

Arthroscopic Subacromial Decompression

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A study group composed of 11 shoulders in 10 patients underwent arthroscopic subacromial decompression for impingement syndrome. There were no biceps tendon ruptures, acromioclavicular arthritis or glenohumeral instability. Eight men and two women ranging in age from 17 to 65 years (mean age 38.7) with dominant arm involvement in 9/10 were evaluated for an average follow-up of 19.4 months (range 12-26) postoperatively. Based on the University of California at Los Angeles shoulder rating scale, nine (82 %) shoulders had satisfactory results and the remaining two (18%) had unsatisfactory results. This is a preliminary report of our early experience in this rather new method of treatment, but the results are encouragingly good.

Key Words: Arthroscopic subacromial decompression, impingement syndrome, acromioplasty, shoulder

Impingement of the rotator cuff is a common source of pain and disability in the shoulder. Open decompression has been widely used for impingement with satisfying results (Raggio 1985; Post and Cohen 1986; Esch et al. 1988). With the recent introduction of an arthroscopic technique for decompression, several authors have reported favorable results with arthroscopic subacromial decompression (Ellman 1987; Each et al. 1988; Altcheck et al. 1989). This retrospective study was conducted to assess the results of arthroscopic subacromial decompression in patients with advanced impingement syndrome.

MATERIALS AND METHODS

From July 1990 to May 1991, 10 consecutive patients (11 shoulders) who suffered from shoulder impingement syndrome underwent arthroscopic subacromial decompression at the Department of

Orthopaedic Surgery, Yonsei University College of Medicine, Seoul, Korea.

This study group consisted of 8 men (9 shoulders) and 2 women (2 shoulders). There was dominant arm involvement in 9 of the 10 patients. The age of the patients ranged from 17 to 65 years (mean age 38.7). The duration of symptoms was 6 months-10 years (mean 1 year 4 months). Six shoulders presented a history of previous local trauma to the shoulder.

The diagnosis of impingement syndrome was based on a history of chronic shoulder pain aggravated by overhead activities. On physical examination, findings included palpable tenderness over the greater tuberosity at the supraspinatus insertion and/or along the anterior edge of the acromion. The painful arc of motion was usually between 60 and 120 degrees. The ranges of motions of the affected shoulders were restricted in varying degrees but mostly in the overhead movements. Painful weakness of external rotation was noticed in most of the cases. The major complaint presented in all patients was pain, which frequently worsened at night. All patients had a positive impingement sign. An injection of 10 ml of Xylocaine to the subacromial bursa as an impingement test relieved the symptoms in all patients.

Six shoulders had comparison pre- and postoperative outlet views. The preoperative morphology

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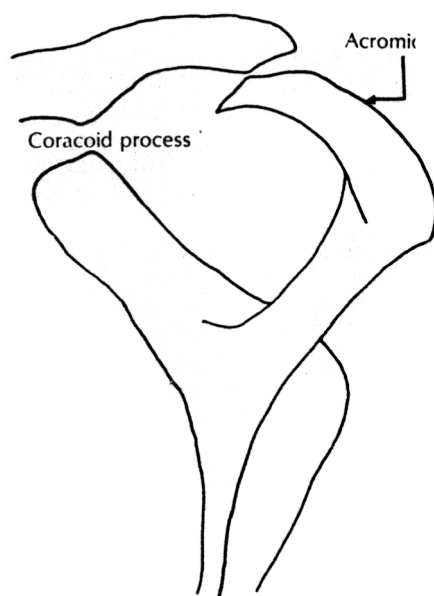


Fig. 1. Preoperative outlet view demonstrates type III acromial morphology.

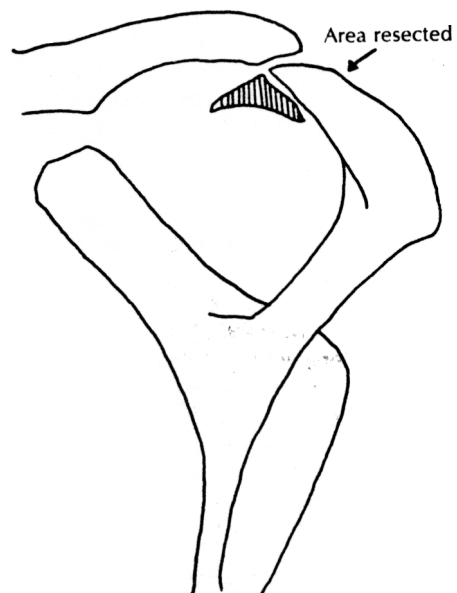


Fig. 2. Postoperative outlet view confirms the adequacy of acromial resection.

