ORIGINAL RESEARCH PAPER

Orthopaedics

KEY WORDS:

ARTHROSCOPIC BANKART REPAIR USING SUTURE ANCHORS IN RECURRENT ANTERIOR DISLOCATION OF SHOULDER EVALUATION OF FUNCTIONAL OUTCOME

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ABSTRACT

Purpose: The purpose of this study was to evaluate the results in patients who underwent arthroscopic stabilization of shoulders with recurrent anterior dislocation .

Hypothesis: Arthroscopic stabilization using suture anchors is useful without a large bone loss of glenohumeral articulation with no loss of function.

Study Design: Prospective cohort study.

Methods: The study group comprised 30 patients, with a mean follow-up of 3 years.

Rowe score, range of motion, recurrence, and functional range of motion was evaluated at immediate post operatively,1st month, 3rd month and after every 1 year.

Results: Mean Rowe score improved from 73 to 98 points. Mean Constant score improved from 9.3 to 3.2 points. According to Rowe score 90% were excellent, 6.6 % were good and 3.3% were fair post-op. Three (7%) had recurrence. All the patients resumed their daily routine activities and no restriction was found in doing activities after 3 years.

Conclusion: Arthroscopic stabilization is a reliable procedure in bankart lesion.

INTRODUCTION

The shoulder is the most versatile joint in the body having a wide functional range of motion. By combining the coordinated glenohumeral and sternoclavicular joints, the shoulder can retain stability without compromising mobility. The wide range of motion provided by the shoulder allows the glenohumeral joint to be used as a stable fulcrum for placing the upper extremity at various positions in three-dimensional space. A consequence of the flexibility is the propensity for the joint to become unstable.1,2 As such, the shoulder is the one of the most commonly dislocated joints in the human body. It accounts 45% of all dislocations3. Shoulder instability may occur in patients with underlying ligamentous laxity or in patients whose shoulder musculature has been deconditioned or a well defined traumatic insult. According to one estimate, up to 96% of acute shoulder dislocations are traumatic in origin4. Rest of 4% occurred due to ligament laxity.

Glenohumeral instability is defined as the symptomatic and pathologic condition in which the humeral head does not remain centered in the glenoid fossa. Dislocation of shoulder can be also classified on the basis of direction of dislocation. Anterior, posterior, superior, inferior, and multi- or bidirectional instability have been described well in literature.5 In shoulder joint, one of the most important stabilizing structure is "glenoid labrum". The defect in anteroinferior part in labrum is known as "essential lesion" or "Bankart lesion".6 The presence of the Bankart lesion, defined as a separation of the glenohumeral ligament-labrum complex from the anterior glenoid rim and scapular neck. With this evolution have been reports of arthroscopic treatment of shoulder instability. Johnson7 described an arthroscopic staple capsulorrhaphy in 1987, using a procedure similar to the du Toit staple. Since that time, multiple arthroscopic techniques have been described that include the use of staples, removable rivets, tacks, suture anchors, screws, and sutures. Caspari8 had described an arthroscopically assisted transglenoid suture technique to reattach the labrum. Arthroscopic repair have its own advantages like improved cosmesis, short operative time, shorter hospital stay, decreased morbidities, decreased complications and lower cost. The purpose of present study is to evaluate the functional results of arthroscopic Bankart repair in patients suffering from recurrent anterior dislocation of shoulder.

MATERIAL AND METHOD

This was a prospective type of study. All patients presented with history of recurrent anterior dislocation of shoulder attending orthopaedics emergency and the out patient department of central institute of orthopaedics, Safdarjung hospital were included in the study.

Inclusion criteria were 1).Patients of either sex with age >15 years with history of anterior dislocation of shoulder. 2)Patients having positive apprehension test and anterior drawer sign. 3)Radiological evidence of anterior shoulder instability i.e. Bankart lesion on magnetic resonance imaging. Exclusion criteria: 1)Patients with a stiff shoulder and adhesive capsulitis of shoulder. 2)Any multidirectional or posterior instability. 3)Large bone loss of anteroinferior glenoid. 4)Previously failed arthroscopic or open surgery. 5)Fractures involoving >30% of articular surface of glenoid or posterolateral humeral head (engaging Hill-Sach's lesion). 6)Other unrelated condition like rotator cuff tears. 6)Medical or surgical contraindications to surgery. 7)Patient with humeral avulsion of glenohumeral ligament.

