



Anterior capsular reconstruction for recurrent anterior shoulder instability: a case report using dermal allograft



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Case report

The patient was a 46-year-old right hand–dominant healthy male who presented with complaints of left shoulder pain and instability. He had been experiencing these symptoms since he was 20 years old, with his onset of symptoms whether traumatic or atraumatic being unclear. In his early 20s, he underwent three arthroscopic interventions to his left shoulder which included at least one arthroscopic capsular shift. Additionally, at the age of 26 years, he underwent an arthroscopic capsulorrhaphy for anterior instability followed by an open distal clavicle excision presumably to address his diffuse anterior shoulder pain. The patient continued to have recurrent pain and anterior instability and underwent left rotator cuff repair and pectoralis major tendon transfer for subscapularis deficiency at the age of 31 years. Although we did not have a clear traumatic history from the patient concerning a rotator cuff tear, his subscapularis tear and deficiency clearly played a large role in his recalcitrant instability as did his lack of a normal anterior capsule/ inferior glenohumeral ligament. The patient then had another arthroscopic debridement and capsulorrhaphy at the age of 34 years for instability. The patient continued to have significant pain and instability to the degree that he could not remove his shirt using the left arm. He endorsed an almost daily dislocation rate and persistent subluxation events. These symptoms were refractory to both dedicated physical therapy and corticosteroid injections. He was able to work as a forklift driver but required regular mild narcotic use for pain control. His left shoulder preoperative range of motion was forward flexion to 140 degrees with pain and external rotation to 70 with pain and apprehension. His preoperative outcome scores were Quick Disabilities of the Arm, Shoulder, and

Hand (QuickDASH) score of 47.7, Simple Shoulder Test of 5, American Shoulder and Elbow Surgeons (ASES) score of 48, and Shoulder Single Assessment Numeric Evaluation (SANE) of 50%.

Current magnetic resonance imaging showed a chronic subscapularis tear with G4 muscle atrophy, pec major transfer with scarring, an intact long head of the biceps tendon with mild medial subluxation at the top of the groove, and intact supraspinatus, infraspinatus, and teres minor tendons. His glenohumeral joint space was maintained on radiographs, and his magnetic resonance imaging showed some mild glenohumeral chondromalacia. Although the patient was initially referred for evaluation for shoulder arthroplasty, a thorough discussion was held regarding his options including continued nonoperative care, shoulder arthroplasty, and shoulder arthroscopy (labral repair versus debridement, possible open capsular reconstruction with dermal allograft versus capsular tightening, and biceps tenodesis). Given the patient's young age, the patient decided to pursue a capsular reconstruction procedure in an effort to delay arthroplasty.

At surgery, examination under anesthesia showed +2 anterior drawer test, +1 posterior drawer, and external rotation of 85 degrees with the arm at the side. Diagnostic arthroscopy showed a type 3 SLAP tear, absent subscapularis tendon with scarring in the anterior glenohumeral joint (Fig. 1), grade 4 chondromalacia on the anterior glenoid (with the remainder having grade 2–3 chondromalacia) with a blunted but present anteroinferior labrum with evidence of prior capsulorrhaphy (Fig. 2), and intact supraspinatus/infraspinatus/teres minor tendons. Debridement and biceps tenotomy were performed arthroscopically as well as removal of one anteroinferior labral suture. Attention was then turned to the open capsular reconstruction. The deltopectoral approach was used with significant scarring secondary to the pectoralis tendon transfer. Some anterior capsular tissue appeared to be present but was very thin. The biceps tendon was tenodesed to the soft tissue in the inferior aspect of the bicipital groove. The thin remaining anterior capsular tissue was incised longitudinally, and deficiencies

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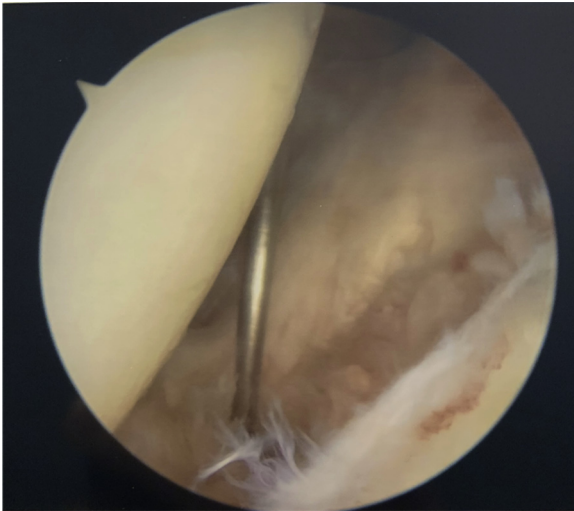


Figure 1 Arthroscopic image of the scarring noted in the anterior glenohumeral joint without a subscapularis present.

