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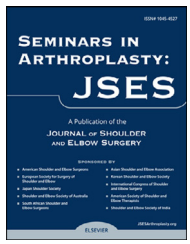

Acute bony Bankart and proximal humeral dislocation in an elderly patient treated with distal tibial allograft glenoid augmentation and reverse shoulder arthroplasty: a case report

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Traumatic large bony Bankart lesions are an uncommon and challenging condition to treat in the elderly due to underlying comorbidities such as osteoporosis, rotator cuff injuries or previous glenohumeral osteoarthritis.[7] Overall, there are several options for treatment of glenoid bone defects including autografts, allografts or metal augmented baseplates.[8] Glenoid reconstruction with distal tibial allograft (DTA) is a reliable and secure surgical option to treat recurrent glenohumeral instability with anterior bone loss in non-arthritic patients.[15]

The management of a large bony Bankart with an associated orthopedic condition such as a fracture or rotator cuff tear could lead to some controversy with regards to potential management. The indications for reverse shoulder arthroplasty (RSA) have expanded over the last few years to include fracture care. The osseointegration rate of RSA combined with glenoid bone grafts for severe glenoid bone loss is quite high. Even in the case of severe bone abnormalities combining the procedures has proven to be a safe surgical treatment with a low risk of complications and a satisfactory functional result.[5]

In this case report, we present an elderly patient with an acute traumatic shoulder dislocation with 50% of anterior glenoid bone loss treated with RSA reinforced by DTA.

Case report

A 72-year-old right hand dominant female presented to the emergency department with an acute fracture dislocation of her left shoulder as a result of a low-energy mechanism. No previous history of rotator cuff disease or shoulder instability was identified. On the physical examination the shoulder dislocation was confirmed with no signs of axillary nerve palsy. Serial plain radiographs demonstrated a shoulder dislocation with a bony fracture of the anterior glenoid (Fig. 1, *A*). In the emergency room, multiple attempts for closed reduction were performed which were unsuccessful and resulted in her requiring hospital admission.

Preoperative CT scan demonstrated 20 mm anterior glenoid bone loss (Fig. 2). Twenty-four hours later a preoperative

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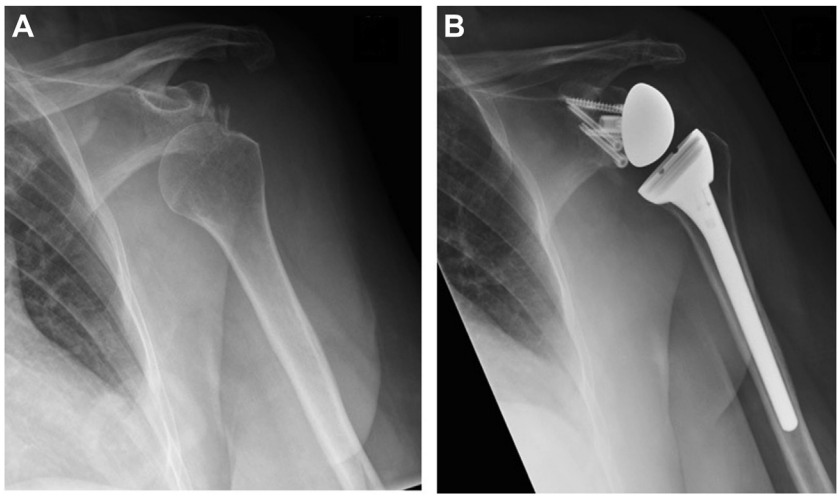

Figure 1 – Preoperative (A) and postoperative (B) AP radiographs. *AP*, anterior to posterior.

MRI was performed to assess the integrity of the rotator cuff which demonstrated a massive rotator cuff tear with obvious dislocation of the humeral head and severe bone loss. (Fig. 3).

After assessing the patient clinically, the preoperative plan was to attempt an RSA with bone graft consisting of either a humeral head autograft or a DTA.

Procedure

The patient was given a general anesthetic. A standard deltopectoral approach was made to the proximal humerus. The shoulder was obviously still dislocated. A subscapularis tenotomy was performed and tagged for further repair at the end of the procedure. Once the humeral head was brought into the wound, it was prepared and cut in a standard fashion for a Delta Xtend Reverse implant (Depuy Synthes), then the protection plate was placed on the proximal humerus and the glenoid was exposed.