was analyzed according to shape and was categorized as type I, II, or III as described by Bigliani *et al.* (1986) and Morrison and Bigliani (1987). The classification is based on the presence and size of the anterior acromial projection. Type I is flat with no hook; type II has a small anterior hook; and type

III has a large anterior hook. Three were considered type III morphology whereas the other 3 were categorized as type I or II. Postoperatively, an outlet view was obtained to evaluate the adequacy of the acromioplasty (Fig. 1 and 2).

Positive radiographic findings on plain X-rays included acromial sclerosis (54.5%), greater tuberosity sclerosis (81.8%) and subacromial spurring (18.2%). One patient had findings of calcific tendinitis and another patient had a malunion of greater tuberosity fracture.

All patients had failed conservative treatment for at least 6 months prior to the operation. Arthroscopic subacromial decompression was performed on all patients by the same surgeon (S-J.K.). At follow-up the patients were evaluated with a subjective and functional questionnaire as well as an objective physical examination utilizing the UCLA shoulder rating scale (Table 1). The average postoperative follow-up was 19.4 Months (range 12-26). The 10 patients (11 shoulders) with the impingement syndrome were classified and summarized in Table 2.

ARTHROSCOPIC TECHNIQUE

All procedures were done under general anesthesia. The standard shoulder arthroscopy was performed with the patient in the lateral decubitus or beach chair position on the operative table. The arm was suspended in 45° abduction and 20 to 30° forward flexion. No more than 10 lbs of traction were used. Glenohumeral evaluation was performed using standard posterior and anterior portals. The glenohumeral joint was thoroughly examined, with particular attention given to the undersurface of the rotator cuff. The glenohumeral ligaments and posterior aspects of the humeral head were also carefully inspected to identify subtle glenohumeral instability.

The arthroscope was removed from the glenohumeral joint and placed into the subacromial space using the same posterior portal. Inflow was maintained through the anterior portal. One cubic centimeter of 1:1000 epinephrine solution was added to each 3 L bag of Ringer's lactate. A third portal was established for the insertion of instruments. This portal was established 2 cm distal to the anterolateral corner of the acromion. Adhesiolysis was done with the blunt trochar first to aid subsequent visualization. The superior surface of the ro-

Table 1. University of California at Los Angeles shoulder rating scale

	Score
Pain	
Present always and unbearable; strong medication frequently	1
Present always but bearable; strong medication occasionally	2
None or little at rest, present during light activities; salicylates frequently	4
Present during heavy or particular activities only; salicylates occasionally	6
Occasional and slight	8
None	10
Function	
Unable to use limb	1
Only light activities possible	2
Able to do light housework or most activities of daily living	4
Most housework, shopping, and driving possible; able to do hair and to dress and undress; including fastening brassiere	6
Slight restriction only; able to work above shoulder level	8
Normal activities	10
Active forward flexion	
> 150°	5
120~150°	4
90~120°	3
45~ 90°	2
30~ 45°	1
< 30°	0
Strength of forward flexion (manual muscle testing)	
Grade 5 (normal)	5
Grade 4 (good)	4
Grade 3 (fair)	3
Grade 2 (poor)	2
Grade 1 (muscle contraction)	1
Grade 0	0
Satisfaction of the patient	
Satisfied and better	5
Not satisfied	0

Maximum score, 35 points; excellent, 34~35 points; good, 28~33 points; fair, 21~27 points; poor, 0~20 points.

