Arthroscopic Repair of Humeral Avulsion of the Glenohumeral Ligaments Based on Location

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Abstract: Humeral avulsion of the glenohumeral ligament (HAGL) can be a difficult problem to treat. HAGL lesions can be particularly challenging to repair when approached arthroscopically. Because of the technical difficulties of HAGL repair, the surgeon must be strategic to successfully address these lesions arthroscopically. The purpose of this article is to propose a surgical technique that can be used in the arthroscopic treatment of HAGL lesions based on their location.

The term “humeral avulsion of glenohumeral ligaments (HAGL)” was not coined until 1995.1,2 Even in the original study of Wolf et al.,2 4 of the 6 cases of HAGL lesions discussed were repaired arthroscopically with excellent results. Arthroscopic HAGL repair has been reported as successful by additional authors.3-5 Although arthroscopic repair can be technically difficult, it does offer the benefit of significantly less tissue dissection and less trauma to the subscapularis tendon than with a more traditional open approach.6,7

Even so, some authors advocate an open repair of HAGL lesions.6,8,9 One of the reasons cited for not performing HAGL repair arthroscopically has been the technically demanding nature of arthroscopic repair.8,9 Another reason cited for performing open repair is that the neurovascular structures, which lie in close proximity to the glenohumeral ligament insertion, can potentially be directly visualized during an open repair.6 Although the subscapularis-sparing mini-open approach described by Bhatia et al.9 does allow for less subscapularis dissection, the approach, by nature of being an open procedure, still requires more overall soft-tissue disruption. Conversely, Provencher et al.10 have advocated performing a partial subscapularis tenotomy to prevent axillary nerve injury when performing anterior HAGL repair.

HAGL lesions present in a variety of locations and configurations in shoulder instability cases. They must be approached differently depending on these characteristics.11,12 In this article, we review our current techniques for arthroscopic HAGL repair, with particular attention paid to the strategy of approach based on the HAGL location.

General Concepts

For arthroscopic instability cases, we recommend the lateral decubitus position, with the arm in approximately 20° to 30° of abduction and 20° of forward flexion.3 Five to ten pounds of traction is applied, and an assistant is positioned across from the surgeon to manipulate the arm to achieve the best view and angle of approach.3 Both 30° and 70° arthroscopes should be available and used interchangeably.3 The pump pressure is routinely set to 60 mm Hg to maximize visualization.3 The key issue in HAGL repair is achieving the exact angle that is required for safe and proper anchor placement along the humerus.4 Because of this, correct portal placement is critical for a successful repair and is performed using a spinal needle under direct visualization instead of blindly using anatomic landmarks. The approach and portal placement are dependent on the location of the specific HAGL lesion as well as concomitant pathology.
Anterior HAGL

Anterior HAGL lesions are generally repaired via anterior working portals while viewing from an anterosuperolateral (ASL) portal. A low anterior working portal can be used to address some anterior HAGL lesions. However, the creation of a trans-subscapularis working portal (5-o’clock portal) is critical for anchor placement for most HAGL lesions because the location of the capsular tear from the humerus is usually anteroinferior.11

After the patient is steriley prepared and draped, the bony anatomic landmarks are delineated on the skin. A posterior viewing portal is made, followed by creation of an ASL portal over the bicipital groove anterior to the supraspinatus. The ASL portal will be used for viewing during anterior portal creation, preparation of the HAGL footprint, and anchor placement. A spinal needle is used to guide subsequent anterior portal creation based on the location of the pathology such that the correct working angles are obtained.

An important step to highlight is the creation of the 5-o’clock (trans-subscapularis) portal, which is necessary

![Fig 1. Left shoulder, external view, showing the creation of a low anteromedial (5-o’clock) portal with spinal needle localization (arrow). Reproduced with permission from Burkhart et al.11 (A, anterior portal; ASL, anterosuperolateral portal.)](image1)

Fig 2. Left shoulder, anterosuperolateral view, with visualization of anterior HAGL tear. The steep angle of approach needed for access to the humeral footprint of the glenohumeral ligaments and the narrow window of space available are shown by the spinal needle (arrow). Reproduced with permission from Burkhart et al.11 (H, humeral head; HAGL, humeral avulsion of glenohumeral ligaments.)

