Technical Note

Two-Portal Arthroscopic Knotless All-Suture Anchor Posterior Labral Repair

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Abstract: Isolated posterior shoulder instability accounts for approximately 10% of shoulder instability cases. Patients may present after an acute trauma or with insidious onset and associated posterior shoulder pain. Knotless and all-suture anchor devices have become increasing popular and are often used in arthroscopic shoulder instability cases to avoid knot stacks and allow for the ability to re-tension the fixation. This technical note describes our technique for 2-portal posterior labral repair using knotless all-suture anchors with the patient in the lateral decubitus position.

Posterior shoulder instability, although rare within the general population, accounts for up to 10% to 12% of shoulder instability cases.[1,2] However, the true incidence may be higher because this condition can be challenging to diagnose. Posterior shoulder instability is typically seen in weightlifters, overhead athletes, and football players. The pathophysiology of this condition may be linked to microtrauma due to a repetitive posterior axial load.[3,4] This may predispose to posterior labral tears, labral avulsion, or erosion of the posterior labrum.[3,5] Diagnosis and treatment are accompanied by various challenges owing to vague symptoms, complex biomechanical characteristics, and limited literature addressing treatment.[1,6]

Physical examination plays a paramount role in the diagnosis of posterior shoulder instability. Provocative testing assists in the recognition of chronic posterior instability, specifically posterior labral tears. The Kim test and jerk test are 2 examinations that are frequently performed when there is a suspicion of posterior shoulder instability. The Kim test is performed by abducting the arm to 90°, internally rotating the arm with a bent elbow, and applying an axial force while adducting the arm to a flexed position. The sudden onset of posterior shoulder pain is suggestive of a positive test finding.[7] The jerk test is performed by abducting the arm to 90° and flexing the shoulder forward to 45° while applying an axial load on the elbow and posterior inferior force on the humerus.[7] A positive test finding occurs when there is a sudden "clunk" as the humeral head slides off of the glenoid. These 2 provocative tests are reliable and sensitive tools that aid in diagnosing posterior shoulder instability.[7]

Treatment options for posterior shoulder instability are dependent on a multitude of factors including chronicity, patient age and activity level, tissue quality, and concomitant pathology. Physical therapy targeted at dynamic strengthening of the rotator cuff and deltoid muscle is the mainstay of nonoperative management.[8] Numerous open and arthroscopic operative procedures exist, including labral repair, posterior capsular plication, and glenoid augmentation or reconstruction.[8-11] Arthroscopic repair techniques continue to evolve within the field of orthopaedic surgery. Specifically, arthroscopic management has progressed to include surgical management with knotless and all-suture anchors, with biomechanical studies showing knotless all-suture anchors to have similar load to failure to traditional suture anchors, with the added benefit of removing knot stacks.[12-15] This technical note describes our technique for 2-portal posterior labral repair (1 viewing portal and 1 working portal) using knotless all-suture anchors with the patient in the lateral decubitus position.

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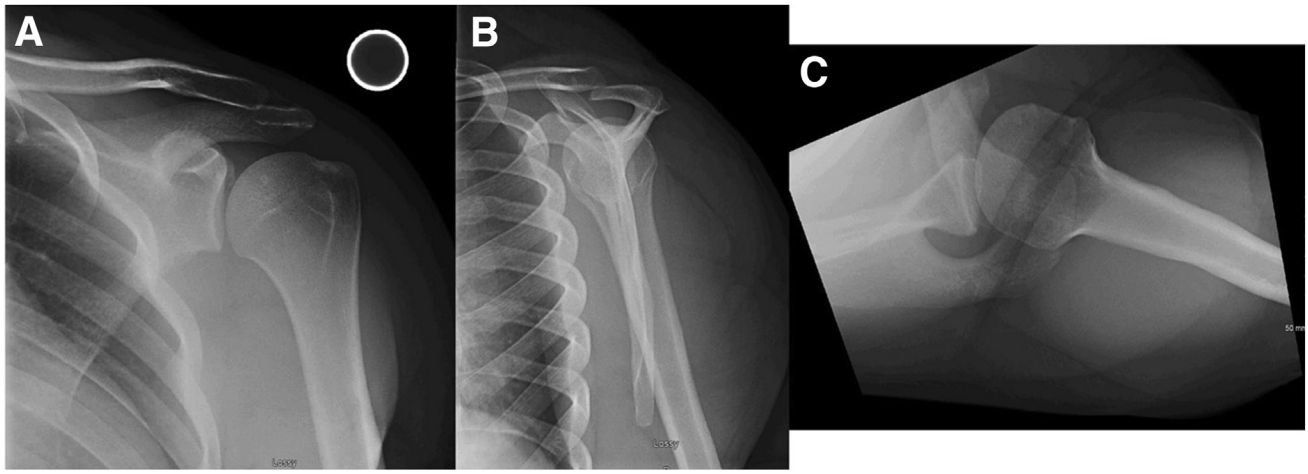

Fig 1. Grashey (A), scapular Y (B), and axillary (C) radiographs of left shoulder showing preserved glenohumeral joint space without evidence of acute fracture.

