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Original Research Article

A short term analysis of external rotation deficit following a combined arthroscopic bankart with remplissage and rotator interval closure for anteroinferior instability with subcritical bone loss

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ABSTRACT

Background: Our study aims at assessing the clinical outcomes of our patients who have undergone arthroscopic bankart and remplissage along with rotator interval closure in the treatment of anteroinferior instability with subcritical bone loss, with focus on external rotation deficit.
Methods: This is a single-center retrospective study including 48 consecutive patients who underwent surgery Arthroscopic Bankarts with remplissage procedure for anterior shoulder instability with Hill-Sachs lesion. In our study, the minimum follow-up was 6 months and the average follow-up of was 21months. At the last follow-up, active range of motion, western ontario shoulder instability index (WOSI) and University of California at Los Angeles (UCLA) scores were assessed.
Results: 48 patients who underwent surgery in the time period of 2019-2023 who completed minimum 6months follow up were included in the study. The average age of the patients was 31.7 years (range, 16-52 years), with 93.8% male patients and 6.2% female patients. The range of motion at follow-up was comparable with the normal side, with loss of terminal external rotation in 2 patients (4%). Average University of California at Los Angeles score was 30.7 and Western Ontario shoulder instability index was 3.8%. One patient had only one episode of subluxation and there was one case of infection.
Conclusions: The results of our study validate the combination of Remplissage and rotator interval closure with Bankart repair in the treatment of anterior instability with glenoid bone loss <15% irrespective of tracking of Hill Sachs lesion for excellent functional outcomes, least rate of recurrence and without significant loss of external rotation.

Keywords: Bankarts repair, Rotator interval closure, Remplissage, Anterior shoulder instability, External rotation deficit, Recurrent shoulder dislocation, Shoulder arthroscopy

INTRODUCTION

The concept of addressing glenoid and hillsachs lesion simultaneously started from year 2000 by Burkhart and De Beer.[1] Arthroscopic Bankart repair with remplissage repair for Hill-Sach lesion is currently the preferred option in most centres for treating anterior shoulder instability. Infraspinatus capsulotenodesis can decrease the risk of recurrence by four times in comparison to an isolated Bankart repair.[2] The addition of an arthroscopic rotator interval closure further improved anterior stability with predictable loss of external rotation.[3,4]

Garcia et al reported that an isolated Bankart repair even in patients with merely 5.3% glenoid bone loss was

associated with 50% failure rate when the lesion was accompanied by a large hill sach.[5] Recent studies show increased failure rates and decreased functional outcomes even in subcritical ranges of 13.5-17.3% after soft tissue stabilization procedures.[6-8] Chechik et al concluded that the addition of RI closure to arthroscopic Bankart repair could provide additional postoperative stability compared to arthroscopic Bankart repair alone.[9]

Combining arthroscopic rotator interval closure and remplissage along with Bankart repair slightly increases cost and operative time with concerns on loss of external rotation, hence demanding further research before standardising the procedure to obtain an optimal outcome.

The aim of our study is to assess functional outcome, range of movements following the combination of arthroscopic bankarts repair, remplissage and rotator interval closure in the treatment of anterior instability of shoulder with subcritical boneloss.

METHODS

Type of study

It is a retrospective case series.

Statistical tool employed was Clincalc and for attaining 80% power we got this number as sample size.

Study period and place

The duration of the study was from January 2020 to May 2023, Bangalore shoulder institute, Bangalore, Karnataka.

The inclusion criteria: primary or recurrent traumatic anterior instability, HS defect (calandra grade 2 and 3), and glenoid bone loss (<15%).

Exclusion criteria: revision surgery; multidirectional or voluntary instability; unstable painful shoulder; no HS lesion; humeral avulsion of the glenohumeral ligament (HAGL) or rotator cuff tear; and hyperlaxity, (VII) psychological conditions or epilepsy.

Ethical clearance taken from Bangalore shoulder institute.

Clinical evaluation

All patients were evaluated retrospectively. Active range of movements (ROM) were measured pre-operatively and postoperatively, with anterior forward elevation (AFE), external rotation elbow at side and internal rotation with level of the thumb on the spine. Stability was assessed using the relocation test and the apprehension test, with the arm in the ABER position (abduction and external rotation). The recurrence was recorded when patients reported symptoms of subluxation, one or more frank dislocations, or at least one episode of dead arm syndrome. Objective functional results were evaluated with Western Ontario shoulder instability (WOSI) and using the University of California at Los Angeles (UCLA) scoring system.[10,11] Return to play (RTP) and sport level were also documented during final evaluation.

