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Strategies for customized neck reconstruction based on the pre-expanded superficial cervical artery flap

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Summary *Background:* It is still highly challenging to restore the esthetic neck contour for postburn deformities. In many patients with burns, the back skin remains intact, which is a useful donor site for extensive contracture release. As the main technique, the refinement of the pre-expanded superficial cervical artery (SCA) flaps may improve its application in diverse neck contractures.
Methods: This study reviewed the cases of three types of neck contractures that were reconstructed with pre-expanded SCA flaps: (1) for unilateral neck contractures, the flaps were harvested as pedicled perforator flaps including a small amount of muscle; (2) for lateral and anterior neck contractures, vascular augmentation with circumflex scapular vessels was used to increase the flap size; (3) for contractures of the entire neck, maximal flap release with pedicle dissection toward the origin of the superficial cervical vessels allowed for reaching contralateral defects.
Results: From March 2010 to September 2012, pre-expanded SCA flaps were recommended in 15 patients with severe neck contracture. Tip necrosis occurred in one patient. The donor sites were closed primarily in all cases. One patient had donor-site wound dehiscence that healed within 2 weeks by conservative management. All patients had restored neck extension to a near-normal position without the sense of restricted neck flexion or rotation.
Conclusions: Pre-expanded SCA flaps are practical and flexible for the reconstruction of diverse scar contractures ranging from unilateral to total neck lesions. Considering the reconstructive efficiency and the reduced donor-site morbidity, this flap may be an ideal option for the reconstruction of severe neck scar contractures.

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Introduction

The neck is one of the most common sites of burn injuries. Postburn neck contracture causes lower face distortion and restricted head movement. The contracture-releasing surgery is very important and extremely urgent in pediatric patients with burns, as postburn neck contractures and inadequate release may cause craniofacial underdevelopment and distortion of facial features.

One of the major challenges for postburn neck reconstruction is the lack of adequate skin coverage for the effective restoration of neck movement and esthetical contour. In many patients with burns, neck injuries are frequently associated with the impairment of the chest skin, which is the main donor site for neck reconstruction. On the contrary, the back usually remains intact, and it can be a very useful donor site for neck reconstruction after extensive contracture release. The superficial cervical artery (SCA) flap, which was introduced by Ogawa et al.,[1] inspired us to develop a strategy using this technique to treat diverse neck deformities from unilateral to total neck contractures.

In the present study, we report our experience of neck reconstruction using SCA flaps in 15 patients with severe postburn neck disfigurement and restricted movement. A method refinement is presented for different types of neck contractures. The treatment restored a near-normal function and the natural esthetic contour of the neck. We found this technique to be very practical and flexible for diverse neck defects, and we considered it to be an ideal option for neck reconstruction.

Patients and methods

Between March 2010 and September 2012, neck reconstruction with pre-expanded superficial cervical perforator flaps was performed in six pediatric patients and nine adult female patients with varying degrees of scar contractures, which ranged from lateral to total neck contractures. Ethical approval of this retrospective study was given by the medical ethics committee of Shanghai Jiao Tong University Medical School. All the patients in this study have signed the consent to permit the usage of their data for medical analysis and publication. The treatment strategies were refined as follows (Figure 1): type I: for unilateral neck contractures, the pedicled SCA perforator flaps were elevated with minimal muscle; type II: for lateral and anterior neck contractures, the circumflex scapular vessels were preserved within the flap, and they were anastomosed to the ipsilateral facial vessels to increase the reconstructive size; type III: for contractures of the entire neck, the flap covered the contralateral defects with pedicle dissection toward the superficial cervical vessels under the trapezius muscle to provide maximal flap release to reach the contralateral part of the neck. The vascular augmentation of the circumflex scapular vessels within the flap to the contralateral facial vessels was also used.

Surgical procedures

Color duplex scanning was used to map the dominating muscular perforator of the SCA before the surgery, and the

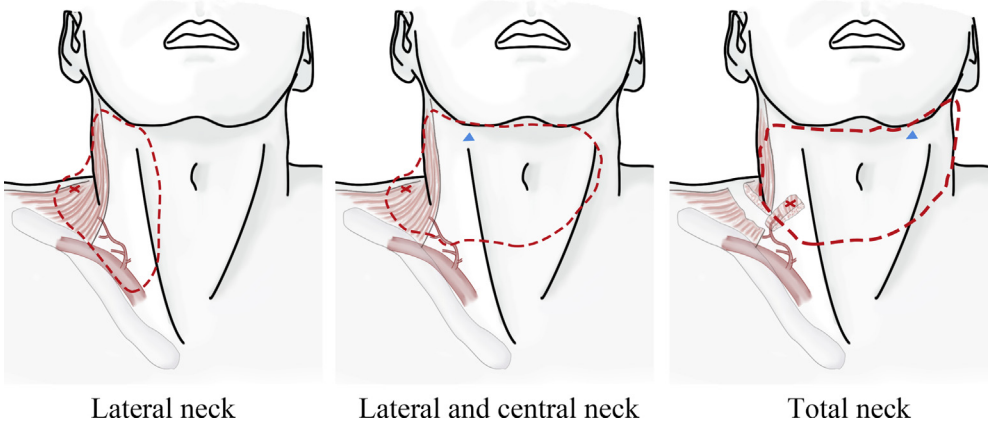

Figure 1 The refinement of SCA flaps for the reconstruction of lateral and total neck scar contractures: (1) The SCA perforator flaps were used for lateral neck reconstructions. Generally, one or two major perforators could be located within 3 cm of the anterior margin of the trapezius muscle (red cross, left). (2) The circumflex scapular vessels were preserved within the flap, and they were anastomosed to the ipsilateral facial vessels (blue triangle) for lateral and central neck reconstructions (middle). (3) The pedicle dissection to the superficial cervical vessels provided maximal flap release in total neck reconstructions (right).