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Operative Techniques in

Sports Medicine

The Glenojet Procedure: A Bone Preserving Alternative

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Bone loss in the setting of shoulder instability increases the likelihood of recurrent instability and increases the failure rate of arthroscopic interventions. Bone loss of the anteroinferior glenoid can be addressed via autograft (coracoid transfer or iliac crest bone graft) or allograft (iliac crest or osteochondral). We describe a technique for managing glenoid bone loss with a preshaped allograft.

The Glenojet (Arthrosurface Inc.) is an allograft cortical bone augment for the glenoid. It is placed with a standard deltopectoral approach. The graft is predrilled and has a disposable targeting guide that fits 2 3.5 mm cortical screws. It offers an easy solution for addressing anteroinferior glenoid bone loss that preserves normal patient anatomy. It is particularly appealing for revision procedures of failed coracoid transfers.

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KEYWORDS shoulder instability, glenoid bone loss, latarjet, coracoid transfer

Introduction

The reported failure rate for arthroscopic Bankart repair is variable but in certain patient populations can be unacceptably high, particularly in the setting of anteroinferior bone loss.[1] This has prompted some physicians to recommend open coracoid transfer as the index operation in the setting of bone loss or in particular patients with a high redislocation risk.[2] Revision surgery for failed arthroscopic Bankart repair has also been demonstrated to be more successful with open procedures.[3] Coracoid transfers are technically more demanding than arthroscopic Bankart repairs and have demonstrated a complication rate of 30% in a meta-analysis.[4] A gap exists in our current treatment algorithms to offer a minimally invasive and low risk intervention with a low risk of redislocation. In this article, we describe a technique in which a preformed allograft (Glenojet) can be placed with greater ease than a coracoid transfer. Ideally this technique will have a redislocation rate similar to that of a coracoid transfer but lower the complication rate. It is particularly appealing for patients with a high redislocation rate: anteroinferior glenoid bone loss, revision surgery (failed arthroscopic or open procedures) and patients with preoperative factors predisposing them to failure after arthroscopic Bankart repair.

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Technique

Graft

The graft is a human cortical allograft harvested from either the proximal or distal tibia or femur and sterilized by gamma irradiation (Fig. 1). There is no chondral surface. The graft is prepared in 2 sizes: 10 mm × 29 mm and 13 mm × 34 mm. The smaller size graft is generally effective for reconstructing defects of approximately 20%-30% of the glenoid. The graft has a flat surface that abuts the native glenoid and a convex surface for capsular repair. It is predrilled with 2 holes for cortical screw placement and 3 smaller holes to pass suture for a capsular repair.

Graft Preparation

The holes for the cortical screws are predrilled. The capsular sutures can be prepared by an assistant on a back table. A

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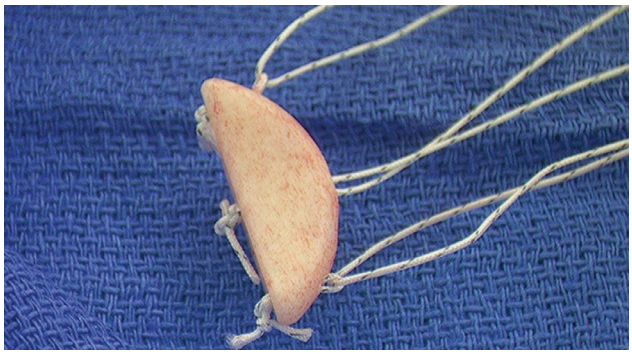

Figure 1 Glenojet cortical allograft (Arthrosurface Inc.) with sutures placed through the predrilled holes. The flat surface abuts the glenoid and the convex surface is repaired to the capsule. The two predrilled holes for the 3.5 mm cortical screws are not visible but are located between the sutures. (Photograph reprinted with permission of Matthias R. Schurhoff, MD, Arthrosurface Inc.).

