Arthroscopic Bankart Lesion Repair with Special Handmade Pull Out Suture

Ahmed Nabeel Mohamed Mahmoud[1*], Atef Mohamed Morsy[2], Emad Gaber Elbana[3], Kareem Elsokkary[4], Mohamed Ahmed Abdelkader[5]

Abstract

Background: The glenohumeral joint of the shoulder is the most common joint liable to dislocation in the human body. Arthroscopic repair of Bankart lesion is an effective primary treatment for anterior shoulder dislocation, it provides successful outcomes without recurrence of instability. **Patients and methods:** This prospective clinical study was conducted in Beni-Suef University hospital including 40 patients with anterior shoulder instability. The key point in this technique that makes it unique is that we used a handmade suture anchor consisted of a ring and a suture block. **Results:** The patient's functions were improving over time according to the quick dash score, the mean preoperative score was 46.70 ±10.35 and at 6 months post-operative the mean score was 4.75 ±6.09 with significant improvement in function and stability (P-value <0.001). 34 patients rated as excellent (85%), 4 patients (10%) rated as good, and 2 patients (5%) as poor. **Conclusion:** Arthroscopic trans-glenoid suture repair of Bankart lesion with hand-made suture anchor technique is a safe, reliable, cost-effective, reproducible method and can be used as an alternative to the traditional anchors.

Key Words: Shoulder dislocation; Bankart; Trans-Glenoid.

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Corresponding author: Ahmed Nabeel Mohamed Mahmoud

Affiliations:

1. Specialist of Orthopaedic Surgery; email: dr_ahmed_nabeel@yahoo.com
2. Professor of Orthopaedic Surgery, Faculty of Medicine, Beni Suef University, Egypt; email: morsyatef@yahoo.com
3. Professor of Orthopaedic Surgery, Faculty of Medicine, Beni Suef University, Egypt; email: elbanaemad@yahoo.com
4. Consultant of Orthopaedic Surgery; email: kareemelsokkary@gmail.com
5. Lecturer of Orthopaedic Surgery Faculty of Medicine, Beni Suef University, Egypt; email: dr.moh3bdelkader@yahoo.com

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Introduction

The glenohumeral joint of the shoulder is the most common joint liable to dislocation in the human body. (1) Acute dislocation is a surgical emergency and demands urgent relocation. Anterior shoulder dislocation is a common injury that results in detachment of the anterior glenoid labrum from its attachment (Bankart lesion). (2) It is commonly seen in emergency and trauma clinics and it will result in a recurrent shoulder dislocation if it's neglected.

Mechanism of injury is violent external rotation in abduction levers the head of the humerus out of the glenoid socket, avulsing anterior bony and soft tissue structures in the process. (3) The posterior part of the humeral head exits the joint. It often collides with the anterior rim of the glenoid, creating a bony indentation at the back of the humeral head (the Hill Sachs lesion). (4)

The labrum creates a deeper cup for the ball of the humerus to fit into. This contributes to the stability of the joint. (5)

Arthroscopic repair of Bankart lesion is an effective primary treatment for anterior shoulder dislocation, it provides successful outcomes without recurrence of instability. (6) It has Advantages of Smaller incisions, less postoperative pain, Shorter surgical times, Decreased complications, and Improved shoulder range of motion. (7) Arthroscopic techniques for reattaching the labrum can be divided into two categories a trans glenoid suture technique and arthroscopically delivered and tied suture anchors. the complication rate of arthroscopic stabilization is lower than that of open procedures. (8) Extravasation of arthroscopy fluid is a rare and potentially life-threatening complication of fluid extravasation and airway compromise. Risk factors such as lateral decubitus positioning, obesity, high pump pressures, and long operative times may increase this risk. (9)

Results of arthroscopic labral repair in the early days using staples or bioabsorbable tacks were discouraging, with a 30% rate of implant-related complications, including loosening, migration, and breakage. However, implant-related complication rates have decreased since the introduction of suture anchors as well as the development of various advanced arthroscopic instruments for secure insertion of the anchor in the glenoid. (10)

PATIENTS AND METHODS

This prospective clinical study was conducted in Beni-Suef University hospital including 40 patients with anterior shoulder instability after an initial episode of traumatic anterior shoulder dislocation, a Bankart lesion confirmed Magnetic resonance imaging (MRI), and clinical examination. 32 were males, and 8 were females. 17 had affected the right side and 23 had affected the left side. 7 patients presented with 1st time dislocation and 33 patients presented with recurrent dislocations. The mean age at the time of surgery was 26.95 ± 8.13 years (range 16–42 years). Patients with Significant glenoid deficiency, bony Bankart, Poor quality capsule-labral tissue, Multi-directional instability, or Ligamentous laxity were excluded from the study.

