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Original Article

Examining the functional results and rate of re-tear in patients with rotator cuff tears who were treated by open surgical repair

Ahmad Dashtbozorg[1]*, Hanon Sadoni Sadoni[1], Mojgan Seifi[1], Naser Nik Khah[1]

[1] Orthopedics Department Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.

Correspondence: Ahmad Dashtbozorg, Orthopedics Depatmen Ahvaz Jundishapur University of Medical Sciences. dashtbozorg-a@ajums.ac.ir

ABSTRACT

RCT is a disease with a high prevalence in society, which can cause disability in old age. In this study, our aim was to investigate the results of mini-open surgery in patients with RCT referred to Imam Khomeini and Golestan Hospital, Ahvaz from 2018 to 2022. The present study is a cross-sectional study in which 40 patients with extensive rotator cuff tears were included in the study by census method. The rotator cuff tear was repaired with mini-open surgery, and using oss and occ questionnaires before, 6 and 12 months after the surgery, the shoulder function and the success of the surgery were checked. Also, the rate of re-rupture of the rotator cuff at 6 and 12 months after surgery was checked by MRI. Data were analyzed using SPSS version 21 software. In this study, 52.5% of patients were female and 47.5% were male. The age group of 39 to 58 years had the highest frequency. The occupation of 32.5% of patients was worker. The average score of the OSS questionnaire before, 6 and 12 months after surgery was 17.3, 27.9 and 31.8, respectively, which had a significant difference ($P < 0.05$). After surgery, shoulder function was very good in 48% of patients and excellent in 44%. The retear rate one year after surgery was 12%. Shoulder surgery along with rotator cuff repair is very effective in people with tendon rupture, and after the surgery, performance is improved and pain is reduced.

Keywords: Rotator cuff, Mini-open surgery, Shoulder, Retear

Introduction

The rotator cuff is a group of tendons that move the shoulder joint. Shoulder pain in some people is related to wear and tear of rotator cuff tendons [1]. Tendon weakening is thought to be caused by aging and mechanical wear. Ultimately, this process may lead to tendon tears. Rotator cuff muscles are among the most active and, in other words, the most basic muscles of the shoulder joint that suffer from such problems. It is said that this complication is more common in middle- aged and old age [2]. The prevalence of this injury is seen in many athletes, especially in swimming, gymnastics, tennis, volleyball, skiing and wrestling [3]. For the treatment of shoulder impingement syndrome, there are various treatment methods, including: administration of anti-inflammatory agents, oral and intramuscular corticosteroids [4], joint filtration by subacromial injection method [5]. Ice therapy in acute cases after injury, friction massage, immobilization of the injured limb, flexibility and strength exercises, therapeutic movement such as range of motion exercises and increasing function in the shoulder joint [6], ultrasound, and stimulation of electrical nerve transmissions. Reducing pain and restoring the person's natural range of motion and finally returning the person to a normal life [7]. Rotator cuff includes four muscles: subscapularis, teres minor, supraspinatus and infraspinatus [8]. The rotator cuff has a unique structure in the musculoskeletal system of the body and it is the only peri-articular structure in the body that can be repaired with various arthroscopic and open methods, and its not being healthy causes disabilities that may require arthroplasty [9]. Full-thickness rotator cuff tears are a common occurrence, and many of these cases undergo surgery and repair to maintain the quality of life in the future [10]. The treatment of rotator cuff tear includes a wide range of non-pharmacological, medicinal and surgical treatments and depends on the location and size of the tear [11]. Size of tear, duration of symptoms, failure of non-surgical treatment, duration of non-surgical treatment, history of trauma and night pain are some of the factors that affect the outcome of rotator cuff repair. Arthroscopic repair of the rotator cuff is used for partial tears as well as complete tears that are small to medium in size (>3) and

open repair is used for large tears (3-5 cm) and massive tears (>5 cm) (12). In this type of tear, due to the pulling back of the tendon and the replacement of fatty tissue in the muscles, despite many efforts, in some cases, it is not possible to close the structural defects created in the muscles (13). The common perception is that the remaining structural defect is directly associated with unsuccessful results, and based on this, various methods have been devised to close it, including the transfer of the healthy tendon of the subscapularis muscle to cover (16), the use of fascia tissue in the form of alograft or autograft. (17), repair in a place deeper than the connection point of the upper defect of the tendons, tendon transfer of the latissimus dorsi muscle (18), free tendon transfer or debridement and simple decompression of the rotator cuff (19).

