Arthroscopic remplissage for the treatment of anterior glenohumeral instability with engaging Hill–Sachs lesions: should it be performed first?

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Received 15 March 2014
Accepted 31 July 2014

Egyptian Orthopedic Journal 2015, 50:166–170

Background
Posterolateral compression fracture of the humeral head (a Hill–Sachs lesion) is a common finding associated with anterior shoulder instability. Burkhart and De Beer were the first to describe engaging Hill–Sachs lesion. They concluded that arthroscopic Bankart repair in the presence of such bone deficiencies is likely to fail and requires open surgery. Purchase and colleagues presented a procedure that consists of an arthroscopic posterior capsulodesis and infraspinatus tenodesis to fill (remplissage) the Hill–Sachs lesion in addition to an arthroscopic Bankart repair.

Objectives
The purpose of this study was to evaluate the outcome of arthroscopic remplissage in cases of recurrent shoulder dislocation with engaging Hill–Sachs lesion using one anchor for the remplissage.

Patients and methods
A total of 15 patients (12 male and three female) with recurrent anterior shoulder instability and engaging Hill–Sachs lesion underwent arthroscopic remplissage procedure with capsulolabral repair. The mean age of the patients was 28 years and the mean follow-up period was 12 months. Two patients had concomitant superior lateral anterior posterior tear (SLAP) lesion type 1.

Results
On the basis of the preoperative MRI, 13 patients had a large Hill–Sachs defect. The dominant arm was involved in eight (53%). The mean surgery duration was ~100 min. Overall, a mean of four anchors were used, including those for Bankart repair, with one anchor used for the remplissage procedure. Rowe score for instability increased from a mean of 12.3 preoperatively to 86.3 at 6 months postoperatively. None of the patients included in this study complained of decreased shoulder range of motion. One patient complained of painful abduction of the affected shoulder.

Conclusion
The remplissage technique achieves good results in patients with anterior shoulder dislocation associated with engaging humeral head defects with concomitant Bankart lesion at short-term follow-up. The Bankart repair can be completed first followed by remplissage.

Keywords:
Hill–Sachs lesion, remplissage, shoulder dislocation

Egypt Orthop J 50:166–170

1110-1148

Introduction

Glenoid bone loss and/or humeral head defects are found in 5–70% of patients with recurrent glenohumeral instability [1,2]. Posterolateral compression fracture of the humeral head (a Hill–Sachs lesion) is a common finding associated with anterior shoulder instability [3,4]. Such defects are extremely common, occurring in 32–51% of initial anterior shoulder dislocations, and have been linked to high rates of recurrent instability after traditional capsulolabral reconstruction [5,6]. The term engaging Hill–Sachs lesion was used by Burkhart and De Beer [6] to describe the leverage of the humeral head from the glenoid rim in the presence of a large bone defect. Burkhart and De Beer concluded that arthroscopic stabilization in the presence of such bone deficiencies is likely to fail and requires open surgery. Thus, despite an adequate Bankart repair, consideration must be given toward treating the associated posterolateral defect within the humeral head if it is of sufficient size [3]. Several different reconstructive solutions have been proposed for dealing with large Hill–Sachs lesions. Some procedures directly address the humeral head, whereas others manipulate the articular arc length, mostly by augmenting anterior and inferior glenoid bone to prevent early engagement [1,3]. The popular surgical options include the following: Latarjet–Bristow

procedure; humeral head osteotomy; osteochondral allograft transplantation; the Connolly procedure, in which the infraspinatus tendon along with a piece of greater tuberosity is used to address the humeral head defect [2,5,7]; distal tibia allograft [8]; or iliac crest bone graft to the anterior glenoid rim [1]. Others advocate hemiarthroplasty as a definitive treatment [3]. Recently, Purchase *et al.* [9] presented a procedure that consists of an arthroscopic posterior capsulodesis and infraspinatus tenodesis to fill (remplissage, which means 'to fill' in French) the Hill–Sachs lesion, in addition to an arthroscopic Bankart repair. Later on, Koo *et al.* [10] modified the arthroscopic 'remplissage' and used the arthroscopic double-pulley remplissage technique.

The purpose of this study was to evaluate the outcome of arthroscopic remplissage in cases of recurrent shoulder dislocation with engaging Hill–Sachs lesion using one anchor for the remplissage.