Surgical technique

All procedures were performed by the senior surgeon, with patients in lateral decubitus position, under general anaesthesia, supplemented by an interscalene nerve block. Through the posterolateral portal, a triple-loaded all-suture anchor or 2 double loaded all suture anchor was introduced into the hill Sachs lesion after thorough debridement with an arthroscopic shaver and burr. Multiple suture passes were performed using a bird beak through the tendinous part of infraspinatus over the hill Sachs defect as part of remplissage. Using anterior rotator interval portal as working portal and viewing through antero-superior portal with a 30 degree arthroscope, Bankarts repair was done with angled suture passing device with fixation points at 6, 5 and 3 o clock position on glenoid using all suture double-loaded fibre tape anchors, and a double-mattress suture bridge construct at 5 o clock position. Using posterior portal as viewing portal and rotator interval portal as working portal, an antegrade suture passer was used to take a fibre wire cinch loop on subscapularis anterior border followed by use of bird beak to pass one end of same fibre wire through the superior capsule under the biceps tendon, rotator interval closure done with arm positioned in abduction and 30 to 40 degree of external rotation, to prevent external rotation deficit.[12] Following which remplissage was completed.

Postoperative protocol

The shoulder is immobilized for two weeks with use of an armsling and active elbow and wrist mobilization is initiated. After immobilization, active assisted exercises were initiated for forward flexion and external rotation within threshold of pain. After six weeks, patients began strengthening exercises of the rotator cuff and scapular stabilizers. Three months after the operation, they were permitted to practice noncontact sports. Full return to throwing or contact sports was allowed after six months according to each individual's functional recovery.

RESULTS

Forty-eight patients were included in the study and the results summarized in Table 1. At a mean follow-up of 21 months the average age of the patients was 31.7 years (range, 16-52 years), with 93.8% male patients and 6.2% female patients. 65% cases were on right shoulder. The range of motion at follow-up was comparable with the normal side, with loss of terminal external rotation in 2 patients (4%). Average University of California at Los Angeles score was 30.7 and Western Ontario shoulder instability index was 3.8%. According to the UCLA scoring system, the result was rated as excellent or good for 45 (93.75%) as fair for 3 (6.25%). The average forward

flexion and abduction was 178 degree whereas external rotation was reduced by 25% in 2(4%) patients and average internal rotation deficit was less than 1 level.

Among 48 patients 33 (68.75%) of them had returned to their pre injury sports activities, seven (14.5%) were into sports with minimal restriction, and 3 (6.25%) were just getting into sports during this study whereas 5 patients limited their sports activity (Figure 1). None of the cases had re-dislocation except 1 shoulder (2%) which reported a single episode of instability at 9 months' follow-up when he attempted lifting 2.5 kg weight beyond 180. Infection was noted in 1 case (2%) which was managed by debridement immediately and put on 6 weeks of antibiotics and physio after which patient regained his full function.

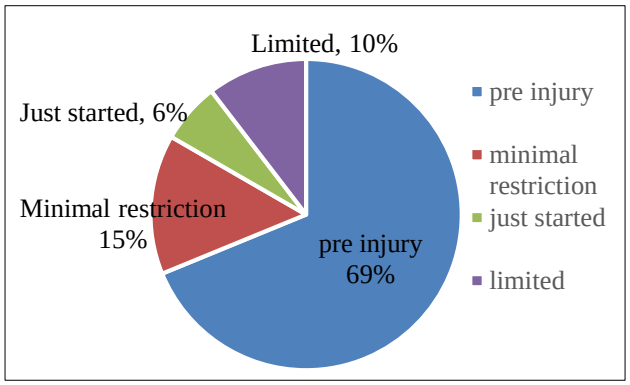

Figure 1: Return to sports.

Table 1: Patient demographics and results.

