

Arthroscopic Posterior Labral Repair and Capsular Closure via Single Working Portal for Posterior Shoulder Instability



Maria E. Dey Hazra, M.D., Rony-Orijit Dey Hazra, M.D., Jared A. Hanson, B.A., and Peter J. Millett, M.D., M.Sc.

Abstract: Posterior shoulder instability (PSI) is a relatively less common form of instability that frequently affects young overhead or contact athletes. The etiology of PSI may be traumatic or atraumatic, with establishment of the diagnosis being more difficult in cases of atraumatic instability. Surgical management of PSI has evolved from open techniques to arthroscopic techniques. Posterior stabilization has commonly been performed with 2 posterior working portals with the patient in the lateral decubitus position. The objective of this Technical Note is to describe a technique for posterior labral repair using all-suture anchors with the patient in the beach-chair position via 1 working portal with capsular closure.

Posterior shoulder instability (PSI) is a relatively less common form of instability, accounting for only 10% of shoulder instability cases.^{1,2} PSI most commonly affects contact and overhead athletes,² can have a traumatic or atraumatic onset,³ and is often overlooked, resulting in delayed diagnosis and treatment.⁴ The sex- and age-corrected incidence is 4.6 per 100,000 person-years, with incidences varying between subgroups.⁴ Risk factors for PSI include repetitive microtrauma in throwing athletes,⁵ bony abnormalities,³ and soft-tissue factors such as connective tissue disease and hyperlaxity.^{6,7}

Nonoperative physical therapy aims to strengthen the dynamic glenohumeral muscular stabilizers such as the deltoid and rotator cuff, as well as the global stabilizers of the shoulder and scapula.⁸ If nonoperative treatment

fails, patients undergo operative management. Various open surgical techniques have been described, with arthroscopic techniques increasing in use.⁹ Arthroscopic posterior stabilization has commonly been performed with 2 posterior working portals with the patient in the lateral decubitus position. The objective of this Technical Note is to describe an arthroscopic approach for the management of posterior labral tears using all-suture anchors with the patient in the beach-chair position via 1 working portal with capsular closure (Video 1).

Surgical Technique

Required Materials

In addition to standard arthroscopy equipment, our technique uses three 5-mm × 7-cm cannulas (Arthrex,

From Steadman Philippon Research Institute, Vail, Colorado, U.S.A. (M.E.D.H., R-O.D.H., J.A.H., P.J.M.); and The Steadman Clinic, Vail, Colorado, U.S.A. (P.J.M.).

The authors report the following potential conflicts of interest or sources of funding: M.E.D.H. receives research support from Steadman Philippon Research Institute (SPRI), outside the submitted work. R-O.D.H. receives research support from SPRI and has a fellowship position partially funded by Arthrex, outside the submitted work. J.A.H. is an employee of SPRI, outside the submitted work. P.J.M. is a consultant for Arthrex; receives royalties from Arthrex, Springer Publishing, and MedBridge; receives grants from Arthrex; owns stock options in VuMedi; is part owner of ProofPoint Biologics; and receives support for research activities from SPRI, outside the submitted work. In addition, his institution receives funding from Arthrex, Smith & Nephew, Siemens, and Össur, outside the submitted work. SPRI exercises special care to identify any financial interests or relationships related to the research conducted here. During the past calendar year, SPRI has received grant funding

or in-kind donations from Arthrex, Department of Defense Office of Naval Research, DJO, Major League Baseball, Siemens, Össur, Smith & Nephew. Full ICMJE author disclosure forms are available for this article online, as supplementary material.

Received March 28, 2022; accepted April 26, 2022.

Address correspondence to Peter J. Millett, M.D., M.Sc., The Steadman Clinic, 181 W Meadow Dr, Ste 400, Vail, CO 81657, U.S.A. E-mail: drmillett@thesteadmanclinic.com

© 2022 THE AUTHORS. Published by Elsevier Inc. on behalf of the Arthroscopy Association of North America. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

2212-6287/22431

<https://doi.org/10.1016/j.eats.2022.04.007>

Table 1. Pearls and Pitfalls

Pearls	
A thorough standardized diagnostic arthroscopy assessing concomitant lesions should be performed.	
Five-millimeter cannulas provide excellent visibility, low cannula interference, and access without creating large capsular defects.	
When the anterior labrum is torn, anterior stabilization should be performed first.	
A drill guide can be used as a lever to displace the humeral head, allowing more access to the inferior labrum.	
The appropriate trajectory for portal and cannula placement should allow for excellent anchor placement and labral visualization.	
Use of an angled drill guide allows for easier anchor placement.	
Pitfalls	
Portal placement too inferomedial results in insufficient visualization during posterior labral repair.	
Not pulling on the shuttle sutures using an in-line trajectory can result in difficult shuttling.	
Anchor placement should occur not in the chondral layer but rather in the cortical bone for strong fixation.	

