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Revision surgery after failed subacromial decompression

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Abstract The purpose of this study was to assess the results of revision subacromial decompression and identify clinical and psychological factors that influence its outcome. Thirty-five patients with intact rotator cuffs who underwent surgery for recurrent stage II impingement were studied at a mean follow-up time of 43 months post-surgery. Twenty-seven patients were satisfied with their surgery. The UCLA Scoring System rated 18 of 35 with good/excellent results and 17 of 35 poor/fair results, 22 patients had worker's compensation injuries, which correlated with poor outcome (P=0.0067). Patients with concomitant brachial plexopathy and/or compressive neuropathies were associated with unsatisfactory results (P=0.02).

Résumé Le but de cette étude est d'étudier les résultats de revision d'acromioplastie chez les patients qui n'ont pas de déchirure de la coiffe des rotateurs, de plus nous avons essayé d'identifier les facteurs cliniques et psychologiques qui influencent ces résultats. 35 patients ont participé à l'étude. La moyenne de suivi était de 43 mois. Il y avait 18/35 de bons ou excellent résultats et 17/35 de résultats médiocres d'après la classification UCLA. Vingt-et-deux patients ont subi leur blessure au travail ce qui était associé à un mauvais resultat (P=0.0067). La présence de lésions de la coiffe associé à des blessures neurologiques ou syndromes de compression neurologique ont demontré de mauvais resultats (P=0.02).

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Introduction

Shoulder pain is an important cause of disability in an industrialized society [9]. Impingement syndrome is a frequent cause of this type of pain. Neer [11] classified the disorder into three stages according to the pathological changes he had noted. In stage I there is reversible inflammation of the bursa. As the disease progresses, a chronic fibrosis occurs. These changes are considered to comprise stage II impingement. Tearing of the cuff, even partial thickness tears, defines the third stage of the disorder. The treatment of stage I disorders is nonoperative. Stage II disease is initially treated nonoperatively. Failure of the disorder to respond is an indication for operative treatment. Partial anterior acromioplasty is the procedure of choice for decompression of the subacromial arch.

Unfortunately, not all patients who undergo subacromial decompression have satisfactory results [1,5,14,16]. There are few studies published that deal with the results of revision surgery for failed subacromial decompression [6,13]. Previous studies have addressed the causes of failure in impingement surgery. These include incorrect diagnosis, operative errors, and workman's compensation claims, especially when associated with smoking [8]. The goal of this study was to assess the outcome of revision surgery in patients with stage II impingement, and to identify clinical and psychosocial factors that would influence the outcome.

Materials and methods

This retrospective study included all patients presenting with a failed subacromial decompression from 1984 to 1996. Inclusion criteria for this study included: persistent pain with overhead activity; a positive Neer and/or Hawkins impingement sign, which improved after selective injections; 1 year since the primary surgery during which no significant improvement had occurred for 6 months despite compliance with a home exercise program. Patients with partial thickness tears as well as patients who had a revision plus re-repair of a major cuff tear were excluded. Patients

with a primary diagnosis other than subacromial impingement, i.e., demonstrable glenohumeral instability or osteoarthritis, documented cervical radiculitis, or peripheral nerve entrapment in which no evidence for residual impingement was found were also excluded from this study.

Forty-five patients, 45 shoulders, with Neer stage II impingement and more than 2-year follow-up after revision surgery, were identified for review. Chart review was performed on all patients. This review was considered satisfactory alone if the patient had been seen in the last 18 months (8 patients). Fifteen patients had a careful history and physical examination performed in the clinic. The remaining 12 patients were interviewed by telephone by using a detailed questionnaire that allowed determination of the University of California, Los Angeles (UCLA) score. Of the 45 cases identified 10 patients were lost to follow-up, leaving a total patient population of 35 shoulders.

Preoperative data collected on all patients included range of motion of both shoulders and visual analog pain scale. Clinical examination including range of motion, manual muscle strength testing, provocative tests for impingement, instability, acromioclavicular joint disease, and biceps tendon disorders was performed in all patients postoperatively.

Anterior-posterior radiographs in internal and external rotation, as well as an axillary lateral, outlet, and 30° caudal tilt [7] views were performed in all patients. Postoperative radiographs were evaluated for anterior acromial overhang and acromial type. A flat acromion on the outlet radiograph was considered type I. A small curved acromion was classified as a type II, while those with a large hooked acromion were typed III. In addition, cervical spine series and electromyelograph (EMG) and nerve conduction velocity of both upper extremities including F-wave evaluation were performed on patients with neurological symptoms. All patients had selective injections performed prior to surgery.

The surgical procedure performed was an open decompression of the involved shoulder. Disorders identified before or at the time of surgery were corrected during the revision procedure. Patients with documented peripheral nerve compression syndromes had releases performed at the same time as the revision procedure. Twenty patients had a shoulder arthroscopy prior to their revision procedure. The patients who did not undergo this procedure had their surgery before this technology was available.