Patients and methods

Between 2009 and 2011, 15 patients (12 male and three female) with recurrent anterior shoulder instability underwent arthroscopic remplissage procedure with capsulolabral repair. Inclusion criteria were as follows: recurrent anterior glenohumeral instability (i.e. subluxation and dislocation defined by >3 episodes within a 12-month period of conservative treatment) and intraoperative findings that showed both a Bankart lesion and a significant Hill–Sachs defect (>25% of humeral head). The size of the lesion was defined based on the criteria defined by Rowe *et al.* [11]. All humeral defects comprised greater than 25% of the humeral head circumference as measured on preoperative axial MRI sequences (a mean of two slices from the axial T1 slice with the presence of the coracoid). During surgery, confirmation of engagement was obtained by placing the arm in external rotation and 90° of abduction and noting engagement of the lesion before 90° of external rotation. Preoperative MRI as well as clinical examination served as the inclusion criteria for the performance of remplissage; however, patients were told that intraoperative assessment of the defect using the parameters mentioned would ultimately determine whether tenodesis was necessary. All patients in this series had a positive apprehension sign or pain in the abducted, externally rotated arm. This study approved by the Ethical committee of Ain Shams University, Cairo, Egypt.

Patients were routinely followed up postoperatively at 2 weeks, 4 weeks, 6 weeks, 3 months, 6 months, and 12 months. At each visit, patients were asked about their symptoms and response to therapy. Patients were assessed with the Rowe score for Instability.

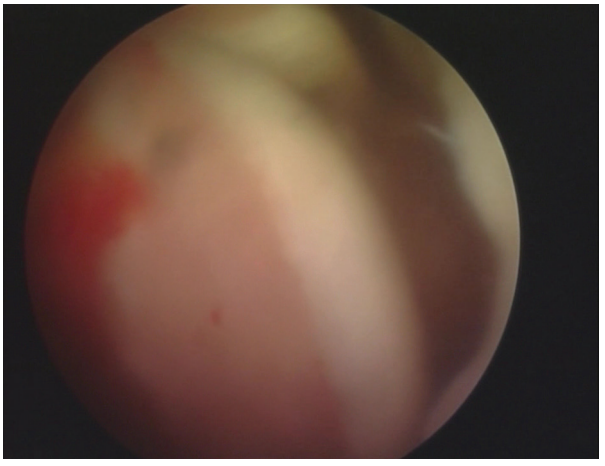
Surgical technique

General anesthesia was used for all patients. The patient was positioned in the beach-chair position. Standard posterior portal was established, and complete shoulder examination was performed. The presence of Bankart lesion was confirmed, and the size of the Hill–Sachs lesion was assessed and Hill–Sachs defect was examined for engagement with the humeral head in 90° abduction and 90° external rotation (Fig. 1). The anterior portal was established in the inferior part of the rotator interval. The anterior labrum and the glenoid were prepared and Bankart repair was completed in the usual manner.

Thereafter, attention was directed toward the Hill–Sachs defect with the arthroscope in the posterior portal. The surface of the entire posterior and inferior capsule was freshened with a shaver. The surface of the Hill–Sachs lesion was gently freshened with a bur with care to remove the minimum amount of surface bone. Two posterolateral portals were established, and the position was confirmed using a spinal needle directed to the Hill–Sachs defect to allow delivery of the anchors through one portal and the penetrating grasper from the other portal through the infraspinatus tendon and the posterior capsule to retrieve the suture limbs (Fig. 2a and b). Thereafter, the sutures were tied drawing the infraspinatus tendon with the posterior capsule to the abraded bone surface of the Hill–Sachs defect with the patient's shoulder in neutral rotation and the humeral head pushed posteriorly (Fig. 3).

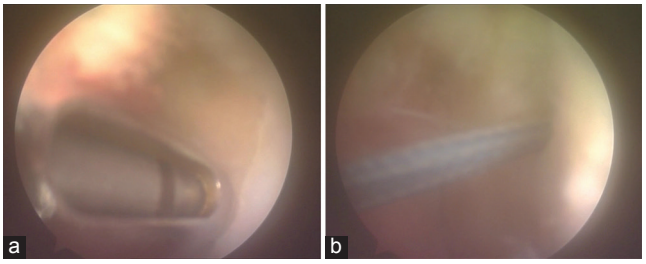
Two patients had concomitant SLAP lesion type 1, which was debrided during the arthroscopic procedure.

