Arthroscopic Repair of Posterior Bony Bankart Lesion and Subscapularis Remplissage

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Abstract: Posterior shoulder instability with glenoid bone loss has only a fraction of the prevalence of anterior instability. Unlike the latter, there is a paucity of literature regarding the treatment of posterior bony Bankart lesions and even less with concomitant reverse Hill-Sachs lesions. This combination of pathology leads to a difficult situation regarding treatment options. We present our technique for arthroscopic repair of a posterior bony Bankart lesion and reverse Hill-Sachs lesion. The importance of proper portal placement cannot be overstated. By use of the lateral position and strategically placed portals, the posterior bony Bankart lesion and attached labral complex were appropriately mobilized. We reduced the glenoid bone, with the attached capsulolabral complex, to the glenoid rim and performed fixation using a knotless suture anchor. We then placed 2 double-loaded suture anchors into the reverse Hill-Sachs lesion. The sutures were passed creating horizontal mattress configurations that were tied at the end of the procedure, effectively externalizing the humeral head defect. Our technique results in satisfactory fragment reduction, as well as appropriate capsular tension, and effectively prevents the reverse Hill-Sachs lesion from engaging.

Bone defects of the glenoid and humeral head can result in instability and recurrent dislocation because they alter the natural congruency and disrupt the inherent static stabilizers of the gleno-humeral joint. In contrast to anterior instability, posterior instability is uncommon, accounting for only 2% to 12% of all the patients with glenohumeral instability. The mechanism resulting in a posterior bony Bankart lesion is usually a traumatic event resulting in posterior translation of the humeral head with the arm positioned in flexion and adduction. This has been well documented in athletes, especially football players and weightlifters, in addition to patients with seizures and those sustaining electric shock. Traumatic posterior shoulder dislocations can lead to impression fractures on the anterior surface of the humeral head, known as “reverse Hill-Sachs lesions.” Depending on the size of the defect, the reverse Hill-Sachs lesion can engage on the posterior glenoid rim with internal rotation leading to subluxation or recurrent dislocation events. The most common complication after posterior dislocation is recurrent instability, with a 17.7% recurrence rate within the first year after dislocation. The risk is highest in patients who are aged less than 40 years, sustain the dislocation during a seizure, and have a large reverse Hill-Sachs lesion (>1.5 cm³).

There exists a general consensus that glenoid bone loss with recurrent instability should be treated by restoring the articular surface anatomy. The technique used to treat reverse bony Bankart lesions, as well as determining when to add a reverse remplissage procedure, remains controversial, however. Methods including posterior iliac crest glenoid bone block, open repair with internal fixation, and arthroscopic labral repair have shown variable outcomes in the literature, and an algorithm based on the degree of bone loss is less concise than anterior glenoid bone loss.

The purpose of this article is to describe our technique of restoring the glenoid articular surface by repairing a large posterior bony Bankart lesion and eliminating an engaging reverse Hill-Sachs lesion using reverse remplissage of the subscapularis (Table 1, Video 1). This all-arthroscopic procedure avoids the morbidity of an open technique or detachment of the subscapularis and allows one to address both the posterior bone loss or capsulolabral pathology and an anterior engaging lesion.
Table 1. Surgical Pearls and Pitfalls

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<th>Description</th>
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<td>Glenoid bone loss should be accurately quantified.</td>
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<td>The surgeon should identify whether a reverse Hill-Sachs lesion engages the</td>
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<td>posterior glenoid.</td>
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It is critical to accurately place the portals.

- The posterior portal should be made slightly more superiorly and laterally than usual—this allows the surgeon to work below the portal more easily.
- A posterior portal that is too medial should be avoided.
- A spinal needle should be used to accurately place both anterior portals within the rotator interval.
- The anterior-superior portal should enable easy access to the reverse Hill-Sachs lesion.
- The accessory posterior-lateral portal should be made using a spinal needle and provide the exact trajectory needed to the most posterior-inferior position on the glenoid.

Failure to properly place the portals can lead to inadequate labrum mobilization, inability to capture the capsule and labrum with suture, and improper anchor positioning.

- Viewing from the anterior-medial portal (in the interval) provides a full view of the posterior glenoid.
- Placing the Liberator or other mobilizing instrument from the anterior-superior portal provides an excellent trajectory to the anterior and posterior labrum.
- Careful mobilization is warranted. A pitfall to avoid is creating a radial tear with the sharp Liberator, creating 2 separate labral segments.

Thorough mobilization of the labrum is paramount to a tension-free repair.

- A well-mobilized labrum should float up evenly with the glenoid edge.
- Inadequate mobilization will prevent the labrum from reaching the glenoid face, leading to suboptimal repair and potential failure of the stabilizing procedure.
- A chevron-shaped drill guide should be used.
  - This enables the guide to easily sit on the glenoid face under axial load without slipping.
  - Medial placement of the anchors on the glenoid neck should be avoided.
- The surgeon should capture the capsule in addition to the labrum with sutures.
- If tying arthroscopic knots, the surgeon should ensure they are docked on the side away from the articular cartilage to avoid abrasion to the humeral head.
- Remplissage should be performed.
  - The calcified layer within the reverse Hill-Sachs lesion should be removed.
  - Anchors should be placed at the periphery of the lesion.
  - This allows the subscapularis to fill the lesion effectively excluding it from the glenohumeral joint.
- Placing the anchors medially within the defect will potentially allow the defect to continue engaging the glenoid.