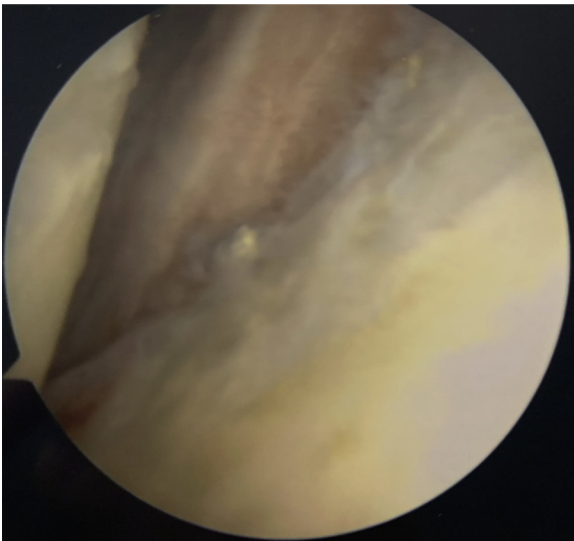


Figure 2 Arthroscopic image of the anteroinferior glenoid with one prior visible suture anchor and a blunted anterior labrum.

of the superior capsule as well as the anteroinferior glenohumeral ligament were noted. There was fatty degenerative tissue over the lesser tuberosity which was excised. Anterior glenoid was exposed, and two double-loaded Arthrex FiberTak anchors (Arthrex, Naples, FL, USA) were inserted. One limb of each tail was passed superficial to deep and deep to superficial through the remaining labrum. Then, two biocomposite anchors were placed on the medial aspect of the lesser tuberosity (Fig. 3). A 4-mm acellular dermal allograft (ArthroFlex; Lifenet Health, Virginia Beach, VA, USA) was sized appropriately and cut on the back table. The free sutures from the glenoid anchors were passed through the graft in a double pulley technique for 1 set of sutures and a horizontal mattress for the sutures that had passed through the labrum slightly more laterally on the medial aspect of the graft. The double pulley sutures were tied first followed by the horizontal mattress sutures. The lateral aspect of the graft was then draped across the anterior glenohumeral joint, and extraneous graft laterally was cut with the arm in a position of 45 degrees of abduction and 30 degrees of external

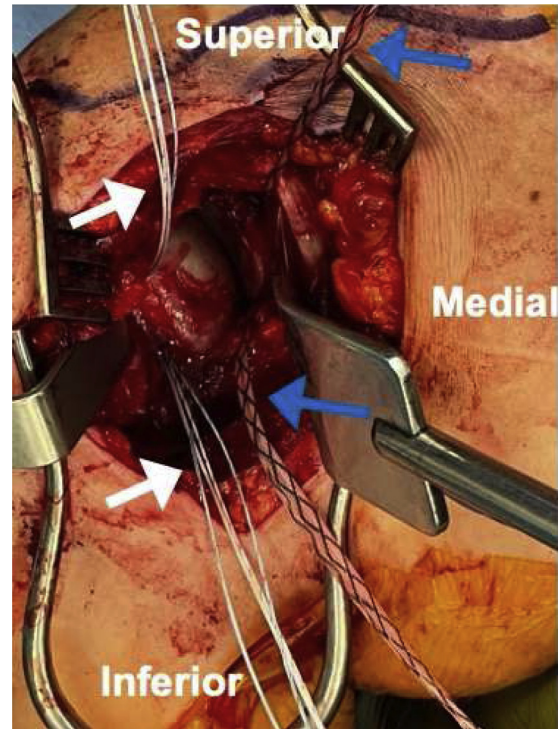


Figure 3 Image of the anterior glenohumeral joint with absent subscapularis. Medial anchors (←) are noted on the glenoid, and lateral anchors (↔) are placed on the medial aspect of the lesser tuberosity.