Figure 1



Arthroscopic view of the left shoulder from a posterior viewing portal with the patient in the beach-chair position, showing a large Hill–Sachs lesion.

Figure 2



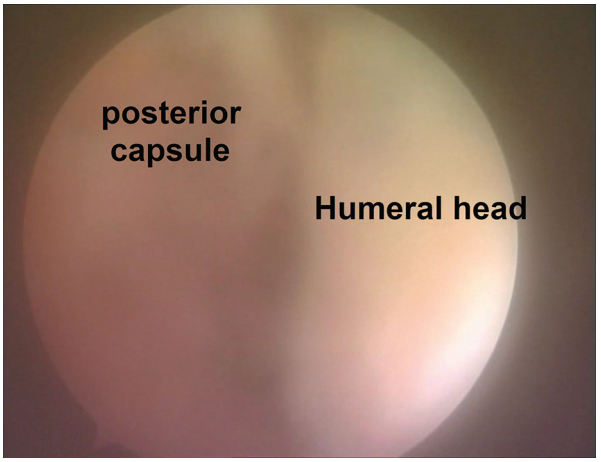
(a, b) Anchor insertion in Hill–Sachs defect.

Postoperatively, patients were immobilized in a sling for 6 weeks, with the shoulder in an adducted position at all times. Gentle active and active-assisted range of motion was allowed at 6 weeks postoperatively. Patients were instructed not to abduct or externally rotate the arm beyond neutral until 6 weeks. At 3 months, progressive capsular stretching and strengthening of the shoulder were allowed. Patients were allowed to resume their preinjury level of activity at 6 months postoperatively.

Results

On the basis of the preoperative MRI, 13 of the 15 patients had a large Hill–Sachs defect (>2 cm long, 0.3 cm deep) as measured on two axial T1 images. The dominant arm was involved in eight of 15 patients (53%). The mean surgery duration was ~100 min. There were 12 male and three female patients included in the study, with an overall mean age of 28 years and a mean follow-up of 12 months (range=8–20 months). There were two patients with concomitant SLAP lesion type 1 in addition to Hill–Sachs and Bankart lesions; the SLAP lesion was addressed (debridement) during the procedure. Rowe score for instability increased from a mean of 12.3 preoperatively to 86.3 at 6 months postoperatively. Overall, a mean of four anchors were used, including those for Bankart repair, with one anchor used for remplissage procedure. All Bankart repairs were performed with three anchors on the anterior glenoid rim. None of the patients had surgical site infection, and there were no complications associated with suture anchors. None of the patients included in this study complained of decreased shoulder range of motion. One patient complained of painful abduction of the affected shoulder following fall on the affected shoulder 1 month postoperatively but without shoulder dislocation; his pain improved with 3 months of physiotherapy. There were no cases of surgical wound infection.

Figure 3



Closure of the Hill–Sachs defect after tying the sutures.

Discussion

Hill–Sachs lesions were not fully appreciated pathologically until Burkhart and DeBeers' work in 2000. They were the first to coin the term 'engaging Hill–Sachs lesion' [6]. In their study there were 21 failures (10.8%) in 194 patients with recurrent shoulder instability treated with suture anchors. Those without significant bone defects had a failure rate of 4% versus a 67% failure rate in those with bone defects [6]. Their work drew attention to the essential role of bone loss in instability and fueled the need for further clinical research into this topic [12]. Several different approaches to address large humeral bone loss have been reported [10,13,14]. Connolly used an open transfer of the infraspinatus and capsule into the defect [9]. Weber *et al.* [13] described the use of rotational osteotomies with good results. Gerber and Lambert [15] were first credited with the use of bone grafting in patients with Hill–Sachs lesions. Re *et al.* [16] have described a 'transhumeral head plasty' using a deltopectoral approach in which the depressed, compacted bone of the Hills–Sachs lesion is tamped up from below. More recently, reports of allograft mosaicplasty and osteochondral allograft transport system, both arthroscopic and open, have been published [5,17]. In cases with failed instability repairs or excessive bone loss due to chronic locked dislocations, shoulder arthroplasty has been recommended [18].

