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Case Study

Arthroscopic Capsulolabral Repair for Posterior Shoulder Instability with Suture Anchors Using a Beach Chair Approach

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Abstract

Background: Posterior shoulder instability is a relatively rare cause of recurrent instability with its incidence at 2 to 10%. It is often associated with a posterior capsulolabral tear for which Arthroscopic repair has shown good outcome. In terms of approach, there is a lack of consensus among surgeons regarding the most optimal position to perform the Arthroscopy with earlier studies favoring the use of the Lateral Decubitus (LD) over the Beach Chair (BC) position.

Aim: This study is a mini-case series describing a surgical technique using the BC position in Arthroscopic posterior capsulolabral reconstruction. The authors of this study hypothesize that the use of the BC position is adequate in Arthroscopic posterior capsulolabral reconstruction so long as the surgeon is cognizant of its limitations.

Methods: A retrospective analysis of the prospectively collected data was performed for 9 shoulders with posterior capsulolabral injury in 8 patients. At a tertiary hospital, the patients underwent an Arthroscopic posterior capsulolabral reconstruction using the BC position by a fellowship trained shoulder Orthopaedic surgeon. Patients were assessed preoperatively and prospectively followed up for two years and at 2 years postoperatively for isometric strength, range of motion (ROM), and various outcome measures. These included the visual analogue scale (VAS), Oxford Shoulder Score (OSS), UCLA Shoulder Score (UCLASS), and Constant Shoulder Score (CSS) and for pain assessment.

Results: All the patients were male with a mean age was 25.1 (Range 20-33). 4 out of 9 (44.4%) patients suffered from a traumatic event. The mechanism of injury varied among these patients. All patients had a posterior labral tear with 7 out of 9 having concomitant capsular laxity. There was significant improvement in UCLA scores (18.4 vs 29.8) (P=0.001), Oxford Shoulder Score (37.8 vs 16.1) (P<0.001) and VAS score (3.9 vs

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1.3) (P=0.017) at 2 years postoperatively. There was no significant improvement in Isometric strength, Constant Shoulder Scores and Range of motion (Abduction and Forward flexion).

Conclusion: The study hypothesized that the use of the BC position is adequate in posterior capsulolabral reconstruction so long as the surgeon is familiar and comfortable with the technique.

Level of evidence: 2

Keywords: Arthroscopy; Posterior labral; Beach chair; Recurrent shoulder instability; Dual row.

Introduction

Posterior shoulder instability is a relatively rare cause of recurrent instability with its incidence at 2 to 10% [1–3]. It is a result of either repetitive microtrauma, traumatic dislocations/subluxations and less commonly from seizure or electrocution injuries [4]. It is challenging to diagnose the posterior shoulder instability and often requires a detailed assessment of the patient's signs and symptoms. Symptoms reported by these individuals tend to be vague, ranging from deep seated posterior shoulder pain, weakness of the arm after overhead activity to generalized instability [1,5]. A thorough physical examination is important in the suspected cases of posterior shoulder instability so as to determine the extent and direction of instability. The following tests have been reported: The load and shift test, Posterior stress test [4] Kim test and Jerk test [6]. Unlike its anterior counterpart, the posterior apprehension test is not as sensitive in detecting posterior shoulder instability [7]. Kim et al. showed that a combination of the Jerk test and Kim test had a 97% sensitivity in detecting posterior shoulder instability [6].

