# Arthroscopic Bankart repair for traumatic anterior shoulder instability with the use of suture anchors

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## ABSTRACT

**Introduction: The arthroscopic method offers a less invasive technique of Bankart repair for traumatic anterior shoulder instability. The results continue to improve with the advancements made in instrumentation and technique. This study aims to evaluate the outcome of arthroscopic Bankart repair with the use of suture anchors for cases that were followed-up for at least two years from the date of surgery.**

**Methods: This was a consecutive series of 40 shoulders in 37 patients who underwent arthroscopic Bankart repair with suture anchor. The mean age at the time of operation was 26.3 years. The patients were assessed with two different outcome measurement tools (the University of California at Los Angeles [UCLA] shoulder rating scale and simple shoulder test [SST] score). The mean duration of follow-up was 30.2 months. The recurrence rate, range of motion, and postoperative function were evaluated.**

**Results: The two shoulder scores significantly improved after surgery (p-value is less than 0.05). According to the UCLA scale, 37 shoulders (92.5 percent) had excellent or good scores, one shoulder (2.5 percent) had a fair score, and two (five percent) had poor scores. All 12 components of SST showed improvement, which was statistically significant. Overall, the rate of postoperative recurrence was 7.5 percent (three shoulders). All patients either maintained or demonstrated improvement of range of motion. There was no loss of external rotation range of motion postoperatively.**

**Conclusion: Arthroscopic Bankart repair with the use of suture anchors is a reliable treatment method that can provide a good clinical outcome with excellent postoperative shoulder motion and low recurrence rate.**


**Keywords: anterior shoulder instability, arthroscopic surgery, Bankart repair, shoulder dislocation, suture anchors**

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## INTRODUCTION

The role of the glenoid labrum in maintaining stability of the glenohumeral joint is well described.[1-4] The anteroinferior labrum also serves as the anchor point for the inferior glenohumeral ligament, the primary static restraint to the anterior humeral translation in the abducted shoulder.[5] An avulsion of the labrum from the glenoid rim is known as Bankart lesion,[6] first described by Perthes[7] and Bankart [8] in the early twentieth century. When treating shoulder instability, one should consider the ideal surgical technique. The technique should include the ability to assess the glenohumeral joint instability with regard to the type of lesion, the anatomic structures involved, its potential for healing and the type of fixation needed.[9] The ideal technique should also avoid injuries to the surrounding normal tissues. Shoulder arthroscopy provides for such a technique. Unlike the open method of Bankart repair, which renders significant loss of range of motion because of disruption of the subscapularis tendon, the arthroscopic method creates minimal tissue trauma.[10-12] While the orthopaedic community continues to debate on the indications for arthroscopic shoulder stabilisation, the recent reports in the arthroscopic method are encouraging.[10,13-16] The following study was to evaluate the outcome of arthroscopic Bankart repairs with the use of bioabsorbable suture anchors for the patients that were followed-up for at least two years from the date of surgery.

## METHODS

From 2002 to 2003, 37 patients underwent arthroscopic Bankart repair for recurrent anterior glenohumeral instability by a single surgeon at our institution. Three patients had bilateral repairs performed. Hence, there were a total of 40 shoulders operated on. The inclusion criteria included recurrent anterior glenohumeral subluxation or dislocation after the initial episode of traumatic anterior shoulder dislocation, a Bankart lesion confirmed by arthroscopic examination and arthroscopic Bankart repair done using bioabsorbable suture anchors. The exclusion criteria were posterior instability, multidirectional instability, Hill-Sachs lesions more than 25% of the humeral head and bony Bankart lesion more than 25%. Preoperatively, the range of motion of the affected