At that moment, the anterior half of the glenoid was seen to be fully fractured as her humeral head had sat in the defect anteriorly and had essentially crushed the remaining glenoid at a 90-degree angle to her normal glenoid face. The remaining labrum was resected with bone fragments. Due to the significant bone loss it was decided to perform an

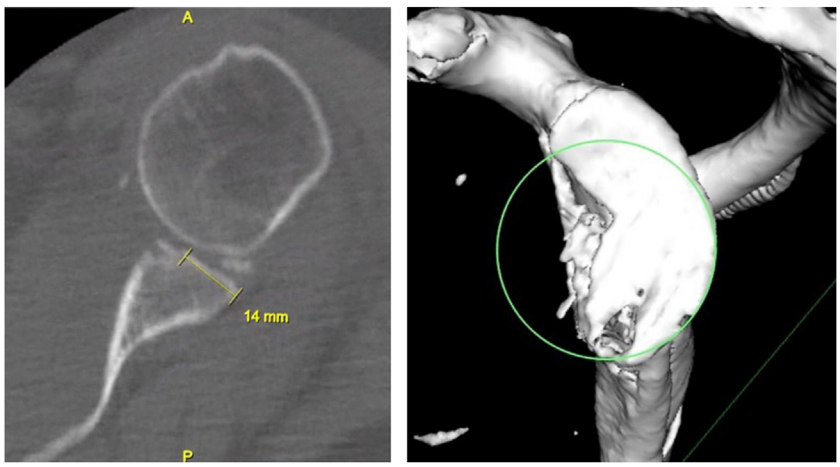

Figure 2 – Preoperative CT scan and 3D reconstruction post first closed reduction identifying anterior bone loss Green circle is the best fitting circle, a measurement technique to identify relative glenoid bone loss area. *CT*, computed tomography.

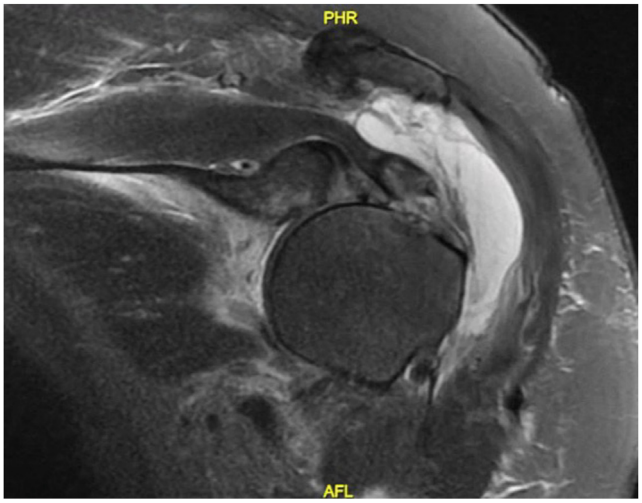

Figure 3 – Preoperative MRI with rotator cuff lesion, shoulder dislocation and severe bone loss. *MRI*, magnetic resonance imaging.

augmentation of the front of the glenoid with a DTA. Prior to placing the allograft, the guide wire for the metaglene was placed in the presumed center-center position of the native glenoid (Fig. 4).

A frozen nonirradiated DTA was used for this surgical technique and came from our institutional bone bank (Capital District Health Authority Regional Tissue Bank, Halifax, Nova Scotia, Canada). The graft was marked in the fibular notch of the tibia to obtain cortical bone of the articular, anterior and inferior surfaces, and cancellous bone on the medial surface so that there was maximal contact with the native glenoid. The graft dimensions were 15 × 20 × 25 mm. Pulse lavage of the graft was performed with 3L of saline solution. It was then fixed to the glenoid using 2 partially threaded cannulated screws (3.5-mm screw and 1.1-mm guide wire) at a 45-degree angle with a 44- and 40-mm length Latarjet Experience Screws (Depuy Synthes), the screws were guided and placed to maximize chance for metaglene central post orientation in the optimal position.