Surgical Technique

Patient Evaluation

Patients with suspected posterior labral pathology may present after an acute traumatic posterior dislocation or with a history of vague insidious posterior shoulder pain. Patients are evaluated in a systematic fashion with a complete history, physical examination, and radiographs (Fig 1). In patients with symptoms and examination findings concerning for labral pathology, advanced imaging in the form of magnetic resonance imaging is ordered to confirm the diagnosis.

Indications

The primary indication for surgical intervention in patients with posterior shoulder instability is symptomatic recurrent instability refractory to conservative treatment options such as physical therapy. Surgery is also indicated for patients with a history of instability due to acute trauma with associated intra-articular pathology. Ultimately, the type of surgical procedure is dependent on the unique constellation of pathology associated with each patient.

Patient Positioning

Labral repair can be performed with the patient in either the beach-chair or lateral decubitus position, with the preference of the senior author (C.W.N.) being to perform instability cases with the patient in the lateral decubitus position. Patients treated at our institution frequently receive both regional anesthesia and general anesthesia in these cases. After the induction of general anesthesia, the patient is placed in the lateral decubitus position with an axillary roll placed in the axilla and all bony prominences well padded. The operative extremity is placed in 10 lb of balanced suspension (Fig 2). The operative extremity is then prepared and draped in the usual sterile fashion.

Operative Technique

To begin, a small stab incision off the posterior-lateral acromion is made with a No. 11 blade scalpel and the arthroscope is introduced into the glenohumeral joint (Table 1, Video 1). For posterior labral repair using the 2-portal technique, the position of the posterior portal is vitally important. To be able to also use this portal as a working portal, it must be placed superior and lateral (more so than a standard posterior portal), near the posterior corner of the acromion, to create the proper trajectory and angle down toward the posterior glenoid (Fig 3). Next, an accessory direct anterior portal is made under the aid of direct visualization. The senior author prefers to use a spinal needle to localize the portal, followed by a stab incision with a No. 11 blade scalpel. The anterior portal is placed superior and medial through the rotator interval to be able to cross from

Fig 2. Intraoperative image of left shoulder viewed from posterior with patient in lateral decubitus position showing left upper extremity in 10 lb of gentle suspension traction.

Table 1. Tips and Pearls for 2-Portal Arthroscopic Knotless All-Suture Anchor Posterior Labral Repair

1. The patient is positioned in the lateral decubitus position with all bony prominences padded.
2. The operative extremity is hung in 10 lb of gentle suspension traction.
3. Superior (high) portals are established: lateral for the posterior portal and medial for the anterior portal.
4. Diagnostic arthroscopy is performed, and the labrum is evaluated.
5. The labrum is mobilized and the glenoid is prepared with an elevator, shaver, and burr.
6. For the labral repair, the camera is placed in the anterior portal while the posterior portal is the working portal.
7. A metal guide sleeve is introduced through the posterior portal, and a pilot hole is drilled for insertion of the first anchor.
8. The anchor is inserted, and a 45° SutureLasso is used to pass a nitinol wire through the labrum and then back out the posterior cannula.
9. The surgeon passes the repair suture with the nitinol wire in a retrograde manner back through the labrum and then uses the pull suture to pull the repair suture down through the anchor to load the anchor and make the repair suture a circumferential stitch.
10. A pull suture is used to pull the repair suture all the way down and to secure the labrum up onto the glenoid. The suture may be left in place until further anchors are placed to allow re-tensioning after each anchor placement.
11. Steps 7-10 are repeated for each anchor that is placed.
12. After a satisfactory number of anchors have been placed, the construct is probed to verify its stability.

anterior to posterior easily with the camera or with instruments. A cannula is placed through the anterior portal. After introduction of the portals, the posterior portal becomes the standard working portal and the anterior portal is the viewing portal (Fig 3). Large (8.25-mm) cannulas are placed both anteriorly and posteriorly to ease passage of the arthroscope and instrumentation both anteriorly and posteriorly. The fluid flow tubing is removed from the arthroscope sheath and is placed on the posterior cannula to create a sheath-less setup, allowing free movement of the arthroscope back and forth between the 2 cannulas. Next, a standard diagnostic arthroscopy is performed, and the posterior labral tear is appreciated.

