

# Arthroscopic Transfer of the Subscapularis Tendon for Treatment of a Reverse Hill-Sachs Lesion



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**Abstract:** Posterior shoulder instability occurs less often than anterior shoulder instability but is increasingly recognized as a relatively common condition. The reverse Hill-Sachs lesion is present in some patients with posterior instability and is best described as an impaction fracture of the anterior humeral head. These reverse Hill-Sachs lesions can predispose the patient to recurrent instability events and may need to be addressed directly at the time of surgery. Multiple open and arthroscopic procedures have been described to transfer bone or soft tissue structures into this reverse Hill-Sachs defect. An arthroscopic technique for the transfer of the subscapularis tendon into the defect using a standard 30° arthroscope, standard portals, and suture anchors is described.

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Posterior shoulder instability is less common than anterior shoulder instability; however, posterior instability is becoming increasingly recognized in the surgical treatment of the unstable shoulder.<sup>1,2</sup> The Hill-Sachs lesion, an impaction fracture of the posterolateral humeral head, is a well-described lesion common in anterior shoulder instability. An analogous lesion is often found in posterior shoulder instability as an impaction fracture of the anterior humeral head.<sup>1,2</sup> This lesion predisposes the shoulder to repeat instability events when the shoulder is placed in internal rotation and is a known risk factor for recurrent instability.<sup>1,3</sup>

Initially, open procedures were developed to advance the subscapularis into the reverse Hill-Sachs lesion; more recently, arthroscopic techniques have been proposed. There are potential benefits to an arthroscopic technique

for subscapularis tendon filling of a reverse Hill-Sachs defect. Arthroscopy offers the opportunity to manage all causes of symptoms at the time of surgical intervention because of its ability to access the entire glenohumeral joint. Likewise, an arthroscopic approach obviates the need to detach the subscapularis tendon, which is a primary stabilizer resisting posterior translation. The subscapularis has a large tendon that is very suitable for transfer into the reverse Hill-Sachs lesion via arthroscopic techniques. The arthroscopic technique we describe here is accomplished using standard portals and suture anchors, and it is technically similar to the “remplissage” technique described for the treatment of the posterolateral Hill-Sachs lesions seen in anterior shoulder instability.<sup>4,5</sup>

## Surgical Technique

The authors prefer the lateral decubitus position for shoulder instability cases. A standard posterior portal is established, and a thorough diagnostic arthroscopy is performed to identify all intra-articular pathology. An anteroinferior portal is established using a spinal needle to localize the entry point just superior to the subscapularis tendon; it is important to ensure that the angle of entry allows perpendicular access to the reverse Hill-Sachs lesion for the placement of suture anchors into the humeral head defect as required. An anterosuperior portal is then established as a viewing portal by using a spinal needle to localize the entry point just anterior to the biceps tendon. Posterior labral pathology is typically identified, and it can be addressed using standard arthroscopic techniques according to the surgeon’s preference. After debridement and mobilization of the

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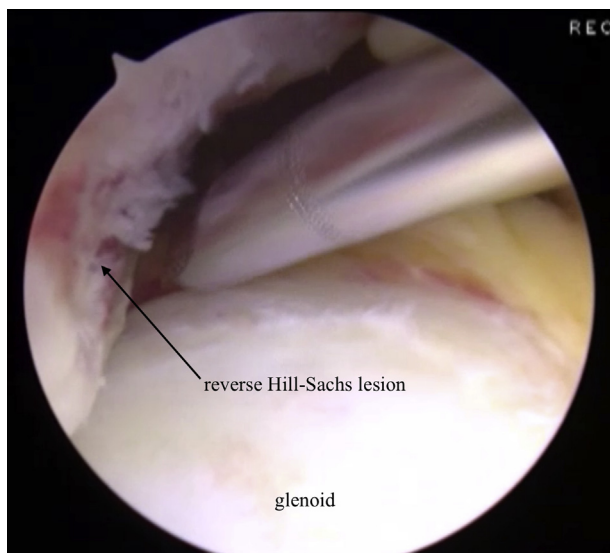
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**Table 1.** Pearls and Pitfalls

