



Comparison between the results of open and arthroscopic repair of isolated traumatic anterior instability of the shoulder

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Objectives: The aim of this study was to compare the early postoperative results of open and arthroscopic Bankart repair for isolated traumatic anterior instability of the shoulder.

Methods: The study included 64 male patients who underwent surgery for traumatic recurrent anterior shoulder instability. Of these, 30 patients (mean age 25.1 years) underwent open Bankart repair and 34 patients (mean age 25.8 years) underwent arthroscopic Bankart repair. All the patients had labral tears on preoperative magnetic resonance scans and had complaints of instability even during daily activities. Patients with at least six dislocations were included in the study; patients with multidirectional instability were excluded. The mean time from the first trauma to surgical intervention was 4.4 years (range 1 to 24 years) in the open surgery group, and 3.8 years (range 1 to 17 years) in the arthroscopy group. Decision for surgical treatment was made based on limitation of activities because of fear of having a dislocation and on positive results of instability tests. Repair was performed using metal anchors in both groups. The clinical results were evaluated using the Rowe scale. The severity of pain on the first postoperative day was assessed using a visual analog scale (VAS). The mean follow-up period was 26.1 months (range 12 to 52 months) in the open surgery group, and 26.6 months (range 12 to 51 months) in the arthroscopic repair group.

Results: The mean duration of operation was 2 hours for open surgery, and 2.5 hours for arthroscopic repair. The size of the incision was approximately 8 cm in the open surgery group, and 3 cm in the arthroscopic repair group. The mean Rowe scores were 90.2 and 91.6, being higher in the arthroscopic repair group. Clinical results of open surgery were excellent in 21 patients (70%), good in eight patients (26.7%), and poor in one patient (3.3%). In the arthroscopic repair group, the results were excellent in 27 patients (79.4%), good in five patients (14.7%), and poor in two patients (5.9%). All the patients with a poor result experienced redislocations due to traumatic falls 5 to 18 months after surgery. The mean VAS score was 5.0±1.3 in the open surgery group, and 4.4±1.3 in the arthroscopic repair group. Loss of external rotation was observed in 15 patients (20° in 8 patients, 10° in 4 patients, 5° in 3 patients) in the open surgery group, and in nine patients (20° in 3 patients, 10° in 6 patients) in the arthroscopic repair group. There were no significant differences between the two groups with respect to Rowe scores, VAS scores, range of motion, apprehension test results, and the incidence of recurrent instability.

Conclusion: Although, in the past, the results of arthroscopic repair were less satisfactory compared to open surgery, this condition has changed remarkably. The results of arthroscopic repair in our study were similar to those of open repair. We believe that, with enhanced experience and advances in arthroscopic repair techniques, arthroscopic treatment may outweigh open surgery.

Key words: Arthroscopy; dislocations; joint instability/surgery; shoulder joint/surgery.

Both the determination of surgical indication and selection of an appropriate surgical method for traumatic anterior shoulder instability require a detailed evaluation and clinical experience in orthopedic practice. While open Bankart repair was previously considered the gold standard, arthroscopic repair has been increasingly accepted during the last decade. The underlying reasons for this change include advances in arthroscopic instrumentation and implants, increased experience of surgeons, and promising long-term follow-up results obtained in patients undergoing arthroscopic repair.^[1-4] Advantages such as smaller skin incisions and less postoperative pain favor arthroscopic surgery. On the other hand, proponents of open surgery advocate that additional capsular sliding or a more efficient capsular narrowing may be performed with the open technique.^[1,5-7]

This study aimed to compare the early results of arthroscopic and open repair of isolated traumatic anterior shoulder instability in young active patients.

Patients and methods

The study included 64 male patients who underwent surgery for traumatic recurrent anterior shoulder instability between January 2000 and June 2008. Of these, 30 patients underwent open Bankart repair and 34 patients underwent arthroscopic Bankart repair. The mean age was 25.1 years in the open repair group, and 25.8 years in the arthroscopic repair group. The decision for the type of treatment was made in a randomized manner. All the patients were young active individuals with isolated traumatic recurrent shoulder dislocations, and had complaints of instability even during their daily activities. In both groups, patients with at least six dislocations were included in the study. Exclusion criteria included the presence of multidirectional instability, a previous history of surgery, bony Bankart lesion, and self-induced dislocations. Anteroposterior shoulder X-rays were obtained from all the patients. Although all were not ordered by our clinic, all the patients had magnetic resonance scans which showed a labral tear.