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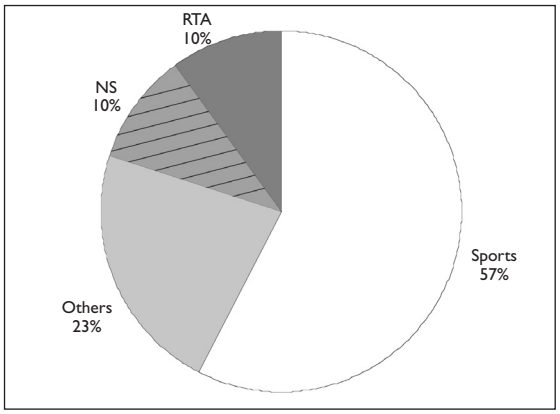


**Fig. 1** Pie chart shows causes of injury.

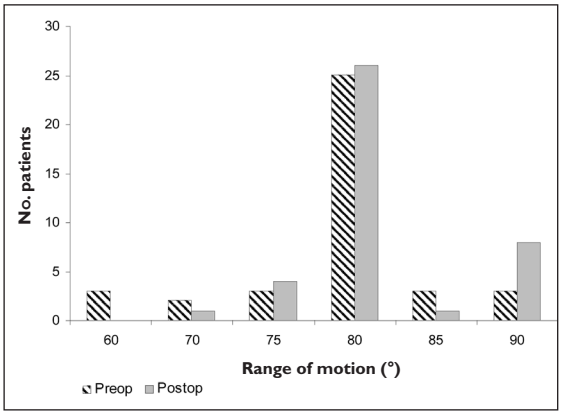


**Fig. 2** Bar chart shows the range of external rotation.

shoulders was measured. All patients demonstrated a positive apprehension test and a load and shift test. They also underwent preoperative radiographic evaluation, i.e. anteroposterior and axillary view radiographs. Magnetic resonance arthrography was not routinely performed in this study. All these patients underwent arthroscopic Bankart repair and were subsequently followed-up for a minimum of two years.

We used two tools for the outcome measurements: the shoulder rating scale of University of California at Los Angeles (UCLA),[17] and simple shoulder test (SST).[18] The patients were asked to fill in these questionnaires before surgery and at two years follow-up, in addition to the clinical examination. The original SST is a series of 12 yes-no questions that measure pain and function of the shoulder through assessing the patient's ability to perform 12 simple tasks with their shoulder. Some of the original questions were modified in order to give them a more local context (e.g. from non-metric to metric measurements, easily recognisable objects). The maximum total score possible is 12 points, with a higher score indicating better shoulder function. The UCLA is a scale that assesses pain, function, forward flexion, strength and patient satisfaction. The five items are rated on ordinal scales of different lengths and scoring points. The maximum total score possible is 35, with a higher score indicating better shoulder function.

We selected the SST and UCLA scoring systems as assessment tools specifically for this study, because we believe that they are the most responsive scoring systems and they also accurately reflect the outcome of shoulder surgery by assessing the tasks the patients are able to perform with their shoulder.[19-21] This has direct correlation with whether the patient is ready to return to their sporting activities. Numerous studies have used SST and UCLA shoulder score systems especially in instability of the shoulder.[10,22-28] Data analysis comparing the scores before and after surgery was performed using the Wilcoxon Signed Rank Test and McNemar Test. A p-value of $< 0.05$ was taken as statistically significant. All the patients were followed-up in the outpatient clinic at intervals of two weeks, one month, three months, and every six months thereafter, postoperatively. All patients had a minimum of two years of follow-up. The criteria used to define the treatment as a failure was recurrent dislocation, symptomatic subluxation or instability preventing return to full active duties or necessitating an additional surgical stabilisation procedure.

