

# Arthroscopic Repair of Humeral Avulsion of the Glenohumeral Ligament for Anterior Shoulder Instability



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**Abstract:** Humeral avulsion of the glenohumeral ligament (HAGL) is a rare cause of anterior shoulder instability. Recurrent instability and anterior shoulder pain could be caused by an unrepaired HAGL; therefore, making the diagnosis is crucial. Only a few articles describe arthroscopic HAGL repair. This uncommon technique uses lateral decubitus arthroscopy and standard Bankart instrumentation. Different methods used to facilitate visualization of the working space as well as anchor placements are described.

**H**umeral avulsion of the glenohumeral ligament (HAGL) is a rare cause of anterior shoulder instability.<sup>1-3</sup> The capsuloligamentous complex provides significant static stability to the glenohumeral joint, and tears most commonly occur in the anterior band of the inferior glenohumeral ligament (IGHL), at its insertion on the glenoid, or intrasubstance.<sup>4</sup> Avulsions at the level of the humeral head are rare and often associated with labral tears, Hill Sachs lesions, and rotator cuff tears. In the setting of shoulder instability caused by a combination of injuries, a HAGL lesion may be missed or left unrepaired.<sup>5</sup> It should be suspected in a patient with a history of failed Bankart procedure.<sup>6</sup> Recurrent instability and anterior shoulder pain could be caused by an unrepaired HAGL; therefore, making the diagnosis is crucial.<sup>1</sup>

Due to the low prevalence of HAGL lesions, there is no clear consensus on the optimal repair technique; open and arthroscopic techniques have been described.<sup>7-9</sup> This article details an all-arthroscopic HAGL repair technique using suture anchors ([Video 1](#)).

## Technique

### Indications, Patient Evaluation, and Imaging

Anterior shoulder instability may not always be the clinical presentation of a HAGL lesion. Patients may only report pain, weakness, and altered shoulder function.<sup>10</sup> Recurrent instability after a Bankart repair may indicate an undiagnosed HAGL lesion. It should also be suspected in the presence of an intact labrum in the setting of multiple shoulder dislocations.

Range of motion and rotator cuff strength are assessed and may help diagnosing an associated rotator cuff tear. Instability shoulder tests, such as apprehension and relocation, are performed; the presence of posterior instability is also evaluated.

Physical examination is often insufficient to precisely determine the etiology of anterior shoulder instability; therefore, the need for advanced imaging is of utmost importance. Radiographs are obtained to assess the glenohumeral joint congruence, presence of a Hill Sachs lesion, or glenoid bone loss. True anteroposterior radiographs, along with scapular Y and axillary views, are obtained. A bone fleck adjacent to the medial humeral neck may indicate a bony HAGL, but this finding is reported in only 20% of cases.<sup>11</sup> IGHL ligament tears are best diagnosed on a coronal T2 magnetic resonance

