

Arthroscopic Double-Row Bony Bankart Bridge Repair Using a Tensionable Knotless System

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Abstract: Posterior labral pathology is common in contact athletes; however, posterior glenoid avulsion fractures, also known as posterior bony Bankart lesions, are less common. Posterior instability affects approximately 10% of all patients with shoulder instability. Diagnosis in these high-risk individuals often follows a traumatic posterior dislocation. The patient feels grossly unstable but may or may not have recurrent dislocations beyond the initial trauma. Surgical correction and favorable surgical outcomes require a full understanding of both the soft-tissue and bony components of the injury. Stable osseous fixation is required to restore appropriate glenoid version, depth, and to prevent malunion. We present a technique to mobilize and stabilize a posterior bony Bankart lesion with a knotless suture bridge construct. We feel that this technique is reliable and reproducible and allows for a superior quality of fragment reduction when compared with systems using larger anchors and knotted systems.

Posterior labral pathology is common in contact athletes; however, posterior glenoid avulsion fractures, also known as posterior bony Bankart lesions, are less common. Posterior instability affects approximately 10% of all patients with shoulder instability.¹ Diagnosis in these high-risk individuals often follows a traumatic posterior dislocation. The patient feels grossly unstable but may or may not have recurrent dislocations beyond the initial trauma. Surgical correction and favorable surgical outcomes require a full understanding of both the soft-tissue and bony components of the injury. Stable osseous fixation is required to restore appropriate glenoid version, depth and to prevent malunion. We present a technique to mobilize and stabilize a posterior bony Bankart lesion with a knotless suture bridge construct. We feel that this technique is reliable and reproducible and allows for a superior quality of

fragment reduction when compared with systems using larger anchors and knotted systems.

Surgical Technique (With Video Illustration)

Patient Positioning

The patient should be placed in the lateral decubitus position with care taken to pad the down leg to protect the common peroneal nerve. A bean bag should extend cephalad to the level of the inferior margin of the scapula to secure the thorax.

Portal and Cannula Placement

Standard posterior, 7:00 posterolateral, low anterior, and anterosuperolateral portals should be marked on the skin and infiltrated with 1% lidocaine and epinephrine (Fig 1). The posterior portal should be created with an 11-blade and the arthroscope should be introduced. Diagnostic arthroscopy should be performed and visualization of posterior pathology identified (Fig 2). Following this, a low anterior portal is localized by placing a spinal needle just above the rolled border of the subscapularis. An 8.25-mm cannula should be placed at this location, and outflow is connected to the cannula. An anterosuperolateral viewing portal is then localized with a spinal needle just anterior to the biceps tendon in the proximal aspect of the rotator interval, maximizing the distance between the 2 anterior cannulas. Then, a 5.5-mm cannula is placed in this location. Inflow is then attached to the anterosuperolateral cannula to allow for “sheathless arthroscopy,”

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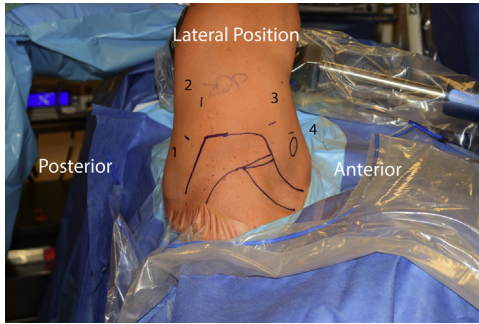


Fig 1. Superior view of operative shoulder with acromion and clavicle marked. This patient is in the lateral position with the left arm abducted. Portal placements are labeled as follows: (1) standard posterior portal; (2) 7:00 posterolateral portal; (3) anterosuperolateral portal; and (4) standard anterior portal.

permitting the surgeon to change viewing and working portals without loss of joint distention or risk of losing access (Fig 3). A 7:00 portal is then localized with a spinal needle, with a starting point on the skin 3 to 4 cm distal to the posterolateral corner of the acromion. Due to propensity of normal threaded cannulas in the 7:00 portal to fall out of the joint, a winged Gemini 8.25-mm cannula is used. This portal placement should be placed to allow perpendicular access to the posterior glenoid. The winged cannula can also be used as a retractor to increase space between the posterior capsule and the posterior glenoid and labrum.

Posterior Labrum and Capsule Preparation

A Bankart elevator is used to carefully dissect the posterior bony Bankart fragment off the posterior glenoid neck with slow, continuous pressure to fatigue the fibrous callus. The fragment should be fully visualized with separation between the osseous labral fragment and the glenoid following preparation (Fig 4 A and B).

