

Arthroscopic Bony Bankart Repair Using Suture Suspension to Increase Bone Contact Area



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Abstract: Bony Bankart lesions are anteroinferior glenoid rim fractures associated with capsulolabral tears. Untreated bony Bankart lesion can cause recurrent dislocation. So, the large bony Bankart lesions should be treated by anatomical reduction and stabilization. This Technical Note describes an arthroscopic bony Bankart lesion repair using suture suspension to increase contact area to gain more contact area and tissue compression to maximize the stability of the repair.

Introduction

Bankart lesion is an avulsion of the capsulolabral tissue from the anteroinferior glenoid rim.¹ It is caused by traumatic anterior shoulder dislocation. The bony fracture of the anteroinferior glenoid rim associated with the Bankart lesion is called a bony Bankart lesion. The bony Bankart lesions are present in 23% of recurrent anterior shoulder dislocations.² Itoi et al. and Burkhart et al. described that bony lesion with more than 25% of glenoid width causes instability.³⁻⁶ Untreated bony Bankart lesion can cause recurrent dislocation.^{7,8} So, the large bony Bankart lesions should be treated by anatomical reduction and stabilization. Several arthroscopic techniques have been reported to stabilize bony Bankart lesions.⁹⁻¹² We propose an arthroscopic bony Bankart repair using suture suspension to increase bone contact area to gain more contact area and tissue compression that will maximize the stability of the repair.

Preoperative Evaluation

Plain radiographs, computed tomography, and magnetic resonance imaging are performed to evaluate the size of bony Bankart lesions and associated capsulolabral injuries.¹³

Surgical Technique (With Video Illustration)

Patient Positioning

The patient is positioned in lateral decubitus. After examination under anesthesia is done, the patient is positioned in the lateral decubitus with the affected shoulder in 30° of abduction and 15° of forwarding flexion with the arm suspended of 5-kg distal traction.

Arthroscopic Portal Placement

First, the arthroscope is placed in the standard posterior portal located at 2 cm medial and inferior to the posterolateral edge of the acromion. Then, the routine arthroscopic examination is performed to evaluate the associated injuries. The anterosuperior portal is placed 1 cm off the anterolateral edge of the acromion and enters the glenohumeral joint just posterior to the long head biceps tendon. The arthroscope is switched to this portal as the main viewing portal. The anteroinferior portal is placed just above the subscapularis tendon using the outside-in technique, and the spinal needle is used to ensure adequate access to the inferior glenoid rim. A cannula is inserted into this portal as the main working portal.

Preparation of the Bony Fragment and Reduction

The bony Bankart lesion is evaluated and mobility is checked using the probe and grasper (Fig 1A, Video 1).

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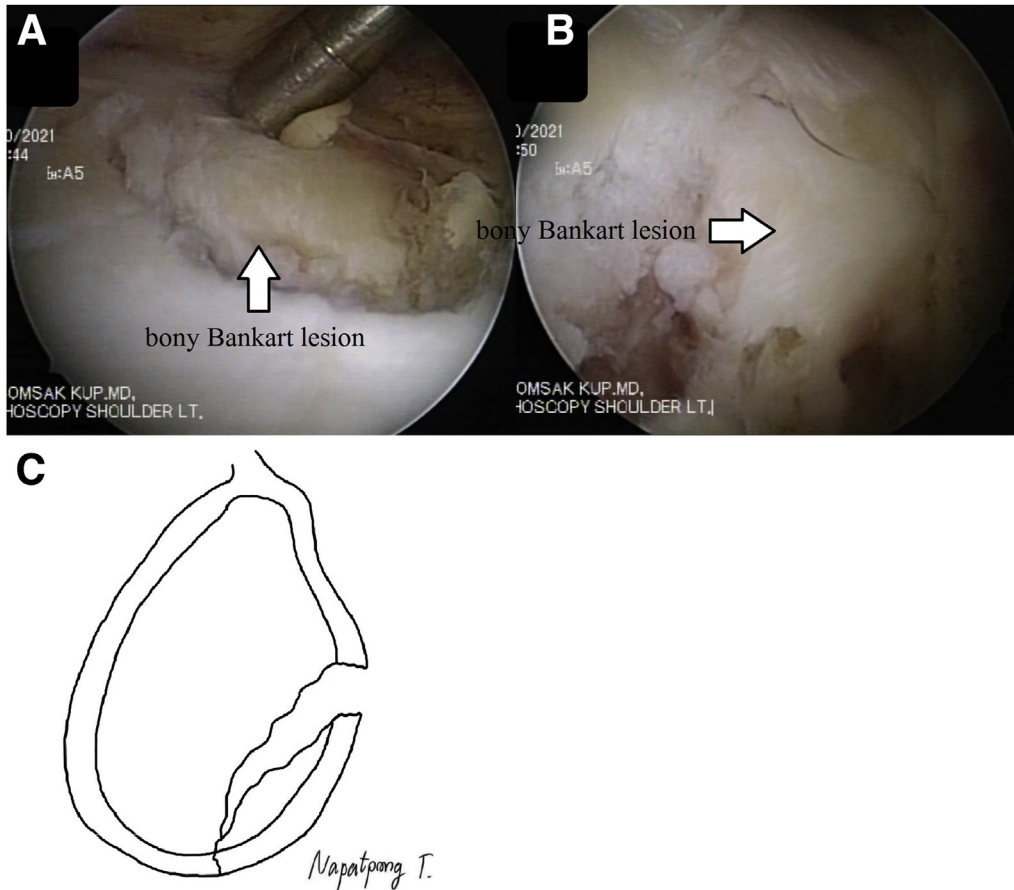