The central post for the metaglene was drilled, positioned, and then fixed with superior and inferior 36 mm locking screws and an 18 mm non-locking posterior screw was placed. It is important to note that all of the metaglene screws were positioned in the native glenoid. The anterior screw could not be placed as it did not fit between the DTA screws. A standard 38mm glenosphere was positioned. After that, our attention turned back to the humeral component, placing a size 10 cementless stem and a size 1 epiphysis with an eccentric body in the humerus. Stability was assessed and a +9 humeral polyethylene cup was implanted. The subscapularis tenotomy was repaired with non-absorbable sutures. The deltopectoral interval was marked with prolene after sacrificing the cephalic vein during the procedure. The surgical wound was closed in the usual fashion. Postoperative films are shown in Figure 1, *B*.

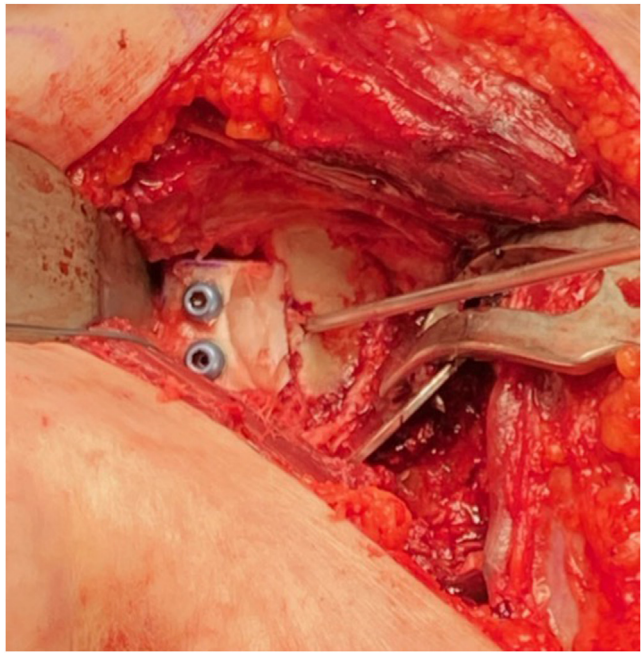

Figure 4 – Clinical photo of the glenoid construct with DTA and 2 screw fixation, the central guide wire is place before implantation of the metaglene. Note the congruency of the bone graft to the native glenoid. *DTA*, distal tibial allograft.

Postoperative follow-up

The patient was assessed in the orthopedic clinic at two weeks postoperatively for sutures removal. At that visit pendular exercises as well as elbow and wrist range of motion were started in a home-based program. Pain control was performed with regular postoperative pain medications and no signs of infection were evident at that time.

At the six-week follow-up, the patient was able to achieve forward elevation up to 80 degrees. At that appointment the patient started active assisted external rotation and was referred for formal physiotherapy. On physical examination at 6 months, she was able to obtain forward elevation to 100 degrees, abduction to 90 degrees, external rotation to 20 degrees and internal rotation to the sacrum, a CT scan was requested to assess the bone graft osseointegration which was successful at that time (Fig. 5). At 2-year mark, functional range of motion was achieved reaching forward elevation of 140 degrees, abduction of 120 degrees, external rotation 30 degrees and internal rotation up to L4. CT scan was performed with no bone graft reabsorption at this time. No pain nor dislocation was reported.

Discussion

Shoulder dislocations in the elderly are more likely to occur secondary to low-energy causes and they can be accompanied by anterior glenoid rim injuries, rotator cuff lesions and lead

