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Modified and classic acromioplasty for impingement of the shoulder

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Abstract We compared the results of modified and classic anterior acromioplasty in order to identify the significance of the resected acromion. Fifty patients with shoulder impingement syndrome resistant to conservative therapy underwent surgical treatment. We treated 30 patients with classic Neer acromioplasty (group 1), and 20 patients with modified Neer acromioplasty (group 2). The patients were assessed according to pain and shoulder movement. Excellent or good results were achieved in 28/30 patients in group 1 and 19/20 patients in group 2. The results indicate that both surgical techniques are effective procedures in the treatment of shoulder impingement syndrome, and the type of bone resection does not influence the clinical outcome.

Résumé Nous avons comparé l'acromioplastie classique et modifiée de Neer pour vérifier l'importance de la résection d'acromion. Nous avons traité 50 patients qui n'ont pas répondu aux traitements non chirurgicaux. Pour 30 cas nous avons exécuté l'acromioplastie classique de Neer (groupe 1). Pour 20 cas nous avons fait l'acromioplastie antérieure modifiée. Nous avons évalué les résultats selon la douleur et le mouvement. Pour le groupe I nous avons obtenu un résultat excellent ou bon dans 28 cas sur 30, pour le groupe II un résultat similaire pour 19 cas sur 20. Le choix du type de la résection osseuse n'influence pas les résultats cliniques.

Introduction

In 1972, Neer [5] described "impingement syndrome" as compression of the supraspinatus tendon against the anterior acromion, the coracoacromial ligament, and – at

times – a projecting spur localized to the acromioclavicular joint. He classified the syndrome in three stages according to clinical and pathologic progression: stage I is a reversible stage predominated by edema and hemorrhage; stage II has tendonitis and irreversible fibrosis; and stage III is characterized by tendon degeneration and tears [6, 7]. Lesions in stage I respond to conservative treatment, as do most stage II lesions. Patients with stage II lesions that are refractory to conservative treatment and those with stage III lesions are candidates for surgery.

Historically, various surgical techniques have been used, including complete acromionectomy and lateral acromionectomy [1, 2, 3]. Neer [5] described the anterior acromioplasty technique, which has gained widespread acceptance for the treatment of impingement syndrome. However, in 1990, Rockwood [9] stated that resection of the inferior acromion is not sufficient and the remaining part of the acromion continues to irritate the underlying structures. He described a new technique as "modified Neer acromioplasty."

The aim of this study was to evaluate whether the type of bone resection affects the clinical outcome. For this purpose patients with stage II and early stage III shoulder impingement syndrome treated with classic type or modified Neer acromioplasty were evaluated.

Materials and methods

The study included 50 patients who had stage II or early stage III shoulder impingement syndrome. Shoulder pain was present in all patients for an average of 13 (3–60) months before surgery.

On physical examination all patients had tenderness over the anterosuperior part of the rotator cuff and positive impingement sign. Muscle atrophy was absent or mild. All patients had full range of motion at the shoulder joint before surgery. The patients were treated initially nonoperatively for a period of at least 6 months without benefit. Nonoperative treatment consisted of the administration of nonsteroidal antiinflammatory medication and physiotherapy.

Both types of acromioplasty were performed with the patient in a beach chair position, with the affected shoulder at the edge of the operating table. An incision along the lateral border of the ac-

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Table 1 Patient group characteristics

Characteristic	Group 1	Group 2
Sex		
Female	14	12
Male	16	8
Age (years)		
Mean	45	43
Range	32–67	23–61
Follow-up (months)		
Mean	68	68
Range	60–100	60–84
Rotator cuff tear	4	5

romion and parallel to the lines of Langer was made in both groups. The raphe between the anterior and lateral borders of the deltoid was split with a dissector from the anterolateral corner of the acromion distally parallel to the deltoid fibers. The anterior aspect of the deltoid was detached from the acromion with an incision at the dorsal surface of the acromion in line with the anterior border of the acromioclavicular joint, extending to the lateral split in the deltoid muscle. A second incision was made at the lateral border of the acromion, extending 1–2 cm posterior.