Patients meeting the inclusion criteria were subjected to clinical examination -apprehension test and anterior drawer test. Roentgenographic examination which included X ray in antero-posterior view in neutral rotation and internal rotation and axillary views of the shoulder. Magnetic resonance imaging of the shoulders were done for evidence of Bankart lesion. Patients diagnosed with anterior dislocation of the shoulder were taken up for surgery after written informed consent. 30 patients with anterior dislocation of shoulder with positive apprehension test and Bankart lesion on magnetic resonance imaging were taken up for study.

Pre-operative Preparation:

Patients were evaluated for evidence of any ligamentous laxity using Beighton's criteria. Anterior apprehension test and Anterior drawer test was performed.Radiological assessment was made using X ray in anteroposterior position in neutral rotation and 90o internal rotation and axillary radiographs.MRI was done to assess any intra-articular pathology such as Bankart lesion or any associated rotator cuff injury.

Procedure – Arthroscopic Bankarts repair

Anaesthesia and positioning

All patients were operated under general anaesthesia. They were positioned in a lateral decubitus position. The affected shoulder was abducted 45 degrees and 15 degrees anteverted. Traction of 4-6 kg was applied to the affected limb.

Portals and surgical technique

After painting and draping, bony landmarks, including the acromion, distal clavicle, acromioclavicular joint and coracoid process was outlined. A posterior portal was made in the soft spot between infraspinatus and teres minor muscles, 2-3 cm inferior and 1 cm medial to the posterolateral tip of acromion. The anterior portal was established with the help of wissinger rod after the posterior portal, using an inside-to-out technique.

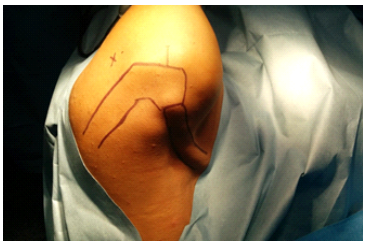
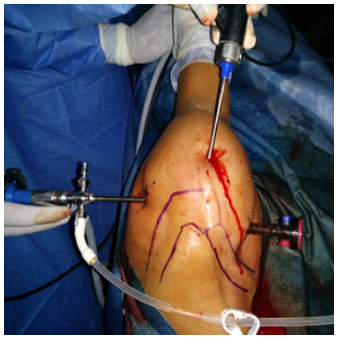


Image showimg marking of landmarks before making of portals

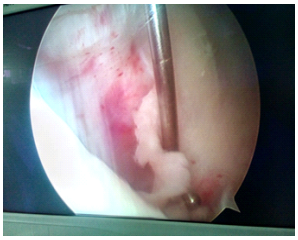
Image showing making of posterior portal

The anterior portal was established with the help of Wissinger rod after the posterior portal, using an inside-to-out or out-to-inside technique using needle into the anterior soft spot triangle formed by the glenoid articular surface, biceps tendon and the subscapularis tendon. Using a Wissinger rod, the cannulated reusable obturator was passed over the rod to dilate the portal. A twist-in or instrument cannula attached to the obturator will then passed over the Wissenger rod or switching stick to ensure controlled atraumatic placement in the glenohumeral joint. The glenohumeral joint was examined for status of biceps tendon, status of labrum, synovitis , rotator cuff tears, loose bodies, signs of instability and any Hill sach's lesion findings was noted. Decision regarding extent of Bankart lesion, status of labrum, fraying, soft tissue involvement, whether glenoid labrum can be mobilize or not was noted down. Third portal-anterosuperior portal was established just inferior to the leading edge of the superior glenohumeral ligament just superior and anterior to biceps tendon.

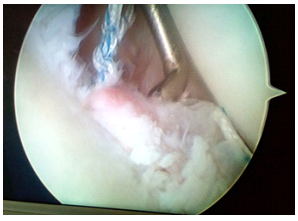


Images showing standard three portals

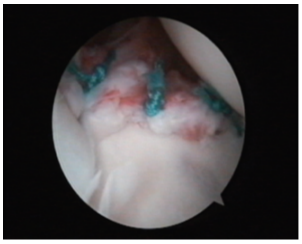
The anterior capsulolabral tissue was mobilized medially along the glenoid neck using periosteal elevators. Mobilization was done beyond the 6 o'clock position. The soft tissue on the medial wall of the glenoid was removed. Debridement of the area was done with a arthroscopic burr, shaver or a rasp to create a bleeding bed for tissue healing.



