Technical Note

Portal Closure After Segmental Posterior Labral Repair for Posterior Shoulder Instability

Victor J. Yu, M.S., John P. Taliaferro, M.D., and Kevin F. Bonner, M.D.

Abstract: Posterior instability, although an uncommon shoulder pathology, is reported most frequently in the athletic population. Arthroscopic repair has emerged as the main surgical treatment modality for posterior instability. However, when compared with arthroscopic repair for anterior instability, the results of this procedure remain suboptimal. The creation of iatrogenic defects in the capsule, due to cannula placement, is a possible culprit. Because these defects typically do not heal satisfactorily, they become stress risers within the capsule itself, which may lead to recurrent instability or an otherwise compromised repair construct. Therefore, we find that routine intraoperative repair of these defects after repair can reduce the risk of injury and possibly improve long-term outcomes. In this article, we illustrate the repair of a posterior segmental tear using all-suture knotless implants with closure of the posterior and posterior-inferior portals after stabilization.

Posterior instability is observed less frequently compared with its anterior counterpart, with posterior instability comprising between 2% and 12% of all shoulder instability cases.[1] Posterior instability is more commonly reported in athletes involved in activities with highly repetitive loads and posteriorly directed forces, such as rock climbers, football linemen, wrestlers, and weight lifters.[2-5]

Over time, minimally invasive arthroscopic posterior shoulder stabilization, including labral repair, has come to be recognized as the mainstay of treatment for posterior instability when significant bone loss is not an issue. Although open posterior stabilization still plays a role in our armamentarium, contemporary arthroscopic techniques provide good reliability in terms of outcomes, patient satisfaction, and return to play after primary surgery. In general, and historically, the results of posterior instability procedures may not be quite at the same level as those of anterior procedures. This is likely because of several factors including the capsular tissue, which may at times be thin owing to natural anatomic variation or may be otherwise compromised.[6,7] As part of the arthroscopic technique, 1 or 2 portals are created posteriorly and cannulas are placed into the joint. These can often be up to 8 mm in diameter. As a result, iatrogenic defects are created in the capsule, which can contribute to postoperative laxity and deficiency of the capsule. It is our experience that these cannula defects often do not heal postoperatively and contribute to capsular laxity and potentially failure. Additionally, they can serve as stress risers for further injury and propagation of capsular tearing. In an effort to address this, we have begun routinely closing the posterior capsular defects after arthroscopic posterior stabilization. The purpose of this article is to present our posterior labral repair technique with subsequent closure of the posterior portal defects.

Technique

The surgical technique can be seen in Video 1. The senior author (K.F.B.) typically performs all instability cases with patients in the lateral decubitus position. A standard posterior viewing portal and anterior working portal in the rotator interval are initially established to perform a standard diagnostic arthroscopy. If needed, which is common, an additional cannula is placed through an anterior-inferior portal to access the

From Eastern Virginia Medical School, Norfolk, Virginia, U.S.A. (V.J.Y.); EmergeOrtho—Triangle Region, Wilson, North Carolina, U.S.A. (J.P.T.); and Jordan-Young Institute, Virginia Beach, Virginia, U.S.A. (K.F.B.).

The authors report no conflicts of interest in the authorship and publication of this article. Full ICMJE author disclosure forms are available for this article online, as supplementary material.

Received September 25, 2022; accepted December 8, 2022.

Address correspondence to Victor J. Yu, M.S., Eastern Virginia Medical School, PO Box 1980, Norfolk, VA 23501-1980, U.S.A. E-mail: yuv@evms.edu

2212-6287/221257

https://doi.org/10.1016/j.eats.2022.12.002

anterior-inferior glenoid and capsule. Any anterior or anterior-inferior labral or capsular imbrication work is performed, although we do not tension the knotless all-suture anchors until after the posterior work is performed. The anterior-superior working portal is used to view posteriorly and perform the posterior repair. We use both 30° and 70° 4-mm arthroscopes (Smith & Nephew, Andover, MA) in all cases.

Patient Evaluation and Indications

Initial diagnostic arthroscopy reveals a segmental posterior tear, in which the labrum is detached from the glenoid and capsule, but that is still in continuity superiorly and inferiorly, from roughly the 5:30 clock-face position to the 2-o'clock position (somewhat analogous to a bucket-handle tear) (Fig 1A). No bone loss was present in the current case, and the patient's pain, instability, and laxity were only posterior, which was confirmed with the load-and-shift test with the patient under anesthesia.