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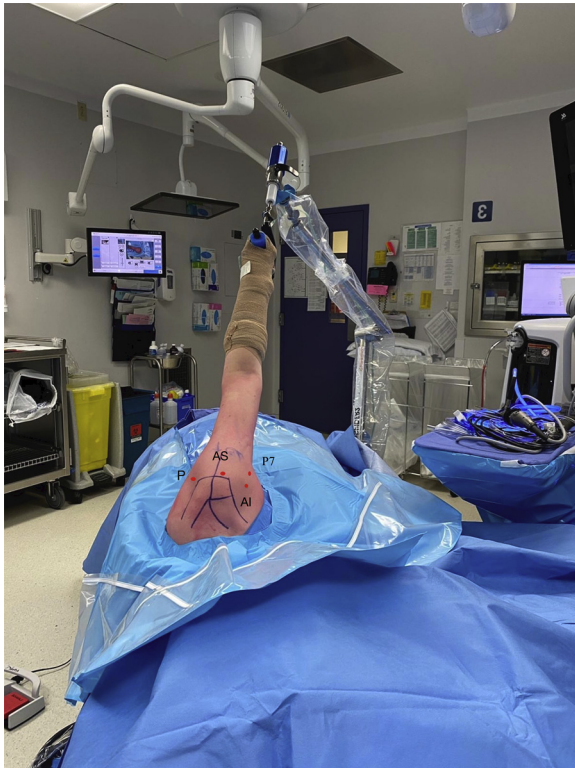
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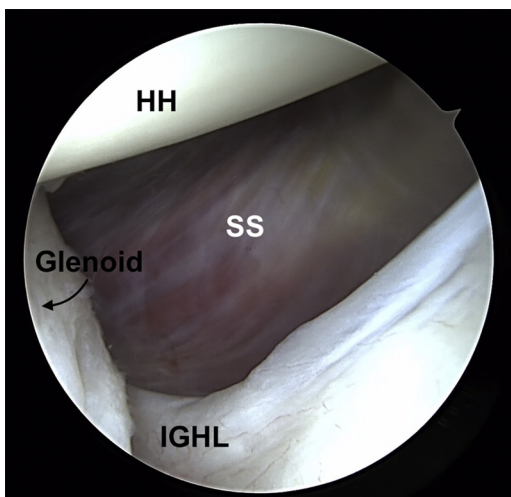
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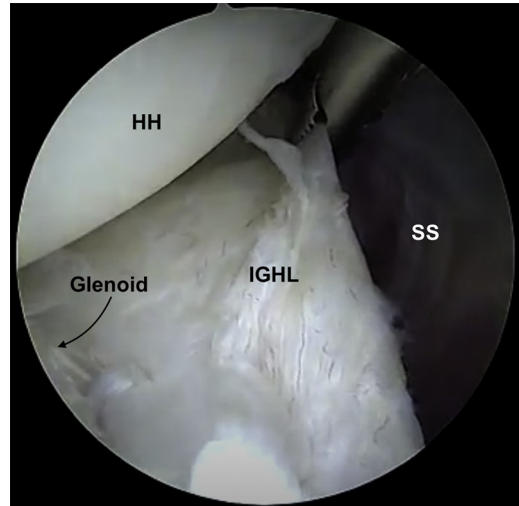


**Fig 1.** Lateral decubitus arthroscopy positioning. The arm is attached to the balancing traction device. Anatomical landmarks were drawn to aid arthroscopic portal creation. AI, anteroinferior portal; AS, anterosuperior portal; P, posterior portal; P7, percutaneous 7 o'clock portal.

imaging (MRI) sequence after injection of intraarticular contrast. The axillary pouch can be stretched and appear J-shaped in contrast to its usual U shape, because of extravasation of contrast in the juxta-



**Fig 2.** Diagnosis: Intact left subscapularis muscle fibers can only be observed in the presence of IGHL tear, viewing from the anterosuperior portal in the left shoulder in the lateral decubitus position. HH, humeral head; IGHL, inferior glenohumeral ligament; SS, subscapularis muscle.



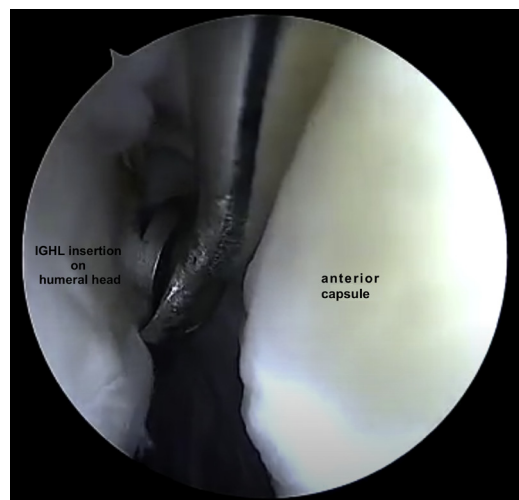
**Fig 3.** Diagnosis: IGHL is retracted to the glenoid and can be reduced back to the humeral head using a grasper, viewing from the anterosuperior portal in the left shoulder in the lateral decubitus position. HH, humeral head; IGHL, inferior glenohumeral ligament; SS, subscapularis muscle.

diaphyseal region along the humeral shaft. Up to 17% of HAGL lesions may be missed on MRI.<sup>12</sup> The diagnosis of a HAGL lesion can be confirmed during arthroscopy, as the muscular striations of the subscapularis muscle can be seen through the IGHL defect.