However, many researchers found that complete and impenetrable closure of structural defects in muscles is not a necessary part of achieving successful surgical results, and despite the good results after surgery, imaging studies showed the existence of defects in rotator cuff muscles (20). In different studies, different criteria have been used to evaluate the tear and the amount of repair after surgery, such as the Simple Shoulder Test (SST), American Shoulder and Knee Surgeons (ASES) and the University of California and Los Angeles shoulder grading scale, as well as the use of radiology criteria. Among them (UCLA), sonography and MRI are common to check the degree of recovery and evaluate the condition of the tear before and after the operation. Currently, the common treatment for rotator cuff tears is arthroscopic repair; Especially in cases where the tear is extensive (12). Surgery is usually considered when other treatments have failed. Surgery involves removing part of the bone to widen the space for the passage of the tendon and to relieve subacromial pressure and repair torn tendons (13). Sometimes surgeons cannot repair the tendon due to the size of the tear or muscle degeneration, and in these cases only subacromial decompression can be used. Most rotator cuff surgeries are currently performed arthroscopically with surgical instruments inserted through small keyholes or through small incisions, the mini- open approach (16). Rotator cuff tears are a common cause of pain and disability among adults. Many people with a rotator cuff tear can manage their symptoms and return to their daily activities with physical therapy exercises that improve the flexibility and strength of the muscles around the shoulder joint. On the other hand, surgery may be needed to treat serious injuries and tears, or those rotator cuff tears that are caused by trauma. Rotator cuff tears do not heal on their own, but many patients can improve function and reduce pain with non-surgical treatments such as strengthening the shoulder muscles. Just because there is a tear, it does not necessarily mean that surgery is needed, but in cases of extensive tears, surgery is necessary. RCT is a disease with a high prevalence in society, which can cause disability in old age. In this study, our aim was to investigate the results of mini-open surgery in patients with RCT referred to Golestan Hospital, Ahvaz from 2018 to 2022.

Materials and Methods

The present study is a cross-sectional study designed to investigate the functional results and rate of re-rupture in patients with rotator cuff tears who were treated with open surgical repair at Golestan and Imam Khomeini Hospitals in Ahvaz from 2018 to 2022. The sampling method in this study was census. The study included 40 patients diagnosed with rotator cuff tears. The inclusion criteria for the study were the duration of complications despite non-surgical treatment for at least three months, full-thickness rotator cuff tear in MRI arthrography, mini-open surgery on the patient. Also, the exit criterion includes patients who did not cooperate. The data collection tool includes the standard Oxford Shoulder Score (OSS) questionnaires, a 12-question questionnaire to be completed by degenerative or inflammatory shoulder patients. This questionnaire is not suitable for patients with shoulder instability. Each question has 5 answers (score range from 1 to 5 for each question). The overall score ranges from 12 (best) to 60 (worst).

These questions examine both pain and the impact of the disease on quality of life. (OSS) is short, practical, reliable, valid and clinically sensitive [9]. The use of this questionnaire in evaluating the impact of interventions on the population has been retrospectively valid [8]. An 8-question Constant Shoulder Score (CSS) questionnaire was used to check shoulder function. Patients were invited for a visit and necessary explanations were given to the patients about the purpose of the study. Verbal and written consent was obtained from the patients to enter the study. According to the information in the file and interview and examination, demographic information including age, gender, occupation, underlying diseases were collected. And Oxford Shoulder Score and Constant Shoulder Score questionnaires were presented to the patients before, 6 and 12 months after the surgery, and after the patients answered, the information related to the questionnaires was collected. Meanwhile, to check the amount of tear, 6 and 12 months after surgical repair, MRI was performed on the patients. In order to analyze the data, descriptive indices including frequency, frequency percentage, mean and standard deviation were used. Data were entered and analyzed in SPSS software version 21.