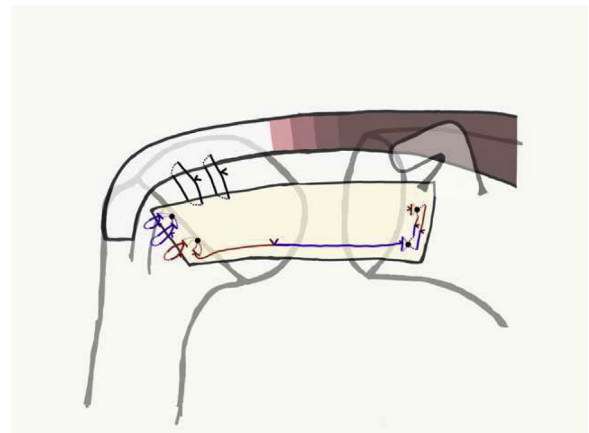


Figure 4 Schematic drawing of the anterior capsular reconstruction construct used in this case.

rotation. The lateral anchors were passed in a horizontal mattress fashion through the graft and tied. The sutures were then passed over the lateral soft tissue forming a lateral double row without anchors. One suture limb from the horizontal mattress sutures on each side of the joint was tied together for an internal brace effect. The superior aspect of the allograft was then sutured to the remaining supraspinatus tendon using a combination of absorbable and nonabsorbable sutures. Schematic of the anterior capsular reconstruction construct is presented in (Fig. 4). Layered closure was performed with absorbable suture.

The patient remained in a sling for 6 weeks and was non-weight-bearing for 4 months. At 6 weeks postoperatively, the patient began physical therapy with limitations to 30 degrees of

Table 1
Patient's shoulder range of motion and outcome scores at different time points.

Time point	Active forward flexion	Active external rotation	Active internal rotation	QuickDASH	SST	ASES score	Shoulder SANE	VAS pain
Preop	140° (170° contra)	70° (45° contra)	L2 (T11 contra)	47.7	5	48	50%	7
6 months postop	160°	40° (80° @ 90° abduction)	L1	6.8	11	82	80-90%	2
18 months postop	-	-	-	18.2	11	78	75-80%	4
30 months postop	-	-	-	36.4	9	62	70%	5

ASES, American Shoulder and Elbow Surgeons; SANE, Single Assessment Numeric Evaluation; SST, Simple Shoulder Test; VAS, visual analog scale.

external rotation for another 6 weeks and passive, active assist, and active forward elevation to tolerance. Internal rotation past the abdomen was allowed after 6 weeks.

The patient did well postoperatively with significant improvement in his pain and function as shown by improved outcome scores and less pain (Table 1). At his 30-month follow-up, the patient had no complaints of instability events and had returned to his job as a fork lift driver without limitation. His final SANE score was 70%, with a 4-point improvement in his Simple Shoulder Test at the final follow-up. The patient was informed and consented to the submission of his clinical data for publication in the form of a case report.

Discussion

Chronic anterior shoulder instability affects many patients, particularly individuals involved in collision sports. Traumatic shoulder dislocation or subluxation, defined as soft-tissue or bony insult that causes the humeral head to subluxate or dislocate from the glenoid fossa, accounts for 95% of shoulder instability events.^{5,27,28} Even after recovery from a primary shoulder dislocation, athletes who return to sports are prone to recurrent injury and instability. Conservative treatment approaches, such as physical therapy, provide a noninvasive option that typically leads to clinical improvement in patients with atraumatic instability, however, young patients with instability stemming from traumatic events who continue to play contact sports typically progress to requiring surgical interventions.³ Open and arthroscopic stabilization procedures have been met with high success, preventing recurrent instability events in most patients (79%-100%).^{3,8,11,26,31} For the patients with recurrent instability despite surgical intervention, additional procedures prove challenging owing to deficiencies of the anterior capsule and ligamentous complex as well as anterior glenoid bony loss.

Subscapularis insufficiency is a less common problem leading to anterior shoulder instability but is associated with devastating functional deficits, often requiring salvage surgical approaches.^{17,20,22} Such approaches include tendon transfers, such as pectoralis major and latissimus dorsi transfers.^{4,19} These tendon transfers are associated with functional improvements but fundamentally alter joint kinematics and are reliant on a competent posterior rotator cuff. Elhassan et al found high complication rates when performing pectoralis major tendon transfer on patients with diminished subscapularis integrity, with clinical failure rates of 27% and 36% from groups of patients that had previously failed procedures for shoulder instability or had massive tears of the rotator cuff.⁷ Latissimus dorsi tendon transfers offer another option for irreparable subscapularis tears but have been met with high clinical failure (41%) and complication rates such as potential axillary nerve injury.¹⁸

The Bristow and Latarjet techniques offer additional options for addressing recurrent anterior shoulder instability, but these approaches have their complications and the risk of reoperation persists.¹⁰ A large meta-analysis of the Latarjet procedure versus a