Purchase *et al.* [9] were the first authors to use the phrase 'remplissage' (French for 'filling') in their description of an arthroscopic approach to inset the infraspinatus muscle into a Hill–Sachs deformity. Koo *et al.* [10] modified the *remplissage* technique of Wolf and Pollack by tying their sutures over the infraspinatus tendon rather than the muscle, thereby

obtaining a more physiologic and mechanically sound construct and eliminating the possibility of muscle necrosis due to strangulation by sutures.

The remplissage technique is unique because the surgeon is already in position for arthroscopic visualization and can address both the humeral head defect and the Bankart lesion during the same operation. As a result, both repairs can be performed quickly and efficiently, potentially saving the patient from more extensive, open surgery and prolonged anesthesia. Moreover, it is a minimally invasive approach to convert an intra-articular lesion into an extra-articular lesion, preventing engagement of the humeral defect on the glenoid rim. In addition, the *remplissage* does not require additional graft material, thereby making the procedure quick and easy to perform [1,10]. In this series, Bankart repair was completed first and then the Hill–Sachs defect was addressed using the posterior portal as viewing portal and two posterolateral portals, one to deliver the anchor and the other portal to retrieve the sutures through the posterior capsule and the infraspinatus tendon. This technique is a modification of the remplissage technique of Wolf and Pollack.

There are few published reports on the remplissage technique, with a lack of comprehensive outcome measures having been reported [1]. The first report, by Connolly, described a transfer of the infraspinatus using an open technique. Of 15 patients, 14 had good results with no apparent complications [1]. Purchase *et al*. [9] described their dislocation rate as two of 24 patients, with no significant complications or loss of range of motion.

Data are still unclear on the best approach to manage large humeral head bone defects that contribute to instability. The popular procedure of choice to address humeral head defects through reducing engagement remains the Latarjet procedure, first described in 1954 [1]. It involves coracoid transfer to the glenoid rim, improving stability by increasing the articular arc length in patients with Hill–Sachs pathology or glenoid bone deficiency [19]. The recurrence rates for this procedure range from 0 to 12% [7,20]. Recently, excellent results were reported with the all-arthroscopic Latarjet procedure [21,22], yet there is a steep learning curve associated with this technique and it does not eliminate the morbidity inherent in this procedure.

Another well-accepted procedure for the repair of large Hill–Sachs lesions is an osteochondral allograft transplantation. This procedure involves placing an osteochondral allograft in the humeral head defect, thus filling the defect and eliminating the possibility of humeral head engagement on the anterior glenoid [5].

Arthroscopic remplissage is a less-morbid alternative that directly addresses primary pathology when a large humeral head defect is the main cause for recurrent anterior glenohumeral instability [1].

In this study, the mean number of suture anchors for the Bankart procedure and the remplissage was four, with the remplissage contributing one anchor to the repair. I found that one anchor is sufficient to convert the engaging Hill–Sachs lesion to a nonengaging one.

The intent of the tenodesis is to fill the defect so that engagement is no longer permitted. Even with substantially large defects, it is occasionally possible to achieve this desired effect with one anchor. Although one anchor may not completely fill the lesion, it may allow for a critical defect to be reduced to a noncritical, nonengaging lesion [1]. Park *et al*. [1] found that there was no difference in postoperative functional scores or episodes of instability between the patients who had two anchors versus one for the remplissage procedure.

Deutsch and Kroll [23] reported the case of a patient who had significant loss of external rotation after the remplissage procedure. The remplissage technique has the potential to cause a disabling lack of external rotation. This could ultimately require infraspinatus release to correct.

In this study, no case complained of decreased shoulder range of motion.

This complication was not reported in other series [1,10].

The Rowe score for shoulder instability increased from 12.3 preoperatively to 86.3 at 6 months postoperatively.

Conclusion

The remplissage technique achieves good results in patients with anterior shoulder dislocation associated with engaging humeral head defects with concomitant Bankart lesion at short-term follow-up. Its feasibility to be performed arthroscopically at the same time of Bankart repair adds the benefit of lower morbidity compared with other open procedures. Bankart repair can be completed first, followed by remplissage. Single anchor for the remplissage is sufficient to convert engaging Hill–Sachs lesion to nonengaging one. Long-term follow-up is required to assess it efficacy on the long term.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

References

1 Park MJ, Tjoumakaris FP, Garcia G, Patel A, Kelly JDIV. Arthroscopic remplissage with Bankart repair for the treatment of glenohumeral instability with Hill–Sachs defects. Arthroscopy 2011; 27:1187–1194.

