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Results of Arthroscopic Remplissage with Bankart Repair for the Management of Glenohumeral Instability with Hill-Sachs Bone Defect

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Abstract: Glenohumeral joint instability is one of the commonest disorders of the shoulder as it has a great range of motion on the expense of stability as refered to the bony configuration of the joint. Instability may be traumatic or atraumatic and uni-directional or multidirectional with wide range of patient complaints from mild pain in micro-instability to obvious dislocation. The most commonly used arthroscopic procedure include filling the humeral head defect by capsulo-tenodesis of the infraspinatus tendon and posterior capsule (Remplissage). The aim of this study was to present our results of Bankart repair and Reimplissage in management of recurrent shoulder instability with Hill-Sachs lesions. 20 young, middle age and fit patients with recurrent anterior shoulder dislocation with combined Bankart lesion and Hill-Sachs lesion. All Hill-Sachs lesions were large or engaging (Calandra grade 3 at time of arthroscopy) and all were managed by arthroscopic Bankart repair combined with Remplissage. When compared to pre-operative ROM, a statistically significant difference was found in the mean increase of anterior elevation by 2°, external rotation (ER) side by 4◦ and 5° for ER at 90° abduction at final follow-up (p value < 0.001). There were statistically significant difference in the mean decrease of 5° and 10° in ER side and ER at 90° abduction respectively at final follow-up compared to normal side ROM (p value < 0.001), also significant decrease in anterior elevation by 4° and IR at 90° abduction by 2° (p value < 0.001) which were not comparable to other studies but was clinically insignificant. The mean final Rowe and SST scores were 85 and 11.35 respectively indicating a statistically significant difference in mean increase of both the total Rowe and total SST percentage score when compared to pre-operative scores (p value < 0.001). All patients were followed prospectively for a minimum of 12 months. Conclusion: arthroscopic Bankart repair and remplissage is an effective means of managing shoulder instability in patients with large Hill-Sachs lesions and no significant glenoid bony defect.

Keywords: Shoulder Instability, Remplissage, Hill-Sachs

1. Introduction

Instability of the glenohumeral joint is “one of the commonest disorders of the shoulder [1].” The glenohumeral joint has the greatest range of motion among joints of the human body [2]. Moreover bony configuration allows such maximum mobility however at the expense of stability. Instability could be traumatic or atraumatic and uni-directional or multidirectional with wide variety of complains from just pain in micro-instability to frank dislocation [1].

The traumatic shoulder instability mostly result from fall onto an outstretched hand or trauma with the shoulder in abducted & externally rotated position which put the anterior capsule and labrum under tension and lead to their potential failure [2], Pathology usually involved injury to the anteroinferior labrum (Bankart lesion) that is essential injury in almost all cases. impaction fracture of the postero-lateral surface of the humeral head (Hill-Sachs lesion) is another

common pathology that could be related to the duration of dislocation. [3], Such lesion could be explained by the wedging of the hard anterior glenoid rim in the relatively soft cancellous bone of the dislocated humeral head in the position of dislocation (external rotation abduction) Figure 1.

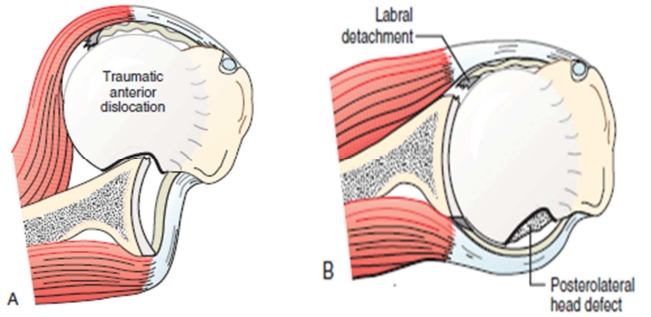

Figure 1. *A, An axillary projection of anterior dislocation showing a Hill-Sachs defect associated with Bankart lesion. B, Although congurent reduction is achieved, the humeral head and capsular lesions remain.*

Diagnosis and management of recurrent shoulder dislocation should encompasses history of the first episode and relation to trauma. Physical and radiographic examination should clearly demonstrate ligamentous laxity and bony affection either of the glenoid side or the humeral head by special x ray views and CT scans.