All operations were performed with the use of a standardised technique by the same surgeon. After induction of a general anaesthesia, the patient was placed in a beach chair position and a thorough examination under anaesthesia was performed to assess the magnitude and direction of instability. The shoulder was prepared and draped in a sterile manner, and the bony landmarks were marked carefully to maintain orientation throughout the procedure. A standard posterior viewing portal was established approximately 2 cm inferior and one cm medial to the acromial angle. Two anterior portals were established using outside-in technique with a spinal needle to establish the most appropriate placement of the cannulas. The anterosuperior portal was made in the rotator interval just inferior to the anterior edge of the acromion, and the anterior midglenoid portal was made just over the superior border of the subscapularis tendon. A small cannula was inserted into the anterosuperior portal, and a large-diameter threaded cannula was placed in the anterior midglenoid portal. Complete diagnostic arthroscopy was done through the posterior and anterior portals, with assessment of the glenoid labrum, capsule, rotator cuff and the humeral head for possible Hill-Sachs lesions.

**Table I. Operative findings.**

| Operative findings | No. of shoulders |
|---|---|
| Bankart lesion | 40 |
| Hill-Sachs lesion (mild grade) | 6 |
| Chondrolabral lesion | 1 |
| Bony Bankart lesion < 10% (bone fragment was left *in situ*) | 2 |
| SLAP lesion | 2* |
| Lax anteroinferior capsule (required capsular plication ) | 6 |
| Fraying biceps tendon associated with severely-inflamed capsule | 1 |

* same patient

The Bankart lesion was mobilised from the anterior glenoid surface using a periosteal elevator. The goal was to mobilise the labrum such that it could be shifted superiorly and laterally. The glenoid neck was lightly abraded using a rasper. The first anchor was placed at the 5.30 clock position, on the glenoid articular surface 3 mm from the articular edge. We believe this is essential in recreating the labral bumper and in re-establishing the concavity compression effect. A suture passer was passed under the Bankart lesion. The suture strand of the suture anchor nearer the labrum was brought out through the anterosuperior portal, and in turn through the labrum in a retrograde fashion using the suture passer and retrieved from the midglenoid portal. This suture limb remained as the post during suture tying and this would ensure that the knot rest of the capsular side of the glenoid labrum and not on the articular side. This technique would effectively push the labrum up towards the glenoid socket and thereby recreating the labral bumper. The sutures were tied using the Tennessee slider knot, which is easy to tie, has a low profile and possesses good holding strength.[29-31] The second and third suture anchors were done at the 4.30 and 3.30 clock positions in the same manner. When there was evidence of anteroinferior capsular laxity, the suture passer would be passed through the perilabral capsule one cm anterior and one cm inferior to the Bankart lesion to plicate the redundant capsule. Postoperatively, the patients were placed in a sling for six weeks. They were allowed to do pendular motion exercises for the first three weeks, followed by elevating the elbow to shoulder level (forward active flexion to 90°) from the third to the sixth week. They were also taught to do isometric rotator cuff exercises during these six weeks. Full shoulder mobilisation was allowed after six weeks. Sport activities were allowed at three months and contact sports at four months.

## RESULTS

There were 37 patients, with three patients having bilateral shoulders affected. All was male. 24 cases were right shoulders and 16 were left shoulders. The mean age at the time of surgery was 26.3 (range 20–44) years. 22 out of 40 (55.0%) shoulders were affected. The aetiology of traumatic dislocation was sports in 57% of cases (Fig. 1). The mean number of dislocations before surgery was 7.7 times. The mean interval from the initial dislocation and surgery was 39.6 months. The mean duration of surgery was 72.5 minutes. The mean duration of follow-up was 30.2 months. The operative findings are summarised in Table I. Excluding recurrent instability, there were no intraoperative complications related to the arthroscopic procedure with regard to nerve injuries, compartment syndrome, or infection. No neurological compromise was detected in all patients at the latest follow-up.

The mean postoperative shoulder scores were significantly improved at the time of the final follow-up. The total SST score improved from a mean and standard deviation (SD) of 5.27 ± 3.82 (range 0–11) preoperatively to 11.22 ± 1.68 (range 6–12) postoperatively ($p < 0.05$) (Table II). The total UCLA score improved from a mean and SD of 20.15 ± 4.03 (range 12–28) preoperatively to 32.07 ± 4.82 (range 14–35) postoperatively ($p < 0.05$) (Table III). According to the UCLA scoring system, 37 shoulders had excellent or good scores (92.5%), one had a fair score (2.5%) and two had poor scores (5%). All patients demonstrated a good range of motion, including external rotation postoperatively (Fig. 2). The mean and SD of degree of external rotation was 81.38° ± 4.93°. Two patients, one of whom had both shoulders operated on, had recurrent instability postoperatively. The failure rate was 7.5% (three of 40 shoulders). We were unable to identify the reasons for failure in these two patients.

