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Is routine coracoplasty necessary in isolated subscapularis tears?

İzole subskapularis yırtıklarında rutin korakoplasti gerekli mi?

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ABSTRACT

Objectives: This study aims to investigate the effect of simultaneous coracoplasty on postoperative clinical outcomes of patients undergoing shoulder arthroscopy due to the tear of the isolated subscapularis.

Patients and methods: The study included 53 patients (16 males, 37 females; mean age 55.8 years; range, 44 to 70 years) who underwent arthroscopic repair for isolated subscapularis tear (type 2 and type 3) with anterior shoulder pain and tenderness. All patients had a coracohumeral distance of less than 7 mm on the preoperative magnetic resonance images and a minimum follow-up period of two years. Patients were divided into two groups as group 1 including patients who underwent coracoplasty and group 2 including those who did not undergo coracoplasty. Patients were evaluated pre- and postoperatively by the University of California Los Angeles (UCLA) shoulder score and the simple shoulder test (SST) score.

Results: There were no significant differences between the groups in terms of age, gender and follow-up time ($p>0.05$). The preoperative mean UCLA score was 19.65 for group 1 and 20.45 for group 2. The postoperative mean UCLA scores were 27.92 and 29.00, respectively. The preoperative mean SST score was 4.9 for group 1 and 5.1 for group 2. The postoperative mean SST scores were 10.0 and 9.5, respectively. Functional scores increased significantly in both groups postoperatively when compared to the preoperative values ($p<0.01$). However, there was no statistically significant difference in terms of the increase in UCLA and SST scores between the two groups ($p>0.05$).

Conclusion: We believe that concomitant coracoplasty during arthroscopic repair may not be a necessary routine in the treatment of isolated subscapularis tears.

Keywords: Arthroscopy, coracoplasty, fatty infiltration, rotator cuff, shoulder, subscapularis.

ÖZ

Amaç: Bu çalışmada izole subskapularis yırtığı nedeniyle omuz artroskopisi uygulanan hastalarda eş zamanlı korakoplastinin ameliyat sonrası klinik sonuçlara etkisi araştırıldı.

Hastalar ve yöntemler: Çalışmaya anterior omuz ağrısı ve hassasiyeti olan, izole subskapularis yırtığı (tip 2 ve tip 3) nedeniyle artroskopik tamir uygulanan 53 hasta (16 erkek, 37 kadın; ort. yaş 55.8 yıl; dağılım, 44-70 yıl) dahil edildi. Tüm hastaların ameliyat öncesi manyetik rezonans görüntülerinde korakohumeral mesafesi 7 mm'den azdı ve takip süreleri en az iki yıldı. Hastalar korakoplasti uygulanan hastaları içeren grup 1 ve korakoplasti uygulanmayanları içeren grup 2 olmak üzere iki gruba ayrıldı. Hastalar ameliyat öncesi ve sonrasında UCLA (University of California Los Angeles) omuz skoru ve basit omuz testi (BOT) skoru ile değerlendirildi.

Bulgular: İki grup arasında yaş, cinsiyet ve takip süresi açısından anlamlı farklılık yoktu ($p>0.05$). Ameliyat öncesi ortalama UCLA skoru grup 1'de 19.65, grup 2'de 20.45 idi. Ameliyat sonrası ortalama UCLA skoru sırasıyla 27.92 ve 29.00 idi. Ameliyat öncesi ortalama BOT skoru grup 1'de 4.9, grup 2'de 5.1 idi. Ameliyat sonrası BOT skoru sırasıyla 10.0 ve 9.5 idi. Ameliyat öncesi değerler ile karşılaştırıldığında, her iki grupta ameliyat sonrasında fonksiyonel skorlar anlamlı olarak arttı ($p<0.01$). Ancak iki grup arasında UCLA ve BOT skorlarındaki artış açısından istatistiksel olarak anlamlı farklılık yoktu ($p>0.05$).