The gold standard for management of recurrent shoulder instability is Bankart repair that involved open or arthroscopic reattachement of the torn labrum to the glenoid [3], Interest was shifted in last decades to arthroscopic surgery as it allow adequate repair and management of associated lesions. [1], The existence of Hill-Sachs lesions may require further interventions. [2],

Most Hill-Sachs lesion are clinically insignificant as they are small, non-engaging, off track and do not require any further surgical treatment. [2], However larger lesion will engage the anterior rim of the glenoid resulting in recurrence of instability even inspite of adequate Bankart repair. [1], As reported by Burkhart and De Beer [2], the clinically significant ‘‘engaging’’ lesions are those having their long axis parallel to the anterior glenoid in the abducted externally rotated position On the opposite side non-engaging lesions have their long axis on a non-parallel diagonal plane with no risk of redislocation after soft tissue repair (Figure 2).

The concept of a glenoid track (GT), as first described by Yamamoto and colleagues [4] is likely the best method for determining the significance of an Hill-Sachs lesion (HSL) and may be the optimal way to address the role of remplissage in reducing the risk of recurrent instability. In their initial investigation, they performed a cadaveric study placing the glenohumeral joint in horizontal extension and maximum external rotation while increasing glenohumeral abduction They concluded that Hill Sachs lesion is “on track” when no engagement with the head on the glenoid track with non significant Hill Sachs lesion. On the other hand other “off track” lesions will override glenoid rim (Figure 3).

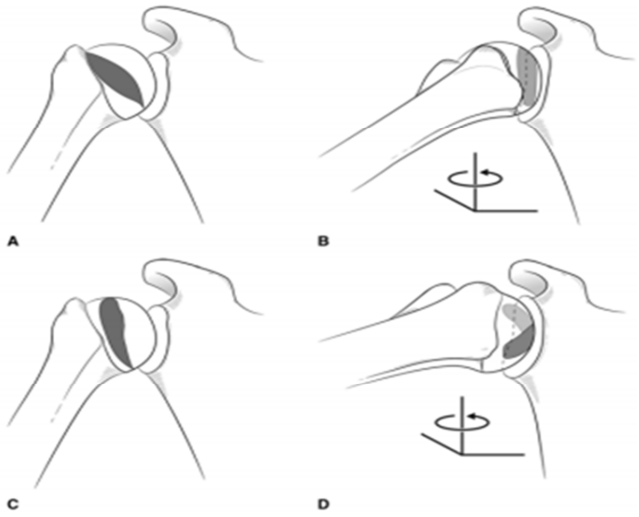

Figure 2. *A. Illustration of an engaging Hill-Sachs lesion (dark gray area). B. The lesion parallelly oriented with the anterior glenoid will engage when the shoulder assumes the functional position of abduction and external rotation. C. The non-engaging lesion (dark gray area), created in a non-functional position. D. The lesion if not oriented parallel to the glenoid will not engage when the shoulder is in the functionally abducted and externally rotated position.*

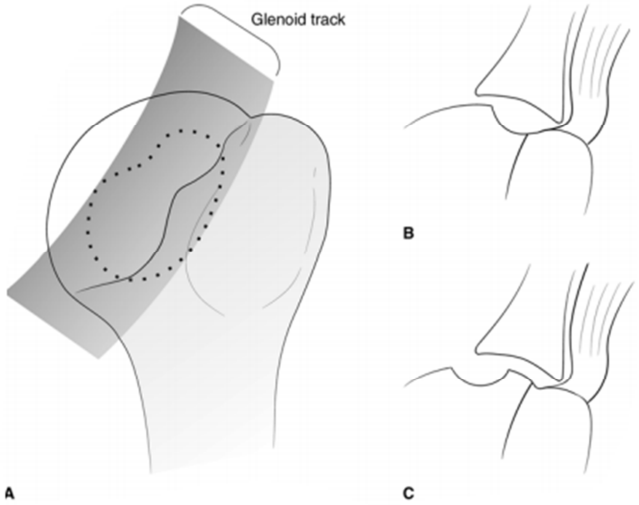

Figure 3. *Figure illustrating the glenoid track. The contact zone between the glenoid and the humeral head is indicated by the gray area. The dotted line indicates the contact between the humeral head and the glenoid. B, Lesion within the track, will not override the glenoid rim. C, If the lesion is found more medial than the track, there will be a possibility for the humeral head to override the glenoid rim.*

