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Reverse shoulder arthroplasty for deltoid-deficient shoulder following latissimus dorsi flap transfer. Case report

Mohamed Al Ateeq Al Dosari*, Shamsi Hameed, Khalid Mukhtar, Aissam Elmhiregh

Orthopedic department, Hamad General Hospital, Doha, Qatar

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ABSTRACT

INTRODUCTION: The usual indication for reverse shoulder arthroplasty is glenohumeral arthritis with inadequate rotator cuff and intact deltoid muscle. We report here a case of reverse shoulder arthroplasty using a lattisimus dorsi flap in a patient with deltoid-deficient shoulder following a gunshot injury.

PRESENTATION OF THE CASE: The patient was an otherwise healthy 51-year-old male with a history of gunshot injury of the left shoulder 2006. Upon presentation in 2011, the patient had a loss of most of his shoulder bony and muscular structures. Due to deltoid muscle deficiency, the patient underwent Lattisimus Dorsi muscle flap followed by reverse shoulder arthroplasty in order to establish an upper limb function.

Upon discharge, 11 days after the surgery, the patient was able to achieve 150° flexion and 90° abduction while in the supine position and 45° in each direction, while sitting. He was able to perform internal rotation (behind back) up to the level of the L1 vertebra, assisted active abduction of 90°, and external rotation of 20°. Power tests showed power of grade 4/5 for both shoulder flexion and extension and grade 2+/5 for both abduction and adduction.

At the last follow up one year after the operation, The patient still had passive pain-free full range of motion, but no progress in active range of motion beyond that upon discharge.

CONCLUSION: Reverse shoulder arthroplasty after Latissmus dori flap in patient with deltoid deficient shoulders can be a successful and reproducible approach to treat such conditions.

1. Introduction

The introduction of Grammont's Delta prosthesis, which, as its name suggests, serves the role of the deltoid muscle for the success of the reverse shoulder arthroplasty has prompted surgeons to consider only the anatomical rather than the functional existence of the muscle. We think that this has limited the scope and the benefits of reverse shoulder arthroplasty and, possibly, a considerable proportion of the reported failure rates.

Here, we present a case of traumatic shoulder injury resulting in arthritis with loss of the rotator cuff and deltoid muscles, which was successfully treated by reverse shoulder arthroplasty, following a latissimus dorsi myocutaneous flap transfer.

This procedure has been described as a solution to arthritic shoulders with rotator cuff deficiency and loss of abduction and external rotation. Ortmaier et al. [13] reported improvement of the functional scores of patients underwent reverse shoulder arthroplasty with Latissimus dorsi transfer in his systematic review. However, using this procedure after severe traumatic shoulder injury has not been described according to our knowledge. This report would add to the indications of such procedure and to the clinical practice.

This case report was written in line with SCARE Guidelines [8]

Case description

The patient was an otherwise healthy 51-year-old male with a history of gunshot injury of the left shoulder by a large caliber machine gun (DShK) in Darfur, Sudan, in December 2006. The patient is smoker with irrelevant drug histoy. As treatment, the patient underwent multiple debridement surgeries (Sudan, Ethiopia). However, he had not received any form of physical rehabilitation, leading to a painfully stiff left shoulder, with a significant loss of bone elements, scarring, and soft tissue loss. There were no available records for the details regarding the initial injury, nor the abovementioned debridement surgeries; however, pre-operative assessment in Qatar (Dec 2011) revealed almost complete loss of the left shoulder components, namely, the humeral head, acromioclavicular joint, along with at least the lateral fifth of the clavicle, tendons of the rotator cuff muscles, and the main bulk of the deltoid muscle, as well as retained ammunition particles of variable sizes (Fig. 1). He also had ipsilateral elbow injury with ulnar nerve neu-

* Corresponding author.
E-mail address: dr.aldosari.orthopedic.hgh@gmail.com (M.A.A.A. Dosari).

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roma and neuropathy, which were resolved by neuroma resection and nerve transposition with no consequent nerve compromise.

The patient was referred to the reconstruction surgeon at the plastic surgery unit, where he underwent pedicled myocutaneus (latissimus dorsi) flap coverage, followed by skin grafting a week later, in December 2011.

Five months later, and after satisfactory soft tissue healing, he was admitted to the orthopedic ward, where he was scheduled to undergo an elective joint replacement in May 2012.

Preoperative assessment: Clinical examination, as shown in the photo (Fig. 1); showed a healed scar indicative of previous soft-tissue reconstruction surgeries, with mild keloid formation. Examination of the axillary nerve revealed intact motor function and normal sensation over the deltoid "patch." Neurovascular examination of the rest of his arm showed tingling and numbness along the ulnar nerve distribution.

Shoulder examination: The patient had very limited active and passive range of movement. He tended to move the scapula instead of the shoulder's glenohumeral joint itself; 15° of forward elevation, 20° of abduction, 15° of external rotation, and internal rotation to L3, with grade "zero" power for shoulder flexion, extension, and external and internal rotation. Passive flexion and abduction was possible to a maximum of 30° only.