Fig 1. Left shoulder, lateral decubitus position. The bony Bankart lesion is evaluated and checked for mobility viewing from the posterior portal (A) and viewing from the anterosuperior portal (B). (C) Illustration shows the bony Bankart lesion.

Viewing through the anterosuperior portal and working through the anteroinferior portal, the bony Bankart lesion is released by Bankart knife (Fig 1B, Video 1). The bone base is prepared using a shaver and rasp to enhance bone healing. The bony Bankart fragment is released until the bony fragment can be reduced with minimal tension.

Then the reduction is performed. The FIRSTPASS suture passer loaded with no. 2 COBRAID suture (Smith & Nephew, Andover, MA) is passed through the capsulolabrum at the upper borders of the bony Bankart fragment (Fig 2, A and B, Video 1). Suture limbs are retrieved to the posterior portal. Another suture is passed through the capsulolabrum at the lower border of the bony Bankart fragment and retrieved in the same fashion. The sutures are tensioned to reduce the bony Bankart fragment (Fig 2C, Video 1).

Bony Bankart Repair

The first 1.9-mm SUTUREFIX ULTRA Anchor with double-loaded with no. 2 COBRAID sutures (Smith & Nephew, Andover, MA) is placed at the lower one-third border of the bony Bankart lesion at the glenoid (Fig 3, A and B, Video 1). The FIRSTPASS suture passer (Smith

& Nephew, Andover, MA) is used to sew the capsulolabral tissue by passing a no. 2 COBRAID suture to shuttle the anchor sutures through the bony Bankart lesion and capsulolabral tissue. Then they are tied with sliding knots (Fig 4, Video 1).

The second 1.9-mm SUTUREFIX ULTRA Anchor (Smith & Nephew, Andover, MA) is placed at the upper one-third border of the bony Bankart lesion at the glenoid. Then, the same process is repeated to shuttle the sutures and tie the knots.

The third 1.9-mm SUTUREFIX ULTRA Anchor (Smith & Nephew) is placed at the outer cortex of the glenoid, medial to the fracture line (Fig 5A, Video 1). The suture limbs from the first anchor are retrieved to the anteroinferior portal. Then, the knots are tied from the suture limbs of the first anchor and the third anchor (Fig 5B, Video 1). The tied suture limbs are then cut. The suture limbs from the second anchor are also retrieved to the anteroinferior portal. Then, the same process is repeated to tie the knot to create contact area suspension of a bony fragment that will gain more contact area and tissue compression to maximize the stability of the repair (Fig 6, Video 1).

Fig 2. Left shoulder, lateral decubitus position, as viewed from the anterosuperior portal. (A) The first-pass suture passer passes the reduction suture through the capsulolabral tissue at the upper border of the bony Bankart lesion. (B) The reduction sutures at the upper and lower border of the bony Bankart lesion are retrieved to the posterior portal. (C) The reduction sutures are tensioned to reduce the bony fragment. (D) Illustration drawing showing reduction step with the reduction sutures. (B, Bony Bankart lesion; F, The first-pass suture passer; G, glenoid. The asterisk (*) denotes reduction sutures.

