ORIGINAL ARTICLE

ARTHROSCOPIC REPAIR OF BANKART'S LESION USING SUTURE ANCHORS IN RECURRENT ANTERIOR SHOULDER INSTABILITY

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ABSTRACT: BACKGROUND: Shoulder instability and its treatment were described even in ancient times by the Greek and Egyptian physicians. Evidence of shoulder dislocation has been found in archaeological and paleopathological examinations of human shoulders several thousand years old.[1] Many techniques have been described in literature for treatment of recurrent shoulder dislocation. Arthroscopic repair of Bankart's lesion using suture anchors is a noble technique. A suture anchor is a tiny screw with a thread attached to it. The screw is inserted into the bone over the glenoid rim while the sutures hold onto the labral tissue. These anchors provide a stable base for reattachment of the capsulolabral complex. We conducted a study on evaluation of long term effect of arthroscopic repair of Bankart's lesion using suture anchors and compared our results with other studies published in literature. **MATERIALS & METHODS:** Since June 2012, arthroscopic Bankart's repair using suture anchors was performed on 35 patients, who presented with recurrent anterior dislocation of shoulder. 34 man and 1 woman patients were included in the study. **METHOD OF COLLECTION OF DATA:** Adult patients with recurrent dislocations of shoulder with. **INCLUSION CRITERIA:** All patients >15 years but <60 years of age, with post traumatic recurrent dislocation of the shoulder with Bankart lesion. No. of dislocations >=2. **EXCLUSION CRITERIA:** Age group <15 & >60 years. Clinical evidence of multidirectional instability. Surgery of injured shoulder before 1st episode of traumatic shoulder dislocation. Number of dislocations <2. Generalised ligamentous laxity. Presence of neuromuscular disorders. Presence of other comorbid conditions. Majority of patients were in the age group between 17 years to 49years, with mean age of 27.43 years. Most patients were young active individuals in the age group of 25 to 35 years. 20 patients (57%) were involved in significant occupation requiring overhead activity such as students with sporting activities, agriculturists. 21(60%) patients had their Right shoulder involved, rest 14(40%) patients had Left shoulder involved. The mean follow-up period was 12 months (range 8-28 months). The patients were evaluated by visual analogue score (VAS), ROWE's score at final follow-up. **RESULTS:** 34/35 patient's regained almost preoperative range of forward flexion at the last follow-up. Preoperative scores were compared with the most recent follow-up scores for all variables with the help of paired t test. All patients had significant improvement in visual analogue score and ROWE's score. In the preoperative period 18(51.43%) patients had full range and 14(48.57%) patient had painful/limited terminal range of motion, as regards external rotation with arm at the side (ER1). And 07(20%) patients had 0-65º, 22(62.85%) patients had 0-70º, 3(8.57%) patient had 0-70º with pain at terminal range of motion, 3(8.57%) of patients had full range of motion, as regards external rotation at 90º abduction (ER2). At the last follow-up, 33/35(94.28%) patients had full range of ER1 & 32/35(91.42%) patients had full range of ER2. This improvement in external

rotation deficit was statistically significant (P <.05). Preoperative scores were compared with the most recent follow-up scores for all variables with the help of paired t test. Three of the patients developed apprehension which got resolved after proper physiotherapy. Pre-operative: mean Total Rowe score was 48.51, mean scores of stability 21.17, mean score of function 12.14, mean score of motion 15.77. The mean post-operative Rowe score improved to 97.63, mean stability component to 47.77, mean motion component to19.47 and mean function component to 28.63 compared to the pre-operative Rowe scores. We had final Rowe's Score excellent in 32 patients, good in 2 and fair in 1 and Poor in 1 (P-value $2.992X10^{-12}$). There was no radiological evidence of loosening and migration of anchors or any gleno-humeral arthritis on subsequent follow-up skiagrams in any of our patients. **CONCLUSION:** Arthroscopic repair of Bankart's lesion using suture anchors is a simple & technically easier method in the treatment of post traumatic recurrent shoulder dislocation.

KEYWORDS: Bankart's lesion, Arthroscopic repair, Suture anchors, Recurrent shoulder instability.