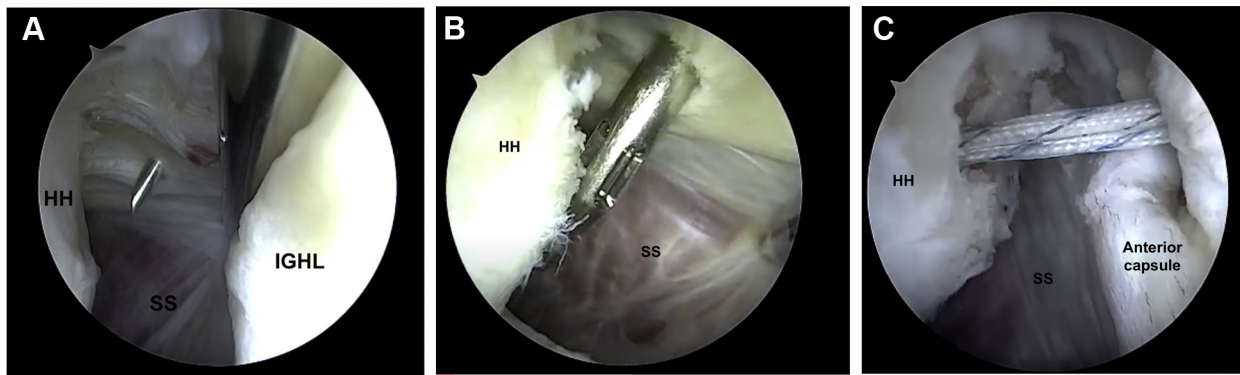
HAGL repair is indicated in patients with instability or pain that failed to improve with conservative management.<sup>13</sup>

**Positioning and Preparation**

The patient is placed in the left lateral decubitus position. A beanbag is used to maintain the positioning.



**Fig 4.** Debridement of the humeral insertion of the inferior glenohumeral ligament (IGHL) with a shaver, viewing from the anterosuperior portal in the left shoulder in the lateral decubitus position.



**Fig 5.** Percutaneous first (B) and second (C) anchor placement: After localization with a spinal needle (A), percutaneous insertion of suture anchor is performed, viewing from the anterosuperior portal in the left shoulder in the lateral decubitus position. A small switching stick inserted inside the anchor drilling guide can help perforate the subscapularis muscle. HH, humeral head; IGHL, inferior glenohumeral ligament; SS, subscapularis muscle.

The left upper extremity is prepped and draped and placed in 45 degrees of abduction and slight flexion using a Spider2 Limb positioning device (Smith & Nephew, Memphis, TN, U.S.A.). Anatomical landmarks are drawn for optimal portal positioning (Fig 1).

#### Arthroscopy and Diagnosis

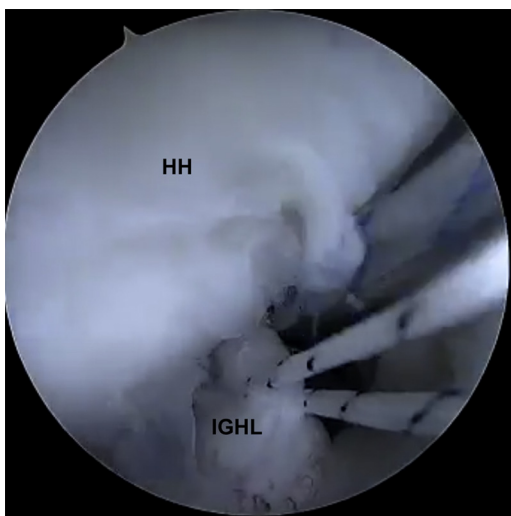
A standard anterosuperior viewing portal is created. Diagnostic arthroscopy is performed. The glenoid and humeral heads are inspected to assess bone loss, osteochondral defects, and arthritic changes. The labrum is circumferentially assessed. The rotator cuff tendons and the long head of the biceps are evaluated for the presence of tendinopathy or tears. The presence

of visible muscle striation of the inferior subscapularis suggests a HAGL lesion (Fig 2).

