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Arthroscopic remplissage: Is it still an option?

Mohamed G. Morsy

- Posterolateral humeral head defects can be large and engage on the anterior glenoid, and they usually contribute to anterior shoulder instability in 40% to 90% of cases.
- The purpose of this study is to evaluate the results of the largest series of patients who underwent arthroscopic remplissage with Bankart repair for recurrent anterior shoulder instability due to associated Bankart lesions, with large and engaging (> 25% involvement) humeral Hill-Sachs defects (HSDs).
- A total of 51 patients underwent arthroscopic Bankart repair with remplissage technique for the treatment of recurrent anterior glenohumeral instability with large and medial HSDs. Pre-operative imaging in all patients identified a Bankart lesion with an associated HSD that involved > 25% of the humeral head. The Rowe score was used to assess the patients clinically.
- A total of 46 patients were male. The mean age of the patients was 28.7 years (18 to 43). The mean follow-up period was 31 months (20 to 39). At the final follow-up, three patients reported recurrence of instability (two dislocations and one subluxation). The mean Rowe score improved to 95.4 points (function, 45.5 of 50; stability, 26.4 of 30; motion, 8 of 10; pain, 8 of 10).
- The arthroscopic remplissage technique with Bankart repair gave satisfactory results and is still considered to be an effective, safe and reliable procedure for treatment of glenohumeral instability in cases with large and medial HSDs.

Keywords: instability; remplissage; Bankart lesion; Hill-Sachs defect

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Introduction

Posterolateral humeral head defects (Hill-Sachs lesions) were first described in 1890 by Broca and Hartman and further classified by Hill and Sachs in 1940.[1] These defects are one of the most common findings in patients with recurrent anterior glenohumeral dislocations.[2,3] It has been reported that humeral head defects contribute to anterior shoulder instability in 40% to 70% of patients with a first-time dislocation, and up to 90% of recurrent cases.[4,5]

Traditionally, the Hill-Sachs defect (HSD) is a posterolateral compression fracture in the humeral head that happens when the glenoid edge hits the humeral head during an anterior dislocation.[5-7] The size of the HSD increases with subsequent dislocation or subluxation and this in turn increases the risk of further recurrence.[8] The shape, size, depth and location of the HSD have been considered as important risk factors that may influence the surgical results.[9] Rowe et al[10] classified the HSD according to the size into "mild, moderately severe, and severe". They reported high incidence of recurrent dislocation in cases of instability with severe defects that had been treated by Bankart repair only.

Burkhart and De Beer[11] described the concept of "significant bone loss" that brings about the failure of arthroscopic Bankart repair. They emphasised this important risk factor related to recurrent instability — the significant bone defect of the humeral head that engages with the anterior glenoid edge as the shoulder moves into abduction and external rotation.

Later, Yamamoto et al[12] introduced the idea of the 'glenoid track', in which they studied the precise anatomical contact area between the humeral head and the glenoid in various degrees of abduction and maximum external rotation using 3D CT scans. They reported that the higher the arm was raised, the more the glenoid contact area moved from the inferomedial to the superolateral portion of the posterior articular surface of the humeral head, thus developing a contact zone between the glenoid and the humeral head. They called this contact zone the glenoid track, and concluded that if the HSD remains within the glenoid track, no engagement between the HSD and the glenoid occurs. On the other hand, in cases where extension of the HSD is beyond the medial edge of the glenoid track, engagement is expected. The width of this glenoid track in live shoulders was measured by Omori et al[13] to be 83% of the glenoid width at 90° of abduction.

Recently, Di Giacomo et al[14] applied the concept of the glenoid track to evaluate the engagement of the HSD on

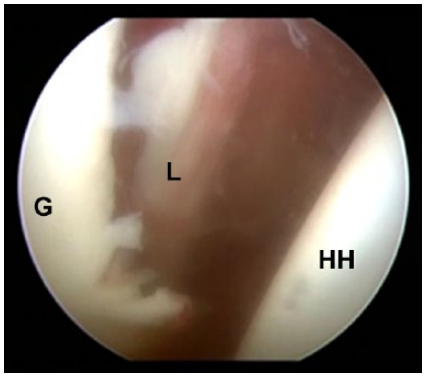

Fig. 1 Right shoulder, posterior portal view (HH, humeral head; G, glenoid; L, detached anterior labrum).