Different surgical procedures have been used for management of large Hill-Sachs lesions including soft tissue tenodesis [5], humeral head rotational osteotomies [6], filling defect by structural osteochondral allografts [7], or trapdoor impaction grafting [8], and finally arthroplasty for large defects [9].

The most commonly used arthroscopic procedure was proposed by Purchase et al [5], and include filling the humeral head defect by capsulo-tenodesis of the infraspinatus tendon and posterior capsule (Remplissage). Many case series of Bankart repair and Remplissage have been published with good results. [10], The aim of the current study was to present our results of Bankart repair and

Reimplissage in management of recurrent shoulder instability with Hill-Sachs lesions.

2. Patients and Methods

2.1. Patients

Patient selection is based on a study of 20 young and middle age fit patients with recurrent anterior shoulder dislocation with combined Bankart lesion and Hill-Sachs lesion. All Hill-Sachs lesions were large or engaging (Calandra grade 3 at time of arthroscopy) and all were managed by arthroscopic Bankart repair combined with Hill-Sachs remplissage.

Exclusion criteria included Patients having multi-directional instability, posterior dislocation, Hill-Sachs lesion < 25%, glenoid bone loss > 20%, associated rotator cuff tears, glenohumeral arthritis, uncontrolled epileptic patients having epileptic fits in last 6 months.

All patients were followed prospectively for a minimum of 12 months. Full history of the patients was collected including demographic characteristics (age, sex and occupation), mode of trauma, side of injury, preoperative level of physical activity, time from injury to surgery. All patients had X-ray, CT and MRI examination, and they were evaluated regarding the range of motion (ROM), the scoring system of ROWE and simple shoulder test (SST), before surgery, 6 months and 1 year post-operative.

2.2. Surgical Techniques

All shoulders were first examined under anesthesia before surgery. This may provide further information about the amount of laxity and the presence of bony crepitation or "clunks" that may indicate bony lesions.

All patient were managed in the lateral decubitus position as was the preferred position to the author, although the procedure can be performed in the beach chair position as well if preferred. The patient is tilted posteriorly 30° to the vertical plane rather than "straight" lateral decubitus. The arm is then prepped and draped in sterile fasion and suspended in approximately 10-15 pounds of balanced suspension during the procedure (Figure 4).

A 30° lens was introduced into the shoulder through the classic posterior portal (1 inch medial and inferior to postero-lateral corner of corner of the acromion). Before fluid inflation of the joint, dry dynamic arthroscopy was done to confirm engagement of the Hill-Sachs lesion in 90° of abduction while progressively external rotating the arm untill the positision of 90°. Once engagement was confirmed, remplissage for the Hill-Sachs lesion was considered (Figure 5).

Fluid inflation was then started and 2 anterior portals were established in an outside-in technique. The anteror mid-glenoid portal (AMG) (the primary working portal for the anterior labral repair) was made just above the subscapularis tendon, followed by insertion of an 8 mm cannula. The antero-superior portal (the viewing portal for remplissage as well as for anterior capsulo-labral release) was made at the anterior margin of the acromion, entering the joint anterior or posterior to the biceps tendon followed by insertion of a 6.5 mm cannula.