Naples, FL), a QuickPass Crescent Lasso device (Arthrex), and knotless suture anchors (Arthrex). The small-diameter cannulas inflict less tissue damage while allowing excellent visualization and passage of arthroscopic tools (Table 1). The crescent-shaped tip of the lasso loop enables the surgeon to pierce through the capsule and labrum and shift a larger amount of tissue. Finally, this technique uses 1.8 mm Knotless FiberTak anchors with No. 2 sutures (Arthrex), which consist of a suture anchor sleeve, a blue repair suture that is connected to the suture anchor base, and a black-and-white striped shuttling suture. The shuttling suture has 2 unique ends, 1 looped and 1 blunt. The striped suture is moved through the suture sleeve and functions to shuttle the blue suture. A 15° FiberTak Guide (Arthrex) with a 2.4-mm drill is used prior to anchor placement.

Anesthesia, Patient Positioning, and Physical Examination

Local and general anesthesia is administered, and the patient is positioned in the beach-chair position for sterile preparation and draping. A physical examination assessing pathologic glenohumeral laxity is performed using the posterior load-and-shift and jerk tests, the findings of which confirm the diagnosis. Using 5-mm × 7-cm cannulas, we establish a standard posterior viewing portal, in addition to 2 anterior portals: the first directly inferior to the clavicle beneath the biceps tendon and the second in the rotator interval. A standard diagnostic arthroscopy is performed, visualizing the labral tear (Fig 1) and any concomitant pathologies. A switching stick is used to place the viewing camera in the anterosuperior portal to evaluate the posterior labral injury.

Thoughtful portal placement is integral to gain access to the entire posterior labrum. The posterolateral working portal is established 2 cm inferior and lateral to the standard diagnostic portal with a 5-mm cannula. The position and trajectory of the cannula are crucial: More medial placement allows for easier passage through the capsule and labrum, whereas more lateral placement allows for easier anchor placement (Fig 2). The anteroinferior portal is placed so that it is parallel to the glenoid to facilitate shuttling back to front. Via the posterolateral working portal, the labrum is mobilized with an elevator and an arthroscopic shaver is used to debride the glenoid bone for an improved healing response.

Anchor Placement

The arthroscopic repair is performed using a 15° angled drill guide with a 2.4-mm drill, drilling first into the subcortical bone at the most inferior, 6-o'clock position. The drill guide may be used as a lever against the humeral head when access is difficult. It is crucial to stabilize the drill guide and to have the proper trajectory to avoid drilling or anchor placement within the chondral tissue (Fig 3A). Without movement of the drill guide, the first 1.8-mm suture anchor is placed through the drill guide and secured with a mallet (Fig 3B). The blue repair suture is then pulled out of the anterosuperior portal with a tape retriever.

Through the posterior working portal, the crescent lasso loop is advanced through the capsule and the chondrolabral junction. A large amount of tissue is grasped, which shifts the capsule during labral fixation. The shuttling wire is then shuttled through the anteroinferior portal out of the body, and the blue repair suture is shuttled through the capsulolabral tissue. The