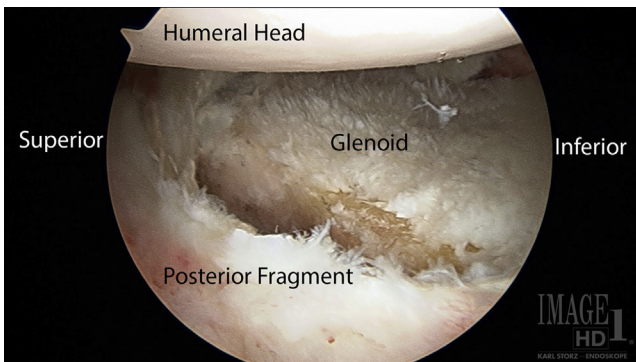


Fig 2. View of posterior bony Bankart fragment visualized from the standard posterior viewing portal (portal 1, Fig 1). Note the large posterior bony fragment attached to labrum and extension of the labral tear that extends beyond the fragment.

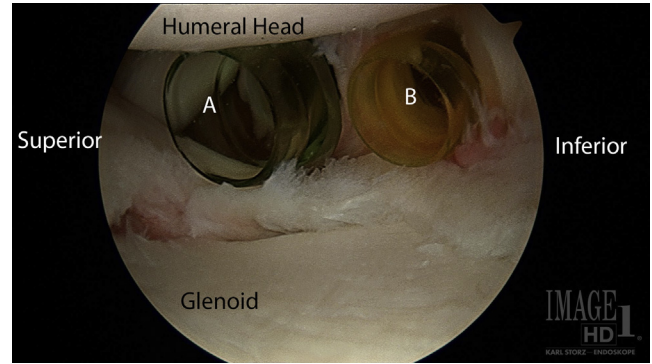


Fig 3. Cannula placed through the anterior (A, green) and anterosuperolateral (B, yellow) portals viewing from standard posterior portal. These accessory portals can be hooked directly to inflow and outflow to ease in instrument and camera placement into and out of the shoulder.

Switching portals and using a 70° Bankart elevator from the anterior portal often allows an easier angle of approach to the posterior glenoid. It is critical to ensure full mobilization of the fragment to allow for anatomic reduction and compression. Once this is achieved, final bony preparation of the posterior glenoid neck is completed using a combination of a ring curette and burr (Fig 4C).

Repair

Repair of the posterior bony Bankart fragment is then performed with a double-row, suture bridge construct. Two medial-row anchors are placed at the inferior and superior border of the defect, respectively (Fig 5). At our institution, we use Stryker NanoTak Flex 1.4-mm anchors (Stryker, Kalamazoo, MI). A distally angled anchor guide allows the anchor to be drilled and inserted at an angle perpendicular to the medial glenoid neck (Fig 6). Using very small anchors reduces the risk of anchor convergence within the glenoid. After initial medial inferior and medial superior placement, the sutures will be passing between the fragment and glenoid. Once the inferior medial anchor is placed, both suture limbs from the anchor are shuttled around the bony Bankart fragment and the posterior labrum using a lasso type device (Fig 7). This is repeated for the superior medial anchor such that all 4 suture limbs are passed around the bony Bankart fragment (Fig 8). Next, fragment reduction is performed as the 2 most inferior sutures are brought into a knotless CinchLock anchor (Stryker) at the interface between the bony Bankart and the native glenoid. One advantage of this system is that the tension on the sutures can be adjusted after the anchor is fully inserted, allowing for precise control of the compression across the fracture. In addition, each suture limb can be tensioned independently, allowing for precise rotational reduction. Full tension should be achieved before the anchor being locked and suture

