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Long-term results of arthroscopic and open anterior acromioplasty

Artroskopik ve açık anterior akromiyoplasti: Geç dönem sonuçlar

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Amaç: Subakromiyal sıkışma sendromu nedeniyle artroskopik veya açık anterior akromiyoplasti uygulanan hastalarda ortalama iki yıllık izlem sonuçları değerlendirildi.

Çalışma planı: Subakromiyal sıkışma sendromu tanısı konan 145 hasta ameliyat edildi. Doksan hastaya (ort. yaş 56; dağılım 36-70) açık, 55 hastaya (ort. yaş 49; dağılım 32-58) artroskopik anterior akromiyoplasti uygulandı. Hastalar Constant omuz skorlamasıyla değerlendirildi. Ameliyat öncesi ve sonrası Constant skorları, aktivite, ağrı, hareket açıklığı ve güç skorları; ameliyat sonrası ağrı, hastanede yatış ve işe dönüş süreleri karşılaştırıldı. Ortalama izlem süresi iki grupta da 24 ay (dağılım 12-60 ay) idi.

Sonuçlar: Açık cerrahi grubundaki hastaların ameliyat öncesinde 32.6 olan ortalama Constant skoru ameliyattan sonra 80.5'e; artroskopi grubunda 25.5'ten 83.1'e yükseldi. Ameliyat öncesi ve sonrası değerlendirmelerde gruplar arasında Constant skoru, aktivite, ağrı, ROM ve güç skorları bakımından anlamlı farklılık bulunmadı ($p>0.05$). Artroskopi ve açık cerrahi gruplarında hastanede yatış (sırasıyla 1.36 ve 1.72 gün), işe başlama (sırasıyla 9 ve 16 gün) ve ameliyat sonrası ağrı (sırasıyla 6 ve 8 hafta) süreleri anlamlı farklılık gösterdi ($p<0.05$). Subjektif hasta değerlendirmesine göre, artroskopi grubundaki 47 hastada (%85.5) iyi-mükemmel, altı hastada (%10.9) tatmin edici, iki hastada (%4.6) kötü; açık cerrahi grubunda 76 hastada (%84.4) iyi, 10 hastada (%11) tatmin edici, dört hastada (% 4.4) kötü sonuç sonuç elde edildi.

Çıkarımlar: Her iki yöntemin, rotator kılıfta yırtık olmayan ancak sıkışma sendromu görülen hastalar için başarılı tedavi seçenekleri olduğu sonucuna varıldı.

Anahtar sözcükler: Akromiyoklaviküler eklem/cerrahi; akromiyon; artroplasti; artroskopi; ağrı ölçümü; hasta memnuniyeti; hareket açıklığı, artiküler; omuz sıkışma sendromu/fizyopatoloji/cerrahi; omuz eklemi/patoloji.

Objectives: We evaluated the results of arthroscopic or open anterior acromioplasty after a mean follow-up of two years in the treatment of impingement syndrome.

Methods: The study included 145 patients who underwent anterior acromioplasty through open surgery (90 patients; mean age 56 years; range 36 to 70 years) or arthroscopic surgery (55 patients; mean age 49 years; range 32 to 58 years). Comparisons were made between both groups with regard to preoperative and postoperative Constant scores, activity, pain, range of motion, and strength scores, and durations for postoperative pain, hospital stay, and return to work. The mean follow-up was 24 months (range 12 to 60 months) for both groups.

Results: The mean Constant scores increased from preoperative 32.6 to postoperative 80.5 and from 25.5 to 83.1 with open and arthroscopic surgery, respectively. No significant differences were found between the two groups with regard to pre- and postoperative Constant scores, activity, pain, range of motion, and strength scores ($p > 0.05$). However, patients who underwent arthroscopic surgery exhibited shorter durations in the following: hospital stay (1.36 *vs* 1.72 days), delay in return to work (9 *vs* 16 days), and postoperative pain (6 *vs* 8 weeks) ($p<0.05$). According to subjective patient evaluations, arthroscopic results were good or excellent in 47 patients (85.5%), satisfactory in six patients (10.9%), and poor in two patients (4.6%); open surgery results were good or excellent in 76 patients (84.4%), satisfactory in 10 patients (11%), and poor in four patients (4.6%).

