Research Article / Araştırma Makalesi

Mid-Term Functional Outcomes Of Arthroscopic Rotator Cuff Repair In Patients With Or Without Frozen Shoulder: A Single-Center Retrospective Cohort Study

Donuk Omuzu Olan ve Olmayan Hastalarda Artroskopik Rotator Manşet Onarımının Orta Dönem Fonksiyonel Sonuçları: Tek Merkezli Retrospektif Kohort Çalışması

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Özet: Donuk omuzun eşlik ettiği rotator manşet yırtığı (RMY), ortopedistler için zorlu bir durumdur; çünkü RMY'ler sıklıkla ameliyat sonrası korunma gerektiren cerrahi onarımla tedavi edilirken, donuk omuzun tedavisi omuz ekleminin hareket açıklığını yeniden sağlamak için fizik tedavidir. Bu patolojilerin aynı anda ortaya çıkması durumunda ideal tedavi konusunda fikir birliği yoktur. Çalışmanın temel amacı donuk omuz omuz eşlik eden veya etmeyen RMY onarımının orta dönem fonksiyonel cerrahi sonuçlarını karşılaştırmaktır. Ocak 2021 ile Ocak 2023 tarihleri arasında kurumumuzda tam kat RMY sebebi ile artroskopik onarım yapılan hastalar retrospektif olarak incelendi. Hastalar artroskopik onarım sırasında donuk omuzu olan ve olmayanlar olarak iki gruba ayrıldı. Donuk omuzlu hastalara genel anestezi altında manipülasyon yapıldı ve RMY onarımı öncesinde rotator intervalleri radyofrekans ile gevşetildi. Hastaların son kontrollerinde görsel analog ağrı skoru (VAS), ASES, Constant skoru ve University of California Los Angeles (UCLA) skorları karşılaştırıldı. Ortalama 23,9 ± 2,7 ay takip süresine sahip toplam 39 hasta (19 donuk omuz ve 20 donuk omuz olmayan) çalışmaya dahil edildi. Son takipte iki grupta ortalama VAS, ASES, UCLA ve Constant skorlarında istatistiksel fark yoktu. Bu çalışmanın bulguları, donuk omuz patolojisinin ameliyat sırasında ele alınması durumunda, ameliyat öncesi donmuş omuzun artroskopik RMY onarımı üzerinde olumsuz bir etkisinin olmadığını göstermektedir.
Anahtar Kelimeler: Adeziv Kapsülit, Omuz Artroskopisi, Omuz Sertliği, Rotator Kılıf

Abstract: Rotator cuff tear (RCT) accompanied by frozen shoulder is a challenge for orthopedic surgeons as RCTs are often treated with surgical repair which need protection of repair, whereas the treatment for frozen shoulder is physical therapy to restore the range of motion of the shoulder joint. There is no consensus for the ideal treatment if those pathologies occur at the same time. The primary aim of the study is to compare the mid-term functional surgical outcomes of RCT repair in patients with or without frozen shoulder. Patients who underwent arthroscopic repair for full-thickness RCT in our institution between January 2021 and January 2023 were retrospectively reviewed. Patients were divided into two groups: with or without frozen shoulder at the time of arthroscopic repair. Patients with frozen shoulder underwent manipulation under general anesthesia and their rotator interval was released with a radiofrequency prior to RCT repair. Patients' visual analog pain score (VAS), Constant score, ASES score, and University of California Los Angeles (UCLA) scores were compared at their latest follow-up. A total of 39 patients (19 frozen and 20 non-frozen shoulders) with a mean 23.9 ± 2.7 months of follow-up were included in the study. At the latest follow-up, there was no statistical difference in frozen and non-frozen groups in the mean VAS, ASES, UCLA, and Constant scores. The findings of the present study suggest that preoperative frozen shoulder does not have a negative impact on arthroscopic RCT repair, if frozen shoulder pathology is addressed during surgery.
Keywords: Adhesive Capsulitis, Shoulder Arthroscopy, Shoulder Stiffness, Rotator Cuff

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1. Introduction

Rotator cuff tears (RCT) are frequent pathologies around the shoulder region and the leading cause of shoulder dysfunction. Arthroscopic RCT has good to excellent success in the treatment of RCTs. Davey et al. reported in their systematic review that arthroscopic RCT repair has high patient satisfaction and satisfactory clinical outcomes at a minimum of 10 years of follow-up (1).

