Arthroscopic Stabilization With Hill-Sachs Remplissage and Bankart Repair: A Surgical Technique

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Abstract: Management of recurrent instability with coexisting Hill-Sachs defect is debatable. Isolated Bankart repairs do not address the bone loss sustained on the humeral side and are associated with higher recurrence risk in those with concomitant humeral bone loss. Further, bone block procedures may not be necessary to achieve stability if there is minimal glenoid bone loss and are associated with higher rate of complications. The arthroscopic remplissage allows the Hill-Sachs defect to be filled with a soft tissue structure to decrease the risk of recurrent dislocations when combined with a soft tissue Bankart repair. Key steps in performing the remplissage include achieving adequate visualization and secure fixation with suture anchors are discussed.

Key Words: arthroscopy, remplissage, Hill-Sachs defect, shoulder instability, Bankart repair

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In the management of recurrent anterior shoulder instability, the presence of a large Hill-Sachs lesion increases the likelihood of recurrence, particularly in those lesions that are able to engage the glenoid rim.[1,2] These lesions on the humerus are outside the normal contact zone of articulation between glenoid.[3] Small Hill-Sachs lesions have been shown to reduce force required to provide glenohumeral translation. Arthroscopic remplissage, involving a capsulotenodesis of the infraspinatus to the humeral head, allows soft tissue filling of this defect to reduce the risk of recurrent instability in patients with subcritical bone loss.[4] Remplissage is the preferred procedure in patients with minimal glenoid bone loss and an engaging, "off-track" lesion as defined by the recent equation by Di Giacomo et al.[3] Glenoid bone loss was <10%, whereas the Hill-Sachs deficit was >20% and "off-track" in this patient based off 3D magnetic resonance imaging reconstruction; thus, the patient was indicated for an arthroscopic remplissage and Bankart repair. The keys to this procedure are optimizing visualization of the bone defect—using strategic portal placement, creating a footprint amenable to healing, and appropriate suture anchor placement.

TECHNIQUE

Preoperative imaging is important to quantify the degree of bone loss. Either 3 dimensional computed tomography, magnetic resonance imaging, or diagnostic arthroscopy must be used to quantify bone loss on humeral and glenoid articular surfaces (Fig. 1). By manipulating the glenoid and humerus to an "en face" view, we estimate the percentage of bone loss using an arthroscopic probe to measure the dimensions of the Hill-Sachs lesion and perform dynamic arthroscopy, by placing the arm in abduction and external rotation, to show an engaging Hill-Sachs lesion.

Step 1: Positioning and Diagnostic Arthroscopy

The lateral position is preferred by the senior author due to improved visualization of the inferior glenoid labrum and improved anchor placement and suture passing for anteroinferior and posteroinferior labral tears. A bean bag is used to support the torso and pelvis and all extremities are well padded. Pump pressure of 50 mm Hg is maintained to achieve appropriate capsular distention and a lateral distraction device is used for optimal visualization (SPIDER2; Smith & Nephew, Andover, MA). Anesthesia is asked to maintain systolic blood pressure of 100 mm Hg for adequate hemostasis. The arm should be placed in neutral rotation and slight abduction for the procedure.

Portal Placement

The initial posterior viewing portal is placed off the posterolateral corner of the acromion. An anterior midglenoid portal is established with spinal needle localization right above the subscapularis tendon. A separate accessory anterolateral viewing portal is created superior to the biceps. The Hill-Sachs defect can be best appreciated through this portal (Fig. 3A). Inferior accessory 5 o'clock and 7 o'clock (Fig. 2) portals are also established with spinal needle localization and used to obtain the appropriate trajectory for anchor placement and suture passage to the anteroinferior and posteroinferior glenoid, respectively. The trajectory is particularly important when labral tears extend inferiorly along the glenoid rim, as in this case.

Step 2: Management of Hill-Sachs and Remplissage

After complete diagnostic arthroscopy, attention is first turned to the Hill-Sachs Lesion. The Hill-Sachs defect can be prepared by creating a bleeding bed using curette, bone shaver (4.5-mm Synovator; Smith & Nephew, Andover, MA), and gentle drilling with Kirschner wire. Preparing this bed will facilitate healing of the infraspinatus capsulotenodesis.

One suture anchor should be placed every 1 cm of the lesion, beginning at the inferior margin of the lesion. Anchors are placed percutaneously from a site 2 cm inferior to the posterior portal. Anchors are placed in the defect just off the articular surface to fill the entire defect with the remplissage. Typically, one can expect 2 to 3 anchors to be used for an average-sized lesion. Double-loaded bioabsorbable suture anchors are used (Healicoil suture anchor; Smith & Nephew, Andover, MA).