All the patients were males and none of them were engaged in professional sports. When making the decision for surgical intervention, limitation of activities because of fear of having a dislocation and positive instability tests during clinical examination were taken into consideration. Before the operation and

under anesthesia, anterior drawer test was performed and the sliding of the humeral head was graded and inferior humeral sliding was assessed.

Both surgical procedures were performed in the beach chair position. In the open Bankart repair, following the classical approach, the capsulolabral complex was repaired using three or four metal anchors (4 in 1 patient, 3 in 29 patients). The lowest anchor was placed in the 6 o'clock position and the remaining anchors were placed in the 3-4 o'clock and 2 o'clock positions for the right shoulder. The capsule was closed when the arm was in 45° abduction, 15° flexion, and neutral rotation, together with a slight traction. After ensuring that the arm could reach 30° external rotation, the subscapularis muscle was anatomically closed without performing plication or contraction. The length of the incision was approximately 8 cm.

In the arthroscopic Bankart repair, standard posterior, anterior, and anterosuperior portals were used. The size of the incisions was approximately 1.5 cm for two anterior portals, and 0.5 cm for the posterior portal. The posterior portal was used to evaluate and visualize the joint. First, a comprehensive diagnostic arthroscopy was performed. Thereafter, the capsulolabral tissues were mobilized up to the line of 6 o'clock and the anterior edge of the glenoid was refreshed using a shaver. Finally, the capsulolabral complex was repaired using 2 to 4 metal anchors (4 in 3 patients; 3 in 15 patients, 2 in 16 patients), the lowest anchor being in the direction of 5 o'clock (Fig. 1). In this treatment, the anteroinferior ligamentolabral tissues were carried proximally and the capsule was slid upward.



Fig. 1. Postoperative radiograph of a patient obtained 42 months after arthroscopic repair.

Table 1
Comparison of the results of open surgery and arthroscopic repair

	Open repair (n=30)			Arthroscopic repair (n=34)			p
	n	%	Mean±SD	n	%	Mean±SD	
Age*			25.8±6.4			24.9±5.0	0.54
Follow-up period			26.6±11.5			26.1±7.9	0.42
Rowe score			90.2±11.4			91.6±13.3	0.59
Excellent	21	70.0		27	79.4		0.46
Good	8	26.7		5	14.7		
Poor	1	3.3		2	5.9		
Limitation of external rotation (°)			7.2±8.6			3.5±6.5	0.053
Pain score			4.4±1.3			5.0±1.3	0.054
Recurrence	1	3.3		2	5.9		0.99

*Based on the results of the Levene test, variances are homogeneous (p>0.05).

Following the operation, all the shoulders were immobilized using a Velpau bandage for three weeks. Active movements of the hand, wrist, and elbow joints were allowed. At the end of three weeks, active assisted movements were started and the arm was held in a sling during the periods without exercise. At 6 weeks, the arm was totally freed, except for external rotation. The patients started to perform gentle sportive activities in the fourth month. Sports and activities with close contact or challenge were not allowed until the sixth month.

The clinical results were evaluated using the Rowe scale.^[8] In the early postoperative period and for final evaluations, anteroposterior X-rays were obtained. The range of motion of the joint was evaluated when the arm was in 90° abduction and neutral position. The severity of pain in the early postoperative period was assessed using a visual analogue scale (VAS) on a numeric scale of 0-10. The mean follow-up period was 26.1 months (range 12 to 52 months) in the open surgery group and 26.6 months (range 12 to 51 months) in the arthroscopic repair group.

For the evaluation of data, descriptive statistical methods, frequency, percentage, mean and standard deviation were used. Statistical analyses were made using the SPSS (for Windows 16.0) software. Data showing a normal distribution were compared using the Mann-Whitney U-test or t-test. The Levene test was used to assess the equality of variances in different samples. The results were evaluated with a 95% confidence interval, taking p<0.05 as the significance level.