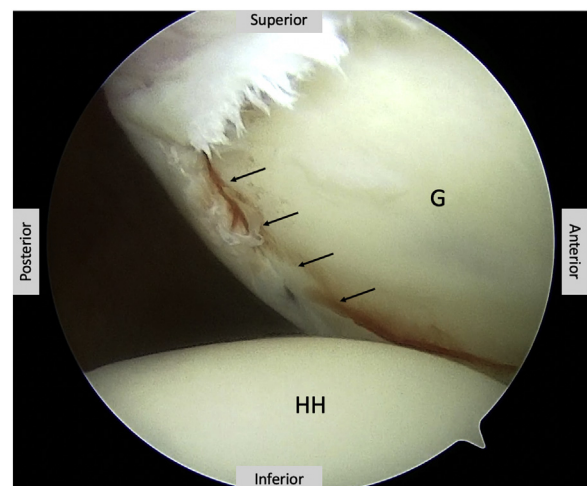
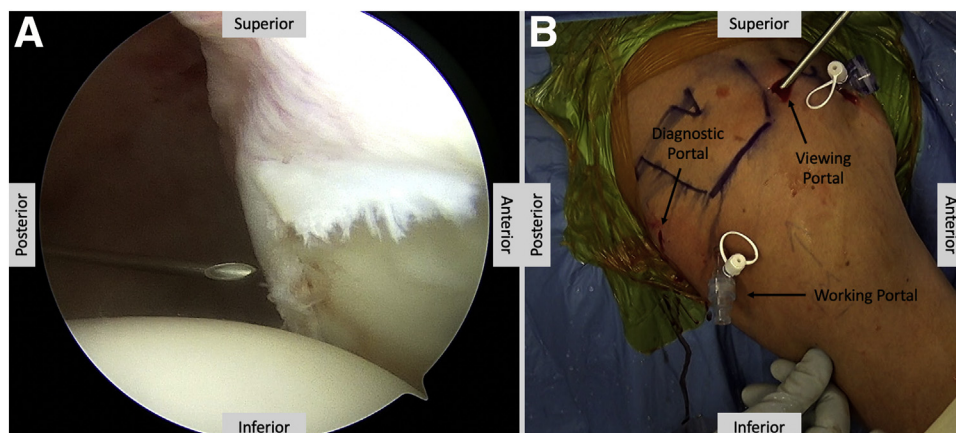


Fig 1. Arthroscopic view of right shoulder from anterosuperior viewing portal showing posterior labral tear (arrows). The posterior labrum can be seen shifted off the glenoid (G) face. (HH, humeral head.)

Fig 2. With the patient in the beach chair position and viewing through an anterosuperior portal, an 18-gauge spinal needle demonstrating the trajectory of the posterior working portal that will allow for posterior working labral repair and capsular shift of the right shoulder (A). On the external view, the trajectory and location of the working portal are illustrated. The portal location is impactful, with more medial placement allowing for easier lasso-loop passage through the capsule and more lateral placement allowing for easier anchor placement (B).



shuttling suture is used to shuttle the repair suture back through the self-locking mechanism of the anchor. It is important to ensure an in-line trajectory through the shuttling process. The blue repair suture is then pulled to tension the soft tissues and secure the repair. Finally, the suture is cut flush with the labrum. The second, third, and fourth anchors are placed in the same fashion at the 7-, 8-, and 9-o'clock positions, respectively. The probe is used to confirm restoration of a sufficient posterior "bumper" (Fig 4).

Posterior Capsular Closure

The tip of the cannula is retracted so that it is just superficial to the capsule, the QuickPass Lasso is used to pierce through the capsule medial to the defect, and the shuttling wire is shuttled out through the anteroinferior portal (Fig 5A). A No. 1 polydioxanone suture (PDS) is passed through the loop, and the lasso is pulled back through the capsule. A 22° angled suture retriever (BirdBeak; Arthrex) is advanced through the capsule lateral to the defect, and the suture is retrieved in an extracapsular manner, tied, and cut, securing the posterior capsule without defect (Fig 5B).

Postoperative Rehabilitation

A postoperative sling is used for 6 weeks. Initially, the repair is protected, pain is managed, and mobility is maintained. Physical therapy begins with passive range of motion after surgeon clearance at 2 weeks postoperatively for the prevention of secondary frozen shoulder. The patient progresses to active strengthening and stabilizing exercises with full active range of motion and weight bearing commencing after 3 months.¹⁰

Discussion

Historically, open techniques were performed for posterior shoulder stabilization. Various techniques have been described, with most requiring an incision in the infraspinatus tendon for access to the joint and visualization.¹¹ The neurovascular structures that are placed at risk are primarily the suprascapular nerve and the axillary nerve.¹¹ The benefits of arthroscopic treatment of PSI include its less invasive nature, ability to leave the infraspinatus tendon intact, greater distance to at-risk nerves, better visualization, ability to access other areas of the joint, and faster recovery.^{5,9,12}