INTRODUCTION: Shoulder instability and its treatment were described even in ancient times by the Greek and Egyptian physicians. Evidence of shoulder dislocation has been found in archaeological and paleopathological examinations of human shoulders several thousand years old.[1] The shoulder is considered the most commonly dislocated joint in the human body,[2,3] accounting for almost half of all joint dislocation with a reported incidence of 17 per 100000 per year.[4] Traumatic glenohumeral instability is defined as occurring after an inciting event that results in subjective or objective subluxation or dislocation that is reduced either spontaneously or by a health professional.[5] Many factors, both static and dynamic, and their interaction with each other have been suggested in maintaining the Glenohumeral stability. Static stability is conferred by the bony configuration of the Glenohumeral joint, the fibrocartilagenous glenoid labrum, the capsule and its ligamentous thickenings,[6] and negative intra-articular pressure. Dynamic factors include the rotator cuff, the biceps tendon and the scapular muscle function. More than 200 different operations have been described for the treatment of recurrent anterior shoulder dislocation.[7] Arthroscopic treatment of shoulder instability introduced certain advantages compared to open procedures including smaller skin incisions, more complete inspection of the Glenohumeral joint with access to all areas of the joint for repair, shorter surgical times, less morbidity, less postoperative pain, reduced hospitalization time, and a decreased risk of complications with maximum preservation of external rotation.[8,9,10] In 1938, Bankart[11] published his classic paper in which he recognized two types of acute dislocations.

In the first type, the humeral head is forced through the capsule where it is the weakest, generally anteriorly and inferiorly in the interval between the lower border of the subscapularis and the long head of the triceps muscle.

In the second type, the humeral head is forced anteriorly out of the glenoid cavity and tears not only the fibrocartilaginous labrum from almost the entire anterior half of the rim of the glenoid cavity, but also the capsule and periosteum from the anterior surface of the neck of the scapula. This traumatic detachment of the glenoid labrum has been called the Bankart lesion. It is still considered to be the most commonly encountered pathological lesion in recurrent subluxation

or dislocation of shoulder. On reviewing the literature and different scientific studies, theoretically it stands out that this procedure would be very effective in preventing recurrence.[12] However, there are few studies which criticize the procedure.[13] In order to overcome the ambiguity over the procedure, we conducted a study on evaluation of result of arthroscopic repair of Bankart's lesion in recurrent shoulder dislocation, using suture anchors and compared our results with other studies published in literature.

MATERIALS AND METHODS: Since June 2012, the arthroscopic repair of Bankart's lesion was performed on 35 patients, who presented with recurrent anterior dislocation of shoulder and were in the age group of 15-60 years. 34 men and 1 woman were included in the study, the mean age being 27.43 years. Twenty one patients were affected on the dominant side. Among 35 patients, 3(8.57%) patients had 5 to 9 episodes of dislocation of the shoulder in the preceding year, 31(88.57%) patients suffered 1 to 4 episodes, 1(2.85%) patient had in the preceding year pre-operatively. [Table 1]. Of the 30(85.71%) patients who had anterior translation preoperatively in a total of 35 patients, 21 patients had anterior translation of 0-1cm (mild), 7 patients had anterior translation of 1 to 2 cm (moderate) and 2 had anterior translation of more than 2cm (severe). [Table-2] All patients had a traumatic onset of symptoms and had a failure of initial non-operative management. One of them had initial failure of Putti Platt operation, which was done four years ago. Twenty-seven patients presented with radiographs taken before reduction, which showed an anterior dislocation. MRI of three shoulders showed anterior instability with small Hill-Sachs lesion(less than 20% of the humeral head).

	Frequency	**Percentage**
1-4	31	88.57
5-9	3	8.57
>=10	1	2.85
Total	**35**	**100**

Table 1: Pre-operative dislocations in past one year

Anterior translation Preoperative	**Frequency**	**Percentage**
0	4	11.43
1	21	60
2	7	20
3	2	5.71
Total	**35**	**100**

Table 2: Pre-operative anterior translation

All of them had objective and subjective measurements in preoperative and follow up period at 2wks, 6wks, 12wks, 6 months, 9 months, 1 year, and yearly thereafter. All recording of data was done on case record form. The case record form included patient's questionnaire,

subjective and objective clinical measurements for analysis of result. Each subject underwent a physical examination after he or she had completed the patient questionnaire, which included the patients profile, pain and functional status of the affected shoulder in comparison to the normal shoulder in terms of 100 percentages scale (ROWE's scale). The affected shoulder was compared with the contralateral shoulder in terms of range of motion, pain, shoulder instability (apprehension test, load and shift, sulcus sign), translation, ADL (activities of daily living). Range of motion was examined in forward flexion, and external rotation at 0° (ER1) and 90° (ER2) of abduction, cross body adduction, internal rotation.