Results

The dominant shoulder was affected in 27 patients (90%) in the open surgery group, and in 23 patients (67.7%) in the arthroscopy group. The mean time from the first trauma to surgical intervention was 4.4 years (range 1 to 24 years) in the open surgery group, and 3.8 years (range 1 to 17 years) in the arthroscopy group. The mean duration of operation was 2 hours for open surgery, and 2.5 hours for arthroscopic repair. The limitations of open surgery were observed as the dissection stage of the capsule and subscapularis and the lack of full view in the operation area. The limitations of arthroscopy was defined as the difficulty to find and use the ideal tool in holding an adequately thick tissue when passing the suture of the anchor through the anteroinferior capsulolabral structure.

The mean Rowe score was 90.2 (range 45 to 100) in the open surgery group, and 91.6 (range 45 to 100) in the arthroscopic repair group. Based on the Rowe scores, the results in the open surgery group were excellent in 21 patients (70%), good in eight patients (26.7%), and poor in one patient (3.3%). One patient with the poor result experienced a fall in the postoperative 12 months, which resulted in a recurrent dislocation. In the arthroscopic repair group, the results were excellent in 27 patients (79.4%), good in five patients (14.7%), and poor in two patients (5.9%). These two patients with the poor results developed a new dislocation in the operated shoulders, following a fall during a football match and a fall down the

stairs in the postoperative five months and 18 months, respectively. These patients did not want reoperation and none underwent revision surgery. They both had a positive apprehension test result and minimal limitation of articular movements because of fear of experiencing dislocation. They could move their arms up to 50% of external rotation and 75% of internal rotation and forward elevation without fear. In addition, another patient in the open surgery group showed apprehension when the arm was in 90° abduction and placed in 75° external rotation in this position.

The severity of pain was assessed on the first postoperative day. The mean VAS score was 5.0 ± 1.3 in the open surgery group, and 4.4 ± 1.3 in the arthroscopic repair group. The two groups did not differ significantly with respect to pain scores.

The range of motion of the shoulder was evaluated by comparison with the healthy shoulder and was expressed as percentage of loss according to the Rowe scoring. When the arms were positioned in the lateral position, loss of external rotation in the open surgery group was 20° in eight patients, 10° in four patients, and 5° in three patients. In the arthroscopic repair group, loss of external rotation was seen in nine patients, being 20° in three patients and 10° in six patients (Fig. 2). The range of motion values obtained when the arm was in 90° abduction were consistent with the values mentioned above.

There were no significant differences between the two treatment groups with respect to Rowe scores, range of motion, apprehension test results, and the incidence of recurrent instability (Table 1).

Discussion

In the past, the results of arthroscopic repair for the treatment of anterior shoulder instability were less satisfactory compared to those obtained with open surgery.^[9-11] In recent years, together with advances in arthroscopy techniques, achievement of an efficient capsular stretching and closure of the rotator interval when necessary have made the postoperative results of arthroscopic Bankart repair more satisfactory.^[6]

Cole and Romeo^[5] reported similar Rowe scores for open and arthroscopic Bankart repairing methods and stated that the scores might be improved by optimizing the indications of both techniques.^[5] Similarly, in our series, both groups showed comparable Rowe scores. The authors also reported that the re-



Fig. 2. Limitation of external rotation of a patient observed in the early postoperative period following open repair. With physical therapy, the limitation of external rotation decreased to 20 degrees.

sults of the Bankart repair depended on the condition of the labrum and the anterior capsule and that they performed arthroscopic repair in patients in whom diagnostic arthroscopy showed a detached Bankart lesion with the glenohumeral ligament in good status. They suggested that open reconstruction was a feasible procedure for capsular pathologies and separated lesions.^[5] Similarly, many authors agree that appropriate patient selection is essential for capsulolabral reconstruction.^[1,12-14] In our series, the patients were assigned to open surgery or arthroscopic treatment on a random basis. Kim et al.^[7] reported that the rates of recurrence did not differ in patients with varying status of labrum, so there was no need for excluding the arthroscopic repair indication because, using an appropriate number of anchors, proximal capsular sliding could be performed even in patients with or without weak anterior labral tissue. Likely, during placement of the suture, we performed capsular sliding by pulling the ligamentolabral complex from distal to proximal and, in the light of our results, we support this approach.

