

INFLUENCE OF JOINT STABILITY ON THE RESULTS OF ARTHROSCOPIC SUBACROMIAL DECOMPRESSION

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We performed arthroscopic subacromial decompression on 70 patients. Each of them had either type I or type II impingement according to Neer. Sixty-five patients were then observed for a postoperative period of three years. The follow-up checks were performed by ultrasound in order to assess the extent of passive inferior shift of the humeral head, compared with the preoperative stage. A shoulder score of 100 was used as a reference. Whereas the average preoperative score was 58.5 (standard deviation ± 12.2), postoperative results showed an increased average value of 79.7 (standard deviation ± 11.4).

In twenty cases (31% of all treated patients), the postoperative score was less than 85 points, i.e. treatment had shown no results.

Comparing these patients with the other 45 who had a score above 85 points, we noted that the age of patients, the preoperative duration of complaints, the preoperative score and duration of the postoperative stay in hospital were of no relevance to the results.

However, among all patients, ultrasound measurements showed significant deviations in the extent of passive inferior shift of the humeral head. Patients in the group with unsuccessful treatment had an average shift value of 5.1 mm. (± 2.0 mm), compared with an average value of only 2.4 mm (± 0.9 mm) among patients in the successful group. The statistical negative Pearson correlation coefficient of -5.36 between postoperative score and inferior shift of the humeral head is very significant. We conclude that hypermobile glenohumeral joints or unstable joints should not be treated by subacromial decompression in the presence of any subacromial pathology.

Keywords : Shoulder arthroscopy ; joint stability ; subacromial decompression ; ultrasound.

Mots-clés : épaule ; arthroscopie ; instabilité articulaire ; décompression sous-acromiale ; échographie.

INTRODUCTION

Endoscopic subacromial decompression has become an established operative method for subacromial pathology. The fact that the impingement syndrome as described by Neer in 1972 is a tendon compression syndrome provided a motive for performing a subacromial decompression by arthroscopy. Ellman [10] was first to publish his results in 1989. In the following years, a great number of studies [3, 17, 18, 24] reported on arthroscopic treatment including anterior acromioplasty and resection of the coracoacromial ligament. Often, results varied from one group of treated patients to the other, so that no homogeneous picture could be drafted. This results from difficulties in differentiating several types of subacromial pathologies. Duplay [9] was first to refer to disorders of the subacromial joint and lesions of the rotator cuff as "périarthrite scapulo-humérale" (humero-scapularis periarthritis). In 1941, Bosworth [4] wrote about the "supraspinatus syndrome" Regarding this tendon compression syndrome, several methods of treatment were published [11, 14, 15, 18, 31].

Smith Petersen [28] described resection of the lateral acromion ; Armstrong [2] recommended resection of even a larger part of it. The open

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procedure described by Neer [21] includes resection of the coracoacromial ligament and anterior acromioplasty which can nowadays be performed by endoscopy.

Since 1987 we have performed the procedure arthroscopically according to Neer. A report is given on both operative procedures and results after the 3-year follow-up check.

MATERIALS AND METHODS

Technique (Arthroscopic Subacromial Decompression)

Arthroscopy is performed with the patient's shoulder fixed by a shoulder holder at 30° abduction. During the operation, the patient is placed on his contralateral side. After the respective anatomical structures have been marked with a sterile pen, the scope, using a standard 30°-optic, is inserted through a trocar via the posterior portal into the glenohumeral joint by stitch incision.

After inspection of the joint, the scope is inserted into the subacromial space. Bursa tissue is removed to inspect the fibers of the coracoacromial ligament and the inferior aspect of the acromion. Electrocautery is used for transection of the ligament. Osteophytes on the inferior aspect of the acromion are reamed off with an acromioplasty and a burr. Postoperatively, immediate shoulder motion is required, but overhead activities are not allowed.

Patients and documentation

From July 1987 through 1991 we performed arthroscopic subacromial decompression (ASD) on 70 patients with an impingement lesion of type I and II. The patients' ages ranged from 18 to 62 years (average age was 38.4 ± 12.6 years). There were 36 male and 34 female patients. All patients underwent a standardized examination. Neither anamnestic nor clinical signs for instability (apprehension test, sulcus sign, anterior/posterior shift) were found in any of these patients. Out of the total number of 70 patients, 65 were still observed postoperatively for at least three years.

Preoperatively, clinical and ultrasound results of all 70 patients and postoperatively of 65 patients were evaluated. For documentation we used a 100-point shoulder score (a modified Constant score) with the following parameters: pain on activity (15 points), pain without activity (15 points), function (20 points), weight

lifting (10 points), muscle strength (15 points) and range of motion (25 points).

A postoperative score of more than 85 points was classified as good, a score of less than 85 points was considered as unsuccessful.

During the preoperative sonographic examination we observed the subacromial pathologic findings, whereas at the time of the follow-up checks we documented the amount of passive inferior shift of the humeral head by ultrasound. The distance from the acromion to the humeral head in neutral position of the shoulder as well as in a distal, extended arm position (sulcus sign) was documented in the lateral plane (fig. 1). By performing the sulcus test, the increase in distance between the humeral head and the acromion can be measured.

