Case Report

J Trauma Inj 2023;36(4):425-430
https://doi.org/10.20408/jti.2023.0024

Journal of Trauma and Injury JTI

pISSN 2799-4317 • eISSN 2287-1683

Free tissue transfer for reconstruction of axillary defects: two case reports

Asha Deepthi Bathini, MCh[1], Parvathi Ravula, MCh[1], Srinivas Jammula, MCh[2], Srikanth Rangachari, MCh[1], Priyanka Pereira, MS[1]

[1]Department of Plastic and Reconstructive Surgery, Nizam's Institute of Medical Sciences, Hyderabad, India
[2]Department of Plastic and Reconstructive Surgery, Yashoda Hospitals, Hyderabad, India

Received: April 13, 2023
Accepted: May 19, 2023

Correspondence to
Priyanka Pereira, MS
Department of Plastic and Reconstructive Surgery, Nizam's Institute of Medical Sciences, Punjagutta Rd, Punjagutta Market, Punjagutta, Hyderabad 500082, India
Tel: +91-70-1369-9352
Email: priyankapereira89@gmail.com

Axillary defects need pliable, vascular tissue to cover the critical structures traversing the axilla and to allow near-normal range of motion in the shoulder. Although local flaps are the first choice, free tissue transfer is a good option when local tissues are injured or scarred. Herein, we report two cases of axillary defects that were reconstructed using anterolateral thigh free flaps. One was a post–electric burn axillary defect for which a thoracoacromial pedicle was used as the recipient, and the other was a posttraumatic axillary defect with the transverse cervical vessels as the recipient. In both patients, the flap survived well with no complications and resulted in adequate functional recovery. In large defects of the axilla with a scarcity of local tissues, free flaps can yield optimal results. The proper selection of recipient vessels and a donor flap with adequate pedicle length impact the outcomes of such reconstruction.

Keywords: Axilla; Free tissue flaps; Case reports

INTRODUCTION

Axillary defects can result from trauma, burns, infections, or tumor excision. Local flaps are the primary method of choice for reconstruction, and the optimal donor areas are the contiguous chest wall or the arm [1,2]. The design of the flaps can be pedicled or propeller-type, and primary closure of the donor site is usually performed. The use of free tissue transfer is uncommon in the literature [3]. Using flaps enables optimal return of function and, in cases of neuromuscular unit loss, allows second-stage reconstruction. For moderate or large defects, the availability of local tissues may not be adequate, which sets the stage for using free skin flaps. Because the axilla is the junction between the limb and the shoulder, recipient pedicles can be accessed from either region. One case report described an axillary reconstruction using a composite free flap following tumor excision, where the subclavian vessels were used in an end-to-side anastomosis [4]. Scarring or previous injury to the vessels forces a search for recipient vessels farther away from the axillary defect [5].

This is a report of two axillary reconstructions using free thigh flaps, with special emphasis on the choice of the recipient vessel.

CASE REPORTS

Case 1

A 17-year-old male patient sustained electrical burns on approxi-

mately 15% of the body surface area while working on a transformer. The burns were on the right arm, axilla, right side of the chest, and supraclavicular region. He initially underwent split-skin grafting and right trapezius musculocutaneous flap coverage for an exposed right scapula at another hospital. He presented 10 months later with a contracture of the right axilla. Clinically, the patient had postburn scarring over the right side of the anterior chest wall, the right infraclavicular region, and the posterior aspect of the right arm, with a grade 3 axillary contracture (Fig. 1). The patient had a right infraclavicular brachial plexus injury. He had passive restriction of right shoulder abduction to only 30° with Medical Research Council (MRC; scale of 0 to 5) grade 3 power. Elbow flexion and extension, wrist extension, and finger extension were absent. He had MRC grade 2 wrist and finger flexion.

Excisional release of the right axillary contracture was planned. Neurolysis of the posterior cord and the median and ulnar nerves was done. The thoracoacromial pedicle and cephalic vein were prepared for anastomosis. The defect of the right axilla measured 12×14 cm and was resurfaced with an anterolateral thigh (ALT) flap harvested from the right thigh, based on the musculocutaneous perforator from the descending branch of the lateral circumflex femoral artery. End-to-end microanastomosis was performed with the pectoral branch of the thoracoacromial artery and a single venous anastomosis of the flap *vena comitans* to the cephalic vein (Fig. 2).