Figure 4. *Lateral decubitus position.*

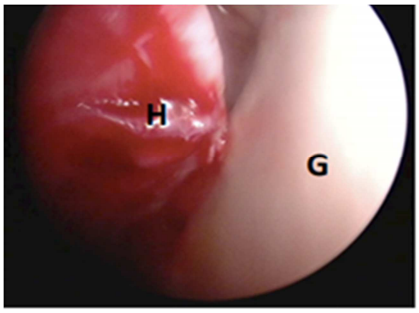

Figure 5. *Engagement with dry arthroscopy.*

Debridement of the Hill-Sachs lesion must be performed for complete evaluation of lesion. Debridement is carried out with an arthroscopic shaver making sure to remove any unnecessary tissue present in the defect. This is performed through the posterior portal while viewing from the antero-superior portal. Debridement is also performed to help stimulate the bony bed to assist in healing of the soft tissues (Figure 6).

After debridement is performed, complete visualization of the Hill Sachs lesion is now possible and attention is taken to appropriate placement of anchors. One or two double loaded suture anchors are typically used by author, depending on the size of lesion. Anchors are placed immediately adjacent to articular cartilage of the posterior humeral head defect (Figure 7).

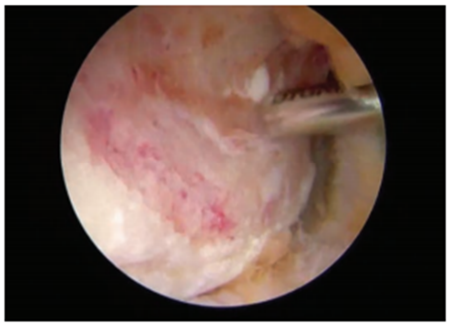

Figure 6. *Debridement of Hill-Sachs lesion.*

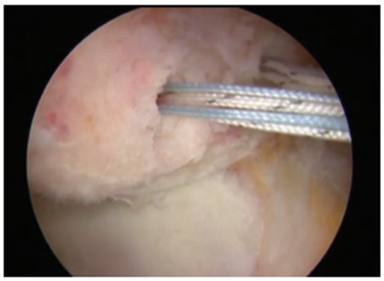

Figure 7. *Two double -loaded anchors.*

With the use of a retrograde suture passer, all suture limbs are then passed sequentially form inferior to superior through the capsule and infraspinatus along the axis of Hill-Sachs Lesion. All sutures used for the remplissage procedure are left untied until completion of the Bankart repair. (Figure 8).

Figure 8. *Suture limbs passed through the infraspinatus and posterior capsule.*

After completion of posterior anchor placement and suture passing, the Bankart repair is performed. A soft tissue elevator is inserted through the mid anterior portal and used to elevate and remove any scarred capsular or labral tissues that may inhibit adequate reattachment of the labrum. 3 double loaded suture anchors were used, and spaced between the 5:30 and 1 o'clock positions for right shoulder, and the 6:30 to 11 o'clock positions, of the left shoulders. Anchor placement and suture tying is started inferiorly and moved superiorly along glenoid rim. While passing suture limbs, they are placed in a more inferior position to corresponding anchor to help restore adequate tissue tension on the labrum. Often with the labral repair, the anteroinferior capsular tissue is included when passing sutures providing a capsular imbrication as well as superior shift (Figure 9).

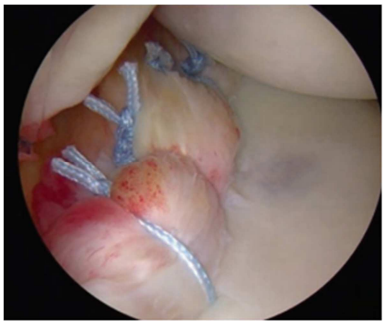

Figure 9. *Bankart repair completed.*

After Completion of the Bankart repair, the Remplissage sutures are now tied while viewing form the antero-superior portal. This is performed by retrieving the sutures through a cannula in the posterior portal. After sutures are retrieved, they are blindly tied through the cannula but only after the cannula is advanced down to the infraspinatus fascia. a sliding knot with 3 alternating half hitches for knot tying, and this is repeated with all suture limbs (Figure 10).