Needle electromyography test of the left shoulder was performed to assess the viability of the latissimus dorsi flap transposition; it showed normal amplitudes and potentials. Moreover, the remnant part of the native anterior deltoid muscle showed muscle potentials upon attempt to voluntarily elevate the arm. Radiological images were then reviewed, followed by preoperative planning and both digital and analog templating.

2. Procedure

After the risks and benefits of the procedure were discussed with the patient, implantation of the Delta III reverse shoulder arthroplasty prosthesis (DePuy, Saint-Priest, France) was performed on 30th May 2012 by a senior consultant adult reconstruction orthopedic surgeon. The operation was performed with the patient in the beach chair position; examination under anesthesia confirmed the restricted range of motion, suggesting the presence of significant contracture. A slightly lateral surgical incision was made to avoid injury to the latissimus dorsi, using a more extensile than the traditional deltopectoral approach. Care was taken to prevent injury to the anterior portion of the deltoid muscle, the axillary nerve, and the rotator-cuff tendons. Scar tissue was cleared from the subdeltoid–subacromial space, including the area between the conjoined tendons and the subscapularis. The subscapularis tendon was divided 1 cm medial to its humeral attachment, and up to two-thirds of the pectoralis major tendon was released from its humeral insertion. The humeral head was identified and was found to be completely destroyed with central and posterior defects and some rotator-cuff fibers, present mainly posteriorly; the remaining cuff tissue was of poor quality, and so further disruption was avoided. Many pieces of shrapnel were detected around the shoulder joint and during the surgery; only those pieces that prevented the movement of the shoulder and those in close proximity to neurovascular structures were removed; the remaining pieces were left in situ to prevent soft tissue damage during dissection. Intramedullary resection of the humeral head was performed, followed by glenoid preparation. A standard baseplate with a 38-mm eccentric glenosphere was inserted into the glenoid. This was secured with 3 locking screws. The humerus was prepared, and the definitive stem (size, 12 mm) was inserted into the prepared pre-existing cement mantle. The reduction was checked for stability (especially during abduction, extension, and internal rotation), and achievement of full passive elevation was confirmed. The subscapularis was reattached through drill-holes into the native proximal humerus, followed by a routine closure using 2-0 vicryl sutures. The range of motion was retested: forward elevation was possible for 60–70°, external rotation for 45°, abduction for 60°, and internal rotation to the level of the iliac crest. Good hemostasis was achieved, and a closed-drain system was left in situ. The patient's recovery was uneventful. Postoperative radiographs showed good positioning of the implant components (Fig. 2).

Early postoperative intensive physiotherapy was started. Passive range of motion was started on the 1st postoperative day along with assisted active range of motion. The wound healed uneventfully. Upon discharge, 11 days after the surgery, the patient was able to achieve 150° flexion and 90° abduction while in the supine position and 45° in each direction, while sitting. He was able to perform internal rotation (behind back) up to the level of the L1 vertebra, assisted active abduction of 90°, and external rotation of 20°. Power tests showed power of grade 4/5 for both shoulder flexion and extension and grade 2+/5 for both abduction and adduction. The physiotherapy was continued for three months after the operation and then stopped since the patient travelled back home. Later serial assessment showed progressive improvement, until eventual discontinuation of follow up after postoperative month 6 since the patient was involved in some political activities at his home-

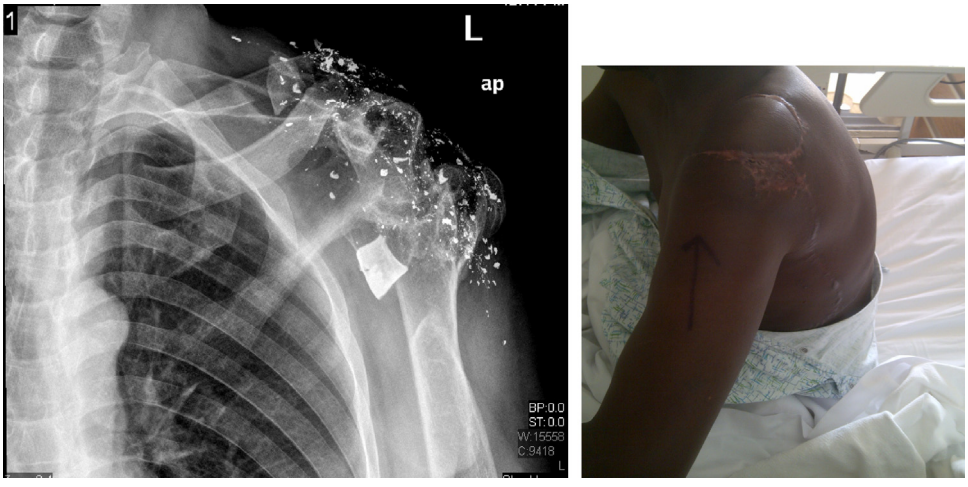

Fig. 1. Preoperative AP shoulder view demonstrating the destroyed joint components as well as the retained ammunition particles. The photograph represents the healed surgical scar of the pedicled latissimus dorsi flap.