Postoperatively, the ALT free flap settled well, with no complications. The patient's range of shoulder abduction improved to 90°. After 4 months of follow-up there was an improvement in elbow extension measuring grade 3 (Fig. 3). The restoration of elbow flexion and an augmentation of hand function with tendon transfers was planned for a second stage.

Case 2

A 22-year-old male patient with a history of blunt trauma to the

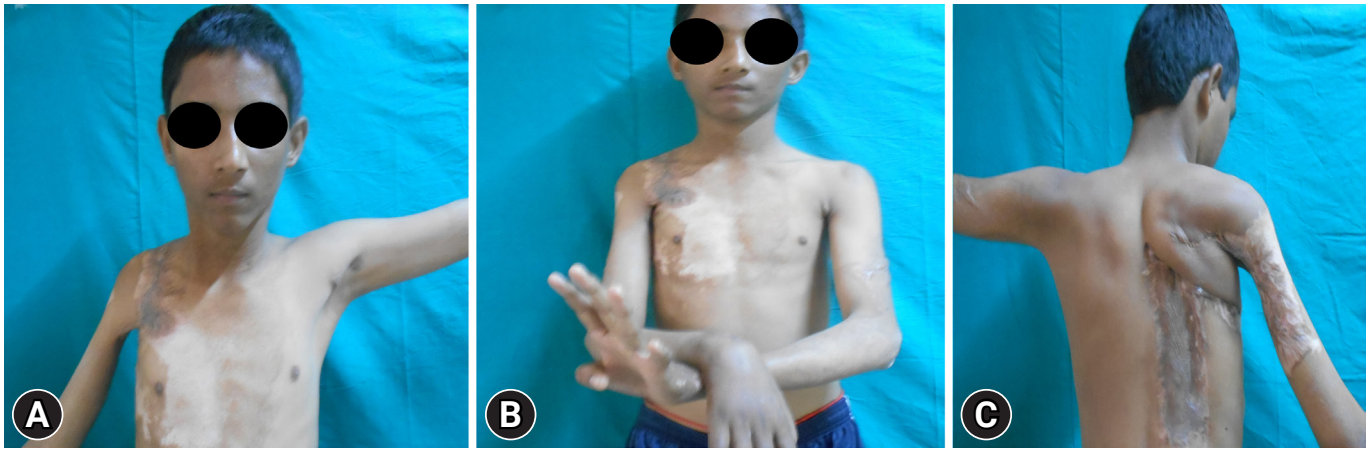

Fig. 1. Preoperative views of patient 1 showing (A) right axillary contracture due to scarring, (B) inadequate abduction, and (C) a previous trapezius myocutaneous flap and skin graft over the posteromedial arm. The results of a posterior cord and musculocutaneous nerve injury can also be seen. The patient provided informed consent for the publication of the images.