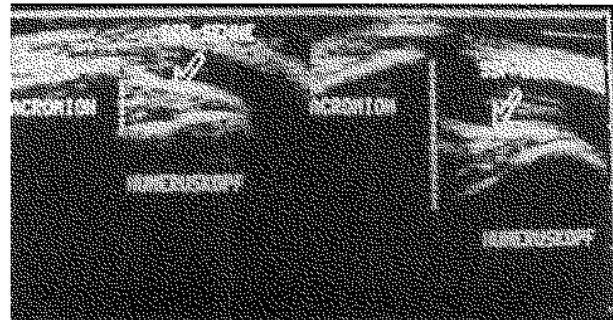


Fig. 1. — Ultrasound of the humeral head (Humeruskopf)-acromion relationship in the lateral plane. Left: normal position. Right: Inferior subluxation of the humeral head by distally-extended arm position (sulcus test). SSP-Sehne (supraspinatus tendon).

In this case the use of an extension apparatus did not prove worthwhile for objective measurements. Manual testing, i.e. observing the muscle tension, is superior to any measurement using the extension apparatus, since muscle relaxation is required to verify the passive range of motion of the glenohumeral joint which is mainly stabilized by muscle strength. Similar experience in testing the ankle and knee joint has already been described in the literature (1, 12, 32).

For determining the statistical significance, the values of the differences were classified into the following categories: significant ($P < 0.05$), very significant ($P < 0.01$) and highly significant ($P < 0.001$) (Student's t-test).

RESULTS

The mean shoulder score increased from 58.5 (± 12.2) preoperatively to 79.7 (± 11.4) postope-

ratively. Twenty of the 65 patients (31 %) who had a postoperative score of less than 85 points were classified as failures.

Comparing the two groups, the responder group A and the failure group B, we found no significant differences in age, preoperative duration of complaints, preoperative score or postoperative stay in hospital.

The average postoperative stay in hospital was 7.9 (± 1.9) days for group A and 8.3 (± 2.0) days for group B.

There was no significant difference regarding the preoperative duration of complaints among the 45 patients in group A (average duration 16.4 \pm 11.8 months) and the 20 patients in group B (average duration 18.2 \pm 12.9 months).

The preoperative shoulder score of the 45 patients in group A (average 60.4 \pm 14.1 points) and the 20 patients in group B (average 57.8 \pm 10.4 points) showed only a small and rather insignificant difference between the two groups

However, we did find some quite remarkable differences between the responder and failure groups as far as the amount of passive inferior shift of the humeral head is concerned: in the failure group an average shift of 5.1 \pm 2.0 mm was measured, whereas in the responder group the mean shift was 2.4 \pm 0.9 mm. This yielded a highly significant correlation ($P < 0.001$) between passive inferior shift of the humeral head and the success or failure of treatment, with a Pearson index of -5.36. The study indicated clearly that the three-year results after ASD on patients with cranio-caudal hypermobility of the glenohumeral joint were not satisfactory.

Major postoperative complications were not seen with any of the patients.

DISCUSSION

Since the number of surgeons performing endoscopic subacromial decompression is steadily increasing, more and more patients suffering from an impingement syndrome grade I, II or III are treated by this method (3,11).

In 1983, based on autopsy studies in older patients, Neer classified 3 impingement syndrome

stages: Stage I: hemorrhage and edema, mainly with patients younger than 25 years; stage II: tendonitis and fibrosis, mostly with patients between 25 and 40 years old; stage III: bone spurs and tendon rupture, mainly with patients over forty. Using this classification, the diagnoses of many shoulder complaints were better defined which so far were simply described as "humeroscapular periarthropathia". Nevertheless, Neer's concept is not generally accepted (10, 23, 30, 33, 34).

Still, for many arthroscopic surgeons this is not an argument against performing arthroscopy on the patient with any subacromial pathology for any of the three stages. Even a stage III case with a ruptured tendon leads to the indication for sufficient arthroscopic subacromial decompression with resection of the coracoacromial ligament without any repair of the ruptured tendon (11, 24, 35). The ultrasound examination is often used to differentiate the ruptured tendon from the intact tendon without consideration of the degree of the various incomplete tendon tears (5, 13, 16).

Rathburn and Macnab (26) postulated a "critical zone" of hypovascularization within the rotator cuff. According to these studies and to Neer's theory (21, 22), the degeneration should develop in the middle third and the layers of the supraspinatus tendon adjacent to the bursa.

Uthhoff (33) however found most of the tendon tears in the inferior part of the tendon and close to the lateral insertion. A primary tendinopathy of unknown origin rather than compression of the tendon should be considered (6, 20, 27, 29). Also intraoperative measurement of the vascularization of the supraspinatus tendon in patients with complete or with incomplete tendon tears performed by Swiontkowski *et al.* (30) did not prove the existence of any avascular zone.

