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Neck burn reconstruction with pre-expanded scapular free flaps

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ABSTRACT

Background: The reconstruction of neck contracture deformities after severe burns is challenging. This is due to insufficient tissue to resurface the large defect after local flap transfer as well as the poor functional and cosmetic results after traditional methods such as skin grafting. We employed free transfer of pre-expanded scapular flaps to reconstruct postburn neck deformities.

Methods: In the first stage, skin expansion was performed with tissue expanders ranging from 400 to 800 mL according to the neck defect size and expanders were filled to their end volumes. In the second stage, the contracture in the neck was released and the unstable scar was resected. The pre-expanded scapular flap was then harvested and transferred to the neck defect. Flap revisions were performed 3–12 months after flap transfer.

Results: A total of 12 flaps (100%) were successful. The contour, colour, and texture of flaps matched well to the nearby skin. The range of motion of the neck was significantly improved. The donor defects were closed directly except for one case, which required skin grafting.

Conclusions: The free tissue transfer of pre-expanded scapular flap is a valuable tool in neck burn reconstruction. It can be used safely and effectively with minimal morbidity in selected patients.

1. Introduction

Postburn neck scar contracture is a major sequela of burn that presents a pressing challenge for plastic surgeons. The contracture causes not only cosmetic but also functional problems. The goals of treatment for neck contractures are to release the contractures thoroughly; to regain the natural profile, contour, and colour match; and to restore the normal mobility. Although skin grafting is a commonly used

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treatment, its major disadvantages are hyperpigmentation and contracture. Local flaps such as the deltopectoral flap [1] and transverse cervical artery perforator flap [2] can be advanced into burn defects. These local flaps are able to obtain contour and colour match with the nearby tissue. However, it can cause a large unaesthetic donor defect that many patients, especially females, are reluctant to accept.

Free scapular fasciocutaneous flaps can be used to resurface defects in the neck [3]. However, the bulkiness and size limitation of the flaps hinder their further application. Several second-stage debulking procedures are usually needed to obtain a better appearance. Furthermore, the usage of a skin graft at the donor site is usually unavoidable. The use of pre-expanded scapular free flaps is a viable option to improve the final aesthetic appearance and functional result and to reduce donor-site morbidity. In this article, we present a series of 12 patients who underwent neck reconstruction with pre-expanded scapular free flaps. The indications, methods, and outcomes for these cases are provided, and the advantages and drawbacks of this technique are discussed.

2. Patients and method

The authors retrospectively reviewed 12 pre-expanded free scapular flaps for neck burn reconstruction. Patient profiles and operative procedures were reviewed.

The age and defect size were recorded for each case. The assessments of outcomes with at least 1-year follow-up included flap failures, infections, partial necrosis, donor-site complications, and the need for future revisions.

3. Surgical technique

3.1. *First operation*

The selection of expander volume is based on the size of the defect. The neck defect size was evaluated by comparing the contracted side with the normal side of the neck or with the normal neck of a person with a similar body type. A major portion of the skin expansion was performed with elliptical tissue expanders with volume ranging between 600 and 800 mL with the exception of one 400-mL expander for a 9-year-old patient who had a small back. With the patient in the lateral decubitus position, a longitudinal incision (6–10 cm) was made at the midaxillary line. The expander was inserted below the deep fascia and above the tunica muscularis. Great attention was paid when a dissection was made at the superior border of the teres major in order to prevent possible injury of the circumflex scapular artery. After good wound healing (14–21 days), expanders were filled twice a week until the targeted volumes were achieved. Annuliform pressure bandages were used (encircling entire body) at the inferior border of the expander to prevent gravitation-induced descent during expansion.

3.2. *Second operation*

The patient was initially placed supine with the neck and shoulder hyperextended. Thorough release of the contracture was achieved by incising scar tissues in the subcutaneous, platysmal, and subplatysmal layers according to the depth of scarring. The shape of the incision along the neck should be perpendicular and curvilinear to avoid future contracture. The size and shape of the defect were evaluated and measured.

For flap elevation, patients were placed in the lateral decubitus position with the ipsilateral arm free. Using the template of the neck wound made after release, marking in the expanded region was carried out based on the size and shape of the defect and on the location of the recipient blood vessels. The expander was then removed and the flap was elevated from the distal to the proximal end. After effective hemostasis and insertion of the drain tube, the donor site was closed directly in most patients after suitable undermining except one case, which needed a skin graft. In this case, the defect was 24 cm × 16 cm and it could not be closed directly. Microsurgical vessel anastomosis was performed in an end-to-end fashion, between the circumflex scapular artery and the facial artery and between the circumflex scapular vein and the facial vein. Gradient debulking in the distal portion of the flaps was performed in two-thirds of the flaps to diminish the thickness of the flaps. Usually, only 3–5 mm of subcutaneous tissue in the distal portion of the flaps was preserved. The flaps were then positioned and inset between the edges of the skin in the remaining defect. The average operative time was about 6.5 h.

Three weeks after the operation, pressure bandages were initiated for 1 year to restrict incisional scars and to keep the neck contour.

3.3. *Third operation*

The third stage was performed 3–12 months after the second stage. Debulking was performed if the flap was still bulky and Z-plasty was carried out if scar contracture occurred.

4. Case reports

4.1. *Case 1*

A 14-year-old boy sustained a burn extending to the deep dermis at the age of 8 years involving the juncture of his neck and upper chest. He was presented to our clinic with a neck contracture extending around the clavicular region that caused a decrease in the cervicomental angle and functional limitation of neck movements (Fig. 1). In the first stage of the reconstruction, an 800-mL elliptical tissue expander was inserted through a 7-cm horizontal incision on the left side. A serial expansion on a twice-weekly basis was performed for 8 weeks. In the second stage of the reconstruction, the contracture in the neck was released and resected in a full-thickness excision. With the neck in full extension, the size of the defect was determined to be 27 cm × 14 cm. By means of a template, a free scapular flap (29 cm × 16 cm) was outlined on the pre-expanded skin at the donor site (Fig. 2). The expander was then removed and the pre-expanded scapular flap was harvested. After microsurgical vessel anastomosis, the flap was positioned and inset between the edges of the wound. The flap donor site was closed directly. The early postoperative