At final follow-up, 85% of cases returned to sports. Most of them returned to their prior sport at the same level of competition. The remainder had not resumed their sports activities because of either recurrent instability or phobia of recurrence. The patients rated their level of satisfaction with the use of the UCLA shoulder score. Preoperatively, no patient rated that he was satisfied; postoperatively, the mean and SD score of satisfaction was 4.63 ± 1.33 with range 0–5 ($p < 0.05$).

## DISCUSSION

The currently-accepted standard treatment of anterior glenohumeral instability is the repair of the Bankart lesion. This is done by re-attaching the anterior inferior labrum along with the ligaments to the glenoid labrum, at the same time reducing any redundant or patulous capsule.[32,33] The socket-deepening effect of the glenoid labrum has been proven to be important in maintaining shoulder stability.[34,35] Studies have shown that the labrum contributes to 50% of the total depth of the glenoid socket.[36] An avulsed or detached labrum therefore causes

**Table II. Simple shoulder test scores pre- and postsurgery.**

| Question | No. (%) positive responses before surgery | No. (%) positive responses after surgery | p-value |
|---|---|---|---|
| 1. Is your shoulder comfortable with your arm at rest by your side? | 16 (40) | 38 (95) | 0.000 |
| 2. Does your shoulder allow you to sleep comfortably? | 13 (32.5) | 37 (92.5) | 0.000 |
| 3. Can you reach the small of your back to tuck in your shirt with your hand? | 25 (62.5) | 40 (100) | 0.000 |
| 4. Can you place your hand behind your head with the elbow straight out to the side? | 19 (47.5) | 39 (97.5) | 0.000 |
| 5. Can you place a coin on a shelf at the level of your shoulder without bending your elbow? | 29 (72.5) | 38 (95) | 0.004 |
| 6. Can you lift a basketball to the level of your shoulder without bending your elbow? | 27 (67.5) | 40 (100) | 0.000 |
| 7. Can you lift a 3-kg dumb bell to the level of the top of your head without bending your elbow? | 14 (35) | 36 (90) | 0.000 |
| 8. Can you carry a 10-kg bag of rice at your side with the affected extremity? | 11 (27.5) | 36 (90) | 0.000 |
| 9. Do you think you can toss a tennis ball underhand 10 m with the affected extremity? | 16 (40) | 38 (95) | 0.000 |
| 10. Do you think you can throw a tennis ball overhead 20 m with the affected extremity? | 4 (10) | 36 (90) | 0.000 |
| 11. Can you wash the back of your opposite shoulder with the affected extremity? | 13 (32.5) | 32 (80) | 0.000 |
| 12. Would your shoulder allow you to work full-time at your regular job? | 24 (60) | 39 (97.5) | 0.000 |
| Mean ± SD | 5.27 ± 3.28 | 11.22 ± 1.68 | |
| Median (range) | 5 (0–11) | 12 (6–12) | |