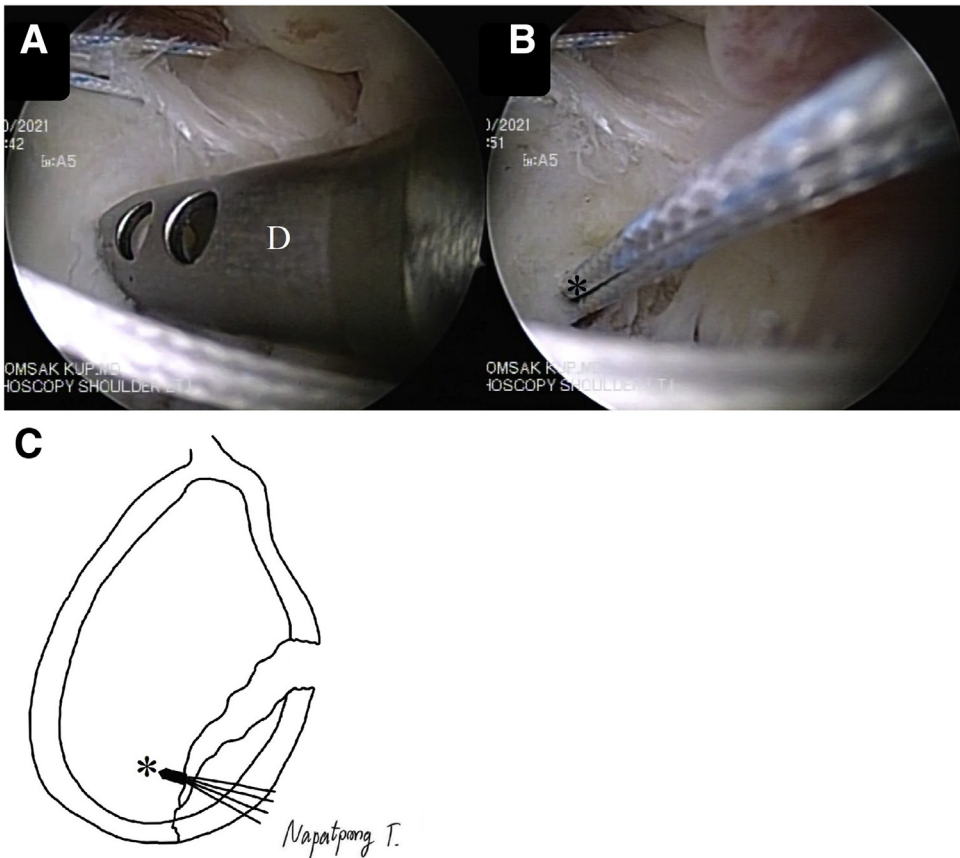
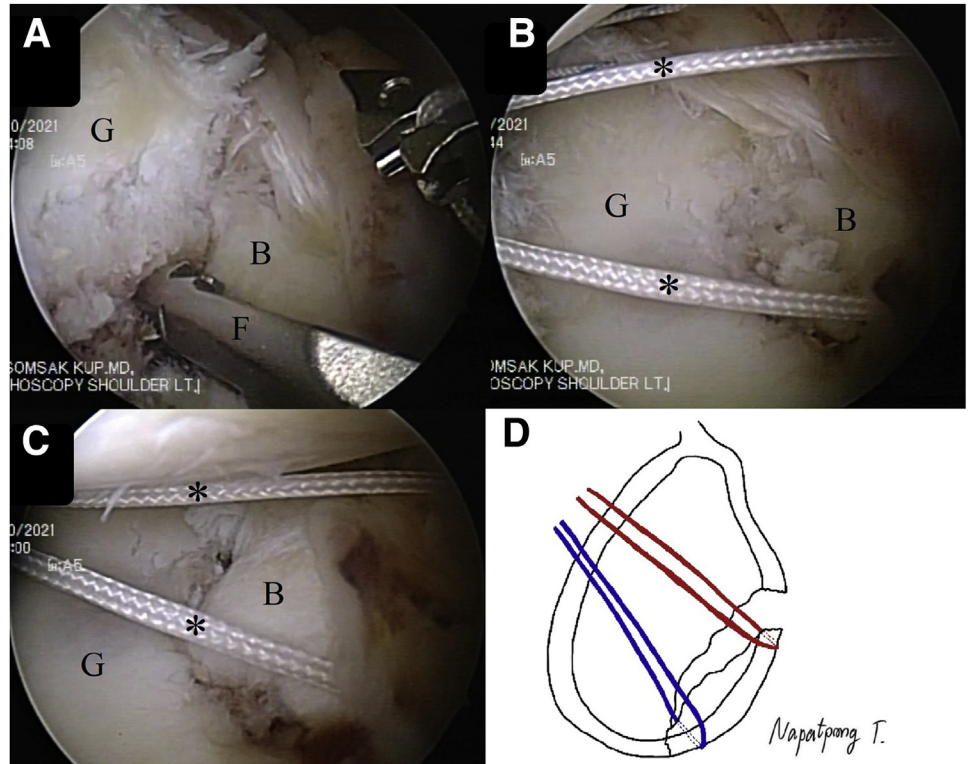


