Technical Note

Arthroscopic Techniques to Stabilize Glenoid Bony Bankart Fragments

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Abstract: A bony Bankart lesion is an avulsion of the labroligamentous complex associated with an anterior glenoid rim fracture. Bony Bankart lesions can be seen in up to 70% of traumatic shoulder dislocations. With such a high prevalence, the development of an optimal repair technique is important. Selection of the most appropriate repair method depends heavily on the individual hard- and soft-tissue characteristics of the presenting lesion, as well as surgeon experience with the various repair options. We describe 3 arthroscopic Bankart fixation techniques (labrum alone, transosseous, and double row) to address a range of presenting Bankart pathologies.

Bony Bankart lesions are a common occurrence in conjunction with traumatic shoulder dislocations and are associated with anterior glenoid rim fracture.[1-3] Historically, fixation strategies for bony Bankart lesions were largely described using open surgical techniques that did allow for anatomic restoration of the joint but also required an extensive approach and muscular dissection, substantially increasing the risk of stiffness and muscular weakness. With advancements in arthroscopic techniques, instrumentation, and fixation techniques, there has been increasing utilization of arthroscopic techniques to manage these injuries.[2,4-8] In 2002, Porcellini et al.[1] reported the first case series using an arthroscopic approach to bony Bankart fixation. This technique placed single-loaded suture anchors into the glenoid fracture surface, with sutures encircling the bony fragment, creating a construct with a single point of fixation. Since then, concerns about using a "single" point of fixation and questions regarding the adequacy of fixation have led to several different fixation strategies that have been described in the literature; these techniques include sutures that utilize ligamentotaxis and are passed through the labrum alone and through the fragment[5] or sutures between 2 anchors that are positioned to form a suture bridge reducing the fragment to the native glenoid.[6]

Surgical Techniques

Once in the operating theater, the patient undergoes induction of general and/or regional anesthesia. The operative shoulder is then examined under anesthesia. Stability and range of motion are compared with the contralateral extremity. The patient is then placed into the lateral decubitus position because this position aids in the visualization and exposure of labral pathology. The operative extremity is prepared and draped using standard sterile technique. The operative extremity is then suspended using approximately 10 lb of balanced traction.

Once the patient is carefully positioned with all bony prominences well padded and the head and neck secured in a neutral position, a standard posterior portal is created using a standard technique. A 30° arthroscope is advanced into the intra-articular space. An 18-gauge spinal needle is then used to localize a standard anterior portal. This spinal needle is advanced from outside in under arthroscopic visualization, with care taken to place the needle into a position that will allow for the appropriate angles needed for eventual anchor placement. Once the location of the anterior portal is confirmed using the spinal needle, an 8-mm threaded cannula is advanced into the glenohumeral

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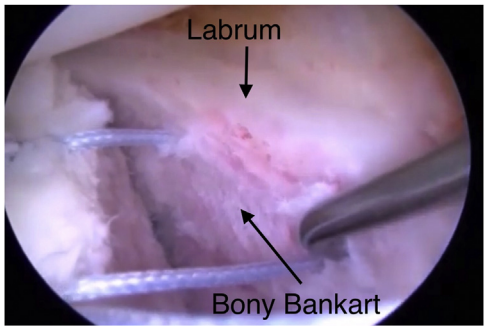

Fig 1. Labrum-alone fixation is shown in a left shoulder with the patient in the lateral decubitus position, as viewed from the posterior portal. Anchors are shown along the articular margin of the face of the glenoid, and sutures are shown passing between the labrum and a bony fragment (arrows).

joint following the same path as the spinal needle. A thorough diagnostic arthroscopy is performed, including careful evaluation of the labrum and osseous fragment. For all techniques, the osseolabral fragment must be freed up to allow for the ability to appropriately reduce the fragment. This can be accomplished with the aid of arthroscopic elevators. Once the fragment is sufficiently mobilized, the glenoid neck is prepared, using a rasp or burr, back to a bleeding surface of cancellous bone.

Technique 1: Labral Fixation Alone

In the first technique, single-loaded 2.4-mm SutureTak anchors (Arthrex, Naples, FL) are placed along the articular surface along the face of the glenoid. By use of a 60° suture grasper (DePuy Synthes, Raynham, MA), sutures are retrieved and passed between the labrum and bone interface (Fig 1). All sutures are passed prior to any knots being tied to ensure maintenance of fragment mobility, which facilitates suture passage. The sutures are then sequentially tied down, reducing the labrum. Anatomic reduction of the labrum assumes appropriate reduction of the associated bony fragment.

Technique 2: Transosseous Technique

In the second technique, single-loaded 2.4-mm SutureTak anchors are placed within the fracture bed. By use of a 60° suture grasper, sutures are retrieved and passed directly through the bone (Fig 2A). All sutures are passed prior to any knots being tied to ensure maintenance of fragment mobility, which facilitates suture passage. The sutures are then sequentially tied down, reducing the bony fragment (Fig 2B). The bony fragment size should be evaluated when considering the transosseous fixation technique. Undersized fragments may be difficult to manipulate when attempting to perforate the fragments. Additionally, for undersized fragments, the perforation may compromise the mechanical integrity of the fragments and could cause a subsequent fracture.

