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ORIGINAL STUDY

The role of acromion morphology in chronic subacromial impingement syndrome

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This study investigated the role of acromion morphology in the aetiology of chronic subacromial impingement syndrome. Forty five patients with chronic subacromial impingement syndrome were included in the study. They were distributed into three groups according to their acromion types : six (13.3%) patients had type 1, 24 (53.3%) patients type 2 and 15 (33.3%) patients type 3 acromion. Constant scoring was used for clinical evaluation. Arthroscopic subacromial decompression was performed in all patients in the three groups, without performing any acromioplasty that would change the morphology of acromion. We then compared the average Constant scores changes in all three groups after arthroscopic subacromial decompression. The average follow-up was 28.6 months (range : 12-47). The average change in Constant score after arthroscopic subacromial decompression was 58.30 in patients with type 1 acromion, 58.21 in those with type 2 and 54.07 in those with type 3. No significant difference was observed between the changes in the average Constant scores of the three groups ($p > 0.005$). The scores were significantly improved following arthroscopic subacromial decompression in all three groups ($p < 0.005$). In this study, acromion type was not found to have an important role in the aetiology of chronic impingement syndrome ; arthroscopic subacromial decompression without simultaneous acromioplasty thus appears as an appropriate treatment.

Key words : chronic impingement syndrome ; acromion morphology.

INTRODUCTION

The most common cause of shoulder pain is subacromial impingement. In 1972, Neer first introduced the concept of rotator cuff impingement, stating that it results from mechanical impingement of the rotator cuff tendons and long head of biceps under the inferior surface of the anterior one-third of the acromion and of the acromioclavicular joint (*11*). Acromioclavicular joint pathologies, osteophytes, acute or chronic inflammation of the subacromial bursa, thickening or calcification of the coracoacromial ligament, proximal humeral

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fractures, structural modification variations in the shape of the acromion have been considered as possible causes of extrinsic impingement. Primary intrinsic degeneration of rotator cuff tendons, SLAP lesions, labral tears, shoulder anterior laxity and instability, posterior capsular contractures, humeral head lesions and glenoid lesions are possible causes of internal impingement. Bigliani *et al* described three different types of acromion as type 1 (flat), type 2 (curved) and type 3 (hooked) based on cadaveric studies (*2*).

In our study, we investigated the effect of acromion type on subacromial impingement sydrome by evaluating clinical results in patients who had undergone arthroscopic subacromial decompression (ASD) without simultaneous acromioplasty.

PATIENTS AND METHOD

Plain radiographs and MRI scan were used to determine the acromion types of the patients, who were distributed into three groups according to their acromion types. There were 6 (13.3%) patients with type 1 acromion, 24 (53.3%) with type 2 acromion and 15 (33.3%) with type 3 acromion. The average age of patients having type 1 acromion was 49.6 (29-57), the average age of patients having type 2 acromion was 45.58 (21-64), the average age of patients having type 3 acromion was 54.87 (43-76). Constant scores before ASD of each three groups were evaluated.

All patients were operated in beach chair position under interscalene block anaesthesia. An arthroscope was placed in the subacromial bursa. Osteophytes about the acromioclavicular joint and spurs on the inferior aspect of the acromion were removed, the subacromial bursa was excised and the coracoacromial ligament was transected at its insertion on the acromion. No radical acromion resection was performed in any patient in order to modify the type of acromion. Constant scores of each three groups having an average follow-up period of 28.6 months (range, 12-47) were calculated and compared with the values prior to ASD. In order to see the effect of ASD, differences between preoperative and postoperative Constant scores of both groups were noted and were evaluated from a statistical viewpoint.

Descriptive statistical methods, frequency count, percentage, average and standard deviation were used to evaluate data. Data were analyzed using the Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, USA) version 18.0. One-way analysis of variance and t test were used. The results were evaluated, with the significance level set at $p < 0.005$.

RESULTS

Before ASD the mean Constant score of patients with type 1 acromion was 14.83 (8-26), (2-52) in type 2 and 12.67 (2-33) in type 3. After ASD the mean Constant score of patients with type 1 acromion was 73.33 (32-90), 75.58 (50-90) with type 2 and 66.73 (2-90) with type 3. Comparing the values after ASD and before ASD, there was a significant improvement in all scores ($p < 0.005$) (Table I).

There was type 1 acromion in 6 (13.3%) of 45 patients with chronic impingement, type 2 in 24(53.3%), type 3 in 15 (33.3%). Average Constant score alteration after ASD was 58.50 (20-82) in patients with type 1 acromion, 58.21 (0-77) in patients with type 2 acromion, 54.07 (0-83) in patients with type 3 acromion (Table II).

When the three groups were compared statistically with one-way analysis of variance, no significant difference was observed in Constant scores ($p > 0.005$) (Table III).

