

# The Results Of Open Acromioplasty In Impingement Syndrome - A Retrospective Study

C H Chui, C Lee, K H Seow

## ABSTRACT

Many published reports have reported generally good results of open acromioplasty in shoulder impingement syndrome. This paper studied retrospectively the results of open acromioplasty done in the Singapore General Hospital. A total of 23 open acromioplasties performed on 22 patients with shoulder impingement syndrome were studied. The post-operative results of the acromioplasties were evaluated using the University of California, Los Angeles (UCLA) shoulder scoring system. With the UCLA shoulder scoring system, results were excellent or good in 14 (60.8%), fair in 7 (30.5%) and poor in 2 (8.7%). At the same time the male sex was identified to have statistically significant better results as compared to the females. There was a trend towards poorer results in those at or above 50 years of age, duration of symptoms of less than 2 years and those with acromiohumeral distance of less than or equal to 1.0 cm. The presence of rotator cuff tears and the duration of follow-up were found not to have any bearing on the post-operative outcome. This procedure seems to be reasonably effective and safe. Careful patient selection and early post-operative rehabilitation with physiotherapy is of utmost importance.

**Keywords:** open acromioplasty, UCLA shoulder scoring system, impingement syndrome

## INTRODUCTION

Impingement syndrome is a common shoulder problem that results in pain, stiffness and occasionally weakness of the shoulder joint, which can severely impair one's physical ability and hence the quality of life. In 1972, Neer's landmark paper<sup>(1)</sup> described the concept of impingement and its solution in treatment. Impingement syndrome refers to the encroachment of the acromion, coracoacromial ligament, coracoid process and/or acromioclavicular joint on the rotator cuff mechanism that passes beneath them as the glenohumeral joint is moved, especially in flexion and rotation. Neer<sup>(2)</sup> later described 3 progressive clinical stages of impingement; Stage I refers to those with oedema and haemorrhage; Stage II refers to those with fibrosis and tendinitis; and Stage III refers to those with tear of the rotator cuff, ruptured biceps or bone excrescence. Operative treatment was recommended for Stages II and III.

Non-operative measures for example, oral non-steroidal anti-inflammatory drugs, modified activities, physiotherapy and subacromial injections of a combination of local anaesthetic and steroids, have been shown to be effective in many cases. Rockwood et al<sup>(3)</sup> reported that 50% of his patients responded to a non-operative rehabilitative program. Those who failed to respond to conservative measures were offered surgical acromioplasty. This procedure aims to relieve the mechanical impingement and prevent wear at the critical area of the rotator cuff<sup>(4)</sup>. To date, many authors<sup>(5-10)</sup> have discussed their experience with open acromioplasty, describing uniformly good results.

This study reviews the results of open acromioplasties performed in the Singapore General Hospital between January 1993 and March 1994.

## METHODS AND MATERIAL

This study included 23 acromioplasties performed on 22 patients by the 2 orthopaedic surgical units in Singapore General Hospital between January 1993 and March 1994. One of the patients had acromioplasties done on both shoulders; acromioplasty on the right shoulder was performed 10 months after the left shoulder. Names and identification numbers of these patients were obtained from the operation record books. All these patients had acromioplasties done for the purpose of impingement syndrome with positive impingement sign. Rotator cuff tears diagnosed preoperatively were excluded from the study. Surgery was performed by 6 orthopaedic surgeons of senior consultant or consultant grade. Review of case notes and radiographs were done, and the post-operative assessment was carried out by completing the University of California, Los Angeles shoulder scoring system through phone calls and/or follow-up consultations after a period of 3 to 8 months.

The patients studied were between 32 and 66 years of age, with a mean age of 47 years ( $\pm 9.3$  years). Of these, 12 (54.5%) were males and 10 (45.4%) were females. Ten of the acromioplasties were done on the right shoulders and 13 on the left shoulders. All the patients presented with chronic shoulder pain for a duration of 6 months to 5 years, with a mean of 16.8 months ( $\pm 16$  months). Two had stiffness in the involved shoulders. Clinical examination revealed limited range of motion especially on forward flexion. Typically, they had painful arcs of movement between 60 and 120 degrees. Seven patients recorded positive impingement test. Antero-posterior views of the shoulder radiographs were reviewed and the acromiohumeral distance was measured for every patient to look for possible obvious trends. The acromiohumeral distance ranged from 0.7 cm to 1.7 cm, with a mean of 0.96 cm ( $\pm 0.27$  cm).