2 Lynch JR, Clinton JM, Dewing CB, Warme WJ, Matsen FAIII. Treatment of osseous defects associated with anterior shoulder instability. J Shoulder Elbow Surg 2009; 18:317–328.

3 Haviv B, Mayo L, Biggs D. Outcomes of arthroscopic 'remplissage': capsulotenodesis of the engaging large Hill–Sachs lesion. J Orthop Surg Res 2011; 6:29.

4 Calandra JJ, Baker CL, Uribe J. The incidence of Hill–Sachs lesions in initial anterior shoulder dislocations. Arthroscopy 1989; 5:254–257.

5 Kropf EJ, Sekiya JK. Osteoarticular allograft transplantation for large humeral head defects in glenohumeral instability. Arthroscopy 2007; 23:322 e1–325.e1.

6 Burkhart SS, De Beer JF. Traumatic glenohumeral bone defects and their relationship to failure of arthroscopic Bankart repairs: significance of the inverted-pear glenoid and the humeral engaging Hill–Sachs lesion. Arthroscopy 2000; 16:677–694.

7 Burkhart SS, De Beer JF, Barth JR, Cresswell T, Roberts C, Richards DP. Results of modified Latarjet reconstruction in patients with anteroinferior instability and significant bone loss. Arthroscopy. 2007; 23:1033–1041.

8 Provencher MT, Ghodadra N, LeClere L, Solomon DJ, Romeo AA. Anatomic osteochondral glenoid reconstruction for recurrent glenohumeral instability with glenoid deficiency using a distal tibia allograft. Arthroscopy 2009; 25:446–452.

9 Purchase RJ, Wolf EM, Hobgood ER, Pollock ME, Smalley CC Hill–sachs 'remplissage': an arthroscopic solution for the engaging Hill–Sachs lesion. Arthroscopy 2008; 24:723–726.

10 Koo SS, Burkhart SS, Ochoa E. Arthroscopic double-pulley remplissage technique for engaging Hill–Sachs lesions in anterior shoulder instability repairs. Arthroscopy 2009; 25:1343–1348.

11 Rowe CR, Zarins B, Ciullo JV. Recurrent anterior dislocation of the shoulder after surgical repair. Apparent causes of failure and treatment. J Bone Joint Surg Am. 1984; 66:159–168.

12 DiPaola MJ, Jazrawi LM, Rokito AS, Kwon YW, Patel L, Pahk B, *et al*. Management of humeral and glenoid bone loss--associated with glenohumeral instability. Bull NYU Hosp Jt Dis 2010; 68:245–250.

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

14 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; 22:227e1–227e6.

15 Gerber C, Lambert SM. Allograft reconstruction of segmental defects of the humeral head for the treatment of chronic locked posterior dislocation of the shoulder. J Bone Joint Surg Am 1996; 78:376–382.

16 Re P, Gallo RA, Richmond JC. Transhumeral head plasty for large Hill–Sachs lesions. Arthroscopy 2006; 22:798.e1–798.e4.

17 Chapovsky F, Kelly JDt. Osteochondral allograft transplantation for treatment of glenohumeral instability. Arthroscopy 2005; 21:1007.

18 Green A, Norris TR. Shoulder arthroplasty for advanced glenohumeral arthritis after anterior instability repair. J Shoulder Elbow Surg 2001; 10:539–545.

19 Burkhart SS, Danaceau SM. Articular arc length mismatch as a cause of failed bankart repair. Arthroscopy 2000; 16:740–744.

20 Allain J, Goutallier D, Glorion C. Long-term results of the Latarjet procedure for the treatment of anterior instability of the shoulder. J Bone Joint Surg Am. 1998; 80:841–852.

21 Lafosse L, Lejeune E, Bouchard A, Kakuda C, Gobezie R, Kochhar T. The arthroscopic Latarjet procedure for the treatment of anterior shoulder instability. Arthroscopy. 2007; 23:1242.e1–1242.e5.

22 Lafosse L, Boyle S. Arthroscopic Latarjet procedure. J Shoulder Elbow Surg 2010; 19:2–12.

23 Deutsch AA, Kroll DG. Decreased range of motion following arthroscopic remplissage. Orthopedics 2008; 31:492.