



Operative Technique: Arthroscopic Remplissage

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Introduction

Glenohumeral bone deficiency has been correlated with recurrent shoulder instability following arthroscopic capsulolabral repair.¹⁻³ In response to this problem, a spectrum of interventions have emerged for the management of large Hill-Sachs lesions including humeroplasty, remplissage, allograft reconstruction, allograft mosaicplasty, rotational osteotomy, partial resurfacing, and prosthetic replacement.^{4,8,17} Remplissage, which means “filling” in French, involves the fixation of the infraspinatus and posterior capsule into Hill-Sachs lesions to prevent humeral bony defects from engaging with the glenoid rim. Several clinical studies have reported decreased recurrence rates of glenohumeral instability with the use of arthroscopic remplissage as an adjunct to standard Bankart repairs when large engaging Hill-Sachs lesions are present.⁹⁻¹³ This article reviews the surgical indications for performing arthroscopic remplissage and provides a detailed discussion of its surgical technique and postoperative care.

Preoperative Evaluation and Indications

Arthroscopic remplissage is a treatment option that should be considered when evaluating patients with recurrent anterior shoulder instability. Recurrent anterior glenohumeral instability can be diagnosed on the basis of a history of multiple shoulder dislocations or subluxations with physical examination findings consistent with anteroinferior instability. Examination maneuvers that can be particularly helpful in reaching this diagnosis include the apprehension test, relocation test, and load-and-shift test. Apprehension in lower degrees of abduction often signifies the presence of a significant engaging Hill-Sachs lesion.

All patients should be evaluated with preoperative radiographic and MRI imaging. When reviewing preoperative imaging, the physician should pay particular attention to the presence of bony defects involving the humeral head and glenoid that may contribute to instability.

Patients with history and physical exam findings consistent with recurrent anteroinferior

instability and imaging studies that reveal large humeral head defects with glenoid bone loss less than 25% are excellent candidates for an arthroscopic remplissage procedure performed in conjunction with a routine capsulolabral repair.⁹⁻¹³ Patients with Hill-Sachs lesions associated with glenoid bone loss greater than 25% are better managed with an open Latarjet procedure.⁵ The presence of a humeral head defect that engages the anterior glenoid rim within the position of athletic function should be confirmed at the time of arthroscopy prior to proceeding with remplissage.^{11,12}

Surgical Technique

Examination under anesthesia is performed to assess shoulder stability on passive range of motion, particularly in abduction and external rotation. The patient is placed in the lateral decubitus position with the shoulder held in 45 degrees of abduction and 15 degrees of forward flexion using 10 pounds of traction. A standard posterior portal is established slightly lateral to the convexity of the humeral head to allow for complete visualization of the anterior capsular injury. An anterior-inferior portal is then created within the rotator interval under direct visualization. An anterior-superior portal is also established at the anterior margin of the acromion, superior-posterior to the biceps tendon. This portal is used for visualization of the humeral defect (Figure 1) and to assess the location of the posterior portal, which should be directly superior to the humeral head to facilitate anchor placement.

While viewing from the anterosuperior portal, the Hill-Sachs lesion is gently debrided with a shaver or thermal device to prepare for the remplissage and the size of the defect is measured using an arthroscopic probe. At this time, the anterior labrum and glenoid are also prepared for a routine capsulolabral repair; however, the Bankart repair should not be performed until after completion of the remplissage procedure. After adequate debridement, a double-loaded suture anchor is placed in the Hill-Sachs defect using the posterior portal (Figure 2). The cannula is then withdrawn external to the infraspinatus. A

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Figure 1. Hill-Sachs lesion: An anterior-superior portal established at the anterior margin of the acromion can provide excellent visualization of the humeral head defect. The Hill-Sachs lesion in this image is marked by the arrow.



Figure 2. Anchor placement: A double-loaded suture anchor is placed in the Hill-Sachs defect using the posterior portal.

penetrating grasper is passed through the infraspinatus tendon and posterior capsule proximal to the initial portal entry site to grasp and pull one suture limb. This step is then repeated to pull the second suture limb through the posterior capsule and infraspinatus tendon distal to the initial portal site. The inferior suture is first tied with the knot remaining extra-articular in the subdeltoid space. The superior set of sutures is tied next.

If multiple anchors are needed to complete the remplissage, the first anchor should be implanted and tied prior to the implantation of an additional anchor. The optimal location of the initial anchor placement should be as far lateral and superior in the defect as possible to minimize the potential loss of external rotation and maximize capsular volume

reduction and soft tissue fill of the Hill-Sachs defect. When the decision is made that a second anchor is necessary to achieve adequate fill of the defect, a grasper is used in the same fashion to pass one suture limb proximal and distal to the initial portal entry site. The sutures are again tied in succession beginning with the inferior suture. Additional anchors may then be placed as necessary. The surgeon should plan placement of all anchors prior to implantation of the first anchor since placement of additional anchors can become difficult after previous anchors are implanted and tied. Once all anchors are placed and sutures are tied, the infraspinatus tendon and posterior capsule should be firmly attached to and filling the prepared bony surface of the Hill-Sachs lesion (Figure 3). After completion of the remplissage procedure, the surgeon can proceed with a routine Bankart repair. If remplissage is done after performing a Bankart repair, there is a high likelihood of failure as the posterior shift resulting from remplissage may induce anterior capsular laxity.

Postoperative Protocol

The senior author prefers a standard Bankart postoperative protocol for all patients following an arthroscopic Bankart repair with or without remplissage. Patients are maintained in a sling for five weeks following surgery. During this time, patients are permitted to perform passive supine forward flexion in the scapular plane. Hand, wrist, and elbow range of motion are not restricted. After five weeks, patients are progressed to active-assisted shoulder range of motion exercises with physical therapy. At 8 to 10 weeks, patients are instructed to gradually advance to resistance exercises using bands guided by their physical therapist.



Figure 3. Completion of remplissage: After inserting all suture anchors and tying all sutures, the infraspinatus tendon and posterior capsule are fixed to the prepared bony surface of the Hill-Sachs lesion and 'fill' the defect as shown in this image.

Discussion

The remplissage procedure is an important adjunct to routine Bankart repairs for the surgical management of patients with recurrent shoulder instability primarily due to large Hill-Sachs lesions. This surgical technique offers significant advantages when compared to alternative methods to address humeral bony defects associated with glenohumeral instability. The all-arthroscopic nature of the remplissage avoids the morbidity associated with open surgical interventions. Arthroscopic remplissage can be performed in the acute and chronic setting and can be performed in conjunction with Bankart repair with minimal additional surgical time. In addition, this technique does not require the use of autograft or allograft bone. A case series performed at our institution by Park *et al* reported improved function, diminished pain, and patient satisfaction in 85% of patients treated with an all-arthroscopic remplissage and Bankart repair with episodes of recurrent instability reported by only three of twenty patients at two-year follow-up.⁹ Many of these patients had large bone defects and would be otherwise considered candidates for a Latarjet procedure.

A few complications of arthroscopic remplissage have been reported, including persistent posterosuperior shoulder pain in 5 of 15 patients treated with arthroscopic remplissage in one clinical study,¹⁴ and one case report of significant loss of external rotation.¹⁶ However, several studies have not demonstrated a correlation between remplissage and persistent shoulder pain,⁹⁻¹³ and have shown no significant loss of shoulder range of motion following this procedure.⁹⁻¹⁴ We believe that the use of arthroscopic remplissage is an effective means of addressing shoulder instability when used as an adjunct to routine capsulolabral repairs in carefully selected patients with large Hill-Sachs lesions and no significant glenoid bony defect.

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