Fig 3. Left shoulder, lateral decubitus position, as viewed from the anterosuperior portal. (A) The drill sleeve is placed at the lower one-third border of the bony Bankart lesion at the glenoid. (B) The first suture anchor is placed at the lower one-third border of the bony Bankart lesion at the glenoid. (C) Illustration drawing shows the first suture anchor placement. D, drill sleeve. The asterisk (*) denotes the first suture anchor.

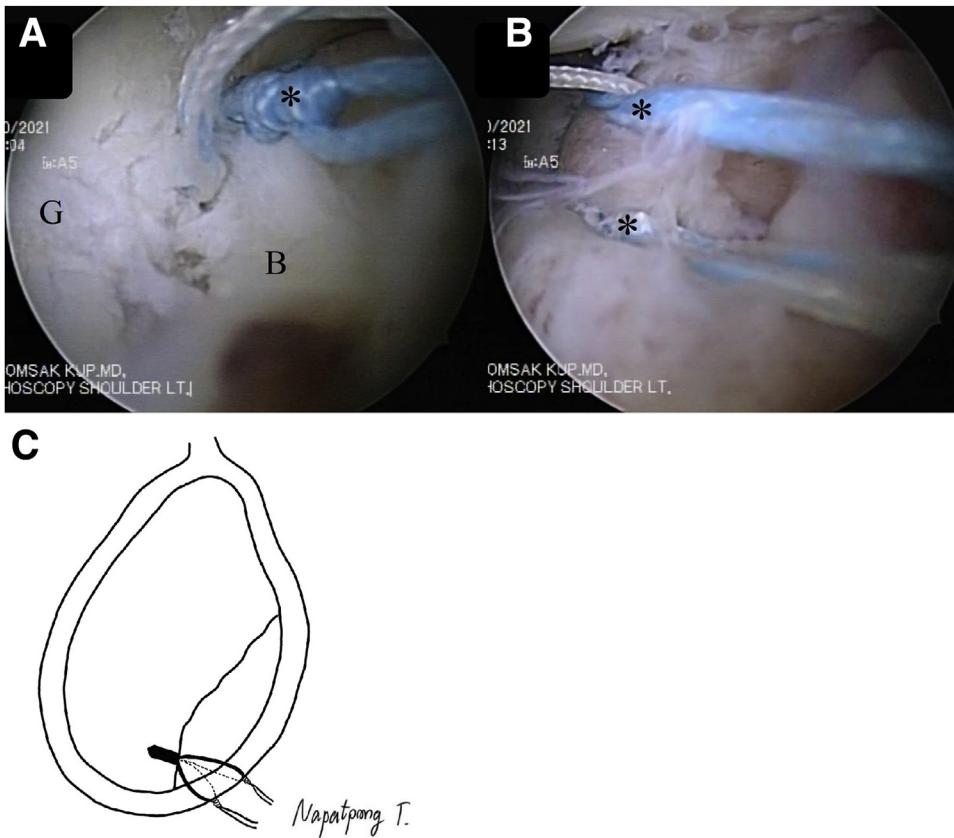


Fig 4. Left shoulder, lateral decubitus position, as viewed from the anterosuperior portal. (A) The anchor sutures are shuttled through the bony Bankart lesion and capsulolabral tissue and are tied with sliding knots (B) The process is repeated to shuttle another suture and tie the knot. (C) Illustration shows the first suture anchor repair of the capsulolabral tissue and bony Bankart lesion. B, Bony Bankart lesion; G, glenoid. The asterisk (*) denotes suture knots.

Postoperative Care

The affected shoulder is protected with a sling for 4 weeks after surgery. After 4 weeks, the patient begins a rehabilitation program, supervised by the therapist, which includes passive range of motion exercise in all directions. The patient is gradually allowed to use their shoulder for everyday activities. Terminal stretching exercises are started 2 months after surgery. Overhead and contact sports are not allowed until 4 to 6 months after surgery.

