Quality of Life and Functional Results of Arthroscopic Partial Repair of Irreparable Rotator Cuff Tears

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Purpose: To evaluate the minimum 2-year results and possible outcomes of arthroscopic partial repair in different patterns of irreparable rotator cuff tears (RCTs). **Methods:** Patients suffering from an irreparable supraspinatus and a reparable infraspinatus tendons who underwent arthroscopic partial repair with a minimum 24-month follow-up were included in this study. The Constant and Murley score (CMS) was used to assess patients' functionality pre- and postoperatively. Postoperative patient assessment included the Simple Shoulder Test (SST) and the Short Form Health Survey questionnaire (SF-36). A postoperative range of motion, CMS, and strength were compared with the contralateral side. Postoperative SF-36 was compared with age- and sex-matched norms. **Results:** Ninety patients (95 shoulders) were reviewed after a mean follow-up of 7 (range 2-12) years. The subscapularis tendon was intact in 80 shoulders and torn but completely reparable in the remaining 15 shoulders. The CMS improved from 39.1 ± 8.4 (10-61) to 76.3 ± 9.7 (32-93) ($P < .001$). The mean postoperative SST was 9.1 ± 2.2 (1-12). Although the patients had lower postoperative abduction and internal rotation, strength in abduction and CMS in comparison with the measurements from the contralateral side, the median postoperative SF-36 physical and mental component summaries were 98% and 100% of the matched norms. No significant differences were found in postoperative outcomes according to the RCT pattern. Males showed significantly higher strengths in abduction (B = −1.384, 95% confidence interval [CI] −2.144 to −0.624, $\eta^2 = 0.123$, $P < .001$, 95% power), external rotation (B = −3.646, 95% CI −5.2 to −2.092, $\eta^2 = 0.189$, $P < .001$, 100% power), and internal rotation (B = −3.867, 95% CI −5.676 to −2.057, $\eta^2 = 0.162$, $P < .001$, 99% power) than females. Significantly higher ranges of abduction ($\eta^2 = 0.431$, $P = .019$, 98% power) and external rotation ($\eta^2 = 0.417$, $P < .03$, 97% power) were noted in younger patients. Higher strengths in abduction ($\eta^2 = 0.495$, $P = .002$, 100% power) and internal rotation ($\eta^2 = 0.464$, $P = .006$, 99% power) were also reported in these patients. **Conclusions:** When there is an irreparable supraspinatus but there is still the possibility to repair the infraspinatus and subscapularis, the arthroscopic partial cuff repair should be considered as an effective surgical option. Indeed, a significant clinical improvement can be achieved and, differently from pure symptomatic surgical procedures, this technique represents a reasonable effort to restore, at least in part, the shoulder joint functionality. Successful and reliable results can be expected at an average 7-year follow-up, regardless of the RCT pattern. Female and older patients have a greater likelihood of lower functional outcomes. **Level of Evidence:** Level IV, therapeutic case series.

Massive rotator cuff tears (RCTs) have been reported to account for as many as up to 40% of all RCTs.[1] Despite the developments in surgical techniques, a complete repair of massive RCTs is sometimes impossible because of the irreducible tendon retraction[2] and both atrophy and fatty degeneration of the muscle belly.[3] In these cases, a partial repair should be considered.[4] In fact, the shoulder has a stable fulcrum of motion when it maintains a balanced force couple (subscapularis/infraspinatus tendons) in the transverse plane. When this force couple is disrupted by a massive RCT, the shoulder's active motion is impaired. If rotator cuff repair restores the anterior and posterior forces, function will be restored too, even in the presence of a persistent defect in the superior rotator cuff (i.e. supraspinatus tendon).[5]

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This procedure was originally conceived by Burkhart et al.[6] in 1994 as an open repair of the inferior half of the infraspinatus to create a balanced force couple. An arthroscopic modification of this technique was described in 2001[7]; however, few data on long-term patient satisfaction, functionality and possible outcome predictors after this procedure have been published to date.[8,9]

In this context, the aim of our study was to evaluate the minimum 2-year results and possible outcomes of arthroscopic partial repair in different patterns of irreparable RCTs. Our hypotheses were that (1) significant clinical improvement may be achieved with surgery, as measured by the Constant and Murley score (CMS)[10] and that (2) demographic, clinical, radiologic, or arthroscopic findings may affect the postoperative outcomes.