In terms of diagnostic imaging, a Magnetic Resonance Imaging (MRI) is often adequate to detect abnormalities in the posterior capsulolabrum as well as the presence of any concomitant reverse Hill-Sachs lesions [8]. It has been shown that the Glenoid retroversion is a significant risk factor for posterior shoulder instability [9,10] and can be measured on MRI scan. In severe cases of instability, a Computed Tomography is useful to evaluate glenoid bone loss. Arthroscopic repair of posterior capsulolabral tears has shown good outcome and is essential in addressing recurrent shoulder instability [11]. It can be performed using the Lateral Decubitus (LD) position or the Beach Chair (BC) position. However, there is a lack of consensus among surgeons regarding the most optimal position to perform the Arthroscopy with earlier studies favoring the use of LD [12,13]. While the approach is mostly down to surgeon preference, there are advantages and disadvantages to both approaches and techniques to address its shortfalls. The study was aimed to hypothesize that the use of the BC position is adequate in Arthroscopic posterior capsulolabral reconstruction so long as the surgeon is cognizant of its limitations.

Methods

The study was approved by the hospital's ethics committee, CIRB Ref:2019/2777 and carried out in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki. A retrospective analysis of the

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prospectively collected data was performed for 9 shoulders with posterior capsulolabral injury in 8 patients. At a tertiary hospital, the patients underwent an Arthroscopic posterior capsulolabral reconstruction using the BC position by a fellowship trained shoulder Orthopaedic surgeon. Detailed history of all the patients were thoroughly investigated by the senior surgeon preoperatively. The history was assessed clinically for labral injury while screening for any concomitant capsular laxity. All patients underwent an MRI scan to evaluate any capsulolabral injury and to assess the osseous glenoid version as shown in Figure 1. Patients were assessed preoperatively and prospectively followed up for two years and at 2 years postoperatively for isometric strength, range of motion (ROM), and various outcome measures. These included the visual analogue scale (VAS), Oxford Shoulder Score (OSS), UCLA Shoulder Score (UCLASS), and Constant Shoulder Score (CSS) and for pain assessment.

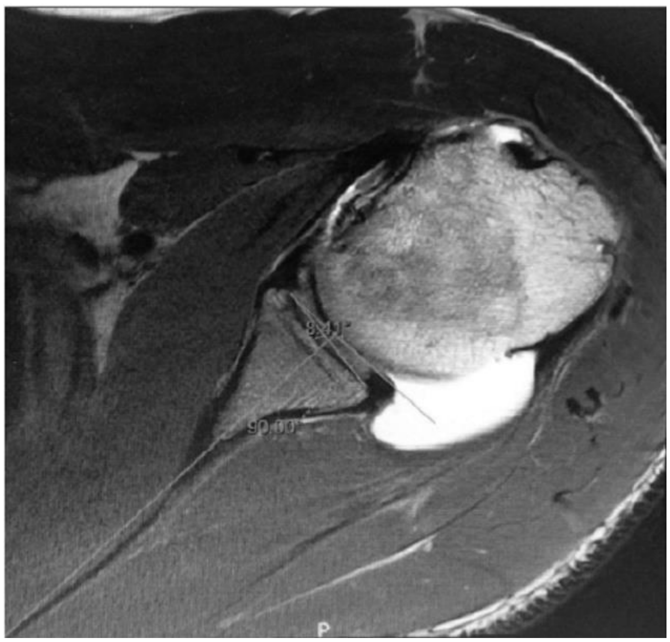

Figure 1: Image showing MRI axial cuts (Proton density, fat saturated) with measurement of the osseous Glenoid version based on the criteria used by Kim et al [17] (Angle between the perpendicular drawn from the plane of scapula and the plane of the osseous portion of Glenoid –8.41 degrees in this shoulder).

Operative technique

Positioning

After general anesthesia, the patient is placed in an upright beach chair position with the arm free to flex forward and rotate. Examination on the affected shoulder was initially performed under the anesthesia conditions to assess the degree of capsular laxity and instability. Portal positions and bony landmarks are surface marked as shown in Figure 2a, 2b and 2c.

Portal placement

The standard posterior portal is often described as 1 inch medial to and inferior to

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the postero-lateral corner of the acromion. For our technique, the posterior portal is sited 1cm more lateral, bringing its trajectory 30 to 45 degrees oblique to the plane of the glenoid. This is important because a far lateral portal may result in hitting the humeral head while a very medial portal may result in a trajectory parallel to the plane of the glenoid, which may affect anchor placement [14]. The posterolateral portal may also be modified to the mid-lateral portal depending on the patient's anatomy [15].