Sonuç: İzole subskapularis yırtıklarının tedavisinde artroskopik tamir sırasında eş zamanlı korakoplastinin gerekli bir rutin olmadığını düşünüyoruz.

Anahtar sözcükler: Artroskopi, korakoplasti, yağlı infiltrasyon, rotator manşet, omuz, subskapularis.

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The term "subcoracoid impingement syndrome" was first described as an entrapment of the subscapularis muscle and tendon between the coracoid process of the scapula and the lesser tubercle of the humeral head.[1] The condition is one of the causes of increasingly frequent anterior shoulder pain. Most patients complain of pain and tenderness in the anterior aspect of the shoulder that is exacerbated by various degrees of flexion, adduction and internal rotation.[2,3]

The subcoracoid impingement syndrome is mostly diagnosed by measuring the coracohumeral distance (CHD) in magnetic resonance imaging (MRI). However, there is no consensus yet in the literature describing the normal range of CHD that would make the diagnosis of impingement. In most studies, a distance of 6 mm or 7 mm were taken as threshold values.[4-6] In patients with subcoracoid impingement syndrome, rotator interval pathologies such as subscapularis tear and biceps long head tendon problems should be investigated.[7]

The superior results of arthroscopic repair of Lafosse type 2 and 3 isolated subscapularis tears have been reported.[8,9] There are also publications that have advocated the simultaneous decompression of the subcoracoid space to reduce the rate of re-detachment of the repaired subscapularis tendon and to improve postoperative clinical outcomes.[10] It has been emphasized that simultaneous coracoplasty is effective in increasing the range of motion during internal rotation, particularly in the arthroscopic treatment of massive tears.[4] The literature holds a few publications that have investigated the effect of coracoplasty in the treatment of isolated subscapularis tear and that were conducted on heterogeneous patient groups. On the other hand, to our knowledge, this study is the only study that included isolated subscapularis tears without fatty infiltration. Therefore, in this study, we aimed to investigate the effect of simultaneous coracoplasty on postoperative clinical outcomes of patients undergoing shoulder arthroscopy due to the tear of the isolated subscapularis.[11]

PATIENTS AND METHODS

Fifty-three patients (16 males, 37 females; mean age 55.8 years; range, 44 to 70 years) who had undergone shoulder arthroscopy in Gazi University Medical Faculty for isolated subscapularis tears between January 2008 and January 2015 were investigated. The study included only type 2a (Figure 1) and type 2b (Figure 2) tears that were not accompanied by fatty infiltration. For the inclusion criteria, the patients had to have a CHD less than 7 mm in the preoperative MRIs and a minimum follow-up period of two years. Patients who had a history of shoulder operation, or had a concomitant cuff, labral or capsular pathology, fatty infiltration or a CHD greater than 7 mm in the preoperative MR measurements were excluded. The study protocol was approved by the Gazi University Medical Faculty Ethics Committee. A written informed consent was obtained from each patient. The study was conducted in accordance with the principles of the Declaration of Helsinki.

The patients were divided into two groups according to whether they had undergone coracoplasty (group 1; 7 males, 20 females) or not (group 2; 9 males, 17 females). The decision of arthroscopic coracoplasty was established according to the presence of fraying at the posterior coracoid during the operation, regardless of the demographic and operative data such as age and tear stage. The pre- and postoperative University of California Los

Figure 1. Arthroscopic view of a type 2a subscapularis tear.

Figure 2. Arthroscopic view of a type 2b subscapularis tear.

Figure 3. Arthroscopic view of coracoid process before coracoplasty.

Figure 4. Arthroscopic view of coracoid process after coracoplasty.

Angeles (UCLA) shoulder score and simple shoulder test (SST) score of all patients were noted. Both radiological measurements and clinical evaluations were performed by blinded researchers.