Methods

Study Group

The study protocol of this retrospective study with prospective data collection was approved by the local ethical committee. Patients that underwent arthroscopic partial rotator cuff repair from February 2003 to April 2013 were included in the study if they fulfilled the following criteria: (1) no previous rotator cuff surgery, (2) no concomitant glenohumeral osteoarthritis, (3) no neurologic deficit, and (4) a minimum 24-month follow-up. Specifically, patients were eligible for arthroscopic partial rotator cuff repair if they had (1) an irreparable supraspinatus and a reparable infraspinatus associated with an intact or a reparable subscapularis tendon and (2) an intact teres minor determined at the time of surgery, and (3) the failure of conservative management for at least 6 months, including administration of at least 1 steroid injection, 1 course of physical therapy for at least 3 weeks, and 1 course of nonsteroidal anti-inflammatory drugs or analgesics.

Specifically, according to the classification system by Castricini et al.,[11] the possibility to perform arthroscopic rotator cuff partial repair was based on the following: (1) preoperative magnetic resonance imaging to evaluate the tendon healing potential (Fuchs[12] stage I–II, good healing potential; Fuchs stage III, poor healing potential) and (2) intraoperative findings (reparable/irreparable, according to the possibility of reducing the tendon to its footprint after intraoperative mobilization and release[13]). Tendons were numbered sequentially: 1, supraspinatus; 2, infraspinatus; 3, teres minor; and 4, subscapularis. Arthroscopically, each single tendon was evaluated and tears were described as follows: a torn but reparable tear with good healing potential was assigned a plus sign (+); a torn but reparable tendon with poor healing potential was assigned a minus sign (−); and a torn but irreparable tendon was merely indicated by the tendon number.

Surgical Technique

All surgical procedures were performed by a single, senior surgeon (R.C.). Patients were placed in the standard lateral decubitus position with the arm under longitudinal traction for routine arthroscopy and they received an interscalene block. Three routine arthroscopic portals (anterior, lateral, and posterior) were used to perform the surgical procedure. The long head of the biceps was evaluated and, in cases of instability or lesions, was treated with tenotomy or tenotomy followed by tenodesis. Specifically, arthroscopic tenodesis was performed with the tendon mobilized out of the bicipital groove and percutaneously fixed with an interference screw. After removal of the subacromial bursa, the mobility of the residual cuff was tested by grasping the edges of the tendons with an arthroscopic clamp and attempting to pull it laterally to the footprint region as much as possible. An arthroscopic release of the supraspinatus tendon was always attempted before deeming it irreparable.

The RCT patterns were definitively classified. Therefore, for patterns 1.2+ or 1.2− only the infraspinatus tendon repair was performed, and for patterns 1.2+.4+ or 1.2−.4+ both infraspinatus and subscapularis tendons were repaired. One or 2 double-loaded metallic suture anchors were used for the single-row repair of the tendon to bone (Fastin RC, DePuy Mitek, Raynham, MA; or TwinfixTi, Smith & Nephew, Andover, MA). An acromioplasty was performed when a type II or III acromion was noted.

Postoperative Protocol

Postoperatively, the arm was placed in a 20° abduction sling for 4 weeks. The sling was then removed and passive range of motion (ROM) exercises were begun. Active assisted ROM was initiated when the full passive ROM was recovered. Strengthening exercises were started at 10 to 12 weeks after surgery and were continued for 3 to 6 months.

Patient Evaluation

Data were collected prospectively, because electronic records have been maintained on patients who are referred to our institution. All patients underwent thorough physical examinations before surgery and at the last follow-up visits by an independent observer using a standardized data sheet. Postoperative examination of shoulder ROM was conducted with the patient's best effort at forward flexion, abduction, external rotation, and internal rotation. Specifically, flexion and abduction were tested with the patient standing and actively moving the outstretched arms; external rotation was tested with the patient's arms adducted and the elbows flexed to 90°; internal rotation was tested with the patient's arm placed behind the back. As previously reported,[14] a hand-held goniometer was used to measure