Figure 2a: Photographs showing the bony landmarks and portal placement for left shoulder arthroscopy for a patient in a beach-chair position.

Figure 2b: Photographs showing the bony landmarks and portal placement for left shoulder arthroscopy for a patient in a beach-chair position.

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Figure 2c: Photographs showing the bony landmarks and portal placement for left shoulder arthroscopy for a patient in a beach-chair position.

The anterior portal is then made lateral and superior to the coracoid process via an outside in technique. This portal is high in the rotator interval and is used as the main viewing portal. An additional antero-inferior portal may be created just inferior to the coracoid process for suture management.

Preparation of the posterior labrum and debridement of the glenohumeral joint

A complete evaluation of the glenohumeral joint is then performed using a 70-degree scope. The anterior portal was used as the viewing portal. Posterior labral tears and Kim lesions [16] are identified while the posterior inferior glenohumeral ligament and capsule are assessed for laxity. With the posterior portal as the viewing portal, the rotator interval and the surrounding synovitis is debrided just enough to allow visualization. During this time, a 5mm cannula is inserted into the anteroinferior portal. The camera is then switched to the anterosuperior portal to identify any posterior labral tears or Kim lesions [16]. The posterior labrum and capsule are then debrided and its attachment to the glenoid rasped and roughened.

Posterior anchor placement

With the anterosuperior portal as the viewing portal, a drill is passed through the posterior portal and directly obliquely, to the posterior edge of the glenoid at about the 4 or 4:30 o'clock position for the left shoulder. The anchor must be directed at about a 45-degree angle oblique to the plane of the glenoid. Too horizontal and the anchor will run beneath the cartilage and cause cartilage injury. Too vertical and the anchor can skive off the posterior glenoid as the posterior vault of the glenoid slopes away sharply. A double loaded suture anchor (Gryphon BR 4mm) is used, and all 4 sutures are retrieved via the cannula from the antero-inferior portal (Figure 3a).

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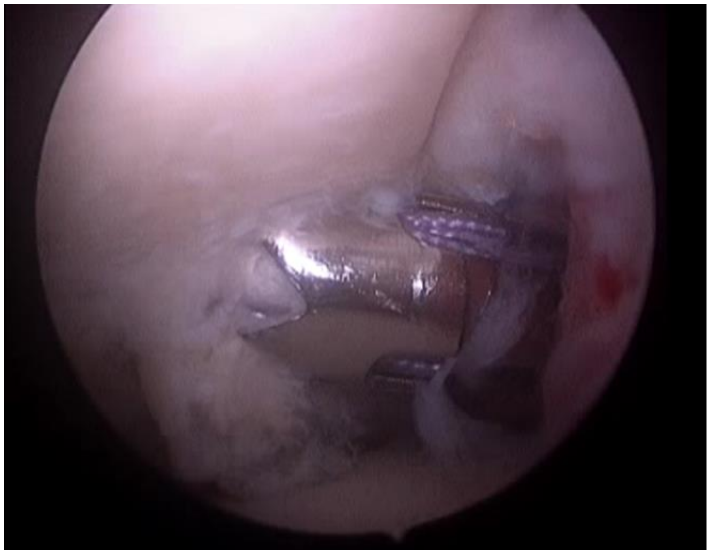

Figure 3a: Arthroscopic image showing the suture anchor pushed into the drill hole.

