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Shoulder impingement syndrome: Outcome of arthroscopic subacromial decompression

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ORIGINAL ARTICLE

Shoulder Impingement Syndrome: Outcome of Arthroscopic Subacromial Decompression

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ABSTRACT

Objective: To describe the outcome of cases with subacromial impingement syndrome managed with arthroscopic subacromial decompression.

Study Design: Quasi-experimental study.

Place and Duration of Study: Section of Orthopaedics, Department of Surgery, The Aga Khan University Hospital, Karachi from April 2005 to March 2006.

Methodology: Thirty patients with impingement syndrome who underwent arthroscopic subacromial decompression after failed conservative treatment were included. The Constant and Murley shoulder scoring system was used for the clinical assessment of pain and function pre-operatively and 1, 6 and 24 weeks postoperatively.

Results: The postoperatively significant improvement was observed in the Constant and Murley scores in all the patients (by mean 40 points, $p < 0.01$), which was progressive over six months. Lower scores were noted in patients over 40 years of age, with advanced stage of impingement and partial tears of the rotator cuff.

Conclusion: Arthroscopic subacromial decompression was effective in reducing pain and improving function in the studied patients with subacromial impingement syndrome.

Key words: *Arthroscopic surgery. Subacromial impingement syndrome. Surgical decompression.*

INTRODUCTION

Since the first description of subacromial bursitis in 1867 by Jarjavay in which he described the symptoms of subacromial bursitis in a few cases,[1] the understanding has improved significantly. In the Subacromial Impingement Syndrome (SIS), the supraspinatus tendon and bursa become entrapped between the anteroinferior corner of the acromion and the greater tuberosity with flexion of the shoulder leading to pain and limitation of movement at the shoulder.[2,3] The diagnosis is essentially clinical, relying on knowledge of various pathological processes that cause pain, coupled with careful physical examination.[4,5] Factors associated with SIS can be broadly classified as intrinsic (intratendinous) or extrinsic (extratendinous). A primary etiology, either intrinsic or extrinsic, causes the impingement process while a secondary etiology is the result of another process, such as instability or neurological injury.[6-8]

For treatment of SIS, non-operative methods are employed first. Most patients respond to those and failure of response is an indication for operative intervention.[9,10] Currently, Arthroscopic Subacromial Decompression (ASAD), first described in 1987 by Ellman,[11] is a widely accepted operative treatment of SIS; it is the most frequently performed arthroscopic procedure for the shoulder and clinical reports support its efficacy, durability and resultant patient satisfaction.[7-9,12] An objective assessment of shoulder pain and function has commonly been reported according to the Constant and Murley shoulder scoring system.[13,14] In Pakistan, patients with shoulder pain are usually treated conservatively for long periods because many cases of SIS are mis-diagnosed as frozen shoulder, and benefits of ASAD for SIS have not become common knowledge among general practitioners. There are few reports on whether locally, ASAD is beneficial in patients with subacromial impingement.

The objective of this study was to describe the outcome using the Constant and Murley shoulder scoring system in cases with subacromial impingement syndrome managed with arthroscopic subacromial decompression.

METHODOLOGY

This quasi-experimental study was conducted in the Section of Orthopaedics, Department of Surgery, The Aga Khan University Hospital, Karachi during the period of April 2005 to March 2006. A total of 30 patients were included through convenience sampling. All adult patients with clinical and radiological diagnosis of

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impingement syndrome and no improvement after six months of conservative treatment were included in the study. Exclusion criteria was patients with full thickness tears of the rotator cuff; internal rotation contracture, previous open shoulder surgery, glenohumeral instability and inadequate follow-up. Data was collected using a proforma. The type of acromion was determined from X-rays (supraspinatus outlet view) and classified as type I (flat), type II (curved) and type III (hooked) as described by Bigliani.[10] All patients underwent clinical assessment pre-operatively, according to the Constant and Murley shoulder scoring system in the outpatient clinic; their final score was graded as excellent (score 90-100), good (80-89), fair (70-79) and poor (< 70).[13] Assessment was done by the authors themselves, and recorded in the proforma.