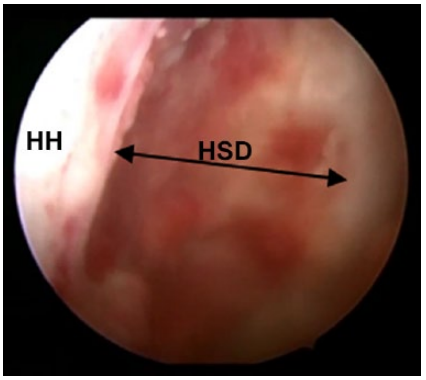

Fig. 2 Posterior Hill-Sachs defect (HSD) (HH, humeral head medial articular surface).

the glenoid rim with or without the presence of an anterior glenoid bone loss. Whereas they defined the HSD that engages as an 'off-track' HSD, the one that does not engage was described as an 'on-track' HSD. Their study concluded that transforming an off-track Hill-Sachs lesion to an on-track defect is mandatory in order to regain stability in the shoulder with anterior instability. Kurokawa et al[15] categorised off-track defects into a large-wide type and a narrow but medially located one.

Different solutions were described to overcome the problem of posterior bone deficiencies, such as the Latarjet procedure,[16] osteoarticular allograft transplantation,[17] rotational humeral osteotomy,[18] and transhumeral impaction grafting.[19] Usually these procedures are performed using an open technique and can be associated with many complications such as hardware problems (e.g. screw breakage or malposition), axillary nerve injury, subscapularis insuffiency and glenohumeral osteoarthritis.

An arthroscopic filling of the HSD using infraspinatus tendon, known as 'remplissage', was described in 2008 by Purchase et al.[20] Since then, this technique has gained popularity in the hope that it will be a successful method for the treatment of HSD.

The purpose of the study was to evaluate the results of the largest reported series of patients who underwent arthroscopic remplissage with Bankart repair for recurrent traumatic anterior glenohumeral instability caused by a combined anterior capsulolabral lesion and a posterior large humeral head defect (> 25% involvement).

Patients and methods

The study was conducted in the Department of Orthopaedic Surgery, El-Hadara Orthopaedic and Traumatology University Hospital, Alexandria University, Egypt, between 2012 and 2014. The 51 shoulders in 51 patients (46 men and five women) who had recurrent traumatic anterior shoulder instability with large and medial HSDs were included in the study.

Patients with associated biceps tendon pathology (e.g. superior labral anteroposterior lesions), small or lateral HSDs, and/or rotator cuff tear were excluded from the study. The mean age of the patients was 28.7 years (18 to 43). The right shoulder was affected in 45 patients (88%) and 38 (75%) were right-handed.

All patients were subjected to thorough clinical examination followed by radiological evaluation with plain radiographs and MRI scans. Clinically, all patients had a positive apprehension sign. Radiologically, an anterior labral tear as well as a significant HSD (> 25% of humeral head) was found in all cases. No significant glenoid bone defects were encountered. The Rowe shoulder score (version 1981)[21] was used in this study to monitor the shoulder state pre-operatively and at least 12 months after the operative intervention. This score evaluates the shoulder function (50 points), pain (10 points), stability (30 points) and motion (10 points).

An arthroscopic remplissage along with a Bankart repair were performed as the surgical treatment of all patients.

Visualisation of the anterior labral tear as well as the posterior HSD was carried out (Figs 1 and 2). The posterior defect was addressed by the following steps: localisation of the defect through a spinal needle inserted from a posterolateral portal, preparation of the defect using a motorised shaver and burr (Fig. 3), a double-loaded bone anchor insertion into the medial edge of the defect (Fig. 4), and finally retrieval of the suture threads of the anchor through the infraspinatus and posterior capsule using an arthroscopic penetrating grasper (Fig. 5). The sutures were left without tying, and the scope was directed anteriorly.

Bankart repair was then performed using three biodegradable bone anchors inserted anteriorly via a 7mm arthroscopic cannula applied through the rotator interval.

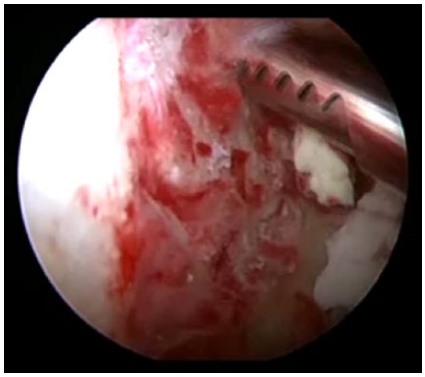

Fig. 3 Preparation of Hill-Sachs defect using motorised shaver inserted from posterolateral portal.

