Case Report

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Posterior shoulder instability following anatomic total shoulder arthroplasty: A case report and review of management

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ABSTRACT

We report a case of posterior shoulder instability following anatomic total shoulder arthroplasty (TSA). In addition, we present guidelines to aid in the management of posterior instability after TSA. A 50-year-old male underwent anatomic TSA for glenohumeral osteoarthritis. Postoperatively, the patient developed posterior instability secondary to glenoid retroversion. He did not improve despite conservative treatment. He underwent an arthroscopic posterior bone block procedure, 4-month after his index arthroplasty. At 14-month follow-up, the patient had regained near full motion and strength, and radiographs demonstrated osseous integration with no evidence of component loosening. Posterior instability following TSA is a relatively rare complication and challenging to manage. The posterior, arthroscopic iliac crest bone block grafting procedure represents a treatment option for posterior instability in the setting of a stable glenoid prosthesis following TSA.

Key words: Arthroplasty, arthroscopic bone block, glenoid, posterior instability, retroversion, shoulder

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INTRODUCTION

Posterior instability after total shoulder arthroplasty (TSA) is a reported complication and can occur for a variety of reasons.[1,2] Factors related to the development of this condition include glenoid and humeral retroversion, glenoid component loosening, soft tissue imbalance, and rotator cuff tears.[2-4] In a cohort of TSA's performed at the Mayo clinic, posterior instability was described in 1.8% of cases.[2] Because of the low reported incidence after anatomic TSA, the methods of treatment are likewise not well studied. Treatment options for posterior instability are dependent on the causes of the instability, and the outcomes for revision surgery demonstrate a moderately high rate of failure.[2] A thorough evaluation is required to determine the potential etiology of the instability before any revision surgical procedure is contemplated. We present guidelines to aid in the diagnosis, cause, severity, and treatment options of posterior instability. In addition, we present a novel treatment method for a case of posterior instability with glenoid retroversion and a well-fixed glenoid component treated with an arthroscopic posterior bone block procedure.

CASE REPORT

A 50-year-old male house painter with longstanding shoulder pain and glenohumeral arthritis refractory to conservative management underwent a TSA with press-fit humeral stem (Global Unite, Depuy, Warsaw, IN, USA) and uncemented glenoid component (Anchor Peg Glenoid, Depuy, Warsaw, IN, USA) in his nondominant extremity. His preoperative imaging revealed a biconcave glenoid with 20° of glenoid retroversion and posterior subluxation of the humeral head [Figure 1a]. Intraoperatively, the anterior glenoid was reamed preferentially in an attempt to correct the posterior retroversion of the biconcave glenoid prior to placement of the glenoid component. Postoperative imaging revealed a well-fixed glenoid component with persistent 20° of retroversion [Figure 1b]. The humeral component was placed according the

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native humeral version. Intra-operative examination following component implantation revealed a stable glenohumeral joint and no additional corrections or modifications were performed. Postoperatively, the patient had a sense of instability coupled with pain and weakness. While he did not experience frank dislocation episodes, the pain and dysfunction prevented him from returning to work. His examination revealed posterior apprehension, but normal strength of both the deltoid and rotator cuff musculature. He did not improve despite 2 months of dedicated physical therapy. Given the clinical history, imaging and exam findings, the patient was diagnosed with posterior instability as a result of glenoid retroversion.

Potential options for treatment in this situation included revision of the glenoid component with bone grafting or placement of a posterior bone block with retention of the glenoid component. Given the amount of morbidity involved in a revision surgery, a less invasive and alternative method of treatment was chosen. An arthroscopic posterior bone block procedure was performed using an iliac crest graft.

Four months following his index arthroplasty surgery, the patient returned for revision surgery. He was placed in the beach chair position. A 25 mm × 10 mm × 10 mm tri-cortical bone graft was harvested and prepared. Shoulder arthroscopy was then performed using standard portals. Verification of glenoid fixation was confirmed, and a horizontal slit in the posterior rotator cuff muscles was performed. In addition, the bone on the posterior glenoid was prepared to a flat surface with an arthroscopic burr [Figure 2a]. Utilizing a custom double cannula instrument (DePuy-Mitek, Raynham, MA, USA), the graft was advanced through the widened posterior portal [Figure 2b]. Graft was then precisely placed on the posterior glenoid with the surface of the bone block placed parallel and flush with the surface of the glenoid prosthesis [Figure 3a]. Fixation of the bone block was performed with two parallel, cannulated, titanium, 3.5 mm screws. Given the existing Anchor Peg Glenoid component (Dupuy, Raynham, MA, USA) relies heavily on the central peg, care was taken to ensure that both screws lie below the equator of the glenoid prosthesis [Figure 3b]. This was critical as damage to the central peg risks compromising the fixation of the glenoid component. By placing the 10 mm wide graft flush with the size 48 mm glenoid, the anterior to posterior articular surface area was effectively increased by 37%.