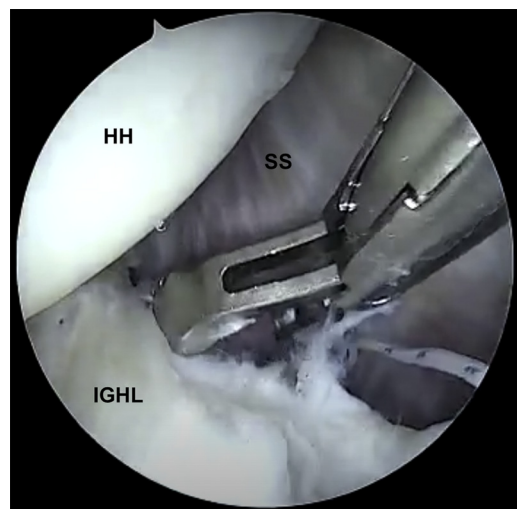
The rotator interval is opened to create the anterosuperior and anteroinferior portals. A grasper is used to retrieve the IGHL, which is retracted to the glenoid (Fig 3). The diagnosis of HAGL lesion is then confirmed (Video 1).

#### HAGL Repair

Using the shaver and a curette, the IGHL is liberated and mobilized until it can be reduced to the humerus when placed in internal rotation. The IGHL insertion on the humeral head is also debrided (Fig 4) to stimulate the healing process. Visualization is aided by applying a

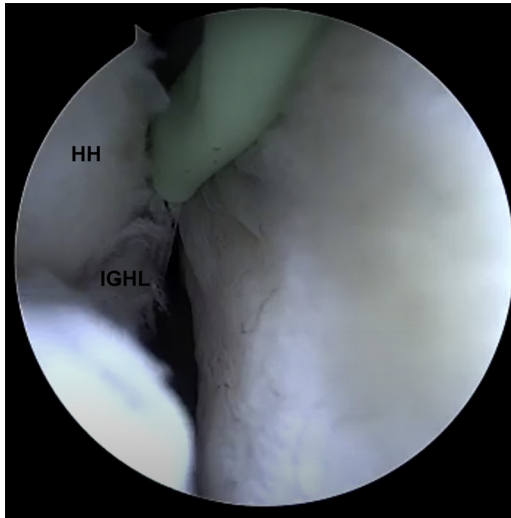


**Fig 6.** Traction suture assistance: A free suture is passed through the IGHL and used to tension the ligament to facilitate suture passage, viewing from the anterosuperior portal in the left shoulder in the lateral decubitus position. HH, humeral head; IGHL, inferior glenohumeral ligament.



**Fig 7.** Suture passage: After being retrieved in the anteroinferior portal, the anchor sutures are passed through the IGHL, viewing from the anterosuperior portal in the left shoulder in the lateral decubitus position. HH, humeral head; IGHL, inferior glenohumeral ligament; SS, subscapularis muscle.

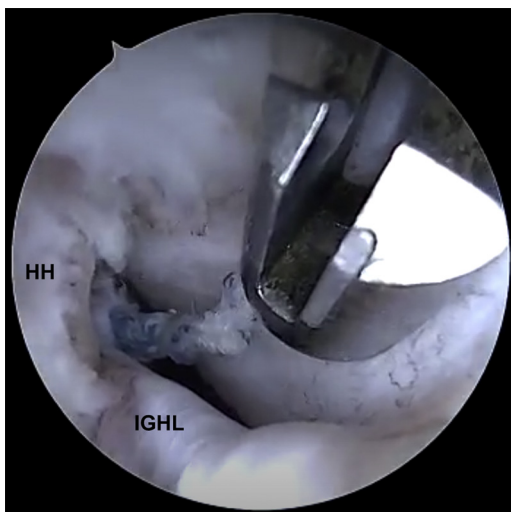




**Fig 8.** Suture holder: A suture holder is inserted over one set of sutures to prevent tangling, viewing from the anterosuperior portal in the left shoulder in the lateral decubitus position. HH, humeral head; IGHL, inferior glenohumeral ligament.