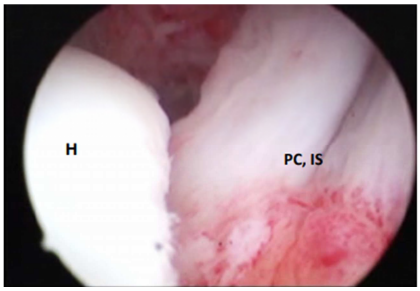

Figure 10. *Final view after tying the remplissage knots, (H=Humeral head, PC= Posterior capsule, IS= Infraspinatus).*

2.3. Rehabilitation Program

The shoulder was immobilized in a broad arm sling with an abdominal belt for 4 weeks in neutral rotation, during which self-directed rehabilitation is permitted with pendulum exercises 5 times daily, 5 minutes each session as well as scapulothoracic active exercises.

Physiotherapist-supervised rehabilitation protocol were followed with restriction of external rotation beyond 30 degrees for 3 months and return to sport six months after surgery.

2.4. Follow-up Evaluation

1. Range of motion (ROM):

Active anterior elevation, ER at side, ER at 90° abduction, IR at 90° abduction and IR hand to back were assessed and documented at 3, 6 and 12 months post-operatively.

2. Scoring:

Rowe and Simple Shoulder Test scores (SST) were calculated at 6 months and at the final follow-up.

3. Results

Demographic data shows that 95% of patients were male, mean age was 26.10 with range from 20 to 36 years, 80% of patients having their dominant shoulder affected, 30% were employee, mean of duration of follow up were 14.8 with range from 12 to 18 and mean of time of first dislocation to surgery were 29.9 with range from 13 to 60.

Table 1. *Comparison between at 12 months and pre-operative as regards ROM.*

	Pre-operative		At 12 months		Paired t test	
	Mean	SD	Mean	SD	t	P value
Anterior elevation	169.8	3.55	171.15	3.75	-4.925	0.001
ER side	53.65	4.93	57.45	5.31	-14.203	0.001
ER at 90° abduction	57.15	4.85	62.55	4.48	-17.352	0.001
IR at 90° abduction	31.2	3.22	31.95	3.03	-3.943	0.001

This table shows that there was statistically significant decrease pre operative in comparison to at 12 months with ROM (Figure 11).

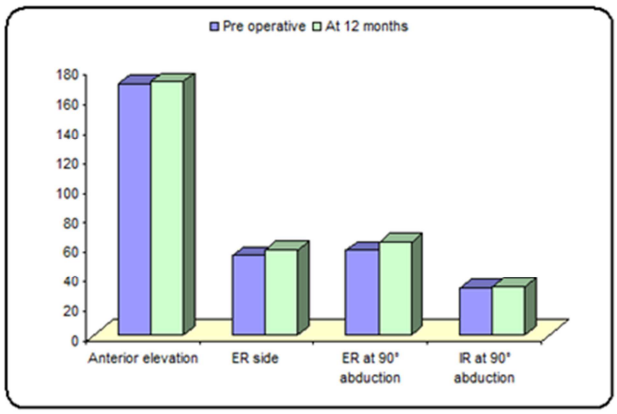

Figure 11. *Comparison between ROM pre-operatively and at 12 months follow-up.*

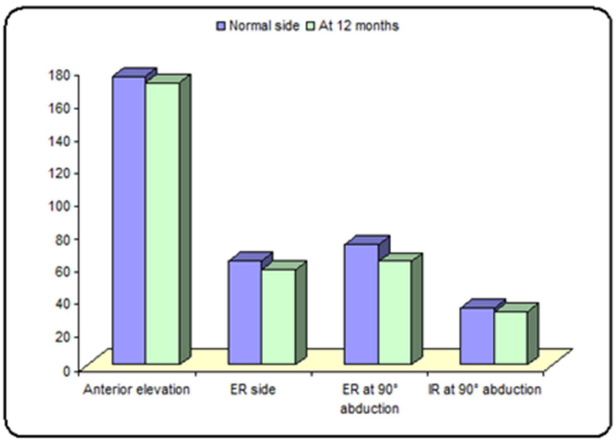

Figure 12. *Comparison between ROM at 12 months follow-up and that of normal side.*

Table 2. *Comparison between at 12 months and normal side as regards ROM.*

	Normal side		At 12 months		Paired t test	
	Mean	SD	Mean	SD	t	P value
Anterior elevation	175.05	2.09	171.15	3.75	-5.274	0.001
ER side	62.65	4.39	57.45	5.31	-7.887	0.001
ER at 90° abduction	73.00	3.40	62.55	4.48	-26.532	0.001
IR at 90° abduction	34.15	3.22	31.95	3.03	-7.936	0.001

This table shows that there was statistically significant increase at normal side in comparison to at 12 months with ROM.

