Posterior Shoulder Instability in the Military and Athlete: An Evidence and Experience-Based Treatment Approach

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Background: Recognition of posterior glenohumeral instability has increased in young, athletic populations, leading to evolution in operative approaches to management. As with anterior instability surgery, successful treatment for these challenging injuries is dependent on understanding the key principles of pathology and restoration of the functional anatomy.

Indications: Operative management of posterior glenohumeral instability is indicated for recurrent instability events or persistent pain refractory to physical therapy in the setting of posterior labral pathology with or without bone loss.

Technique: In this video article, we present our approach to operative management of posterior glenohumeral instability in a young, athletic population, as developed through extensive experience in military and athlete populations and supported by research. Our approach to posterior glenohumeral instability is to restore the functional anatomy of the bone, labrum, and capsuloligamentous static restraints. We consider concomitant pathology and bone loss as components of these restraints that need to be restored to achieve a stable, painless shoulder. Using standard portals and tools, we prepare the glenoid and mobilize the labrum. When present, large osseous lesions can be restored using allograft distal tibia. We then repair and superiorize the inferior labrum, taking care to create a secure buttress against translation by positioning anchors at the edge of the chondral surface and everting the interior flap of tissue. If capsular pathology is present, this is also addressed. In the setting of significant posterior glenoid bone loss, we reconstruct the osseous support with a distal tibial allograft, which we perform arthroscopically and augment with labral repair. Using these techniques, surgeons can expect a low overall failure rate. In our young, highly active population, we observed 17.2% failure by 5 years, although this is dependent on multiple factors including age and bone loss.

Discussion: Outcomes for posterior glenohumeral instability can be excellent with both nonoperative and operative treatments. When operative intervention is pursued, it is important to critically evaluate the anatomy, place portals considerately, and functionally restore the damaged structures.

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: posterior shoulder instability; posterior labral tear; military shoulder; glenohumeral instability; distal tibial allograft

VIDEO TRANSCRIPT

This is Dr. Lance E LeClere from Vanderbilt University Medical Center with Drs. Benjamin Hoyt, Kelly Kikcoyne, and Jonathan Dickens from Walter Reed National Military Medical Center and Duke University Medical Center.

This video will demonstrate our current approach to posterior shoulder instability.

Posterior shoulder instability was once thought to be a rare form of shoulder instability; however, multiple recent studies have shown that this may not be the case especially in young, active patients.[10,14] Our review of operatively treated patients at the US Naval Academy found that over half of all shoulder instability surgeries involve repair of the posterior labrum and nearly 20% of all patients have pure posterior instability.

Our team recently performed a retrospective review of posterior shoulder instability to evaluate the success and failure rates of attempted nonoperative treatment of the instability. With a minimum 2-year follow-up, approximately half of all posterior shoulder instability patients with magnetic resonance imaging (MRI) arthrogram–confirmed posterior labrum tears required surgical treatment in our series.[17] Several key imaging findings

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predicted failure of nonoperative treatment. These included increased glenoid retroversion, static posterior humeral head subluxation, a shallow glenoid fossa, and glenoid dysplasia or hypoplasia. Several key history and examination findings were predictive of the need for surgery, including a history of distinct injury, and examination findings were consistent with instability, including a positive posterior load and shift and interestingly a positive anterior apprehension test.

A 21-year-old Division 1 varsity football player presented with complaints of right shoulder pain and multiple posterior subluxation events. His MRI demonstrated a posterior labrum tear with a 5% posterior bony Bankart lesion and anterior extension of the tear. Additional imaging findings include a shallow glenoid and static poster humeral head subluxation. Given his multiple subluxation events, positive physical examination, and desire to return to contact sport, he was indicated for right shoulder arthroscopy with labral repair and capsulorraphy.

We prefer a lateral decubitus position with a balanced suspension device for arm positioning. (Authors' note: patient positioning in either beach chair or lateral decubitus for posterior labral tears has not been associated with differences in outcomes, although this is author preference for ease of visibility and access.)[6,13] A bump is placed in the axilla to aid in distraction of the humeral head to increase visualization of the inferior portion of the glenohumeral joint.[8] Our typical viewing portal begins in the posterolateral position. Optimal viewing can be obtained by placing the posterolateral skin incision inferior and lateral to the posterior portion of the acromion by 1 to 2 cm. This allows for excellent visualization of the joint and also a downward trajectory onto the glenoid face once anchor placement begins. It is ideal to keep the posterior and accessory posterolateral portals high and tight for this reason. The accessory posterolateral portal is approximately 4 to 5 cm straight lateral to the posterior corner of the acromion. Prior to skin incision, localization with the spinal needle demonstrates appropriate trajectory and accessibility to the inferior aspect of the glenoid. Typically, 2 anterior portals are used; the midglenoid anterior portal is kept somewhat medial to allow instruments to reach across the face of the glenoid to the posterior and inferior glenoid.