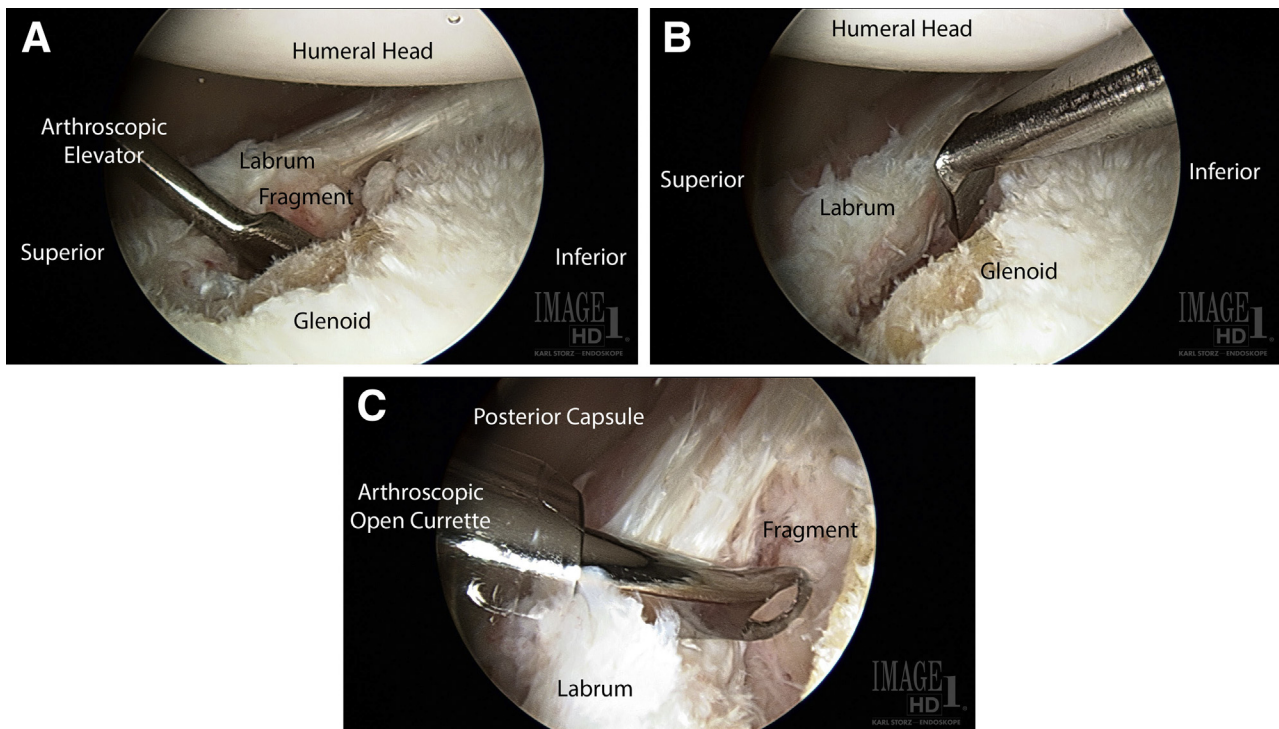


Fig 4. Viewing from the anterosuperolateral portal (cannula B, Fig 3), the posterior bony fragment is addressed. Mobilization of the fragment is performed with (A) an arthroscopic elevator from the 7:00 posterolateral portal, (B) an arthroscopic elevator from the standard anterior portal, and (C) a ring curette from the standard posterior portal.

tails being cut. This process is then repeated with a second CinchLock anchor placed in line with the superior medial row anchor and at the junction of the native glenoid face and the bony Bankart fragment. At this point, the bony Bankart fragment should be flush with the posterior glenoid and resolution of the posterior labral tear should be visualized (Fig 9). The security of the fragment can be tested with a probe.

Pearls and pitfalls for this technique are listed in Table 1. Key steps for this surgical technique are listed in Table 2.

Additional Pathology

Labral tears extending inferiorly or anteriorly from the bony Bankart fragment should now be addressed in sequential fashion from inferior to anterior. In our patient, an additional 3 anchors were used to repair an inferior and anterior labral tear.

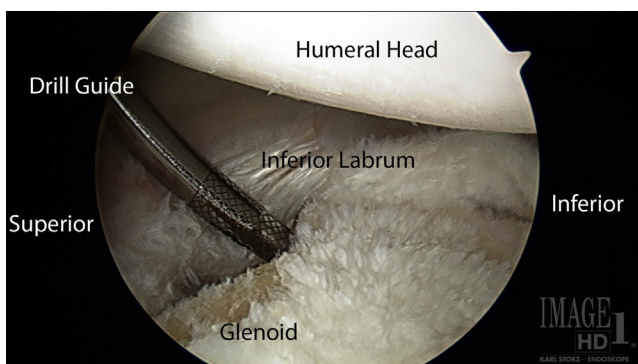


Fig 5. Placement of medial inferior anchor using a distally angulated anchor guide placed through the 7:00 posterior portal. Care should be taken to ensure anchor is placed medial to the mobilized bony Bankart fragment footprint and that the anchor is perpendicular to the glenoid neck. Viewed from the standard anterior portal with the camera viewing inferiorly and posteriorly.