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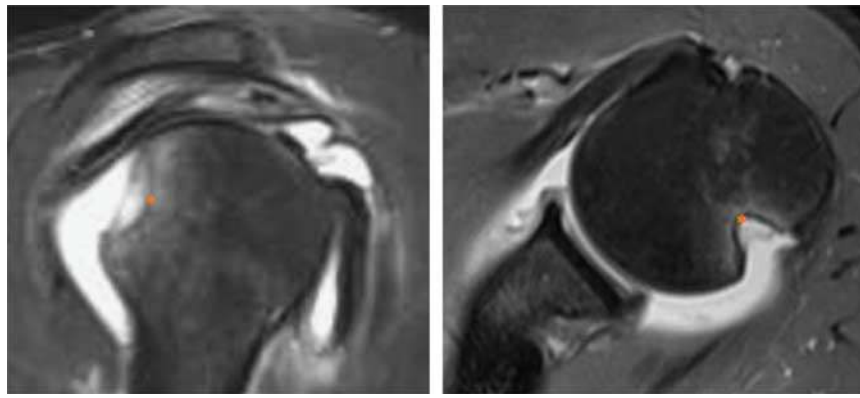

FIGURE 1. Magnetic resonance imaging showing moderate to large Hill-Sachs defect (*). full color online

A suture penetrating device is then passed through the posterior capsule and infraspinatus, to pass the sutures outside the capsule in a mattress manner (Fig. 3B). The first suture limbs maintain the trajectory of the suture anchor while the other limbs are passed inferior and superior to this penetration. These sutures should not be tied down until the Bankart repair is complete so as to not impede visualization. This step is repeated for the second anchor, placed 1 cm superior.

Step 3: Bankart Repair

In this patient, labral tear extended from the 6 o'clock position. An arthroscopic elevator is used to free the torn labrum for repair. Using the 7 o'clock portal, we begin the Bankart repair by percutaneously placing a 1.9 mm, double-loaded, suture anchor (Suturefix; Smith & Nephew, Andover, MA) at the 6:30 position of the glenoid. A spectrum instrument is used to pass a temporary PDS-II (polydioxanone) stitch, which is then used to shuttle sutures through the capsule and labrum from the anterior midglenoid portal. It is important to pass suture through the capsule and underneath the labrum to facilitate an anatomic repair. Suture passage is repeated for the next suture at a site anterior to the initial pass.

For the anteroinferior labrum, sutures are similarly shuttled as before with a spectrum device. When placing the anteroinferior anchor, the working portal is switched to the accessory 5 o'clock transsubscapularis portal to create a more orthogonal angle to the glenoid and limit risk of disrupting the posteroinferior anchor (Fig. 3C). When proceeding anteriorly for the remaining sutures, the anterior working portal may be used. It is important to place the labrum under tension when passing suture to identify the precise location of the repair; additionally, this may reduce the tension during knot tying.

Step 4: Completing the Remplissage

After the labral repair is completed, the arthroscope is inserted into the subacromial space from the standard posterior portal. A standard mid-lateral portal is created, and a bursectomy is completed. The bursa in the subdeltoid space is debrided laterally with shaver and continued down the back with a radiofrequency wand to avoid cutting the remplissage sutures. The viewing portal is then switched to the mid-lateral portal. The sutures are retrieved through an 8.25-mm cannula through the 7 o'clock accessory portal; at this point, an instrument can be placed through the standard posterior portal to help retract the soft tissues for visualization during knot tying (Fig. 3D) (Supplementary Video, Supplemental Digital Content 1, http://links.lww.com/TSES/A33).

Postoperative Rehabilitation

The addition of remplissage to arthroscopic stabilization does not significantly change rehabilitation. Patients are first immobilized in a sling (UltraSling; DonJoy, Vista, CA) 4 weeks after surgery. The arm must be placed in neutral rotation after surgery to limit tension to the posterior sided repair. Passive range of motion may be started 10 to 14 days postoperatively with supine forward flexion to 90 degrees and external rotation at adduction to 30 degrees. Active range of motion may be started at 4 to 6 weeks, but limit forward flexion to 140 degrees and external rotation at adduction to 40 degrees. Full painless range of motion can be instituted 8 to 12 weeks postoperatively (Table 1).

DISCUSSION

Patient selection is critical in performing arthroscopic remplissage. Engaging "off-track" Hill-Sachs in the presence of subcritical glenoid bone loss should lower the threshold for

FIGURE 2. Portal placement for arthroscopic remplissage: anterior midglenoid portal (A); superior anterior portal (B); posterior portal (C); inferior accessory 7 o'clock portal (D); inferior accessory 5 o'clock portal (E). Cannulas (8.25 mm) were used for accessory 7 o'clock and anterior midglenoid portals. full color online

