

Does subscapularis tears combined with supraspinatus tears affect postoperative functional outcomes?

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ABSTRACT

Aims: Roughly 50% of rotator cuff tears includes a tear in the subscapularis tendon. We conducted a comparative analysis of the functional outcomes following arthroscopic repair in patients with a tear in both the supraspinatus and subscapularis tendons, as well as those with a rupture solely in the supraspinatus tendon. Our hypothesis posits that the functional outcomes after surgery for rotator cuff tears, specifically those with tears including subscapularis tendon, are inferior compared to tears that only involve the supraspinatus tendon.

Methods: We classified patients who had arthroscopic repair for a rotator cuff tear in our clinic from January 2017 to April 2022 into two groups. The study comprised patients who received arthroscopic surgery for a diagnosed rotator cuff injury. The study excluded individuals who were younger than 18, individuals with large tears that could not be repaired, individuals with paralabral cysts, individuals with glenohumeral arthritis, individuals who had undergone labrum tear repair or slap lesion repair, individuals with concomitant neurovascular damage, and individuals who had a follow-up period of less than 6 months, patients who benefit from physiotherapy and medical treatment for 6 months. Following the application of exclusion criteria, a total of 39 patients were selected to participate in the study. The presence of a rotator cuff injury was verified through arthroscopy after being detected using clinical tests such as Jobe, drop arm test, Neer sign, lift-off and belly-press tests, and radiographic evidence such as magnetic resonance imaging. Patients who received subscapularis repair together with a supraspinatus tear were categorised as Group 1 (n=14), while those who just had supraspinatus surgery without any subscapularis tears were categorized as Group 2 (n=25). We recorded the demographic information. At the last postoperative outpatient clinic follow-up, both groups were compared in terms of mortality, laboratory parameters, radiological findings, visual analogue scale (VAS), Constant-Murley score¹, American Shoulder and Elbow Surgeons score (ASES)², and University of California Los Angeles (UCLA) scores.³ Postoperative satisfaction levels were categorised into four groups: very satisfied, satisfied, undecided, and dissatisfied.

Results: The groups did not show any significant differences in terms of age, gender distribution, and follow-up periods (p>0.05). There was no statistically significant disparity observed between the groups in relation to VAS, Constant-Murley score, ASES, and UCLA ratings assessed during the final postoperative outpatient clinic follow-up (p>0.05). There were no instances of re-rupture observed in any patient throughout the postoperative follow-up period. The postoperative satisfaction ratings show no significant difference between the two groups (p>0.05).

Conclusion: Our findings indicate that the outcomes of patients who received a surgical repair of rotator cuff tendons including subscapularis were at least as successful as those who underwent surgery for just supraspinatus tendon rupture. There is no basis to believe that arthroscopic repair will have a detrimental impact on the functional outcomes of individuals with rotator cuff tears which includes subscapularis tendon tears.

Keywords: Supraspinatus, subscapularis, shoulder arthroscopy, postoperative function, repair

INTRODUCTION

Surgical intervention is becoming increasingly common in the treatment of rotator cuff injuries, which are quite common.^{4,5} Most rotator cuff injuries primarily affect the supraspinatus tendon, and as the size of the injury increases, it usually progresses posteriorly and involves the infraspinatus tendon.⁶ The size of the rupture is the main determinant of postoperative functional outcomes. However, other factors such as age, fatty degeneration of muscle, diabetes and smoking also affect this situation.⁷

The subscapularis muscle is the strongest of the rotator cuff group and has been ignored for many years during the development of surgical treatment and has been

called the "forgotten tendon".^{7,8} The subscapularis muscle plays an important role in the anteroposterior dynamic stabilization of the shoulder with the infraspinatus and teres minor muscles,^{8,9} and if it is damaged, joint biomechanics is significantly affected.¹⁰ There are studies reporting that only 1% of rotator cuff tears consist of isolated subscapularis tears.^{11,12} However, there have also been studies showing that more than half of rotator cuff tears are accompanied by subscapularis tears.^{13,14} It is predicted that the expected functional results will be worse even after arthroscopic repair of this type of combined tears, and studies comparing post-surgical results seem limited in this regard.⁷

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In our study, we tried to examine the hypothesis that the functional results observed after arthroscopic repair of subscapularis tears accompanying supraspinatus tears would be more negative compared to cases with isolated supraspinatus tendon tears.

METHODS

The approval from the Clinical Researches Ethics Committee of Karabük University has been obtained (Date: 13.12.2022, Decision No: 2022/1204). The procedures adhered to the ethical guidelines and principles outlined in the Declaration of Helsinki.