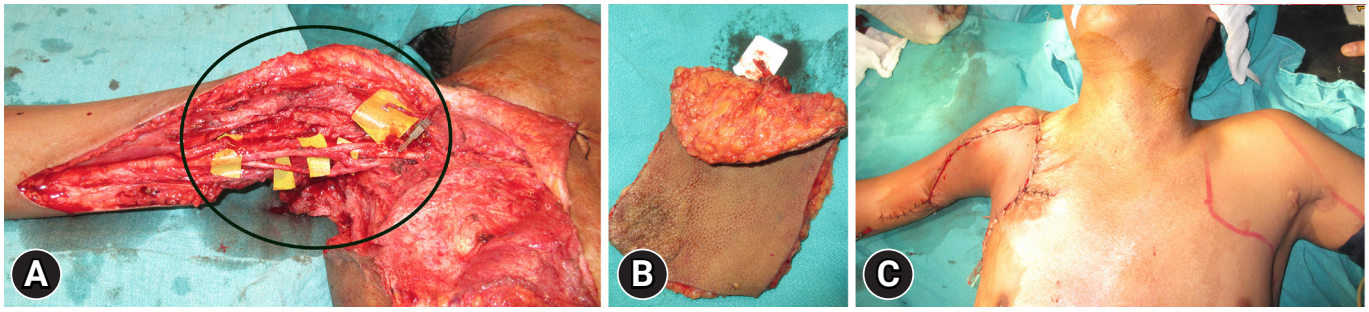

Fig. 2. Surgical images of patient 1. (A) Release of scar to permit adequate shoulder abduction, exposure of the thoracoacromial vessels and neurolysis of the cords of the brachial plexus. (B) Harvested anterolateral thigh anterolateral thigh flap. (C) Complete flap inset.

https://doi.org/10.20408/jti.2023.0024

chest from the fall of a heavy object, sustained a degloving injury of the left axilla and a left proximal one-third humerus fracture with vascular injury (brachial artery thrombosis). There were multiple rib fractures and tension pneumothorax for which intercostal drainage had been done. Exploration and brachial artery thrombectomy, interposition vein graft bypass, exploratory thoracotomy, repair of lung laceration, and left humerus plating were done at another hospital.

The patient presented 15 days after the trauma with a 15×20-cm left axillary defect extending from the anterior axillary fold to the posterior axillary fold that was covered with granulations. Surgical incisions were present over the medial aspect of the arm (Fig. 4). Wound excision and free flap coverage were planned. A transverse cervical pedicle and the external jugular vein were exposed and prepared for anastomosis using an incision above and parallel to the clavicle. An 18×30-cm tensor fascia lata flap was harvested from the right thigh based on a perforator from the ascending branch of the lateral circumflex femoral artery. End-to-end microanastomoses were done with one arterial and two venous anastomoses (transverse cervical vein and external jugular vein). A split-skin graft was applied over the neck incision to prevent compression over the pedicle (Fig. 5). The postoperative flap healed uneventfully, and 3 months later the patient underwent flap thinning (Fig. 6).

Ethics statement

Written informed consents for the publication of research details

Fig. 3. Images of patient 1 at 4-month follow-up. (A–C) adequate shoulder abduction is shown. Further tendon transfers are planned to improve wrist extension.

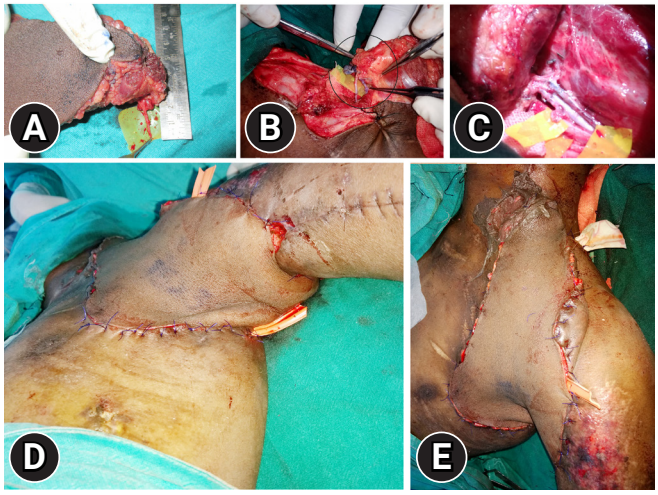

Fig. 5. Surgical images of patient 2. (A) Harvested tensor fascia lata flap. (B, C) Views of completed anastomosis to the transverse cervical vessels in the neck. (D) Completed flap anastomosis with split-skin graft over pedicle. (E) View from the axilla side of the flap inset.