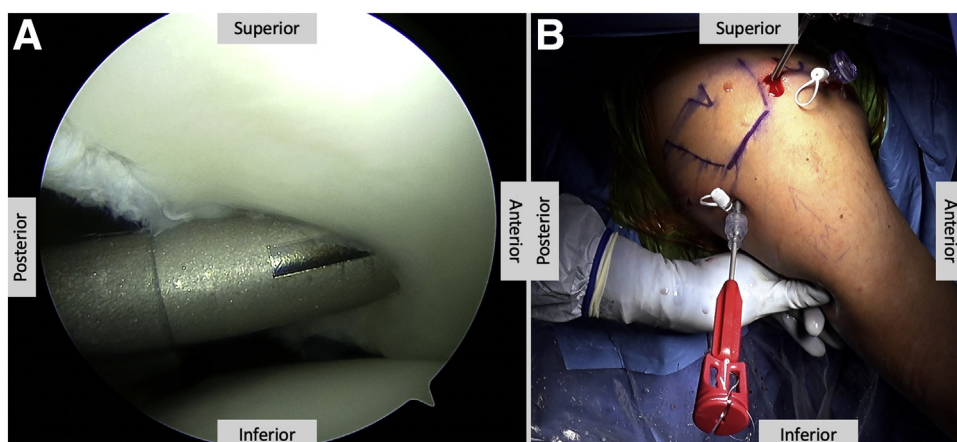


Fig 3. With the patient in the beach chair position, placement of the first anchor at the 6-o'clock position is visualized via an anterosuperior viewing portal during repair of a right posterior labral tear. On both the arthroscopic (A) and external (B) views, the anchor trajectory can be visualized. It is important that the trajectory is somewhat obtusely oriented in relation to the glenoid to ensure that the anchor is deployed in subchondral bone rather than chondral tissue.

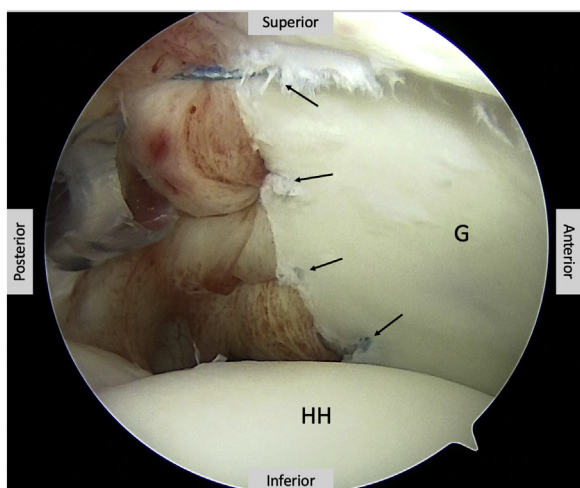


Fig 4. Arthroscopic view of right shoulder via an anterosuperior viewing portal showing completed right posterior labral repair using 4 knotless, all-suture anchors (arrows). In this view, the posterior bumper that has been re-created by the arthroscopic posterior labral repair and capsular shift may be seen. (G, glenoid; HH, humeral head.)

Despite increasing literature on recurrent PSI, a relative paucity of clinical outcomes literature on posterior capsulolabral repair remains. In 1 case series using a single-working portal arthroscopic repair with double-loaded absorbable suture anchors with patients in the beach-chair position for the treatment of PSI, significant improvements in the American Shoulder and Elbow Surgeons score were observed, with all patients returning to their previous level of athletic activity with no surgical revisions.¹² Moreover, improved pain and function were reported in a retrospective study of 32 baseball players after arthroscopic posterior labral repair with a single working portal, resulting in a 94% rate of patient satisfaction and a 94% rate of return to sport, with 61% of patients returning to their previous level of play.¹³

Park et al.⁵ published a single-working portal technique in which posterior stabilization was performed

with the patient in the lateral decubitus position and conventional PEEK (polyether ether ketone) suture anchors were used. In comparison, the illustrated technique has the advantage of using knotless, all-suture anchors, which have been shown to result in excellent fixation¹⁴⁻¹⁸ while reducing the operating room time.¹⁹ In addition, performing the procedure with the patient in the beach-chair position allows for easier and quicker patient positioning than the lateral decubitus position. When compared with techniques that use multiple working portals, the presented technique results in decreased violation of the posterior capsule, which may reduce the risk of recurrent instability. One theoretical limitation of the single-working portal technique is decreased access to the posterior labrum. However, with proper portal placement, as illustrated in Figure 2, it is feasible to perform the posterior labral repair and capsular shift via the single working portal. The presented single-working portal technique carries the aforementioned advantages while maintaining the same risk profile as other arthroscopic approaches to posterior labral repair. Risks associated with this procedure include neurovascular injury, infection, cartilage injury during anchor placement, and repair failure.

