Complex Reconstruction of a Massive Shoulder and Chest Wall Defect: De-Bone Appétit Flap

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Citation: Lee GK, Mohan SV. Complex Reconstruction of a Massive Shoulder and Chest Wall Defect: De-Bone Appétit Flap. JSCR. 2010 3:1

ABSTRACT

We report the use of a fillet of upper arm pedicled flap, which has not been previously reported in the literature. The fillet of upper arm flap follows the principle of “spare parts” surgery, and can provide vascularized soft tissue coverage for defects of the shoulder and the chest wall when the upper extremity cannot otherwise be salvaged, such as in cases of radical tumor excision.

The fillet of upper arm pedicled flap was used to successfully cover a large shoulder and chest wall defect measuring 25 cm x 15 cm. This “spare parts” reconstructive technique has several advantages over the previously reported forearm free flap, including minimal need for microsurgery and the ability for expansion to cover larger defects. This case demonstrates effective use of fillet of upper arm flaps in reconstruction of large defects of the shoulder and chest wall.

INTRODUCTION

The traditional approach when dealing with a malignant tumour involving the shoulder joint or extensively infiltrating the deltoid, pectoral, or subscapular muscles is forequarter amputation of the affected upper extremity. This involves removal of the entire upper extremity and shoulder girdle scapulae. Due to the complexity of such an amputation procedure and the necessity for wide margins when resecting cancer, closure can be difficult and may require the use of skin flaps and grafts from areas like the anterolateral thigh or abdomen (1). In this case, we present a “spare parts” surgical technique to successfully close a large defect of the shoulder and chest wall using a fillet of upper arm pedicled flap.

CASE REPORT

The patient is a 55 year-old Caucasian male who presented with a slow-growing ulcerative skin lesion on the right shoulder and chest. He reported it began over 30 years ago as a small lesion on his right shoulder which slowly grew and spread to cover the majority of his shoulder and part of his chest. The patient denied any past medical history or family history of cancer. He did admit to a history of heavy smoking and alcohol consumption. He presented with a

massive lesion approximately 21 x 11 cm involving the right shoulder

Biopsy and pathological examination confirmed the lesion to be basal cell carcinoma. After tumour board consultation, surgical excision of the lesion with wide 2-cm circumferential margins was recommended. MRI and CT scans determined that deeper structures including the shoulder joint were affected, and salvage of the right upper extremity was not possible. MRI angiogram showed that the vascular system to the upper extremity was unaffected. The patient was to undergo a forequarter amputation. However, because of the anticipated extent of tumour resection, traditional skin flaps offered in a standard forequarter amputation would not be available. Therefore a modification of the standard forequarter amputation was performed and incorporated the concept of “spare parts surgery” to create a fillet of upper arm pedicled flap to use for coverage instead. Rather than discarding the entire upper extremity in a traditional amputation, the existing unaffected vasculature and tissue of the patient’s upper arm were de-boned and created into a flap. This fillet of upper arm flap would provide ample tissue to cover the large defect formed by tumour resection.

We utilised a posterior, longitudinal incision down the length of the upper arm, with careful preservation of the subclavian, axillary, and brachial vascular pedicle. Dissection can be carried posteriorly through either the lateral intermuscular septum, or between the heads of the triceps muscle. After reaching the humerus, dissection progresses through a sub-periosteal plane in order to “de-bone” the flap. Once the humerus is removed, the flap can then be transposed with its intact vascular pedicle and tailored accordingly to fit the corresponding defect. A very large flap can be obtained in this manner, and if needed, can be continued down the entire length of the upper extremity to include the forearm and hand if more tissue is needed.

DISCUSSION

While the concept of pedicled myocutaneous flaps in reconstructive surgery is not new, in our review of the literature, the technique presented in this case has not yet been reported. In reconstructing chest wall defects, whether due to trauma or excision of cancer, the idea of “spare parts” surgery incorporates tissue from the arm to cover the defect created by amputation. This has previously been performed by making use of a free forearm flap (2,3,4,5). In all the reported cases using this approach, the patient’s forearm was de-boned and used to create a free flap which could be used to cover the defect produced by the initial amputation. The clear benefit of this technique is that it allows immediate wound coverage and preservation of functional amputation stump length, without the morbidity of an additional donor site. We present another solution involving a fillet of upper arm flap to cover such defects of the shoulder and chest wall.

Important initial considerations for a successful fillet of upper arm pedicled flap include healthy donor site soft tissue and blood supply. If cancer spreads to the upper arm or trauma disrupts the normal structure, this tissue will be unsuitable and not be available for flap creation.

Additionally, MRI angiogram of the brachial artery and vein is necessary to make sure the vasculature is unaffected. These criteria are essential in determining if a patient is a suitable candidate for a fillet of upper arm pedicled flap.

There are multiple additional advantages to the fillet of upper arm pedicled flap. Since the vasculature remains intact, this eliminates the need for microsurgery to reconnect blood vessels. Therefore when creating a fillet flap in this manner, an incision is made opposite the blood supply to ensure that the vascular pedicle is in the centre of the flap. This is the reason why a posterior incision was made opposite the brachial artery. The brachial artery used in this procedure provides a robust blood flow, and since the flap is pedicled, this eliminates ischaemia time and re-perfusion injury which can occur when the vasculature is disconnected as in free flaps. The process of de-boning a fillet flap is a relatively easy dissection when performed sub-periosteally. Once de-boned, the flap has a large axis of rotation around the brachial artery, allowing it to cover defects in various regions around the shoulder. In addition, this approach can be expanded to include the forearm and hand as well; salvaging large amounts of tissue and allowing for the coverage of even larger chest wall defects.

REFERENCES

1. Kuhn JA, Wagaman LD, Lorant JA, et al. Radical forequarter amputation with hemithoracectomy and free extended forearm flap: Technical and physiologic considerations. Annals of Surgical Oncology. 1994;1:353-359
2. Erdmann D, Sundin BM, Yasui K, et al. Microsurgical free flap transfer to amputation sites: indications and results. Annals of Plastic Surgery. 2002;48(2):167-172
3. Cordeiro PG, Cohen S, Burt M, et al. The total volar forearm musculocutaneous free flap for reconstruction of extended forequarter amputations. Annals of Plastic Surgery. 1998;40:388-396
4. Cavadas PC. The free forearm fillet flap in traumatic arm amputation. Plastic Reconstructive Surgery. 1996;98(6):1119-1120
5. Baek RM, Eun SC, Heo CY, et al. Amputation stump salvage using a free forearm flap from the amputated part. Journal of Plastic and Reconstructive Aesthetic Surgery. 2009;62(10):398-400