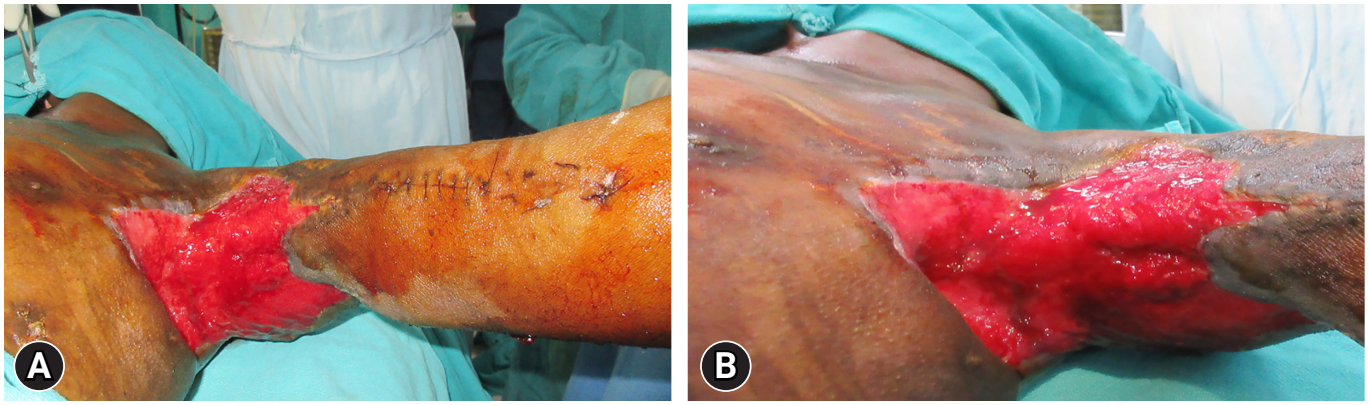

Fig. 4. Preoperative images of patient 2. (A, B) Preoperative defect with granulating wounds in the axilla, medial chest wall, and one-third circumference of the proximal arm.

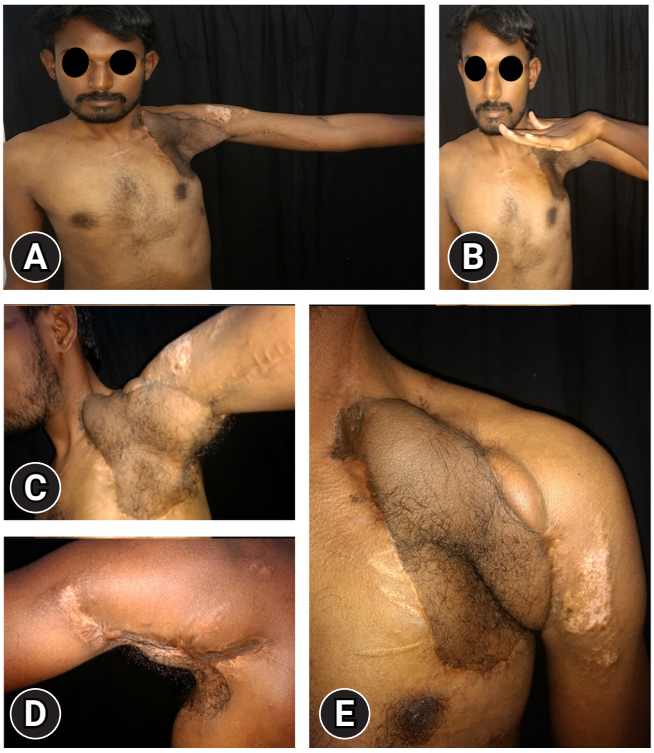

Fig. 6. Follow-up images of patient 2. Follow-up images of patient 2. (A, B) Adequate shoulder abduction is shown. (C) Complete flap healing. (D) Flap after first flap thinning. (E) The patient is awaiting a second session of flap liposuction. The patient provided informed consent for the publication of the images.

and clinical images were obtained from both patients. The images do not reveal the identity of the patients.

DISCUSSION

The pedicled parascapular flap and the latissimus dorsi myocutaneous flap are most widely used for axillary reconstruction [6]. These, and the lateral thoracic perforator flap [1], are based on known, reliable perforators; replace like with like; and provide adequate tissue for coverage of even larger defects if needed by split-skin grafting the donor site.