This slide demonstrates our typical cannula setup. The arthroscope is placed in the posterior viewing portal initially. An anterior-superior portal is established, and the midglenoid portal is placed anteriorly. The accessory posterolateral portal is then placed under direct visualization. After diagnostic arthroscopy, the arthroscope is moved to the anterior-superior position and a smoothbore cannula is placed in the posterosuperior position to allow for instrumentation and suture passage.

After diagnostic arthroscopy, preparation of the labral tissue begins. First, a spatula elevator is used to free the labrum of adhesions and scar tissue. Care is taken to fully mobilize the capsular labral tissue to allow for anatomical repair. This portion of the procedure is especially critical as it optimizes healing of the repaired soft tissue back to the glenoid rim. After soft tissue mobilization using the elevator, a serrated rasp is used to prepare the glenoid rim and remove all soft tissue attachments. The arthroscopic sucker-shaver also allows for debridement above the labrum and the glenoid. Following full and adequate preparation, soft tissue mobilization is once again checked.

In our case example of the right shoulder of the 21-year-old football player, the bony Bankart lesion is visualized beneath the spatula elevator in this video. Adequate soft tissue elevation has been performed and will allow for anatomical reduction of the bony Bankart. Also visualized is a posterior glenoid labrum articular disruption (GLAD) lesion at the 9 o'clock position.

After appropriate soft tissue and glenoid preparation, a curved suture passing device is used to pierce the capsule approximately 10 mm from the capsulolabral junction and is passed underneath the capsule and labrum. This is initially done at the 6 o'clock position with the suture passing device in the posterolateral cannula. The wire loop is retrieved out of the posterolateral portal and the suture tape is placed into the wire loop. One limb of the suture is placed and then pulled in a retrograde fashion under the labrum and capsular tissue. The free limb of the suture tape is then retrieved out of the posterolateral cannula and looped over the top of the soft tissue.

Both limbs of the suture tape are then passed into the eyelet of a 2.9-mm polyether ether ketone (PEEK) or biocomposite suture anchor. The drill guide is placed through

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the posterolateral cannula and onto the corner of the glenoid at the edge of the chondral surface. The drill is started on full power while off the bone and a drill hole is placed. The inferior limb of the suture tape that has been passed underneath the labrum is preferentially tightened to evert the labrum. While holding the tape under tension, the labral tissue is translated to the aperture of the drill tunnel. Care is taken to place the anchor at the same angle as the drill tunnel while holding tension on the labral tapes. Excess limbs of suture are then trimmed.

We typically begin our posterior repairs at the 6 o'clock to 6:30 position and march superiorly to complete the posterior repair. The 6 o'clock anchor is the keystone in an anatomical repair as it has been shown to reduce recurrence in arthroscopic instability surgery.[3] Eversion of the labrum and placement of the anchor on the corner of the glenoid will allow for anatomical repair. In addition to allowing for a knotless repair, labral tapes have superior biomechanical pull-through strength as demonstrated in our biomechanics lab and significantly higher soft tissue pull-through strength when compared with conventional suture.[7,11]

As Dr Jim Bradley and colleagues[2] have shown, the number of suture anchors may be a contributing factor for failure of posterior labrum tears. We strive for a minimum of 3 anchors in each repair spaced 1.5 hours apart on the clock face. In general, posterior glenoid bone loss (PGBL) occurs in the posterior inferior quadrant in an oblique orientation compared with the long axis of the glenoid. In this particular case, the bony Bankart lesion spanned the 7:30 to 9 o'clock position. Given the thickness of the bony Bankart lesion, the drill is used to place a pilot hole through the bony Bankart lesion to facilitate suture tape passage and anatomical reduction of the bone fragment. After suture passage, the anchor was drilled and placed onto the face of the glenoid into the GLAD lesion to provide soft tissue coverage over the lesion.

Following placement of the 6 o'clock anchor, the 7:30, 9 o'clock, and if needed the 10:30 anchors are placed.

