



Expectations Following Rotator Cuff Surgery

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Abstract

Purpose of Review To outline the radiographic and clinical outcomes after a rotator cuff surgery in order to set the expectations with the patient before the surgery to obtain a better outcome, taking into account the factors that can affect the outcome and the technique used for the repair.

Recent Findings The majority of surgeons use arthroscopic repair.

The double-row repair has better biomechanical strength, footprint coverage, and radiographic healing rates.

The principal factors that can affect the outcome of the surgery are the tendon quality, tear size and retraction, fatty infiltration, chronicity of the tear, and concomitant pathologies.

Summary Arthroscopic rotator cuff repair can decrease pain and increase function allowing patients to improve their quality of life; 90% of patients are happy 6 months after the surgery and maintain stability during 5 years. Greater preoperative expectations would show better outcomes and patient satisfaction after the surgery.

Keywords Rotator cuff repair · Shoulder surgery · Expectations · Outcomes · Arthroscopic repair · Radiographic outcomes

Introduction

The shoulder is considered one of the most complex joints of the human body because of its wide range of motion. The rotator cuff is a group of tendons situated in the shoulder joint that provides support and enables wide range of motion. Because of this, the rotator cuff is susceptible to injuries in sports as well with activities of daily living.

Rotator cuff tears are one of the most common causes of shoulder pain in middle-aged adults and older individuals [1•]. The cause of these tears is multifactorial. There are extrinsic factors that can cause a rotator cuff lesion such as impingement of the acromion into the bursal side of the rotator cuff. But, more recently, it has been recognized that intrinsic degeneration is most likely the leading cause of rotator cuff pathology [2•]. Rotator cuff tears can cause severe pain and

weakness that interfere with functional activities and a decreased quality of life [3•].

Rotator cuff tendon tears are a common cause of disability related to the upper extremity [4•]. The age group that is mainly affected with these lesions is people older than 50 years old [5•]. Up to 50% of the patients over the age of 50 have some form of rotator cuff pathology [2•].

Some tears can be successfully treated non-operatively with good clinical results [6•]. However, patients who fail non-operative treatment are candidates for surgical fixation. Surgical repair of the rotator cuff is one of the most common orthopedic procedures performed and accounts for approximately 75,000 operations each year in the USA alone [7•, 8•].

Indications for Surgical Treatment

The indications for surgical intervention are not widely agreed upon, as evidenced by the results of a survey of the American Academy of Orthopedic Surgeons membership [6•]. Despite the lack of consistent, evidence-based agreement on indications, surgical treatment of the rotator cuff has been used since 1911 [8•].

The least controversial indication for surgery is in patients with a full thickness rotator cuff tear who have failed a trial

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non-operative treatment [9••]. Relative indications are young patients (< 60 years old) with acute, traumatic, and full thickness rotator cuff tears and those that present with significant weakness [10].

Surgical Treatment

The treatment goals of a rotator cuff repair are pain relief and improvement in function [11].

Several studies have shown good functional results and patient satisfaction with arthroscopic rotator cuff repairs at early follow-up [7••, 11].

Numerous studies have demonstrated clinically predictable outcomes in regaining function and relieving pain after rotator cuff repair [8•, 12, 13, 14••, 15•]. There are several factors that can adversely affect the success of rotator cuff repair such as the size of the tear, amount of retraction, degree of fatty infiltration of the muscles, age of the patient, chronicity of the tear, smoking status, and diabetes [9••].

However, there is a discrepancy in the literature between anatomic healing and functional results—with many patients still able to achieve a clinically successful result despite evidence of radiographic failure of the repair [16, 17].

Surgical Techniques

The surgical techniques that can be used to repair a rotator cuff tear are as follows: formal open repair with deltoid take down and repair, mini open repair through a deltoid split, and arthroscopic repair using single or double row repairs [8•].