Bankart repair performed by Imam et al including >3000 patients found that the Latarjet procedure was more effective than Bankart procedures at preventing recurrent instability at 6-10 years postoperatively without increased complications.¹³ These findings echoed an earlier meta-analysis performed by An et al with >700 patients which also showed that the Latarjet procedure offered greater stability than the Bankart repair with no significant increase in complications.² Improvements in complication rates compared with the Bankart repair does not necessarily mean that the complication rate is low. A different comprehensive review of the literature, conducted by Griesser et al, found a total complication rate of 30% when investigating 45 studies (1904 shoulders), with recurrent dislocation rates being 2.9% among open surgeries and 5.8% among those performed arthroscopically.¹⁰ In total, nearly 7% of patients required unplanned reoperation after surgery.¹⁰ Domos et al found moderately high rates of postoperative complications (15%), which include infection, frozen shoulder, hematoma formation, symptomatic implants, fracture or nonunion of the coracoid graft, neurological complications, arthritis, and recurrence of instability.⁶ These results were mirrored by a systematic review completed by Longo et al including >1000 patients revealing a complication rate of 15% including postoperative infections, neurologic injuries, and stiffness, among others.¹⁵ An analysis performed by Willemot et al in the setting of revision Bristow/Latarjet procedures revealed that the primary causes of failures were graft nonunion (42.3%) and graft resorption (23.1%).³⁰ Although the Bristow and Latarjet surgical techniques offer an effective approach to ameliorating anterior shoulder instability with bony deficiency, these complications remain problematic. In addition to these complications, concerns about long-term development of shoulder arthritis exist with these procedures.^{12,23,25}

Several different techniques for anterior capsule reconstruction are present in the literature but have been met with mixed clinical outcomes. Alcid et al performed a case series using hamstring tendon allografts (n = 9) or tibialis tendon allograft (n = 6) to reinforce deficient anterior capsular tissue in shoulder instability patients who had previously failed shoulder immobilization.¹ In follow-up, 5 patients (3/9 hamstring autograft patients and 2/6 of tibialis anterior autograft) continued to experience subluxation events and postoperative restricted range of motion with regards to forward flexion (10°), external rotation at the side (21°), external rotation with the arm in abduction (24°), and 4 spinal levels of internal rotation.¹ Anterior capsular reconstruction with Achilles tendon allograft offers another approach to this clinical challenge, particularly for patients with Ehlers-Danlos syndrome; however, long-term outcome data remain limited, with failure rates reported ranging from 20% to 69%.^{16,24}

Reconstruction of the anterior capsule using a dermal allograft has previously been described in the literature, but postoperative data remain limited and additional clinical trials are required to determine the long-term clinical implications.^{9,14,21,29} Promising elements of this approach include reduced surgical pain, decreased harvest site morbidity, and increased postoperative range of motion.²⁹ Anterior capsular reconstruction appears to be a viable

option for recurrent shoulder instability with deficient anterior soft-tissue stabilizers.

To our knowledge, there is only one study in the literature that reports follow-up data on one patient receiving anterior capsular reconstruction with a dermal allograft.³² A case report on a 42-year-old male, who had previously failed arthroscopic Bankart repair and an open Latarjet procedure to his nondominant arm, was described by Zink et al.³² At a 24-month postoperative follow-up, the patient's shoulder remained stable, with no recurrent instances of anterior subluxation or dislocation.³² Functional outcome scores for the ASES, Constant, and SANE were measured to be 70%, 97%, and 50%, respectively. The visual analog scale pain score was rated at 0 with only minor anterior shoulder discomfort during activity reported by the patient at the final follow-up.³² Although the patient described in this report had many clinical similarities to that of Zink et al, it should be noted that the patient from this study had undergone a Mumford procedure and pectoralis major tendon transfer instead of prior bony instability procedures.³² The findings described in this case report corroborate the positive experience of anterior capsular reconstruction described by Zink et al. Our patient described experienced improvements in the QuickDASH score, Simple Shoulder Test, ASES score, and Shoulder SANE. These improvements occurred despite his significant surgical history including multiple capsulorrhaphies and a failed pectoralis major tendon transfer.

Conclusion

This case demonstrates that anterior capsular reconstruction with acellular dermal allograft may be a viable option when treating patients with refractory anterior instability and a deficient anterior capsule. Further clinical investigations, particularly long-term follow-up data and case series, are still required to elucidate the potential of this surgical option for patients with recalcitrant anterior shoulder instability.

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