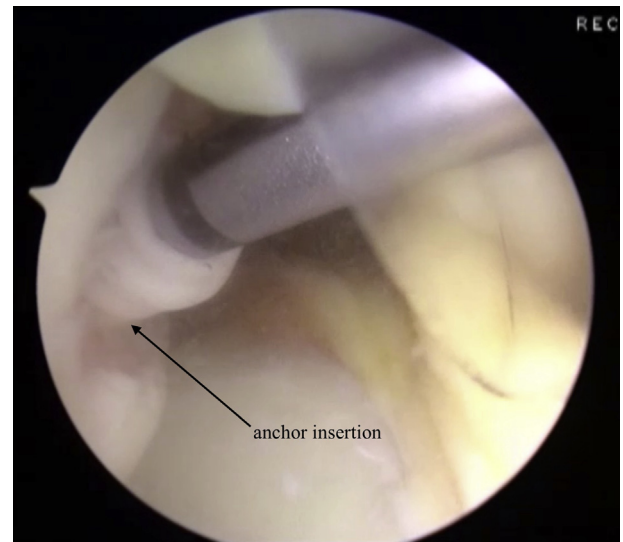
Pearls	Pitfalls
After posterior stabilization is completed and under direct arthroscopic visualization, determine if the reverse Hill-Sachs lesion engages on the posterior glenoid rim to determine whether subscapularis tendon advancement into the defect might be a consideration	If insufficient rotator interval tissue is debrided, it is difficult to fully visualize the anterior, extra-articular portion of the subscapularis tendon
Be sure that the anteroinferior portal is in a good position for the placement of suture anchors into the reverse Hill-Sachs lesion as necessary	Do not pass sutures through the subscapularis tendon too medially so as to avoid excessively tensioning the tendon

posterior labral tear, multiple suture anchors are placed along the posterior glenoid rim, and the sutures are sequentially passed and tied to reapproximate the labrum and retension the posterior capsuloligamentous structures. If, after completion of the posterior reconstruction procedure, significant posterior humeral translation remains, then advancement of the subscapularis tendon into the reverse Hill-Sachs defect may be considered as a supplemental stabilizing procedure (Table 1).

A 30° arthroscope in the anterosuperior portal is used for viewing throughout the procedure (see Video 1). The anteroinferior portal is used as the working portal, and an 8.75-mm threaded cannula (Arthrex, Naples,

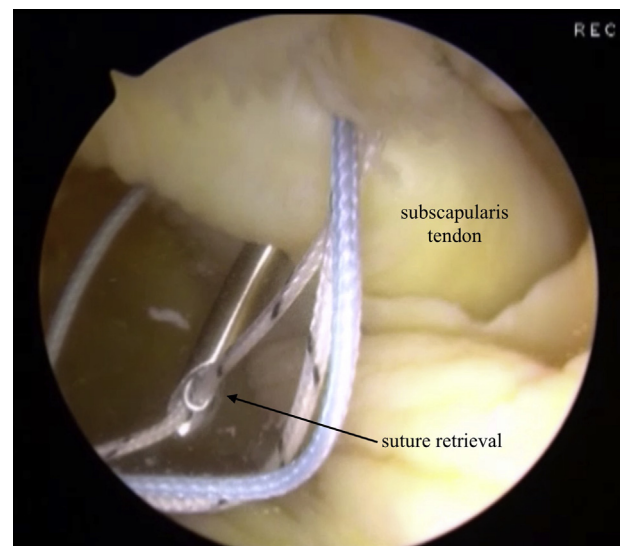


**Fig 1.** Arthroscopic view of the left shoulder in the lateral decubitus position with a 30° arthroscope in the anterosuperior portal. The reverse Hill-Sachs lesion is debrided with an arthroscopic shaver to establish an area of bleeding bone for the transferred tendon to heal into and in preparation for insertion of a suture anchor into this defect.

