ARTHROSCOPIC DEBRIDEMENT VERSUS OPEN REPAIR FOR ROTATOR CUFF TEARS

A PROSPECTIVE COHORT STUDY

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We compared two treatments for tears of the rotator cuff of 1 to 4 cm in size. One group of 22 patients had an arthroscopic subacromial decompression and rotator-cuff debridement; the other comparable group of 23 patients had open repair and acromioplasty. Review was at 2 to 5 years postoperatively.

Both groups had similar pain relief and range of active forward flexion, with significant improvement from the preoperative condition. The open repair group scored better for function, strength and overall score, but patient satisfaction was similar in the two groups.

We recommend the use of arthroscopic subacromial decompression and debridement for low-demand patients who require mainly pain relief and range of movement. Open repair is necessary if strength and functional recovery are the prime objectives.

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There is controversy about the management of rotator-cuff tears of 1 to 4 cm in size: some authors advocate repair of all or most of these tears, but others treat them conservatively or by an acromioplasty. This study compares a standard open repair with the simpler procedure of arthroscopic debridement.

PATIENTS AND METHODS

Study design. Our aim was to carry out a cohort study in which 25 patients had an arthroscopic debridement and 25 had an open rotator-cuff repair. The preoperative diagnosis of a rotator-cuff tear was based on the history, physical examination and failure to respond to conservative treatment of at least six months' rehabilitation. Before surgery, patients were allocated alternately to

either the arthroscopic group or the open repair group. After confirmation of the diagnosis and appropriate size of the tear by arthroscopy, the operation which had been selected was performed. In this way 50 consecutive patients were assigned to either the arthroscopic group or the open repair group on a cohort basis.

It took approximately three years to enrol the 50 patients, and follow-up therefore ranged from two to five years.

All patients were reviewed and examined preoperatively and postoperatively using the UCLA shoulder score for evaluation (Ellman 1987). We recorded age and size of tear as independent variables and pre- and postoperative pain, function, range of active forward flexion, and strength of forward flexion, as dependent variables. Patient satisfaction and the grading of overall score were also recorded.

Statistical analysis between variables pre- and postoperatively was carried out using the Wilcoxon rank-sum test. The results in the open and the arthroscopic groups were compared by the Wilcoxon matched-pairs signed-rank test.

Arthroscopic debridement. A 5.5 mm full radius resector was used to remove loose fragments of rotator cuff, hypertrophic synovium and other debris both from within the shoulder and from the subacromial space. The arthroscope was inserted via a posterolateral portal approximately 2 cm below the posterolateral corner of the acromion and the acromioniser (a cylindrical burr) and resector through a posterior portal (Figs 1, 2). We used a gas-operated pressure pump and added 1:100 000 adrenaline to the irrigation saline.

The thickened bursa beneath the acromion was resected completely, and bone was removed from beneath it to leave a smooth surface (Ellman 1987; Esch et al 1988; Altchek et al 1990; Gartsman 1990), taking sufficient anteroinferiorly to detach the coracoacromial ligament (Fig. 3) and to leave the deltoid visible at the anterolateral edge of the acromion. Less bone, however, was resected than is usual for impingement syndrome. The shoulder was then moved through a range of movement to ensure that there was no impingement.

Open repair. Open repair was performed through a lateral deltoid splitting approach (Fig. 4) using a 5 cm incision

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Fig. 1

Fig. 2

Fig. 3

Arthroscopic debridement. Figure 1 – The patient on the operating table, in a lateral position with the trunk elevated 45°. Figure 2 – The posterior arthroscopic portal is in line with the long axis of the acromion and at about the mid-point of the glenohumeral joint; it is used for the initial arthroscopy and subsequently for the resector and acromioniser (a cylindrical burr). The second portal is 2 cm below the posterolateral corner of the acromion. Figure 3 – Bone is resected from the undersurface of the acromion thereby removing its anterior inferior portion and detaching the coracoacromial ligament so that the deltoid can be seen.

Fig. 4

Fig. 5a

Fig. 5b

Open repair. Figure 4 – The deltoid-splitting incision for repair of a torn supraspinatus tendon is made at the mid-point of the origin of the deltoid for 4 to 5 cm. Deltoid is not detached. Figure 5 – Repair of the supraspinatus tendon. The edges of the tear are freshened, then repaired with interrupted nonabsorbable sutures (a). The repair is reinforced and held to the bone by interrupted nonabsorbable sutures with screw-thread anchors (b).

from the mid-lateral edge of the acromion to expose the rotator-cuff tear. Anterior acromioplasty was performed and the coracoacromial ligament was resected. The rotator-cuff tear was then repaired end-to-end or side-to-side, the primary repair being reinforced by small anchor sutures placed in the bone at the insertion of the supraspinatus tendon (Fig. 5).