Conclusion: Both treatment options seem to be equally effective in the treatment of impingement syndrome in the absence of rotator cuff tears.

Key words : Acromioclavicular joint/surgery; acromion/surgery; arthroplasty; arthroscopy; pain measurement; patient satisfaction; range of motion, articular; shoulder impingement syndrome/physiopathology/surgery; shoulder joint/pathology.

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The subacromial impingement syndrome is associated with the encroachment of the rotator cuff between the anteroinferior edge of the acromion and coracoacromial arc during the shoulder elevation.[1] Acromioclavicular joint hypertrophy and degeneration may also play a role in the impingement. [2] In the initial period, most of the cases are successfully treated with conservative therapy including anti-inflammatory drugs, exercise programs and steroid injections.[3,4] Surgery is required for cases not responding to the conservative therapy.

Positive outcomes have been reported using open surgery, which is performed by resection of the anteroinferior edge of the acromion and coracoacromial ligament in patients with impingement syndrome.[1,5,6] Following the introduction of appropriate arthroscopic instruments, the arthroscopic resection of the lower surface of acromion and coracoacromial ligament became a surgical method of choice.[7] This intervention has the same indication and purpose as with the patients undergoing open anterior acromioplasty. The advantages of arthroscopic anterior acromioplasty include making use of both sides of the rotator cuff, enabling early shoulder activity by protecting the attachment point of the deltoid, shortening of hospital stay leading to a small cosmetic scar.[7-12]

The present study compared the follow-up results of subacromial decompression practices, carried out by arthroscopic and open methods within two years.

Patients and method

The study included retrospective analysis of patients who underwent surgery with a diagnosis of subacromial impingement syndrome between 1997 and 2001. Of patients who were refractory to conservative therapy, 90 (mean age 56 years; range 36 to 70) underwent open surgery while 55 (mean age 49 years; range from 32 to 58) were referred to arthroscopic subacromial decompression and anterior acromioplasty. Based on the subsequent referral list, patients who could afford the financial burden of it underwent arthroscopic while others were referred for open surgery. Patients were assessed by Constant-Murley shoulder scoring.[13,14]

The coracoacromial arc is located right above the supraspinatus tendon, which could be compressed between the head of the humerus and coracoacromial arc during the elevation of the shoulder joint. All patients were diagnosed with impingement syndrome as described by Neer [1], and this was the most significant finding used for diagnosis. Identification of a painful arc and presence of an anterior encroachment during the elevation of the shoulder resulted in diagnosis of the impingement syndrome. [4,15,16]

All patients were firstly given conservative therapy. They received non-steroidal anti-inflammatory drugs, physiotherapy and subacromial local steroid injection. Surgical intervention was planned for the cases, which were refractory to the preoperative 3-6 months period of rehabilitation.

The results were evaluated “excellent” when all the complaints were relieved; “satisfactory” when mostly relieved; and “poor” when there was no or little reduction in the pain following a local anesthetic on subacromial bursa and its environ. The responses were excellent in 130, satisfactory in 10, and poor in 5 patients who underwent surgery. The patients with shoulder instability, acromioclavicular joint pathology accompanied with radiographic findings, rotator cuff tear, tear on the long head of the biceps, and calcified tendonitis were all excluded from the study.

Each patient was evaluated preoperatively by front-rear shoulder, 30º caudal tilt, scapular Y graphs and magnetic resonance imaging. Their activity, pain, ROM and strength levels were also assessed.

Twenty-three patients in the arthroscopy group were operated under interscalen block anesthesia, and 32 patients under general anesthesia while in the open acromioplasty group 38 patients were operated under interscalen block anesthesia, and 52 patients were under general anesthesia.

