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IDEAS AND INNOVATIONS

Hand/Peripheral Nerve

Bipolar Posterior Deltoid Transfer for Massive Rotator Cuff Tears: A Report on 2 Patients

V. Prem Kumar, FRCS

Summary: A transfer of the posterior deltoid innervated by the posterior branch of the axillary nerve and vascularized by the posterior circumflex humeral artery is described for irreparable tears of the supra- and infraspinatus muscle tendons. Functionally useful abduction and flexion were restored in 2 patients. *(Plast Reconstr Surg Glob Open 2015;3:e390; doi: 10.1097/GOX.0000000000000359; Published online 6 May 2015.)*

The posterior deltoid is defined as that segment of the deltoid posterior to a straight line drawn from the posterior lateral corner of the acromion to the deltoid insertion. In a 2005 study, it was shown that the posterior deltoid was innervated by the posterior branch of the axillary nerve in 20 cadaveric shoulders. The posterior circumflex humeral artery perfused the posterior third of the deltoid in 19 of the 20 specimens.[1] That study also alluded to the possibility of using the posterior deltoid to restore the posterior superior rotator cuff following irreparable retracted tendon tears of the supra- and infraspinatus muscles.[1] We herein report our experience with this procedure.

METHODS

A retrospective analysis was performed in 2 patients. A 64-year-old male truck driver presented with retracted irreparable tears of the supra- and infraspinatus tendons following a road traffic accident in April 2009. After failed conservative treatment, a bipolar posterior deltoid transfer was carried out on June 4, 2009. The preoperative abduction was 50 degrees, flexion 80 degrees, and external rotation 10 degrees. Internal rotation was full. At his last review on September 17, 2014, active flexion was 120 degrees and abduction 130 degrees. Internal and external rotations were unchanged. The power of abduction and flexion was grade 3/5 (Medical Research Council grading). The shoulder pain had resolved, and the patient was independent with all activities of daily living. He was, however, unable to return to driving his truck.

The second patient, a 62-year-old right-handed technician, presented with irreparable tears of the supra- and infraspinatus tendons after a fall at work on December 13, 2013. Preoperative abduction was 90 degrees and flexion 170 degrees. Internal and external rotations were full. Power of abduction and flexion was grade 3/5 (MRC grading). Nine months after surgery, all shoulder movements were restored (Fig. 1). The power had improved to grade 4/5. His shoulder pain had resolved and he had returned to his preinjury vocation.

Surgical Technique

The patient is placed in the lateral position after a general anesthesia. Once irreparability of the cuff is confirmed via an anterolateral deltoid splitting approach, a second posterior saber cut incision is made from the posterior axillary fold to the top of the shoulder. Full-thickness skin and subcutaneous flaps are raised. The posterior third of the deltoid is detached sharply off the scapula spine and acromion taking some periosteum up to the posterolateral corner of the bone (Fig. 2A). Careful splitting of the muscle fibers is carried out using a sharp scissor

From the Department of Orthopaedic Surgery, Yong Loo Lin School of Medicine, National University of Singapore, and University Orthopaedics, Hand & Reconstructive Microsurgery Cluster, National University Health System, Singapore.
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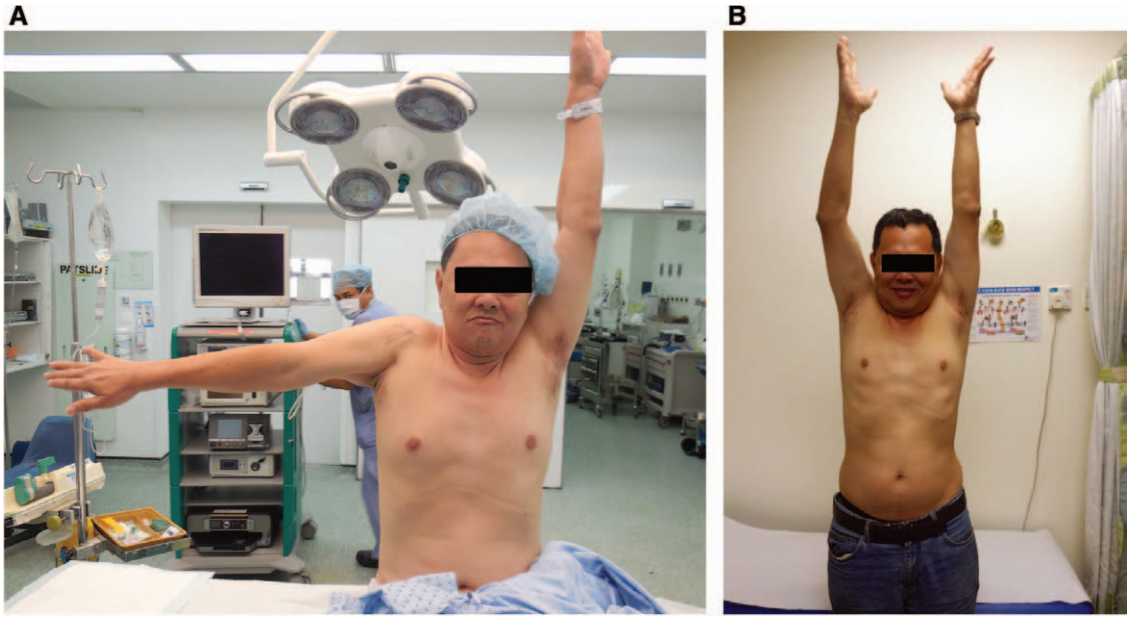

Fig. 1. Preoperative active abduction (A) and postoperative abduction 9 months after surgery (B).