After diagnostic arthroscopy, the arthroscope is moved into the anterior-superior portal, where it will remain for the majority of the procedure when the posterior work is performed. A second, posterior-inferior portal is created with the aid of a spinal needle to optimize the trajectory for anchor placement and access the posterior-inferior capsule. Initially, we prepare the posterior labrum for appropriate reduction and repair. By use of an elevator inserted through the posterior portal(s), the labrum is elevated off of the glenoid and mobilized to allow for appropriate reduction, all while the segmental labral fragment is salvaged to incorporate into the repair (Fig 1B). A shaver and curette (Smith & Nephew) are used to carefully debride and prepare the glenoid while close attention is paid to avoid damage to the labral tissue so that it can be incorporated as part of the repair.

Beginning posterior-inferiorly, all-suture knotless implants (Arthrex, Naples, FL) are placed in the glenoid to repair the posterior labral tear, as well as to perform concomitant capsulorrhaphy. These anchors are placed through whichever posterior portal is most optimal depending on the location of the desired anchor. An additional posterior-superior portal can now be placed if required to achieve optimal placement of more superior anchors (typically more lateral than the standard posterior viewing portal). Smaller percutaneous cannulas can be used as well for anchor placement. The senior author (K.F.B.) begins by placing the first anchor posterior-inferiorly and moving superiorly. The