At 14-month postoperatively from the bone block procedure, the patient regained near full motion and strength. He has no sense of pain or instability with resisted forward flexion with his

Figure 1a: Preoperative axillary X-ray

Figure 1b: Postoperative axillary X-ray with posterior subluxation and glenoid component retroversion

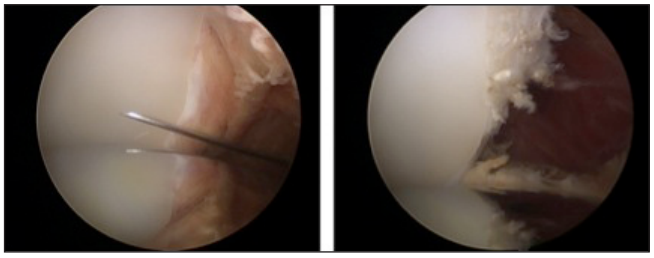

Figure 2a: Pre- and post-arthroscopic preparation of the posterior glenoid bone surface

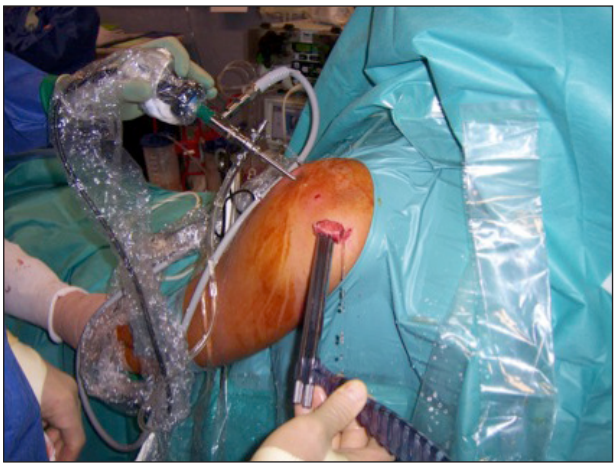

Figure 2b: Iliac crest bone graft in custom double cannula instrument (DePuy-Mitek, Raynham, MA, USA) for insertion through the posterior portal

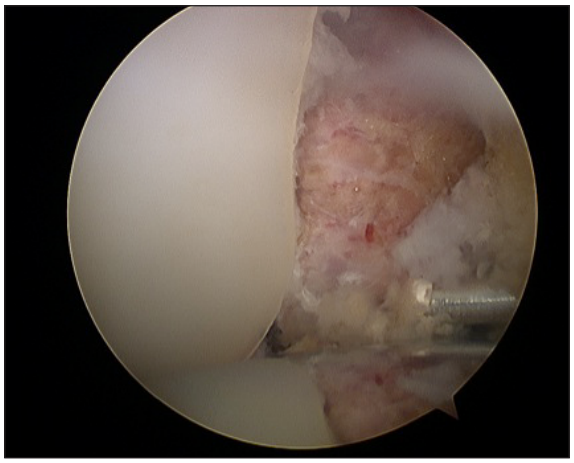

Figure 3a: Intra-articular placement of bone block flush with the surface of glenoid component

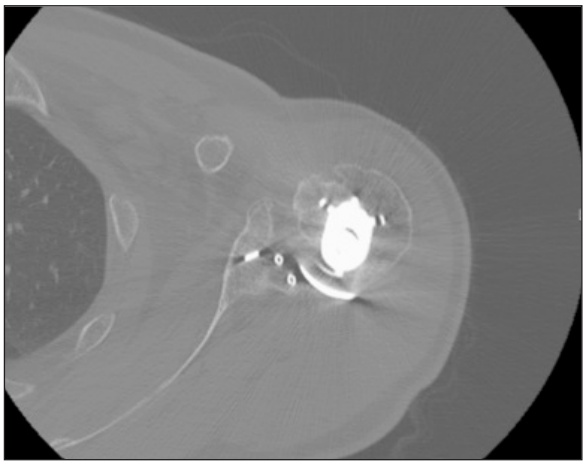

Figure 3b: Axial computed tomography scan showing orientation of screws relative to intact central peg of glenoid component

Figure 4a: Postoperative examination without instability

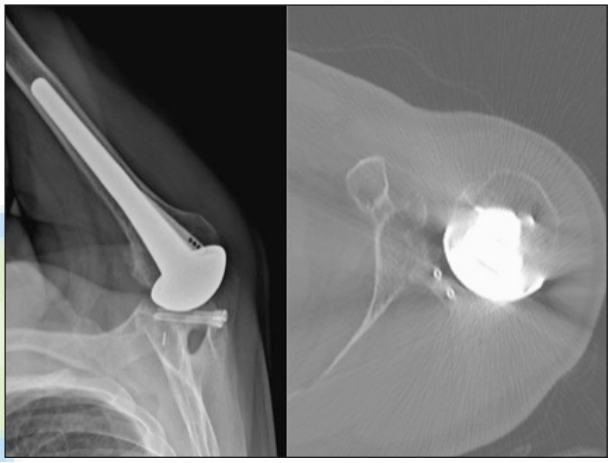

Figure 4b: Postoperative X-ray and computed tomography scan demonstrating osseous integration and intact central peg

arm in an adducted and internally rotated position [Figure 4a]. The patient's subjective shoulder value is 80, with a 2 out of 10 pain score. Imaging obtained at 14-month revealed osseous integration of the bone block to the posterior glenoid, no evidence of glenoid prosthesis loosening and an intact central peg [Figure 4b].

