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Long-term results of open surgical repair of rotator cuff tears

Rotator kılıf yırtıklarında açık cerrahi onarımın uzun dönem sonuçları

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Amaç: Rotator kılıf yırtıklarının açık cerrahi ile tedavisinin uzun dönem sonuçları değerlendirildi.

Çalışma planı: Çalışmada rotator kılıf yırtığı nedeniyle açık cerrahi tamir ve akromiyoplasti uygulanan 88 hastanın (36 kadın, 52 erkek; ort. yaş 57; dağılım 36-75) 90 omzunda uzun dönem sonuçlar değerlendirildi. Ameliyat sonrasında üç aşamalı rehabilitasyon programı uygulandı. Objektif değerlendirme Constant-Murley skorlama sistemiyle yapıldı. Ağrı subjektif olarak görsel analog skala kullanılarak ölçüldü. Ortalama izlem süresi 61 ay (dağılım 24-102 ay) idi.

Sonuçlar: Ameliyat öncesinde 41.7 (dağılım 12-82) bulunan Constant-Murley skoru ortalaması, ameliyat sonrası dönemde 79.7'ye (42-100) yükseldi ($p<0.0001$). Görsel analog skala ortalama skoru ameliyat öncesinde 7.5 (dağılım 4-10), ameliyat sonrasında 1.25 (dağılım 0-5) bulundu ($p<0.0001$). Sadece sekiz hastanın (%9) ameliyattan memnun olmadığı öğrenildi. Ameliyattan memnun olan 80 hastada (%91) gece uyku düzeni ve günlük aktivitelere dönüş sağlandı. Hastaların hiçbirinde cerrahi sonrası sinir paralizisi ve omuz fonksiyon kısıtlılığına rastlanmadı. İki hastada (%2.2) yüzeyel yumuşak doku enfeksiyonu gelişti ve pansumanlarla iyileşti.

Çıkarımlar: Açık cerrahi tedavi ve akromiyoplastinin uzun dönem sonuçları, yöntemin rotator kılıf yırtıklarının tedavisinde etkili olduğunu göstermektedir.

Anahtar sözcükler: Hasta memnuniyeti; hareket açıklığı, artiküler; rotator manşet/yaralanma/cerrahi; omuz/yaralanma/cerrahi/radyografi; omuz eklemi/fizyopatoloji; tendon yaralanmaları; tendon, paraartiküler/yaralanma.

Objectives: We evaluated the long-term results of rotator cuff tears treated by open surgical repair.

Methods: Ninety shoulders of 88 patients (36 females, 52 males; mean age 57 years; range 36 to 75 years) with rotator cuff tears were treated by open surgical repair and acromioplasty. A three-staged rehabilitation program was implemented following surgery. Objective evaluations were made with the use of the Constant-Murley scoring system. Pain was assessed through a visual analog scale. The mean follow-up period was 61 months (range 24 to 102 months).

Results: The mean Constant-Murley score increased from preoperative 41.7 (range 12 to 82) to postoperative 79.7 (range 42 to 100) ($p<0.0001$). The mean preoperative and postoperative pain scores were 7.5 (range 4 to 10) and 1.25 (range 0 to 5), respectively ($p<0.0001$). Only eight patients (9%) showed dissatisfaction with the surgical outcome. The remaining 80 patients (91%) were satisfied with the outcome and returned to their previous night comfort and daily activities. None of the patients had postoperative nerve palsy or limitations in shoulder functions. Two patients (2.2%) developed superficial soft tissue infections that disappeared following multiple wound debridements.

Conclusion: Our long-term results favor open surgical repair and acromioplasty in the treatment of patients with rotator cuff tears.

Key words: Patient satisfaction; range of motion, articular; rotator cuff/injuries/surgery; shoulder/injuries/surgery/radiography; shoulder joint/physiopathology; tendon injuries/surgery; tendons, para-articular/injuries.