Posterior labral repair and capsular shift

An Acupass suture passer (70 degree straight) is delivered from the posterior portal to pierce the posterior labrum just below the anchor. The monofilament is retrieved from the anteroinferior portal and a suture limp from the first pair is shuttled. The cannula is withdrawn slightly to enable the soft tissue rim of the portal to be seen. The Acupass is then passed behind the soft tissue of the portal and directed along posterior labrum, outside of the capsule, from about the 4 o'clock position, to pierce and re-enter the joint space at the 6 o'clock position. The other limb is then retrieved back to the posterior portal and the knot tied to secure the posterior labrum. This is done with the arm in neutral rotation, that is, facing forwards (Figure 3b).

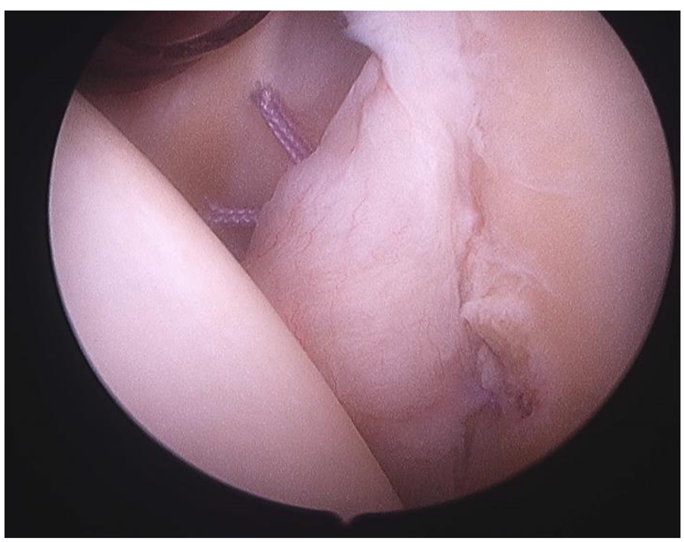

Figure 3b: Arthroscopic image showing the suture anchor well seated.

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Multiple single loaded suture anchors can additionally be placed according to the size of the posterior labral tear. Capsulolabral plication is then performed by passing the posteroinferior capsule superiorly using a standard suture passer. However, this was not necessary in most cases and only a single suture anchor was used.

Postoperative rehabilitation

All patients are placed in an arm sling and started on pendulum exercises in the immediate postoperative period. The sling is discontinued at 4 weeks and active shoulder ROM is started. Strengthening exercises are started at 2-3 months after surgery. Patients are permitted to return to sporting activities at 4-6 months of rehabilitation after they have achieved full ROM and strength.

Statistical analysis

Statistical analysis was performed in consultation with the in-house biostatistician, using SPSS® 20.0 (IBM, Armonk, New York, United States). Student t-test was used to compare quantitative variables.

Results

All patients were male, and the mean age was 25.1 (Range 20-33). 4 out of 9 (44.4%) patients suffered a traumatic event and the mechanism of injury varied among these patients. 3 of these patients suffered sports related injuries involving overhead motion while the last patient had a direct fall onto the shoulder.

No history of epilepsy was detected in this group of patients. All patients had a posterior labral tear with 7 out of 9 having concomitant capsular laxity. Interestingly, 5 shoulders had an incidental Bankart lesion detected on Arthroscopy for which an anterior labral repair was performed. No other abnormalities were detected in the shoulders (rotator cuff, biceps or superior labral tears). One patient suffered a recurrence of symptoms after surgery and was found to have a glenoid boss loss of at least 20%. The patient was subsequently treated with a posterior labral repair with glenoid reconstruction using iliac crest bone grafting. The mean glenoid version was 8.1 degrees (Figure 1). This is consistent with other studies looking at glenoid osseous version as a risk factor for posterior shoulder instability. Kim et al. looked at the glenoid retroversion in 33 shoulders and compared it with an equal number of age-matched controls without any shoulder pathology and found that the affected group had greater osseous retroversion (4.6 degrees versus 1.4 degrees for controls) [17]. There was significant improvement in UCLA scores (18.4 vs 29.8) (P=0.001), Oxford Shoulder Score (37.8 vs 16.1) (P<0.001) and VAS score (3.9 vs 1.3) (P=0.017) at 2 years postoperatively. There was no significant improvement in Range of motion (Forward flexion and abduction), Isometric strength and Constant Shoulder Scores (Table 1).