A suture-retrieving device can be used to assist in optimal suture tape placement prior to tensioning the suture in challenging cases. In this case, a bucket handle tear was debrided and the tension was applied after cerclage of the remaining labral tissue at the 6 o'clock position. The eyelet is then taken to the undersurface of the labrum and the inferior limb of suture can be preferentially tightened to evert the labrum and allow for anatomical repair. The anterior repairs are performed next followed by any humeral avulsion of the glenohumeral ligament (HAGL) or capsular repair.

Care must be taken to evaluate for atypical lesions including HAGL lesions. When appropriately identified and addressed as seen here in an offensive lineman who had failed previous posterior repair, excellent outcomes can be expected.[1,12] In our prior case example, the 21-year-old football player, a capsular tear was present, but there was no true HAGL lesion. However, a side-to-side repair should be performed to prevent recurrent poster instability. If left untreated, chronic instability from HAGL lesions and capsular tears can lead to early glenohumeral arthritis as seen in this 40-year-old Marine.

In our 21-year-old football player, a side-to-side capsular repair was performed and appropriate capsular tension and anatomy were restored.

Also of critical importance is the identification and treatment of PGBL. Our recent series of 66 Active Duty military patients with posterior instability demonstrated that patients with moderate PGBL did significantly worse when compared with patients without bone loss.[15] Patients with moderate bone loss presented more frequently with primary complaints of instability and higher degrees of clinical failure and recurrent shoulder instability. Therefore, early recognition and treatment of posterior instability prior to the onset of significant bone loss is optimal. In general, good and excellent outcomes can be expected for most patients treated with arthroscopic surgery for posterior shoulder instability.[5]

Our midterm follow-up of more than 200 patients with arthroscopically treated posterior shoulder instability from the US Naval Academy demonstrated low recurrence rate at short-term follow-up with a 17.2% failure rate at greater than 5 years of follow-up.[4] While no statistically significant risk factors for recurrence were identified, younger age was shown to contribute to failure within the first 4 years of follow-up. Tear size was not predictive of failure.

Our current treatment algorithm for posterior shoulder instability is as follows. For patients with new onset or first-time posterior shoulder instability with no bone loss, both conservative and surgical treatments are discussed and offered. For patients with minimal bone loss, surgical treatment is recommended. For patients who have failed primary arthroscopic surgery but do not have bone loss, revision arthroscopic surgery is possible. But if patients have moderate to severe bone loss or have failed prior surgery with mild to moderate bone loss, arthroscopic distal tibia allograft (DTA) reconstruction is performed.

We recently published our preferred technique for arthroscopic DTA posterior glenoid reconstruction in the *Video Journal of Sports Medicine*.[9] This patient demonstrates a typical PGBL and a prior failed arthroscopic posterior labral repair. A diagnostic arthroscopy was performed, and the posterior glenoid recipient site was prepared with an arthroscopic burr. A fresh DTA was harvested and prepared based on the defect size as measured on a 3-dimensional printed model of computed tomographic (CT) scan imaging. The graft is delivered through the infraspinatus muscle using a 3-cm incision parallel with the posterior glenoid rim. Cannulated screws are placed percutaneously for graft fixation. A capsulolabral repair is then performed at the native glenoid rim to make the allograft extra-articular to mitigate risk of allograft reabsorption.[16] Follow-up CT scan 3 months postoperatively shows excellent allograft incorporation and healing. Clinically, the patient was pain-free, had full range of motion, and there were no complaints of instability. Functionally, he was able to perform push-ups without pain and was cleared to return to full duty a little over 4 months postoperatively. This procedure may offer enhanced treatment options for patients with PGBL.

Our standard postoperative rehab protocol includes use of a sling for 4 weeks postoperatively. Strength training is

initiated at 10 weeks postoperatively and a push-up progression is started 16 weeks postoperatively. Most patients are cleared to return to full activities and full duty at 6 months postoperatively.

In summary, attempted nonoperative treatment can be successful in approximately half of posterior shoulder instability patients. If treated arthroscopically, the optimal position of the patient in the lateral decubitus position, appropriate placement of viewing and working portals, and diligent preparation and recreation of anatomy are essential. While performing arthroscopic surgery, careful attention must be paid to unique lesions such as HAGLs, GLAD lesions, and bony Bankarts. Finally, in a revision or bone loss setting, arthroscopic bone augmentation techniques are now available and offer improved treatment options for these challenging patients.

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