Axillary Reconstruction with a Posterior Circumflex Humeral Artery Perforator Flap as a Salvage Surgery for Axillary Invasion of Advanced Breast Cancer

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**Summary:** A case of advanced breast carcinoma with large skin invasion that extended from the breast to the axilla and which was reconstructed with a meshed split skin graft for the chest defect and a posterior circumflex humeral artery perforator flap for the axillary area was described. When skin invasion of the breast cancer extends to the axillary area, reconstruction methods of the defect are probably complicated. The purpose of reconstruction is not only to close defects, but also to protect important tissues, such as axillary vessels and the brachial plexus. Moreover, thinner flaps are preferred to prevent a bulky contour. Many reconstruction methods can be used; however, if total mastectomy causes a large tissue defect from the breast to the axilla involving the subscapular artery, and only limited reconstruction is possible, a posterior circumflex humeral artery perforator flap can be an option to reconstruct the axilla. (Plast Reconstr Surg Glob Open 2018;6:e1920; doi: 10.1097/GOX.0000000000001920; Published online 14 September 2018.)

**CASE REPORT**

A 61-year-old woman presented with a right advanced breast carcinoma measuring 22 cm × 20 cm in maximum dimensions with skin invasion that extended from the breast to the axilla. The patient had pathological stage IIIB (T4b-N1M0; estrogen receptor–positive and human epidermal growth factor receptor 2-negative). Total mastectomy and axillary lymph node dissection resulted in a 25 cm × 29 cm skin defect. Since the defect was extremely large, a meshed split skin graft from bilateral thighs on the chest and flap reconstruction in the axillary region were planned. The subscapular artery was involved in the tumor and resected together with it; therefore, flaps vascularized from its branches, such as a thoracodorsal artery perforator (TAP) flap, could not be used. Thus, a 14 cm × 25 cm transposition flap, which was including fascia, was done from the caudal side of the axillary defect. However, the distal aspect of the flap was congestive on the second operative day because the flap was folded for many hours by closing the upper limb, and it became partially necrotic. Therefore, 5 days later, the necrotic area of the flap was resected, and as a result, a 7 cm × 10 cm defect was occurred. Thus, we planned reoperation with a PCHAP flap. An 8 cm × 12 cm flap was

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designed at the shoulder (Fig. 1). The incision was started at the lateral side of the flap and continued down through the fascia over the deltoid muscle. The flap was elevated including a posterior circumflex humeral artery and transferred to the axilla through a quadrangular space without any tension (Fig. 2). The donor site was closed primarily as much as possible, and the remaining defect was closed with a skin graft from the dog-ear that was made by primary closure. The wounds healed uneventfully. Ten months after the operation, the patient was continuing on hormone therapy, and she could abduct the shoulder (Fig. 3).

DISCUSSION

Many reconstruction methods for the axilla have been previously reported, but most of them were related to releasing scar contracture or covering defects after resection of axillary hidradenitis suppurativa or malignant tumors in the axilla. In these cases, the defects were limited to the axilla, so various reconstructive methods were available from surrounding tissues. For instance, the pectoralis major perforator flap was reported by Kosutic,4 and the TAP flap,5 scapular flap, and latissimus dorsi flap were often used. The TAP flap provides a natural contour with reliable vascularization and a long pedicle, without muscle sacrifice, and it could thus be the first choice for axillary reconstruction.

On the other hand, if axillary reconstruction is necessary due to mastectomy, the range of the defect usually involves the breast area. Hence, the pectoralis major perforator flap cannot be used. Furthermore, in the current case, the subscapular artery was resected with the breast cancer; therefore, all the flaps vascularized from its branches, such as the TAP flap, latissimus dorsi flap, and scapular flap, could not be used. Under these conditions, free flaps were available as an alternative,6 but appropriate recipient vessels were not found.

Therefore, we should look at different ways of reconstruction. A PCHAP flap, sometimes called a “deltoid flap,” was reported as a free flap for penile,7 plantar, palmar,8 oral, and maxillofacial reconstruction9 because of its thinness and reliable vascularization. Moreover, Halmy et al.10 reported axillary reconstruction by a PCHAP flap in Hungarian as a pedicle flap. It was used for releasing scar contracture. The name “deltoid flap” causes some confusion because it often means a deltoid muscle flap to treat a rotator cuff tear in orthopedic surgery. Hence, it is more correct that the flap should be called a PCHAP flap. Since it can be harvested from the posterior side of the shoulder, even if a large defect involving the subscapular artery was left following mastectomy, the PCHAP flap can still be used. It can be transferred to the axilla through a quadrangular space, and the thinness of the flap provides a natural contour and lets the arm close easily. Moreover, its reliable vascularization prevents flap necrosis when it is folded by closing the upper arm. The limitation is that a skin graft is sometimes needed at the donor site, and it is slightly complicated to transfer the flap to the axilla through a quadrangular space.
In conclusion, axillary reconstruction after mastectomy for advanced breast cancers was discussed through presentation of a case and consideration of the previous literature. Many reconstruction methods can be used for such cases, but if reconstruction is limited due to large tissue resection, the PCHAP flap can be an option to reconstruct the axilla.

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REFERENCES
1. Schmauss D, Machens HG, Harder Y. Breast reconstruction after mastectomy. Front Surg. 2015;2:71.
2. Bertozzi N, Pesce M, Santi P, et al. One-stage immediate breast reconstruction: a concise review. Biomed Res Int. 2017;2017:6486859.
3. Smith ML, Lee JC. Bilobed flap for axillary reconstruction. Plast Reconstr Surg. 2009;124:179e–180.e
4. Kosutic D. Use of pectoralis major perforators for local “free-style” perforator flap in axillary reconstruction: a case report. Microsurgery. 2010;30:159–162.
5. Busnardo FF, Coltro PS, Olivan MV, et al. The thoracodorsal artery perforator flap in the treatment of axillary hidradenitis suppurativa: effect on preservation of arm abduction. Plast Reconstr Surg. 2011;128:949–953.
6. Miyamoto S, Fujiki M, Kawai A, et al. Anterolateral thigh flap for axillary reconstruction after sarcoma resection. Microsurgery. 2016;36:378–383.
7. Harashina T, Inoue T, Tanaka I, et al. Reconstruction of penis with free deltoide flap. Br J Plast Surg. 1990;43:217–222.
8. Russell RC, Guy RJ, Zook EG, et al. Extremity reconstruction using the free deltoide flap. Plast Reconstr Surg. 1985;76:586–595.
9. Meltem A, Metin G, Zeynep A, et al. The free deltoid flap: clinical applications to upper extremity, lower extremity, and maxillary defects. Microsurgery. 2007;27:420–424.
10. Halmy C, Szetei K, Nádai Z, et al. [Posterior circumflex humeral artery perforator flap (PCHAP flap) in axillary scar release]. Orv Hetil. 2009;150:605–606.