Parameters	Mean post-operative value (n=48)
Sex	93.5% - male
Age (years)	31.7 (17-49)
Forward flexion loss compared to opposite shoulder	2 degrees (0-20)
External rotation loss compared to opposite shoulder	1.4 degrees (0-20)
UCLA score	30.7(24-35)
WOSI score	3.8 (0.48-9.61)
Follow-up	21 months (7-49)
Infection	1 (2%)
Recurrence	1 (2%)
Return to sports	68.7% - full return

DISCUSSION

Burkhart and De Beer reported the concept of significant bone defects either on the humerus or the glenoid and also described the 'engaging' Hill-Sachs lesions, highlighting that the one sided restoration of the soft tissues alone with Bankart repair would not be adequate in these cases.[1] The importance of a bipolar fixation in anterior instability with Bankart and HS lesions was emphasized after the concept of glenoid track with 'on-track' and 'off-track' humeral head defects proposed by Yamamoto et al and then investigated further by Di Giacomo et al.[13,14] In 1987, Nobuhara and Ikeda were the first to surgically repair rotator interval lesions in 101 patients with inferiorly unstable shoulders.[15] Yamamoto et al concluded that RI closure reduces anterior and posterior instability, improving clinical outcomes following arthroscopic stabilization procedures, although the loss of external rotation and abduction should be considered in overhead throwing athletes.[4]

Filling of the engaging HS lesions with arthroscopic tenodesis of the infraspinatus and the posterior capsule into the defect, as described by Wolf and Pollack, can be performed to prevent recurrent instability.[16] There is a widespread notion based on findings of multiple studies that Remplissage procedure leads to loss of external rotation.[17-19] However, the biomechanical study of Argintar et al showed that the Bankart repair restored all ER to normal values at 0_ and 60_ abduction, and the addition of the remplissage procedure did not significantly alter the overall ROM and the anteroposterior translation.[20]

The remplissage (French, "to fill in") procedure of tenodesis of infraspinatus during arthroscopic stabilization prevents recurrent dislocations by: as checkrein against anterior translation of the humeral head, and by preventing it from engaging the glenoid by converting the Hill-Sachs lesion to an extra-articular defect.[21-24] The recurrence rate after arthroscopic Bankart repair with remplissage for engaging HS lesions is reported as being less than 10% in the literature.[17,21-23] Most studies have focused solely on the management of engaging HS lesions with remplissage but, regardless of the location and the size, all Hill-Sachs lesions, including those classified as 'non-engaging', have to be engaged at least once to be created.[24,25] Some studies have already confirmed that simultaneous Bankart repair with the remplissage procedure for engaging HS can provide lower recurrence rates compared to Bankart repair alone.[26-28] In our series we had 1 case of subluxation and the activity predisposed to same was supra physiological as he tried lifting weight beyond 180 degree further emphasizing the confidence level of patient following this procedure. The same patient also had large Hill Sachs pre-operatively which is a known risk factor for subluxation as suggested by other researchers.[29]

Chechik *et al* concluded that arthroscopic rotator interval closure (ARIC), could be performed as an adjunct to arthroscopic Bankart repair (ABR) in order to improve stability and reduce the risk of recurrent dislocations in patients with established unidirectional instability.[9] Maman *et al stated that* final limitation of ROM compared to preoperative state was similar in both groups. They concluded that ARIC+ABR showed no superiority in stability compared to ABR alone, highlighting remplissage as a source of possible bias.[30] Boileau et al found a ROM loss in all planes compared with the contralateral shoulder, with a loss of about 8 and 9 degree in ER1 and ER2,

respectively.[22] Harris et al reported an 83% reduction in ER after BRR compared with the contralateral shoulder but found no difference in forward elevation or IR.[31] Wolfe and Arianjam reported no ER loss in any plane of motion either before or after remplissage.[21] Other studies investigating postoperative ROM differences between Bankart repair and a combination with remplissage found no difference in any of the movements they assessed. Whereas Zhu and colleagues found a significant improvement in postoperative forward elevation.[18] In our study the average forward flexion was 178 degree whereas external rotation was reduced by 25% in only 2 (4%) patients. It was also found that some studies mention greater loss of abduction and external rotation in isolated Bankarts repair patient group than those when combined with remplissage and they reported that more capsular plication was usually done by surgeons to prevent redislocation.[32,33]

Along with the same the surgeons who practise combination of same are more comfortable in pushing their patients to accelerated rehab further improving the range. We attribute the same to have significant effect on our results.

Among 48 patients 33 (68.75%) of them had returned to their pre injury sports activities, seven (14.5%) were into sports with minimal restriction, and 3 (6.25%) were just getting into sports during this study whereas 5 patients limited their sports activity of which 3 were advised to restrict sports till they achieve strength and conditioning by our physiotherapist (Figure 1).