Various Technical Notes have focused on posterior capsular closure. The objective is to limit the possibility of recurrent posterior instability without clear evidence. Compared with the illustrated 1-suture technique, most published studies have used 2-suture techniques.^{20,21} The presented technique is advantageous because it is technically straightforward, it is reproducible, and it uses only 1 suture to effectively close the posterior capsular defect, which may reduce posterior capsular deficiency.

Another historical technique is thermal capsulorrhaphy; however, with unsatisfactory results and high complication rates, this procedure is no longer used.^{22,23} The major limitation of the presented surgical technique is the isolated focus on soft-tissue repair.

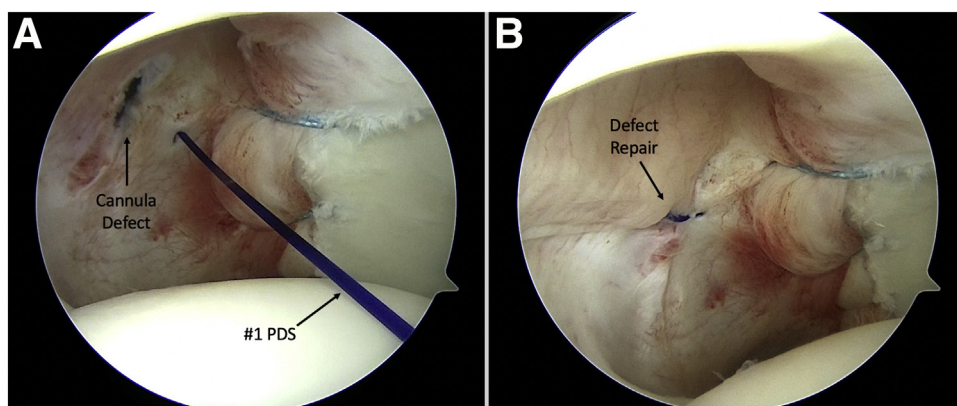


Fig 5. Arthroscopic visualization of posterior capsular defect created by 5-mm cannula of working portal. (A) A No. 1 polydioxanone suture (PDS) can be seen passing just medial to the defect. (B) The suture is retrieved from the medial aspect of the defect. After retrieval, the suture is tied, effectively closing the defect in the posterior capsule, which reduces laxity in the posterior capsule.

Bony malformations, which most commonly occur in the posteroinferior quadrant,²⁴ may be corrected with procedures such as augmentation with iliac crest autograft or a bony Bankart bridge technique.^{25,26} In conclusion, the presented surgical technique illustrates a feasible arthroscopic approach using a single posterior working portal with the patient in the beach-chair position for the treatment of PSI.