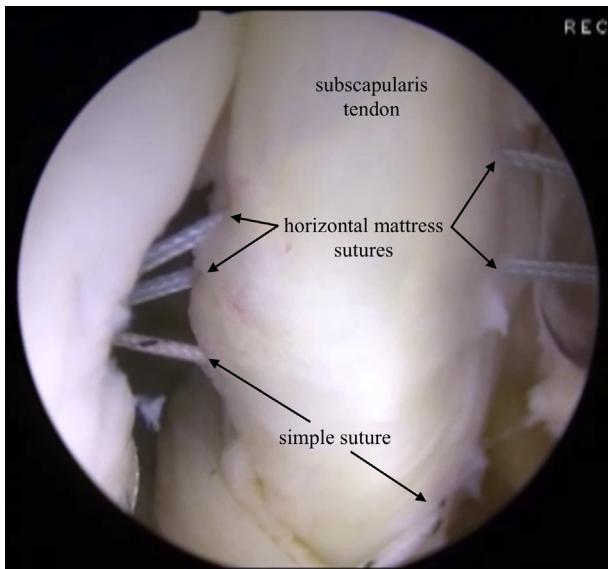


**Fig 2.** Arthroscopic view of the left shoulder in the lateral decubitus position with a 30° arthroscope in the anterosuperior portal. A 5.5-mm double-loaded biocomposite suture anchor (Arthrex) is placed within the reverse Hill-Sachs lesion through the anteroinferior portal.

FL) is inserted (Table 1). The reverse Hill-Sachs lesion is identified and debrided of all soft tissue using an arthroscopic shaver (Fig 1). The arthroscopic shaver is also used to excise the central portion of the rotator interval tissue to create a “window” anterior and superior to the subscapularis tendon. This facilitates

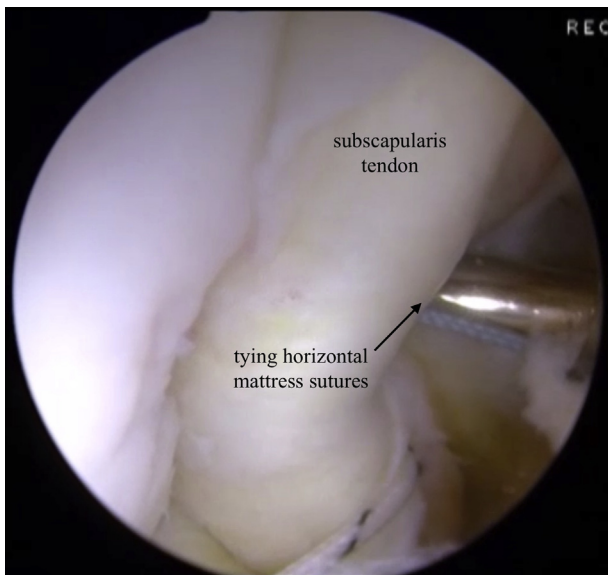


**Fig 3.** Arthroscopic view of the left shoulder in the lateral decubitus position with a 30° arthroscope in the anterosuperior portal. The sutures are passed through the subscapularis tendon using a retrograde suture retriever. Both limbs of the blue suture will be passed in a horizontal mattress configuration, and 1 limb of the striped suture will be passed inferior to the horizontal mattress to create a rip-stop construct once the sutures are tied.

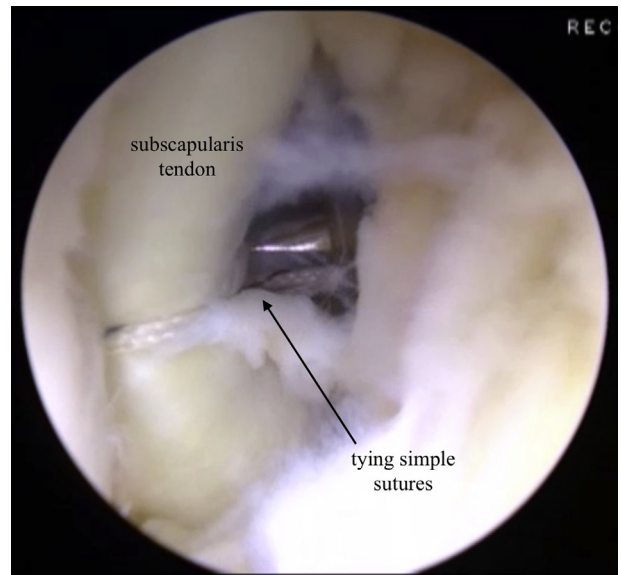


**Fig 4.** Arthroscopic view of the left shoulder in the lateral decubitus position with a 30° arthroscope in the anterosuperior portal. The sutures have been passed through the subscapularis tendon. The blue suture limbs have been passed in a horizontal mattress configuration, and 1 limb of the striped suture has been passed more inferiorly to the mattress sutures. This configuration will create a rip-stop construct once the sutures are tied.

visualization of the anterior surface of the subscapularis tendon and suture passage across the subscapularis tendon (Table 1). The center of the reverse Hill-Sachs



**Fig 5.** Arthroscopic view of the left shoulder in the lateral decubitus position with a 30° arthroscope in the anterosuperior portal. The subscapularis tendon has been reduced and compressed into the reverse Hill-Sachs defect as the blue horizontal mattress suture limbs are tied using an arthroscopic knot pusher. The striped suture will then be tied to complete the rip-stop construct.



