increases the risk of having a rotator cuff tear.



**MRI of Normal RC** **MRI of Torn RC**

Treatment for rotator cuff tears is not standardized. Routine x-rays are helpful. MRI is the imaging modality of choice to evaluate suspected rotator cuff problems. Injecting dye into the shoulder before the MRI (arthrogram MRI) greatly increases the chance of finding a partial tear. An arthrogram MRI should be considered in younger athletic types with persistent pain but no weakness. We must be cautious about interpreting MRI's. One study performed MRI's on people with *normal* shoulder function. Over half the people older than 60 years had a partial or full thickness rotator cuff tear. This emphasizes the danger of basing treatment decisions on MRI scans alone.

Activity modifications, anti-inflammatories, physical therapy, and injections are all part of a conservative algorithm which needs to be tailored to the individual. There must be close monitoring of the treatment response.

Surgery is considered if pain or dysfunction fail to improve in spite of a reasonable trial of conservative measures. Factors that influence decision toward early surgical repair include: acute tears, younger physiologic age and higher activity levels. Massive rotator cuff tears do much better when repaired (reattached to bone) within the first few months after injury.

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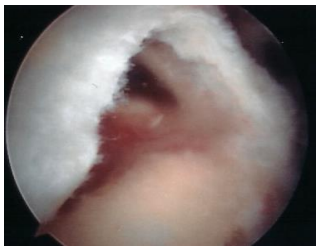
Historically, rotator cuff surgery was performed through large incisions. The deep nature of the structure required splitting and stripping the large deltoid muscle off the acromion bone. This process provided limited visualization of all the potentially injured structures and caused significant problems with healing and scar tissue.

The introduction of the arthroscope to shoulder surgery has been a revolution. A camera the size of a pencil is introduced into the shoulder joint through a small "portal" (approximately 1 cm). This provides a perfect view of both sides of the rotator cuff plus most other structures in the shoulder which may be contributing to the patient's symptoms. Additional portals are created to introduce various specialized instruments such as shavers and burrs.

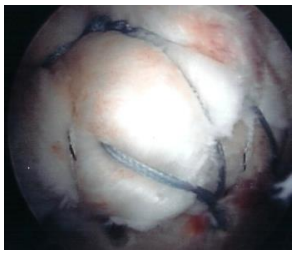
The depth of a partial thickness rotator cuff tear is the most important factor in the decision to repair or debride (shave down) the tear. There is a general consensus that tears involving 50% depth or greater shoulder be repaired. Surgeons are more aggressive in repairing partial tears in younger and more active patients. Articular/inner surface rotator cuff tears often have cartilage or labrum injuries which need to be addressed. Bursal/outer surface tears often have a downward bony projection off the edge of the acromion, or "spur", which is removed with a rotating burr (acromioplasty).

Skills needed to perform arthroscopic rotator cuff repairs include: the ability to secure sutures to bone by means of suture anchors; the ability to shuttle sutures through tendon tissue with specialized instruments; and the ability to tie arthroscopic sliding knots. Although technically demanding, the all-arthroscopic repair causes less blood loss, less pain and fewer complications. It should also lead to less postoperative stiffness with an overall higher patient satisfaction rate.



**Rotator Cuff Tear**

**Anchors Placed**



**Double Row Repair**

Postoperative recovery typically involves 4 to 6 weeks of shoulder immobilization. Gentle early range of motion exercises are accelerated by 6 weeks after surgery. Shoulder motion is optimized by 3 months. Strengthening is emphasized from 3 to 6 months. Heavy labor and sports may take 6 to 9 months to resume. Clinical improvements can be seen up to a year after surgery. Maintenance exercises are recommended.

Imaging studies have shown that even in the best hands up to 30% of rotator cuff tears fail to heal. While patients with solid, well-healed repairs have better function, the majority of patients with tears that do not heal still gain significant improvements from surgery.

Many factors affect tendon healing. These include operative technique, age and general health of the patient, age of the tear, genetics, and environmental factors such as smoking, activity level and rehabilitation regimen. Some tears may not be repairable or are only partially repairable secondary to tissue loss from disuse atrophy (thinning and fatty infiltration) and chronic retraction. With a partial repair, surgeons can sometimes convert a symptomatic tear into an asymptomatic tear. These patients may have less pain but persistent weakness.

Recent research has focused on repair geometry and fixation. Compared to a single row of anchors, double row repairs have more favorable strength characteristics. The "suture bridge" double row repair technique creates greater contact area and pressure, which may help to optimize healing.

Biological patches of various tissues have been implemented to augment tenuous repairs. They are not currently used to gap major full thickness defects in tendon tissue. The role of these patches in rotator cuff surgery remains under investigation. Future trends in tendon healing will focus on enhancing the biological environment with pharmacologic agents, growth factors, tissue engineering and gene therapy.