We retrospectively reviewed the hospital database to review the records of patients who underwent arthroscopic rotator cuff repair in our clinic from January 2017 to April 2022. The study comprised patients who received arthroscopic surgery for a diagnosed rotator cuff injury. The study excluded individuals who were younger than 18, individuals with large tears that could not be repaired, individuals with paralabral cysts, individuals with glenohumeral arthritis, individuals who had undergone labrum tear repair or slap lesion repair, individuals with concomitant neurovascular damage, and individuals who had a follow-up period of less than 6 months, patients who benefit from physiotherapy and medical treatment for 6 months. Following the application of exclusion criteria, a total of 39 patients were selected to participate in the study. The presence of a rotator cuff injury was verified through arthroscopy after being detected using clinical tests such as Jobe, drop arm test, Neer sign, lift-off and belly-press tests, and radiographic evidence such as magnetic resonance imaging. Patients who received subscapularis repair together with a supraspinatus tear were categorised as Group 1 (n=14), while those who just had supraspinatus surgery without any subscapularis tears were categorized as Group 2 (n=25). We recorded the demographic information. At the last postoperative outpatient clinic follow-up, both groups were compared in terms of mortality, laboratory parameters, radiological findings, visual analogue scale (VAS), Constant-Murley score¹, American Shoulder and Elbow Surgeons score (ASES)², and University of California Los Angeles (UCLA) scores.³ Postoperative satisfaction levels were categorised into four groups: very satisfied, satisfied, undecided, and dissatisfied.

Surgical Procedure

A single surgeon conducted all of the procedures. The surgeries were conducted using general anaesthesia while the patient was positioned on lateral decubitus position with 4 kilogrammes of longitudinal traction applied. The glenohumeral joint was examined by first opening the conventional posterior portal. The diagnosis

of a rotator cuff injury was verified by inspecting the subscapularis and supraspinatus tendons by using a probe. Intraoperatively, all subscapularis tendons were evaluated and classified according to Lafosse et al.¹⁵ in Group 1 The subscapularis tendon repaired to its insertion site by a suture anchor. The supraspinatus repairs in both groups were conducted using the transosseous equivalent technique, which was double-row suture bridge fixation according to Park et al.¹⁶ Prior to the repair procedure, all patients received subacromial decompression, bursectomy, and acromioplasty. The supraspinatus attachment site was cleaned by removing debris using a shaver. Based on the tear's size, either one or two double-strand suture anchors were positioned just to the side of the articular cartilage. A knotless anchor was positioned 1 cm away from the supraspinatus attachment site in order to apply pressure to the rotator cuff. Every patient received antibiotic prophylaxis using a first-generation cephalosporin for a duration of 24 hours. Both groups received postoperative analgesia via intravenous and oral routes. Postoperative rehabilitation includes a 2-week period of strict immobilization with a sling with the shoulder in zero degrees of abduction, and postoperative periods 2-6. It involves gradual introduction of protected, passive range of motion over weeks, followed by restoration of active range of motion, followed by gradual strengthening starting at week 12 postoperatively.¹⁷ Every patient was released on the first day following the surgery.

Statistical Analysis

The data was statistically analysed using the Statistical Package for the Social Sciences (SPSS) for Windows version 20.0 (Chicago, IL, USA). Categorical variables were represented using numbers and percentages, whereas numerical variables were provided as mean±standard deviation and minimum-maximum values. The eligibility of numerical data for normal distribution will be assessed using the "Kolmogorov-Smirnov" and "Shapiro-Wilk" tests. Parametric and non-parametric approaches are employed to analyse numerical variables that follow a normal distribution. In the analysis of numerical variables that do not exhibit a normal distribution, For data that follows a normal distribution, the "Independent Samples t test" was employed to determine the difference in means between two independent groups. On the other hand, the "one-way ANOVA" test was used to compare the means of more than two groups. To analyse numerical data that did not exhibit a normal distribution, the "Mann-Whitney U" test was used to determine the median difference between two independent groups. Additionally, the "Kruskal-Wallis H" test was employed to compare more than two groups. The examination of categorical variables among themselves was conducted utilising the "Chi-Square" test statistic when the "Chi-Square" criterion was satisfied and

the "Fisher's Exact Test" statistic when it was not satisfied. The correlation between two numerical datasets was assessed using either the "Pearson" or "Spearman" tests, depending on the fit to a normal distribution. Paired sample statistics, or Wilcoxon tests, were employed to make pairwise comparisons between groups that are dependent on each other. Tests were deemed statistically significant if the p-value, analysed at a confidence level of 95%, was below 0.05.