OPERATIVE PROCEDURE: All the surgical procedures were performed under formal general anaesthesia with the patients in lateral decubitus position. An arm holder was used to put traction (5-10lbs) and to keep the shoulder in 20-30 degrees of forward flexion and about 45 degrees of abduction. All the anatomical landmarks and portal entries were marked preoperatively. A standard 30 degree arthroscope was used. The primary posterior midglenoid portal was created 1.5 cm inferior and medial to the posterolaleral corner of the acromion.

A complete evaluation of the capsular complex and osseous structures were done for evidence of;

- Significant injury of articular surface.
- Concomitant injury to biceps origin, SLAP lesions.
- Humeral avulsion of the glenohumeral ligament or a rotator cuff tear.
- The antero-inferior aspect of the labrum was evaluated.
- Presence of a Bankart lesion noted in all patients.
- Presence of Hill Sachs lesion looked for as well the 'Inverted pear shaped glenoid' due to bone loss of the antero-inferior aspect of glenoid.

The Bankart lesion was identified and probed. The surgeon evaluated the amount of capsular shift needed, depending on the quality of the tissue and severity of the capsular stretch. Antero-superior and anterior mid glenoid portals were created in outside-in fashion. The labral tissue was elevated medially with the help of angled elevator and glenoid neck was the rasped. Visualisation of the subscapularis fibers medially after elevation was the evidence of satisfactory soft tissue release. Then the anchors preloaded with fibre-wires were put in after making pilot holes at the face of the glenoid 2-3mm from the edge, not at the margin of it. The preferred position of the anchors was between 3 and 5 o'clock for right shoulder between 7 & 9 o'clock for left shoulder. The inferior most anchors (5 o'clock for right and 7 o'clock for left) were placed first. The anchors were screwed completely below the bone so as to ensure they are 2 mm below subchondral bone. Capsular stitches were taken 1 o'clock below the respective anchor using ACCU PASS® suture shuttle or BirdBeak® and relayed using crochet hook. Then the capsular tissue was secured with 6 alternate half hitches on the top of it either with the 6th finger knot pusher or simple knot pusher. In all of the cases we inserted 3 anchors. At the end of the procedure the capsule-labral complex should be like a bump at the glenoid margin and the humeral head should be centrally placed.