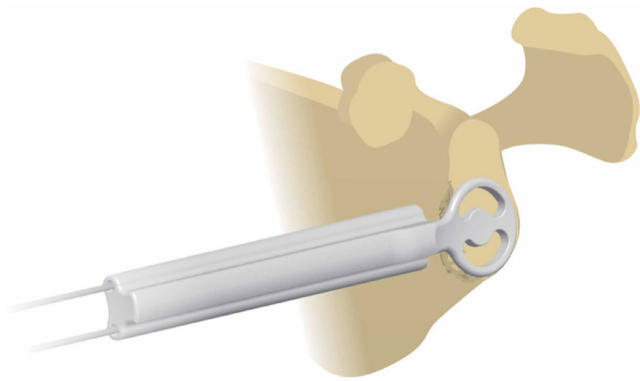

Figure 2 Drill guide centered over defect on the central to inferior aspect of the glenoid. There is a slight convexity of the guide which matches the glenoid concavity. A laser mark on the guide helps unsure the pins are placed perpendicular to the fracture plane. (Image reprinted with permission of Matthias R. Schurhoff, MD, Arthrosurface Inc.).

number 2 polyester suture is tied over a small thin object such as a freer elevator. The knots are cut with short tails. A second suture is then passed through the loop that has been created until the limbs are even length. These 2 limbs are then passed through the graft starting on the flat side and exiting out the convex side of the graft. They are pulled through and are able to slide through the knotted portion similar to a suture anchor (Fig. 1). The sutures can be passed in the opposite direction if the capsular repair is preferred inside the graft.

Graft Placement

A deltopectoral approach is performed in the beach chair position. The approach can be slightly less extensile than for shoulder arthroplasty (tip of the coracoid to pectorals major insertion) but is utilitarian if it needs to be extended. After the pectoralis major is retracted medially and the deltoid is retracted laterally, the medial border of the conjoint tendon is identified. A blunt retractor is placed to retract the tendon medially and protect the musculocutaneous nerve. The clavipectoral fascia and bursa are removed to expose the subscapularis. The subscapularis can be split longitudinally, it can be tenotomized leaving a small attachment, it can be peeled from the lesser tuberosity or an osteotomy of the lesser tuberosity can be performed and the tendon retracted. It is important to separate the capsule from the subscapularis for subsequent capsular repair directly to the graft.

A retractor should be placed on the anterior neck of the glenoid to facilitate exposure and allow placement of the guide. The conjoint tendon can be released from the tip of the coracoid for the sling effect and stay sutures can be placed for later attachment to the Glenojet implant but this is left to surgeon preference. The drill guide is then placed on the central to inferior aspect of the glenoid centered over the defect (Fig. 2). The convex guide should match the native glenoid concave articular surface. The laser mark on the guide should be in line with the anterior fracture plane. The first guide pin is then advanced into the drill guide and placed into the bone bicortically. The pin has an etch mark, which should roughly correspond to the posterior cortex or just distal to the cortex.

The reamer is then placed over the first guide pin and advanced until the depth stop reaches the proximal end of the guide pin. This is repeated for the second pin. This reaming will create a stable apposition of the graft by creating a congruent glenoid surface. The Glenojet graft is then placed over the guide pins in the predrilled holes so the concave surface matches the native glenoid. The inferior guide pin is then removed and a 3.5 mm cortical screw (not supplied) is placed through the predrilled hole in the graft at length measured by a depth gauge. This step is repeated for the superior screw (Fig. 3). The screws should have excellent purchase but it is important to avoid over tensioning which could cause failure of the graft.

Once the screws have been placed and the suture has been prepared (as described above), a free needle can be used to pass the suture through the capsule. The capsule can be advanced and tensioned as deemed appropriate (Fig. 4). A standard subscapularis repair and more superficial closure are then performed.

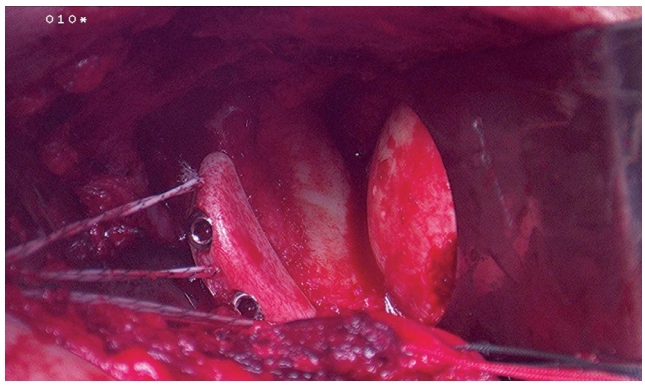

Figure 3 Glenojet graft after placement of 2 3.5 mm cortical screws with sutures passed through predrilled holes. (Photograph reprinted with permission of Matthias R. Schurhoff, MD, Arthrosurface Inc.).