RESULTS

The patients' demographic and follow-up data are displayed in **Table 1**. There was no statistically significant disparity in age, gender distribution, or follow-up length between patients who underwent subscapularis repair and those who did not ($p > 0.05$).

Table 1. Patient's demographic data comparison

	Total		Group 1 (n=14)		Group 2 (n=25)		p
	$\bar{x} \pm SD$		$\bar{x} \pm SD$		$\bar{x} \pm SD$		
	Mean (Min-Max)	Mean (Min-Max)	Mean (Min-Max)	Mean (Min-Max)	Mean (Min-Max)	Mean (Min-Max)	
Age (year)	59.92±10.00 60 (37-87)	59.71±8.98 59.5 (43-79)	60.04±10.70 60 (37-87)	0.924 ^a			
Follow up (month)	11.67±3.22 10 (7-18)	10.64±3.27 9.5 (7-17)	12.24±3.11 11 (8-18)	0.062 ^b			
	n	%	n	%	n	%	
Gender							0.862 ^c
Male	16	41	6	42.9	10	40	
Female	23	59	8	57.1	15	60	

a: Independent Samples t test, b: Mann Whitney U test, c: Chi-Square test

The average functional score findings of the groups are compared and displayed in **Table 2**. No statistically significant differences were seen between the groups in terms of VAS, Constant-Murley score, ASES, and UCLA scores evaluated at the last postoperative outpatient clinic follow-up ($p > 0.05$). There were no instances of re-rupture observed in any patient throughout the postoperative follow-up period. The postoperative satisfaction ratings show no statistically significant difference between the two groups ($p > 0.05$) (**Table 3**).

Table 2. Functional outcomes comparison

	Total		Group 1 (n=14)		Group 2 (n=25)		p
	$\bar{x} \pm SD$		$\bar{x} \pm SD$		$\bar{x} \pm SD$		
	Mean (Min-Max)	Mean (Min-Max)	Mean (Min-Max)	Mean (Min-Max)	Mean (Min-Max)	Mean (Min-Max)	
VAS	1.79±2.23 1 (0-8)	1.93±1.85 1 (0-5)	1.72±2.45 1 (0-8)	0.443 ^b			
Constant Score	73.41±10.15 77 (39-86)	74.21±6.73 76 (58-81)	72.96±11.74 80 (39-86)	0.573 ^b			
UCLA Score	30.95±6.24 33 (8-35)	31.14±4.24 32.5 (20-35)	30.84±7.20 34 (8-35)	0.409 ^b			
ASES Score	26.74±6.65 29 (0-35)	27.57±2.82 28 (20-30)	26.28±8.07 29 (0-35)	0.633 ^b			

b: Mann Whitney U test

Table 3. Postoperative satisfaction levels compared

	Total		Group 1 (n=14)		Group 2 (n=25)		p
	n	%	n	%	n	%	
Level of satisfaction							0.598 ^c
very satisfied	24	61.5	8	57.1	16	64	
satisfied	12	30.8	6	42.9	6	24	
undecided	1	2.6	0	0	1	4.0	
dissatisfied	2	5.1	0	0	2	8.0	

c: Fisher's Exact test

DISCUSSION

Our study has demonstrated that our hypothesis was not supported, as it revealed that the functional outcomes following surgery for rotator cuff tears with accompanying subscapularis tendon tears are inferior to those observed in cases of isolated supraspinatus tendon tears. The key discovery we made is that the existence of a subscapularis tendon tear did not result in a substantial alteration in the functional outcomes of rotator cuff repairs after surgery.

In a study conducted in South Korea in 2016, Park et al.⁹ examined 92 patients to assess the condition of the subscapularis muscle in cases of extensive rotator cuff tears. The researchers categorised the patients into three groups based on the extent of subscapularis involvement: intact (n=42), less than half affected (n=22), and more than half or completely affected (n=28). They then compared the outcomes of arthroscopic repair among these groups. Previous biomechanical and clinical investigations have demonstrated the significance of maintaining a minimum of 50% integrity in the subscapularis muscle. As a result, these three groups were established with this criterion in mind.⁹ According to reports, the functional outcomes after surgery for massive rotator cuff tears, where more than half of the subscapularis tendon is affected, are worse compared to the other two groups. Additionally, there is a higher likelihood of the repaired tendon tearing again, although this difference did not reach statistical significance.⁹ The postoperative functional outcomes were comparable between the group of patients who underwent isolated supraspinatus surgery (n=25) and the group of patients who underwent combined subscapularis and supraspinatus repair (n=14) in our study. Simultaneously, there were no instances of re-rupture observed in any of the cases included in our study.

