

Clinical and functional results of patients after arthroscopic single row rotator cuff repair and arthroscopic acromioplasty

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Abstract

Aim: The present study aims to evaluate clinical and functional results of arthroscopic single row rotator cuff repair and acromioplasty in patients with Rotator cuff tears (RCT).

Materials and Methods: Sixty one patients whom were applied arthroscopic single row rotator cuff repair and arthroscopic acromioplasty between 2016 and 2019 were included in the present study. Patients' rotator cuff tears (Patte classification) and acromion were classified based on X-ray and Magnetic Resonance Imaging (MRI) results. In addition, patients' Constant Murley Scores, Shoulder Range of Motion (ROM) and visual analogue scale (VAS) scores were also analyzed prior to and following the surgical operation.

Results: Forty one (67.2%) out of 61 patients in the present study were applied surgery on the right shoulders, while 20 of them (32.8%) were applied surgery on the left shoulders. Twenty one (34.4%) of patients were male, while 40 (65.6%) of them were female. Patients were divided into three groups as type 1 (n=10), type 2 (n=41), type 3 (n=10) based on their acromion classification and three stages as stage 1 (n= 15), stage 2 (n=36), and stage 3 (n=10) based on their rotator cuff tears. In addition, while their mean preoperative Constant-Murley and VAS scores were 29.8 ± 0.79 and 9.14 ± 0.11 , respectively, it increased to 81.1 ± 1.07 and decreased to 2.06 ± 1.07 in the postoperative period, respectively. Finally, while patients' preoperative mean abduction ROM was $60.73^\circ \pm 1.31^\circ$, it increased to $126.22^\circ \pm 2.27^\circ$ in the postoperative period.

Conclusion: Arthroscopic single row rotator cuff repair and arthroscopic acromioplasty in patients suffering from RCT contributes to significant relief of pain and remarkable increase in shoulder abduction ROM, thus offering an effective and reliable surgical treatment which allows the active use of extremities.

Keywords: Arthroscopic acromioplasty; arthroscopic cuff repair; rotator cuff; single row

INTRODUCTION

RCT can be listed as one of the most common reasons for shoulder pains. Although the formation mechanism of shoulder RCT has not been fully revealed yet, some theories in the past attributed these tears to chronically relapsing traumas in the acute post-trauma period, while current theories generally maintain the idea that both intrinsic and extrinsic elements play an important role in the etiology (1,2).

While an increase can be observed in the incidence of full-thickness RCT increases after the age of 50, the incidence of asymptomatic RCT was measured as nearly 22-23%. Even though RCT is directly proportional to aging, it can also be diagnosed in younger individuals and even athletes, and it may range from partial RCT to full thickness RCT (3,4).

Both conservative and surgical treatment methods are employed in the treatment of RCT (5). Among surgical options are open, mini open or arthroscopic RCT repair. In recent years, arthroscopic RCT repair has come to the forefront as a more favorable option, and thus used more frequently in surgical operations (6).

Subacromial decompression which involves bursectomy, coracoacromial ligament release and acromioplasty occupies an important position in the surgical treatment of RCT. Constituting a significant part of subacromial decompression, acromioplasty is recommended by Neer for the surgical treatment of stage II and III shoulder impingement syndromes. On the other hand, the objective of acromioplasty in rotator cuff repair is to obtain a wide and smooth surface under acromion and acromioclavicular joint to increase ROM for supraspinatus and other rotator

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cuff muscles, and eliminate shoulder impingement (7). Various studies indicated that rotator cuff repair significantly contributed to better acromioplasty results for patients suffering from RCT (8).

Suture anchors are often preferred for RCT repair. An anchor is selected for the bone based on distal tear in an arthroscopic or mini-open surgical method. At this stage, depending on the surgeon's selection, RCT size and type (full-thickness, partial or massive tears), single or double row suture anchors may be used for rotator cuff repair (9).