Results and Discussion

This study aims to investigate the functional results and the rate of re-rupture in patients with rotator cuff tears who were treated by open surgical repair in Golestan and Imam Khomeini hospitals in Ahvaz, 40 patients who were diagnosed with RTC between 2018 and 2022. They underwent mini-open surgery and were included in the study. Demographic information of the patients was extracted from the patient file and after contacting the patient and obtaining informed consent, Oxford Shoulder Score and Constant Shoulder Score questionnaires were provided to the patients. Questionnaires were filled before surgery, 6 and 12 months after surgery. **Table 1** shows the distribution of the

demographic variables of the patients before surgery, 6 and 12 months after surgery. There were 40 patients in total, and six months after surgery, six patients were excluded from the study, and one year after surgery, four more patients were excluded from the study. The result of chi-square test showed no significant difference in the distribution of variables of age, sex, occupation and weight of patients at a significance level of 0.05 and with 95% confidence (p value < 0.05). In **Table 2**, the mean score of OSS questionnaire is expressed in terms of distance from surgery. Repeated measures were compared at the significant level of 0.05 at preoperative, 6 and 12 months after surgery. The OSS questionnaire consists of 12 questions ،each with 1 to 4 points. The results showed significant difference between OSS score in pre-surgery, 6 and 12 months after surgery (p value > 0.05). In **Table 3**, shoulder function scores are expressed using CSS questionnaire based on surgical distance. The CSS questionnaire consists of 8 questions with different options ranging from 3 to 10 options. The results showed that there was a significant difference between shoulder function scores in pre-surgery, 6 and 12 months after surgery (p value > 0.05). **Table 4** shows the rate of retear in the rotator cuff using MRI. Before surgery, 12 patients had retear in the rupture. After 6 and 12 months, the patients were examined by MRI only 3 patients had a rotator cuff tear one year after reoperation. Using Fisher's exact test, the frequency of retear was compared at the significance level of 0.05 in three study periods which showed no significant difference (p value < 0.05). In **Table 4**, the rate of retear of patients 6 and 12 months after surgery
is based on age, sex, weight and occupation. The results of chi-paired test showed a significant difference in age, weight and occupation variables (P value > 0.05).

Repairing large and extensive rotator cuff tears has been a difficult task for a long time. The tendons are retracted and the muscle changes similar to fatty tissue. Despite many efforts, some surgeons are not able to close the structural defects created in the muscles. The common perception is that residual structural defects are directly associated with unsuccessful results. The highest prevalence of wide rotator cuff tears is in the middle-aged, which are caused by wear and tear with age, and people over 40 years old are at greater risk [17], in our study, the highest incidence of this complication is between the ages of 39 and 58 years. Was. Depalma and his colleagues showed that the incidence rate of rotator cuff tears increases steadily after the fifth decade of life [18]. Other studies have also shown rotator cuff tears in 7 to 20 percent of cases in old age. This result suggests the fact that this process is part of the aging process [15]. The selected approach to repair rotator cuff tears depends on the type and quality of the remaining tissue. Previously, in the case of complete and extensive tears, a full course of non-surgical treatment was recommended, but today they believe that complete tears should be repaired in any case. except in elderly and sedentary people or in cases where achieving a reliable repair is doubtful. If the surgical repair is delayed, fat degeneration and atrophy occur in the tendon. Evaluation of the results of rotator cuff reconstructive surgery, whether open or arthroscopic, has been the subject of various studies. Pain is caused by damage and inflammation of the rotator cuff tendon due to the accumulation of calcium in the muscle. Calcium builds up slowly over time. The body responds to this inflammatory tissue by accumulating calcium. Generally, patients have a history of shoulder pain. In the studied patients, 100% of the patients complained of shoulder pain at night before surgery, and this rate reached about 49% after six months of surgery, and one year after surgery, almost none of the patients complained of shoulder pain at night. In similar studies, without differentiating incomplete from complete rupture, the night pain reduction rate was 50 to 90 percent [16]. Studies have shown that engaging in some activities that require frequent overhead arm movements, such as carpentry or house painting, can damage the rotator cuff over time [19]. In our study, workers and pregnant women (35.5 and 22.5 percent) were the most occupational groups who suffered from rotator cuff tears. Although the family history of the patients was not investigated in our study, the investigation showed that a genetic component may be involved in rotator cuff injuries, because it seems that these injuries are more common in certain families [20]. In many sources, rotator cuff tears are called an athlete's disease, some types of rotator cuff injuries are more common in people who participate in sports such as baseball, tennis, and weightlifting [19]. In the present study, two cases of patients were athletes, the point of interest is that athletes are in a younger age group. In many studies, there is no significant difference in the distribution of the disease in men and women. In this study, the proportion of male and female patients was almost equal. However, in occupational studies or studies conducted exclusively on athletes, the percentage of male patients is usually higher. Retear or retear, especially if the first tear is larger
than 3 cm, may occur in many patients a few months after surgery. A retear that causes severe pain or loss of motion may require surgery, and the most accurate method for detecting a retear in all patients is MRI. According to the meta-analysis study by Roy *et al.*, the sensitivity and specificity of MRI for detecting complete and extensive tears is 96% and 97%, respectively. However, depending on which area the tear occurs, this rate is different, until the sensitivity and specificity of 100 is related to complete tears of the long head of the biceps muscle, which according to its location and the possibility of easier comparison of clinical findings and It is clinically significant. The lowest sensitivity in detecting a complete tear is related to the subscapularis tendon, which due to its location and the posterior shadow caused by the coracoid, less accuracy to detect its complete tears can be justified [21]. Therefore, in cases where we doubt the complete rupture of this tendon, MRI is an accurate method. In the present study, retear was not seen in the examination six months after surgery, but in 25 patients who were re-examined within one year after surgery, 3 patients had rotator cuff tears again. Studies have shown that retear is highly dependent on age, occupation and extent of initial tear. Considering that all patients in this study had extensive rotator