All arthroscopies were performed by the senior surgeon of this study, in the semi-lateral decubitus position, with the patients being rotated 20-30°. The arm was in 45° of abduction and 15° of flexion under 10 lb of longitudinal traction. A standard posterior portal was created to view the shoulder and the subscapularis tendon. Additional portals were created according to the pathologic findings. The subscapularis tendon was examined with the help of a spinal needle. If a subscapularis tear was doubted, an anterolateral portal was created and the subscapularis tendon was reexamined with an arthroscopic probe. All subscapularis tears were classified based on the Lafosse's subscapularis tears classification system.[12] Tears of the subscapularis tendon without a superior or posterior superior rotator cuff tear were defined as isolated subscapularis tears.

The subscapularis tears were repaired with the single-row technique and using a double-threaded anchor. The posterolateral side of the coracoid process was burred by 5 mm to form a flat plane (Figures 3 and 4). Burring was performed carefully to avoid the detachment of the pectoralis minor and the short head of the biceps tendon (the conjoint tendon).

Magnetic resonance images were evaluated by one of the authors of this study, but not the senior author who performed the surgeries. Coracohumeral distance measurements were performed on T_1-weighted axial sections of the MRIs. The CHD was defined as the shortest distance between the coracoid process and the humeral head in the subcoracoid space on axial MRIs. Subcoracoid impingement was defined as a CHD of less than 7 mm on preoperative MRIs.

TABLE I

Demographic characteristics of patients

	Group 1 (n=27)		Group 2 (n=26)		
	n	Mean±SD	n	Mean±SD	*p*
Age (year)		54.8±10.9		56.9±9.9	0.410
Follow-up duration (month)		37.2±4.8		44.4±5.5	0.510
Gender					0.418
Male	7		9		
Female	20		17		
Coracohumeral distance (mm)		4.7±0.8		5.1±0.7	0.112

SD: Standard deviation.

Statistical analysis

The IBM SPSS version 21.0 software (IBM Corp., Armonk, NY, USA) was used in data analysis. Analyses of the homogenous and normally distributing continuous variables were performed with the independent samples t-test and those not distributed normally or the non-homogenous continuous variables were analyzed with the Mann-Whitney U test. The categorical variables were assessed with Pearson's chi-square test. For all comparisons, the statistical significance level was set at $p<0.05$.

RESULTS

The mean age of the patients at the time of surgery was 55.8 years (range, 49 to 69 years) in group 1 and 57 years (range, 44 to 70 years) in group 2. There were no significant differences between the groups in terms of age and gender ($p>0.05$) (Table I).

Patients in group 1 were followed up for a mean period of 37.2±4.8 months (range, 24 to 51 months) and those in group 2 for 44.4±4.8 months (range, 27 to 55 months) (Table I). The duration of follow-ups between the two groups was statistically similar ($p>0.05$).

The mean CHD of the patients was 4.7±0.8 mm in group 1 and 5.1±0.7 mm in group 2 ($p>0.05$) (Table I). The preoperative mean UCLA score was 19.65 for group 1 and 20.45 for group 2. The postoperative mean UCLA scores were 27.92 and 29.00, respectively. The preoperative mean SST score was 4.9 for group 1 and 5.1 for group 2. Postoperative mean SST scores were 10.0 and 9.5, respectively (Table II).

Functional scores increased significantly in both groups postoperatively when compared to the preoperative values ($p<0.01$). However, there was no statistically significant difference in terms of the increase in UCLA and SST scores between the two groups ($p>0.05$).

TABLE II

Clinical results of patients

	Preoperative score	Postoperative score	
	Mean points	Mean points	*p*
UCLA			
Group 1	19.65	27.92	0.331
Group 2	20.45	29.00	
SST			
Group 1	4.9	10.0	0.413
Group 2	5.1	9.5	

UCLA: University of California Los Angeles shoulder score; SST: Simple shoulder test.

DISCUSSION

The most important finding of the study was that concomitant coracoplasty did not improve the clinical outcomes, although the preoperative CHDs were decreased.