Postoperative management. After arthroscopic debridement patients were mobilised rapidly, starting active movements through the full range on the day after operation. Physiotherapy continued for six weeks to three months to strengthen the shoulder and maximise the range of movement.

After an open repair, patients were given a sling for

Table I. Age range of 45 patients treated for rotator-cuff tears

	Age (yr)				
	30 to 39	40 to 49	50 to 59	60 to 69	> 69
Arthroscopic debridement	3	8	6	4	1
Open repair	2	9	9	1	2

Table III. Pain scores (UCLA) of 45 patients treated for rotator-cuff tears

	Score										Total
	1	2	3	4	5	6	7	8	9	10	
Preoperative	9	9	12	10	4	1					45
Arthroscopic debridement						1	4	6	9	2	22
Open repair					1	2	4	7	6	3	23

Table II. Size of tear in 45 patients treated for rotator-cuff tears

	Size (cm)			
	1	2	3	4
Arthroscopic debridement	5	3	8	6
Open repair	6	5	8	4

Table IV. Function scores (UCLA) of 45 patients treated for rotator-cuff tears

	Score										Total
	1	2	3	4	5	6	7	8	9	10	
Preoperative	5	9	17	11	3						45
Arthroscopic debridement				1	3	4	6	6		2	22
Open repair					2	2	1	6	9	3	23

three weeks, but removed the arm from the sling several times a day to carry out a range of movement. Active assisted range-of-movement exercises were started at three weeks with active strengthening exercises after six weeks. Treatment continued for about six months, until there was maximal improvement.

RESULTS

Of the 50 patients entered in the study, 45 were available for review at two to five years postoperatively. Of these, 23 had had open repair and 22 arthroscopic debridement. The two groups showed no significant differences in age, size of tear, preoperative pain, function, active forward flexion and strength of forward flexion (Tables I, II and X). Follow-up varied from two to five years because of the three-year period of recruitment, but again there was no significant difference between the two groups.

Table V. Active forward flexion scores (UCLA) of 45 patients treated for rotator-cuff tears

	Score					Total
	1	2	3	4	5	
Preoperative	3	16	18	6	2	45
Arthroscopic debridement			4	9	9	22
Open repair			2	7	14	23

All patients in both groups showed a significant improvement in pain, function, active forward flexion and strength of forward flexion.

Pain. Preoperative pain was severe (1 to 3 on the UCLA scale) in 30 patients (66%) and moderate (4 to 6) in 15 (Table III). Postoperatively, there was a highly significant improvement in pain score ($p = 0.0001$). The two groups showed no significant differences with regard to pain relief ($p = 0.51$). Twelve patients (27%) had moderate pain (4 to 7), and 73% had minimal or no pain.

Function. Preoperatively, 31 patients (68%) had significant limitation of function (1 to 3 on the UCLA score)

Table VII. Patient satisfaction scores (UCLA) of 45 patients treated for rotator-cuff tears. Five represents very satisfied

	Score					Total
	1	2	3	4	5	
Arthroscopic debridement		2	3	9	8	22
Open repair		1	1	7	14	23

Table VIII. Overall results (UCLA) of 45 patients treated for rotator-cuff tears

	Score				Total
	Excellent (34 to 35)	Good (28 to 33)	Fair (21 to 27)	Poor (0 to 20)	
Arthroscopic debridement	2	11	7	2	22
Open repair	4	16	1	2	23

and 14 had moderate loss (4 to 7) (Table IV). Postoperatively, no patient had severe loss of function. In the open repair group, five patients (22%) had moderate loss, while in the arthroscopic debridement group 14 (64%) had moderate loss. This difference was significant ($p = 0.006$) in favour of the open repair group.

Active forward flexion. There was a significant improvement in the amount of active forward flexion in both groups (Table V), but no significant difference between the open repair and arthroscopic debridement groups ($p = 0.16$).

Strength of forward flexion. Preoperatively, most patients had grade 2 or 3 power (Table VI). Both groups showed improvement, but this was significantly greater for the open repair group ($p = 0.003$). Arthroscopic debridement allows improvement of power but not as much as an open repair.

Patient satisfaction. Patient satisfaction was greater after

Table VI. Strength of forward flexion scores (UCLA) of 45 patients treated for rotator-cuff tears

	Score					Total
	1	2	3	4	5	
Preoperative		20	17	8		45
Arthroscopic debridement			7	13	2	22
Open repair			2	10	11	23

open repair (Table VII) but the difference was not significant ($p = 0.08$). Pain relief and restoration of movement were probably more important to the patient than strength or overall function.