Table 2. classification and results of operation

Case	Age	Sex	Site	Job	Stage	Pre-op.	Post-op.
1	17	M	Rt	Wrestler	II	14	31
2	21	M	Rt	Rugby	II	20	35
3	23	M	Rt	Boxer	II	13	18
3*	34	M	Rt	Boxer	II	18	31
4	42	M	Rt	Officer	II	23	34
5	43	M	Rt	T.V camera	II	15	31
6	45	M	Rt	Heavy delivery Driver	II	5	30
7	48	M	Rt	"	II	8	33
8	48	F	Rt	House Wife	III	3	32
9	48	M	Rt	Heavy labor	III	17	29
10	65	F	Lt	House wife	III	15	21
Average						13.7	29.5

tator cuff tendons, particularly the supraspinatus and infraspinatus, was carefully examined. With the arthroscope in the posterior portal and a full radius shaver through the lateral portal, bursal tissue and loose soft tissue were removed from the acromion. The periosteum was removed from the inferior acromion. Acromioplasty was done to a depth of 6-8 mm along the anterior 2 cm of acromion using the acromionizer or arthroscopy burr as a size reference. The anterior and lateral corner was resected initially to the desired depth and the resection continued medially to the acromioclavicular joint. Anterior bone resection resulted in release of the coracoacromial ligament at its bony attachment without actual transection of the ligament. An electrocautery was used in some cases and was convenient for the division of the coracoacromial ligament and the control of bleeding. The subacromial space was reinspected and adequacy of the decompression was verified. All puncture wounds were left open and a dry, sterile dressing was applied.

POSTOPERATIVE REHABILITATION

Passive range of motion was begun in the immediate postoperative period. A sling was used for comfort. Active motion was begun as soon as tolerated. The patients were referred for progressive range of motion and strengthening about 4 days after the operation. A resistive strengthening program was started usually by 2-6 weeks.

Table 3. UCLA shoulder rating scale

Result	No. of cases	(%)
Excellent	2	(18%)
Good	7	(64%)
Fair	1	(9%)
Poor	1	(9%)
Total	11	(100%)

RESULTS

The results of the arthroscopic subacromial decompression were assessed utilizing the UCLA shoulder rating scale (Table 1) as proposed by Ellman (1987). Nine out of 11 shoulders (82%) were rated as satisfactory. Two were excellent, and 7 were good. Two patients were rated as unsatisfactory. One was fair, and one was poor. Only one patient was dissatisfied with the outcome of the procedure and was satisfied after receiving a arthroscopic acromioplasty (Table 3). There were no complications. There was no correlation between duration of symptoms and the final results. Of the 4 patients actively involved in sports prior to developing shoulder impingement, 3 (75%) were able to return to their previous highest level of athletic activity.

Table 4. UCLA pain score

Case No.	Pre-op.	Post-op.
1	4	9
2	4	10
3	2	2
3*	2	8
4	3	10
5	6	10
6	1	8
7	2	9
8	1	9
9	1	8
10	4	6
Average	2.7	8.1

Table 5. UCLA function score

Case No.	Pre-op.	Post-op.
1	4	8
2	8	10
3	4	8
3*	8	8
4	10	10
5	4	8
6	1	8
7	2	9
8	1	8
9	6	8
10	6	8
Average	4.9	8.4

Table 6. UCLA active forward flexion score

Case No.	Pre-op.	Post-op.
1	4	5
2	4	5
3	4	4
3*	4	5
4	5	5
5	2	3
6	2	5
7	2	5
8	0	5
9	4	4
10	3	3
Average	3.1	4.5

Table 7. UCLA strength score of forward flexion

Case No.	Pre-op.	Post-op.
1	3	4
2	4	5
3	3	4
3*	4	5
4	5	5
5	3	5
6	1	4
7	2	5
8	1	5
9	4	4
10	2	3
Average	2.9	4.5

Associated Pathology

SLAP (superior labrum anterior and posterior) lesion was found in 3 patient on arthroscopic examination. One patient underwent calcific deposit removal from the supraspinatus tendon at the time of the arthroscopic decompression.

Analysis of Results by Parameters

Pain: All except one patient had less pain postoperatively (Table 4). The average preoperative rating was 2.7 (range of 1-6) and postoperative was 8.1 (range of 2-10). This represents significant improvement ($p < 0.05$) with the arthroscopic subacromial decompression. One shoulder rated as 2

preoperatively was not improved postoperatively. There was no correlation between duration of pain preoperatively with the final result.

Function: All except one patient had improved postoperatively (Table 5). The average preoperative rating was 4.9 (range of 1-10) and postoperative was 8.4 (range of 8-10). One shoulder rated as 8 preoperatively was not improved postoperatively.