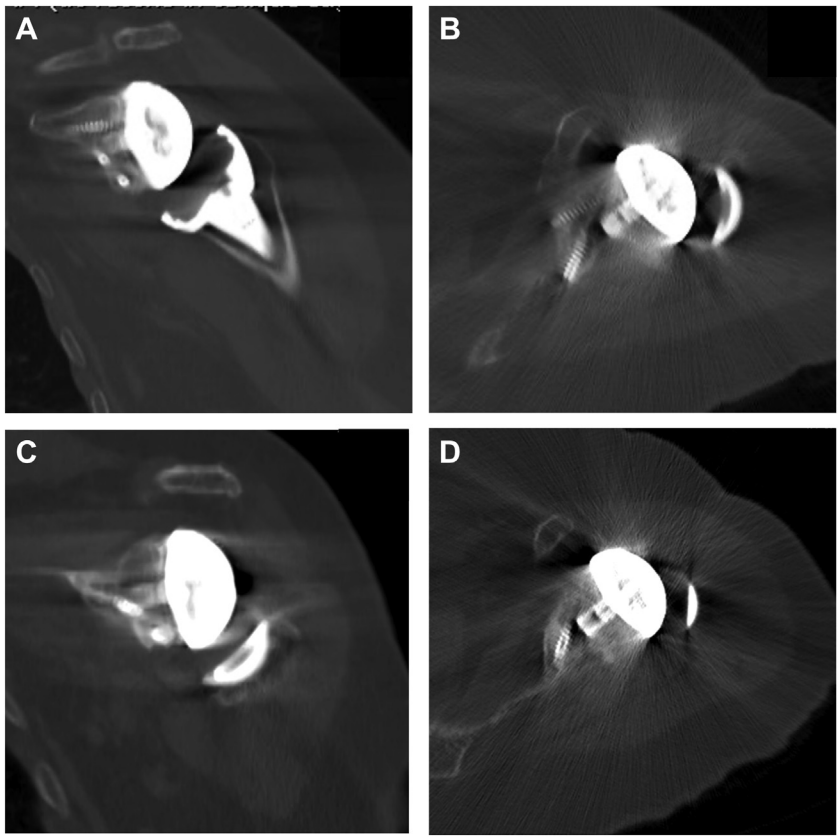

Figure 5 – Six-month (A and B) and 2-year (C and D) CT scan with adequate bone graft osseointegration. The glenosphere is congruent and no lucencies are noted in both follow-up images. *CT*, computed tomography.

to recurrent instability in this age group.[11] It is estimated that approximately 27.9% of shoulder dislocations occur in patients older than 70 years of age and they have the shortest time of recurrence after the first shoulder dislocation.[4]

Severe glenoid bone loss after shoulder dislocation establishes a significant reconstructive challenge and currently there is no agreement on an ideal surgical treatment for these types of bone defects.[14] Use of structural allograft for glenoid bone loss in primary RSA has an overall graft union rate of 92%, with a low revision rate (2%) and low complication rates (18%).[6,9] For this reason, we present an alternative glenoid reconstruction method in the setting of a RSA.

In the case of a significant anterior glenoid fracture associated with an anterior shoulder dislocation, a minimum anchorage length of 10 to 15 mm of the central peg in the native glenoid bone stock should be obtained in order to obtain reliable baseplate stability.[2] There are several studies that report the use of allograft in glenoid bone loss, including femoral neck, humeral head or iliac crest.[1,3,13] The use of a lateral DTA for reconstruction of the anterior glenoid shows excellent clinical results with 80-100% success of bone graft integration at 1.4 years of follow-up, reducing the rate of dislocation while improving pain and function.[10,12]

In this case report DTA was used instead of humeral head autograft due to the type of bone defect that was encountered. The humeral head bone quality of this patient was a concern during the surgical procedure. DTA offers an anatomic and congruent solution with cortical support for this bone defect without compromising the adjacent structures. In this case, the graft screws used were longer than those applied for arthroscopic stabilization in young patients in order to angle them so that the baseplate screws could be avoided. Care was taken to make sure the screws were not lateral to impede on the metaglene. Since the conjoint tendon was still intact, the difficulty of the graft insertion with an open approach increased.

The advantages of this technique include maintenance of proper joint lateralization and a stable construct with a flexible technique. On the other hand, some disadvantages that were identified include the availability and costs of the allograft, the screw trajectory for the graft placement and glenoid neck interfering with the RSA fixation screws.

Conclusions

RSA with DTA augmentation is a viable and successful option for the treatment of a large glenoid fracture with associated acute shoulder instability and preexisting rotator cuff tear in the elderly.