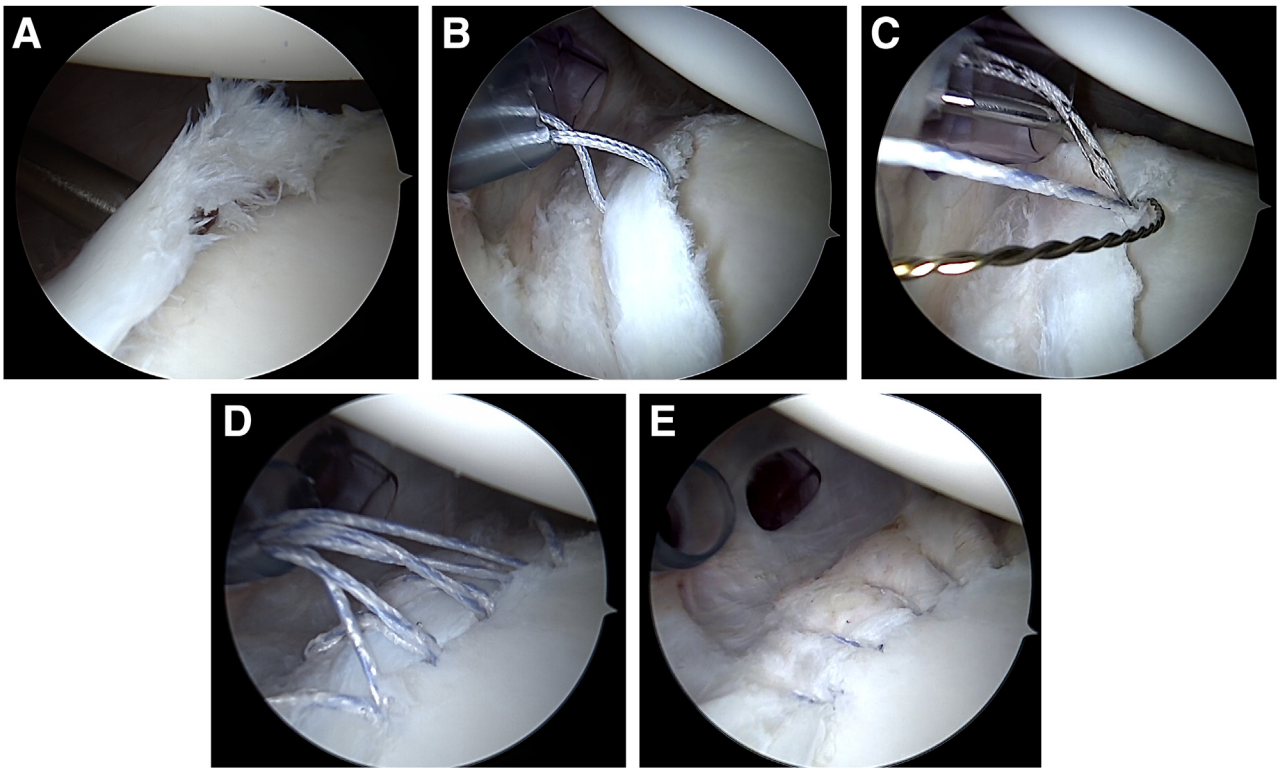

Fig 1. Arthroscopic images during repair to address posterior instability with patient in lateral decubitus position. A 30° scope is positioned through the anterior viewing portal directed posteriorly. The intraoperative steps of the repair are shown. (A) Diagnostic arthroscopy showing segmental posterior labral tear. (B) Elevation of labral tear from glenoid prior to glenoid rim preparation. (C) Passage of suture after placement of initial all-suture anchor (Arthrex). (D) Arthroscopic image after placement and passage of all anchors, prior to cutting. (E) Completed repair construct, prior to portal closure.

knotless all-suture anchors are placed just onto the glenoid to ultimately reduce and repair the labral tissue onto the edge of the glenoid face (Fig 1C). Curved suture-passing devices are used to penetrate through the capsule and labrum not only to achieve an anatomic reduction of the labrum but also to obtain appropriate tensioning of the capsule once the knotless sutures are tightened. Careful attention is paid to plicate the appropriate amount of tissue and to restore as much of a bumper as possible with the labrum and capsule by incorporating the segmental component of the labral tissue into the repair.

Once the self-tensioning sutures are all passed in the appropriate positions—but are only partially tensioned—final tensioning of the sutures is carried out from the inferior-to-superior direction (Fig 1D). The sutures are re-tensioned after the subsequent sutures are tightened. This ensures that all slack is relieved from the system. The pull sutures are then cut using an arthroscopic cutting device to finalize the repair construct (Fig 1E).

After the labral repair and capsulorrhaphy, the posterior portals are closed. The accessory posterior-inferior portal closure is performed by first withdrawing the accessory posterior-inferior cannula to just outside the capsule. Next, a curved suture hook is inserted through the now-withdrawn accessory posterior-inferior cannula and pierces the capsule just adjacent to the portal (Fig 2A). The nitinol wire is then grasped and pulled through the standard posterior portal, loaded with suture, and withdrawn back. A self-penetrating suture retriever is used to pierce through the capsule on the opposite side adjacent to the portal (Fig 2B). The suture is then retrieved and tied down to the capsule in a blinded manner by use of an arthroscopic knot pusher just outside the capsule. A similar set of steps is performed to close the posterior portal. The cannula is again withdrawn to a depth just outside the capsule, and a self-penetrating suture retriever loaded with suture is used to pierce the capsule on the inferior side of the posterior portal. The suture is released, and the suture retriever is withdrawn, is introduced again on the superior side of the portal, and retrieves the suture. This simple stitch is tied down just outside the capsule to achieve closure of the second portal (Fig 2C).

Discussion

Addressing posterior instability with an arthroscopic repair can sometimes be challenging and is not always successful. Failure is not that uncommon and can be