Table 3. *Comparison between at final follow-up and pre-operative as regards SST score.*

SST	Pre-operative		Final follow-up		Paired t test	
	Mean	SD	Mean	SD	t	P value
	6.35	1.46	11.0	1.02	11.676	0.001

This table shows that there was statistically significant increase at final follow-up in comparison to pre-operative with SST score (Figure 13).

Table 4. *Comparison between at final follow-up and Normal side as regards SST score.*

SST	Normal side		Final follow-up		Paired t test	
	Mean	SD	Mean	SD	t	P value
	11.80	0.41	11.0	1.02	-3.254	0.002

This table shows that there was statistically significant decrease at final follow-up in comparison to normal side with SST score (Figure 14).

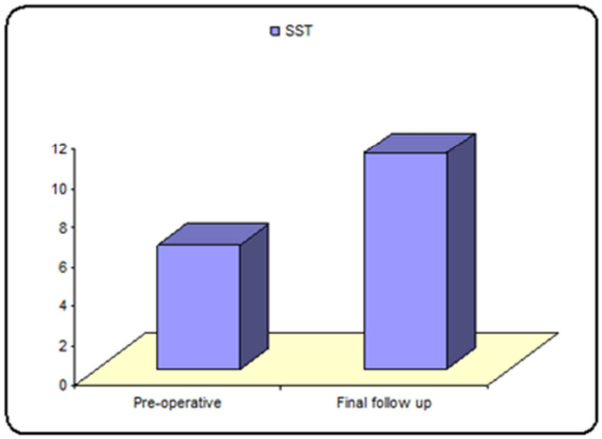

Figure 13. *SST. score pre-operatively and at final follow-up.*

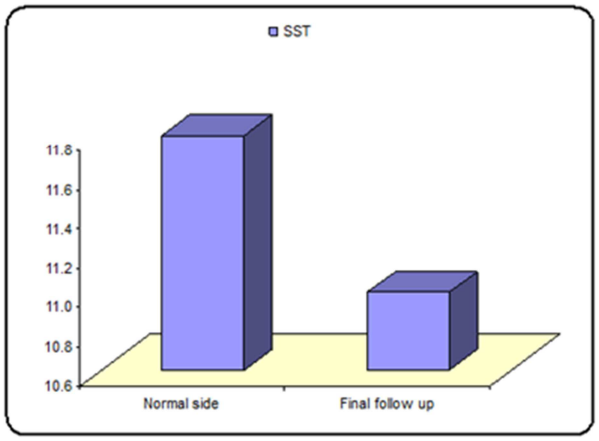

Figure 14. *Comparison between SST score values at final follow-up and that of normal side.*

Table 5. *Comparison between at final follow-up and pre-operative as regards ROWE score.*

ROWE	Pre-operative		Final follow-up		Paired t test	
	Mean	SD	Mean	SD	t	P value
	19.75	10.19	85.00	13.38	-19.223	0.001

This table shows that there was statistically significant decrease at in pre-operative comparison to final follow- up with ROWE score (Figure 15).

Table 6. *Comparison between at final follow-up and Normal side as regards ROWE score.*

ROWE	Normal side		Final follow-up		Paired t test	
	Mean	SD	Mean	SD	t	P value
	98.75	2.75	85.00	13.38	-4.983	0.001

This table shows that there was statistically significant decrease at final follow-up in comparison to normal side with ROWE score (Figure 16).