The surgical technique may also play a role, since anchor fixation in the humeral head defect with sutures passed 1 cm more medial through the posterior soft tissues involves significantly reduced ER and IR and greater joint stiffness compared with anchors placed in the defect valley or in the humeral head rim.[34] These biomechanical considerations prompted us to place the anchor in the defect valley and to pass the sutures close to the anchor, not medially, to reduce the risk of joint stiffness. Care should be taken not to place the anchors too medially in the defect otherwise this may result in too much loss of external rotation.[35]

To avoid loss of external rotation during rotator interval closure, the shoulder is placed in abduction and 30 to 40 degree of external rotation, before knot tying.[12] When compared with similar literature with identical demographic data the loss of external rotation is comparatively minimal (Table 1).[27-29,35]

Average University of California at Los Angeles score was 30.7 and Western Ontario shoulder instability index was 3.8%. According to the UCLA scoring system, the result was rated as excellent or good for 45 (93.75%) as fair for 3 (6.25%). Which is similar to all the literature regarding combination of Bankarts and remplissage with significantly reduced recurrence rate and more patient satisfaction in our study.

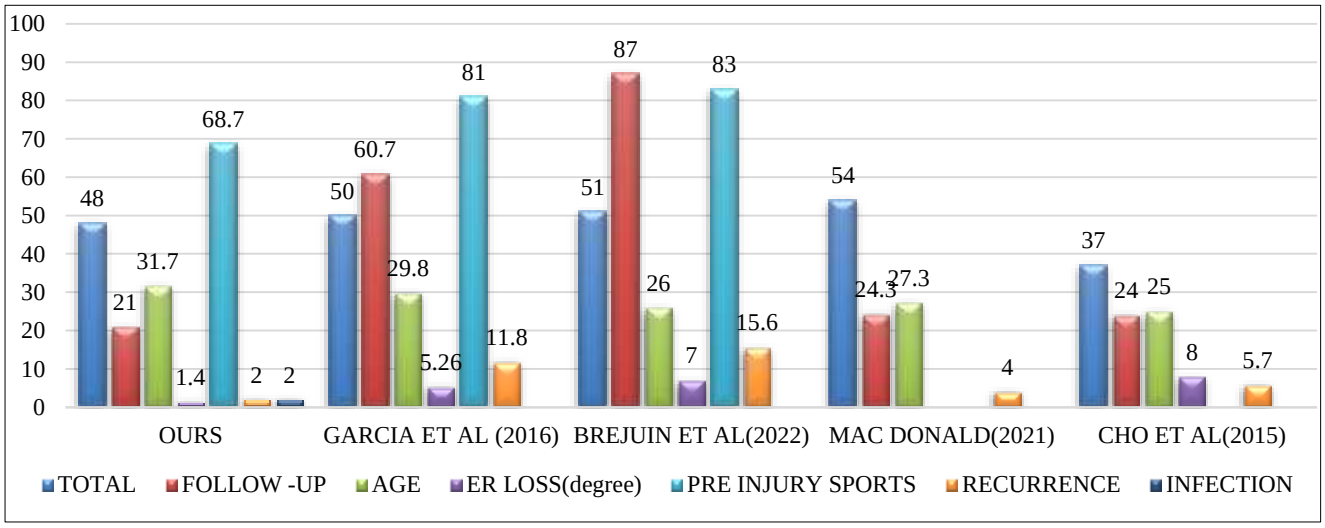

Figure 2: Comparison of our data with current literature.

Limitations and strength

There are several limitations to the present study: this was a retrospective analysis and the mean follow-up period was relatively short; the size of HS lesion was not accurately measured volumetrically with cross-sectional imaging; our data were compared with a historical group of patients and different anchors were used for labral and Hill Sachs fixation, which may have influenced our results; and correlation and sub classification of patients as per beighton score can give better insight.

The present study has several strengths as well: All patients in this series were operated on by a single upper limb surgeon, with the same indication, surgical technique and standardized rehabilitation protocol, thereby reducing the variability of the clinical results.

CONCLUSION

Results in our study further emphasize that a combination of Bankarts with remplissage and rotator interval closure in patients with glenoid bone loss <15% with an associated Hill Sachs weather its engaging or not gives better outcome functionally without causing significant external rotation deficit. The combination can give all round stability to joint and when combined with a meticulous physiotherapy for capsular stretches can provide better result with least recurrence rate and hence should be considered in all patients with anterior shoulder instability.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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