Malavolta et al.⁷ In their study including 326 patients in 2020, the patients were divided into two groups: the group with isolated posterosuperior rotator cuff repair (n=194) and the group with rotator cuff repair with the addition of subscapularis repair (n=132). At the end of

the 2-year follow-up period, ASES and UCLA scores were found to be similar in both groups, and no statistically significant difference was observed in postoperative functional results.⁷ In another study conducted later, the functional results and rerupture rates of 107 patients with anterosuperior rotator cuff tears (Group A) and 119 patients with subscapularis repair (Group B) were compared at the end of a 3-year postoperative follow-up period.¹⁸ Rupture rates were reported as 23.4% in the anterosuperior rotator cuff rupture group and 19.3% in the subscapularis repair group, but the difference did not reach statistical significance.¹⁸ At the same time, the results were reported to be similar in both groups in terms of VAS, ASES and UCLA scores.¹⁸ In our study, similar to these studies; There was no statistically significant difference between the groups in all functional scores ($p>0.05$). In the meta-analysis of Longo et al.¹⁹ in 2021, they reported rerupture rates as 15% in the first 3 months after surgery, 16% between 6-12 months and after 24 months, and 21% between 3-6 months and 12-24 months. In this meta-analysis, advanced age, large size of the tear, and advanced fatty degeneration were reported as negative risk factors for rerupture.¹⁹ In our study, we did not encounter any cases of rerupture in neither of the groups. We attribute the reason why we did not encounter rerupture in any patient to the short follow-up period, which is one of the notable shortcomings of our study, and to the fact that we did not classify according to tear size and preoperative fatty degeneration staging.

Ide et al.²⁰ conducted a prospective study in 2007 involving 20 patients, where they published the outcomes of arthroscopic repair for traumatic combined cuff tears, which also included subscapularis tendon tears (18 cases). They documented unsatisfactory outcomes in just 2 patients, with 1 moderate outcome and 1 unsatisfactory outcome. Within our research, a total of 14 patients were assigned to Group 1, out of which 8 expressed a high level of satisfaction and 6 indicated a moderate level of satisfaction. In contrast, within Group 2, consisting of 25 patients, 2 individuals reported a lack of satisfaction, while 1 patient remained uncertain about their level of satisfaction. Thus, whereas all patients who received subscapularis restoration expressed pleasure, the isolated supraspinatus repair group had a satisfaction percentage of 88%. While the observed differences in these values did not reach statistical significance, it is worth noting that patients with subscapularis tears exhibited more preoperative complaints and poorer functional conditions in comparison to patients with isolated supraspinatus tears. This disparity may have contributed to a greater level of postoperative satisfaction.

Limitations

The limitations of our investigation encompass the limited sample size, brief duration of follow-up, omission of tear size consideration, lack of analysis on fatty degeneration classification, and failure to measure preoperative functional scores.

CONCLUSION

Hence, it is evident that there is no basis to believe that arthroscopic treatment will have an adverse impact on the functional outcomes of patients with rotator cuff injuries accompanied by subscapularis tendon tears. Our findings indicate that the outcomes of individuals who underwent subscapularis tendon surgery were at least as favourable as those who had isolated supraspinatus tendon repair.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of the Karabük University Clinical Researches Ethics Committee (Date: 13.12.2022, Decision No: 2022/1204).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

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Author Contributions

All the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

REFERENCES

1. Constant CR, Murley AH. A clinical method of functional assessment of the shoulder. *Clin Orthop Relat Res.* 1987;(214):160-164.
2. Michener LA, McClure PW, Sennett BJ. American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form, patient self-report section: reliability, validity, and responsiveness. *J Shoulder Elbow Surg.* 2002;11(6):587-594. doi:10.1067/mse.2002.127096
3. Ellman H, Hunker G, Bayer M. Repair of the rotator cuff. end-result study of factors influencing reconstruction. *J Bone Joint Surg Am.* 1986;68(8):1136-1144.
4. Yamamoto A, Takagishi K, Osawa T, et al. Prevalence and risk factors of a rotator cuff tear in the general population. *J Shoulder Elbow Surg.* 2010;19(1):116-120. doi:10.1016/j.jse.2009.04.006