In order to reveal clinical and functional results in clinically and radiologically diagnosed patients suffering from RCT and treated using arthroscopic single row rotator cuff repair and arthroscopic acromioplasty, we hypothesize in the present study that arthroscopic rotator cuff repair using single row suture anchor offers an effective repair method in terms of patient satisfaction and better daily life activities and biological recovery.

MATERIALS and METHODS

Before the present study, an ethical approval was obtained from Ethical Committee of Kahramanmaraş Sutcu Imam University and Kahramanmaraş Necip Fazil Hospital (Decided number: 10, session: 2020/07, date: 15/04/2020). In addition, the patients participating in the study were asked to sign a consent form. RCTs in 61 patients were diagnosed by clinical and physical examination firstly, then were confirmed by radiologically evaluation with Magnetic Resonance Imaging (MRI) and included this study. Patients with advanced shoulder degenerative osteoarthritis, a history of septic arthritis, and rotator cuff tear that did not accept surgical treatment were excluded. Later, sixty one patients were treated arthroscopic single row rotator cuff repair and arthroscopic acromioplasty by a single surgeon (FD) in Orthopedics and Traumatology Clinic of Kahramanmaraş Sütçü İmam University and Kahramanmaraş Necip Fazil Hospital between January 2016 and September 2019. After patients' demographic data were recorded, it was questioned whether any non-surgical treatments were applied following the diagnosis of RCT etiology. In addition, patients' RCTs (Patte classification) and acromion were classified based on their X-rays and MRI results obtained from PACS prior to and following the surgical operation (Figure 1). All patients went through shoulder arthroscopy surgical operation under general hypotensive anesthesia and in beach chair position. Single row anchor or anchors were used depending on RCT size and type. Acromioplasty was applied to all patients. In addition, biceps tenotomy was applied to patients suffering from biceps tendon sensitivity and bicipital sulcus pain during the examination due to biceps tendon degeneration in shoulder arthroscopy.

All patients were asked to wear 30 degree abduction shoulder orthosis for 4 to 6 weeks following the surgical operation. They were also trained with passive and active physical therapy exercises during these 6 weeks. After the sixth week, the orthosis was removed and strengthening shoulder exercises were demonstrated to patients.

The patients were able to do their active work within an average of 3 months. Clinical evaluation of the patients was performed using patient files which were completed following their physical therapy exercises along with the physical examination findings in the preoperative period. Constant scoring was preferred to measure pain, position, daily life activities, joint ROM, and strength. Shoulder constant score was evaluated out of 100. Patients' Constant Murley score, shoulder ROM, shoulder abduction movements and VAS scores were analyzed prior to and following the surgical operation.

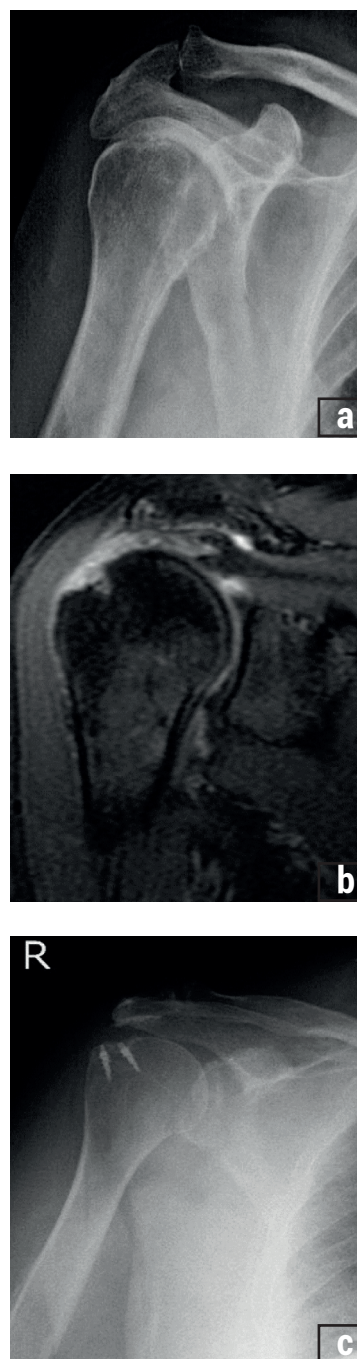


Figure 1. Preoperative and Postoperative images; a: Preoperative shoulder A-P graphy; b: Preoperative magnetic resonance image; c: Postoperative shoulder A-P graphy