Range of motion: Out of 11 shoulders, 7 had greater range of motion postoperatively (Table 6). The other 4 shoulders had no change postoperatively. The average preoperative motion score was 3.1 (range of 0-5) and postoperatively was 4.5 (range 3-5). Limitation of overhead activities was found in 2 patients who had a malunion of greater tuberosity fracture and incomplete rupture of the

rotator cuff respectively.

Strength: Out of 11 shoulders, 10 had increased strength postoperatively (Table 7). One patient was rated as 4 preoperatively and had no change. The average preoperative strength was 2.9 (range of 1-5) and postoperatively was 4.5 (range 3-5). This was a significant improvement in strength ($p < 0.05$).

Satisfaction: In nine (90.0%) out of ten patients, the results were satisfactory in the subjective and objective evaluations.

DISCUSSION

The impingement syndrome of the shoulder has been extensively described by Neer (1972; 1983). The syndrome is caused by many factors resulting from an impingement of the rotator cuff, the overlying subacromial bursa, and occasionally the tendon of the long head of the biceps against the anterior edge of the acromion and its associated coracoacromial arch. Three progressive stages have been described by Neer. Stage 1 consists of edema and hemorrhage of the subacromial bursa, usually seen in patients younger than 25 years of age. If impingement continues, the condition becomes chronic and proceeds to thickening and fibrosis of the bursa and tendinitis of the cuff. This is frequently noted in patients 25 years-40 years of age (Stage 2). Stage 3 results from further impingement, producing degeneration or complete or incomplete tears of the rotator cuff. These more advanced changes are usually seen in patients older than 40 years of age.

The shape and slope of the acromion were described as important factors in the development of impingement syndrome. The classification is based on the presence and size of the anterior acromial projection. Type I is flat with no hook; type II has a small anterior hook; and type III has a large anterior hook.

Nirschl (1986) described subacromial impingement as a secondary phenomenon. He reported that primary pathologic changes in the rotator cuff cause muscle weakness imbalance with subsequent upward migration of the humeral head and impingement.

Anterior acromioplasty for decompression of the subacromial space has been well described in the literature (Raggio *et al.* 1985). The anatomic rationale and technique for anterior acromioplasty have been described by Neer II (1972). The subacromial

decompression procedures have three objectives: to debride the hypertrophic bursa, to release of the coracoacromial ligament, and to resect the undersurface of the anterior acromion.

Most surgeons agree that surgical treatment for subacromial impingement should include decompression of the coracoacromial arch. An open anterior-inferior acromioplasty has proven to be a reliable procedure. Hawkins and Abrams (1987) has noted 87% satisfactory results, Post and Cohen (1986) has reported 89% with significant pain relief, and Neer II (1972) has reported 94% with satisfactory results in patients without full-thickness rotator cuff tears.

In recent years, arthroscopic subacromial decompression has been advocated as an effective alternative to the open procedure (Hawkins and Abrams 1987; Altcheck *et al.* 1989; Andrews and Schemmel 1989; Meyers 1989). Ellman (1987) has reported 90% good and excellent results in shoulders with advanced stage II impingement without full thickness rotator cuff tear. Esch *et al.* (1988) found a 78% objective success rate and 82% patient satisfaction rate in patients without full-thickness rotator cuff tears. Altcheck *et al.* (1989) has recently reported 83% good and excellent results and a 95% patient satisfaction rate in patients without full-thickness rotator cuff tears.

Arthroscopic acromioplasty offers certain advantages over the open procedure. Arthroscopy requires less surgical dissection, resulting in less postoperative morbidity. Another advantage compared to the open surgery is the ability to examine the glenohumeral joint as well. Glenohumeral arthroscopy is important to rule out other abnormalities and to effect appropriate treatment.

This study found an objective success rate of 82% and a patient satisfaction rate of 90.9% for patients with advanced impingement syndrome without full-thickness rotator cuff tears. Two patients in this study had unsatisfactory results. One had a Stage II impingement. He reported little improvement and still graded a poor result. Another was a 65-year-old woman who had an incomplete rupture of the rotator cuff. She was improved to a fair degree after the arthroscopic acromioplasty.

Although our experience is limited in this small series of cases, these results demonstrated that arthroscopic subacromial decompression may be an effective alternative means of relieving mechanical impingement of the rotator cuff in the coracoacromial arch in the properly selected cases.

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