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The results of surgical procedure in rotator cuff tears have been widely studied. There are several treatment methods.[1] At present, the postoperative complication rate of widely used atroscopic method is lower than the open repair. [1, 2]

Although atroscopic and mini open-cuff repairs have been more frequently preferred in our clinic since 2000, the monitoring period is insufficient for these cases. In the present study, objective and subjective results of 90 shoulders, which were followed up for an average of 61 months following an open cuff repair operation were evaluated in comparison to other studies.

Patients and method

110 shoulders of 102 patients with the main complaints of shoulder pain, limited range of motion and non-responding to the conservative treatment were treated by open rotator cuff repair and acromioplasty between 1990-2001. All the operations were performed by the same surgeons (MB, OG). The patients with proximal humerus tears, shoulder instability and rheumatoid arthritis or with shoulder prosthesis were excluded. Fourteen patients who did not comply with the study criteria were also excluded during the evaluations. Ten of these patients had internal problems while 4 didn't show up for the follow-up. The study continued with 90 shoulders of eighty-eight patients (36 female, 52 male; mean age 57 years; range 36 to 75 years). Two patients with two-sided rotator cuff tears were operated twice in a two years period. Seventy-five patients were mainly using the right arm, with 18 patients using the left. For diagnosis, physical examination, magnetic resonance monitoring (MRM) and artrography were used. During the pre- and post-operative physical examinations, the main concerns were motion range and strength. The active and passive motion ranges were assessed with goniometry. Abduction, flexion, extension, internal and external rotation were also studied. The strength was measured in abduction maneuverability. The patients received Constant & Murley's shoulder function scoring test and visual analog scale for pain evaluation before the operation and after a mean 61 months (range from 24 to 102 months) of follow-up. Furthermore, MR monitoring was performed in order to identify any tear that may reoccur in patients with on-going complaints during the follow-up.

The rotator cuff was reached by anterior-superior method. After the tears were identified, all patients underwent acromioplasty by means of modified Neer method. The size of the rotator cuff tear was graded according to the area it covered. Thus, the definitions were as follows: less than 1 cm, small; between 1 and 3 cm, moderate; between 3 and 5 cm, large; and 5 cm and over 5 cm, massive (Table 1). [3-5] Two ethibonds were repaired using non-absorbable polyfilament sewing (tendon to tendon and tendon to bone method) with the Mason-Allen sewing method. [3-5] One-week postoperative immobilization was followed by a three-stage rehabilitation program, varying depending on the extent of the tear. [5]

During the immobilization and rehabilitation period, the small and moderate tears were monitored by forearm-suspension and the large and massive tears by shoulder-abduction device. The active motions started one month after the surgery, and the full load was allowed two months after the surgery. For statistical analysis, dual and non-dual specimen t-test and one-sided variance analysis (ANOVA) were used.

Table 1. The intra-operative evaluation of rotator cuff tear

Structure of rotator cuff tear	Number	Percentage
Size		
Small (<1 cm)	18	20.0
Moderate (1-<3 cm)	40	44.4
Large (3-<5 cm)	22	24.4
Massive (≥5 cm)	10	11.1
Location		
Supraspinatus	68	75.5
Supraspinatus and infraspinatus	12	13.3
Supraspinatus and subskapularis	7	7.7
Supraspinatus, infraspinatus and subskapularis	3	3.3
Form of tear		
Longitudinal	16	17.7
Transverse	18	20.0
Longitudinal and transverse	42	46.6
Triangular	14	15.5
Number of operated shoulder	90	

Table 2. Objective and subjective evaluations on open rotator cuff tear repair

	Constant-Murley score (mean)			Improved night sleep		Patient satisfaction	
	Preoperative	Postoperative	*p*	Number	Percentage	Number	Percentage
Small tear	40.6	83.3	<0.0001	18/18	100	18/18	100
Moderate tear	38.1	76.9	<0.0001	37/40	92.5	38/40	95.0
Large tear	48.54	81.9	<0.0001	18/22	81.8	19/22	86.3
Massive tear	34.0	78.0	<0.0001	7/10	70.0	8/10	80.0

Results

The mean Constant-Murley score, which was 41.7±24.7 (range from 12 to 82) during the pre-operative period increased to 79.7±13.63 (range from 42 to 100) during the post-operative period (p<0.0001). The preoperative and postoperative Constant-Murley scores are shown in Table 2 according to the size of the tears.