Table I. — Constant score before and after arthroscopic subacromial decompression

Chronic impingement	Acromion type	Patient number percent	Before ASD	After ASD	Significance
Constant	1	6 (13.33%)	14.83	73.33	.002
	2	24 (53.33%)	17.38	75.58	.000
	3	15 (33.3%)	12.67	66.73	.000

Table II. — Average Constant score difference

ASD after-before	Acromion type	Patient number	Average	Std. Deviation	Std. Error	sig
Constant difference	1	6	58.500	2.011	9.394	0.000
	2	24	58.208	25.886	5.284	0.000
	3	15	54.067	21.015	5.426	0.000

Table III. — Mean Constant scores in patients with different acromion types

Acromion type	Type 1	Type 2	Type 3	sig
Constant difference	58.50	58.21	54.07	0.668

In patients with chronic impingement syndrome, the effect of acromion type on subacromial impingement sydrome is controversial. In the clinical evaluation after ASD, although a radical acromionectomy was not performed, absence of a statistically significant difference between results of patients with type 1, type 2 and type 3 acromion suggests that acromion type does not play a role in the aetiology of impingement. Besides, as satisfactory results were achieved in all patients, this suggests that acromioplasty is not necessary in the treatment of chronic impingement syndrome ; ASD and a regular exercising program would be sufficient.

DISCUSSION

The role of acromion type in the aetiology of chronic subacromial impingement syndrome is controversial. Neer reported in 1972 that the acromion type plays a role in the aetiology, and acromioplasty should be performed in some patients (*11*). Elman has performed subacromial decompression in patients with impingement and proposed that resection should be performed in the anteroinferior part of the acromion (*5*). Akpinar *et al* reported good results in patients with impingement in whom they had performed acromioplasty, subacromial decompression, acromial hypertrophy scalping, coracoacromial ligament resection, and they related their good outcomes with sufficient acromial resection (*1*).

According to the theory which claims that acromion morphology plays a role in the aetiology of chronic impingement syndrome, as acromion type alters from type 1 to type 3 the anterior acromion bends distally and its pressure on the rotator cuff increases. According to this theory, mostly type 3 acromion should be observed in patients with impingement ; however, mostly type 2 acromion was observed in patients with impingement in studies by Bigliani *et al* and also in our study (*2*). Morrison *et al* have noted type 1 acromion in 6% of patients, type 2 in 42% and type 3 in 51% in patients with impingement (*10*). Petje *et al* reported 8% type 1, 78% type 2 and 14% type 3 acromion in patients with impingement (*12*).

Despite these diverging opinions, publications proposing that the type of acromion is not important in the aetiology are predominant. Acromion types are different in various age groups (*8,13*) and the occurrence of impingement in individuals having a type 1 acromion is not consistent with the theory that acromion morphology is important in the aetiology. Muscle imbalance and age are more important in the aetiology of impingement than the morphology of the acromion, as type 2 acromions are found in patients with impingement although most individuals having a type 2 acromion do not have impingement (*4,6*).

It is also controversial whether the hamate morphology in a type 3 acromion results from the structure of the acromion itself or from traction of the coracoacromial ligament. In cases in which both

rotator cuff repair and acromioplasty were performed in the same setting, outcomes were unsatisfactory. It has been argued that in these cases, the main problem is not the morphology of the acromion, but the imbalance developing with increasing age between elevator and depressors of the shoulder (*4*). Rotator cuff muscles weaken with increasing age whereas the deltoid muscle essentially retains its strength. This leads to decreased depressor force in the shoulder which may be the cause of subacromial impingement (*7*).

Jerosch *et al* concluded from their cadaveric study that the main reason for impingement is muscle imbalance. They suggested that this situation can be treated by muscle strengthening exercise rather than acromioplasty (*6*).

It has been reported that acromioplasty worsens clinical outcomes in patients with rotator cuff tears which are too large to be repaired ; in these cases debridement and if necessary steroid injections should be done (*14,15*). According to Matsen *et al*, misdiagnosis, incomplete decompression, insufficient repair of the deltoid, excessive excision of the acromion and insufficient rehabilitation were common causes of failures in subacromial decompression (*9*).

Kesmezacar *et al* reported that if impingement is cleared after subacromial bursectomy, soft tissue debridement and osteophyte excision, acromioplasty is not necessary. However, they believe that if the impingement persists after debridement, it is reasonable to resort to acromioplasty in order to be able to perform rehabilitation (*7*). Budoff *et al* have reported very successful results in cases where they applied only subacromial soft tissue debridement and osteophyte excision (*3*).

Consequently, although we did not perform acromioplasty on any patients to improve the morphology of the acromion, no significant difference was observed in treatment results of patients with type 1, type 2 and type 3 acromion. We think that acromioplasty is not necessary in the treatment of chronic impingement syndrome and ASD and a regular exercise program afterwards would be sufficient.

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