Postoperative assessment was done at one week, six weeks and six months follow-up, according to the same scoring system. Stage of impingement (stage II=fibrosis and tendonitis-irreversible, stage III=structural changes at the under surface of acromion with partial rotator cuff defect) and rotator cuff status (intact or partial tear) were determined intra-operatively. All ASAD procedures were carried out under general anaesthesia, while the patients were in semi-sitting or 'beach chair' position. Standard anterolateral and posterolateral portals were used. Criteria for a complete ASAD was removal of entire anterior acromial protuberance, leveling of inferior aspect of the acromioclavicular joint at the same level as the acromion and complete resection of coracoacromial ligament. At the end of the ASAD procedure, 10 ml of 0.5% bupivacaine hydrochloride with epinephrine was injected subacromially to control the pain and bleeding.

From the data obtained, results were evaluated according to the Constant and Murley scoring system for the shoulder. For statistical analysis, SPSS version 13.0 was used. Data was described in terms of mean, standard deviation/minimum-maximum for age, duration of symptoms and Constant and Murley scores, and frequency and percentage for side, type of acromion, stage of impingement and rotator cuff status. The friedman test was applied to determine the significance of variation of the score over time, with post-hoc analysis for pair-wise comparison using Wilcoxon signed rank test. Mann-Whitney test was applied to compare between-group difference in scores according to the age group (< 40 vs. 40+ years), stage of impingement (stage II vs. III) and rotator cuff status (intact vs. partial tear). Chi-square test was applied to compare difference of proportions in stage of impingement and rotator cuff status between the two age groups. P-value < 0.05 was considered significant.

RESULTS

Thirty patients were clinically evaluated with a minimum 6 months follow-up after operation. There were 17 males (57%) and 13 females (43%) with a mean age of 38 (ranging from 18 to 63) years. The mean duration of symptoms was 16 (ranging from 7 to 36) months. The left shoulder was affected in 11 (37%) patients, while the right was affected in 19 (63%) patients.

Pre-operatively, the mean Constant and Murley shoulder score was 48 (ranging from 23 to 60). Post-operatively, a progressive improvement in the score was observed (Table I); this change was statistically significant ($p < 0.01$). Overall there was an improvement in the score by 40 points (ranging from 28 to 65). Grading of the final result at the 6 month follow-up showed that the vast majority of patients had either excellent (62%) or good (28%) results, while a few (10%) had fair result. No patient had poor result. One case had wound infection, otherwise no complication of the surgical procedure was noted.

Table I: Constant and Murley scores over the study period.

	Mean ±SD	Minimum	Maximum		
Pre-op score	48±10	23	60		
				}p < 0.01	
One week score	69±7	48	78		}p < 0.001
				}p < 0.01	
Six weeks score	79±7	59	89		
				}p < 0.01	
Six months score	88±6	70	96		
Total change of score	40±7	28	65		

Numbers indicate mean Constant and Murley scores ± SD. Variance of score over time significant at p-value < 0.01; Friedman test with post-hoc pair-wise comparison with Wilcoxon signed rank test.

There were 10 patients with type II acromion and 20 patients with type III acromion, while there were no patients with type I acromion. Twenty one patients (70%) had stage II impingement, while nine patients (30%) had stage III impingement. There were no patients with stage I impingement. There were 7 patients (23%) with partial tears of the rotator cuff while in the remaining 23 patients (77%), the rotator cuff was intact. The rotator cuff status did not vary with the stage of impingement.

There were significantly lower scores at all time points in patients 40+ years of the age as compared to those < 40 years of the age (Table II). Scores were also significantly

Table II: Constant and Murley scores according to age, impingement stage and rotator cuff status.

	Age group		Stage impingement		Rotator cuff status	
	< 40 years	40+ years	Stage II	Stage III	Intact	Partial tear
Pre-op score	54 ± 6	*41 ± 10	51 ± 7	*41 ± 13	50 ± 9	*39 ± 9
One week score	73 ± 4	*64 ± 7	71 ± 4	*62 ± 9	70 ± 6	*63 ± 8
Six weeks score	83 ± 4	*75 ± 8	81 ± 6	*75 ± 8	80 ± 7	*75 ± 8
Six months score	91 ± 3	*85 ± 7	90 ± 4	84 ± 9	89 ± 5	*83 ± 8

*Numbers indicate mean Constant and Murley scores ± SD. * Difference of scores between the two age groups, Stage I and II impingement, and intact and partially torn rotator cuff significant at p-value < 0.05; Mann-Whitney test for individual time points.*

KEY: Stage II: Fibrosis and tendinitis (irreversible); Stage III: Structural changes at the under surface of acromion with partial rotator cuff defect.

lower at all times in patients who had advanced stage of impingement (stage III) and partial rotator cuff tears. Moreover, age appeared to influence the type of acromion as well as the stage of impingement (Table III). Thus, 86% of patients 40+ years of age had type III acromion as compared to 50% of those under 40 ($p < 0.05$). Fifty percent of patients 40+ years of age had stage 3 impingement as compared to only 13% of patients under 40 ($p < 0.05$).