All of our patients had been treated conservatively before surgical intervention was offered. Nineteen (82.6%) were prescribed non-steroidal anti-inflammatory drugs, 20 (87.0%) had undergone physiotherapy and 18 (78.3%) had subacromial injections of local anaesthetic with steroids. All had a combination of two or three of the above conservative measures.

All our patients had open acromioplasties done after failed conservative treatment. Arthroscopic acromioplasties were excluded from the study. Indications for surgery were long term disability from persistence and/or progression of symptoms eg, increase in shoulder pain and impairment of function. The principle of the surgery was to remove the anterior aspect and the inferior prominence of the acromion and excise the coracoacromial ligament and the

Department of  
Orthopaedic Surgery  
Singapore General Hospital  
Outram Road  
Singapore 169608

C H Chui, MBBS  
Medical Officer

C Lee, MBBS  
Medical Officer

K H Seow, MBBS,  
FRCS (Edin), FRCS (Glas)  
Senior Consultant

Correspondence to:  
Dr K H Seow



subacromial bursa. If the rotator cuff was torn ie Neer's Stage III, which was present in 10 (43.5%) of the patients, it was repaired at the same time. All our patients had partial tears of the rotator cuffs. Each operation took 30 minutes to 115 minutes (mean 50.2 minutes  $\pm$  17.6 minutes). Aftercare included non-steroidal anti-inflammatory drugs and physiotherapy for all the patients and arm-slings for 10 of the patients. Follow-up period was between 3 and 8 months (mean 4.7 months  $\pm$  1.8 months).

All the patients were subjected to the UCLA shoulder scoring system<sup>(6)</sup>. (Table I)

## RESULTS

The overall results were excellent or good in 14 (60.8%) of the 23 shoulders, fair in 7 (30.5%) and 2 (8.7%) had poor results. From the patients' standpoint, 19 (86.4%) were satisfied with the results of treatment, while 3 (13.6%) were not satisfied. The patient who had acromioplasties performed on both shoulders was satisfied with both operations.

91.3% of our patients had none, or slight pain on heavy activities only. In terms of function, 78.3% had good function, many were able to perform normal activities or work above shoulder level. 82.6 % had active forward flexion of more than 120 degrees. Eighty seven percent of our patients had good or normal strength of forward flexion.

The results were analysed in several other ways (Table II). 76.9% of the patients below the age of 50 years had excellent or good results compared to 40.0% of those who were at or above the age of 50 years (median age 49 years). Patients who were at or above the age of 50 years seemed to do worse than those who were younger. However, the difference in the results by age was not statistically significant

when analysed ( $0.05 < p < 0.10$  chi-square test). Patients who had symptoms for less than one year had excellent or good results in 54.5% after surgery. 66.7% of those who had symptoms between 1 and 2 years were shown to have excellent or good results. 83.3% of those who had symptoms for more than 2 years had excellent or good results. On statistical analysis, the differences did not prove to be significant ( $0.1 < p < 0.5$  chi-square test).

The acromiohumeral (AH) distance was also measured. 52.9% of the patients with AH distance of less than or equal to 1.0 cm achieved excellent or good results after surgery, as compared to 83.3% of good results for those with AH distance of  $> 1.0$  cm. Again, the difference in these results suggest a trend, but on statistical analysis, the difference did not prove to be significant ( $0.1 < p < 0.5$  chi-square test). Perhaps most importantly, considering the results in relation to the patients' sex, there were significantly poorer results in the females compared to the males. 84.6% of the males obtained excellent or good results compared to 30.0% of the females ( $0.02 < p < 0.05$  chi-square test).

Ten of the patients had rotator cuff tears diagnosed (Neer's stage III) intraoperatively. Among those with rotator cuff tears, 60.0% had excellent or good results which was quite similar to 61.5% who achieved excellent or good results when the rotator cuff was intact.

Our patients were followed up for a variable period of time ranging between 3 to 8 months. There seems to be no deviation of results if they were evaluated at 3 months compared to those followed up at 6 months. When the patients were evaluated at 3 months, 5 out of 8 patients (62.5%) had good results. When they were evaluated at 6 months, 4 out of 7 patients (57.8%) had good results. The number of patients who were evaluated at other durations was too small for comment.

