

# Partial Humeral Head Arthroplasty, Glenoid Allograft Augmentation, and Open Bankart Reconstruction for Critical Glenoid Bone Loss and Engaging Hill-Sachs Lesion

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**Background:** Shoulder instability with critical bipolar bone loss can be difficult to treat. Anterior glenoid bone block augmentation and partial humeral head resurfacing is a viable option.

**Indications:** This procedure is indicated in patients with both critical anterior glenoid bone loss ( $\geq 20\%$ ) and an engaging Hill-Sachs lesion.

**Technique Description:** A deltopectoral approach is performed, followed by a subscapularis tenotomy. The Hill-Sachs lesion is resurfaced with a partial humeral head arthroplasty. The anterior glenoid bone loss is replaced with a prefabricated allograft. An open Bankart repair is then performed.

**Results:** Three case reports give evidence that this technique is a viable surgical option for patients with critical glenoid bone loss and an engaging Hill-Sachs lesion.

**Discussion/Conclusion:** Partial humeral head resurfacing, glenoid allograft augmentation, and open Bankart is a viable surgical option for patients with critical anterior glenoid bone loss and an engaging Hill-Sachs lesion.

**Patient Consent Disclosure Statement:** The author(s) attests that consent has been obtained from any patient(s) appearing in this publication. If the individual may be identifiable, the author(s) has included a statement of release or other written form of approval from the patient(s) with this submission for publication.

**Keywords:** Hill-Sachs; critical bone loss; HemiCap; anterior instability

## VIDEO TRANSCRIPT

This video article reports the technique of utilizing a partial humeral head arthroplasty, glenoid allograft augmentation, and open Bankart reconstruction to treat a patient with critical glenoid bone loss and an engaging Hill-Sachs lesion.

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In this video, we will discuss the background information related to this challenging pathology. We will also discuss other treatment options, the patient positioning that is required for this technique, a detailed description of the surgical procedure itself, how to avoid potential complications specific to the technique, the postoperative rehabilitation protocol, and the outcomes of this procedure currently reported in the literature.

Shoulder instability in the setting of glenoid bone loss and/or an engaging humeral defect, also known as a Hill-Sachs lesion, presents patients and surgeons with a very difficult problem to address. The literature is clear that addressing both critical glenoid bone loss and engaging humeral head defects can optimize outcomes and decrease recurrent instability.<sup>1,2</sup>

While shoulders with unipolar glenoid bone loss that is  $\geq 20\%$  of the native glenoid can effectively be stabilized with a Latarjet procedure or bone block allograft, and shoulders with unipolar engaging Hill-Sachs lesions can effectively



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be stabilized with bone grafting the defect or arthroplasty resurfacing techniques, it is the shoulder that has both of the aforementioned pathologies that lack a well-established treatment algorithm in the literature.

The authors agree with a 2009 report of such a patient by Grondin and Leith<sup>3</sup> who discussed that surgeons should be prepared to address both glenoid and humeral pathologies if imaging provides evidence that both sides have 30% or more surface loss. The primary author of this video prefers to treat these complicated patients on a case-by-case basis. A discussion of the case-specific characteristics that led the primary author to perform the surgical technique presented in this video will be discussed later in this video.

Several options exist for treating large, engaging Hill-Sachs lesions of the humeral head. These options include bone grafting the defect, transferring the infraspinatus into the defect, derotational osteotomy of the humerus to decrease the engagement of the glenoid, and of course humeral head arthroplasty.

Recently, there have been reports of combining a coracoid transfer, or Latarjet procedure, for glenoid bone loss and a partial humeral head arthroplasty to cover the engaging Hill-Sachs lesion.

The implant utilized in the literature is the HemiCAP partial humeral resurfacing arthroplasty (Anika Therapeutics). This comes in numerous sizes, offsets, and contours, allowing for precise matching of the residual, uninvolved cartilaginous head.

Although coracoid transfer has been previously described in the literature to address critical bipolar bone loss, another option for glenoid bone grafting exists. This is the Glenojet (Anika Therapeutics). The Glenojet is a prefabricated allograft. Its use does not come with the same complication profile as the traditional coracoid transfer.

In this technique video today, we will be addressing a 33-year-old woman with epilepsy who presents to our clinic with recurrent left shoulder instability that has recurred countless times over the previous 15 years.

On clinical examination, the left shoulder dislocates routinely with only 20° of external rotation.

There was critical bone loss of the anterior glenoid measuring 33% of the native surface. A massive off-track Hill-Sachs lesion measuring 38% of the humeral head was characterized.

Although there is no defined algorithm to guide the treatment of a patient who presents with severe bipolar bone loss in the setting of instability, let us discuss the clinical decision making that led to this physician-patient decision to proceed with partial humeral head resurfacing and glenoid allograft augmentation.

First, multiple options were discussed with the patient, including undergoing a Latarjet and allograft bone block augmentation of the Hill-Sachs lesion. However, the patient preferred not to wait for a fresh allograft to become available due to her high frequency of dislocations with relatively minimal external rotation. Moreover, the primary author of this video has treated several similar large Hill-Sachs defects successfully using a partial humeral head arthroplasty. Both reasons made the partial head resurfacing the desired procedure in this case for the humeral side.