The UCLA rating scale [2] was used to evaluate patients after surgery. All patients were also asked to subjectively grade the surgery. A visual analog scale was used to measure the difference between preoperative and postoperative pain. Statistical analysis of the results was performed using the Kruskal-Wallis test for nonparametric groups. Alpha was selected at 0.05 and beta at 0.80.

Results

Surgical results

Twenty-eight patients were felt to be symptomatic because of inadequate initial acromioplasty. Seven patients had residual anterior overhang of the entire acromion. Persistent anterior medial acromion was found in 14 patients while residual anterolateral acromion was felt to be responsible for pain in 7 patients.

In addition to residual acromion most patients also had other possible pain generators identified at surgery. Fourteen patients had an acromioclavicular (AC) joint derangement and 3 acromial fractures were encountered in patients with previous arthroscopic acromioplasties. Diagnostic glenohumeral arthroscopy identified two type I superior labral anterior to posterior (SLAP) lesions [15] and one type II SLAP lesion in the 20 patients who underwent this procedure. Three patients were found to have concomitant biceps tendinosis (2) or tenosynovitis (1). Two patients required partial coracoidectomy for coracoid impingement syndrome. Six patients underwent peripheral nerve decompression. All these lesions were surgically treated during the revision procedure.

Table 1 Preoperative and postoperative range of motion (ROM)

Direction	Preoperative ROM	Postoperative ROM
Active forward flexion	121° (80–160°)	129° (110–180°)
Passive forward flexion	128° (90–180°)	146° (125–180°)
Passive external rotation	20° (-30–45°)	40° (20–80°)
Active internal rotation	L2 (Greater trochanter-T7)	T10 (Sacrum-T4)

Clinical results

There were 26 male and 9 female patients. The average age at the time of surgery was 44.8 years (range 22–75). Follow-up averaged 43.3 months (range 24–125 months). The pre- and postoperative range of motion is listed in Table 1. Strength, measured by manual muscle testing, averaged 3.2/5 (range 2–5) preoperatively compared to 3.8/5 (range 3–5) postoperatively. Using the UCLA Rating Scale, postoperative results were as follows: 8 excellent; 10 good; 5 fair; and 12 poor. The mean score was 26.6 for all patients. A score of 28 points or less was considered unsatisfactory. Nearly 50% of our patients had an unsatisfactory result.

Of the 17 unsatisfactory results, all had active compensation cases at the time of their surgery. UCLA scores of patients with and without active worker's compensation claim were compared utilizing the Kruskal-Wallis test. Patients with active compensation cases had statistically significant (P=0.0067) poorer results.

Statistically significant poorer results were obtained in patients with concomitant conditions (P<0.02). Concomitant conditions that adversely effected the outcome included diabetes mellitus (2); cerebrovascular accident (CVA) (1); brachial plexopathy (7); peripheral nerve entrapment (6); degenerative cervical spine disease (4), and reflex sympathetic dystrophy (2). Four patients with more than one concomitant condition all had poor results.

Smoking also affected the results. The 14 smokers had an inferior result compared to the nonsmokers. This was significant at the P=0.042 level. Patients who underwent an initial open acromioplasty showed a trend toward a poor result after revision (P=0.5) (Fig. 1).

Return to work

Of the 21 working patients none had returned to work prior to their revision subacromial decompression. Four patients returned to full duty, while 14 patients were only

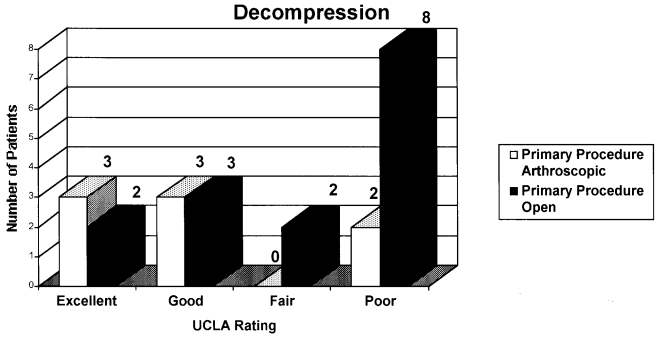

Fig. 1 UCLA scores in patients initially treated with an open subacromial decompression compared to patients whose initial procedure was an arthroscopic subacromial decompression

able to return to light duty. The remaining 3 patients were unable to return to work. All patients who did not return to work were older and had at least one concomitant pain generator.

Pain relief

Prior to the surgery, all patients in the study required routine medication for pain. A visual analog scale was utilized to assess the degree of pain present, both before and after the index procedure. Pain on the visual analog scale changed from an average of 8.2 preoperatively to 4.5 postoperatively.

Patient satisfaction

When asked if they were satisfied with the results of the surgery, 27 of 35 of patients stated in the affirmative and would have the surgery again. The remaining patients stated they would not have the surgery again and were dissatisfied. Four patients felt they were worse after the surgery than prior to the surgery.