5. Colvin AC, Egorova N, Harrison AK, Moskowitz A, Flatow EL. National trends in rotator cuff repair. *J Bone Joint Surg Am*. 2012;94(3):227-233. doi:10.2106/JBJS.J.00739
6. Agout C, Berhouet J, Bouju Y, et al. Clinical and anatomic results of rotator cuff repair at 10 years depend on tear type. *Knee Surg Sports Traumatol Arthrosc*. 2018;26(8):2490-2497. doi:10.1007/s00167-018-4854-1
7. Malavolta EA, Chang VYP, Montechi JMN, et al. Does a subscapularis tear combined with a posterosuperior rotator cuff tear affect postoperative functional outcomes? *J Shoulder Elbow Surg*. 2020;29(12):2523-2529. doi:10.1016/j.jse.2020.03.044
8. Richards DP, Burkhart SS, Lo IK. Subscapularis tears: arthroscopic repair techniques. *Orthop Clin North Am*. 2003;34(4):485-498. doi:10.1016/s0030-5898(03)00096-8
9. Park JY, Chung SW, Lee SJ, et al. Combined subscapularis tears in massive posterosuperior rotator cuff tears: do they affect postoperative shoulder function and rotator cuff integrity? *Am J Sports Med*. 2016;44(1):183-190. doi:10.1177/0363546515610552
10. Yoo JC, McGarry MH, Jun BJ, Scott J, Lee TQ. The influence of partial subscapularis tendon tears combined with supraspinatus tendon tears. *J Shoulder Elbow Surg*. 2014;23(6):902-908. doi:10.1016/j.jse.2013.09.015
11. Garavaglia G, Ufenast H, Taverna E. The frequency of subscapularis tears in arthroscopic rotator cuff repairs: a retrospective study comparing magnetic resonance imaging and arthroscopic findings. *Int J Shoulder Surg*. 2011;5(4):90-94. doi:10.4103/0973-6042.91000
12. Gyftopoulos S, O'Donnell J, Shah NP, Goss J, Babb J, Recht MP. Correlation of MRI with arthroscopy for the evaluation of the subscapularis tendon: a musculoskeletal division's experience. *Skeletal Radiol*. 2013;42(9):1269-1275. doi:10.1007/s00256-013-1669-5
13. Furukawa R, Morihara T, Arai Y, et al. Diagnostic accuracy of magnetic resonance imaging for subscapularis tendon tears using radial-slice magnetic resonance images. *J Shoulder Elbow Surg*. 2014;23(11):e283-e290. doi:10.1016/j.jse.2014.03.011
14. Malavolta EA, Assuncao JH, Guglielmetti CL, et al. Accuracy of preoperative MRI in the diagnosis of subscapularis tears. *Arch Orthop Trauma Surg*. 2016;136(10):1425-1430. doi:10.1007/s00402-016-2507-8
15. Lafosse L, Lanz U, Saintmard B, Campens C. Arthroscopic repair of subscapularis tear: surgical technique and results. *Orthop Traumatol Surg Res*. 2010;96(8):S99-S108. doi:10.1016/j.otsr.2010.09.009
16. Park MC, Elattrache NS, Ahmad CS, Tibone JE. "Transosseous-equivalent" rotator cuff repair technique. *Arthroscopy*. 2006;22(12):1360.e1-1360.e5. doi:10.1016/j.arthro.2006.07.017
17. Thigpen CA, Shaffer MA, Gaunt BW, Leggin BG, Williams GR, Wilcox III RB. The American Society of Shoulder and Elbow Therapists' consensus statement on rehabilitation following arthroscopic rotator cuff repair. *J Shoulder Elbow Surg*. 2016;25(4):521-535. doi:10.1016/j.jse.2015.12.018
18. Yoon TH, Kim SJ, Choi YR, Shin JC, Alruwaili SH, Chun YM. Anterior rotator cable disruption does not affect outcomes in rotator cuff tear with subscapularis involvement. *Knee Surg Sports Traumatol Arthrosc*. 2021;29(1):154-161. doi:10.1007/s00167-020-05891-z
19. Longo UG, Carnevale A, Piergentili I, et al. Retear rates after rotator cuff surgery: a systematic review and meta-analysis. *BMC Musculoskelet Disord*. 2021;22(1):749. doi:10.1186/s12891-021-04634-6
20. Ide J, Tokiyoshi A, Hirose J, Mizuta H. Arthroscopic repair of traumatic combined rotator cuff tears involving the subscapularis tendon. *J Bone Joint Surg Am*. 2007;89(11):2378-2388. doi:10.2106/JBJS.G.00082