The key point in this technique that makes it unique is that we used a handmade suture anchor consisted of a ring and a suture block, the suture block hangs on the posterior rim of the glenoid neck and the ring allow the 2 ends of the suture wire to slide within it and then passed through the bony tunnel from posterior to anterior **(Fig. 1, 2).**

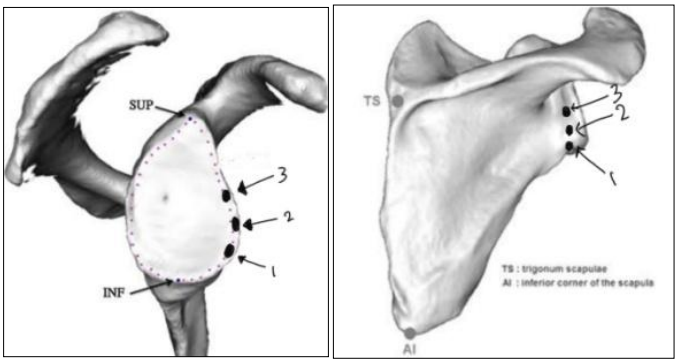

Fig. (1): A) Site of placing of tunnels 3,4,5 clock position (if right shoulder. **B)** Site of exit of passing wire.

Fig. (2): The handmade suture anchor consists of a suture block and the suture wire inside its ring in a sliding manner.

Surgical technique:

All patients received general anesthesia. The patient's position was in lateral decubitus with the arm hanging up. Standard diagnostic shoulder arthroscopy was done using the posterior viewing portal and anterior working portal. The labrum was mobilized and the glenoid bed was prepared for repair as usual.

Step 1: The no. 2 fiber wire pull-out suture was circled with a 2nd fiber wire suture and a big knot was made using the 2nd wire by making an alternative half hitches (5 clocks and 5 anticlockwise) with a total of 30 hitches to be big enough to hang on bony tunnel made by the guidewire without passing through it **(Fig.2).**

Step 2: A sleeve with sharp serrations at its end was introduced in the desired inclination at the site of 5 o'clock of the glenoid. A suture passing guide wire (2mm diameter) was drilled either parallel to or ≤150 medial to glenoid articular surface from anterior to posterior to exit posteriorly through the safe zone about (7-10cm) below the acromion process. **(Fig. 3, 4)**

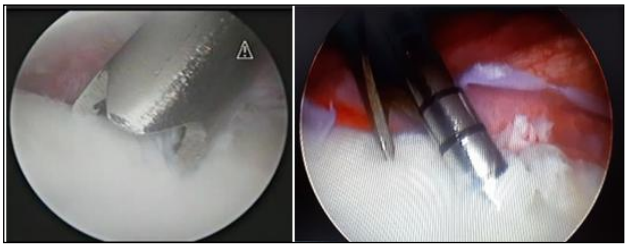

Fig. (3): Arthroscopic posterior portal view of the sleeve used (left) for protection during drilling the tunnel by the passing pin through the anterior portal (right).

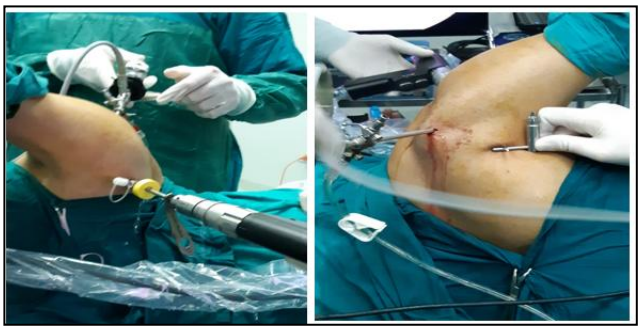

Fig. (4): Drilling of suture tunnel from the anterior portal (left). The exit of the guide pin from the posterior aspect of the shoulder (right).

Step 3: 1 cm skin incision is made over the exit point of the guidewire. The guidewire is drilled several times forward and back to make it easily pulled out in the next step.

Step 4: The sleeve was removed, and a proline no. 2 thread was shuttled at the end of the guidewire so that the two ends of the thread were out of the cannula anteriorly and the loop was pulled through the bony tunnel.

Step 5: T-handle was used to pull out the guidewire from its posterior exit pulling the proline thread loop posteriorly **(Fig.5B, C).** The 2 ends of the orthocord wire of the anchor were passed through the proline loop, while the suture block of the anchor was held by the surgeon's hand.