Discussion

The bony Bankart lesion results from a traumatic anterior shoulder dislocation. The bony Bankart lesions are present in 23% of recurrent anterior shoulder dislocations.² If the lesion is left untreated, it will cause a recurrent anterior shoulder dislocation.¹³ Multiple bony Bankart repair techniques have been described. Porcellini et al. described an arthroscopic acute bony Bankart repair using a suture anchor producing single-row fixation. The authors reported good clinical outcomes, but 2 of 25 patients (8%) had radiographic nonunion.¹⁴ Later, Millet and Braun described the bony Bankart bridge technique or double-row fixation with more contact area of fixation.¹⁵ Spiegl et al. and

Greenstein et al. reported the biomechanical study found that double-row fixation, which has more contact points of fixation, has superior biomechanical properties to single-row fixation.^{16,17}

The key to the treatment of bony Bankart lesion is to achieve bony union. A secured fixation and anatomic reduction are important to promote bone union. We believe that the more contact area there is, the higher stability there is. Advantages of the presented technique include increasing contact area and tissue compression to maximize the stability of the repair, less area of articular cartilage injury because of the use of the soft suture anchor, adjustable tension repair by upper and lower anchors, and the ability to treat concomitant intra-articular lesion (e.g., Hill-Sachs lesion, SLAP lesion, Posterior labrum lesion). The technique presented here differs from the previous one in that the contact area of the fixation and stability is greater. Using a soft suture anchor with a low-profile design results in less articular cartilage injury. Erickson et al. reported the biomechanical study of soft anchor suture (SUTUREFIX; Smith & Nephew) and PEEK anchor (BIORAPTOR, Smith & Nephew) and found that the soft suture anchor has similar biomechanical properties to the PEEK suture anchor.¹⁸ The systematic review