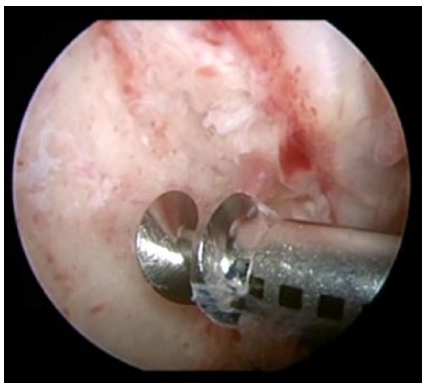

Fig. 4 Anchor insertion in Hill-Sachs defect.

Fig. 5 Suture retrieval through infraspinatus and capsule.

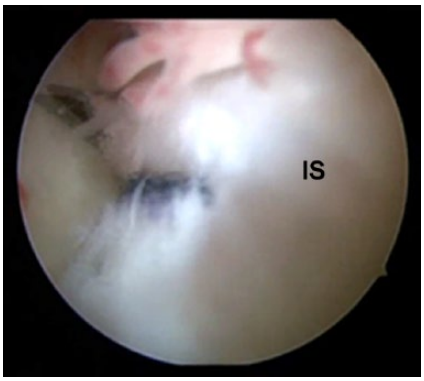

Fig. 6 Filling and closure of Hill-Sachs defect with infraspinatus tendon (IS).

Following secure repair of the anterior labrum, the posterior sutures were tied, bringing the infraspinatus and the capsule down to fill and close the HSD (Fig. 6). The sutures were tied with the patient's shoulder in neutral rotation and with the humeral head pushed posteriorly.

Post-operatively, a sling was applied for five weeks for all patients, with gentle daily activities allowed. Six weeks post-operatively, active assisted and active exercises were started. At three months, shoulder strengthening exercises were permitted. Patients were allowed to return to pre-injury level of activity six months post-operatively.

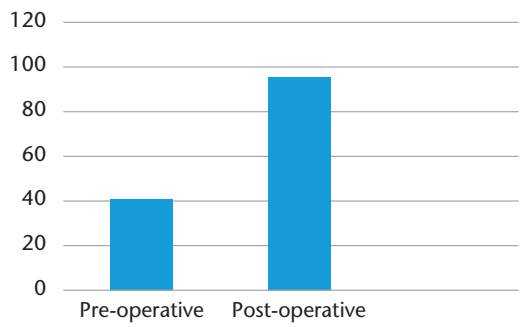

Fig. 7 Pre- and post-operative Rowe Scores (mean).

Results

The follow-up period ranged from 20 to 39 months with a mean of 31 months. The Rowe score improved significantly from a mean of 40.8 points (30 to 53) pre-operatively to a mean of 95.4 points (80 to 100) post-operatively ($p < 0.001$) (Fig. 7). The mean score of function improved from 18.3 points (12 to 25) pre-operatively to 45.5 points (41 to 50) post-operatively.

The stability component of the score improved significantly from a mean of 10.3 points (6 to 13) pre-operatively to 26.4 points (24 to 30) post-operatively (Fig. 8). Pain improved from a mean of 5 points (3 to 6) pre-operatively to 8 points (7 to 10) post-operatively. Similarly, motion improved from a mean of 4 points (2 to 6) pre-operatively to 8 points (7 to 10) post-operatively (Fig. 9).

In this study, three patients (4%) had recurrent instability (two dislocations and one subluxation). All were traumatic in nature and spontaneously reduced. None of those patients underwent any further surgical intervention.

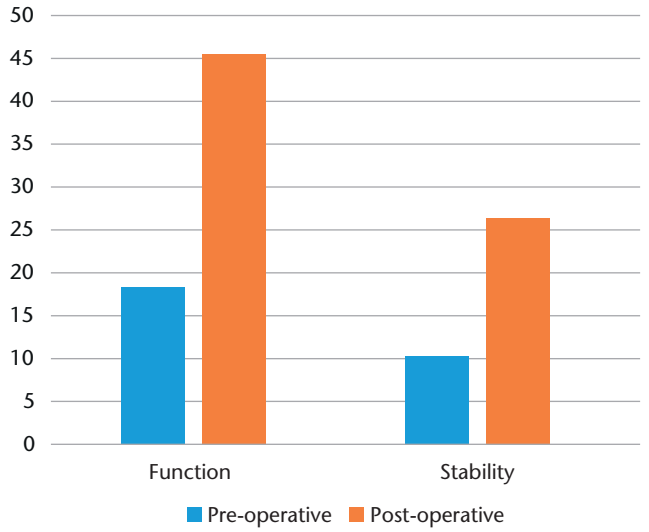

Fig. 8 Pre- and post-operative function and stability Rowe Scores (mean).