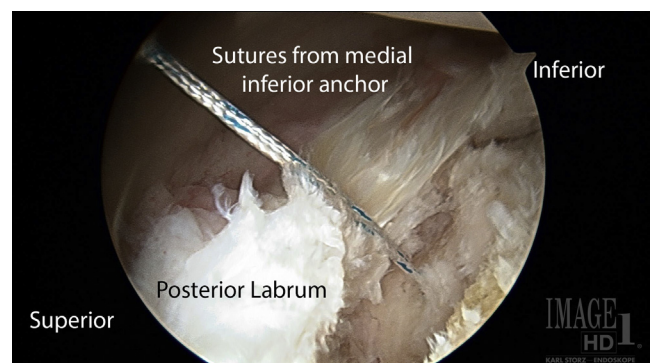


Fig 6. Sutures from the medial inferior anchor coursing between the bony Bankart fragment and posterior glenoid and exiting through the 7:00 posterolateral portal. Viewed from the standard anterior portal.

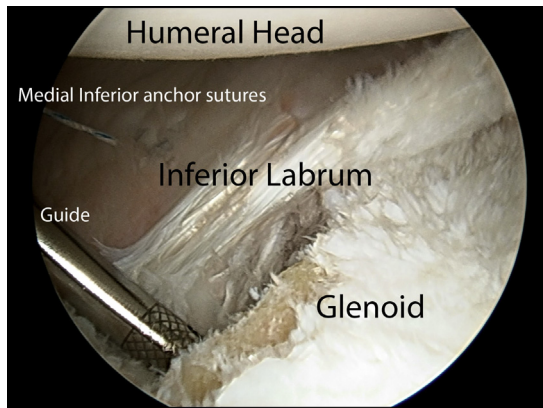


Fig 7. Placement of the medial superior anchor. Posteriorly you can see that the medial inferior anchor sutures have been passed behind (deep to) the bony Bankart fragment and through some posterior capsule. This helps increase strength of the construct. Viewed from standard anterior portal.

Discussion

Surgical correction of recurrent posterior instability is recommended due improved clinical outcomes.² For both acute and chronic posterior bony Bankart fragments, such as our patient, this technique allows for direct reduction of the posterior fragment. In cases in which the fragment is immobile, or the fragment is too large to be secured with suture anchors, alternative procedures should be considered.³ For smaller posterior bony Bankart lesions not amenable to skeletal fixation, this posterior bony Bankart bridge (BBB) repair technique allows for stable osseous fixation and restoration of normal capsulolabral anatomy and tension. Previously, Millet and Braun⁴ described a double-row “bony Bankart bridge” technique for anterior bony Bankart

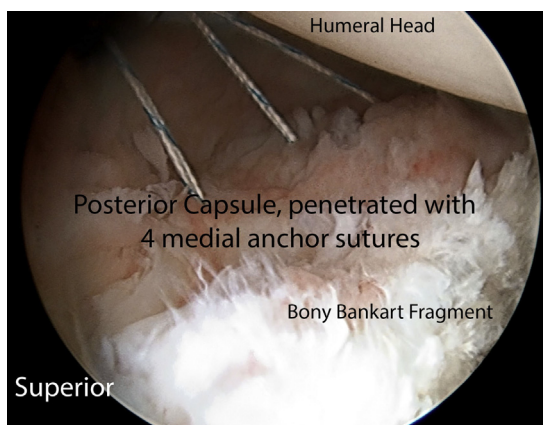


Fig 8. Suture limbs from both medial anchors are shown exiting medial to the fragment with incorporation of the posterior capsule. With tension on these sutures, you can see the fragment has partially reduced. Viewed from standard anterior portal. The glenoid is not visualized in this image but is just to the right of the image and approximated to the reduced bony Bankart fragment.

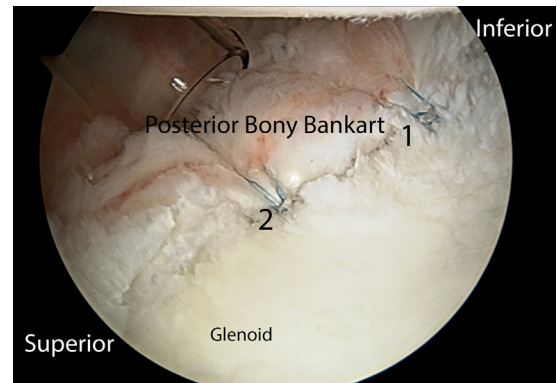


Fig 9. Repair of the posterior bony Bankart avulsion is now completed. Anatomic reduction can be visualized through the standard anterior portal. Appropriate tension was applied prior to locking of the knotless suture anchors. Both limbs from the inferior medial anchor are passed through anchor 1. Both limbs from the superior medial anchor are passed through anchor 2. Viewed from the standard anterior portal.

lesion. This repair was modified by Ly et al.⁵ to include a single-row suture repair and double-row knotted system, but compression of the bony fragment may be asymmetric leading to a tilted fragment or malreduction. Bony fixation with direct percutaneous techniques may work well for larger posterior fragments; however, this technique makes restoration of normal anatomy difficult. Our system allows for anatomic reduction with stable osseous fixation and restoration of normal capsulolabral anatomy and tension.