The incidence of primary frozen shoulder is reported as 2% to 5% in the general population (2). Frozen shoulder is associated with restriction in the range of motion (ROM) and pain depending on the stage of the disease. In addition, shoulder stiffness after arthroscopic RCT repair is well-known complication. Tauro et al. reported preoperative shoulder stiffness is associated with postoperative shoulder stiffness after arthroscopic RCT repair (3). Therefore, in patients suffering from RCT and Frozen shoulder simultaneously, previous literature recommended treatment of frozen shoulder first, and a delayed arthroscopic RCT repair (4). This staged approach causes a delay in the RCT treatment and patients often complain about long treatment periods. However, Sabzevari et al. reported recently that simultaneous surgical treatment of RCT and shoulder stiffness had comparable outcomes to the surgical treatment of RCT in patients without preoperative stiffness (5). Given those conflicting opinions regarding patients with RCT and frozen shoulder, there is no consensus in the literature regarding the optimum treatment for this shoulder pathology. The aim of this study was to compare the clinical outcomes of surgical treatment in patients with RCT and frozen shoulder and patients with only RCT in mid-term follow-up.

2. Materials and Methods

Patients who underwent arthroscopic rotator cuff repair in our institution between January 2021 and January 2023 were retrospectively reviewed after obtaining local ethic committee approval. A written informed consent was obtained from each patient. The study was conducted in accordance with the principles of the Declaration of Helsinki. Patients with a partial rotator cuff rupture, had a previous history of shoulder surgery on the same side, aged below 18 years of age, had follow-up less than 12 months, had additional shoulder pathology including calcific tendinitis, superior labrum anterior-posterior lesion, and acromioclavicular or glenohumeral arthritis were excluded. The patients who met the inclusion criteria with full-thickness RCT were included in the study. The patients were divided into two groups whether they had frozen shoulder at the time of surgery or not. Patients who had restricted active assisted shoulder range of motion: less than 120° for forward flexion, less than 30° for external rotation, and less than the L3 level for internal rotation at the back, had visually identifiable limited active ROM compared to the contralateral shoulder were diagnosed with frozen shoulder (6).

Patients' demographics and past medical history data were obtained from our institutional electronic medical records system. Patients' visual analog pain scores (VAS), American Shoulder and Elbow Surgeons (ASES) scores, University of California Los Angeles (UCLA) scores, and constant scores were compared at their latest follow-up. A post graduate year-3 (PGY-3) orthopedics resident who was blinded to the preoperative status of the patients performed the functional examination.

2.1. Surgical technique

Patients with frozen shoulder underwent manipulation under general anesthesia in the supine position. Then the lateral decubitus position was secured, and all the procedures were performed on that position under general anesthesia. All the patients with frozen shoulder had inflamed hyperemic capsules (Figure 1). Following the diagnostic shoulder arthroscopy (Figure 2), the rotator interval was released with a radiofrequency device in patients with frozen shoulder. Then the scope was administered to the subacromial space. A subacromial decompression was performed and the RCT was identified and repaired with the double-row technique. Following the repair, the stability of the repair was

confirmed with probe examination, then acromioplasty was performed.

Figure 1. Hyper inflamed rotator interval in frozen shoulder group.

Figure 2. Normal appearance of rotator interval in a patient in non-frozen shoulder group.

2.2. Post-operative rehabilitation

All the patients were treated with the same post-operative rehabilitation protocol. All patients were immobilized with an abduction brace for 4 weeks. Passive ROM exercises were initiated after 4 weeks. Once the full passive ROM was obtained, active ROM exercises were started. Strengthening exercises were started after 10 weeks.

2.3. Statistical analysis

Descriptive statistics were expressed as mean ± standard deviation for continuous numerical variables, categorical variables were expressed as the number of patients and percentage. Distribution of variables was measured with the Kolmogorov-Smirnov test. Statistical analysis was performed for continuous variables with student t-test and Mann Whitney-U test when appropriate. Categorical variables were compared with Pearson Chi-square test. A priori power analysis was performed for the primary outcome (ASES score) according to the previous study by Jeong et al. Utilizing an alpha value of 0.05 and beta of 0.80, the estimated sample size required at least 16 patients per cohort or 32 total patients to obtain 0.8 actual power. Statistical analysis was performed with SPSS v23.0 (IBM SPSS Statistics for Windows, v23.0. Armonk, NY: IBM Corp.). Level of confidence was set at 0.05.

3. Results

A total of 39 patients met the inclusion criteria and were included in the study. There were 19

patients in the frozen shoulder group while there were 20 patients in the non-frozen shoulder group. The mean follow-up of the patients was 23.9 ± 2.7 months. There was no statistical difference in the baseline demographics and the mean follow-up time of the groups. (Table 1)

Table 1. Demographics and mean follow-up time of the patients in both groups. (M: male, F: female, R: right, L: left)

	Frozen shoulder group (n=19)	**Non-frozen shoulder group (n=20)**	**P value**
Mean age (years)	63.1 ± 10.2	59.2 ± 7.6	0.258
Gender (M/F)	7/12	9/11	0.268
Side (R/L)	14/5	9/11	0.069
Mean follow-up (months)	23.4 ± 3.1	24.4 ± 2.3	0.184

Of the 19 patients in the frozen shoulder group at the latest follow-up, 9 patients were very satisfied, 7 patients were moderately satisfied, 1 patient was neutral, and 2 patients were dissatisfied. Of the 20 patients in the non-frozen shoulder group, 15 were very satisfied, 5 were moderately satisfied, and there were no dissatisfied patients.