Technique 3: Double-Row Technique

In the third technique, single-loaded 2.4-mm SutureTak anchors are placed medially along the glenoid neck. By use of a 60° suture grasper, sutures are retrieved and passed beneath the osseolabral fragment. All sutures are passed prior to any fixation to ensure maintenance of fragment mobility, which facilitates suture passage (Fig 3A). The sutures from the medial row are secured into position with a second row of anchors placed laterally along the articular margin of the face of the glenoid in a knotless configuration (Fig 3B). The advantages and disadvantages of each discussed repair method are summarized in Table 1.

Discussion

Even though there are several arthroscopic fixation techniques described in the literature for the treatment of bony Bankart lesions, there remains no consensus on the most effective construct. This is likely because fixation techniques are influenced by a variety of factors, such as surgeon preference, technical skill level of treating surgeon, patient age and activity level, and lesion characteristics (acute vs chronic, large vs small

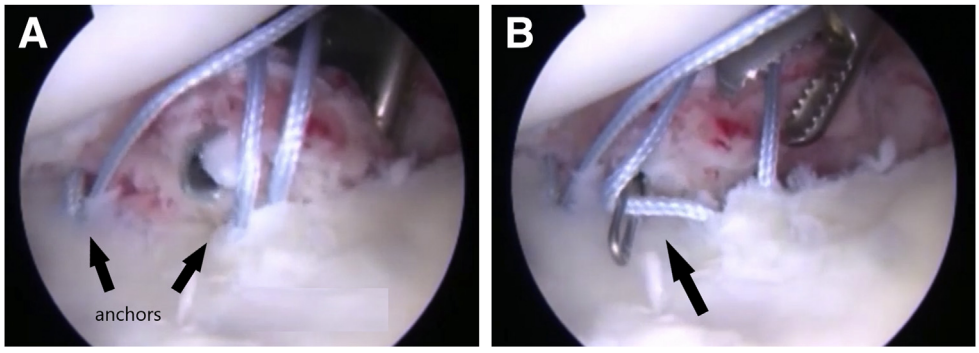

Fig 2. The transosseous technique is shown in a left shoulder with the patient in the lateral decubitus position, as viewed from the posterior portal. (A) Anchors (arrows) are shown embedded in the fractured surface of the glenoid. (B) The sutures are retrieved and passed directly through the osseous fragment (arrow).

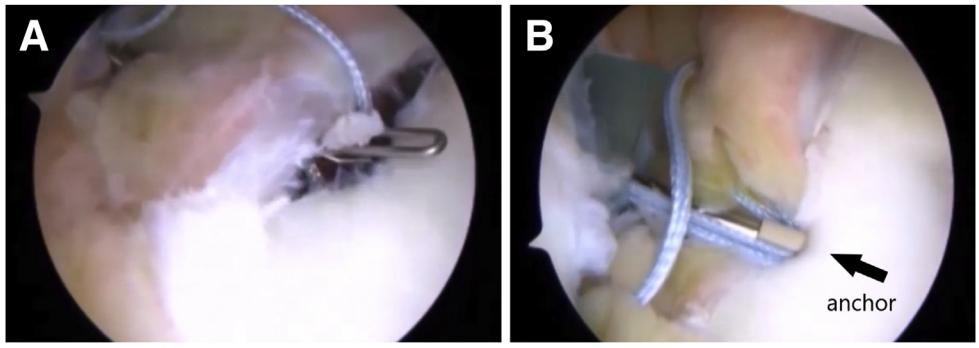

Fig 3. The double-row technique is shown in a right shoulder with the patient in the lateral decubitus position, as viewed from the anterior portal. (A) A medial row of anchors is placed, and the sutures are shown being passed beneath the osseolabral fragment. (B) The medial-row sutures are shown being secured in place with an additional lateral row along the articular margin (arrow).

fragment, and anterior vs posterior). When one is deciding between the 3 illustrated techniques, there are several factors that need to be considered. Some of these factors can be assessed during preoperative planning, whereas others will require intraoperative evaluation. The most important factor to consider preoperatively is the size of the bony fragment. The size of the bony component can be evaluated with radiographic or magnetic resonance imaging studies; however, computed tomography scans give the most accurate measurements regarding the size of the bony component. Intraoperatively, one must assess the mobility of the lesion. This is most important if considering a double-row repair technique because the fragment must be able to be sufficiently medialized to allow for bony preparation, anchor placement, and suture passage.

Several advantages and disadvantages are found with each of the aforementioned techniques, and understanding how and when to use these techniques is crucial for a successful arthroscopic outcome. For repair using sutures passed through the labrum alone, ligamentotaxis is applied to gain secondary reduction of the bony fragment. This technique has the advantage of being technically similar to anchor placement and suture passage in a soft-tissue Bankart repair, and it can be used in settings in which the bony Bankart fragment may be too small to use a transosseous technique. This technique may also be viewed as a more cost-effective method, when compared with the double-row technique, because fewer anchors are used, decreasing implant costs. The largest disadvantage seen with this technique is a lack of bone-to-bone fixation and the use of only a single point of fixation, which biomechanically will lack rotational control.