Fig. 1a: Patient positioning

Fig. 1b: Landmark development

Fig. 1c: Portal development

Fig. 1d: Portal development

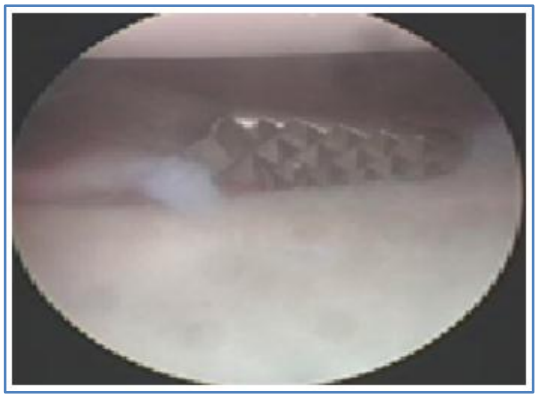

Fig. 1e: Rasping

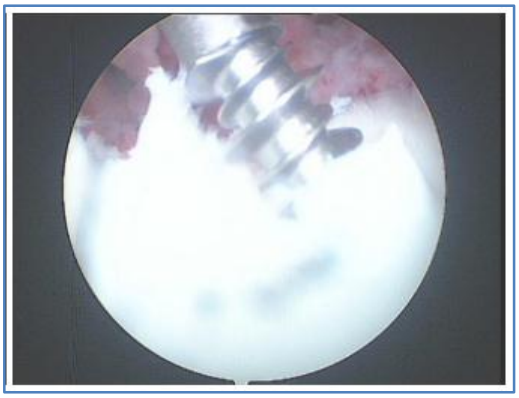

Fig. 1f: Anchor placement

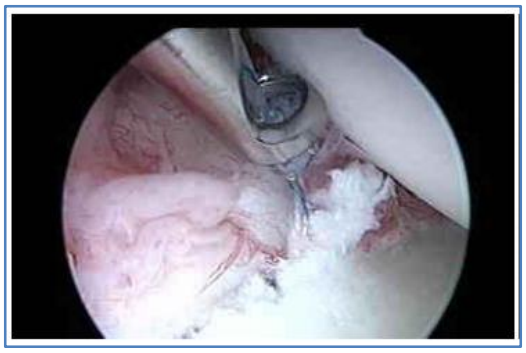

Fig. 1g: Knott Tying

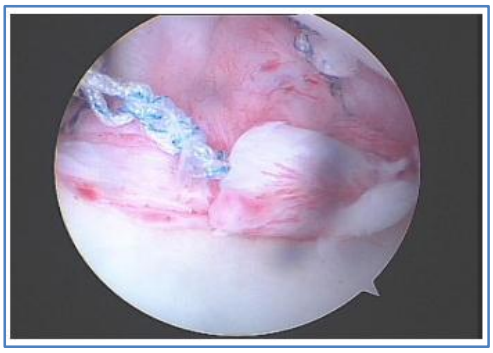

Fig. 1h: Tissue Bump

RESULTS: All patients were followed up for period ranging from 9 months to 28 months with an average of 12 months. Results were analysed in terms of recurrence, range of motion, VAS score, ROWE'S score. None of the patients had recurrence. All patients had significant improvement in visual analogue score and ROWE's score. In the preoperative period, 18(51.43%) patients had full range and 14(48.57%) patient had painful/limited terminal range of motion, as regards external rotation with arm at the side (ER1). And 07(20%) patients had 0-65º, 22(62.85%) patients had 0-70º, 3(8.57%) patient had 0-70º with pain at terminal range of motion, 3(8.57%) of patients had full range of motion, as regards external rotation at 90º abduction (ER2). At the last follow-up, 33/35(94.28%) patients had full range of ER1 & 32/35(91.42%) patients had full range of ER2. This improvement in external rotation deficit was statistically significant (P<.05). Preoperative scores were compared with the most recent follow-up scores for all variables, with the help of paired t test. Three of the patients developed apprehension, which got resolved after proper physiotherapy. Pre-operative: mean Total Rowe score was 48.51, mean scores of stability 21.17, mean score of function 12.14, mean score of motion 15.77. The mean post-operative Rowe score improved to 97.63, mean stability component to 47.77, mean motion component to19.47 and mean function component to 28.63 compared to the pre-operative Rowe scores. We had final Rowe's Score excellent in 32 patients, good in 2 and fair in 1 and Poor in 1 (P-value $2.992X10^{-12}$). There was no radiological evidence of loosening and migration of anchors or any gleno-humeral arthritis on subsequent follow-up skiagrams in any of our patients. There was no recurrence of dislocation or subluxation reported among 35 patients, during their periodical follow up to 1 year. However, 1 patient at 1 year follow-up had shoulder stiffness with restricted abduction, forward elevation and external rotation, with apprehension.

	MEAN SCORE
PRE-OP	21.14
2 WEEKS	30
6 WEEKS	30
12 WEEKS	30
6 MONTHS	45.43

9 MONTHS	47.71
12 MONTHS	47.77

Table 3: Stability component of Rowes Score

	MEAN SCORES
PRE-OP	15.57
2 WEEKS	5
6 WEEKS	15.29
12 WEEKS	16.86
6 MONTHS	18.57
9 MONTHS	19
12 MONTHS	19.47

Table 4: Motion Component of Rowes Score

	MEAN SCORE
PRE-OP	12
2 WEEKS	0
6 WEEKS	26.14
12 WEEKS	26.71
6 MONTHS	27
9 MONTHS	28.43
12 MONTHS	28.63

Table 5: Function component of Rowes Score

	Mean Rowes Score
PRE-OP	48.51
2 WEEKS	35
6 WEEKS	71.43
12 WEEKS	73.57
6 MONTHS	91
9 MONTHS	95.14
12 MONTHS	97.63