posterior-directed force on the humeral head. The subscapularis is also retracted anteriorly using a switching stick from the anteroinferior portal.

Through a percutaneous 7 o'clock portal, a single-loaded 1.8 Q FIX (Smith & Nephew) anchor is inserted into the humeral head at the 7 o'clock position (Fig 5 A and B).



**Fig 9.** Knot tying: The inferior anchor is tied first, viewing from the anterosuperior portal, in the left shoulder in the lateral decubitus position. Notice the limited visualization once the IGHL is partially reduced. HH, humeral head; IGHL, inferior glenohumeral ligament.

The retraction of the IGHL can make the passage of the anchor sutures very challenging. A free suture is passed through the IGHL (Fig 6) with a suture passer (First Pass Mini; Smith & Nephew). This traction suture is used to tension the capsuloligamentous complex while the inferior portion of the IGHL is captured using a suture passer (First Pass Mini; Smith & Nephew).

Percutaneously, through the subscapularis, another double-loaded 2.8 Q FIX (Smith & Nephew) is inserted at the 9 o'clock position on the humeral head (Fig 5C). A small switching stick is inserted inside the blunt anchor guide to assist its passage through the thick subscapularis muscle. Once optimal positioning of the anchor guide on the humeral head is obtained, the anchor is inserted, superior to the first one. One set of sutures from the double anchor is passed through the midportion of the IGHL. Sutures from the second anchor are then passed through the superior-most portion of the IGHL (Fig 7). After all sutures have been retrieved into the working portal, a suture holder (Fig 8) is inserted over the second anchor's sutures to prevent tangling. All sutures must first be passed before any fixation to the humerus takes place, because fixation limits visualization of the working space, which is already limited. The sutures are tied using Revo knots (Fig 9).

The stability of the glenohumeral joint is assessed after the HAGL repair. The subscapularis muscle is covered by the reinserted IGHL, confirming adequate repair (Fig 10 A and B). Additional pathologies can be addressed at this point. Wounds are irrigated and closed with staples.

### Postoperative

The patient is placed in a shoulder sling and scheduled for a 2-week postoperative visit.

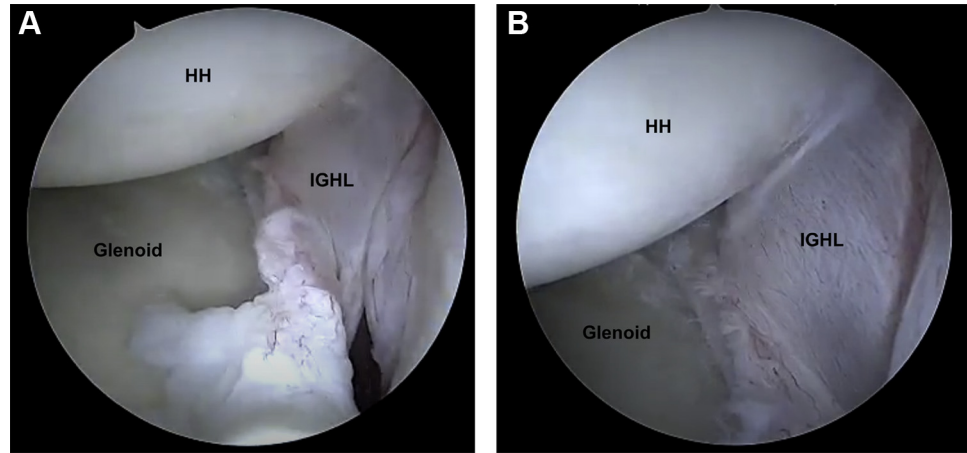
### Discussion

HAGL lesions are a rare clinical entity. IGHL reinsertion is infrequently performed and can be challenging, especially in unexperienced hands. The advantages of performing the arthroscopic repair in lateral decubitus are a better visualization of the glenohumeral joint and increased working space.<sup>14</sup> However, traction increases the risk of neurologic injury to the brachial plexus. Conversion to an open procedure is also easier when the beach chair position is used.