The anchor was placed at 5 o clock or 5' 30 position and advanced through guide until laser line is flushed with bone surface assuring implant was countersunk 2 mm in bone.One limb of the suture was retrieved through an anterosuperior portal with a suture retriever. The other limb of the suture will remain in the working portal. The sharp tip of the SutureLasso was passed through labral tissue below suture anchor. A varied amount of tissue was incorporated in the stitch depending on the laxity or degree of plication required. The shuttle loop was pushed through the SutureLasso tip and was retrieved out of the superior portal with a suture retriever. While holding the shuttle loop, the handle of the SutureLasso was removed from the working portal. With the SutureLasso shuttle loop outside the accessory cannula , the suture limb from the anchor was placed in the loop. Two shuttle tails was grabbed outside the working cannula and pulled so that the shuttle loop holding the anchor suture limb was passed down the accessory cannula through the tissue, and back out the working cannula.



A sliding knot with subsequent locking half hitches was put through the anchor eyelet. Following knot tying, a probe was inserted to verify firm apposition of the soft tissue to bone for the entire length of the repair. Similarly, a second suture anchor was placed at 3' 30 position and if require third at 1'30 position, repositioning the capsulolabral complex to its anatomical position onto the anterior glenoid rim.



Post operative management

A shoulder immobilizer with arm in adduction and internal rotation was given initially for 3 weeks. During this time, patients was allow to exercise the elbow and forearm and move the wrist intermittently. Pendulum exercises, wrist isotonics and grip exercises was started on 2nd day or as soon as pain subsides.

First follow up was done at 4 weeks. At this time, progression to active assisted range of motion exercises was allowed. Forward flexion to 160o and external rotation to 40o was targeted. During

further follow up in 6-12 weeks, upper body exercises for endurance was started. Forward flexion to 170o and external rotation to 40o to 45o was targeted. Active resistance exercise with a light rubber band was started 3 months postoperatively. Having progressed to a more resistant rubber band, patients were encouraged to work on rotator cuff strengthening exercises. Light sports activity, including overhead sports, was permitted 3 months after surgery, whereas participation in contact sports was restricted until 6 months postoperatively. Post operative assessment was performed using the Rowe scale and Constant score. Patients was followed up at 1 month,3 months and data was collected as per proforma. At every visit findings was recorded in proforma and patients were evaluated according to Rowe score and Constant score and patients was graded as excellent, good, fair or poor depending on the score obtained.

Statistical Analysis:
All data was compiled and checked for discrepancies. Statistical analysis was done using Wilcoxon Statistical method. The paired t test was used for matched pairs. The differences in
values between the 2 groups were analyzed using the unpaired t test. Multivariate analysis was done by a 2 test. A value of P < .05 was considered significant.

RESULT

RANGE OF MOTIONS

A) FORWARD FLEXION

The mean pre-op pain forward flexion was 1540 with the highest value being 1800 and the lowest being 500. The score however decreased by 1000 immediately to reach 54.330 and increased by 500 in 1 months to reach 1040. The mean post-op 3 months forward flexion was 174.33 ± 19.35. Total increase from pre-op period was 200 with the highest value being 180 and the lowest being 1500.

B) ABDUCTION

The mean pre-op pain abduction was 156.33±31.13 0 with the highest value being 1800 and the lowest being 600. The score however decreased by 1050 immediately after operation to reach 510 and increased by 830 in 1 months to reach 1030. The mean post-op 3 months abduction was 172.97 ± 14.16. Total increase from pre-op period was 180 with the highest value being 180 and the lowest being 1200.

C) INTERNAL ROTATION

Majority of patients (17)had internal rotation upto T7 vertebrae level. However Immediately after operation all of patients able to do internal rotation upto lumbosacral junction . By the end of 1 month, 22 (73.3 %) able to do till lumbar 3rd vertebrae. And at the end of 3 month, 28 patients (93.3 %) able to do till T7 vertrebrae level and 1 patient upto T12 and 1 upto L3 level.

D) LOSS OF EXTERNAL ROTATION

The mean pre-op pain loss of external rotation was 16.33±6.07 0 with the highest external rotation value being 500 and the lowest being 300. The score however increased by 240 immediately after operation to reach 400 and increased by 40 in 1 months to reach 200. The mean post-op 3 months loss of external roation was 6.17 ± 3.87. Total improvement from pre-op period was 100 with the highest value being 550 and the lowest being 400.

E) ROWE SCORE

The mean pre-op pain score was 73 ± 9.79 with the highest value being 95 and the lowest being 45. The score however decreased by 43 points immediately to reach 30.67 and increased by 17 points in 1 months to reach 90. The mean post-op 3 months rowe score was 98.83 ± 4.68 . Total increase from pre-op period was 25 with the highest value being 100 and the lowest being 75.

TABLE 17: Rowe score observation

Time	<50	51-75	76-90	90-100
Pre-op	3	20	7	0
Immediate	30	0	0	0
1 month	0	2	11	17
3 month	0	1	2	27

The post-op rowe score at 3 months (98.83±4.68) was significantly higher (p<0.005) than the pre-op pain score (73±9.79).