cuff tears, they had the same chance in this regard. All three cases of retear in this study occurred in the age group of 50 to 59 years, and the occupation of the patients was usually heavy. If the age variable is not taken into account, what affects the rate of retear more than other factors is the job. The results of the study by Diebold G *et al*. also showed that the risk of retear increases significantly for every ten years of age, in patients aged 50 to 59 years, the rate of retear is close to 10%, 15% in patients 60 to 69 years old, and 25% in patients 70 years old. It is possible to retear up to 79 years and more than 34% in patients over 80 years old. The Diebold G study was a study with a sample size of 1,600, so the high sample size of the study made it possible to examine subgroups of age groups [22]. One of the vulnerable areas of the body is the shoulder area, and one of the methods of evaluating the upper limb and the shoulder is evaluation using the shoulder functional test. In our study, the shoulder function score was measured at three examination times in patients using css questionnaire, which were significantly different, and the surgery was able to increase and improve the shoulder function. In Sadeghi Far's study, the amount of shoulder function 6 and 12 months after surgery showed a significant difference, although in that study, the questionnaire of shoulder and knee surgeons of America was used to check shoulder function. In the present study, while using the acceptable criterion of Score Constant to evaluate the outcome of repair in cases of rupture, it was shown that open surgical repair of the rotator cuff is associated with very good results. In addition, after 6 to 12 months of surgery, the results showed significant improvement, studies have shown that time is an important factor in evaluating the outcome of this operation. In fact, it has been shown in many studies that the analysis of response to treatment should be done at least one year after the operation, because at least one year is enough time to gain muscle strength after recovery [23, 24]. In addition to the small sample size, the weakness of our study is the relatively short follow-up of patients because there is a possibility of recurrence and tendon rupture in the following years. In this study, we showed that the mid-term results of the surgical treatment of complete rotator cuff tear repair are very satisfactory, especially in terms of pain relief and reduction. The severity of the clinical symptoms before the operation, which indicates the severity of the disease, has a negative effect on the result of the surgery. Finally, studies with long-term follow-up are recommended for more accurate evaluation of surgical results.