Tissue expansion and the subsequent use of regional pedicled flaps provide large pliable flaps, with the added advantage of primary closure of the donor defect. Kulahci et al. [7] studied the use of preexpanded pedicled thoracodorsal artery perforator flaps for the reconstruction of postburn axillary contractures in six patients. Tissue expansion is well suited for conditions such as burn contracture in which there are no wounds to manage. In a meta-analysis of reconstructive procedures for the excision of hidradenitis suppurativa (by far the most common indication in the literature), the authors recommended the use of free flaps for defects larger than 200 cm^2 [8]. The use of free flaps is infrequent, given the wide choice of regional pedicled flaps available. However, in patients with extensive trauma or burns, where the regional flaps are not available or have already been used, free flaps are an obvious choice in axillary reconstruction.

In the first case of this report, the patient underwent a trapezius musculocutaneous flap for axillary coverage at another hospital for two probable reasons: nonavailability of flaps closer to the wound and not having considered the possibility of a free flap. The decision to use free flaps for axillary defects leads to the question of which recipient vessels to choose for anastomosis. The choice of recipient vessels depends on their proximity to the defect, the zone of injury, and the available pedicle length. An end-to-end anastomosis implies the use of a thoracodorsal pedicle, thoracoacromial pedicle, transverse cervical vessels, circumflex humeral vessels, lateral thoracic vessels, and the internal mammary vessels. Availability of any one of the above can avoid a difficult end-to-side anastomosis to the axillary artery in the depth of the wound.

Miyamoto et al. [9] reported the use of ALT free flaps for axillary reconstruction after sarcoma resection in six patients. Five of the six patients had multiple previous operations for tumor resection and reconstruction. Three of the six had previous ipsilateral latissimus dorsi myocutaneous flap coverage. Three were ALT flaps and, in three of the six patients, the vastus lateralis muscle was harvested along with the ALT flap to cover the extensive defect. Their choice of recipient vessels was the thoracoacromial artery in two cases, the thoracodorsal artery in two cases, the circumflex scapular artery in one patient, the subscapular artery in one patient, and the transverse cervical artery in one patient. The previous use of the latissimus dorsi flap would have precluded the use of its primary pedicle as a recipient.

Bali et al. [10] studied the feasibility of using the ALT free flap for reconstruction of burn contractures in various sites. Fifteen ALT free flaps were used at various anatomical sites, two of which were used for reconstruction of axillary contractures. The recipient vessels were a thoracodorsal artery and vein in one case and a thoracodorsal artery and serratus vein in the other case.

Chen et al. [3] retrospectively studied a series of 10 patients in whom ALT free flaps were used for reconstruction of postburn axillary contractures. The most used recipient vessels were the thoracodorsal artery and the concomitant vein. They reported satisfactory functional outcomes in all cases, with no donor site morbidity.

https://doi.org/10.20408/jti.2023.0024

The first patient in our report had postburn contracture of the right axilla with infraclavicular plexus injury. Exploration of the brachial plexus and procedures for a plexus injury, such as neurolysis or nerve transfer, can be done only when stable skin coverage is in place. This led to the decision to use an ALT free flap to reconstruct the defect. Since the circumflex scapular region and thoracodorsal vessels were scarred, the thoracoacromial artery and cephalic vein were used as recipient vessels for microanastomosis. This was facilitated by cutting the pectoralis major (scarred and not functional) and the pectoralis minor.

Thoracoacromial vessels are usually used as alternative recipient vessels in head and neck microvascular tissue transfers where the usual recipient vessels are not available [11]. A cadaveric anatomical and sonographic study by Kompatscher et al. [12] described the ease of access to the thoracoacromial vessels and their pectoral branches for anastomosis. It is equally feasible to use the neck as a vessel source for a defect outside the neck, as described in the second case in this report.

The second patient had a large posttraumatic defect of the left axilla with trauma to the chest and left upper limb with brachial artery thrombosis. A tensor fascia lata musculocutaneous flap was harvested, as the perforator for the ALT flap could not be found on dissection. No attempt was made to expose the thoracoacromial vessel since it was in the zone of trauma. Scarring in the infraclavicular region precluded end-to-side anastomosis to the axillary or subclavian vessels. In addition, the patient had a previous vascular repair of the axillary-brachial artery. The choice of recipient vessels, in this case, was the transverse cervical pedicle and the external jugular vein, considering that the other more approachable vessels were in the zone of trauma and fibrosis.