Statistical analysis

SPSS 20.0 (IBM SPSS for Windows version 20, IBM Corporation, Armonk, New York, United States) was used for statistical analysis. Quantitative data were defined as mean data \pm standard deviation, while descriptive data were defined in percentage. The normal distribution of the data was analyzed using Kolmogorov-Smirnov test or Shapiro-Wilk test. Chi-square test was used to compare two different independent groups. The obtained data were evaluated at a reliability level of 95%, and p value was considered significant if lower than 0.05.

RESULTS

Out of 61 patients whom were applied arthroscopic rotator cuff repair and arthroscopic acromioplasty, 41(67.2%) patients suffered from right shoulder, while 20 of them (32.8%) suffered from left shoulder. 21 patients (34.4%) were male, whereas 40 patients (65.6%) were female. Mean age and monitoring process were 58.76 ± 9.075 (35-78) years and 13.6 ± 8.93 (6-44) months, respectively. Rotator cuff pathology was caused by falling in 36 patients (59%), lifting heavy objects in 24 patients (39.3%), and other reasons (sports or traffic accident) in 1 patient (1.6%). In the preoperative period, 19 patients (31.1%) received physical therapy, 7 patients (11.5%) received injection treatment, 18 patients (29.5%) received physical therapy along with injection treatment, and, finally, 17 patients (27.9%) only received medical treatment (oral or parenteral drug therapy) (Table 1).

| Table 1. Patients' demographic data | |
|--|-------------------|
| Mean age (mean \pm SD) years | 58.76 \pm 9.075 |
| Mean monitoring process (mean \pm SD) months | 13.6 \pm 8.93 |
| Sex | |
| Female | 40 (65.6%) |
| Male | 21 (34.4%) |
| Side | |
| Right | 41(67.2%) |
| Left | 20 (32.8%) |
| Dominant Arm | |
| Right | 45(73.7%) |
| Left | 16 (26.3%) |
| RCT etiology | |
| Falling | 36 (59.1%) |
| Lifting heavy objects | 24 (39.3%) |
| Other reasons (Sports and traffic accident etc.) | 1 (1.6%) |
| Preoperative treatment | |
| Physical therapy | 19 (31.1%) |
| Injection treatment | 7 (11.5%) |
| Physical therapy and injection therapy | 18 (29.5%) |
| Medical treatment | 17 (27.9%) |

SD; Standard Deviation

In terms of acromion classification, the number of patients at stage 1 (flat), stage 2 (curved) and stage 3 (hook) were 10, 41, and 10, respectively. As for RCT Patte classification, the number of patients in stage 1, 2 and 3 were 15, 36 and 10, respectively (Table 2).

| Table 2. Patients' acromion and rotator cuff tear classification (Patte classification) | | | |
|---|------------|-----------|------------|
| | Stage 1 | Stage 2 | Stage 3 |
| Acromion Type | 10 (16.4%) | 41(67.2%) | 10 (16.4%) |
| RCT Classification (Patte classification) | 15 (24.6%) | 36 (59%) | 10 (16.4%) |
| RCT; Rotator Cuff Tear | | | |