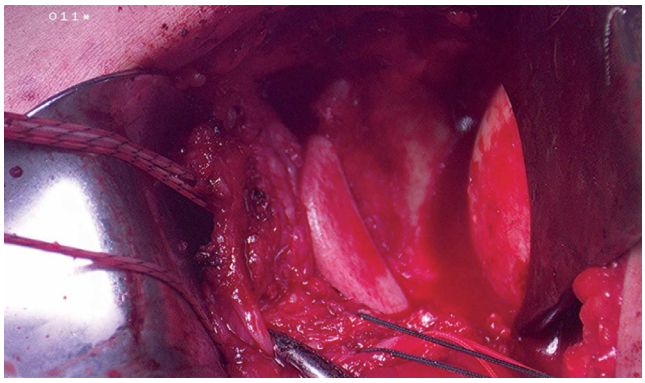

Figure 4 Capsular repair to the peripheral surface of the Glenojet graft. Note, repair can also be performed centrally between the graft and native glenoid. (Photograph reprinted with permission of Matthias R. Schurhoff, MD, Arthrosurface Inc.).

Discussion

In challenging cases of glenohumeral instability, shoulder surgeons are often forced to decide between an operation with an unacceptably high failure rate (Bankart repair) and an operation with an unacceptably high complication rate (coracoid transfer). Shymon et al demonstrated that Bankart repair (open and arthroscopic) in the pediatric population has a plotted 2-year survival curve rate of 86% but this decreased to 49% at 5 years.[5] This lack of success has prompted some surgeons to advise the Latarjet as the index operation.[2] However, Griesser et al in a meta-analysis note a 30% complication rate and a 7% reoperation rate.[4] This disease process would benefit from a low morbidity, high success operation.

In the setting of bone loss the decision making becomes more straightforward as arthroscopic Bankart repair has a high redislocation rate.[1] In these patients bony procedures have better success with the principal treatments being autograft coracoid transfer or allograft reconstruction. The allograft reconstructions are appealing as they would avoid some of the drawbacks of coracoid transfers; including nerve injury, nonanatomic surgery and potentially less graft resorption and lysis.[6]

Allograft reconstruction of the glenoid has some favorable early results. Provencher et al noted 89% union rate with an average follow-up of 45 months using fresh distal tibia.[7] They also noted no episodes of recurrent instability. Iliac crest allograft has also been studied with an 80% radiographic union rate at 6 months and no recurrent instability.[8]

When compared with the other allograft options the Glenojet has the benefit of being predrilled and preshaped facilitating ease of placement. Similar to allograft preparation for ligament reconstruction of the knee the graft can be prepared by an assistant as it only requires the passage of sutures. The graft is also available in 2 sizes which cover the majority of the defects encountered when used in the setting of bone loss.

Allograft procedures do not avoid all the potential complications of coracoid transfers as some pertain to open shoulder surgery such as wound complications and neurologic injuries related to retractor placement. Allograft procedures also do not incorporate the "sling effect" from the conjoint tendon when compared to a Latarjet. The conjoint tendon can be attached to the Glenojet graft and we have done so but we are unable to provide a recommendation if this is advisable. Comparative studies and cadaveric biomechanical studies may help evaluate the role of the tendon but simple evaluation of recurrent dislocation could indirectly answer the question.

The Glenojet graft has been placed by the principal surgeon in 25 patients. There have been no cases of recurrent instability or graft failure but it is worth noting that several underwent concomitant procedures for Hill-Sachs lesions. There was 1 deep infection with *Propionibacterium acnes*. One patient had a fracture extending to the superior screw hole and required arthroscopic removal of a bony fragment but retained the graft and has experienced no subsequent instability. The screw may have been over tensioned resulting in a stress riser or a subtle fracture missed at the time of the index operation. All patients are being followed for functional outcome scores and range of motion.

The principal limitation of this technique is the lack of long-term follow-up. A trial comparing it to patients undergoing Latarjet would be useful to evaluate the potential benefits of decreased operative time and lower complication and reoperation rates. Further studies to evaluate graft viability are particularly important in a disease process that requires decades of success in young, active patients. Degenerative changes are also a potential risk as the graft does not have a chondral surface but a capsular repair internal to the graft may help protect the articular cartilage.

Conclusion

The Glenojet allograft offers an appealing option for particular patients (anteroinferior glenoid bone loss and/or revision procedures) with glenohumeral instability. It is a technically straightforward procedure and early results are promising but long term studies are required to validate its utility.

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