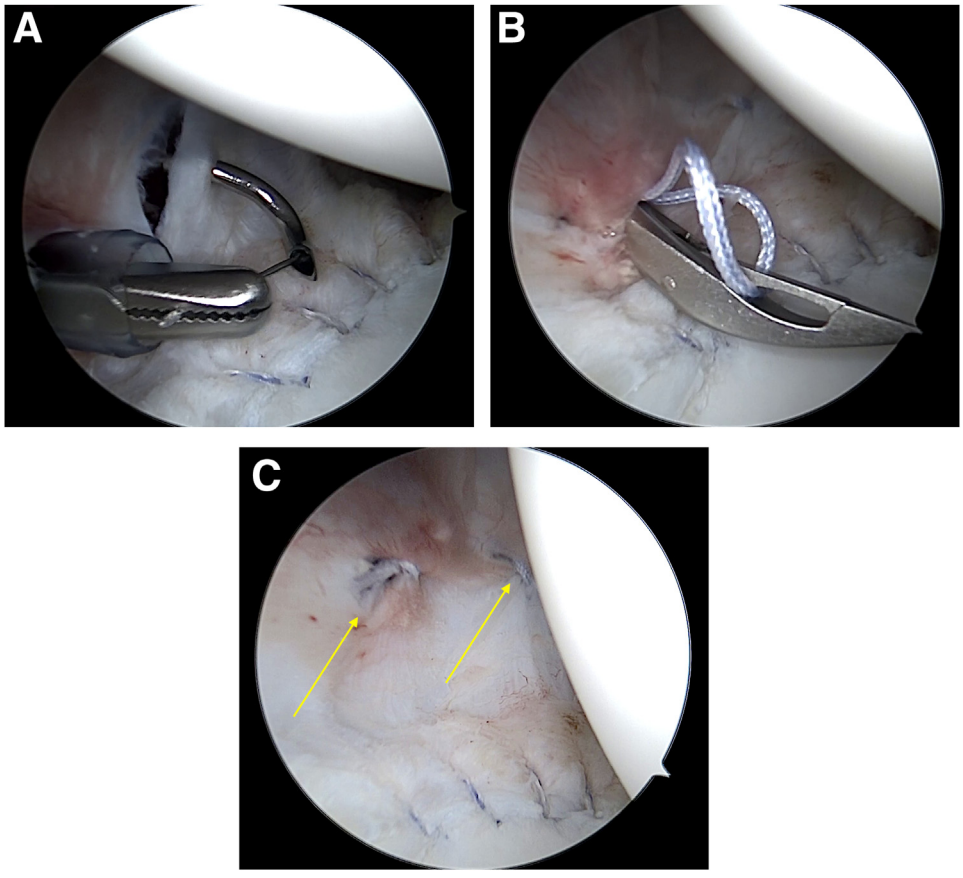

Fig 2. Arthroscopic images from anterior portal during closure of posterior and accessory posterior-inferior portals with patient in lateral decubitus position. (A) With the cannula of the posterior-inferior portal withdrawn to just outside the capsule, a shuttling device is used to pierce the capsule and deliver a suture via a nitinol wire, which is retrieved by a grasper through the posterior portal. (B) A BirdBeak arthroscopic forceps (Arthrex) is used to pierce and deliver suture through the capsule adjacent to the posterior portal, with its cannula withdrawn. (C) Completed closure of posterior and accessory posterior-inferior portals (arrows) alongside completed posterior labral repair construct.

Table 1. Pearls and Pitfalls

Pearls
Risk of iatrogenic laxity minimized
Low-profile knotless repair construct
Pitfalls
Nonstandard technique with learning curve
Potential for iatrogenic axillary nerve damage

multifactorial. This pathology disproportionately impacts the athletic population, which has led to an increased interest in outcomes and return to previous levels of activity after repair. Whereas early approaches to both open and arthroscopic management of posterior instability showed higher rates of failure, the arthroscopic technique has evolved to a point at which it is considered the gold-standard treatment for this pathology without bone loss.[8] In athletic and high-demand patients, arthroscopic repair has been shown to provide good outcomes with low rates of revision and high rates of return to sport and levels of activity prior to injury. In 2020, Chan et al.[9] reported an 83% rate of return to previous duties after posterior labral repair in 65 military patients, with only 1 revision. Similar results were shown by Matar et al.[10] in their 2020 systematic review of 23 studies with 1,047 total patients. Despite these favorable results, complications such as recurrent instability and persistent pain have also been reported.

The purpose of this article is to present our method for performing posterior knotless labral repair with closure of the posterior capsular defects resulting from cannula placement. Pearls and pitfalls of this technique are presented in Table 1. Through our technique, we aim to potentially decrease the likelihood of recurrent instability or failure by addressing a potential cause of residual posterior laxity. Owing to the nature of the capsule itself, the posterior portals are generally located in a thinner, attenuated, fragile area of tissue. Creating both posterior and accessory posterior-inferior portals can generate 1 or 2 defects, and depending on the size of the cannula selected, each of these defects can be up to even 8 or 9 mm in size. The presence of these new iatrogenic defects creates distinct areas of stress risers, or stress concentrations, imparting a "Swiss cheese" effect within the posterior capsule, which logically raises the risk of recurrent instability or failure in these areas. Therefore, by repairing these defects, our technique not only addresses the potential stress risers in the capsule but also further plicates the capsule. Capsular portal closure with the purpose of minimizing the risk of recurrent instability has also previously been described in anterior stabilization.[11] These portal closure techniques follow similar steps to ours. Tying in a blinded manner outside the capsule is not without potential risk. There is potentially risk to the axillary nerve if the repair sutures envelop the nerve. Although this specific complication has not previously been reported, this risk can be mitigated by only bringing the cannula to just outside the capsule when suturing the portal.