Table 1. Advantages and Disadvantages of Bankart Lesion Repair Methods

	Advantages	Disadvantages
Labrum-alone method	Technically easier	Single point of fixation
	Cost-effective	No rotational control
Transosseous method	Technically easier	Single point of fixation
	Cost-effective	No rotational control
		Bony fragment size limits
Double-row method	Double-row fixation	Technically more challenging
	Rotational control	Higher implant cost

The transosseous technique has the advantages of being considered technically easier and providing bone-to-bone fixation. However, it shares a disadvantage with the labrum-alone repair technique in that it relies on a single point of fixation and biomechanically lacks rotational control.

Finally, the double-row technique improves on the biomechanical concerns of single-point fixation by generating dual vectors of suture constraint. This technique provides the advantages of a second point of fixation leading to rotational control and added compression[1] but has the disadvantage of being considered technically more challenging, as well as having sutures that potentially sit on the articulation surface.[9] Despite the biomechanical advantage observed with the double-row technique, the current literature has shown no significant differences in clinical outcomes between the 3 techniques discussed herein and demonstrated in Video 1. All 3 techniques were associated with a 6% to 8% traumatic redislocation rate in acute and chronic bony Bankart repair groups.[1,4,5,7,8,10] Therefore, all of the aforementioned methods have been shown to be accepted treatment options. Technique pearls and pitfalls are presented in Table 2.

In conclusion, the treatment of bony Bankart lesions can be a challenging and technically demanding problem. Having the ability to comfortably and confidently execute the appropriate fixation techniques is an invaluable skill for any arthroscopist treating this condition. Selection of the most appropriate repair method depends heavily on the individual hard- and soft-tissue characteristics of the presenting lesion, as well as surgeon experience with the various repair options.

Table 2. Pearls and Pitfalls of Bankart Lesion Repair Methods

	Pearls	Pitfalls
Labrum-alone method	Pass all sutures prior to tying knots.	Avoid tying knots prior to passing all sutures because this makes subsequent suture passage more difficult.
	Ensure appropriate portal positioning with spinal needle prior to cannula placement.	
	Mobilize bony fragment to allow for reduction.	
Transosseous method	Pass all sutures prior to tying knots.	Avoid tying knots prior to passing all sutures because this makes subsequent suture passage more difficult.
	Ensure appropriate portal positioning with spinal needle prior to cannula placement.	Note that bony fragment size may be too small to prevent fragment fracture.
	Mobilize bony fragment to allow for reduction.	
Double-row method	Pass all sutures prior to tying knots.	Avoid tying knots prior to passing all sutures because this makes subsequent suture passage more difficult.
	Ensure appropriate portal positioning with spinal needle prior to cannula placement.	
	Mobilize bony fragment to allow for reduction.	

References

1. Porcellini G, Campi F, Paladini P. Arthroscopic approach to acute bony Bankart lesion. *Arthroscopy* 2002;18:764-769.
2. Porcellini G, Paladini P, Campi F, Paganelli M. Long-term outcome of acute versus chronic bony Bankart lesions managed arthroscopically. *Am J Sports Med* 2007;35:2067-2072.
3. Bigliani LU, Newton PM, Steinmann SP, et al. Glenoid rim lesions associated with recurrent anterior dislocation of the shoulder. *Am J Sports Med* 1998;26:41-45.
4. Sugaya H, Kon Y, Tsuchiya A. Arthroscopic repair of glenoid fractures using suture anchors. *Arthroscopy* 2005;21:635.
5. Cameron SE. Arthroscopic reduction and internal fixation of an anterior glenoid fracture. *Arthroscopy* 1998;14:743-746.
6. Sugaya H, Moriishi J, Kanisawa I, Tsuchiya A. Arthroscopic osseous Bankart repair for chronic recurrent traumatic anterior glenohumeral instability. Surgical technique. *J Bone Joint Surg Am* 2006;88:159-169 (suppl 1, pt 2).
7. Millett PJ, Braun S. The "bony Bankart bridge" procedure: A new arthroscopic technique for reduction and internal fixation of a bony Bankart lesion. *Arthroscopy* 2009;25:102-105.
8. Bauer T, Abadie O, Hardy P. Arthroscopic treatment of glenoid fractures. *Arthroscopy* 2006;22:569.e1-569.e6.
9. Millett PJ, Horan MP, Martetschlager F. The "bony Bankart bridge" technique for restoration of anterior shoulder stability. *Am J Sports Med* 2013;41:608-614.
10. Lynch JR, Clinton JM, Dewing CB, Warme WJ, Matsen FA III. Treatment of osseous defects associated with anterior shoulder instability. *J Shoulder Elbow Surg* 2009;18:317-328.