Arthroscopic Repair of the Floating Posterior-Inferior Glenohumeral Ligament Lesion

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Abstract: We present our technique for diagnosis and arthroscopic repair of a floating posterior-inferior glenohumeral ligament avulsion injury. A high degree of suspicion based on the patient’s history, along with careful examination, should alert the surgeon to the existence of this lesion. By use of an anterolateral viewing portal and precisely placed posterior working portals, the lesion is repaired through suture anchor fixation to the humeral head and glenoid rim in a carefully sequenced fashion to achieve appropriate tension and restore the anatomy.

In their classification system for inferior glenohumeral ligament (IGHL) injuries, Bui-Mansfield et al. identify 6 types of humeral avulsion of the glenohumeral ligament (HAGL) lesions including the floating segment consisting of a posterior HAGL with an associated posterior Bankart lesion (floating posterior-inferior glenohumeral ligament [PIGHL]). These rare lesions can be difficult both to diagnose and to address surgically. Unfortunately, these injuries often are missed at the time of magnetic resonance imaging and diagnostic arthroscopy and can remain undiagnosed. It has been previously proposed that the lack of success after surgical repair of posterior instability relative to anterior instability may in fact be due to missed pathology, and this highlights the importance of considering this pathoanatomic injury pattern in the initial evaluation of traumatic and recurrent shoulder instability. Hill et al. and Pokabla et al. in 2 separate, small case series have described the floating PIGHL lesion and a technique for repair with suture anchor fixation of the Bankart lesion followed by the HAGL lesion in the former and vice versa in the latter.

The technique described in this report uses modified portal placement based on careful clinical examination and/or imaging findings suspicious for a combined posterior labral and capsular avulsion injury. We outline our unique sequencing of the capsular and labral repairs to attain optimal tension in the construct and avoid over-tightening the capsular structures to the humerus in the first step of the repair with the potential sequela of inability to achieve capsulolabral repair on the glenoid side in the second phase of the operation. Diagnostic and technical pearls are outlined in Table 1.

Diagnosis and Surgical Technique

In our experience, a high level of suspicion for posterior capsular injury is essential when a patient describes a history of posterior shoulder dislocation requiring reduction. In contrast to anterior dislocation in relation to Bankart lesions, most posterior shoulder instability associated with a labral tear alone appears to be associated with subluxation rather than frank dislocation. We have found that most cases of posterior capsular disruption can be identified preoperatively using magnetic resonance imaging with intra-articular gadolinium (Fig 1), but this certainly does not obviate the need for suspicion based on history, and a careful examination both in the clinic and with the patient under anesthesia remains paramount for definitive diagnosis.

The patient is placed under general anesthesia, allowing a careful physical examination in the absence of any potential guarding. We have found that patients with a floating PIGHL show a 3+ posterior load-and-shift test (humeral head locks posteriorly over glenoid rim). This finding should alert the surgeon to the possibility of a posterior capsular tear, because an isolated posterior labral tear typically has a 2+ posterior load and shift (humeral head subluxates over posterior glenoid rim but does not lock posteriorly).

After examination under anesthesia, the patient is placed into the lateral decubitus position. Video 1
demonstrates our surgical technique. Diagnostic arthroscopy is commenced through the posterior portal. In these cases the posterior portal is made slightly more lateral and superior to facilitate an eventual working portal that is at the appropriate angle for suture passage around the posterior labrum (similar to the inferomedial portal in anterior arthroscopic labral repair). An anterolateral rotator interval portal is then made instead of the typical anterior rotator interval portal. When the camera is placed in this more anterior and lateral portal, it facilitates viewing the posterior shoulder over the humeral head, rather than viewing “through” the glenohumeral joint (Fig 2). A full view of the posterior capsule and labrum should be able to be made from this portal with a 30° arthroscope; if the capsular insertion to the humeral head is not clearly visualized, then a 70° arthroscope can be used.5

After arthroscopic confirmation of the floating PIGHL, attention is first turned to the humeral side of the lesion by use of the anterolateral viewing portal. An accessory posterolateral working portal is established as a trans—rotator cuff portal of Wilmington, with placement of the portal at the musculotendinous junction of the infraspinatus. Working through this posterolateral portal, the surgeon assesses and mobilizes the posterior band of the IGHL. The footprint of its insertion on the humerus is prepared with a shaver or rasp to create a bleeding bony bed to promote healing of the capsule. One double-loaded Arthrex 4.5-mm Bio-Corkscrew suture anchor (Arthrex, Naples, FL) is subsequently placed into the humeral neck at the site of anatomic insertion of the posterior band of the IGHL. Care is taken to place the anchors superiorly and laterally so as to closely reapproximate the anatomic site of insertion (Fig 3). The 2 sutures are then shuttled through the capsuloligamentous tissue to create 2 mattress-type stitches. Importantly, the tension on the capsular repair is estimated at this point, but the sutures are not yet tied.