Table I - University of California, Los Angeles shoulder rating scale

	Score (postoperative rating)	No. of patients
<b>PAIN</b>		
Present always and unbearable; strong medication frequently	1	0
Present always but bearable; strong medication occasionally	2	0
None or little at rest, present during light activities; salicylates frequently	4	2
Present during heavy or particular activities only; salicylates occasionally	6	16
Occasionally and slight	8	2
None	10	3
<b>FUNCTION</b>		
Unable to use limb	1	0
Only light activities possible	2	0
Able to do light housework or most activities of daily living	4	3
Most housework, shopping, and driving possible; able to do hair and to dress and undress, including fastening brassiere	6	2
Slight restriction only; able to work above shoulder level	8	8
Normal activities	10	10
<b>ACTIVE FORWARD FLEXION</b>		
$> 150$ degrees	5	14
120-150	4	5
90-120	3	2
45-90	2	2
30-45	1	0
$< 30$	0	0
<b>STRENGTH OF FORWARD FLEXION</b>		
Grade 5 (normal)	5	12
Grade 4 (good)	4	8
Grade 3 (fair)	3	3
Grade 2 (poor)	2	0
Grade 1 (muscle contraction)	1	0
Grade 0 (nothing)	0	0
<b>TOTAL SCORE</b>		
Excellent = 34-35 points		3
Good = 28-33 points		11
Fair = 21-27 points		7
Poor = 2-20 points		2



**Table II - Analysis of results according to age, sex, duration of symptoms and acromiohumeral distance**

	Excellent/Good	Fair/Poor	Total
Age			
30-49 yrs	10 (76.9%)	3 (23.1%)	13
50-69 yrs	4 (40.0%)	6 (60.0%)	10
Sex			
Male	11 (84.6%)	2 (15.4%)	13
Female	3 (30.0%)	7 (70.0%)	10
Duration of symptoms			
<1 year	6 (54.5%)	5 (45.5%)	11
1 to 2 years	4 (66.7%)	2 (33.3%)	6
>2 years	5 (83.3%)	1 (16.7%)	6
Acromiohumeral distance			
< or equal 1.0 cm	9 (52.9%)	8 (41.7%)	17
> 1.0 cm	5 (83.3%)	1 (16.7%)	6

## DISCUSSION

Impingement syndrome is mainly due to the pathoanatomic changes in the acromion, coracoid, coracoacromial arch, and or the acromioclavicular joint, and the rotator cuff<sup>(1,11,13)</sup>. This together with the hypovascularity and constant pressure in the region in the impinged supraspinatus tendon, especially if there is upward translational movement of the humeral head, lead to symptoms and signs of impingement. Hence this makes surgical decompression a highly successful procedure<sup>(1,6,7,9)</sup>.

Many previous reports have shown generally satisfactory results from open acromioplasty, ranging from 65% to 90%. Nielsen<sup>(8)</sup>, in particular, used the UCLA shoulder scoring system for the assessment of the results of open acromioplasties. He reported excellent or good results in 68% of the 48 shoulders that he studied. Bjorkenheim<sup>(5)</sup> reported acromioplasties done on 60 shoulders achieving 73% of satisfactory or excellent results. Ha'eri<sup>(6)</sup> had success in 19 of his 21 patients who underwent acromioplasties. Hawkins<sup>(7)</sup> reviewed 108 patients with acromioplasties done and reported 87% success. Post and Cohen<sup>(9)</sup> had good results in 72 of their patients; 89% had improvement. Thorling<sup>(10)</sup> reported 76% of satisfactory results in 51 patients studied. Our study agrees with earlier published reports, not only as they relate to the post-operative result rating but also to the level of patient satisfaction.

The main problem in the comparison of the results of acromioplasties is the difference in the shoulder scoring systems. Each tends to isolate and emphasise one particular area and therefore can be misleading. However, if one elects acromioplasty for pain relief, then achieving it will be considered a success. Differences in the expectation of patients was an important variable in the evaluation of results in acromioplasties. Various shoulder rating systems had been used to assess the success of acromioplasties. Neer, Hawkins and Post included post-operative pain, range of movement, function and strength in their assessment. The UCLA shoulder scoring system that was adopted in our study evaluates the same criteria but on a system of points. It also considers the patients' subjective evaluation of the post-operative results.