Green and Christensen^[11] evaluated labor loss, duration of hospital stay, use of narcotic analgesics, loss of blood, and operation times when comparing open and arthroscopic Bankart repair and found that, in the arthroscopic repair group, there were considerable decreases in all these parameters. They also observed subjectively less postoperative pain and fewer complications in this group compared to

patients undergoing open surgery.^[1] In our series, no significant difference was found in terms of VAS scores for postoperative pain.

Jørgensen et al.^[15] pointed out that external rotation performed with the arm in 90° abduction was probably the most important movement. In our study, placement of the sutures during open surgery was made as described by Jørgensen et al.,^[15] that is in 45° abduction, 15° flexion, and neutral rotation together with traction. Then, it was tested whether the arm could reach 30° external rotation. Loss of joint range of motion observed following open surgery may result from several causes including excessive thickening of the capsule, cutting and probably shortening of the subscapularis tendon and, especially, the development of fibrosis between the reconstructed capsulolabral complex and the subscapularis tendon. Similarly, we observed limitation of external rotation of varying degrees. Although it was slightly more common in the open surgery group, the difference was not statistically significant. As stated by Jørgensen et al.,^[15] many causes may play a role in the development of limitations in joint movements, and it is important to perform an efficient physical therapy following treatment.

Recurrence rates following arthroscopic repair vary from 1.9% to 16%.^[6,16-19] In our study, the recurrence rate was 3.4% in the open surgery group, and 5.9% in the arthroscopic repair group, and there was no significant difference in this respect. The cause of all the recurrences was new trauma. It was unclear whether the trauma was severe enough to cause the dislocation or the recurrence was associated with inadequate repair.

Mohtadi et al.^[20] reported that it was difficult to compare the results of the studies due to heterogeneous patient groups in these studies, the use of different techniques for complex pathologies, and the use of different scoring systems for the evaluation of the results. In our study, the two patient groups were to a greater extent homogeneous. Age, gender, and occupational activity levels of the patients were comparable. Existing pathologies were also similar in terms of a Bankart lesion.

In our study, we used metal anchors. In recent years, biodegradable anchors have been increasingly preferred to metal anchors. The causes of this switch include the potential risk for damage to articular car-

tilage in case of inappropriate placement of metal anchors and the possibility of metal-induced artifacts during magnetic resonance imaging.^[21] In addition, it has been demonstrated that new-generation biodegradable anchors are at least as strong as metal anchors and are not associated with serious chemical reactions.^[21-23] Although we did not observe any complications related to metal anchors, their cautious and appropriate positioning is very important in terms of potential complications.

Our study has some limitations. It was a nonrandomized study. The authors were not blinded and the follow-up period was short for some patients. All of the patients were males. However, the strength of this study arises from the homogeneity of the patients; they were similar in terms of age and activity levels and belonged to a specific occupational group. In addition, suture anchors were used in both groups and patients in each group were treated with the same surgical technique.

We concluded that, although there was no significant difference between the VAS scores, arthroscopic repair was better in terms of less postoperative pain and better cosmetic appearance. It is a fact that, in open Bankart repair, the capsule can be tightly closed, the knots can be tightly tied, and the stiffness of the knots may be felt. Therefore, open surgery may seem to be more efficient and safer. However, it has been shown that, when an appropriate technique is used, arthroscopic knots are as strong as those of open surgery.^[24] In addition, it should be noted that all the structures are easily visualized in arthroscopic repair, and everything can be done whatever required.^[25] The incision was 8 cm in the open surgery group and 3 cm in the arthroscopic repair group, and detachment of deep folds may also be regarded as a disadvantage of open surgery. Moreover, open surgery requires a good retraction and effective illumination. On the other hand, arthroscopic repair requires a good pumping, profuse irrigation serum, and experience as well as patience. At present, we mostly use arthroscopic techniques for the treatment of isolated anterior shoulder instability.

In conclusion, our results were similar for open repair and arthroscopic repair in the surgical treatment of instability secondary to isolated traumatic shoulder dislocations. Both methods yielded satisfactory results. In the light clinical practice and experience

obtained from this study, we believe that arthroscopic repair is at least as efficacious as open surgery and that, with enhanced experience and knowledge, it may outweigh open repair.

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