F) CONSTANT SCORE OBSERVATION

The mean pre-op function score was 9.3 with the lowest value being 4 and the highest being 42. The score increased by 64 points immediately after operation to reach 75.5 and by 20 points in 1 months to reach 29.37. The mean post-op 3 months CONSTANT score was 3.2. Total decrease from pre-op period was 6.1 with the lowest being 4 and the highest being 42.

TABLE 18: CONSTANT score

Time	>30	21-30	11-20	<11
Pre-op	4	0	0	26
Immediate	30	0	0	0
1 month	7	22	1	0
3 month	1	0	1	28

The post-op CONSTANT score at 3 months (3.2±7.99) was significantly higher (p<0.005) than the pre-op shoulder function score (9.3±11.55).

SATISFACTION LEVEL

Satisfaction level has been graded according to ROWE score and individual response. 28 patients (93.3%) were satisfied with arthroscopic Bankart repair. 1 patients was partially satisfied while 1 patients was not satisfied with the operation.

COMPLICATIONS

3 of the patients had scar pain which resolve in follow up. Three patient developed shoulder dislocation after sustaining trauma.

DISCUSSION

Recurrent anterior dislocation of the shoulder is the most common disorder of the shoulder, accounting for 44–50 % of all complaints of shoulder pain30. The recurrent anterior dislocation of the shoulder appears to be largely a clinical diagnosis. Main patholgy which lead anterior dislocation of shoulder being the tear or avulsion of labrum-IGHL complex from its attachment to glenoid.

Out of 30 patients in our study, 20 (66.6%) patients had complaint in dominant shoulder and 10 (33.3%) patients in non-dominant shoulder. This is in accordance of Grana et al(1993)24 17 (62.9%) in dominant hand; Morgan et al (1987)10 18 (72%) doiminant, Marquardt et al (2004)23 11 (61.1%) dominant; Green et al (1995)15 35 (59%) dominant; Boileau et al (2006)13 53 (58%) dominant; Bacilla et al (1997)25 19 (47.5) dominant . Dominant shoulder affection can be attributed to increased use of the particular shoulder for most day to day activities especially overhead activities and throwing activities. Moreover during falls persons tends to get support from dominant extremity during falls which can explain the more involvement of dominant hand.

In our study,12 (40%) patients suffered injury while involved in sports, 5 (26.6%) suffered in accident, 8 (26.6%) due to fall and 5 (16.6%) due to other reasons. In Barbar et al (2003)16 32 (56%) patients due to sports, 16(28%) due to accident,9 (16%) due to other reason; Hinterman et al (1995)9 25 at work related, 45 at home and 15 due to road traffic accident.

Mean duration of symptoms in our study was 53.77 weeks with range from 25-48 weeks.In Carriera et al (2006)18 mean duration of symptoms was 188 weeks (range 2 weeks- 311 month); Linde et al (2011)17 51 month (range 8 – 479 month); Castagna et al (2010)20 3.8 month (range 8 month to 24 years); Hinterman (1995)9 5.2 month (range 3 month – 9 years). There was a significant relation between duration of symptoms and severity of symptoms (p<.005) in our study. Patients with prolonged duration of symptoms used to have more tear of glenoid labrum as observed intraoperatively.

In our study population of 30, mean number of dislocation was 3.87 with range from 3 to 50. In Boileau et al (2006)13 mean

number of dislocation was 7 (range 2-40); Bacilla et al 7 (range 2-100)25 ; Carriera et al(2006)18 8.6; Linde et al (2011)17 5 (range 2-40); Castagna et al (2010)20 5(1 - >10). There was a significant relation between number of dislocation and severity of symptoms (p<.005) indicate severe labrum tear with more number of dislocation.

In our study, on X ray 4 patients (13.3 %) had Hill-Sachs lesion while 26 (86.6 %) had normal x ray of shoulder. It is comparable to Grana et al(1993)24 where 4 (5%) had Hill sachs lesion. But in Morgan et al(1987)10 16 (64%) patients had Hill sachs lesion; Boileau et al (2006)13 76 (84%) ; Bacilla et al(1997)25 38(95%); Larrain et al (2001)22 15 ; Linde et al (2011)17 45%; Castagna et al (2010)20 100% of grade 1 or grade 2; Hinterman et al (1995)9 144(68%) ; Mcglynn (1984)21 19 (100%) which is very high comparitively to our study.