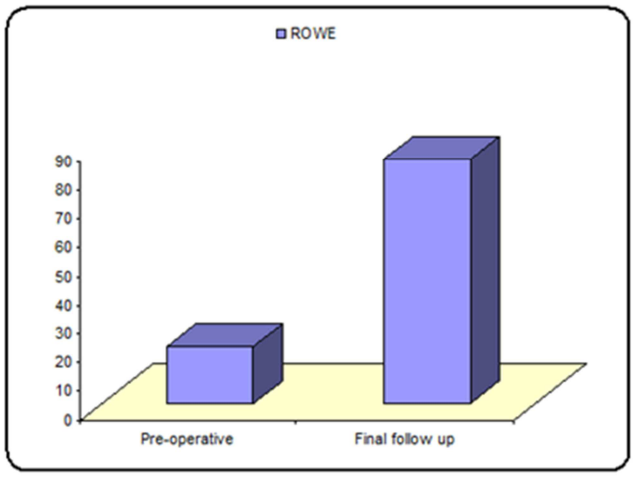

Figure 15. *ROWE score values pre-operatively and at final follow-up.*

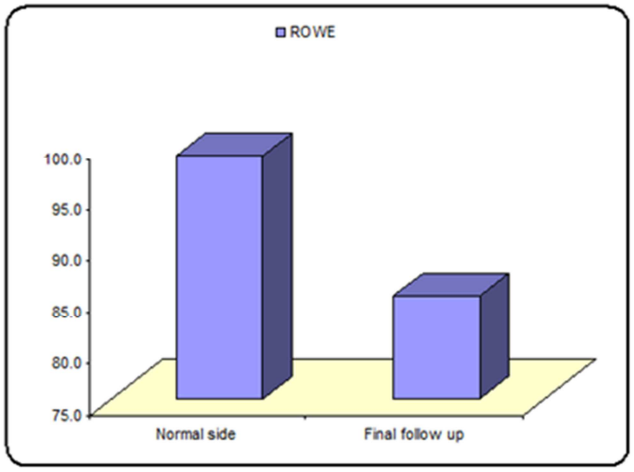

Figure 16. *ROWE score values of the normal side and at final follow-up respectively.*

4. Discussion

Although the association between the presence of large Hill-Schs lesion and recurrence of instability is known, the significant size and orientation of the Hill-Sachs defect remained controversial [11]. While most authors recommend doing nothing for Hill-Sachs defects less than 20% and bony procedures for lesions over 40%, no great consensus exist regarding lesions between 20 and 40%, [12]. One of the factors of such non consensus is that management depend on their orientation as well as the size [13]. Sekiya [14] et al., founds that in the absence of anterior capsulolabral injury, isolated 25% Hill-Sachs defects was stable, suggesting that after proper healing of anterior capsulolabral injury, a 25% Hill-Sachs defect may not be of critical size. Recent review articles recommended the remplissage procedure to be performed in patients with > 25% Hill-Sachs defect and less than 20–25% glenoid bone loss [15]. The remplissage procedure together with Bankart repairs has gained popularity in management of recurrent shoulder instability patients with large Hill-Sachs lesions. Such popularity was gained as it offers significant advantages if compared to its alternative methods such as bone block procedures. The simplicity of the procedure and feasibility of allarthroscopic remplissage avoids the morbidity usually associated with open bony surgical interventions. Other advantage included short surgical time.

Our study showed significant improved pain score, functional outcome scores, and patient satisfaction in about 85% of patients. recurrent instability was reported in only one case who had an epileptic fit 6 months after the surgery resulted in recurrence of dislocation. Patient was managed later by open Laterjet procedure and no more dislocation reported till last follow up visit.

A few complications were reported in our series, including posterosuperior pain in the shoulder in 5 of 15 patients. Pain was mild and treated with simple analgesics. loss of external rotation was reported in one patient. Although, several studies have not demonstrated a correlation between remplissage and persistent shoulder pain, pain was reported following Remplissage by several studies [16]. Similarly although loss of external rotation was not frequently associated with Remplissage procedure, it was reported [17].

5. Conclusion

Our study conclude that arthroscopic Bankart repair and remplissage is an effective means of managing shoulder instability in patients with large Hill-Sachs lesions and no significant glenoid bony defect.