**Fig 6.** Arthroscopic view of the left shoulder in the lateral decubitus position with a 30° arthroscope in the anterosuperior portal. There is additional compression of the subscapularis tendon achieved as the striped simple suture limbs are tied to complete the rip-stop construct.

lesion is identified, and a 5.5-mm double-loaded bio-composite suture anchor is inserted (Arthrex) (Fig 2). A 60° retrograde suture retriever (IDEAL suture passer, Depuy Mitek) is used to retrieve sutures through the subscapularis tendon (Fig 3). The inferior sutures are passed in a horizontal mattress configuration, and a single suture limb is passed through the upper border of the tendon for a simple configuration (Fig 4), resulting in a combined rip-stop suture construct. The mattress sutures are tied first (Fig 5), followed by the simple suture (Fig 6), using an arthroscopic knot of the surgeon's preference. The subscapularis tendon is thus advanced and secured into the reverse Hill-Sachs

**Table 2.** Advantages and Limitations

Advantages	Limitations
Less morbidity than open surgical procedures	May not be sufficient to address very large proximal humeral bone defects
Uses equipment, portals, and suture passage methods familiar to the arthroscopic shoulder surgeon	May cause a limitation of humeral rotation, although this has not been seen clinically
Management of posterior labral pathology can be easily performed without the need for an additional approach	
Minimally invasive approach to address a lesion that has been shown to increase the recurrence of posterior instability	

defect. The procedure can be modified as necessary by employing a triple-loaded anchor or 2 suture anchors depending on the size of the reverse Hill-Sachs lesion.

## Discussion

Posterior instability has been increasingly recognized as a relatively common instability pattern representing up to 24% of all surgically treated instability patients in a young, active population.<sup>2</sup> Many of these cases are the result of repetitive microtrauma, but acute, traumatic dislocations are described in populations that include contact athletes.<sup>1,2</sup> In a study of 36 patients who sustained a traumatic posterior dislocation, 86% were found to have a reverse Hill-Sachs lesion.<sup>6</sup> In another study of 112 acute, traumatic posterior dislocations, a reverse Hill-Sachs lesion  $> 1.5 \text{ cm}^3$  was found to be an independent risk factor for recurrence.<sup>3</sup> It is clear that in cases of traumatic posterior instability, it is imperative that the treating surgeon has an understanding of surgical techniques available to manage an engaging reverse Hill-Sachs lesion, especially if posterior stabilization fails to adequately reduce posterior translation intraoperatively.

Open procedures designed to treat these lesions include transferring the lesser tuberosity into the lesion, filling the defect with allograft bone, and performing humeral head arthroplasty.<sup>7-9</sup> Open surgical management of posterior instability has been reported to be less successful than the open treatment of anterior instability<sup>1</sup>; moreover, these techniques are very invasive, often require an additional anterior approach, and may not be ideally suited for a young, athletic population.

As the arthroscopic treatment of posterior instability has evolved, multiple techniques have been proposed to manage the reverse Hill-Sachs lesion. Mobilization of the subscapularis tendon to fill the defect was originally described by Krackhardt et al.<sup>10</sup> in 2006, and a similar technique to transfer the middle glenohumeral ligament was described by Duey and Burkhart<sup>11</sup> in 2013. Martetschläger et al.<sup>12</sup> recently described a modification of the original McLaughlin procedure to arthroscopically transfer the lesser tuberosity into the defect. In 2016, Lavender et al.<sup>13</sup> described a technique for arthroscopic reverse remplissage using multiple suture anchors. The literature regarding the outcomes of these procedures is limited, but there are many potential and real advantages of arthroscopic techniques (Table 2). Most importantly, arthroscopy facilitates the treatment of all contributory lesions using a minimally invasive approach. The surgical technique presented here uses

equipment, portals, and suture management methods that are very familiar to the arthroscopic shoulder surgeon and can be reliably performed, when necessary, as a supplemental procedure after arthroscopic posterior stabilization.

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