Visualization of the lesion and the working space can be improved by retracting the subscapularis via an anteroinferior portal and a switching stick. External rotation and abduction of the humerus may also be helpful.

Additional portals may be needed to best access the lesion. Placement of the anteroinferior (5 o'clock)

**Fig 10.** Inferior glenohumeral ligament (IGHL) reduced and repaired to the humeral head (HH), viewing from the anterosuperior portal in the lateral decubitus position (A). The subscapularis muscle is no longer visible through the anterosuperior viewing portal in the left shoulder (B).



portal, used in this technique, may result in musculocutaneous nerve injury. Neutral position of the arm during the insertion prevents this complication. Obtaining the optimal angle for anchor placement on the humeral head is laborious due to the position of the IGHL insertion. If the existing portals do not permit adequate anchor positioning, optimal anchor placement may be achieved using a percutaneous, outside-in technique. Anatomical landmarks and safe zones must be considered to avoid iatrogenic nerve injuries. When retraction of the IGHL to the glenoid is encountered, traction sutures can aid freeing and reducing the ligament to the humerus. Moreover, care must be taken when manipulating the IGHL. Axillary nerve palsies have been reported after 0.2% of shoulder stabilization procedures, including HAGL repair. According to a retrospective study by Hiroshige and Hiroyuki,<sup>15</sup> the axillary nerve can be found as close as 2.5 mm from the

inferior capsule. Axillary nerve palsy may present as discomfort, deltoid weakness, and atrophy.

No special equipment is needed to repair the HAGL lesion beyond what is commonly used for Bankart repair. The Hill Sachs remplissage and Bankart repair can be added to the HAGL repair if needed. The pearls and pitfalls of this technique are described in Table 1. The advantage and disadvantage of this technique are outlined in Table 2.

**Conclusion**

HAGL lesions are a rare and underdiagnosed cause of anterior shoulder instability. This injury is unforgiving and can lead to recurrent dislocations if unaddressed. MRI or intraoperative diagnosis helps differentiate HAGL from other causes of shoulder instability. All-arthroscopic repair can be performed with standard instrumentation following the technique described in this article.

**Table 1.** Pearls and Pitfalls of the Technique

Pearls	Pitfalls
Retracting the subscapularis muscle using a switching stick can increase the working space and improve visualization.	Limited visualization and working space make this technique laborious.
Traction suture can help mobilize the IGHL and optimize the anchor suture passage.	Retraction of the IGHL can prevent adequate suture passing through the ligament.
Percutaneous portals can allow ideal anchor position and angle on the humeral head.	The subscapularis muscle is thick and can be difficult to pierce with blunt instruments.
Numerous sutures in a small working space may be difficult to handle. A suture holder can prevent suture tangling.	All sutures need to be passed through the IGHL before tying them, since tying the first anchor may limit visualization and suture passage.

IGHL, inferior glenohumeral ligament.

**Table 2.** Advantages and Disadvantages of the Technique

Advantages	Disadvantages
Lateral decubitus arthroscopy technique is minimally invasive but technically demanding.	When conversion to an open technique is required, the patient must be placed in a beach chair position.
Bankart repair as well as Hill Sachs remplissage can be addressed using the same instrumentation.	The use of multiple arthroscopy portals and percutaneous anchor insertion could lead to nerve injury.
Arthroscopic technique does not require tenotomy of the subscapularis tendon.	The subscapularis muscle is violated to insert the anchors.

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