Godin et al.⁶ and Millet and Braun⁴ recently published long-term outcome results for anterior BBB repair and found that, at 5 years, none of the patients required additional surgery and the cohort had an average single assessment numeric evaluation score of 92.8. Short-term results from the same author for posterior BBB repair found that none of the 7 patients required additional surgery and the cohort had an average single assessment numeric evaluation score of 99.⁶

In summary, the arthroscopic posterior BBB repair provides a minimally invasive solution for shoulder instability caused by smaller posterior bony fragments. Improving anatomic reduction of the bony Bankart fragment without malreduction or over-tensioning of the soft tissue is performed through the use of a smaller anchor that can be drilled and inserted perpendicular to the glenoid surface using a distally angled guide, as well as a CinchLock glenoid-based anchor that allows for tension to be applied after the anchor is fully seeded. Limitations of the technique include posterior fragments that are too large and require percutaneous stabilization, chronic attritional bone loss without frank fragment, and severe posterior dysplasia.

Table 1. Pearls and Pitfalls for an Arthroscopic Double-Row Bony Bankart Repair

Step	Pearl	Pitfall
Patient positioning	Ensure bean bag extends to level of inferior scapula to prevent the patient from rolling during surgery Using an impermeable tape can prevent fluid from leaking over patients face during surgery Traction on the arm can aid in opening up the glenohumeral joint and visualization of the posterior labrum	Failure to properly pad the fibular head can result in peroneal nerve palsy
Portal/cannula placement	Using a Gemini 8.25-mm (Arthrex, Naples, FL) portal posteriorly can prevent the cannula from repeatedly falling out With your 2 anterior cannulas, attaching one to inflow and one to outflow will allow for easier portal switching during surgery	Placing the posterior 7:00 portal too anteriorly can prevent perpendicular access to the posterior glenoid
Posterior labral preparation and fragment mobilization	An arthroscopic elevator used from the anterior portal will help with opening up the interval between the fragment and glenoid Using the burr on reverse can prevent too much bone from being removed during preparation	Too aggressive of debridement using the burr or ring curette will prevent proper anchor purchase in the softer posterior bone
Repair	Small anchor systems with distally angled guides, like the SutureTak system (Arthrex), can aid in obtaining perpendicular anchor placement of the medial anchors on the glenoid neck It is easy to get a suture knot during the repair. Take time to carefully control each set of sutures and prevent crossing. We find that passing the superior medial anchor sutures inferior (on top of) the inferior anchor and out the anterior portal is an easy way to prevent crossing of the sutures as you secure the inferior set of sutures	Keeping both sets of sutures from the medial row exiting through the posterior cannula can cause a suture not as you go to insert the lateral anchor
Additional pathology	If the tear extends inferiorly or anteriorly, place a suture loaded anchor(s) before reducing the posterior bony Bankart fragment.	Reducing the bony Bankart fragment before placing inferior anchors makes it difficult to instrument the inferior glenoid

Table 2. List and Description of Key Steps for Surgical Fixation of Posterior Bony Bankart Defect

Patient positioning	Knees should be slightly flexed and the patient tilted posteriorly approximately 10-20°. The arm should have gentle traction and be pulled slightly into a flexed position to open up the posterior inferior glenoid
Portal/cannula placement	Attach inflow and outflow to the anterior cannulas quickly to ease camera and instrument passing For the 7:00 posterolateral portal, a self-retaining cannula should be used Ensure the 7:00 posterolateral is placed to allow for perpendicular access to the posterior glenoid
Posterior labral preparation and fragment mobilization	Full mobilization of the fragment should include soft-tissue elevation medial to the fragment on the glenoid neck An arthroscopic elevator from the posterior portal will start mobilization, but switching to the anterior portal can help complete mobilization A ring curette helps to remove fibrous tissue on the bony surface. Avoid removing too much bone.
Repair	A distally angled guide helps for perpendicular insertion of the medial anchors Suture ends are passed out posterior cannula and separated. Moving the superior anchor sutures over top/inferior to the inferior anchor can help prevent knotting of the sutures as the inferior lateral anchor is tightened Use a knotless, tensionable lateral anchor Incorporate posterior capsule if plication is needed Placing inferior labral anchors before reducing the bony Bankart can help with proper anchor position

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