Surgical technique

Following the anesthesi a, the motion range and stability of both shoulders were evaluated in chaise lounge position. The technique of arthroscopic anterior acromioplasty was adapted from the method described by Ellman.[7] Arthroscopic procedures included bursectomy, coracoacromial ligament resection, and anterior acromioplasty; acromioclav-

Table 1. Characteristics of patient groups and mean Constant-Murley scores

		Age		Gender		Constant-Murley scores			
						Preoperative		Long term	
	No.	Mean	Distribution	Female	Male	Mean	Distribution	Mean	Distribution
Arthroscopic acromioplasty	55	49	32-58	31	24	25.5	10-40	83.1	24-95
Open acromioplasty	90	56	36-70	54	36	32.6	15-45	80.5	54-95

icular osteofits were resected. The efficiency of the decompression was assessed by checking the smoothness of the surface under acromion via a probe sent through the portal in the posterior. Before the procedure was finished, efficient motion range was achieved by manipulating the shoulder in all directions.[17]

The insertion was done between anterior and medial ligaments of the deltoid by coracoacromial incision in the open anterior acromioplasty. The intervention was carefully done so as not to detach the deltoid muscle from the acromion; however, under insufficient conditions, it became slightly detached from the adhesive part. Following the subacromial bursectomy, the area under acromion was reached to perform anterior acromioplasty via osteotom.[18]

Postoperatively, the patients who underwent open anterior acromioplasty were fitted within (18) slings and they did pendulum exercises. At the end of one week, passive abduction, inner and outer rotation exercises were initiated. The active exercise rehabilitation started during the third week. The patients who underwent arthroscopic acromioplasty started to perform the Codman pendulum exercises inside the sling the day after the operation. Once the patient was comfortable, the sling was removed, and the active exercises began within the first week.

The patients were evaluated by the Constant-Murley shoulder scoring, including factors like pain, daily activity score, and motion range of joints. For statistical analysis, dual and non-dual t-tests were used. The mean follow-up period was 24 months (range 12 to 60 months) for both groups.

Results

The mean preoperative and postoperative Constant-Murley scores of the patients who underwent open surgery and arthroscopy are shown in Table 1, and their scores for activity, pain, ROM and strength in Table 2. No significant difference was found between the groups in preoperative Constant-Murley score, activity, pain, ROM and strength ($p>0.05$). Furthermore, the comparison of postoperative Constant-Murley scores, activity, pain, ROM and strength scores didn't demonstrate a significant difference between the open surgery patients and arthroscopy patients ($p>0.05$). None of the patients developed surgical complications except the edema resulting from the leakage of athroscopic liquid into the tissue. One patient (1.1%) had temporary Homer syndrome in the interscalen block arthroscopy group.

The patients in the arthroscopy group returned to work earlier. The mean duration for return-to-work was 16 days (range 7 to 42 days) in the acromioplasty group while it was nine days (range 5 to 30 days) in the arthroscopy group. The mean hospital stay was 1.72 days (range 1 to 5 days) in the open surgery group while it was 1.36 days (range 1 to 8 days) in the arthroscopy group. The mean duration for postoperative pain was eight weeks (range 1 to 16 weeks) in the open surgery group, and six weeks (range 1 to 12 weeks) in the arthroscopy group. The differences

Table 2. Comparison of mean preoperative and postoperative late-period score parameters for the patients undergoing arthroscopic and open anterior acromioplasty

	Activity score				Pain score				Active exercise score				Strength score			
	Pre		Post		Pre		Post		Pre		Post		Pre		Post	
	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range
Arthroscopic	6.98	2-14	17.63	12-20	2.0	0-5	13.27	10-15	8.45	4-20	32.90	14-40	8.25	3-19	19.72	10-25
Open	8.02	2-16	17.73	12-20	3.0	0-5	12.44	5-15	10.0	4-20	31.01	16-40	11.66	4-23	19.05	10-25

between the two procedure groups were found significant in duration for return-to-work, transition to painless period and duration of hospital stay ($p<0.05$).

The patients were also subjectively evaluated following the surgery. The results were excellent-good in 47 patients (85%), satisfactory in six patients (10.9%), and poor in two patients (4.6%) in the arthroscopy group. The results reported by the patients in the open anterior acromioplasty group were as follows: excellent in 76 cases (84.4%), satisfactory in 10 cases (11%), and poor in four cases (4.4%). The poor results were subjectively reported by two patients in the arthroscopy group responding to the preoperative local anesthetic injection into the subacromial area and three patients in the open surgery group. When the patients were evaluated according to the type of anesthesia they received, no difference was found between the interscalen block anesthesia and general anesthesia groups.