Open rotator cuff surgery has been used since the early twentieth century. Neer described five fundamental principles to succeed in open rotator cuff repairs: meticulous repair of the deltoid origin, subacromial decompression with division of the coracoacromial ligament, release of the cuff as needed to obtain freely mobile muscle tendon units, secure transosseous fixation to the tuberosity, and closely supervised rehabilitation with early passive motion [8•]. While these points were penned years ago, the general tenets of rotator cuff repair surgery are still valid today. Open rotator cuff repair has shown good to excellent results in terms of functional improvement and pain relief, despite the morbidity resulting from taking down the deltoid [8•].

The mini open technique became popular in the 1990s because it preserves the deltoid origin, allows for strong suture fixation, and involves a shorter learning curve [18]. A study by Baker and Lib [19] compared open repair with mini open and found equally effective results in terms of pain relief and functional outcomes.

In the modern era, arthroscopic rotator cuff repairs have become the preferred surgical technique for many surgeons because it provides patients with excellent pain relief and improvement of function leaving less scarring and minimal trauma to the deltoid. It also allows the surgeon to fully evaluate and treat other pathologies inside the shoulder joint such as labral tears and injuries to the long head of the biceps tendon [6•, 12, 14••]. A 2012 survey of 372 members of the American Shoulder and Elbow Surgeons [6•] showed that 77.8% of surgeons used arthroscopic repair, 15.7% used open repair, and 6.5% used a mini open repair as their preferred technique.

It has been reported that the results of all arthroscopic repair techniques are similar to those of open and mini open repairs with 85–95% of patients having improved pain relief and functional outcomes [18–20]. Advocates for all arthroscopic repairs argue that arthroscopy gives surgeons the ability and flexibility with various portal locations to completely visualize and analyze a tear. Additional advantages of all arthroscopic repairs include small skin incisions, decreased postoperative pain, faster recovery, better cosmetic results, no deltoid detachment, and less soft tissue dissection [18, 21]. Up to now, there has been no documented significant difference in patient outcomes when compared with other techniques [8•, 18, 20].

Single-row and double-row constructs are two types of arthroscopic rotator cuff repairs that have been subject to study with regard to decreasing re-tear rates of the rotator cuff after surgery [11]. Recent studies have shown structural healing after double-row rotator cuff repair to have biomechanical characteristics and reconstruction of the rotator cuff footprint superior to those of a single row repair with higher rates of intact tendon healing [11]. Biomechanical and cadaver studies have shown that a double-row repair is superior to single-row repair in terms of fixation strength [8•]. A clinical intraoperative study found that, on average, a single-row repair left 52.7% of the footprint uncovered, whereas double-row provided complete coverage which allowed for greater surface area between the tendon and bone to allow for healing. A study by Millett et al. [15•] showed that single-row repairs resulted in a significantly higher re-tear rate compared with double-row repairs, especially with regard to partial thickness re-tears. However, there were no statistically significant differences in outcome scores between single-row and double-row repairs. Dunquin et al. [22] showed the same outcomes for all tears greater than 1 cm.

Outcomes

Outcomes following rotator cuff repair surgery can be divided into the clinical and radiographic results. It is well-established that, on average, the clinical results are

better than the radiographic results—patients can still have a good clinical result despite radiographic failure of healing. In fact, up to 90% of the patients are happy at 6 months after rotator cuff repair surgery [7••].

Factors that Affect Outcomes Following Rotator Cuff Repair

Age, gender, smoking, size of the tear, tendon quality, healing of the rotator cuff repair, hyperlipidemia, worker's compensation status, fatty infiltration of the muscle, traumatic onset of the lesion, obesity, diabetes, multiple tendon involvement, and additional procedures during the rotator cuff repair surgery to the biceps and AC joint have been shown to be associated with less favorable outcomes after rotator cuff repair (Table 1) [2•, 3, 4, 5•, 9••, 23].