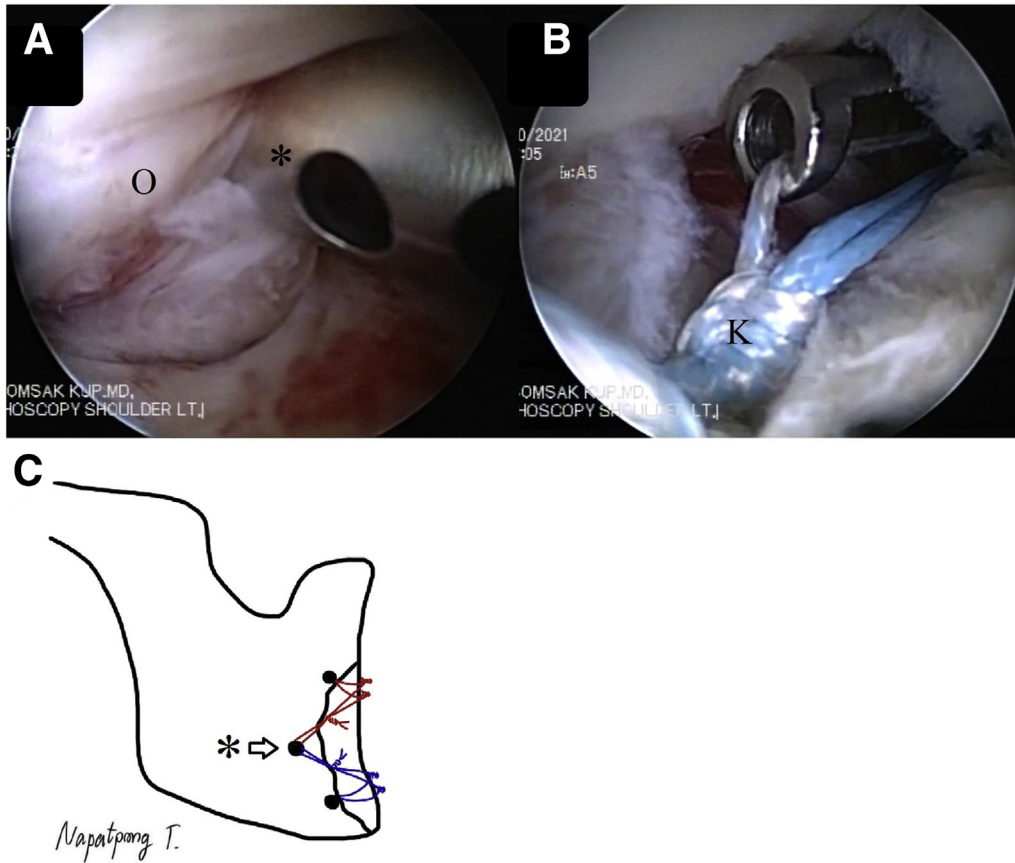


Fig 5. Left shoulder, lateral decubitus position, as viewed from the anterosuperior portal. (A) The third suture anchor is placed at the outer cortex of the glenoid, medial to the fracture line. The suture limbs from the first anchor are retrieved to the antero-inferior portal. (B) Then, the knots are tied from the suture limbs of the first anchor and the third anchor to create contact area suspension of a bony fragment to gain more contact area and tissue compression to maximize the stability of the repair. (C) Illustration shows the final construct of contact area suspension of a bony fragment to the glenoid. O, outer cortex of the bony Bankart fragment; K, suture knot of the first and third suture anchor. The asterisk (*) denotes the third suture anchor.

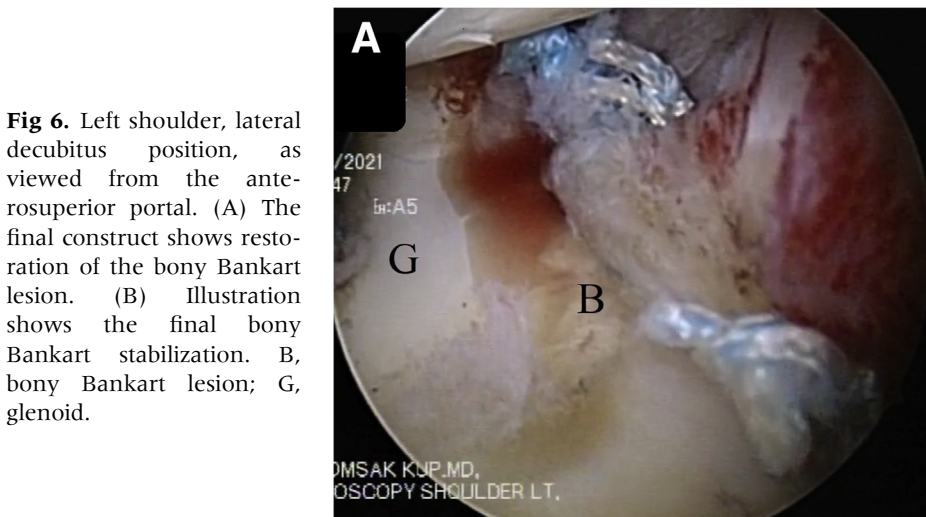


Fig 6. Left shoulder, lateral decubitus position, as viewed from the anterosuperior portal. (A) The final construct shows restoration of the bony Bankart lesion. (B) Illustration shows the final bony Bankart stabilization. B, bony Bankart lesion; G, glenoid.

Table 1. Advantages and Disadvantages

Advantages	<ul style="list-style-type: none"> - Increasing contact area and tissue compression to maximize the stability of the repair - Less area of articular cartilage injury because of use of a soft suture anchor - Adjustable tension repair by upper and lower anchors - Ability to treat the concomitant intra-articular lesion. (e.g., Hill-Sachs lesion, SLAP lesion, posterior labrum lesion)
Disadvantages	<ul style="list-style-type: none"> - High technical demand - Difficulty in suture management - Risk of iatrogenic fracture from fixation through the bony fragment in the small fragment

Table 2. Pearls and Pitfalls

Pearls	<ul style="list-style-type: none"> - Release the bony Bankart fragment until it can be reduced with minimal tension. - Use two reduction sutures to manipulate and reduce the bony Bankart fragment. - Identify and treat the concomitant intra-articular lesion. Failure to address concomitant intra-articular lesion will increase the risk of recurrent instability.
Pitfalls	<ul style="list-style-type: none"> - There is a risk of iatrogenic bony Bankart fragment fracture in the small lesion. - Tying the compression knot before anatomic reduction of the bony Bankart fragment will result in malreduction.

also showed that soft suture anchors have similar biomechanical properties to other suture anchors.¹⁹ This technique is done in the lateral decubitus position with standard shoulder arthroscopy equipment.

Advantages and disadvantages and pearls and pitfalls of the procedure are further described in Tables 1 and 2.

In conclusion, this presented technique is a reproducible method and a safe surgical technique to repair the bony Bankart lesion.

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