Discussion

The significance of spurs developed under the acromion was first pointed out by Neer,[1,4] who described the space between the acromion with supraspinatus spur, coracoacromial ligament, coracoid, acromioclavicular joint and glenoid. He indicated that the narrowing of the space leads to the shoulder impingement syndrome, and he started to treat it using anterior acromioplasty and distal clavicular resection.[1,4] Ellman[10] described the arthroscopic anterior acromioplasty. A cadaveric study by Gartsman [11] showed that there is no difference between arthroscopic and open acromioplasty in terms of bone resection. Furthermore, Sachs et al.[19] reported that the measurements performed during the surgery demonstrated no difference between open and arthroscopic methods in the thickness of acromion. The same study showed that the thickness of the bone resected was 5.0 mm in the open acromioplasty and 5.1 mm in the arthroscopic acromioplasty based on the measurements done 1 cm posterior of the anterior acromion, and it was concluded that it was acceptable for the acromioplasty. In the arthroscopic method, the resection is continued until the acromion gets to the same level as the clavicula (even more posterior). Only periost should be left in the acromion anterior following the resection. In order to achieve an efficient imaging, both posterior and lateral subcramial portals should be used. [17] Later studies demonstrated very good results in arthroscopic subacromial decompression. However, the success of surgical treatment is directly associated with the precision of diagnosis. Surgery should be considered after a 3-6 months rehabilitation program. If there is no improvement in the complaints of the patient or there is a suspicion about the diagnosis, further analysis should be performed prior to the surgical procedure. Misdiagnosis is the major cause of unsuccessful acromioplasty. On the other hand, in the arthroscopic method, further imaging of glenohumeral joint provides an advantage when the clinical diagnosis is unclear. For example, it may result in findings imitating the osteoarthritis impingement syndrome in the patients of middle-age groups. Also, conditions such as labral defects, biceps tears, subscapularis tendon tears, and adhesive capsulitis can easily go unnoticed during the open acromioplasty.[8-12,15,20,21]

Interscalen block anesthesia in chaise lounge position is more comfortable for the patient; it also provides flexibility for the surgeon to move the shoulder as he/she wants. In case any necessity to go on with open surgery arises, then the procedure can be continued with no need to change the position. However, traction and assistance are required for sufficient sighting. [22] When the two methods are compared, arthroscopic acromioplasty has some advantages. First of all, surgical morbidity is less and rehabilitation is faster in the arthroscopic method. In the open acromioplasty, the anterior fibers of the deltoid muscle are frequently detached from the acromion, resulting in delayed rehabilitation. As a result of protection of the deltoid muscle, early rehabilitation can be started right after the surgical procedure in the arthroscopic acromioplasty. Altchek et al.[8] reported that using this method the mean duration for return-to-work was nine days, and it was 2.4 months for sportive activities. In our study, the mean duration for return-to-work was nine days in the arthroscopic acromioplasty group while it was 16 days in the open anterior acromioplasty group.

The duration of preoperative symptoms, response to impingement test and experience of the

surgeon should also be considered among the basic factors affecting the outcome. In patients with longer symptoms, the outcome is not so favorable.[8,11,23] Gartsman[11] reported that the results were better in patients whose symptoms had continued for less than one year. The conservative therapy can be given at most for 12 months; longer period of conservative therapy may influence the outcome of the interventions to be planned. Furthermore, the rotator cuff may be damaged, and symptoms may progress.[24]

In this study, five patients who responded poorly to the impingement test were not satisfied with the outcome. It was observed that postoperative symptoms were less in patients with good responses to the impingement test. A similar approach was also reported by Altchek et al.[8]

Spangehl et al.[25] evaluated the arthroscopic and open acromioplasty in the long period with UCLA scoring, and no difference was found between the groups in patient satisfaction, visual analog scale scores, and strength scores. However, they indicated that open acromioplasty was superior in the pain and function scores. In our study, the activity, pain, ROM and strength scores of the patients were found to be similar using both methods in the late period.

The results of our follow-up study for a mean two years period showed that anterior acromioplasty performed both by arthroscopic and open methods is a successful choice of treatment in patients diagnosed with impingement syndrome in the absence of rotator cuff tears. The duration of hospital stay, the duration to return-to-work and duration for postoperative pain are shorter in arthroscopic acromioplasty compared to the open anterior acromioplasty. However, no significant difference was found between the two techniques in terms of long-term functional results.

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