Table III: Age group according to type of acromion and stage of impingement.

		Type of acromion*		Stage of impingement*	
		Type 2	Type 3	Stage II	Stage III
Age group	< 40 years	8	8	14	2
	40+ years	2	12	7	7

*Numbers indicate number of patients in each sub-group. n = 30. *Difference of proportions between age groups significant at p-value <0.05; chi-square test.*

DISCUSSION

The treatment of SIS was considered to be open acromioplasty for many years till the introduction of ASAD by Ellman in 1987.[11,15] Within a few years, ASAD became the most frequently performed arthroscopic procedure of the shoulder. Current literature suggests that in terms of indications and surgical goals, ASAD is equivalent to open decompression.[7,9,16]

In this study, pre-operative diagnosis of SIS or abnormality of the rotator cuff was made on the basis of the history and the physical examination. Radiographs were made for all patients. Types of acromial morphology were identified by X-ray.[10,17] All of the patients had failed to respond to non-operative therapy that included an intensive program of rehabilitative exercises designed to restore strength, flexibility, and endurance to the rotator cuff, deltoid, scapulothoracic stabilizers, and thoracic muscles.

A substantial number of other patients had arthroscopic procedures during this time-period, but they were excluded from the present study because they had a full-thickness tear of the rotator cuff and glenohumeral instability (noted either on examination under anaesthesia or on glenohumeral arthroscopy or both).

All ASAD procedures were performed in the beach-chair position under general anaesthesia and no difficulties were encountered regarding this position. Skyhar *et al.* reported superiority of beach-chair position as compared to lateral position.[16] They noted faster and easier patient positioning, reduced risk of neurapraxias since traction was not used, less distortion of intra-articular capsular anatomy, improved mobility of the patient's arm, and easier conversion to open procedures since repositio-ning and repreparation were not required. During this study, glenohumeral arthroscopy was performed in all the patients for thorough evaluation of the glenohumeral joint, biceps tendon and the rotator cuff undersurface. The next step was subacromial arthroscopy starting with subtotal bursectomy, followed by release of coracoa-cromial ligament and then acromioplasty by shaving the hook-like projection of acromion.

It was observed that none of the patients had a type I (flat) acromion, while 33% had a type II (curved) acromion and 66% had type III (hooked) acromion. This is in line with Bigliani,[10] who reported that type II and III acromions predispose to impingement.

The stage of impingement was advanced (stage III) in 30% of patients, and these patients had significantly lower pre-operative as well as early postoperative shoulder scores (upto 6 weeks). However, the final score at 6 months was not significantly different between stage II and III impingement. This is probably related to rehabilitation following the procedure.

Partial tear of the rotator cuff was noted in 23% of the patients and corresponded to low shoulder scores at all time points. Others have reported an improved outcome following rotator cuff debridement during ASAD.[18,19] We routinely performed rotator cuff debridement when a partial tear of the bursal site was found. The low shoulder scores in these patients were probably due to two factors. They had lower pre-operative scores and 71% of the patients were aged 40 and above, or had a type III acromion.

During this study, one patient had deep infection of the shoulder joint; she was managed with debridement and intravenous antibiotics. The reported infection rate is generally < 1%. The present sample size is not sufficiently large enough to make conclusions regarding infection rate.

Ellman reported the results for 49 patients who had been followed for at least one year after ASAD.[11] The average duration of pre-operative symptoms was 29 (range 6 to 60) months, and the average duration of follow-up was 17 (range 12 to 36) months. Eighty eight percent of patients had excellent or good result. In this study of 30 patients, the mean duration of pre-operative symptoms was 16 months. Eighty seven percent of patients had excellent or good result, which is comparable to Ellman's result.[11] Duration of pre-operative symptoms was more in patients aged 40 years and above. Moreover, due to their long-standing symptoms they had a lower pre-operative Constant and Murley shoulder score than the patients less than 40 years of age. Altogether, patients aged 40 and above as well as those with a longer duration of symptoms showed a greater improvement in shoulder score. This implies that such patients should not be considered unsuitable for ASAD. It has also been shown that arthroscopic acromioplasty consistently provides a good surgical outcome and the ability to return to work in both the Workers' Compensation and non-Workers' Compensation populations.[20]