Group I consisted of 30 patients (16 men and 14 women) with a mean age of 45 (32–67) years. Classic Neer acromioplasty was performed between May 1989 and December 1993 (Table 1). In this procedure the anterior edge of the acromion and its under surface was removed with an osteotome, excising a wedge-shaped piece of bone. Resection of the coracoacromial ligament and bursectomy was performed in all patients. Full thickness partial rotator cuff tear requiring repair was found in four patients.

Group 2 consisted of 20 patients (8 men and 12 women) with a mean age of 43 (23–61) years. This group was treated with modified Neer acromioplasty between January 1991 and December 1993 (Table 1). Modified acromioplasty is a two-step operation. In the first step complete excision of the anterior acromion that extends beyond the anterior border of the clavicle is done. In the second step the inferior prominence of the acromion is addressed. The surgeon, using finger palpation with one hand, precisely controls the anteroinferior corner of the acromion while the other hand controls the angulation of the osteotome. This technique ensures optimum removal of the bone piece. The cut cancellous surface of the acromion is then smoothed with a rongeur and finally with a hand-held bone rasp. Rotator cuff tear was found in five patients and repaired.

Postoperative rehabilitation was the same for both groups. Passive exercises were started immediately after the operation, active exercises were started at 2 weeks, and full range of motion was started after 4–6 weeks.

Patients were assessed with regard to pain relief, range of motion, and shoulder strength as compared to the contralateral shoulder [9]. The result was considered excellent if the patient had no pain, normal range of motion, and normal strength.

A good result was a subjective response of occasional minor discomfort or restriction in the range of motion within 20° of the contralateral shoulder. The result was considered poor if the symptoms persisted, if there were postoperative complications, or the patient required a second operation. The two groups were compared using an independent samples t-test.

Results

The mean duration of follow-up was 68 months for both groups. The range of follow-up was 60–100 and 60–84 months for group I and group II respectively. In group I,

Fig. 1 **a** A 30° caudal AP radiogram of the right shoulder reveals irregular anterior prominence of the acromion. **b** Postoperative 30° caudal AP radiogram after classic Neer acromioplasty

22 patients had excellent results, six had good results, and two had poor results. In group II, 14 patients had excellent results, five had good results, and one a poor result. None of the patients required subsequent surgery. There was no statistically significant difference between the two groups ($P=0.99$).

Discussion

The method of choice for the treatment of shoulder impingement syndrome has been Neer anterior acromioplasty since Neer's article was published in 1972 [5]. Several authors [4, 10, 12] have reported successful results with this technique. In a study by Post and Cohen [8] open anterior acromioplasty was performed in 72 patients with stage II and early stage III lesions. The average follow-up was 23 months, and 89% of patients showed significant improvement. The authors also stated that the procedure is expected to be highly effective when the stabilizers of the glenohumeral joint are sufficiently strengthened. Thorling et al. reported good or excellent results for 28 (70%) of 40 patients at an average

Fig. 2 **a** A 30° caudal AP radiogram of the patient demonstrates the anterior prominence of the acromion. **b** Postoperative 30° caudal AP radiogram confirms the removal of the anterior-inferior aspect of the acromion after modified Neer acromioplasty

of 21 (6–42) months after open subacromial decompression [12]. Stuart et al. [11] reported an overall long-term (average 8 years) successful result of 77% after open subacromial decompression.

Although the results with anterior acromioplasty have been reported as successful, Rockwood et al. [9] reported 33 patients who had failed results after acromioplasty. He believed the most common reason for continued impingement syndrome was the remaining anterior portion of the acromion that extended beyond the anterior border of the clavicle. Therefore, he stated that resection of the anterior prominence with the anteroinferior prominence is crucial.

In our study we aimed at evaluating the effect of the resected portion of the acromion on the clinical outcome. There was no statistically significant difference between the classic and modified Neer acromioplasty groups ($P=0.99$). Patients in both groups were satisfied with the operation (Figs. 1, 2).

We concluded that, when surgical treatment is indicated, the majority of patients with shoulder impingement syndrome can be treated satisfactorily with anterior acromioplasty. In recent years preserving and reconstructing the normal anatomy has been the aim of many techniques in orthopedic surgery. Excision of the traction spurs at the anterior-inferior border of the acromion by either technique is a satisfactory procedure.

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