Table 6: Total Rowe's Score pre and post-operatively

Sl. No.	Motion Score (Pre-operative)	Motion Score (Post-operative) at final f/u	d=B-c	Positive Ranks	Negative Ranks
1	15	20	-5	13.5	
2	15	20	-5	13.5	
3	15	20	-5	13.5	
4	15	20	-5	13.5	
5	20	20	0		
6	15	20	-5	13.5	
7	15	20	-5	13.5	
8	15	20	-5	13.5	
9	5	20	-15	28	
10	15	20	-5	13.5	
11	15	20	-5	13.5	
12	15	20	-5	13.5	
13	15	20	-5	13.5	
14	15	20	-5	13.5	
15	15	20	-5	13.5	
16	15	20	-5	13.5	
17	20	20	0		
18	20	20	0		
19	15	20	-5	13.5	
20	20	20	0		
21	20	20	0		
22	15	20	-5	13.5	
23	15	20	-5	13.5	
24	15	20	-5	13.5	
25	15	20	-5	13.5	
26	15	20	-5	13.5	
27	15	20	-5	13.5	
28	15	20	-5	13.5	
29	15	20	-5	13.5	
30	15	20	-5	13.5	
31	15	15	0		
32	15	20	-5	13.5	
33	15	5	10		27
34	15	20	-5	13.5	
35	20	20	0		

Table 7: Motion Score. Wilcoxon Matched Paired Test (Left tailed test)

Sl. No.	Function Score (Pre-operative)	Function Score (Post-operative) at final f/u	d=B-c	Positive Ranks	Negative Ranks
1	0	30	-30	28.5	
2	25	30	-5	5	
3	10	30	-20	18	
4	10	30	-20	18	
5	10	30	-20	18	
6	25	30	-5	5	
7	0	30	-30	28.5	
8	10	30	-20	18	
9	10	30	-20	18	
10	0	25	-25	23	
11	0	30	-30	28.5	
12	25	25	0		
13	0	30	-30	28.5	
14	0	30	-30	28.5	
15	10	30	-20	18	
16	25	30	-5	5	
17	10	25	-15	11.5	
18	10	30	-20	18	
19	0	30	-30	28.5	
20	25	30	-5	5	
21	10	25	-15	11.5	
22	0	30	-30	28.5	
23	0	30	-30	28.5	
24	10	30	-20	18	
25	10	25	-15	11.5	
26	25	30	-5	5	
27	10	30	-20	18	
28	25	30	-5	5	
29	25	30	-5	5	
30	0	30	-30	28.5	
31	25	25	0		
32	0	30	-30	28.5	
33	25	10	15		11.5
34	25	30	-5	5	
35	25	30	-5	5	

Table 8: Function Score. Wilcoxon Matched Paired Test (Left tailed test)

Sl. No.	Stability Score (Pre-operative)	Stability Score (Post-operative) at final f/u	d=B-C	Negative Ranks (R-)	Positive Ranks (R+)
1	30	50	-20	11	
2	30	50	-20	11	
3	30	50	-20	11	
4	30	50	-20	11	
5	30	50	-20	11	
6	30	50	-20	11	
7	0	50	-50	28.5	
8	30	50	-20	11	
9	10	50	-40	23.5	
10	0	30	-30	22	
11	0	50	-50	28.5	
12	30	50	-20	11	
13	30	50	-20	11	
14	0	50	-50	28.5	
15	30	50	-20	11	
16	30	50	-20	11	
17	30	50	-20	11	
18	30	50	-20	11	
19	0	50	-50	28.5	
20	30	50	-20	11	
21	30	50	-20	11	
22	0	50	-50	28.5	
23	0	50	-50	28.5	
24	10	50	-40	23.5	
25	30	30	0		
26	30	50	-20	11	
27	30	50	-20	11	
28	30	50	-20	11	
29	30	50	-20	11	
30	0	50	-50	28.5	
31	30	30	0		
32	0	50	-50	28.5	
33	30	30	0		
34	30	50	-20	11	
35	30	50	-20	11	