Concerning the glenoid bone loss, the patient preferred to avoid the morbidity and complication profile associated with the Latarjet, making the prefabricated allograft a desirable option. We feel that a precontoured glenoid allograft is more restorative of native glenoid anatomy than is the Latarjet. Furthermore, it simplifies subscapularis management with a standard vertical tenotomy versus a subscapularis split, the latter of which does not provide access the posterior Hill-Sachs lesion.

Finally, in our opinion, an anatomic capsulolabral reconstruction, with or without capsular shift, is much easier accomplished through a vertical subscapularis tenotomy rather than a subscapularis split.

General anesthesia was induced. An examination under anesthesia was performed on the patient. The glenohumeral joint could be dislocated with anterior load and shift testing. The patient was then placed into a beach chair position with a padded Mayo stand used for positioning of the arm.

A standard deltopectoral approach is performed. The subscapularis is tenotomized 0.5 cm from its insertion. The humeral head is dislocated and the massive Hill-Sachs lesion is visualized. The drill guide is placed at the margin of intact bone just anterior to the Hill-Sachs defect to maximize bone stock for implant purchase. If the pin is placed in the center of the lesion, there is insufficient bone for implant purchase. A guide pin is placed into the head. A step drill is placed over the guide pin and drilled until the shoulder of the step is flush with the articular surface. A tapered post for the implant is then advanced into the drill hole until the top is flush with the articular surface.

Now a centering shaft is placed into the taper post and the contact probe is rotated to measure articular index points superior, inferior, medial, and lateral to the center of the post. These index points are then utilized to select the most appropriate articular component to maximize and is contoured with the uninvolved residual cartilage. Based on index point measurements, the appropriate reamer offset and diameter is used to ream involving articular cartilage to the level of the taper post, which has a hard stop while reaming. A sizing trial is then placed to ensure that the final implant is congruent with the residual humeral head. The final implant is placed and the humeral head is reduced.

We then turned our attention to the critical bone loss on the anterior glenoid. A drill guide for the precontoured anterior glenoid allograft is placed flush with the articular surface of the glenoid. Care is taken to make sure the guide is not positioned lateral to the articular surface. Two guide pins are placed bicortically and the drill guide is removed. The reamer is used to remove bone down to the level of pin insertion. Although, one can measure off of the pins, we elect to remove the pins and manually measure for screw length. The final allograft is 10 mm anterior to posterior, so 10 mm is added to our manual depth guide measurements. One guide pin is reintroduced and the prefabricated allograft is passed down the pin. The screws are then placed and the graft is secured. The graft is inspected to ensure that it is flush with the residual articular surface.

To supplement our construct, an open Bankart repair was also performed. Three suture anchors were placed

into the anterior neoglenoid. The middle suture anchor is placed between the allograft and neoglenoid in an attempt to mobilize the labrum over the allograft and make it an extra-articular structure. Care is taken not to capture the subscapularis in our open Bankart repair. The sutures are tied, completing the open Bankart portion of the procedure. Vancomycin powder is placed into the wound. The subscapularis tenotomy is repaired with multiple figure-of-8 #2 reinforced polyester sutures. A #2 suture is also utilized to close the rotator interval.

Anterior-posterior and Velpeau radiographs obtained at her first follow-up visit demonstrate a congruent partial humeral resurfacing arthroplasty and an appropriately placed allograft on the anterior glenoid.

A potential complication that is unique to this technique and procedure is the theoretical risk of secondary glenoid wear due to the partial humeral arthroplasty being incongruent with residual humeral articular surface. To avoid this potential incongruency, multiple checks are built into the technique. Most importantly, use the contact probe to measure 4 reference points, superior, inferior, anterior, and posterior to the center post. This helps to guide the surgeon to choose the correct reamer size and the correct implant, which can come in numerous offsets, heights, and diameters.

The postoperative rehabilitation protocol in this case is as follows. The shoulder is immobilized in internal rotation for 6 weeks, allowing for pendulums and elbow and wrist motion. At 6 weeks, shoulder motion is initiated, with a 30° external rotation limit. Subscapularis strengthening and terminal motion are delayed until 12 weeks postoperatively.

Outcomes in the literature related to this procedure are limited to case reports. Grondin and Leith<sup>3</sup> reported 2 patients with combined large Hill-Sachs lesions and bony Bankart lesions treated with Latarjet and partial humeral

head resurfacings. At 1 year follow-up, both patients had no incidence of recurrent instability. Both patients were happy with improved range of motion. American Shoulder and Elbow Surgeons (ASES) and Western Ontario Shoulder Instability Index (WOSI) scores had both improved.

Alternatively, Moros and Ahmad<sup>4</sup> had reported the use of partial humeral head resurfacing and Latarjet in a 50-year-old patient with bipolar critical bone loss who failed an open Bankart stabilization procedure. This patient was successfully treated with no incidence of recurrent dislocation.

In conclusion, partial humeral head resurfacing, with glenoid allograft augmentation and open Bankart reconstruction, is a viable surgical option for patients with critical anterior glenoid bone loss and an engaging Hill-Sachs lesion. The precontoured glenoid allograft used in this case is a specific novel augmentation, possibly mitigating complications seen with the Latarjet procedure in combination with partial humeral head resurfacing and open Bankart reconstruction.

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