

Pre-Expanded, Prefabricated Monoblock Perforator Flap for Total Facial Resurfacing

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KEYWORDS

- Total facial resurfacing • Prefabricated flap • Pre-expanded flap • Cervicothoracic flap
- Stem cell transplantation

KEY POINTS

- The pre-expanded, prefabricated supercharged cervicothoracic monoblock perforator flap can be used for total and subtotal facial resurfacing.
- This flap has similar color, thickness, and texture as the face, maintains facial contour and mediates facial expression, and is large enough to cover the total face.
- Our approach includes preoperative evaluation, flap prefabrication, tissue overexpansion assisted by stem cell transplantation, flap transfer for total facial resurfacing, and multistep flap revisions.

INTRODUCTION

The resurfacing of total facial defects resulting from burn injuries, trauma, and tumor ablation remains one of the biggest challenges in reconstructive surgery.^{1,2} Various reconstructive techniques exist for the treatment of total facial defects, among which skin grafting is the simplest method. However, the often complicated graft contraction and severe mismatched skin color and texture make it difficult to obtain ideal aesthetic and functional results.³ Conventional local/regional flaps or free flaps are also used for total facial resurfacing, but the flap thickness obscures the ideal facial contours and expression. Also, conventional flaps always have problems, such as insufficient donor site and limited vascular territory.^{4,5} In the past

decade, face allotransplantation has been performed for severely disfigured patients and seems to have a satisfactory risk to benefit ratio. However, this facial repair procedure could be only offered in rare and selected cases owing to its technical challenges, ethical concerns, and adverse reactions from immunosuppressive therapy.^{6,7}

We have proposed the pre-expanded, prefabricated, supercharged cervicothoracic monoblock perforator flap for total facial resurfacing, which has similar color, texture, and thickness as the face and is large enough to cover total facial defects.⁸ This technique could provide good functional and aesthetic outcomes for patients who have extensive facial skin and subcutaneous

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deformities with undamaged muscles and deep structures.

TREATMENT GOALS AND PLANNED OUTCOMES

The goals of total facial resurfacing are to restore normal organ function (breathing, eating, vision, etc) and facial expression and to obtain a perceived normal face with normal facial outline and natural 3-dimensional structure. We have proposed a evaluation system to score the aesthetic and functional outcomes of facial resurfacing⁹ (Table 1).

To obtain ideal aesthetic and functional outcomes, we have proposed the principle of “matching, large size, and thinner thickness” (MLT) for facial resurfacing.¹⁰ “Matching” requires a donor site that has matched skin color and texture (soft and elastic) with the face. “Large size and thinner thickness” imply sufficient flap size to cover the whole defect and adequately thin thickness to form facial contour and expression. In addition to the matched, large and thin coverage of the defects, the formation of fine and delicate features of the central face are also very important to reflect the 3-dimensional structure of the face and to obtain a “perceived normal” face.

PREOPERATIVE PLANNING AND PREPARATION

Indications for Total Face Resurfacing

Pre-expanded, prefabricated cervicothoracic flaps are recommended for those patients identified as type III and type IV deformities according to our

classification⁹ and without severe destruction of the muscle.

Donor Site Selection

According to the matching principle, the anterior chest can be regarded as the ideal donor sites for facial resurfacing,¹¹ thus the pre-expanded, prefabricated internal mammary artery perforator (IMAP) supercharged cervicothoracic flap was our first choice for total facial resurfacing. In case of scarred anterior chest skin, the bipedicle perforator flaps from the lateral chest, back, and abdomen could be used for total facial resurfacing.

Vascular Carrier Selection

The descending branch of the lateral circumflex femoral vessels with the surrounding fascia were ideal vascular carrier for flap prefabrication based on their anatomic characters.¹⁰ Color duplex ultrasonography was used preoperatively to evaluate the peak systolic velocity, caliber, and length of the vessels of the 2 sides and to choose the vascular carrier with better quality. Besides, the superficial temporal vessels and the thoracodorsal vessels could be used as vascular carriers.

Preoperative Evaluation with 3-Dimensional Digital Technology

Three-dimensional computed tomography and computer-aided design techniques were performed preoperatively to better evaluate and simulate the sizes and 3-dimensional structures of defects and donor site.

Table 1
Appearance and function status score

	Appearance and Function Status	Score
Aesthetic status	Nearly normal appearance	3
	Nearly normal facial outline and organs; flat, ill-defined, normally pigmented scar	2
	Mild deformation of facial outline and organs or protuberant, hard, well-defined, and hypopigmented or hyperpigmented scar	1
	Nearly normal facial outline and organs; flat, ill-defined, normally pigmented scar	0
Functional status	Nearly normal organ function and facial expression	3
	Essentially normal organ function, slightly limited or unnatural facial expression	2
	Mouth opening limited to approximately 2 finger breadths, mildly restricted nasal ventilation or expiration with a feeling of resistance, impaired eye closing or opening, obviously limited facial expression	1
	Impaired mouth closing or severely restricted mouth opening, blocked nasal ventilation, absent eye closing or opening, severely limited facial expression	0

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