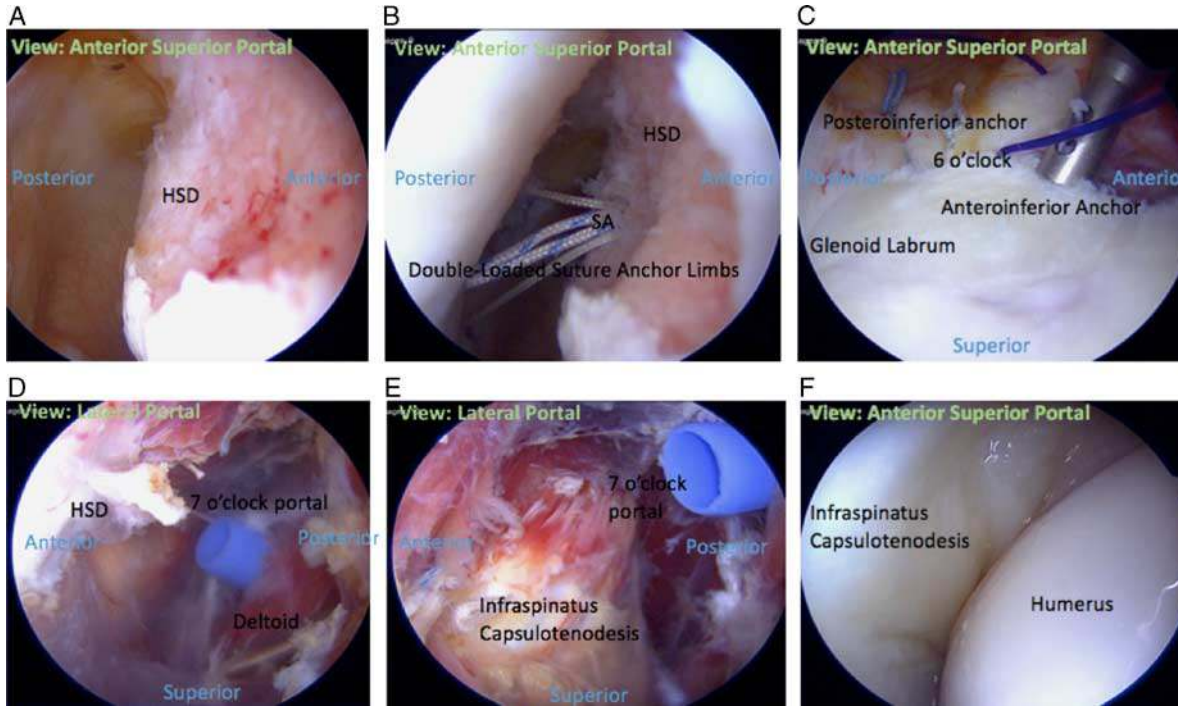

FIGURE 3. Arthroscopic remplissage with Bankart repair viewing from superior anterior portal: HSD estimated as 20% of humeral head surface (A); working through posterior portal to load first triple-loaded anchor in Hill-Sachs footprint (B); labral repair working through transsubscapularis portal to drill anteroinferior anchor (C); retraction of soft tissue structures through 7 o'clock portal while tying down sutures of the remplissage (D); final remplissage showing infraspinatus capsulotenodesis within the HSD (E); remplissage of Hill-Sachs lesion viewed from anterior superior portal showing filled defect by infraspinatus and posterior superior capsule (F). HSD indicates Hill-Sachs defect; SA, suture anchor. full color online

TABLE 1. Pearls and Pitfalls of Performing Arthroscopic Remplissage With Bankart Repair

Pearls	Pitfalls
After placing remplissage anchors, do not tie sutures until after completing Bankart repair so that visualization is not impaired	The transsubscapularis portal encounters several neurological structures—keep a lateral trajectory to avoid injury to neurological structures
Watch base of anchor as you pull suture out of the capsule during remplissage, to ensure you are not unloading it	While dissecting the subacromial space for remplissage, careful not to cut sutures—use of radiofrequency wand instead of burr can avoid this
Placing the anterior capsulolabral complex under tension by putting the arm in external rotation, allows you to differentiate torn labrum from native anatomy	Excess suture anchors in the anterior labrum can cause increase constraint in range of motion—generally stop repair at the equator of the labrum to avoid
Accessory 7 o'clock portal is useful for posteroinferior anchor placement	Greatest risk for soft tissue failure postoperatively is during the 6-8 wk period
Accessory 5 o'clock portal is useful for anteroinferior anchor placement	
Employ knot pusher on sutures to locate the remplissage anchors when ready to tie down	When tying down the remplissage, visualization may be improved by employing an assistant to retract soft tissue structures in the subacromial space

performing a remplissage. Remplissage has been found to reduce recurrence rates of instability (0% to 20% reported in literature) when compared with Bankart repair alone (odds ratio, 0.07 to 0.88).[5,6] By prioritizing key steps, the arthroscopic remplissage is an effective procedure in the management of recurrent anterior instability with an engaging Hill-Sachs lesion.

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