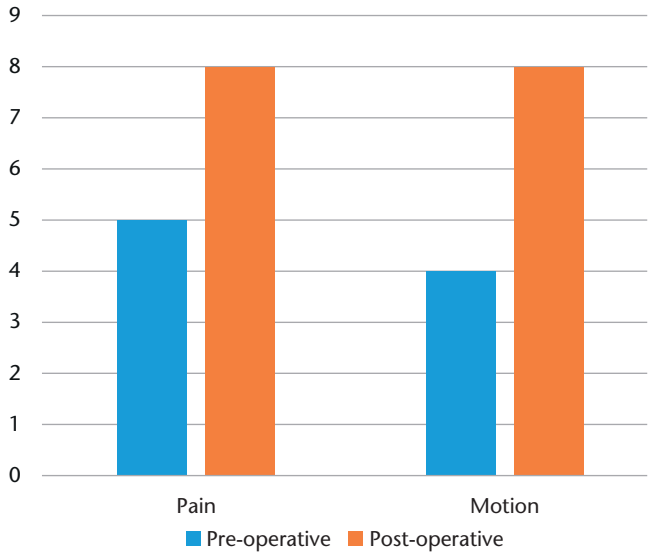

Fig. 9 Pre- and post-operative pain and motion Rowe Scores (mean).

No surgical site infection was encountered in the study and there were no complications associated with suture anchors. None of the patients included in this study reported complaints of decreased shoulder range of motion and all showed excellent degrees of shoulder external rotation (Fig. 10).

Discussion

HSDs were considered to be the main cause of recurrent instability following glenohumeral dislocation.[4] Lynch et al[22] recorded recurrent instability in > 90% of cases due to large engaging Hill-Sachs lesions. In a study published by Patel et al[23] the authors attributed failures of previous instability interventions to unrecognised Hill-Sachs lesions. In fact, most of the failure cases were associated with a Bankart repair. Up to 80% correlation between anterior capsulolabral lesions and posterior humeral head defects were found in a study by Widjaja et al.[24]

Many procedures were suggested to solve the problem of posterior bone deficiencies together with the arthroscopic Bankart repair. Unfortunately, most of these procedures were carried out using an open technique and associated with many complications.[8,16-19] Lafosse and Boyle[25] described an arthroscopic Latarjet technique with excellent results. However, this can be a technically demanding procedure with a steep learning curve, and other authors found difficulty in achieving the satisfactory results reported by these authors.

The remplissage procedure described by Purchase et al[20] in 2008 converts an intra-articular HSD into an extra-articular lesion without the need for any open procedure or additional graft material. Ever since, the technique has gained popularity as a minimally-invasive approach that can be applied easily and quickly with promising outcomes. A combination of arthroscopic Bankart repair and arthroscopic remplissage was recommended by Di Giacomo et al[14] for treatment of unstable shoulders with off-track HSDs, provided that the glenoid bone loss is < 25%. As the interest in the remplissage procedure increased, many reports with variable clinical outcome have been published.[8,26-29]

The clinical success rate in patients included in this study was 96% with acceptable overall patient satisfaction, less pain and good shoulder function. Franceschi et al[30] compared in a small study the results of Bankart repair alone and combined with remplissage, with 25 patients in each group. None of the patients had recurrence of instability in the remplissage group, compared with 20% recurrence with Bankart repair alone.

In a small number of patients, Park et al[31] reported 9% recurrence (one out of 11 patients). Zhu et al[32] evaluated the outcome of remplissage with Bankart repair; three out of 49 patients in their study (6%) suffered from recurrent instability.

The present study evaluated the results of arthroscopic remplissage with Bankart repair in 51 patients; the largest series in the current literature. Only three cases (4%) had recurrent instability (two dislocations and one subluxation). None of them asked for any further surgical intervention. No limitation of external rotation caused by infraspinatus tenodesis was encountered by any of the patients.