References

- Bokshan SL, Kotchman HM, Li LT, DeFroda SF, Cameron KL, Owens BD. Incidence of posterior shoulder instability in the United States military: Demographic considerations from a high-risk population. *Am J Sports Med* 2020;49:340-345.
- Robinson CM, Seah M, Akhtar MA. The epidemiology, risk of recurrence, and functional outcome after an acute traumatic posterior dislocation of the shoulder. *J Bone Joint Surg Am* 2011;93:1605-1613.
- Katthagen JC, Tahal DS, Montgomery SR, Horan MP, Millett PJ. Association of traumatic and atraumatic posterior shoulder instability with glenoid retroversion and outcomes after arthroscopic capsulolabral repair. *Arthroscopy* 2017;33:284-290.
- Woodmass JM, Lee J, Wu IT, et al. Incidence of posterior shoulder instability and trends in surgical reconstruction: A 22-year population-based study. *J Shoulder Elbow Surg* 2019;28:611-616.
- Park J, Kim JY, Kim D, et al. Single-portal arthroscopic posterior shoulder stabilization. *Arthrosc Tech* 2021;10:e2813-e2817.
- Meyer DC, Ernstbrunner L, Boyce G, Imam MA, El Nashar R, Gerber C. Posterior acromial morphology is significantly associated with posterior shoulder instability. *J Bone Joint Surg Am* 2019;101:1253-1260.
- Olds M, Ellis R, Donaldson K, Parmar P, Kersten P. Risk factors which predispose first-time traumatic anterior shoulder dislocations to recurrent instability in adults: A systematic review and meta-analysis. *Br J Sports Med* 2015;49:913-922.
- Alepuz ES, Pérez-Barquero JA, Jorge NJ, García FL, Baixauli VC. Treatment of the posterior unstable shoulder. *Open Orthop J* 2017;11:826-847.
- DiMaria S, Bokshan SL, Nacca C, Owens B. History of surgical stabilization for posterior shoulder instability. *JSES Open Access* 2019;3:350-356.
- Goldenberg BT, Goldsten P, Lacheta L, Arner JW, Provencher MT, Millett PJ. Rehabilitation following posterior shoulder stabilization. *Int J Sports Phys Ther* 2021;16:930-940.
- Robinson CM, Aderinto J. Current concepts review: Recurrent posterior shoulder instability. *J Bone Joint Surg Am* 2005;87:883-892.
- Maalouly J, Aouad D, Darwish M, et al. Arthroscopic repair for posterior shoulder instability: Case series and surgical outcome. *Int J Surg Case Rep* 2020;74:177-181.
- Kercher JS, Runner RP, McCarthy TP, Duralde XA. Posterior labral repairs of the shoulder among baseball players: Results and outcomes with minimum 2-year follow-up. *Am J Sports Med* 2019;47:1687-1693.
- Martetschläger F, Michalski MP, Jansson KS, Wijdicks CA, Millett PJ. Biomechanical evaluation of knotless anterior and posterior Bankart repairs. *Knee Surg Sports Traumatol Arthrosc* 2014;22:2228-2236.
- Matache BA, Hurley ET, Kanakamedala AC, et al. Knotted versus knotless anchors for labral repair in the shoulder: A systematic review. *Arthroscopy* 2021;37:1314-1321.
- Nolte P-C, Midtgaard KS, Ciccotti M, et al. Biomechanical comparison of knotless all-suture anchors and knotted all-suture anchors in type II SLAP lesions: A cadaveric study. *Arthroscopy* 2020;36:2094-2102.
- Lacheta L, Brady A, Rosenberg SI, et al. Biomechanical evaluation of knotless and knotted all-suture anchor repair constructs in 4 Bankart repair configurations. *Arthroscopy* 2020;36:1523-1532.
- Lobo FL, Conforto Gracitelli ME, Malavolta EA, et al. No clinical or radiographic difference seen in arthroscopic Bankart repair with knotted versus knotless suture anchors: A randomized controlled trial at short-term follow-up [published online December 22, 2021]. *Arthroscopy*. <https://doi.org/10.1016/j.arthro.2021.12.017>.
- Burns KA, Robbins L, LeMarr AR, Childress AL, Morton DJ, Wilson ML. Rotator cuff repair with knotless technique is quicker and more cost-effective than knotted technique. *Arthrosc Sport Med Rehabil* 2019;1:e123-e130.
- Schneeberger AG, Yian EH. Arthroscopic posterior portal closure. *Arthroscopy* 2004;20:110-112.
- Wolf EM, Eakin CL. Arthroscopic capsular plication for posterior shoulder instability. *Arthroscopy* 1998;14:153-163.
- Hawkins RJ, Krishnan SG, Karas SG, Noonan TJ, Horan MP. Electrothermal arthroscopic shoulder capsulorrhaphy. *Am J Sports Med* 2007;35:1484-1488.
- Toth AP, Warren RF, Petrigliano FA, et al. Thermal shrinkage for shoulder instability. *HSS J* 2011;7:108-114.
- Dekker TJ, Peebles LA, Goldenberg BT, Millett PJ, Bradley JP, Provencher MT. Location of the glenoid defect in shoulders with recurrent posterior glenohumeral instability. *Am J Sports Med* 2019;47:3051-3056.
- Arner JW, Elrick BP, Nolte PC, Goldenberg B, Dekker TJ, Millett PJ. Posterior glenoid augmentation with extra-articular iliac crest autograft for recurrent posterior shoulder instability. *Arthrosc Tech* 2020;9:e1227-e1233.
- Lacheta L, Goldenberg BT, Horan MP, Millett PJ. Posterior bony Bankart bridge technique results in reliable clinical 2-year outcomes and high return to sports rate for the treatment of posterior bony Bankart lesions. *Knee Surg Sports Traumatol Arthrosc* 2021;29:120-126.