![Fig 3. Arthroscopic image of the right glenohumeral joint from the anterosuperolateral portal with visualization of posterior humeral avulsion of the glenohumeral ligaments with a longitudinal tear in the posterior capsuloligamentous complex. Reproduced with permission from Burkhart et al.11 (H, humeral head.)](image2)

Fig 3. Arthroscopic image of the right glenohumeral joint from the anterosuperolateral portal with visualization of posterior humeral avulsion of the gleno[u]humeral ligaments after suture passage. One should note the reduction of the longitudinal tear, with the suture limbs being tied extracapsular. Reproduced with permission from Burkhart et al.11 (H, humeral head.)
for lesions that are in the 4- to 5-o’clock position. The 5-o’clock portal is created with the shoulder held in 0° of abduction to avoid injury to the musculocutaneous nerve while viewing from the ASL portal (Fig 1). The “window” for this low anteromedial portal is very narrow: If placed too inferiorly or medially, the neurovascular structures in the axilla are at risk; if placed too laterally, the instruments will skive off the humerus (Fig 2).

After appropriate portal placement, attention is turned to the humeral footprint of the avulsion. The footprint is gently debrided to a bleeding surface. This can be performed with a burr or ringed curettes. Preloaded suture anchors (4.5- to 5.5-mm BioComposite FT Corkscrew; Arthrex, Naples, FL) are placed in the prepared surface on the humerus. Alternatively, tape suture (LabralTape or SutureTape; Arthrex) can be passed through the torn capsule and fixed with knotless anchors (3.5-mm BioComposite SwiveLock or 2.9-mm BioComposite PushLock anchors; Arthrex). Suture passage through the lateral capsule and glenohumeral ligaments is accomplished using a passing device such as the SutureLasso or Scorpion (Arthrex). It is important to note that all sutures must first be passed before any fixation to the humerus takes place because fixation eliminates the space available for working and visualization.

**Low Inferior HAGL**

The low inferior HAGL lesion (Fig 5), which generally lies in the 5:30 to 6:30 clock-face position, is a subtype that also requires a unique treatment strategy. Lesions in this position are in close proximity to the axillary nerve. Because of this, the low inferior HAGL lesion is best approached posteriorly because an anterior approach would endanger the neurovascular structures. Two posterior portals are created, with the posterosuperior portal being a viewing portal and the posteroinferior portal (7-o’clock position) being a working portal. A 70° arthroscope is used in this approach because it allows for visualization of the acute angle needed for anchor placement into the anatomic footprint of the capsuloligamentous complex on the humerus. In addition, the positioning of the arm can be a significant factor in the successful repair of a very low inferior HAGL lesion. The shoulder should be

Table 1. Pearls and Pitfalls of Arthroscopic HAGL Repair

| Pearls                                      | Pitfalls                      |
|---------------------------------------------|-------------------------------|
| A spinal needle should be used to guide portal placement and left in place until the portal has undergone initial instrument placement. | A narrow window (Fig 1) exists for working portal placement in anterior HAGL repair such that instruments remain lateral to the conjoint tendon. |
| For an anterior HAGL lesion, a trans-subscapularis working portal should be used in most cases. | Portal placement too laterally will force an angle of approach to the humerus that is too shallow (Fig 2). |
| For a posterior HAGL lesion, traumatic or iatrogenic posterior capsular splits should be repaired. | In combined HAGL lesion–Bankart tear cases, performing HAGL repair first risks iatrogenic disruption during subsequent Bankart repair. |
| For an inferior HAGL lesion, 2 posterior portals should be used with internal arm rotation to improve access to the humeral neck and capsule. |  |

HAGL, humeral avulsion of glenohumeral ligament.
Table 2. Advantages and Disadvantages of Arthroscopic HAGL Repair

| Advantages                                      | Disadvantages                                    |
|------------------------------------------------|--------------------------------------------------|
| Less surgical morbidity than open surgery      | Technically demanding                             |
| Ability to address concomitant pathology arthroscopically | No direct visualization of neurovascular structures |

HAGL, humeral avulsion of glenohumeral ligament.

Table 2 continues...
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