DISCUSSION

Instability in the setting of TSA is well described in the literature. In a large review, instability was noted in 5.2% of the cases and was the most common complication of the procedure, however, isolated posterior instability is felt to be relatively rare.[3] The type of instability is classified by the direction (superior, inferior, anterior, and posterior), and the etiology is often multifactorial. In cases of posterior instability, causative factors are reported to be excessive glenoid component retroversion, humeral component retroversion, glenoid component loosening, continued static posterior subluxation, a smaller glenoid component, and soft tissue imbalances or insufficiency including rotator cuff tear.[1,5,6] Preoperative factors include posterior glenoid wear, bone loss, a biconcave glenoid, and static posterior subluxation.[4,7] A detailed understanding of the underlying etiology is essential to determine the appropriate treatment.

At the time of the arthroplasty, methods to prevent postoperative instability include eccentric reaming, posterior bone grafting, using an augmented glenoid component, and addressing posterior capsular laxity or rotator cuff pathology.[2] A study has demonstrated that increasing the humeral component anteversion does not provide improved stability in the setting of persistent glenoid retroversion.[8] Patients with postoperative instability of the prosthesis despite the use of the aforementioned methods present a difficult clinical challenge. Nonoperative measures may not be successful in alleviating the symptoms. In evaluating a patient with instability, the etiology must be determined through a clinical exam and appropriate imaging. The position of the components, loosening, static posterior subluxation and soft tissue stabilizers are all assessed. Based on the underlying cause

of the instability, operative options include revision of one or both of the components, soft tissue plication or repair, bone grafting procedures with or without component revision, and bone block type procedures. Understanding the reasons for posterior instability is critical to determining the treatment options [Figure 5]. In many cases, more than one factor can contribute to posterior instability. Current surgical treatment has demonstrated only fair results in restoring stability with inconsistent reproducibility.[2,9]

In the case presented here, the patient was found to have clinically symptomatic posterior instability after a primary TSA with persistent subluxation and glenoid retroversion. An open revision surgery was considered, but secondary to the reported mixed results of these procedures a novel, less invasive surgery was undertaken. This included an arthroscopic posterior bone block augmentation of the glenoid with iliac crest autograft. While this procedure has recently been published for posterior instability, there are no reports to our knowledge of this technique in the setting of a TSA.[10] Endres and Warner described two patients with anterior instability after TSA successfully treated with an open Latarjet procedure.[11]

The arthroscopic bone block procedure offers a number of advantages in this setting. It can be performed through a minimally invasive approach, and excellent visualization is achieved to allow proper positioning of the graft. The graft helps to re-center the humeral head by increasing the surface area of the glenoid, thus making a dislocation more difficult. In addition, the graft is placed flush against the glenoid component, which may help stabilize this and prevent loosening from edge loading.

CONCLUSION

This case report describes the management of symptomatic posterior shoulder instability following TSA and also reports a novel technique. To our knowledge, this is the first description of a posterior, arthroscopic iliac crest bone block grafting procedure in this setting. The procedure represents a treatment option for posterior instability in the setting of a stable glenoid prosthesis following TSA.

Declaration of Patient Consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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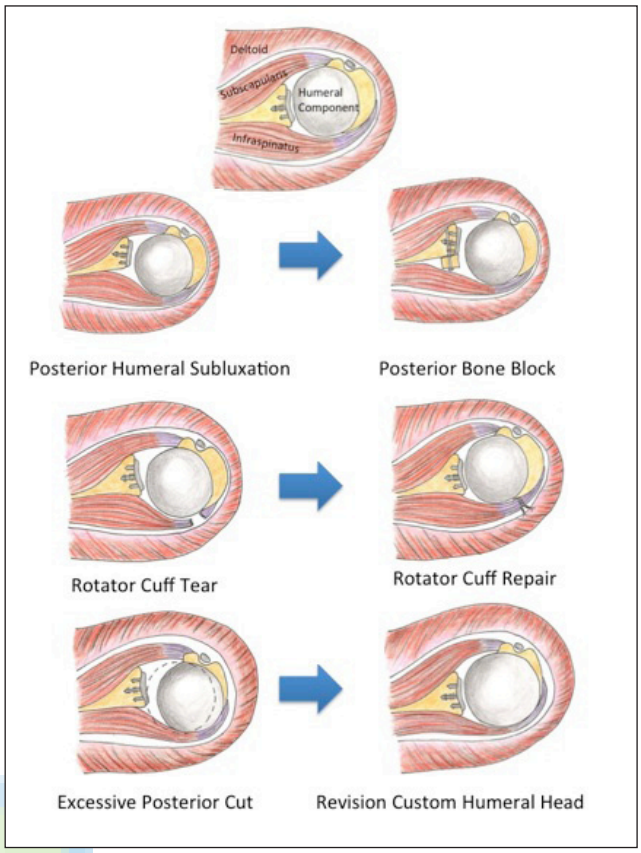

Figure 5: Causes and treatment options for posterior instability

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