Ogawa et al. [5] reported the use of three free flaps for necrotizing defects in the axilla and specified seeking recipient vessels far removed from the area of the defect. The thoracoacromial vessel was the first choice, and in that series, neck vessels such as the superior thyroid were the second choice. They endorsed using flaps with long pedicles to enable reach and adequate coverage of the defect.

In conclusion, When a free flap is used for axillary defect coverage, it is important to be aware of the selection of recipient vessels in the chest or the neck and select a donor flap with adequate pedicle length.

ARTICLE INFORMATION

Author contributions

Conceptualization: PR, SJ; Data curation: SR, PP; Formal analysis: ADB, PP; Interpretation: ADB, PP; Writing–original draft: ADB, PR, SR; Writing–review & editing: all authors. All authors read and approved the final manuscript.

Conflicts of interest

The authors have no conflicts of interest to declare.

Funding

The authors received no financial support for this study.

Data availability

Data sharing is not applicable as no new data were created or analyzed in this study.

REFERENCES

1. Mello DF, Helene Junior AM. Lateral thoracic fasciocutaneous flap for reconstruction of axillary defects after resection of hidradenitis suppurativa: a series of 10 cases. Rev Bras Cir Plast 2023;31:186–91.
2. Sirvan SS, Demir IA, Irmak F, et al. Posterior arm perforator flap for axillary reconstruction after hidradenitis suppurativa excision. Plast Surg (Oakv) 2019;27:204–10.
3. Chen HC, Wu KP, Yen CI, et al. Anterolateral thigh flap for reconstruction in postburn axillary contractures. Ann Plast Surg 2017;79:139–44.
4. Agarwal A, Pandey N, Mishra A, Mahendru V. Composite reconstruction of arm, axilla and lateral chest wall defect following resection of extensive marjolin neoplasm with an antero-lateral thigh chimeric free flap: case report and review of literature. Int J Surg Open 2020;27:208–13.
5. Ogawa H, Nakayama H, Nakayama S, Tahara S. Reconstruction of axillary defect due to necrotizing fasciitis and debridement using a free-flap transfer: a report of three cases. J Reconstr Microsurg Open 2021;6:e63–9.
6. Nesmith RB, Merkel KL, Mast BA. Radical surgical resection combined with lymphadenectomy-directed antimicrobial therapy yielding cure of severe axillary hidradenitis. Ann Plast Surg 2013;70:538–41.
7. Kulahci Y, Sever C, Uygur F, Oksuz S, Sahin C, Duman H. Pre-expanded pedicled thoracodorsal artery perforator flap for postburn axillary contracture reconstruction. Microsurgery 2011;31:26–31.
8. Sanz Aranda E, Yuste Bevanvente V, Reola Ramirez E, Perales Enguita A, Marti Ayats JM, Sobrino Casorran A. Axillary reconstruction: proposal of a therapeutic algorithm based on

systematic review of the literature. Eur J Plast Surg 2023;46:9–14.
9. Miyamoto S, Fujiki M, Kawai A, Chuman H, Sakuraba M. Anterolateral thigh flap for axillary reconstruction after sarcoma resection. Microsurgery 2016;36:378–83.
10. Bali ZU, Ozkan B, Kececi Y, Ertas N, Yoleri L. Reconstruction of burn contractures with free anterolateral thigh flap in various anatomic sites. Ulus Travma Acil Cerrahi Derg 2021;27:337–43.
11. Aycock JK, Stenson KM, Gottlieb LJ. The thoracoacromial trunk: alternative recipient vessels in reoperative head and neck reconstructive microsurgery. Plast Reconstr Surg 2008;121:88–94.
12. Kompatscher P, Manestar M, Schuster A, Lang A, Beer GM. The thoracoacromial vessels as recipient vessels in microsurgery and supermicrosurgery: an anatomical and sonographic study. Plast Reconstr Surg 2005;115:77–83.

https://doi.org/10.20408/jti.2023.0024