Unlike Park et al,[26] no posterior cannulae were used in the study. This has the advantages of avoiding not only large incisions needed to introduce the cannulae but also

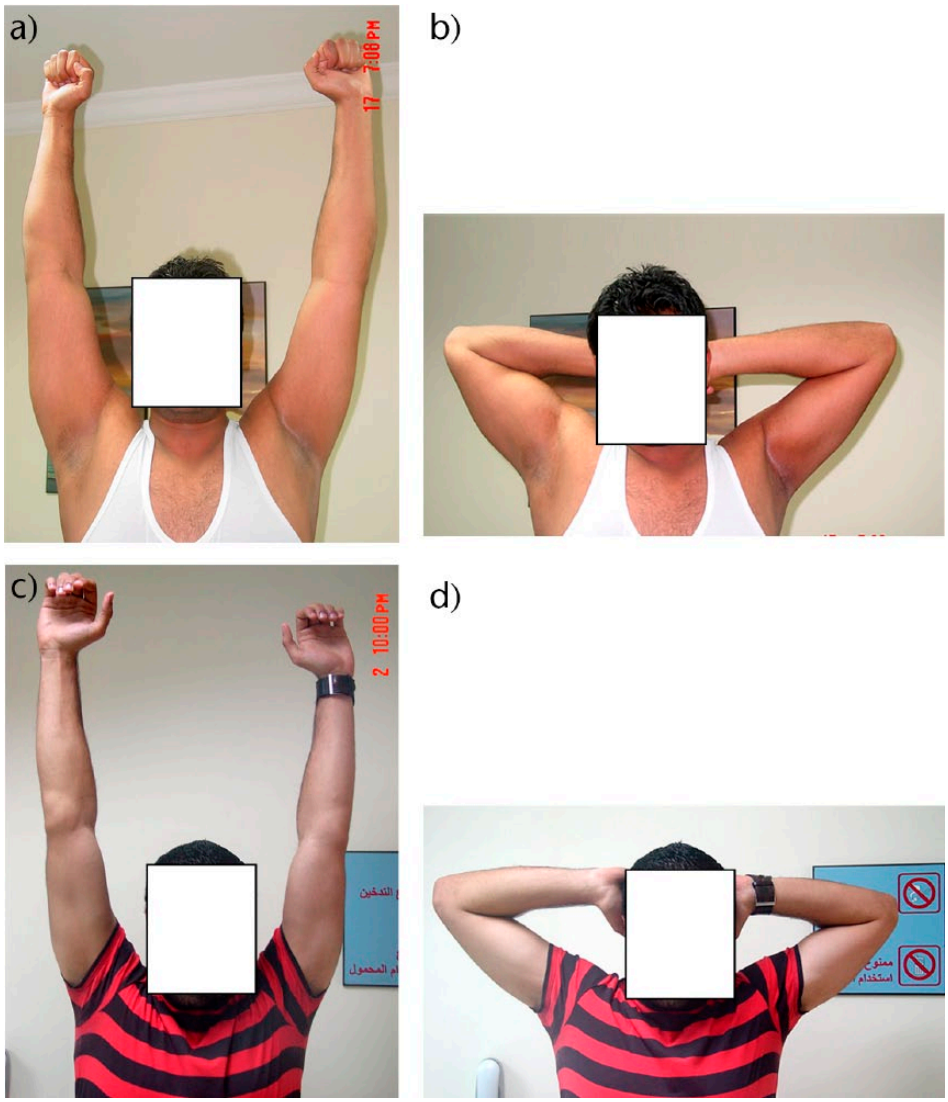

Fig. 10 Examples of postoperative range of motion.

the defects in infraspinatus caused by the passage of cannulae which may weaken the tendon.

Arthroscopic remplissage technique with Bankart repair gave satisfactory results and is considered to be an effective, safe and reliable procedure for treatment of glenohumeral instability in cases with large and medial HSDs.

AUTHOR INFORMATION

El-Hadara Orthopaedic and Traumatology Hospital, Alexandria University, Egypt.

Correspondence should be sent to: Mohamed G. Morsy, Department of Orthopaedic Surgery, El-Hadara Orthopaedic and Traumatology Hospital, Alexandria University, Egypt.
Email: morsimoh@gmail.com

ICMJE CONFLICT OF INTEREST STATEMENT

None declared.

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