**Surgical Technique**

**Step 1**

We perform shoulder procedures with the patient in the lateral position with 10 lb of free-weight traction. After proper preparation and draping, we create our posterior portal slightly more laterally and superiorly than the standard portal. This not only provides good visualization but also enables us to use it as a working portal that is appropriately positioned for access to the posterior glenoid. It is much easier to use the suture shuttle instrument below the cannula, hence our reasoning for placing the portal slightly more superiority. A standard 4-mm 30° arthroscope is inserted.

**Step 2**

After diagnostic arthroscopy identifying labral pathology, we place both of our anterior portals. The first is placed medially in the rotator interval (midglenoid portal), whereas the second cannula is located high and laterally within the interval (anterior-superior portal) at this point (Fig 1). The 2 separate cannulas resemble a double-barrel configuration when viewed from the posterior portal.

We then switch the arthroscope to visualize from the anterior aspect, giving us an excellent view of the posterior bone loss. Specific attention is given to the degree of posterior bone loss and size of the reverse Hill-Sachs lesion, not to mention the presence or absence of a reverse humeral avulsion of the glenohumeral ligament (reverse HAGL). Figure 2 shows the posterior bone loss encountered in our patient.

**Step 3**

While the surgeon is viewing from the anterior portal, the posterior bony Bankart lesion with the attached capsulolabral complex is completely mobilized from its most inferior to superior extent. We begin this mobilization from the anterior-superior portal with an angled Liberator (Arthrex, Naples, FL) (Fig 3). One should be aware that if the appropriate angled device is not used, the labrum could be lacerated, creating a radial tear with 2 separate floating fragments. If the capsulolabral complex is scarred too medially to reach from the anterior-superior portal, working from the posterior or posterolateral portal may allow further access medially. Once appropriate mobilization is obtained, the bony fragment and labrum will often “float” up to the level of the glenoid surface for a tension-free repair.

**Step 4**

Once the bone-labral complex is well mobilized, we prepare the glenoid bone to improve healing. Using a rasp (Arthrex) or motorized shaver, the surgeon removes the calcified layer often covering the native glenoid bone and creates a bleeding bone bed to facilitate healing. If using a shaver, the surgeon must avoid causing iatrogenic glenoid bone loss.

**Step 5**

At this point, we have mobilized the posterior bony Bankart lesion and prepared a bleeding bone bed. The posterior bony fragment is now reduced to its anatomic position. If this cannot be accomplished without excessive tension, additional mobilization is required.
Beginning inferiorly, we capture the bony fragment in addition to the capsule using an Arthrex FiberLink suture. This allows us to create a “luggage tag” stitch by simply passing the single end through the loop and removing tension. To provide better access to the inferior aspect, we place a traction stitch (Fig 4) around the labrum at the midaspect of the glenoid. Often this will be used and placed in our second suture anchor. This pulls the inferior labrum taut and more superiorly, enabling easier passage of the most inferior suture through the capsule and inferior labrum. The surgeon places the drill guide through the accessory posterolateral portal (still viewing from anterior) at an optimal trajectory and predrills for our knotless anchor. We find it more efficient to use the chevron-shaped drill guide because its wedge shape fits well on the glenoid edge and decreases the chance of sliding off with axial load. We also recommend using a small cannula in the posterolateral portal to prevent soft-tissue bridges and to decrease the chance of creating multiple holes in the thin posterior capsule. At this point, the most inferior FiberLink suture is loaded into a 2.9-mm SutureTak knotless anchor (Arthrex) and immediately placed in the hole. Using knotless anchors, we leave approximately 2 to 3 mm of slack between the anchor and labrum to appropriately tension the repair after driving in the anchor. Additional anchors are placed approximately 5 mm apart by repeating the aforementioned steps (Fig 5). We close the posterior portal with a suture at the end of the case (Fig 6).

**Step 6**

After repair of the posterior bony Bankart lesion, we turn our attention to the reverse Hill-Sachs lesion (Fig 7). The camera is switched back to the posterior portal. With the shaver or a curette (from anteriorly), we now remove the calcified layer covering the lesion to again create a bleeding bed of bone. With a spinal needle, an accessory anterolateral portal is made under direct visualization. A drill guide or punch is placed through the subscapularis, and one hole is placed medially and another laterally within the reverse Hill-Sachs lesion. Two double-loaded 4.75-mm SwiveLock anchors (Arthrex) are then placed into the drill holes (Fig 8). Using a BirdBeak device (Arthrex), we capture all sutures (4 pairs total). The sutures are then tied in a horizontal mattress fashion, pulling the subscapularis into the defect. This effectively creates 2 horizontal mattress sutures medially and 2 laterally (Fig 9).