A completely different etiology of the subacromial pathology was suggested by Jobe *et al.*, who found tendinous lesions even in hypermobile joints (19). The reason for this might be the permanent stress on the rotator cuff as shoulder stabilizer. In such a hypermobile joint with insufficient passive joint stabilization, the active stabilizers have to stand more stress than in a stable joint. Clinical studies showed relief of symptoms after

strengthening of the remaining shoulder stabilizers by physical therapy. Only in a few cases was operative stabilization needed (25, 31).

The results of our study, showing greater inferior shoulder shift among the failure group, are not incidental. Although we did not note any sulcus sign in the preoperative clinical examination, the postoperative sonographic findings referring to joint stability show that we performed ASD on patients with a hypermobile shoulder joint. A 3-year follow-up is perhaps too short for a final evaluation and conclusion. However, the rather high failure rate of 30%, compared with similar values found in the literature (17, 18, 23, 24, 35), is a serious indication that attention must be given to joint stability, when performing arthroscopic subacromial decompression.

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SAMENVATTING

T. SCHNEIDER, J.M. STRAUSS, B. FINK, W. MENKE, W. RÜTHER. Invloed van de gewrichts-stabiliteit op de resultaten van arthroscopische subacromiale decompressie.

De auteurs hebben 70 arthroscopische subacromiale decompressies verricht. Elk van deze gevallen had een type I of type II „impingement” volgens Neer. Vijfenzestig patiënten werden drie jaar lang post-operatief gevolgd. Bij lange termijn controle werd gebruik gemaakt van echografie om de mate van de passieve verplaatsing naar distaal van de humeruskop in te schatten vergeleken met de pre-operatieve status. Een score van 100 was de referentie. Wanneer de gemiddelde pre-operatieve score 58,5 beliep (met een maximale deviatie van $\pm 12,2$ van het gemiddelde) toonden de post-operatieve resultaten een verhoogde gemiddelde waarde van 79,7 (met een maximale deviatie van $\pm 11,4$ van het gemiddelde).

Bij 20 gevallen (bij 31% van de behandelde patiënten) was de post-operatieve score kleiner dan 85, met andere

woorden werd er door de behandeling geen resultaat bereikt.

Wanneer men de klinische resultaten vergelijkt bij meer dan 85 punten, ziet men dat de leeftijd van de patiënten en/of de duur van het post-operatief verblijf in het ziekenhuis geen invloed hadden op de resultaten. Maar, voor alle patiënten, toonde de echografie een relevante deviatie voor de amplitude van de passieve verplaatsing van de humeruskop naar distaal. De patiënten in de groep met negatief resultaat hadden een gemiddelde verplaatsingsamplitude van 5,1 mm (± 2 mm) vergeleken met een gemiddelde waarde van 2,5 mm ($\pm 0,9$ mm) bij de patiënten met een goed resultaat. Het statistisch negatief Pearson correlatie coëfficiënt van $-5,36$ tussen de post-operatieve score en de verplaatsing naar distaal van de humeruskop is relevant. De auteurs konkluderen dat een hypermobiel glenohumeraal gewricht of een onstabiel gewricht niet moet behandeld worden door middel van subacromiale decompressie in geval van subacromiale pathologie.

RÉSUMÉ

T. SCHNEIDER, J.M. STRAUSS, B. FINK, W. MENKE, W. RÜTHER. Influence de la stabilité articulaire sur les résultats de la décompression sous-acromiale par voie arthroscopique.

Sur 70 malades présentant un conflit sous-acromial de type I ou II, nous avons procédé à une décompression sous-acromiale arthroscopique. Un examen post-opératoire a été pratiqué sur 65 malades. Pour chacun nous avons recensé différents points concernant l'état de l'épaule avant et après la décompression sur la base d'un score de 100 points. Lors de l'examen post-opératoire, un examen échographique a été également effectué pour évaluer le tiroir inférieur passif de la tête humérale. Le score moyen avant l'opération était de 58.5 (± 12.2). Après l'opération, nous avons noté une élévation significative du score à 79.7 (± 11.4). Pour 20 patients (soit 31 %) le score postopératoire était inférieur à 85 points, et par conséquent nous avons considéré le traitement de ceux-ci comme un échec. Ce groupe de malades, comparé aux patients dont le traitement avait été couronné de succès, ne présentait pas de différence d'âge, montrait une différence négligeable dans la durée de la symptomatologie avant l'opération et ne présentait aucune différence dans la durée du séjour à l'hôpital après l'opération. Nous avons pu constater au contraire une différence très importante

dans l'amplitude du tiroir inférieur passif de la tête humérale. Dans le groupe présentant un échec, le tiroir inférieur moyen était de $5.1 \text{ mm} \pm 2.0 \text{ mm}$, tandis que pour l'autre groupe il n'était que de $2.4 \text{ mm} \pm 0.9 \text{ mm}$. Cette différence était très significative du point de vue statistique. Nous avons relevé également un coefficient négatif de corrélation selon Pearson de $- 5.36$ de grande

importance statistique, entre le score après l'opération et le tiroir inférieur de la tête humérale.

Nous en concluons que les malades présentant une pathologie sous-acromiale et des articulations gléno-humérales hypermobiles pourraient être de mauvais candidats pour un traitement par décompression sous-acromiale.