After evaluation of the labral tear, the next step is to debride and prepare the glenoid. A combination of elevators, a motorized oscillating shaver, and a burr are used in this process. The goal is to thoroughly debride the glenoid to a bleeding bony healing surface and to mobilize the labrum (Fig 4). After the labrum has been mobilized and the glenoid has been adequately prepared, anchor placement and formal repair are commenced.

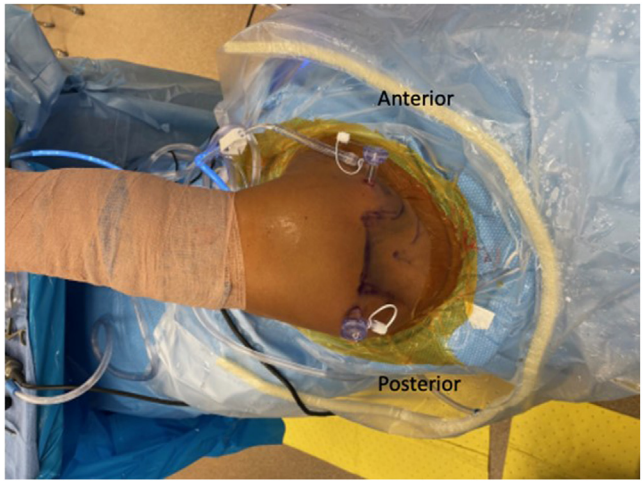

Fig 3. Intraoperative overhead image of left shoulder with patient in lateral decubitus position showing anterior viewing portal and posterior working portal for 2-portal labral repair technique.

Through the posterior portal, a curved metal guide sleeve is introduced at the 6-o'clock position on the glenoid clock face (Fig 5A). A socket is drilled, and a 1.8-mm knotless all-suture FiberTak anchor (Arthrex, Naples, FL) is inserted. A 45° SutureLasso (Arthrex) is used to pass a nitinol wire beneath the labrum and is then retrieved with a suture passer back out the posterior cannula (Fig 5B). The repair suture is loaded through the nitinol wire and is then pulled in a retrograde manner back underneath and through the labral and capsular tissue. Finally, the repair suture is loaded through the loop of the white striped pull suture, and the tail of the pull suture is pulled to load the repair suture through the anchor, creating a circumferential stitch around the labrum and through the anchor construct. The repair suture is then pulled taut to secure the labrum to the glenoid. This sequence is repeated for each of the subsequent all-suture 1.8-mm FiberTak anchors, with placement of as many anchors as needed to fully repair the tear. The anchors can then be sequentially tightened prior to being cut (Fig 6). After placement of all anchors, the repair construct is probed and checked for stability. The remainder of the irrigation fluid in the shoulder joint is suctioned out through the arthroscope. The portals are closed with No. 3-0 nylon stitches in a figure-of-8 configuration, and the incisions are then dressed according to surgeon preference. The full technique is described in Video 1.

Rehabilitation

After the surgical procedure, the patient is seen postoperatively at the following intervals: 2 weeks, 6 weeks, 3 months, 6 months, and 1 year. Physical therapy is initiated within the first week after surgery, with the goal of controlling pain and swelling while maintaining gentle passive range of motion. By