Radiographic results

Preoperatively, 28 patients had an acromion that extended anterior to the distal clavicle. Sclerosis of the greater tuberosity was seen in 18. Acromial shape was: 20 type III, 12 type II, and 3 type I.

Postoperatively all acromions were converted to type I with the exception of 2 patients with a type III acromion. Two patient's acromions extended beyond the anterior border of the clavicle. Of the 17 fair and poor results, only 4 had radiographic evidence of residual abnormalities. In 2 cases, overgrowth or inadequate distal clavicular excision was present, and in 2 cases a persistent type III acromion was present. All 4 of these cases were associated with some heterotopic ossification extending into the deltoid origin.

Discussion

Anterior acromioplasty resulted in 15 of 16 satisfactory results in Neer's initial review [10]. Several authors have shown 66–90% satisfactory results with anterior acromioplasty [1,3,5,10,14,16]. Neviaser et al. [12] described the four-in-one arthroplasty for the treatment of impingement. Residual acromion and/or the AC joint were implicated as a cause of failure in the majority of our cases. Only 2 patients required biceps tenodesis in our series. Our data may support routine distal clavicular excision during revision acromioplasty, but it does not support routine biceps tenodesis.

Failure of acromioplasty to relieve pain has been studied by Hawkins et al. [6]. Thirty-four of 51 patients who failed surgery were felt to have a diagnosis other than impingement. He found poorer results in patients claiming worker's compensation. He did not recommended revision in these patients. While we share his lack of enthusiasm for repeat acromioplasty on worker's compensation patients our data suggest that some of these patients may benefit from surgery. Both in our series and that of Hawkins et al., failure of revision surgery is frequently associated with conditions that exist in addition to what was felt to be an impingement syndrome. In our series even when both conditions are successfully treated objectively, i.e., normalization of radiographs and conduction studies, the results were not as good as in patients who only had residual impingement.

Our surgical findings were similar to those of many other authors. Residual impingement from the anteromedial acromion was considered to be a factor in 20% of patients in Neer's initial article. It is difficult to completely excise the coracoacromial ligament through an open approach without removing the distal clavicle. The most common area of residual acromion was this anteromedial portion.

A factor that may have contributed to the poor results of patients undergoing simultaneous shoulder surgery and peripheral nerve decompression is difficulty performing the rehabilitation. The longer the immobilization the higher the risk for a poor result. Although patients undergoing concomitant surgery in our series were not totally immobilized they all had difficulty performing their rehabilitation exercises, which may account for their poor results. Based on our study, the Senior author no longer recommends peripheral nerve decompression immediately following coracoacromial arch decompression under the same anesthetic.

Ogilvie-Harris et al. [13] studied the results of revision acromioplasty. Their results revealed 47% of patients with good and excellent results. The results compare similarly to our 51% satisfactory rate; however, he does not give his criteria for good results. Our patients were more likely to return to some sort of work following their surgery when compared to those of Ogilvie-Harris et al., despite a UCLA fair and poor rating. A number of factors are involved in our 85% return to work, not the least of which is the likelihood of better

long-term benefits for injured workers in the Province of Ontario than the State of Texas.

All patients that are seen by the senior author are given a questionnaire that includes a visual analog scale. This data was compared to the visual analog pain scale given postoperatively. The initial patient encounter form also includes a section where the patient's range of motion is entered. This allowed us to compare the patients preoperative and postoperative motion. Unfortunately all the data necessary to provide a UCLA score preoperatively are not present on this questionnaire. Because of this we were unable to calculate preoperative UCLA scores and compare them to the patients postoperative score.

In our series, patients with prior open acromioplasty faired poorer than those with previous arthroscopic acromioplasty, independent of their work-related status. The most likely explanation for this is that adequate decompression had already been done in individuals with open decompressions. Surgeons performing open decompressions were experienced in using this technique. Arthroscopic subacromial decompression on the other hand was a recently described technique and this factor could be responsible for the inadequate resection of bone in some patients. Inexperience may have also led to the acromial fractures seen in this series. The three fractures observed at surgery may have been secondary to inappropriate thinning of the acromion posteriorly. A small stress or trauma in the postoperative period may have completed the fracture. As a surgeon's learning curve improves this type of complication should become less frequent. Surgeon inexperience may have contributed to both the fractures and the inadequate resection of the acromial spur seen in our series.

The results of this study suggest that some patients may benefit from revision subacromial decompression. The ideal candidate for a revision subacromial decompression appears to be the non-compensation patient with a previous arthroscopic acromioplasty. Worker's compensation patients who have had previous open acromioplasty and concomitant peripheral nerve entrapment or cervical degenerative disease should be considered cautiously for surgery. In the absence of demonstrable radiographic abnormalities, these patients are no longer offered surgery, but instead encouraged to settle their workers' compensation claims and be retrained for lighter duty work.

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