At the latest follow-up, there was no statistical difference in the mean VAS, ASES, UCLA, and Constant scores. (Table 2).

Table 2. Comparison of mean functional outcomes in both groups. (VAS: visual analog pain score, ASES score: American Shoulder and Elbow Surgeons Score, UCLA score: University of California Los Angeles scores)

	Frozen shoulder group (n=19)	**Non-frozen shoulder group (n=20)**	**P value**
Mean VAS pain score	2.4 ± 2.5	1.2 ± 1.7	0.101
Mean ASES score	72.8 ± 11.5	73.9 ± 8.8	0.967
Mean UCLA score	29.7 ± 8.1	32.0 ± 3.4	0.879
Mean Constant score	26.3 ± 8.2	27.1 ± 4.9	0.627

4. Discussion

Frozen shoulder is often associated with RCTs (7). There is a dilemma in the literature whether these two pathologies need to be addressed simultaneously or require staged intervention (8). The main finding of the present study was there was no statistical difference in functional outcomes between surgically treated RCTs accompanied by frozen shoulder and RCTs without frozen shoulder at mid-term follow-up. Therefore, it may not be necessary to stage the treatment of patients with RCT and frozen shoulder.

Preoperative frozen shoulder is a risk factor for postoperative shoulder stiffness, especially in the early postoperative period (3). The gold standard treatment for frozen shoulder is physical therapy. In recalcitrant cases, manipulation under anesthesia or arthroscopic capsular release is indicated (9). However, accompanying RCT struggles orthopedic surgeons in decision making as most RCTs require arthroscopic repair, but frozen shoulder can be treated with physical therapy. In addition, in the conservative treatment of frozen shoulder, aggressive physical therapy is

utilized while postoperative protection of RCT repair is recommended (10).

The effect of the presence of frozen shoulder at the time of RCT repair is controversial. Oh et al. their results in patients undergoing RCT repair with or without frozen shoulder at the time of arthroscopic repair surgery. Patients with frozen shoulder underwent manipulation under anesthesia and arthroscopic capsular release prior to RCT repair at the same surgical session. The authors reported no significant difference in postoperative pain scores and clinical outcomes in both groups (11). However, Jeong et al. compared the similar patient cohorts with Oh et al. and suggested patients undergoing RCT repair in the setting of frozen shoulder had similar active ROM but functional outcomes were lower in frozen shoulder group (6). The present study showed no statistical difference in both postoperative pain and functional scores.

The objective definition of frozen shoulder varies in studies examining the effect of frozen shoulder on the functional outcomes after arthroscopic RCT repair. Ho et al. assumed frozen shoulder as forward flexion <135° and abduction <60°(12), McGrath et al. defined forward flexion <90° and external rotation <20°(13). In the present study, the criteria in the diagnosis of frozen shoulder were <120 of forward flexion and <30 of external rotation, limited internal rotation less than L3 level, and any visually identifiable limited active ROM compared to the contralateral shoulder. We believe that different results regarding the effect of frozen shoulder in RCT repair may be due to different assumptions of frozen shoulder thresholds.

The natural course of frozen shoulder is classified into three phases. The first stage includes “freezing stage” in which patients suffer from pain and stiffness that lasts around 6 months. The second stage is the “frozen stage” accompanied by mainly shoulder stiffness that lasts approximately 4 to 20 months. The third stage is the “thawing stage” constitutes pain relief and resolution of stiffness (14). Considering the phases and the inherent self-limiting nature of frozen shoulder and the similar outcomes at mid-term follow-up in both groups, we may argue that the presence of frozen shoulder does not affect the functional outcomes if the frozen shoulder is addressed surgically at the time of RCT repair.

This study has several limitations. This is a single-center retrospective study; thus, it carries the inherent limitations of this study design. The patient population is relatively small. Preoperative functional outcome scores were absent. The ROMs of the shoulders were not included in the outcomes, yet the functional outcomes scores were reported. Although we used the same double-row repair technique in all patients, the morphology of the RCTs may vary thereby the results may be affected. We acknowledge that frozen shoulder is not associated only with RCTs. However, in the present study, both groups had RCTs, but one of those two groups also had frozen shoulder symptoms at the time of surgery. In addition, the comorbidities of the patients were absent but the analysis of the effect of comorbidities on the frozen shoulder group was beyond the aim of the study.

In conclusion, the present study suggests that preoperative frozen shoulder does not have a negative impact on arthroscopic RCT repair, if frozen shoulder pathology is addressed during surgery.

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Ethics

Ethics Committee Approval: The study was approved by Karabük University Noninterventional Clinical Research Ethical Committee (Decision no: 2023/1599, Date: 26.12.2023).

Informed Consent: The authors declared that A written informed consent was obtained from each patient.

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