CONCLUSION

This study shows that ASAD is effective in reducing pain and improving function in patients with SIS. Both young and old patients benefit from the procedure regardless of the duration of symptoms. The presence of partial rotator cuff tear at the bursal site does not eliminate the beneficial effect of ASAD although the magnitude of improvement in the shoulder score is lower as compared to intact rotator cuff. The type of acromion and the stage of impingement do not have a distinct bearing on the long-term outcome. Thus, ASAD is the recommended procedure for treatment of SIS in adult patients whose symptoms do not resolve with trial of conservative therapy including intensive rehabilitative exercises for at least 6 months. Postoperative rehabilitation is important in achieving good and excellent results.

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REFERENCES

1. Codman EA. The shoulder. Boston: Thomas Todd; 1934.
2. Koester MC, George MS, Kuhn JE. Shoulder impingement syndrome. *Am J Med* 2005; **118**:452-5.
3. Neer CS 2nd. Anterior acromioplasty for the chronic impingement syndrome in the shoulder: a preliminary report. *J Bone Joint Surg Am* 1972; **54**:41-50.
4. McFarland EG, Selhi HS, Keyurapan E. Clinical evaluation of impingement: what to do and what works. *J Bone Joint Surg Am* 2006; **88**:432-41.
5. Park HB, Yokota A, Gill HS, El Rassi G, McFarland EG. Diagnostic accuracy of clinical tests for the different degrees of subacromial impingement syndrome. *J Bone Joint Surg* 2005; **87**:1446-55.
6. Flatow EL, Soslowsky LJ, Ticker JB, Pawluk RJ, Helper M, Ark J, *et al.* Excursion of the rotator cuff under the acromion: patterns of subacromial contact. *Am J Sports Med* 1994; **22**:779-88.
7. Hawkins RJ, Plancher KD, Saddemi SR, Brezzenoff LS, Moor JT. Arthroscopic subacromial decompression. *J Shoulder Elbow Surg* 2001; **10**:225-30.
8. Bigliani LU, Levine WN. Subacromial impingement syndrome. *J Bone Joint Surg Am* 1997; **79**:1854-68. Comment in: p. 1851-3.
9. Morrison DS, Greenbaum BS, Einhorn A. Shoulder impingement. *Orthop Clin North Am* 2000; **31**:285-93.
10. Bigliani LU, Morrison DS, April EW. The morphology of the acromion and its relationship to rotator cuff tears. *Orthop Trans* 1986; **10**:228.
11. Ellman H. Arthroscopic subacromial decompression: analysis of one- to three-year results. *Arthroscopy* 1987; **3**:173-81.
12. Neer CS 2nd. Impingement lesions. *Clin Orthop Relat Ris* 1983; **173**:70-7.
13. Constant CR, Murley AH. A clinical method of functional assessment of the shoulder. *Clin Orthop Relat Res* 1987; **214**:160-4.
14. Martin SD, Baumgarten TE, Andrews JR. Arthroscopic resection of the distal aspect of the clavicle with concomitant subacromial decompression. *J Bone Joint Surg Am* 2001; **83-A**:328-35.
15. Jafri SMH, Khan WA, Pervaiz M, Abdul Ghaffar, Raziq S. Surgical repairs of the rotator cuff tears. *Ann King Edward Med Coll* 2002; **8**:8-10.
16. Skyhar MJ, Altchek DW, Warren RF. Tips of the trade # 5. Shoulder arthroscopy in the seated position. *Orthop Rev* 1988; **17**:1033-4.
17. Hyvonen P, Paivansalo M, Lehtiniemi H, Leppilahti J, Jalovaara P. Supraspinatus outlet view in the diagnosis of stages II and III impingement syndrome. *Acta Radiol* 2001; **42**:441-6. Erratum in: p.624.
18. Budoff JE, Rodin D, Ochiai D, Nirschl RP, Ochiai D. Arthroscopic rotator cuff debridement without decompression for the treatment of tendinosis. *Arthroscopy* 2005; **21**:1081-9.
19. O'Holleran JD, Kocher MS, Horan MP, Briggs KK, Hawkins RJ. Determinants of patient satisfaction with outcome after rotator cuff surgery. *J Bone Joint Surg Am* 2005; **87**:121-6.
20. Nicholson GP. Arthroscopic acromioplasty: a comparison between workers' compensation and non-workers' compensation populations. *J Bone Joint Surg Am* 2003; **85**:682-9.