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REFERENCES

1. De Biase CF, Ziveri G, De Caro F, Roberts N, Delcogliano M. Reverse shoulder arthroplasty using a "L" shaped allograft for glenoid reconstruction in a patient with massive glenoid bone loss: case report. Eur Rev Med Pharmacol Sci 2014;18(1 Suppl):44–9.
2. Garofalo R, Brody F, Castagna A, Ceccarelli E, Krishnan SG. Reverse shoulder arthroplasty with glenoid bone grafting for anterior glenoid rim fracture associated with glenohumeral dislocation and proximal humerus fracture. Orthop Traumatol Surg Res 2016;102:989–94. https://doi.org/10.1016/j.otsr.2016.09.009.
3. Jones RB, Wright TW, Zuckerman JD. Reverse total shoulder arthroplasty with structural bone grafting of large glenoid defects. J Shoulder Elbow Surg 2016;25:1425–32. https://doi.org/10.1016/j.jse.2016.01.016.
4. Kao JT, Chang CL, Su WR, Chang WL, Tai TW. Incidence of recurrence after shoulder dislocation: a nationwide database study. J Shoulder Elbow Surg 2018;27:1519–25. https://doi.org/10.1016/j.jse.2018.02.047.
5. Lopiz Y, Garcia-Fernandez C, Arriaza A, Rizo B, Marcelo H, Marco F. Midterm outcomes of bone grafting in glenoid defects treated with reverse shoulder arthroplasty. J Shoulder Elbow Surg 2017;26:1581–8. https://doi.org/10.1016/j.jse.2017.01.017.
6. Lorenzetti A, Streit JJ, Cabezas AF, Christmas KN, LaMartina J 2nd, Simon P, et al. Bone graft augmentation for severe glenoid bone loss in primary reverse total shoulder arthroplasty: outcomes and Evaluation of host bone contact by 2D-3D image registration. JB JS Open Access 2017;2:e0015. https://doi.org/10.2106/JBJS.OA.17.00015.
7. Malahias MA, Chytas D, Kostretzis L, Brilakis E, Fandridis E, Hantes M, et al. Bone grafting in primary and revision reverse total shoulder arthroplasty for the management of glenoid bone loss: a systematic review. J Orthop 2020;20:78–86. https://doi.org/10.1016/j.jor.2019.12.005.
8. Patel MS, Davis DE. Augmented reverse shoulder arthroplasty for complex instability with glenoid fracture: a case report. Semin Arthroplasty: JSES 2021;31:465–70. https://doi.org/10.1053/j.sart.2021.01.008.
9. Paul RA, Maldonado-Rodriguez N, Docter S, Khan M, Veillette C, Verma N, et al. Glenoid bone grafting in primary reverse total shoulder arthroplasty: a systematic review. J Shoulder Elbow Surg 2019;28:2447–56. https://doi.org/10.1016/j.jse.2019.05.011.
10. Provencher MT, Frank RM, Golijanin P, Gross D, Cole BJ, Verma NN, et al. Distal tibia allograft glenoid reconstruction in recurrent anterior shoulder instability: clinical and radiographic outcomes. Arthroscopy 2017;33:891–7. https://doi.org/10.1016/j.arthro.2016.09.029.
11. Rapariz JM, Martin-Martin S, Pareja-Bezares A, Ortega-Klein J. Shoulder dislocation in patients older than 60 years of age. Int J Shoulder Surg 2010;4:88–92. https://doi.org/10.4103/0973-6042.79792.
12. Robinson SP, Patel V, Rangarajan R, Lee BK, Blout C, Itamura JM. Distal tibia allograft glenoid reconstruction for shoulder instability: outcomes after lesser tuberosity osteotomy. JSES Int 2021;5:60–5. https://doi.org/10.1016/j.jseint.2020.09.018.
13. Tashjian RZ, Broschinsky K, Stertz I, Chalmers PN. Structural glenoid allograft reconstruction during reverse total shoulder arthroplasty. J Shoulder Elbow Surg 2020;29:534–40. https://doi.org/10.1016/j.jse.2019.07.011.
14. Verstuyft L, Vergison L, Van Tongel A, De Wilde L. Is bone grafting always necessary in revision reverse total shoulder arthroplasty with uncontained glenoid bone defects? J Shoulder Elbow Surg 2021;30:1891–8. https://doi.org/10.1016/j.jse.2020.10.033.
15. Wong I, John R, Ma J, Coady CM. Arthroscopic anatomic glenoid reconstruction using distal tibial allograft for recurrent anterior shoulder instability: clinical and radiographic outcomes. Am J Sports Med 2020;48:3316–21. https://doi.org/10.1177/0363546520960119.