Table 9: Stabiity Score. Wilcoxon Matched Paired Test (Left tailed test)

Sl. No.	Total Rowes Score(Pre-operative)	Total Rowes Score(Post-operative)at sfinal f/u	d=C-B	Negative Ranks(R-)	Positive Ranks(R+)
1	45	100	-55	22.5	
2	70	100	-30	9	
3	55	100	-45	19	
4	55	100	-45	19	
5	60	100	-40	15.5	
6	70	100	-30	9	
7	15	100	-85	30.5	
8	55	100	-45	19	
9	25	100	-75	26	
10	15	75	-60	24	
11	15	100	-85	30.5	
12	70	95	-25	3.5	
13	45	100	-55	22.5	
14	15	100	-85	30.5	
15	55	100	-45	19	
16	70	100	-30	9	
17	60	95	-35	13.5	
18	60	100	-40	15.5	
19	15	100	-85	30.5	
20	75	100	-25	3.5	
21	60	95	-35	13.5	
22	15	100	-85	30.5	
23	15	100	-85	30.5	
24	35	100	-65	25	
25	55	75	-20	1	
26	70	100	-30	9	
27	55	100	-45	19	
28	70	100	-30	9	
29	70	100	-30	9	
30	15	100	-85	30.5	
31	70	70	0		
32	15	100	-85	30.5	
33	70	45	25		3.5
34	70	100	-30	9	
35	75	100	-25	3.5	

Table 10: Total Rowes Score. Wilcoxon Matched Paired Test (Left tailed test)

Fig. 2: Pre-operative (A, C) and followup (B, D) skiagrams of shoulder (anteroposterior views) of two patients showing no glenohumeral Osteoarthrosis/ suture anchor migration in follow up period.

Fig. 2a

Fig. 2b

Fig. 2c

Fig. 2d

DISCUSSION: The arthroscopic repair of Bankart's lesion is a biomechanically sound technique with advantages of, less tissue dissection and damage to normal structures, unaffected proprioception due to uninjured subscapularis, less blood loss, less post-operative pain, early recovery and less hospital stay, better cosmesis and less loss of external rotation. Early arthroscopic repairs of anterior labral laxity performed using metal staple to advance Bankarts lesions superiorlyand medially were associated with failure rates of almost 50%.[13,14] Since then the fixation technique has evolved from metal staples through tack, transglenoid suture fixation to metal and bio absorbable anchor fixation. Arthroscopically assisted transglenoid suture technique involving passage of sutures through the avulsed labrum and then through drill holes in the scapular neck, where the sutures were tied over soft tissues or bone were associated with very good initial success rates but they deteriorated with longer follow-up.[15]

A suture anchor is a tiny screw with a thread attached to it. The screw is inserted into the bone over the glenoid rim while the sutures hold onto the labral tissue. These anchors provide a stable base for reattachment of the capsulolabral complex. Using suture anchors, various authors

have reported good to excellent results in a vast majority of patients including those with "high demand" of the shoulder.

To make the best outcome the patient selection must be very meticulous, without generalized ligamentous laxity and bony defect in the glenoid or an engaging Hill-Sachs lesion. In our study we have tried to assess the functional outcome in patients, controlling the homogeneity of independent variables like lesion mechanism (traumatic), number of dislocations, direction of instability, lesion pattern, surgical technique and post-operative rehabilitation and duration of follow-up evaluation. Daniel et al[16] in their study of the forty patients found none of the patients complained of any pain or subjective sense of instability post-operatively. Fabbriciani et al.[17] in a prospective study comparing the arthroscopic and open procedure for recurrent dislocation showed similar re-dislocation rate and better range of motion in the arthroscopically treated group. Burkhart S et al.[18] reported 1.6% recurrence rate which is even lower than many studies in which the comparison of open and arthroscopic procedure was made. Morgan et al[14] had reported 0 recurrence rate with 25 patients following arthroscopic Bankart repair over an average follow-up period of average 17 months. M Amit et al[19] also reported no recurrence at an average follow-up period of 27 months. We did not record any re-dislocation in our study with an average of 1 year follow-up period. The goal of our study is to prove that arthroscopic repair represents an excellent mode of treatment for recurrent shoulder dislocation with respect to functional outcome.

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