In our study, all 30 patients had labrum tear of varing degree from complete to partial tear, 4 patients (13.3%) had Hill Sachs lesion, 2 patients (6.6%) had rotator cuff tear, 1 patient (3.3%) had SLAP lesion and 3 patients (10%) had joint effusion in MRI. Gartman et al (2000)11 had similar findings in MRI, 5 patients had normal MRI,labrum tear in 8, SLAP in 2, Hill Sachs in 8 and rotator cuff tear in 3 patients; Linde et al (2011)17 had done MRI of 4 shoulders,glenoid was intact in 15, 30 had some degree of labrum tear, Hill sachs in 45. He also stated there was no relationship between presence of Hill Sach lesion and number of dislocation (p=0.07). In our study, there was significant relationship was present of Hill Sach lesion or other associated injury and number of dislocation (p<.005). which is interpreted as patients having any associated injury of injured shoulder tends to get dislocated more.
Mean forward flexion in our study population was 154 degree pre operatively and increased to 174 degree post operatively after 3 month. In Barber et al (2003)16 FF increased from 155 degree to 175 degree; Bacilla et al (1997)25 all patients achieved more than 170 degree; Carriera et al (2006)18 156 degree to 172 degree.

Mean abduction in our study population was 156 degree pre operatively and increased to 172 degree post operatively. In Ide et al (2004)12 there was mean loss of 1 degree in abduction post operatively; Grana et al (1993)24 preoperatively and postoperatively equal; Bacilla et al (1997)25 more than 170 degree post operatively.

Mean loss of external rotation in our study population was 6 degree postoperatively after 3 month. In Ide et al (2004)12 mean loss was 4 degree; Grana et al (1993)24 6.3 degree; Marquardt (2004)23 2.6 degree ; Gross et al (1989)19 10 degree; Green at al (1995)15 1 degree; Barber et al (2003)16 6 degree; Cairrera et al (2006)18 5 degree. Moreover loss of external rotation was more in initial 3 month which on later follow up patients regained their pre operative level.

In our study population mean Rowe score was 73 pre operatively and 98 after 3 month post operatively, 27 (90%) had excellent, 2 (6.6%) had good, 2 (6.6%) had fair and none had poor rowe score. In Goldberg et al (1993)11 excellent and good in 34 (89.4 %), 2 (5.3%) had fair, 2 (5.3%) had poor; Grana et al (1993)24 very good 15 (56%) fair 0 (0%) poor 6 (37.5%); Morgan et al (1987)10 80 had 25 (100%) had excellent; Marquardt et al (2004)23 excellent 13 (72%) good 2 (11%) fair 1(5.5%) poor 2(11%) with mean rowe score 90.3; Gross et al (1989)19 excellent 6 (50%) good 2 (16.6%) fair 2(16.6%) poor 2 (6.6%); Boileau et al (2006)13 mean 77.8 excellent or good 62 (65%); Barber et al (2003)16 mean rowe score 93; Bacilla (1997)25 mean rowe score 90.

In our study population mean Constant score was 9.3 pre operatively and improved to 3.2 post operatively.28 (93.3%) were satisfied with their outcomes after 3 month postoperatively, 1 (3.3%) was partially satisfied and 1 (3.3%) was not satisfied. Both the patients were unhappy due to delay in achievement of expected targets of range on movements.

In our study population 3 (10%) patients had recurrence in follow up duration. Grana et al (1993)24 had 12 (44.4%); Marquardt et al (2004)23 2 (11.1%); Barber et al (2003)16 4 (7%); Bacilla (1997)25 3 (7.5%) ; Carreira (2006)18 7 (10%) which was higher than our study population. However Morgan et al (1987)10 had no recurrence. Those who had recurrence in our study, one patients suffered accident and sustained injury to operated shoulder. Another suffered after fall from stairs.

Arthroscopic Bankart repair is a tool that has been validated with symptomatic and functional improvement in both short and long-term, for patients with recurrent anterior dislocation of shoulder . Apart from the lessened surgical morbidity, one of the main advantages of the arthroscopic procedure compared to the open procedure is the ability to directly visualize the complete glenohumeral joint. Glenohumeral arthroscopy is particularly important to rule out other abnormalities like rotaor cuff tear, Hill sach lesion and to effect appropriate treatment. Another advantage of arthroscopic procedure is that the rehabilitation can be quicker compared to the open procedure.

The goal of arthroscopic bankart repair is to repair torn or avulsed glenoid labrum and prevent recurrence of dislocation again.

CONCLUSION AND RECOMMENDATIONS

On analyzing the below mentioned points it can be concluded that arthroscopic Bankarts repair is an effective and safe method for treatment of selected patients with anterior dislocation of shoulder with relief from the symptoms with an accompanying improvement in function, Patients were able to return to activities of daily living after a very short time.

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