References

[1] Palmer I, Widen A. The bone block method for recurrent dislocation of the shoulder joint. J Bone Joint Surg Br. 1948; 30: 53-58.

[2] Burkhart SS, De Beer JFB. Traumatic glenohumeral bone defects and their relationship to failure arthroscopic Bankart repairs: significance of inverted pear glenoid and the humeral engaging Hill-Sachs lesion. Arthroscopy. 2000; 16-7: 677-94.

[3] Calandra JJ, Baker CL, Uribe J. The incidence of Hill-Sachs lesions in initial anterior shoulder dislocations. *Arthroscopy*. 1989; 5 (4): 254-257.

[4] Yamamoto N, Itoi E, Abe H, et al. Contact between the glenoid and the humeral head in abduction, external rotation, and horizontal extension: a new concept of glenoid track. *J Shoulder Elbow Surg*. 2007; 16: 649-656.

[5] Purchase RJ, Wolf EM, Hobgood ER, Pollock ME, Smalley CC. Hill-Sachs "remplissage": an arthroscopic solution for the engaging Hill-Sachs lesion. Arthroscopy. 2008; 24 (6): 723-726.

[6] Weber BG, Simpson LA, Hardegger F. Rotational humeral osteotomy for recurrent anterior dislocation of the shoulder associated with large Hill-Sachs lesion. J Bone Joint Surg Am. 1984; 66: 1443-1450.

[7] Miniaci A, Berlet G. Recurrent anterior instability following failed surgical repair: Allograft reconstruction of large humeral head defects. J Bone Joint Surg Br. 2001; 83 (Suppl 1): 19-20.

[8] Kazel MD, Sekiya JK, Greene JA, Bruker CT. Percutaneous correction (humeroplasty) of humeral head defects (Hill-Scahs) associated with anteriro shoulder instability: a cadaveric study. Arthroscopy. 2005; 12: 1473-1478.

[9] Moros C, Ahmad CS. Partial humeral head resurfacing and Latarjet coracoid transfer for treatment of recurrent anterior glenohumeral instability. Orthopedics. 2009; 32 (8).

[10] Krackhardt T, Schewe B, Albrecht D, Weise K. Arthroscopic fixation of the subscapularis tendon in the reverse Hill-Sachs lesion for traumatic unidirectional posterior dislocation of the shoulder. Arthroscopy. 2006; 22 (2): 227.el-227.e6. doi: 10.1016/j.arthro.2005.10.004.

[11] Boileau P, Villalba M, Hery JY, Balg F, Ahrens P, Neyton L. Risk factors for recurrence of shoulder instability after arthroscopic Bankart repair. J Bone Joint Surg Am 2006; 88-8: 1755-63.

[12] Bollier MJ, Arciero R. Management of glenoid and humeral bone loss. Sports Med Arthrosc Rev. 2010; 18: 140–148.

[13] Itoi E, Lee S, Berglund LJ, Berge LL, An K. The effect of a glenoid defect on anteroinferior stability of the shoulder after Bankart repair: a cadaveric study. J Bone Joint Surg. 2000; 82A: 35–46.

[14] Sekiya JK, Jolly J, Debski RE. The effect of a Hill-Sachs defect on glenohumeral translations, in situ capsular forces, and bony contact forces. Am J Sports Med. 2012; 40 (2): 388–394.

[15] Provencher M, Bhatia S, Ghodadra N, Grumet R, Bach B Jr, Dewing C et al. Recurrent shoulder instability: current concepts for evaluation and management of glenoid bone loss. J Bone Joint Surg Am. 2010; 92 (Suppl 2): 133–151.

[16] Nourissat G, Kilinc AS, Werther JR, et al. A prospective, comparative, radiological, and clinical study of the influence of the “Remplissage” procedure on shoulder range of motion after stabilization by arthroscopic Bankart repair. Am J Sports Med 2011; 39: 2147-52.

[17] Deutsh AA, Kroll DG. Decreased range of motion following arthroscopic remplissage. Orthopedics 2008; 31: 492.