Sixty-two (75.5%) patients were able to put their hands on their head, elbow being in front. Seventy-two (80%) patients were able to raise their arm forward up to 160 degrees, and 82 patients (91%) were able to extend their hand up to the dorsal vertebrae on the back. Sixty-three patients (70%) were able to raise loads over 10 kg during abduction. The mean preoperative and postoperative scores for visual analog scale were 7.5±1.69 (range from 4 to 10) and 1.25±1.32 (range from 0 to 5) respectively (p<0.0001) (Figure 1). Furthermore, it has been found that eighty-one patient (90%) had better night sleep and reduced pain. Twenty-seven (30%) patients were able to use their shoulders without any limitation, even though they had a little pain. Eight patients (9%) reported dissatisfaction. Eighty (91%) patients were satisfied with the surgical outcome and they returned to their daily activities. None of the patients experienced postoperative nerve palsy or limitations in shoulder functions. The eight dissatisfied patients with on-going postoperative symptoms underwent MR monitoring with no repeated formation of tears. Two patients (2.2%) developed superficial soft tissue infection, which disappeared following wound debridement.

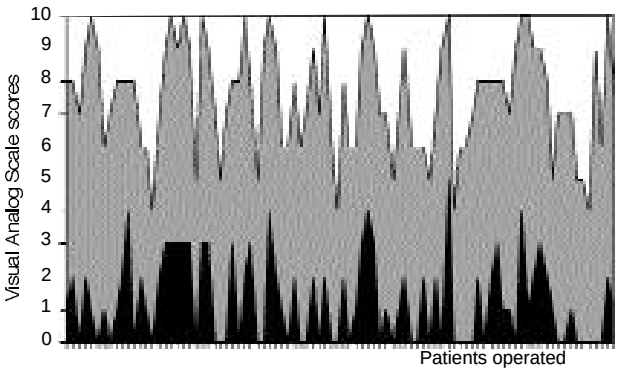

Figure 1. Remarkable decrease in postoperative scores (black zone) of visual analogue scale compared to preoperative scores (gray zone).

Discussion

The rotator cuff tear generally affects the 40-70 ages group. [1] The cadaver studies showed that one third of the patients over 60 years of age had rotator cuff tear. [1, 2, 6] It has been thought that the etiology of rotator cuff tear depends on many, but mainly on two factors, which are the tensile stress of tendon and the load on the rotator cuff. [1 - 3, 6, 7] As a result of the load on shoulder, almost all of the patients over 60 years of age develop acute trauma. [1] Repeated actions, even though they are fewer, can also become a cause of rotator cuff tear. The pain usually appears during resting or sleeping in the elderly patients.[1, 2, 6] There may be no remarkable history of trauma in such patients. The first line therapy for rotator cuff tear is usually physical therapy, however physical therapy leads to continued pain and shoulder dysfunction.[4, 5, 8 - 1 0] Therefore, conservative therapy should be considered for patients who are away from active life, who have medical conditions due to some other reasons, and who cannot use their upper extremities actively. [9, 1 0] For cases not responding to the physical therapy, and with full-layer tears, surgery should be considered.[1 - 4, 6, 7]