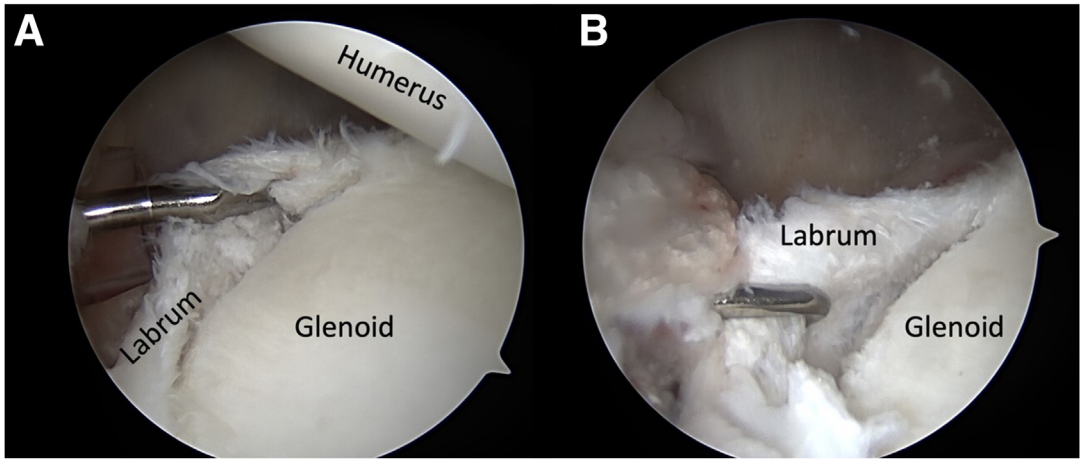

Fig 4. (A, B) Arthroscopic images of left shoulder with patient in lateral decubitus position with 30° arthroscope viewing from direct anterior portal showing detachment of posterior labrum from glenoid.

3 months postoperatively, the patient progresses to full weight bearing with active strengthening and stabilizing exercises.

Discussion

Posterior shoulder instability is less common than anterior instability, typically presenting in weightlifters, overhead athletes, and football players.[1] Repetitive axial load leads to microtrauma, predisposing athletes to posterior labral tears.[3] The diagnosis continues to be challenging because of vague symptoms. A thorough history and physical examination are essential to the diagnosis, with deep pain in the posterior shoulder being the most reported symptom.[16] Range-of-motion and strength testing results are generally normal; therefore, provocative testing with the Kim test and jerk test yields reliable findings.[7] Radiographic images are typically normal in patients with atraumatic posterior instability; however, glenoid changes may be seen if articular cartilage loss is the cause of instability.[16] Magnetic resonance imaging is the most sensitive imaging test for diagnosing posterior labral tears. Treatment goals include pain reduction, functional improvement, and recurrence prevention.[16] First-line treatment consists of nonoperative interventions, focusing on deltoid and rotator cuff dynamic strengthening, whereas operative treatment is reserved for patients in whom conservative treatment fails and those with pathology due to acute trauma.

Over time, the treatment options for posterior shoulder instability have continued to evolve, with knotless and all-suture anchors becoming increasingly

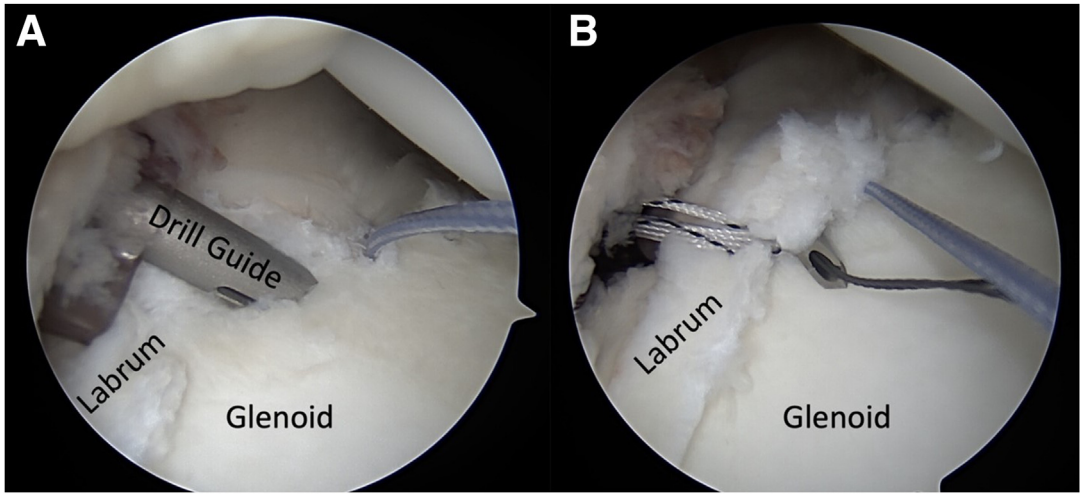

Fig 5. Arthroscopic images of left shoulder with patient in lateral decubitus position with 30° arthroscope viewing from direct anterior portal. (A) A curved metal guide sleeve is placed on the glenoid. (B.) A 45° SutureLasso is used to pass a nitinol wire beneath the labrum and is then retrieved with a suture passer back out the posterior cannula.