**Discussion**

To date, there has been a paucity of literature accurately establishing which posterior bone defects should be managed with bony procedures, as well as the correlation between posterior bone loss and risk of redislocation. Algorithms on anterior bone loss have been reported in the literature, however. These algorithms take into account the degree of bone loss; location of defects; associated reverse Hill-Sachs lesions; and patient age, activities, and medical factors such as unstable epilepsy.1

DeLong et al.9 reported in their systematic review on posterior shoulder instability that stabilization with...
anchors results in fewer recurrences and revisions than anchorless repairs in young adults engaging in highly demanding physical activity. Furthermore, the literature has suggested that patients with posterior labral tears treated arthroscopically have good outcomes with respect to stability, recurrence of instability, patient satisfaction, return to sport, and return to previous level of play.

Our arthroscopic approach allows for improved visualization and avoids the surgical morbidity associated with open arthrotomy (Table 2). The described technique highlights the crucial role of proper portal placement. The posterior portal is established slightly more superiorly and laterally than usual to enable its use as a working portal and provide an optimal angle for suture shuttling and anchor insertion. The double-barrel configuration of the anterior portals allows...
perpendicular access to the reverse Hill-Sachs lesion, provides an excellent view while the surgeon is working posteriorly, and gives an excellent trajectory for mobilization of the posterior labrum. In addition, our remplissage technique differs from that of Krackhardt et al. in that we place 1 suture anchor medially and 1 laterally into the defect.\textsuperscript{10} By doing so, a larger footprint is established, which allows for a broader area of contact and an improved healing environment for the subscapularis tendon.

**Fig 7.** In a left shoulder, viewing from the midglenoid portal provides good visualization of the reverse Hill-Sachs lesion (RSH) on the anterior humeral head. (S, subscapularis tendon.)

**Fig 8.** Two double-loaded 4.75-mm SwiveLock anchors (Arthrex) inserted into the reverse Hill-Sachs lesion are shown in a left shoulder, viewing from the midglenoid portal. These anchors are placed percutaneously within the reverse Hill-Sachs lesion through the subscapularis tendon (S).

**Fig 9.** An excluded reverse Hill-Sachs lesion is shown in a left shoulder, viewing from the midglenoid portal. The subscapularis (S) is tied into the defect by use of a horizontal mattress technique to provide a broad surface area for healing.

**Table 2.** Advantages, Disadvantages, Risks, and Limitations of Technique

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<th>Advantages</th>
<th>Disadvantages</th>
<th>Risks</th>
<th>Limitations</th>
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<td>Minimally invasive approaches facilitate recovery and rehabilitation.</td>
<td>Bony procedures such as Latarjet or posterior bone block procedures are technically difficult to perform.</td>
<td>Infection (&lt;1%)</td>
<td>Surgeon experience is necessary to successfully carry out the technique arthroscopically.</td>
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<td>The technique allows the surgeon to access the anterior, posterior, and inferior glenoid and Hill-Sachs lesion reliably and reproducibly.</td>
<td>There are some reports of a higher risk of failure with arthroscopic labral repair.</td>
<td>Stiffness</td>
<td>Bone loss may preclude this technique depending on surgeon experience.</td>
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<td>Lateral positioning with traction allows easy access to the most inferior aspect of the glenoid.</td>
<td>There is a risk of neurovascular injury with the portals.</td>
<td>Failure of repair</td>
<td>Preoperative assessment with computed tomography and/or magnetic resonance imaging will provide insight into the degree of bone loss.</td>
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<td>Percutaneous placement of the posterior anchor provides an optimal trajectory for the most posterior-inferior anchor placement.</td>
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<td>Iatrogenic cartilage injury</td>
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configuration also reduces strangulation of the tissue and possible tissue necrosis, as described by DeLong et al.⁹ and Koo et al.¹⁰ Using the subscapularis to fill the reverse Hill-Sachs lesion effectively externalizes the lesion and prevents engaging on the posterior-inferior glenoid with internal rotation of the arm.

Carefully scrutinizing advanced imaging such as computed tomography and/or magnetic resonance imaging provides better visualization of bone loss and more accurate estimation of the degree of bone loss. This is particularly important for bone loss greater than 20% in which posterior bone block procedures may be required for stability. Limitations exist regarding our technique. First, it is only reliable for smaller posterior bony Bankart lesions. In lesions with a larger degree of bone loss, the technique may not provide adequate stability, thus necessitating other bony procedures. Second, our case demonstrates an acute injury. Chronic lesions are more difficult to mobilize and may be healed in a medial position, requiring extensive mobilization. Finally, we suggest explaining to the patient that an open procedure may be required if the reverse Hill-Sachs lesion or posterior bone loss is greater than expected. In conclusion, our technique offers concise arthroscopic management of a posterior bony Bankart lesion and moderate-sized reverse Hill-Sachs lesion and provides immediate stability for an acute posterior dislocation of the shoulder.

References