While mean subacromial distance was 4.67 mm in the preoperative period, it reached 7.16 mm by increasing 53.3%. Biceps tendon pathologies were diagnosed in 38 patients (62.3%) during shoulder arthroscopy, and they were applied arthroscopic biceps tenotomy. While patients' preoperative mean Constant-Murley score was 29.8 ± 0.79 (18-42), this value increased to 81.1 ± 1.07 (52-94) in the postoperative period ($p < 0.01$). Similarly, mean VAS score in the preoperative period was 9.14 ± 0.11 (7-10), which decreased to 2.06 ± 1.07 (1-4) in the postoperative period ($p < 0.01$). In addition, while patients' preoperative mean abduction ROM was $60.73^\circ \pm 1.31^\circ$, it rose to $126.22^\circ \pm 2.27^\circ$ in the postoperative period ($p < 0.01$) (Table 3).

| Table 3. Preoperative and postoperative VAS and Constant-Murley Scores, Shoulder Abduction ROM values | | | |
|---|------------------------------|-------------------------------|----------|
| | Preoperative mean value | Postoperative mean value | P value |
| VAS Score | 9.14 ± 0.11 | 2.06 ± 1.07 | < 0.01 |
| Constant-Murley Score | 29.88 ± 0.79 | 81.19 ± 1.07 | < 0.01 |
| Shoulder Abduction ROM ($^\circ$) | $60.73^\circ \pm 1.31^\circ$ | $126.22^\circ \pm 2.27^\circ$ | < 0.01 |
| Subacromial Distance (mm) | 4.67 ± 0.81 | 7.16 ± 0.93 | < 0.01 |

VAS; Visual Anaolg Scale , ROM; Range of Motion

No statistically significant differences were observed between patients' pre- and postoperative Constant scores and abduction ROM values in terms of their RCT stages and acromion classification ($p > 0.05$). However, there was a statistically significant difference between patients' postoperative VAS scores of Stage 2 acromion and Stage 3 acromion groups ($p = 0.034$). Two patients were diagnosed to suffer from anchor suture pull-out following physical therapy, and with double row repair technique revision shoulder arthroscopy was applied to them.

DISCUSSION

Conservative and surgical methods are usually preferred in the treatment of RCT. However, the treatment methods for small RCT displaying mild symptoms are still

controversial. Although surgery is a popular method for the treatment of full-thickness RCT, some studies demonstrated that conservation treatment methods also yielded effective results in this field (10,11).

In today's world, conservative treatment methods do not suffice because individuals tend to lead a more active daily life, which results in an increasing number of surgical operations. Three different treatment methods are available for RCT as open, mini-open and arthroscopic surgery. Van der Zwaal et al. reported that there were no significant differences between arthroscopic and mini-open surgery in the treatment of full-thickness RCT repair after patients had been monitored for one year (12).

In recent years, arthroscopic surgery methods have been more popular compared to open surgery methods for the treatment of RCT due to several factors such as decreasing need for the use of painkillers, a lower number of wound site infection problems, a shorter duration of hospital stay, earlier and more effective physical therapy, evaluation of glenohumeral joint without hemorrhage, and a more comfortable surgical operation thanks to visible rotator cuff muscles (13-15).

RCT does not necessitate full anatomic repair in order to maintain shoulder functions, which is not also technically feasible. Because RCT sides become fibrotic and avascular, a vascular bone bed needs to be prepared, and torn sides must be renewed in RCT repair area (12). This aims to expose the repaired tendon surface to bone surface, which will eventually provide a more rapid and effective recovery for the patient (16). Therefore, we renewed torn RCT sides in each patient, and prepared a vascular bone bed.

Single row suture repair, which has been used since the introduction of arthroscopic treatment and gradually become the standard suture method, yielded successful results (17). However, despite the patients' satisfaction with the surgical operation, various factors reasons such as a high risk of recurrence of RCT in the postoperative period and problems in the anatomic attachment of the tendon paved the way for double row suture repair method (18). Millett PJ et al. reported in a study on 524 patients that the recurrence of RCT was higher in patients who were treated with arthroscopic RCT using single row suture anchor compared to those using single row suture anchor (19). Although various cadaveric studies demonstrated that single row suture method were more effective from a biomechanical point of view, no statistically significant differences were observed between them from a functional perspective in clinical data (20,21).