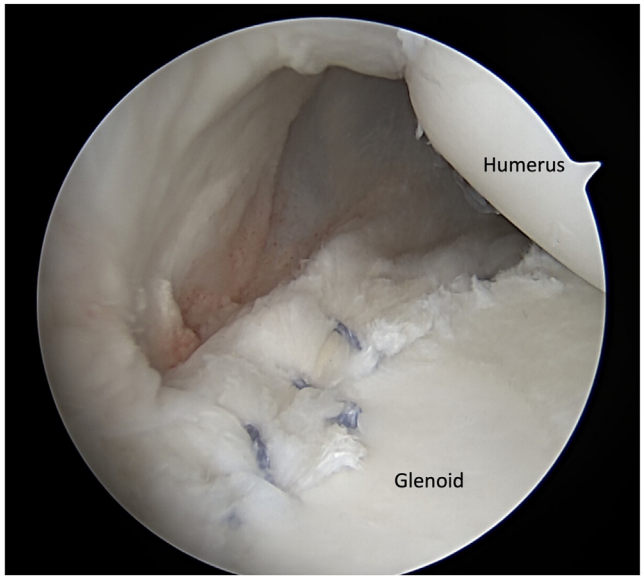

Fig 6. Arthroscopic image of left shoulder with patient in lateral decubitus position with 30° arthroscope viewing from direct anterior portal showing posterior labral repair.

popular.[17] The use of suture anchors in arthroscopic stabilization of posterior shoulder instability results in fewer revision operations and fewer recurrences than anchorless repairs in young patients involved in high-demand physical activity.[18] There are numerous unique benefits associated with knotless and all—soft tissue suture anchors. Biomechanical studies have shown that all-suture anchors offer load to failure similar to traditional suture anchors.[12,13] Furthermore, patients treated with all-suture anchor fixation experience similar rates of healing without the evidence of cystic changes or other bone reactions that have been attributed to traditional suture anchors.[19] Knotless suture anchors may confer decreased operative time and fewer soft-tissue reactions.[20] Knotless suture techniques may offer earlier rehabilitation by providing a wider compression area of the labrum and allowing anatomic fixation strong enough to yield early motion.[17] Finally, the findings of current clinical studies evaluating patient outcomes after all-suture anchor labral repair are promising.[12,21,22]

This technical note describes a 2-portal arthroscopic all-suture anchor technique for labral repair in patients with posterior labral tears resulting in posterior instability. This technique offers many advantages (Table 2) while minimizing the number of posterior portals and, subsequently, the damage to the posterior capsule. In theory, less damage to the posterior capsule could minimize the risk of recurrent instability. However, with 1 working posterior portal, anchor placement may be more challenging than when using multiple portals. Despite this, this technical note describes a reproducible 2-portal technique for all-suture anchor posterior labral repair.

Table 2. Advantages and Disadvantages of 2-Portal Arthroscopic Knotless All-Suture Anchor Posterior Labral Repair

Advantages
The procedure is performed with the patient in the lateral decubitus position, which confers easier patient setup.
Only 2 arthroscopic portals are required, which minimizes capsular and soft-tissue injury.
Knotless all-suture fixation offers low-profile fixation without the risk of cartilage abrasion from knot stacks and allows multiple anchors to be placed into the glenoid for optimal fixation.
Biomechanical strength is equivalent to that of conventional suture anchors.
Knotless all-suture anchors avoid potential bone and soft-tissue reactions.
Disadvantages
With the use of only 2 portals, specific portal placement is required to ensure appropriate access to the labrum and/or glenoid for anchor placement.
Obtaining access to the inferior aspect of the labrum or joint capsule can be difficult via only 2 portals, especially in large patients.
Meticulous suture management is needed to ensure that no knots are created when using 1 working portal.

Disclosures

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: S.F.D. reports board membership with the American Orthopaedic Society for Sports Medicine and Arthroscopy Association of North America; receives speaking and lecture fees from AO North America; receives funding grants from Arthrex; is on the editorial or governing board of *Arthroscopy*; and receives publishing royalties and financial or material support from Springer. C.W.N. reports board membership with the American Academy of Orthopaedic Surgeons, American Orthopaedic Society for Sports Medicine, and Arthroscopy Association of North America; reports a relationship with AO Foundation; receives speaking and lecture fees from Arthrex and Vericel; has a consulting or advisory relationship with Guidepoint Consulting; is on the editorial or governing board of *Arthroscopy*; and receives publishing royalties and financial or material support from *Arthroscopy*. All other authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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