Isolated subscapularis tendon tears constitute 4% of all rotator cuff tears.[13] Most of them are degenerative tears due to intrinsic changes and subcoracoid impingement syndrome is a rare cause in etiology.[14,15] On the other hand, subcoracoid impingement syndrome is diagnosed clinically and radiologically. The cutoff value of CHD to support the diagnosis in clinically compatible patients in MRIs has not been clearly defined. When the patients were included in this study, the cutoff value was taken as 6 mm in consideration to similar studies in the literature.[4-10]

The superior results of arthroscopic repair of Lafosse type 2 and 3 isolated subscapularis tears have been reported.[8,9] Lafosse et al.[12] achieved good clinical results of isolated subscapularis tendon tear treated by arthroscopic repair, with an average postoperative constant score of 84 points in 17 patients. Katthagen et al.[8] reported a mean postoperative American Shoulder and Elbow Surgeons score of 93.7 points in 31 patients with two years of follow-up after arthroscopic isolated subscapularis tendon repair. In another study, Lanz et al.[9] had excellent outcomes for arthroscopic isolated subscapularis repair of 52 patients with a mean follow-up period of 35 months. In an evaluation of the patients who underwent arthroscopic repair for a clinically symptomatic isolated subscapularis tendon tear after a mean clinical follow-up of 49 months, Rhee et al.[15] reported postoperative STT scores of 10.2 and 9.7, which were similar to the results of the control group of the current study.

Despite numerous publications on the arthroscopic treatment of isolated or combined subscapularis tears, coracoplasty has been added to the procedure in a small number of studies. There are two studies in the literature which were designed similar to ours. Park et al.[4] reported the outcomes of 51 patients who had rotator cuff pathology, subacromial impingement and subcoracoid impingement and were followed up for an average of 32.4 months after arthroscopic repair of the isolated subscapularis tendon. Patients were divided into two groups in which coracoplasty was or was not applied, and no significant difference was found between the clinical outcomes of the groups, although the large rotator cuff tear subgroup of the study group showed a significant increase in internal rotation. However,

Park et al.[4] included only six patients (four studies/two controls) with isolated subscapularis tears. The superiority of our study to this study was that the study and control groups were composed of patients with isolated subscapularis tear and subcoracoid impingement. Kim et al.[16] assessed 62 patients who underwent isolated arthroscopic subscapularis repair and compared patients who underwent or did not undergo coracoplasty. At the second-year follow-up, all functional scores improved significantly in both groups compared to preoperative values although, similar to our study, no significant difference was found between the study and control groups. In Kim et al.'s study,[16] the preoperative mean UCLA score was 16.8 for group 1 and 16.4 for group 2 and the postoperative mean UCLA scores were 31.3 and 31.5, respectively, compared to the preoperative mean UCLA scores of 19.6 and 20.4 and postoperative mean UCLA scores of 27.9 and 29.3 in our study. On the other hand, Kim et al.[16] included Lafosse type 4 tears in their study whereas, in our study, only type 2 and 3 tears were evaluated, so that fatty infiltration did not have an impact on clinical outcomes.

Our study had several limitations. The limited study size made our statistical analysis less robust for false-negative results (type 2, or beta error). Although we evaluated approximately 3,000 patients with shoulder arthroscopy, we were able to include this very specific number of patients in the study. Thus, we believe that our results are valuable for other surgeons. Furthermore, Cetinkaya et al.[5] specified that the coracoid overlap was more valuable than CHD in predicting subcoracoid impingement. In our study, the presence of subcoracoid compression syndrome could also be assessed by coracoid overlap. Besides, the integrity of the subscapularis tendon, which was repaired, could be assessed radiologically in the postoperative follow-up period. The fact that the measurements were performed by only one researcher is another limitation of the study. Despite all these shortcomings, we believe that the outcomes of the study will contribute to the literature.