For the described repair, we elected to use knotless, tensionable all-suture anchors because of their favorable attributes, which have previously described in both technique articles and cadaveric studies.[12,13] The specific advantages of this anchor system have been detailed; these include small glenoid holes and implants to minimize the risk of a postoperative traumatic postage-stamp fracture, the creation of a greater number of points of fixation, and a decreased risk of knot abrasion and chondral damage owing to its knotless design.[14] Various studies have concluded that knotless anchors, when compared with knotted anchors, offer a strong and low-profile repair construct.[15-17]

Arthroscopic posterior labral repair, especially in the setting of minimal or no significant bone loss, has become the procedure of choice of most surgeons to address symptomatic posterior instability. Despite relatively good results with this procedure, there are still failures and room for improvement. Although causes of failure can be multifactorial, we believe that it is prudent to close the posterior portals at the conclusion of the repair in an effort to improve on our results. Overall, we believe that the technique presented in this article shows how to close posterior portals after labral repair.

References

1. Antoniou J, Harryman DT II. Posterior instability. *Orthop Clin North Am* 2001;32:463-473. ix.
2. Mair SD, Zarzour RH, Speer KP. Posterior labral injury in contact athletes. *Am J Sports Med* 1998;26:753-758.
3. Song DJ, Cook JB, Krul KP, et al. High frequency of posterior and combined shoulder instability in young active patients. *J Shoulder Elbow Surg* 2015;24:186-190.
4. Pollock RG, LU Bigliani. Recurrent posterior shoulder instability. Diagnosis and treatment. *Clin Orthop Relat Res* 1993;(291):85-96.
5. Frank RM, Romeo AA, Provencher MT. Posterior glenohumeral instability: Evidence-based treatment. *J Am Acad Orthop Surg* 2017;25:610-623.
6. Ciccone WJ II, Hunt TJ, Lieber R, Pedowitz R, Esch J, Tasto JP. Multiquadrant digital analysis of shoulder capsular thickness. *Arthroscopy* 2000;16:457-461.
7. Itoi E, Grabowsi JJ, Morrey BF, An KN. Capsular properties of the shoulder. *Tohoku J Exp Med* 1993;171:203-210.
8. DeLong JM, Jiang K, Bradley JP. Posterior instability of the shoulder: A systematic review and meta-analysis of clinical outcomes. *Am J Sports Med* 2015;43:1805-1817.
9. Chan S, O'Brien LK, Waterman BR, Chan AG, Pallis M, Kilcoyne KG. Low risk of recurrence after posterior labral repair of the shoulder in a high-risk United States military population. *Arthrosc Sports Med Rehabil* 2020;2:e47-e52.
10. Matar RN, Shah NS, Gardner TJ, Grawe BM. Return to sport after surgical treatment for posterior shoulder

instability: A systematic review. *JSES Int* 2020;4:797-802.

11. Matsuki K, Sugaya H. Complications after arthroscopic labral repair for shoulder instability. *Curr Rev Musculoskelet Med* 2015;8:53-58.
12. Uggen C, Wei A, Glousman RE, et al. Biomechanical comparison of knotless anchor repair versus simple suture repair for type II SLAP lesions. *Arthroscopy* 2009;25:1085-1092.
13. Cohn MR, Perry AK, Kaplan DJ, et al. Arthroscopic Bennett lesion resection and posterior labral repair using all-suture anchors. *Arthrosc Tech* 2021;10:e1603-e1608.
14. Lacheta L, Dekker TJ, Anderson N, Goldenberg B, Millett PJ. Arthroscopic knotless, tensionable all-suture anchor Bankart repair. *Arthrosc Tech* 2019;8:e647-e653.
15. Thal R, Nofziger M, Bridges M, Kim JJ. Arthroscopic Bankart repair using Knotless or BioKnotless suture anchors: 2- to 7-year results. *Arthroscopy* 2007;23:367-375.
16. Kocaoglu B, Guven O, Nalbantoglu U, Aydin N, Haklar U. No difference between knotless sutures and suture anchors in arthroscopic repair of Bankart lesions in collision athletes. *Knee Surg Sports Traumatol Arthrosc* 2009;17:844-849.
17. Ng DZ, Kumar VP. Arthroscopic Bankart repair using knot-tying versus knotless suture anchors: Is there a difference? *Arthroscopy* 2014;30:422-427.