Discussion

This study consists of a mini-series of patients who underwent an arthroscopic posterior capsulolabral reconstruction using the beach chair position. Overall results show an improvement in shoulder outcome scores with minimal recurrence of symptoms and postoperative complications.

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9 Shoulders	Preoperative mean	Postoperative (2 years) mean	P-value
ROM (Forward Flexion) (Degrees)	102 ± 51.4	127 ± 29.6	0.069
ROM (Abduction) (Degrees)	103 ± 51.4	124 ± 30.2	0.06
Isometric Strength (lbs)	13.4 ± 11.6	17.9 ± 9.4	0.302
VAS	3.9 ± 2.8	1.3 ± 2.4	0.017
UCLA	18.4 ± 4.7	29.8 ± 5.5	0.001
Oxford shoulder score	37.8 ± 8.4	16.1 ± 3.7	<0.001
Constant Shoulder score	55.8 ± 25.9	80 ± 20.7	0.09

Table 1: Patient characteristics and functional outcome scores.

Arthroscopic posterior capsulolabral repair can be performed in either the LD or BC position. Surgeons choose the position for repair, based on the experience level. Both positions offer advantages and disadvantages in terms of both surgical and anesthetic concerns. For the anesthetist, the BC position has been associated with risks in terms of cerebral hypoperfusion during elevation of the head [18]. This can result in serious neurological sequelae, though its incidence is very low at 0.004% [19,20]. Conversely, the LD position poses no increased risk of cerebral hypotension but requires more assistance during intubation and takes a longer time to setup. The BC position also allows easier access to the airway as the patient can be lowered to the supine position. For the Surgical team, earlier studies report inadequate visualization of the posteroinferior glenoid with the BC position [21].

The advantage of the LD position over the BC is the use of traction to increase the glenohumeral joint space. There is also easy access into the posteroinferior glenoid as the operating table/patient's head is not in the way when compared to the BC position [18]. However, the use of traction in LD position has been associated with skin related injuries and transient paresthesia/nerve related injuries with rates reported to be 0.2% to 10% [22,23].

On the other hand, the BC position confers multiple advantages while avoiding the risk of traction related injuries. Firstly, the BC position offers a more "anatomical" view of the glenoid as the patient is upright [23,24]. This allows for easier orientation of the glenohumeral joint for surgical trainees. Moreover, the mobility of the surgical arm allows for more flexibility in terms of humeral translation and rotation. Lastly, in rare situations, the BC position allows for a quick conversion to an open surgery without the need to re drape the patient. In recent years, studies reporting good outcomes using either the BC or LD position have been increased. A systemic review of 15 studies by Moeller et al. showed low rates of recurrence and high rates of return to sport after arthroscopic posterior shoulder stabilization with either BC or LD position [21].

Another study by Darren et al. of 25 studies showed comparable outcomes between the two groups with the LD group showing a marginally higher patient satisfaction rate but higher failure rate [13]. The shift towards the BC position can be explained by the advent of

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novel techniques and tips to help overcome the shortfalls of the BC position.

Costouros et al. described his trans-cuff portal for arthroscopic posterior capsulorrhaphy [25]. This accessory portal is placed through the mid-portion of the rotator cuff and allows a superior-to-inferior view of the posterior glenoid rim and capsule.

Shital et al. recently introduced his new technique of suture anchor placement from superior-to-inferior via a posterolateral working portal which prevents the risk of damage to the articular cartilage [26]. Similarly, in this study, posterolateral portal was used to gain access to the posterior capsule.

Conclusion

The study successfully hypothesized that the use of the BC position is adequate in posterior capsulolabral reconstruction so long as the surgeon is familiar and comfortable with the technique.

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