Several factors were identified that may have a bearing on the patient selection and the anticipated outcome of this surgical procedure. Patients who were below 50 years of age tended to do better after acromioplasty. Female patients seemed to have a higher failure rate as compared to males, which was also reported by Hawkins<sup>(7)</sup>. Those with more than 2 years of symptoms had better results. Patients with an acromiohumeral distance of more than 1.0 cm also did better after acromioplasty. However, certain factors we analysed were found not to have any bearing on our patients. These were the presence of rotator cuff tears and the duration of follow-up. Rockwood<sup>(3)</sup> in his study

agreed that there was no difference in terms of pain and function between patients who had intact rotator cuffs and those who had both modified acromioplasties and repair of rotator cuffs for Neer's stage III disease. Both managed to achieve good results at 89.0% and 88.0% respectively. One might only be able to speculate why the above factors of age, sex, duration of symptoms and the acromiohumeral distance may have a bearing on the results. One cannot conclude that one would only recommend operation in patients who were male, of age less than 50 years, with an acromiohumeral distance of more than 1.0 cm and a preoperative duration of more than 2 years as the study does not exclude the potential for successful surgery in the other cases.

We evaluated our patients at 3 to 8 months post-surgery. There were no substantial differences seen in the post-operative results between those who were scored earlier and those scored later. Rockwood<sup>(3)</sup> and Hawkins<sup>(7)</sup> evaluated their patients after a minimum of 2 years, while Nielsen<sup>(8)</sup> scored them between 6 months and 65 months. All these studies showed generally good results irrespective of the duration of follow-up. Our study tends to agree with Bjorkheim<sup>(5)</sup>, Ha'eri<sup>(6)</sup>, Hawkins<sup>(7)</sup> and Neer<sup>(1,2)</sup> that most patients may well not gain further improvement beyond 6 months of minimum follow-up.

In summary, open acromioplasty is a reasonably effective and safe procedure in the treatment of impingement syndrome. Post-operative early rehabilitation with physiotherapy is of utmost importance. Most of the published reports have since confirmed a favourable outcome after open acromioplasty<sup>(5-10)</sup>.

## REFERENCES

1. Neer CB. Anterior acromioplasty for the chronic impingement syndrome in the shoulder. *J Bone Joint Surg* 1972; 54A:41-50.
2. Neer CB. Impingement lesion. *Clin Orthop* 1983;173:70-7.
3. Rockwood CA Jr et al. Shoulder impingement syndrome: Diagnosis, radiographic evaluation and treatment with a modified Neer acromioplasty. *J Bone Joint Surg* 1993; 75A: 409-24.
4. Rathbun JB, Macnab I. The microvascular pattern of the rotator cuff. *J Bone Joint Surg* 1970;52B:540-53.
5. Bjorkheim JM et al. Subacromial impingement decompressed with anterior acromioplasty. *Clin Orthop* 1990; 252: 150-5.
6. Ha'eri GB et al. Shoulder impingement syndrome: Results of operative release. *Clin Orthop* 1982; 168:128-32.
7. Hawkins RJ et al. Acromioplasty for impingement with intact rotator cuff. *J Bone Joint Surg* 1988; 70B: 795-7.
8. Nielsen et al. The shoulder impingement syndrome: The results of surgical decompression. *Journal of Shoulder & Elbow Surgery*. Jan/Feb 1994.
9. Post M et al. Impingement syndrome. *Clin Orthop* 1986;207: 126-32.
10. Thorling J et al. Acromioplasty for impingement syndrome. *Acta Orthop Scand* 1985;56: 147-8.
11. Armstrong JR. Excision of the acromion in the treatment of the supraspinatus syndrome. Report of ninety-five excisions. *J Bone Joint Surg* 1949; 31B: 436-42.
12. Bigliani LU et al. Anterior acromioplasty for subacromial impingement in patients younger than 40 years of age. *Clin Orthop* 199;246: 111-6.
13. Codman EA. The shoulder. Rupture of the supraspinatus tendon and other lesions in or about the subacromial bursa. Boston: Thomas Todd, 1934.
14. Fu et al. Shoulder impingement syndrome, a critical review. *Clin Orthop* 1991;269: 162-73.
15. Okutsu I et al. Coracoacromial ligament release for shoulder impingement syndrome using the universal endoscope system.
16. Lazarus et al. Comparison of open and arthroscopic subacromial decompression. *Journal of Shoulder & Elbow Surgery*. Vol 3 No 1 Part 1, 1-11.
17. Lirette et al. The difficulties in assessment of results of anterior acromioplasty. *Clin Orthop* 1992; 278: 14-6.
18. McShane et al. Conservative open acromioplasty. *Clin Orthop* 1987; 223: 137.