Conclusion

A complete rotator cuff tear is repaired by suturing the tendon back to its original location in the humerus. Advances in surgical techniques for rotator cuff repair include less invasive procedures. While each of the available methods has its own advantages and disadvantages, the goal of all of them is to heal the tendon. The type of repair performed depends on various factors, including the size of the tear, anatomy, and the quality of the tendon and bone tissue. Shoulder surgery along with rotator cuff repair is very effective in people with tendon tears, and after surgery, performance is improved and pain is reduced.

Table 1. Distribution of variables of age, sex, occupation and weight of patients

Variable		Before surgery	6 months after surgery	12 months after surgery	P value
Age	18-38	(12.5 %) 5	(12.5 %) 4	(12.5 %) 5	0.074
	39-58	(55.0%) 22	(59.4 %) 19	(55.0%) 22	
	59-78	(27.5 %) 11	(28.0 %) 9	(27.5 %) 11	
	> 79	(5.0 %) 2	(0.0%) 0	(5.0 %) 2	
Gender	Female	(52.5 %) 21	(53.2 %) 17	(52.5 %) 21	0.100
	Man	(47.5 %) 19	(46.8 %) 15	(47.5 %) 19	
Job	Housewife	(22.5 %) 9	(21.8 %) 7	(22.5 %) 9	0.321
	Worker	(32.5 %) 13	(31.3 %) 10	(32.5 %) 13	
	Employee	(15.0 %) 6	(15.6 %) 5	(15.0 %) 6	
	Athlete	(5.0 %) 2	(6.3 %) 2	(5.0 %) 2	
	Retired	(25.0 %) 10	(25.0 %) 8	(25.0 %) 10	
Weight	< 60 kg	(2.5 %) 1	(3.1 %)1	(2.5 %) 1	0.123
	60-69	(17.5 %) 7	(16.5 %) 5	(17.5 %) 7	
	70-79	(22.5 %) 9	(21.8 %) 7	(22.5 %) 9	
	80-89	(30.0 %) 12	(28.1 %) 9	(30.0 %) 12	
	90-99	(22.5 %) 9	(25.0 %) 8	(22.5 %) 9	
	> 100	(7.5 %) 3	(6.2 %) 2	(7.5 %) 3	

Table 2. Mean score of OSS questionnaire before, 6 and 12 months after surgery

Check Time	Mean	Standard Deviation	Confidence Interval	P value

Before surgery	17.3	7.4	2.5-32.1	
6 months afterm surgery	27.9	6.8	14.3-41.5	0.027
12 months after surgery	31.8	7.2	17.4-46.2	

Table 3. Mean score of CSS questionnaire before, 6 and 12 months after surgery

Check Time	Mean	Standard Deviation	Confidence Interval	P value
Before surgery	43.9	6.8	30.3-57.5	
6 months afterm surgery	58.4	8.3	41.8-75.0	0.047
12 months after surgery	71.5	5.7	60.1-82.9	

Table 4: Retear rate using MRI, 6 and 12 months after mini open surgery based on age, gender, weight, and occupation

Variable		6 months after surgery	12 months after surgery	P value
	18-38	0(0.0%)	0(0.0%)	
Age	39-58	0(0.0%)	0(0.0%)	
	59-78	0(0.0%)	3(12.0 %)	0.162
	> 79	0(0.0%)	0(0.0%)	
	NO	(100.0 %)	22 (88.0 %)	
Gender	Female	0(0.0%)	2(8.0 %)	
	Man	0(0.0%)	1 (4.0 %)	0.094
	NO	32 (100.0 %)	22 (88.0 %)	
	Housewife	0(0.0%)	2(8.0 %)	
	Worker	0(0.0%)	1(4.0 %)	
Job	Employee	0(0.0%)	0(0.0%)	0.133
	Athlete	0(0.0%)	0(0.0%)	
	Retired	0(0.0%)	0(0.0%)	
	NO	32(100.0 %)	22 (88.0 %) 22	
	< 60 kg	0(0.0%)	0(0.0%)	
	60-69	0(0.0%)	0(0.0%)	
Weight	70-79	0(0.0%)	0(0.0%)	0.214
	80-89	0(0.0%)	2(4.0 %)	
	90-99	0(0.0%)	1(2.0 %)	
	> 100	0(0.0%)	0(0.0%)	
	NO	32 (100.0 %)	22(88.0 %)	

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