**Table III. UCLA scores.**

| | Median (range) before surgery | Mean and SD before surgery | Median (range) after surgery | Mean and SD after surgery | p-value |
|---|---|---|---|---|---|
| Pain | 6 (2–8) | 5.1 ± 1.92 | 8 (4–10) | 8.65 ± 1.53 | 0.000 |
| Function | 6 (2–10) | 5.75 ± 2.53 | 10 (2–10) | 8.9 ± 1.97 | 0.000 |
| Active forward flexion | 5 (4–5) | 4.8 ± 0.41 | 5 (4–5) | 4.95 ± 0.22 | 0.014 |
| Strength of forward flexion | 4.5 (4–5) | 4.5 ± 0.51 | 5 (4–5) | 4.95 ± 0.22 | 0.000 |
| Satisfaction of patient | 0 | 0 | 5 (0–5) | 4.63 ± 1.33 | 0.000 |
| Total | 20 (12–28) | 20.15 ± 4.03 | 33 (14–35) | 32.07 ± 4.82 | 0.000 |

significant instability because the bumper effect of the labrum is lost and the humeral head has the tendency to roll off the edge of the glenoid socket, resulting in subluxation or dislocation of the humeral head.[37] Re-attaching the labrum onto the articular surface and placing the knot on the capsular side of the Bankart lesion restores its socket-deepening bumper effect. This is accomplished using sutures and suture anchors, which can be done either open or arthroscopically.[32,35,37]

Arthroscopic Bankart repair has many advantages compared to the open technique. It offers a minimally invasive approach with less surgical trauma and blood loss. Postoperative recovery and rehabilitation is faster, without the need for admission. Postoperative range of motion is also not sacrificed for the sake of stability. Patients are able to have a good range of motion functionally, especially external rotation which allows them to return to their sports or high-demand jobs.[22,23,38,39] With modern techniques of arthroscopic Bankart repair continuing to evolve and improve, results of this technique are fast catching up with that of the open technique.[23] The introduction of bioabsorbable suture anchors simplifies any revision surgery and reduces concerns about infected implants[40] and anchor migration leading to articular cartilage damage.[41,42]

During surgery, either two or three suture anchors are inserted, depending on the size of the Bankart lesion. When the Bankart lesion is small, two instead of three suture anchors suffice. Patients who had only two suture anchors did not have a higher rate of recurrence. They

have been shown to be adequate in such situations, unlike some studies which insist on the use of three anchors for all patients.[15,43] Our patients with anteroinferior capsular laxity were of mild or moderate degree, and were treated accordingly by pinch tuck capsular plication as described earlier. Although studies have shown that the presence of capsular laxity may affect the outcome of arthroscopic stabilisation,[16,22,44] we do not consider Bankart lesions associated with capsular laxity a contraindication to arthroscopic surgery. On the contrary, capsular plication can be done arthroscopically to address the issue of anteroinferior capsular laxity and this significantly augments the stability achieved with Bankart repair.

All our patients are young, physically active males who engage in vigorous sports or high-demand jobs. The first episode of acute shoulder dislocation is invariably painful and traumatic. Subsequently, it is found that they sustain recurrent shoulder dislocation with increasing ease, even during performing tasks of daily activities, i.e. reaching for overhead objects, stretching, sleeping. The recurrence sustained varies from multiple subluxations to frank dislocations. This proves to be a significant morbidity for many of them whose sporting activities or occupations are seriously affected. Our patients expressed a high degree of satisfaction with arthroscopic Bankart repair. Satisfactory range of motion, especially external rotation that allows proper functioning during sports and activities of daily living, is high on the priority list for these patients. A good range of motion is considered more important than just stability alone. Several other studies published also reported a good range of motion achieved after arthroscopic repair, and were even better than those achieved after open repair.[14,45-47]

The failure rate in our study was 7.5%, which was similar to other published studies. Gartsman et al reported a failure rate of 7.5%.[22] Mishra and Fanton reported a failure rate of 7% with arthroscopic Bankart repair combined with thermal treatment.[48] Similarly, Ide et al reported a 7% failure rate after performing arthroscopic Bankart repair in a young, athletic group of patients.[49] Our results also compare favourably to those of open Bankart repairs. This is in line with recent studies comparing open and arthroscopic Bankart repairs.[45-47] In conclusion, arthroscopic Bankart repair is a reliable method to treat anterior glenohumeral instability. This method is able to yield a good clinical outcome in terms of excellent postoperative shoulder motion and low recurrence rate.

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