Overall score. Open repair was significantly better than arthroscopic debridement ($p = 0.017$; Table VIII), with a higher percentage of patients with excellent or good function. Arthroscopic debridement produced effective pain relief and restored forward flexion, but failed to restore power or function as well as the open procedure.

There was no significant difference in the results in relation to the age of the patient or the size of the tears (Tables IX, X).

DISCUSSION

Our aim was to compare the results of arthroscopic debridement and decompression with standard open repair and acromioplasty. Our results show that equal pain relief was achieved by either procedure, and both

restored the same range of active forward flexion. The arthroscopic procedure effectively relieved some symptoms, but failed to restore as much strength and therefore function as the open repair. The residual weakness and loss of function are presumably related to the residual defect in the supraspinatus tendon.

Table IX. Size of tear related to overall result (UCLA) of 45 patients treated for rotator-cuff tears

	Size of tear (cm)				Total
	1	2	3	4	
Poor (0 to 20)		1	2	1	4
Fair (21 to 27)	1	1	5	1	8
Good (28 to 33)	8	5	8	6	27
Excellent (34 to 35)	2	1	1	2	6
Total	11	8	16	10	45

Debridement of the rotator cuff alone, without decompression, does not seem to lead to acceptable results (Cofield 1983; Rockwood 1984; Ogilvie-Harris and Wiley 1986). Arthroscopic acromioplasty for impingement syndrome without full-thickness tears is effective although not necessarily better than open acromioplasty (Ellman 1987; Esch et al 1988; Altchek et al 1990; Gartsman 1990; Van Holsbeeck et al 1992). Esch et al (1988) included patients with rotator-cuff tears in their report on the results of arthroscopic acromioplasty. They found that 67% (24 of 36) of those with complete tears had a satisfactory result but that few had excellent scores. Ellman (1987) had no excellent results from arthroscopic acromioplasty for complete tears. Levy, Gardner and Lemak (1991) reported 25 patients with complete tears treated in this way: minimum follow-up was only one year, but 84% had satisfactory results. Their results were much worse in patients with larger tears, as in our series.

Other authors have reported satisfactory results in 80% to 90% of patients after open repair of the rotator cuff (Wolfgang 1974, 1978; Cofield 1981, 1983, 1985; Packer et al 1983; Hawkins, Misamore and Hobeika 1985; Ellman, Hanker and Bayer 1986; Essman, Bell and Askew 1991). Rockwood (1984) and Rockwood and Burkhead (1988), however, described 58 patients with massive rotator-cuff tears who underwent open acromioplasty and cuff debridement without repair, of whom 95% had pain relief and 90% had increased strength and motion. There was no deterioration with time and they considered that the pain relief and functional improvement demonstrated successful decompression of the associated impingement. Arthroscopic acromioplasty without a cuff repair has been shown to give quicker recovery and greater patient satisfaction than open acromioplasty but no improvement in long-term results (Van Holsbeeck et al 1992).

In our series, the arthroscopic procedure produced considerably less perioperative morbidity than the open repair, and most of the patients had the procedure as outpatients, being admitted only when there was a concomitant medical problem. Patients with an open repair stayed in hospital for three to four days, mainly for pain relief, and took considerably longer to regain the range of movement and strength. Thus, although the overall results are better after open repair, the cost is considerably more in terms of hospitalisation and rehabilitation.

Table X. Summary of outcome results and their statistical significance in 45 patients treated for rotator-cuff tears using the Wilcoxon rank-sum test (p values)

	Preoperative arthroscopic versus open	Postoperative arthroscopic versus open	Postoperative versus preoperative
Age	0.77		
Size of tear	0.43		
Pain	0.21	0.51	<0.0001
Function	0.75	0.006	<0.0001
Forward flexion	0.77	0.16	<0.0001
Strength	0.32	0.003	<0.0001
Satisfaction		0.08	
Final score		0.017	

Conclusions. On the basis of our results, we consider that arthroscopic debridement is ideal for patients with limited demands whose main complaints are pain and loss of range of movement: the procedure is quicker, cheaper and involves less rehabilitation. For a patient, however, who needs good function and strength, arthroscopic debridement and acromioplasty are not sufficient, and we advise open repair and acromioplasty. The proper selection of patients is therefore important in the optimum treatment of patients with rotator-cuff tears of from 1 to 4 cm.

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