Sheibani-Rad et al. indicated in a prospective randomized study that clinical results of patients treated with RCT repair using single and double row suture anchor displayed no statistically significant results (22), which overlaps the findings of several other studies in the existing literature (18,23,24). The present study, too, demonstrates that rotator cuff repair using single row suture anchor displays clinically positive results. Additionally, we preferred using

single row arthroscopic rotator cuff repair method due to the high cost of treatment and the length of surgical operation in double row suture anchor method.

Given the statistically significant increase in mean Constant score ($p \leq 0.05$) and 95% of the patients' satisfaction with the surgical operation, it can be stated that arthroscopic rotator cuff repair using a single row suture anchor offers an effective and successfully treatment method, which also overlaps similar studies in the current literature (5,25,26).

Knudsen et al. analyzed tendon integrity in 31 patients following a single tendon tear repair based on MRG, and reported recurrence of tear in 32% of the patients although they didn't observe any statistical relationship between tendon integrity and functional results (20). In the present study, all patients went through control, radiography and shoulder examination in order to examine patients suffering from tears using MRG. Two patients were observed to suffer from anchor suture pullout following the physical therapy (3.2%), resulting in recurrence of RCT, and, as a result, revision shoulder arthroscopy was used as a surgical treatment method (27).

Acromioplasty aims to create a smooth surface under the acromion and acromioclavicular joint, thus eliminating impingement by increasing supraspinatus muscle volume. The idea that acromion morphology was responsible for the impingement was put forward by Neer and supported by an anatomic study carried out by Bigliani et al. (28). The differences among acromion types in different age groups and painless rotator cuff tears demolish the theory that acromion morphology is the primary cause of RCT. In the present study, a statistically significant difference was observed between stage 2 and 3 acromion groups in terms of VAS score in the postoperative period ($p=0.034$).

Whether routine acromioplasty is necessary has still been a controversial issue in today's scientific community. Therefore, instead of treating each patient with acromioplasty, there is a general consensus on the idea that bone resection that decompresses the rotator cuff in al distance and provides a smooth surface for rotator cuff movements must only be used if necessary. However, in the present study, arthroscopic acromioplasty was used as a routine treatment for all patients.

In addition to RCT repair, a number of biological support treatments are also used in patients suffering from RCT. For instance, Platelets Rich Plasma (PRP), which is known to contain bioactive protein and many growth factors that play a vital role in the tendon recovery, is often used in rotator cuff repair. Even though various studies reported that PRP occupied a significant position in repair, its repair mechanism and homogeneity of its consequences are still controversial (29, 30). In the present study, on the other hand, no biological supports were used for rapid recovery of RCT.

Acromioplasty and hemorrhage caused by decorticated tubercles bear importance for RCT repair because

progenitor cells from these bones play an active role in the tendon recovery (31). In this respect, acromioplasty and tubercle decortication were applied to all patients in the present study.

As a result; it can be concluded that it is very likely for surgeons to encounter more RCT cases due to increasing physical activities in an advanced age and longer lifespan. Arthroscopic rotator cuff repair is becoming more and more popular compared to open rotator cuff surgery thanks to the comfort and broader angle of view offered by shoulder arthroscopy as well as rapid rehabilitation of the patients.

CONCLUSION

Arthroscopic single row rotator cuff repair and arthroscopic acromioplasty in patients suffering from RCT contributes to significant relief of pain and remarkable increase in shoulder abduction ROM, thus offering an effective and reliable surgical treatment which allows the active use of extremities.

Conflict of interest : The authors declare that they have no competing interest.

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Ethical approval: Before the present study, an ethical approval was obtained from Ethical Committee of Kahramanmaraş Sutcu Imam University and Kahramanmaraş Necip Fazil Hospital (Decided number: 10, session: 2020/07, date: 15/04/2020).

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