The success of rotator cuff tear surgery is associated with reduced pain and reconstruction of shoulder functions. Adamson and Tibone[11] reported that the success rate was 80% after a mean 10 years

follow-up for 30 patients who underwent open rotator cuff repair surgery. Bigliani et al. [1 2] found that the success rate was 85% in a mean 7-years follow-up period for 61 patients. In our study, the mean Constant-Murley score increased from 41.7 to 79.7, and 91% of the cases were satisfied with the surgical outcome. The latest evaluations showed that the increase in Constant-Murley scores was significant for each size ($p<0.0001$). The scores of 83.3 and 76.9 for small and moderate tears respectively, and 81.9 and 78 for large and massive tears respectively show that the open surgical repair method has a high success rate ($p<0.0001$). These results seem to be mostly in compliance with the results of other studies. [1 - 4, 6, 7] We noticed that the mean score for massive tears (78) was high compared to the ones found in other studies. [1- 4, 6, 7] When the patients were asked about their pain subjectively, the mean score of visual analog scale was found to decrease around 80% ($p<0.0001$) (Figure 1). It has been reported that there is a 13-68 % of reoccurrence in tears following open rotator cuff repair surgery. [13] We had MR monitoring for patients with ongoing symptoms during early follow-up, however we couldn't obtain any findings, which support this. For shoulders with no symptoms, MR evaluation was not necessary due to the decrease in follow-up scores. But it is also important to note that repeatable tears can appear without symptoms, therefore an MR monitoring may be required.

We found that the mean age of the patients with open rotator cuff repair surgery was similar to the values reported in the literature.[1,2,6] It has been reported that the elderly patients had more extensive cuff tears, that they had weak adherence to bones, and that it increased according to age. [1,2,6,7] We have found that the patients over 65 years of age had more extensive tears (Figure 2), and the postoperative results were worse, irrespective of the gender. Furthermore, patients with more limited preoperative shoulder mobility and more weakness had more extensive tears. And, for patients who had a longer preoperative waiting period, the Constant-Murley scores were lower after the surgery.

The necessity for acromioplasty during rotator cuff repair surgery is uncertain. [1, 2, 6] All patients, who participated in our study, underwent anteroinferior acromioplasty procedure. Acromioplasty is recommended particularly to enable room for rotator cuff tendons, to improve the quality of tear repair by providing a better surgical sight, to ensure tendon protection during the course of treatment, to prevent pinching, to improve rehabilitation and to decrease postoperative pain, and it has been routinely used. [1 - 4, 6, 7, 11, 1 2, 1 4, 1 5] The extremities of patients with large and massive tears are immobilized postoperatively during the rehabilitation period by holding the shoulder in suspension, which keeps the joint in abduction (shoulder abduction device). This method reduces the postoperative pain and tension on the repaired tissue, and prevents early active movements. [1, 2] A 4-6 week period is necessary before the patient is able to start passive exercise during the early period.

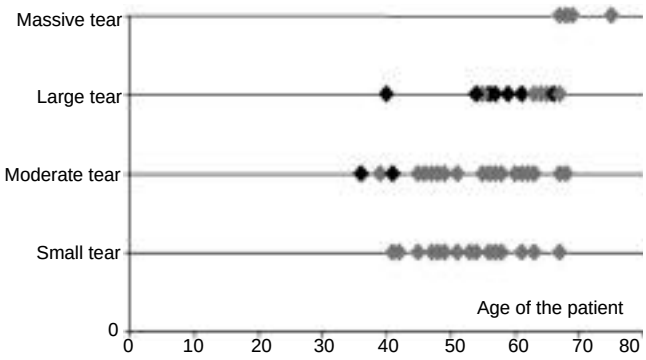

Figure 2. It is observed that tears in patients over the age of 65 are larger.

In conclusion, open repair surgery of rotator cuff tears and acromioplasty efficiently improve the comfort, active motion range and strength of patients. Presence of biceps injury, particularly, is a negative factor influencing the prognosis. If the tear is less than 6 cm and biceps tendon is firm, better outcomes may be expected after the surgery. Although the use of artroscopic repair of rotator cuff tears has recently increased, no late-period results are available. However, open surgery repair with longer follow-up results combined with acromioplasty reduces the postoperative pain of patients, and it makes it possible to set up the range of shoulder motion to any level required.

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