In addition to non-modifiable factors, there are also modifiable factors that are associated with outcomes. In particular, higher preoperative expectations have been shown to be associated with better function and better pain relief following surgery, regardless of the surgical technique used. Henn et al. [4••] reported that patients' preoperative expectations have a dramatic positive association with their self-assessed outcome after rotator cuff repair. Therefore, counseling patients prior to rotator cuff repair can affect their expectations and thus the outcome of surgery.

A 5-year follow-up study after arthroscopic rotator cuff repair by Gulotta et al. [7••] found that the functional results of all arthroscopic rotator cuff repairs remain stable at an intermediate follow-up of 5 years. The ASES scores improved over the course of the first 2 years, but remained stable between years 2 and 5. In that study, the authors showed that

patients made significant improvements from baseline to 6 months following surgery, with 93% of patients satisfied with their outcome at that time point. This information is important in advising patients on the trajectory of their recovery.

Radiographic Outcomes

Despite the presence of good functional outcome following a rotator cuff repair, postoperative imaging is very challenging because of the fixation, tissue manipulation, and residual defects that may leave scar tissue. MRI allows for superior soft tissue contrast that provides a complete assessment of the shoulder, while the ultrasound enables to observe the repaired tissue movement dynamically [24].

Early radiological evaluation of rotator cuff repairs with MRI or ultrasound can be difficult to interpret as the disorganized scar tissue of the healing tendon-bone junction can be difficult to distinguish from a tear. Studies have shown that early postoperative MRIs and ultrasounds that have shown non-retracted re-tears have to ability to remodel and “heal” with time [7••, 14••, 24–26]. Therefore, early postoperative imaging should be interpreted within the context of the clinical presentation of the patient.

The predictors of a radiographic defect are similar to the predictors of clinical outcomes and include increased age, larger tear size, and multiple tendon tears. Also, patients who underwent a concomitant biceps tenotomy or tenodesis are more likely to have a defect than those in which there was no biceps pathology; similarly, patients who underwent an AC joint resection [14••]. While patients may achieve a clinically successful outcome despite radiographic evidence of repair failure, Harryman et al. [27••] showed that those with healed rotator cuff repairs had better clinical outcomes when compared to patients with failures.

Table 1 Factors that affect outcomes

Age
Gender
Smoking
Size of the tear
Tendon quality
Healing of the rotator cuff repair
Hyperlipidemia
Worker's compensation status
Fatty infiltration of the muscle
Traumatic onset of the lesion
Obesity
Diabetes
Multiple tendon involvement
High WBC
Additional procedures during the repair surgery

Conclusions

Arthroscopic rotator cuff repair is an effective, minimally invasive surgical procedure that can decrease pain and increase function allowing patients to improve their quality of life [28–30]. Factors that affect results following rotator cuff repairs include tendon quality, fatty infiltration, tear size and retraction, chronicity of the tear, age of the patient, smoking status, diabetes, concomitant pathology, and patients with hyperlipidemia and high white blood cell count (WBC). Surgical considerations such as double-row repair techniques have been shown to offer better initial biomechanical strength, better footprint coverage, and better radiographic healing rates in most studies. However, it has been difficult to conduct studies with sufficient power to consistently show a clinical advantage of double-row techniques over single-row [25, 31, 32].

There remains a discrepancy between clinical outcomes and radiographic healing rates with patients still capable of achieving a clinically successful outcome despite radiographic evidence of failure [17]. It has been demonstrated that arthroscopic rotator cuff repair is an effective surgical procedure with 90% of the patients happy at 6 months after the surgery and maintained satisfaction over 5 years [7•, 13].

Greater preoperative expectations are consistently and independently associated with significantly better performance on multiple outcome instruments after rotator cuff repair, and this would lead to a better satisfied patient after the surgery [4•, 33, 34].

Compliance with Ethical Standards

Conflict of Interest Lawrence Gulotta reports personal fees from Zimmer-Biomet, Inc. Alejandro Novoa-Boldo declares no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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- Of major importance

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