In conclusion, we believe that concomitant coracoplasty during arthroscopic repair may not be a necessary routine in the treatment of isolated subscapularis tears. Even if the presence of fraying is detected in the posterior coracoid, routine coracoplasty is not required. It should be decided separately for each case rather than routinely.

Declaration of conflicting interests

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REFERENCES

1. Goldthwait JE. An anatomic and mechanical study of the shoulder joint, explaining many of the cases of painful shoulder, many of the recurrent dislocations, and many of the cases of brachial neuritis. Am J Orthop Surg 1909;6:579-606.
2. Dines DM, Warren RF, Inglis AE, Pavlov H. The coracoid impingement syndrome. J Bone Joint Surg Br 1990;72:314-6.
3. Gerber C, Terrier F, Ganz R. The role of the coracoid process in the chronic impingement syndrome. J Bone Joint Surg [Br] 1985;67:703-8.
4. Park JY, Lhee SH, Oh KS, Kim NR, Hwang JT. Is arthroscopic coracoplasty necessary in subcoracoid impingement syndrome? Arthroscopy 2012;28:1766-75.
5. Cetinkaya M, Ataoglu MB, Ozer M, Ayanoglu T, Kanatli U. Subscapularis tendon slip number and coracoid overlap are more related parameters for subcoracoid impingement in subscapularis tears: a magnetic resonance imaging comparison study. Arthroscopy 2017;33:734-42.
6. Gerber C, Terrier F, Zehnder R, Ganz R. The subcoracoid space. An anatomic study. Clin Orthop Relat Res 1987;215:132-8.
7. Nair AV, Rao SN, Kumaran CK, Kochukunju BV. Clinico-radiological correlation of subcoracoid impingement with reduced coracohumeral interval and its relation to subscapularis tears in indian patients. J Clin Diagn Res 2016;10:17-20.
8. Katthagen JC, Vap AR, Tahal DS, Horan MP, Millett PJ. Arthroscopic repair of isolated partial- and full-thickness upper third subscapularis tendon tears: minimum 2-year outcomes after single-anchor repair and biceps tenodesis. Arthroscopy 2017;33:1286-93.
9. Lanz U, Fullick R, Bongiorno V, Saintmard B, Campens C, Lafosse L. Arthroscopic repair of large subscapularis tendon tears: 2- to 4-year clinical and radiographic outcomes. Arthroscopy 2013;29:1471-8.
10. Lo IK, Burkhart SS. Arthroscopic coracoplasty through the rotator interval. Arthroscopy 2003;19:667-71.
11. Atik OŞ. Platelet-rich plasma: Everything new may not be good enough! Eklem Hastalik Cerrahisi 2017;28:63.
12. Lafosse L, Jost B, Reiland Y, Audebert S, Toussaint B, Gobezie R. Structural integrity and clinical outcomes after arthroscopic repair of isolated subscapularis tears. J Bone Joint Surg [Am] 2007;89:1184-93.
13. Edwards TB, Walch G, Nové-Josserand L, Boulahia A, Neyton L, O'Connor DP, et al. Arthroscopic debridement in the treatment of patients with isolated tears of the subscapularis. Arthroscopy 2006;22:941-6.
14. Kuntz AF, Raphael I, Dougherty MP, Abboud JA. Arthroscopic subscapularis repair. J Am Acad Orthop Surg 2014;22:80-9.
15. Rhee YG, Lee YS, Park YB, Kim JY, Han KJ, Yoo JC. The outcomes and affecting factors after arthroscopic isolated subscapularis tendon repair. J Shoulder Elbow Surg 2017;26:2143-51.
16. Kim SJ, Choi YR, Jung M, Yoon YK, Chun YM. Concomitant coracoplasty during arthroscopic subscapularis repair does not yield better clinical outcomes and structural integrity. Knee Surg Sports Traumatol Arthrosc 2018;26:56-62.