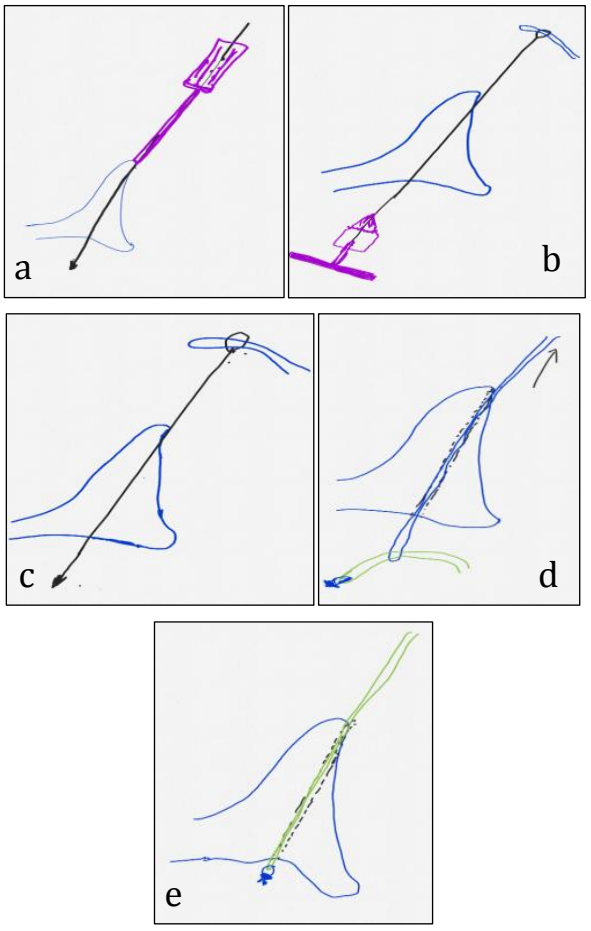

Fig. (5): Hand drawing illustrations, **A)** the drilling step from the anterior portal. **B)** passing of shuttle suture. **C)** pull the passing pin with shuttle suture from posterior with T handle **D)** pull out suture from the posterior aspect. **E)** Hanging on the posterior glenoid and the sliding suture derived from the anterior portal.

Step 6: The 2 ends of the proline at the anterior portal were pulled anteriorly taking with it the orthocord wire ends through the bony tunnel till it exit through the anterior cannula **(Fig 5D, E) and (Fig.6).**

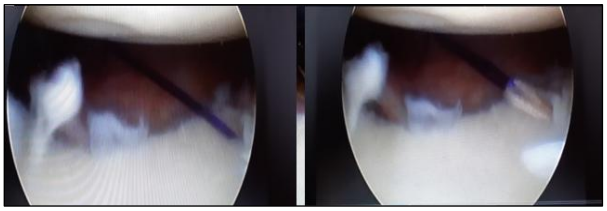

Fig. (6): Arthroscopic view from posterior portal, Shuttle suture on proline lobe.

Step 7: The two ends of the orthocord wire were then grasped with a Kocher forceps and pulled out anteriorly to pull the suture block till it rested (hanged) over the posterior aspect of the bony tunnel at this point make sure that there was no soft tissue interposition between the suture block and the bone by repetitive pulling of the orthocord wire till no rebound happened.

Step 8: The sliding of the orthocord wire through the ring of the suture block was checked.

Step 9: A parrot peak was passed taking a good grip through the labrum and then catching one thread of the orthocord and passing it out of the cannula **(Fig.7).**

Fig. (7): Arthroscopic view from posterior portal, using a bird peak to passing the sutures through the glenoid labrum from the anterior portal.

Step 10: A sliding knot was made to secure the labrum to the glenoid surface and a suture cutter was used to cut the suture a few mm. above the knot.

The previous steps were repeated for the subsequent anchors. Concurrent reimplissage procedure was done to address large engaging Hill Sachs lesions in 6 patients (15%).

Post-operatively, shoulder Immobilization for 6 weeks was applied for all patients. Passive pendulum exercises were initiated at the third week and active range of motion exercises after six weeks. All patients were followed up at regular intervals (2 weeks, 6 weeks, 3 months, 6 months, and every 6 months thereafter). The postoperative assessment included evaluation of quick dash score and constant score for shoulder function.

Results

The technique was used in 40 patients with a mean follow-up of 20 months. 23 patients with dominant side affected and 17 patients with non-dominant side affected.

The patient's functions were improving over time according to the quick dash score, the mean preoperative score was 46.70 ±10.35 and at 6 months post-operative the mean score was 4.75 ±6.09 with significant improvement in function and stability (P-value <0.001). 34 patients rated as excellent (85%), 4 patients (10%) rated as good, and 2 patients (5%) as poor **(fig. 8).**

According to the constant score, the patient's functions were also improving over time, the mean preoperative score was 48.53±8.31 and at 6 months post-operative the mean score was 92.65±5.99 (P-value <0.001). 34 patients were rated as excellent (85%), 2 patients (5%) rated as good, 2 patients (5%) rated as fair, and 2 patients (5%) as poor **(fig. 8).**

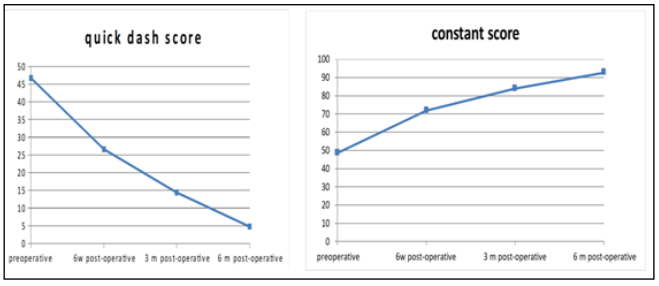

Figure 8: the mean quick dash and constant scores results showing improving outcomes over time.