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Table 1. Diagnostic and Technical Pearls

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<th>Diagnostic pearls</th>
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<td>Suspicion when a reduction of a posterior dislocation is performed</td>
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<td>Magnetic resonance imaging with intra-articular gadolinium</td>
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<td>Assessment of appropriate capsular tension by placing humeral-sided sutures first but tying after glenoid-sided repair</td>
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Fig 1. An axial magnetic resonance image with intra-articular gadolinium clearly shows contrast pooling posterior to the floating PIGHL. The asterisk marks the floating PIGHL.

Fig 2. The floating PIGHL lesion in this left shoulder is identified on diagnostic arthroscopy viewing through the anterolateral portal in the lateral position.

Fig 3. The humeral-sided double-loaded suture anchor is placed superiorly and laterally on the humeral neck in the anatomic footprint of the PIGHL. Left shoulder, lateral position, viewing through anterolateral portal.
Subsequently, attention is turned to the glenoid side. The glenoid bone bed is prepared in the standard fashion with a rasp or small 3.5-mm arthroscopic shaver. Three 3-mm Bio-Suture tack suture anchors (Arthrex) are placed at the articular margin of the glenoid rim at the site of the labral avulsion (Fig 4). The suture is then shuttled with a mattress stitch, and the labral tissue is repaired to the glenoid rim with a standard knot-tying technique. It is critical to assess the amount of capsular shift while maintaining tension on the humeral-sided stitches to avoid over-tensioning the construct and not being able to tie down the humeral side of the capsule after glenoid-sided labral repair. An assistant can hold temporary tension on the humeral-sided sutures while the capsule is being shifted on the glenoid side. After repair of the glenoid side of the lesion, attention is returned to the humeral side. The sutures are tensioned, and the “sail is raised” (Video 1) to tension the PIGHL. After these sutures are tied, 2 posterior cannulas are placed between the posterior capsule and the rotator cuff, which allows closure of each capsular disruption with a single absorbable suture that is tied blindly to complete the capsular repair.

Shoulders are immobilized immediately after surgery in an external rotation UltraSling (DonJoy, Carlsbad, CA) in approximately 30° of abduction, with prevention of internal rotation and a near neutral position, for 4 to 6 weeks postoperatively, depending on the amount of capsular laxity seen at the time of surgery. During this period, pendulum exercises are allowed. At the 4- to 6-week point, sling immobilization is discontinued, gentle active and active-assisted range-of-motion (ROM) exercises are advanced, and gentle pain-free internal rotation is allowed. By 2 to 3 months after surgery, ROM is progressed to achieve full passive and active ROM. Strengthening exercises are instituted and isotonic strengthening continued with emphasis on the rotator cuff and periscapular muscles with avoidance of dyskinesia. Return to sport is anticipated at 6 months.

**Discussion**

The floating PIGHL lesion is a rare pathology associated with posterior shoulder instability. George et al. in their review of HAGL lesions iterate that a high degree of suspicion must be maintained, and they note that often these lesions remain undiagnosed until after a failed surgery to correct instability. We have described an approach to these patients that we believe should make this result less likely. On the basis of suspicion from history and physical examination, subsequent magnetic resonance arthrography can aid in the diagnosis of posterior capsular avulsion and labral injury. At the time of examination under anesthesia, we have found that a 3+ posterior load-and-shift test should alert the surgeon to the possibility of a combined posterior capsulolabral injury. Importantly, this test has been found to have good to excellent interobserver reliability. Any surgeon performing arthroscopic shoulder stabilization should be familiar with diagnosing this pathology and appropriately addressing it at the time of arthroscopy.

Portal placement is vital to successful arthroscopic surgical management of shoulder pathology. In the case of isolated posterior HAGL lesions, multiple portals have been described, including standard portals; modified portals such as a medialized posterior portal, an axillary pouch portal (Bhatia portal), and an anteroinferior portal; or a standard anterior portal with a more inferior posterior portal. In their review of a single case of a floating PIGHL, Hill et al. do not address portal placement. Pokabla et al. in their review of 2 floating PIGHL lesions report using standard portals. In their description of repair of a floating PIGHL including an osseous Bankart component, Ames and Millet describe a standard anterior portal with posterior working portals placed posteromedially and posterolaterally. We believe that appropriate arthroscopic treatment of the combined capsulolabral pathology of the floating PIGHL is facilitated by discrete portal modifications as described earlier and the difficulty of addressing both the medial- and lateral-sided pathologies requires precision in placement.

Previously described repair techniques for the floating PIGHL lesion do not address a method to obtain ideal tension on the posterior capsule while avoiding overtightening and a resultant inability to tie down the second portion of the lesion. Our novel method of placing the humeral-sided capsular sutures first (without tying them down) and then using them for tensioning the capsule during labral repair prevents this complication. We believe that our combined approach to preoperative and operative management of the floating PIGHL lesion provides an effective approach for diagnosis and successful surgical fixation.
References