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CASE REPORT
Reconstructive

Forequarter Amputation and Immediate Reconstruction with a Free Extended Humeral-Radial Forearm Flap

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Abstract: A forequarter amputation is a radical ablative surgical procedure that includes the entire upper extremity with its shoulder girdle. We present a 53-year-old woman with a solid slow growing tumor in her right shoulder of 15 x 20 cm in diameter. Resection and immediate reconstruction with a free radial forearm flap extended from the distal third of the arm to the midpalmar region, taking the humeral artery and the cephalic vein as a main peddicle. The final outcome is shown at six weeks after the surgery. *(Plast Reconstr Surg Glob Open 2015;3:e568; doi: 10.1097/GOX.0000000000000553; Published online 20 November 2015.)*

The interscapulothoracic amputation (forequarter amputation) was initially performed for the treatment of gunshot wounds by Ralph Cuming in 1808. Later, in 1836, Dixie Crosby described its use for cancer treatment.[1-2]

A forequarter amputation is a radical ablative surgical procedure that includes the entire upper extremity with its shoulder girdle. Currently, the most frequent indications are the presence of malignant tumors of the arm, axilla, shoulder, and scapula.[3,4]

There have been described many techniques for reconstruction based on the type of resection that vary from local fasciocutaneous flaps in minor resections,[3] deltoid flap,[7] local + vacuum–assisted therapy, and skin grafts[8] to more complex surgeries as a free osteomyocutaneous forearm flap with intact ulna[9] and the whole osteomyocutaneous forearm segments.[10]

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Received for publication July 28, 2015; accepted October 6, 2015.

DOI: 10.1097/GOX.0000000000000553

The free forearm flap from the amputated arm has been widely used for this purpose. Initially, it was used as salvage replantation, when a replantation was unfavorable because of a high proximal level injury, severe crushing, and avulsion injury. The use of free fillet flaps in emergency reconstructions of the upper extremities has been described as a useful technique for maximizing stump function without causing additional donor morbidity.[5,6]

No cases from extended humeral-radial artery forearm flap with fasciocutaneous extension from the middle arm to the middle hand were found.

CASE REPORT

We present a 53-year-old woman with a previous history of simple mastectomy (8 years back) secondary to a phyllodes tumor in her right breast. In this occasion, she presented with a solid slow growing tumor in her right shoulder of 15×20 cm in diameter, stretching from the scapular region to the clavicle, including the deltoid muscle area laterally and the base of the neck medially (Fig. 1). On plain shoulder x-rays, we can see total scapulohumeral articulation lysis, with total destruction of both articulations. The histopathology diagnosis was fibrosarcoma.

The key symptom was severe pain, which was managed with gabapentin, tramadol, and acetaminophen. Extremity movements were limited exclu-

Disclosure: *The authors have no financial interest to declare in relation to the content of this article. The Article Processing Charge was paid for by the authors.*

Fig. 1. Preoperative view. The 15 × 20 cm fibrosarcoma in the shoulder of the patient is shown.

sively to the hand in a partial matter because of the neuropathic pain. Elbow and shoulder articulations were immobile.

Surgical Technique

The patient was placed in a left lateral decubitus position to expose the thorax, with the upper extremity freely able to rotate. The anterior approach was used with an elliptical incision from the midsternal line to the 10th intercostal space, in the anterior lower border to the entire length of the scapula trough the midaxillary line, taking all the shoulder to the medial border of the supraclavicular triangle.

The clavicle was carefully elevated to expose the subclavian artery, vein, and brachial plexus. The subclavian artery was ligated and cut first, and then the subclavian vein. Branches of the brachial plexus were ligated and divided proximally. Next, the chest wall attachments of the pectoralis major and minor were divided.

Once the whole arm was detached form the thorax, a second surgical team made the dissection of the extended humeral-radial middle arm and forearm flap.

First, a midline incision in the back of the forearm extended to the lower third of the arm was performed to dissect the fasciocutaneous flap from the underlying muscles. The lower fasciocutaneous limit was the wrist line in the back and the midpalmar line in the front. The upper limit was the midpoint of the arm, 10 cm from the lower limit of the tumor. Once in the brachioradialis muscle, the radial artery of the forearm flap was dissected as previously described (Figs. 2 and 3).[11]

The radial pedicle was dissected and followed until the bifurcation of the common interosseous artery, and the ulnar artery was tied. We continued dissecting the humeral artery until the upper limit was reached. Once the flap was harvested, the anastomosis was made from the humeral artery (in the flap) to the internal mammary artery, 5 cm after its origin in the subclavian artery in an end-to-end fashion. The humeral vein was anastomosed end-to-side to the subclavian vein. Because there was an initial congestion of the flap, a second end-to-end vein anastomosis needed to be made from the cephalic vein from the flap to the internal thoracic vein at the level of the third intercostal space. We show the outcome after 6 weeks (Fig. 4).

DISCUSSION

The interscapulothoracic amputation is an infrequent procedure that is carried out in highly specialized centers with an incidence below 5%. It is considered a surgical alternative when other treatments fail. Current oncologic indications includes patients with locoregional neoplastic activity in the shoulder girdle who are not candidates to salvage procedures of the affected extremity; poor response to chemo-/radiotherapy or recurrence posterior to a salvage procedure of the extremity; pathologic fracture in high-grade sarcomas with poor response to

Fig. 2. The extended radial forearm flap. Intraoperative view of the components of the flap, including the humeral artery and the cephalic vein.

Fig. 3. The donor area after taking the flap. The upper and lower limits of the dissection are shown.

induction chemotherapy (neoadjuvant); palliation in ulcerated tumors with severe lymphedema, severe dysfunction of the extremity, intractable pain, bleeding, infection, or tumor fungation.[12]

In this case, the patient referred intense pain with poor response to opioid analgesics. The forequarter amputation was the only alternative to pain management and to increase the overall survival even with distant metastases. Trying to reduce the functional and aesthetic impact of the interscapulothoracic disarticulation, a few authors have described the shoulder defect reconstruction with free composite tissue transference from the elbow of the amputated extremity.[9–14] The humeral segment of the replanted shoulder is fixated to the remnant clavicle using an osteosynthesis plate, and the proximal forearm is coupled distally to the thoracic wall with a flexed elbow. In this way, the aesthetic appearance improves considerably; however, in our case, the clavicle was totally resected, so we lack an adequate anchorage to perform such reconstruction. Nevertheless, multiple reconstruction techniques with fasciocutaneous flaps based on the amputated extremity have been described, and they range from small radial flaps to large flaps depending on the remnant defect. However, we did not find any case in which the humeral artery was used all the way to the midpalmar region for covering the defect.

In conclusion, we assure that the flap based in the humeral artery can safely irrigate the fasciocutaneous tissue all the way from midpoint in the arm to the midpalmar region, making it possible to harvest larger flaps for interscapulothoracic amputation reconstruction.

Fig. 4. Outcome after 6 weeks of the surgery.

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PATIENT CONSENT

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

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