Only 8 patients (20%) have a routine sports activity (football, swimming, and weight lifting) and 80% of patients are non-sportive. All sportive patients return to sports activity after the rehabilitation program in duration from 6 – 10 months post-operative.

Post-operative complication, 1 patient (2.5%) with post-operative infection managed by arthroscopic drainage and debridement,1 patient (2.5%) have a

shoulder dislocation by re-injury 10 months post-operative and 4 patients (10%) had radiological bony osteolysis at the sites of the tunnels detected at 6 months postoperative but with good clinical performance **(fig. 9).** No patients reported neurological complications either brachial plexus traction injury from the lateral position or suprascapular nerve injury from exiting wire posterior.

Figure 9: X-ray 6months postoperative showing bony osteolysis of the glenoid neck at the site of the tunnels.

Discussion

Historically, open and arthroscopic trans-osseous Bankart repair was described using pull-out sutures tied posteriorly over buttons or the infraspinatus fascia. However, the results of this technique were variable. (11-14) **De Mulder et al,** in 1998 reported a total failure of 45.1% in 31 patients with recurrent anterior shoulder dislocation after arthroscopic trans-glenoid suture of Bankart lesions.

Morgan and Bodenstab in 1987 described the arthroscopic trans-glenoid suturing technique in Twenty-five patients. All results were rated excellent after an average 17 months of follow-up. (11) Also, **Torchia et al,** reviewed 2-8 years results of Arthroscopic trans-glenoid multiple suture repair technique and reported re-dislocation only in 11 shoulders (7.3%). (14)

In our study, we evaluate the clinical and functional results after arthroscopic Bankart repair using a handmade suture anchor from orthocord no. 2 and making a suture block through a trans-osseous tunnel that hangs on the posterior aspect of the glenoid and tying anteriorly by sliding knot. This technique upgrades the concept of Trans-osseous sutures for Bankart repair and made it easy to tie the knot under vision in a sliding manner using the anterior portal and ensure the fixation technique.

This technique has advantages over other trans-osseous techniques: first, it includes fixing the suture on the posterior neck of the glenoid and tying the labrum by a traditional sliding knot easily and grantee a good repair of the labrum to the bone and avoids the possibility of suture laxity and failure of the repair.

This method of fixation doesn't place implants other than fiber wire suture (orthocord) inside the joint (implant-free fixation). Thus, avoid the complications that could occur with metal and biodegradable anchors and gain the advantages of all suture anchors. It also achieves the complete healing of the bony tunnels and preserves the glenoid bone stock.

Our method of fixation is a cost-effective technique using simple instruments and any surgeon can made the suture block easily inside at the time of surgery within two minutes. The lateral decubitus position is preferred in this technique to facilitate the exit of passing wire posterior through the scapula in the safe zone for the supra-scapular nerve to avoid nerve injury.

The results of our study showed a statistically significant improvement in the mean of the postoperative constant and quick dash score at the final follow-up compared to that of the preoperative (p-value <0.001).

In all patients in our study, no reported complications from suprascapular or brachial plexus nerve injury, 4 patients had radiological bony osteolysis and widening of the tunnels detected at 6 months postoperatively but with good clinical performance and didn't report any episodes of re dislocations. We think this radiological finding may result from pressure of the suture block on the posterior glenoid

The technical pitfalls for our technique, the lateral decubitus position avoid the convergence of bony tunnels which may corrupt the other tied anchor. The Beach chair position does not achieve easy control of the exit of passing wire on the safe exit on the posterior part of the scapula.

The limitation of our study is no available data on elite athletes in a contact sport, only use of constant and quick dash scoring system for assessment of our patients, the relatively short follow-up period, and the small number of cases included in the study.

We recommend a study on a larger number of cases in multiple centers and with variable levels of experience for surgeons between experts, seniors, and junior surgeons and longer follow-up time for establishing the replacement of the currently used technique.

Conclusion

Arthroscopic trans-glenoid suture repair of Bankart lesion with hand-made suture anchor technique is a safe, reliable, cost-effective, reproducible method and can be used as an alternative to the traditional anchors. However further studies are needed on a larger number of cases and longer follow-up time for establishing this technique.

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