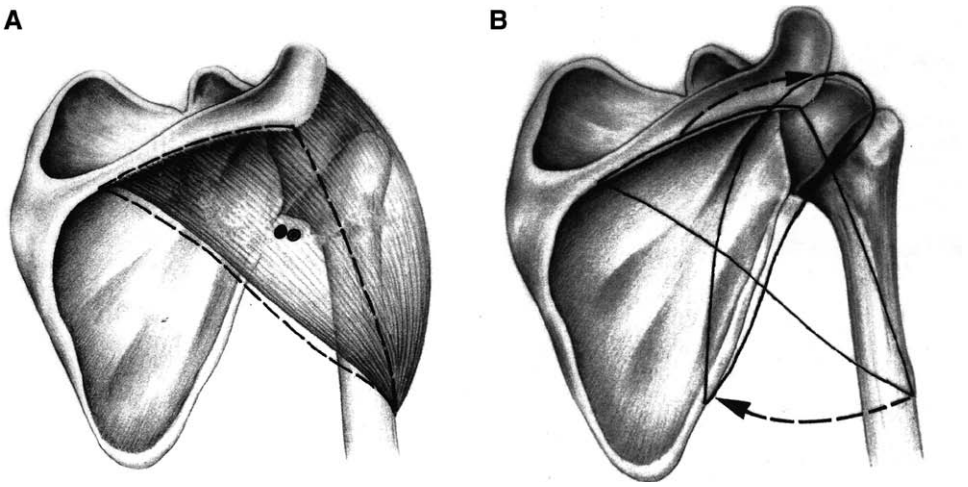

Fig. 2. A, Outline (dotted line) of the posterior deltoid before detachment from the spine of the scapula and the humerus. The 2 dots represent the posterior circumflex neurovascular pedicle. B, The origin is passed under the acromion to be secured to the greater tuberosity (top arrow). The insertion is swung medially to be secured to the scapula (bottom arrow).

starting from the posterolateral corner of the acromion to the deltoid insertion, taking care not to damage the neurovascular pedicle approximately 5 cm from the acromial edge and ending with sharp elevation of the posterior deltoid insertion off the humerus (Fig. 2A). The detached superior end of the deltoid is folded into 2 and the end secured with a no. 5 Ethibond whip stitch. The inferior insertion end of the detached muscle is swung medially and secured with no. 5 Ethibond through drill holes through the denuded inferolateral border of the scapula with the muscle under tension (Fig. 2B). The superior end is now drawn under the acromion from back to front, and the stay sutures are drawn out through the previously made anterolateral deltoid split (Fig. 2B). The proximal end of the detached posterior deltoid is now secured with the Ethibond sutures passing through drill holes in the greater tuberosity with the shoulder in 110 degrees of abduction and 90 degrees of external rotation with the muscle in maximum tension. The incisions are closed and the limb secured in a prefabricated splint with the shoulder abducted and externally rotated. Splintage is maintained for 6 weeks before abduction is reduced to 90 degrees for another 3 weeks. Shoulder mobilization and strengthening exercises are commenced after that.

DISCUSSION

Segments of the deltoid muscle have been used previously to restore functions in and around the shoulder. Apoil and Augereau[2] and others[3] have used a segment of the anterior deltoid as an inlay flap to bridge massive cuff defects. However, Glanzmann et al[4] have reported inferior functional gains with deltoid flaps in the long term.

In the author's view, the anterior and lateral segments of the deltoid play a vital role in forward and side elevation of the shoulder for activities of daily living and even most vocations. The role of the posterior deltoid is less defined and, in the view of the author, a better option for transfer.

Previous work[1] and the present report albeit in only 2 cases do show that the neurovascular supply to the posterior deltoid is reliable. Careful splitting of the posterior deltoid fibers from the lateral muscle belly ensures preservation of the innervation and circulation to the posterior deltoid. Damage is also avoided to the anterior branch of the axillary nerve. Also adequate tension needs to be maintained when proximal and distal fixation of the flap is achieved. Postoperative splintage with the shoulder abducted and externally rotated is also important.

The first patient unlike the second had inadequate tension on the flap as it was secured with the arm at the side and in neutral rotation, and postoperative splintage had inadequate abduction and external rotation. This was felt to be responsible for the less than optimal abduction, flexion, and external rotation achieved.

It is felt that this bipolar deltoid flap is easy to raise, mobilize, and transfer with little risk to its neurovascular pedicle. The latissimus dorsi flap, the now accepted tendon transfer for posterior superior massive cuff tears, is technically demanding, and although improvement in pain is consistent, the functional benefits are unpredictable.[5] Gerber et al[6] reported an increase in flexion of 19 degrees and abduction of 18 degrees in a series using the transfer.

The posterior deltoid flap functions like the latissimus dorsi both as a spacer in the subacromial space and as an active depressor of the humeral head. Unlike the latissimus dorsi and the teres major, another muscle that may be used for massive cuff tears,[7] the posterior deltoid is an abductor and external rotator of the shoulder. Its transfer is therefore synergistic.

CONCLUSIONS

The posterior deltoid may be an alternative muscle transfer for massive cuff tears. With adequate attention to the neurovascular pedicle and to maintenance of adequate tension before securing the flap, acceptable results would be possible.

V. P. Kumar
Department of Orthopaedic Surgery
National University of Singapore
University Orthopaedics
Hand & Reconstructive Microsurgery Cluster
National University Health System
NUHS Tower Block, Level 11, 1E Kent Ridge Road
Singapore 119228
E-mail: doskumar@nus.edu.sg

PATIENT CONSENT

The patient provided written consent for the use of his image.

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