

Pre-Expanded Transverse Cervical Artery Perforator Flap

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KEYWORDS

- Perforator flap • Transverse cervical artery • Preexpansion • Face reconstruction
- Neck reconstruction

KEY POINTS

- High-quality and thin skin flaps should be used to reconstruct defects in the cervicofacial region.
- The transverse cervical artery perforator flap is useful for reconstruction of cervicofacial defects because it has good color and texture match, and minimal flap complications.
- This pre-expanded perforator flap is one of the best options for cervicofacial reconstruction, producing excellent result with only an inconspicuous linear scar on the donor site after being sutured directly.

INTRODUCTION

Deformed appearance and impaired function in the face and neck region necessitate appropriate and high-quality reconstructive tissue. Microsurgical techniques using distant free flaps are time consuming and costly. Local flaps (eg, pectoralis major, deltopectoral flaps) are bulky. With an excellent color and contour match for this application, the supraclavicular island flap (SIF) should be considered, and is pedicled by the supraclavicular artery, a branch of the transverse cervical artery (TCA). The inconspicuous scar is located on the donor site at the shoulder. The arteria cervicalis superficialis, first illustrated by Toldt,¹ originates from the thyrocervical trunk. The first clinical application of a shoulder flap was described by Kazanjian and Converse.²

The supraclavicular artery flap has a long history. The original report was by Lamberty³ for neck reconstruction in 1979. A vessel named the

supraclavicular artery was reported in 1983.⁴ Pallua studied the anatomy of this flap and examined the vascularity of what is now known as the SIF. Then Pallua and colleagues⁵ reported the SIF used for mentosternal contracture and tumor defect from 1997 to 2000,⁶ and for postburn head and neck reconstruction in 2005.⁷ From 2006 to 2012, a larger number of reports focused on SIF used in noma deficits, the mandibular region, postburn head and neck reconstruction, tracheocutaneous fistulas, posterolateral skull base repair, and so forth.^{8–16} Free flaps were also used.^{17–19} The results were not always satisfactory because of inadequate skin match or a patchwork facial appearance.

The supraclavicular angiosome is supplied by a constant and reliable vascular pedicle, which allows safe pedicled flap transfer. There are several main branches extending forward that dominate the blood supply for the supraclavicular and chest

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wall regions, so it is termed the anterior branch flap. A fairly constant anterior cutaneous branch and main skin artery arise from the TCA perforator and can guarantee reconstructive success. The area of the flap can reach the chest wall, but not in the area near the shoulder. In accordance with the perforating point located on the supraclavicular region, the transverse cervical arteries perforator (TCAP) flap can be rotated and advanced much more easily than other flaps. Moreover, a pre-expanded TCAP flap can be designed. With the help of the expanded flaps, not only can the face and cervical sites be covered but also the donor area can be closed directly. This article introduces use of the TCAP flap and the pre-expanded TCAP flap.

TREATMENT GOALS AND PLANNED OUTCOMES

The pre-expanded TCAP flap is a better choice for the reconstruction of lesions and deformities on the middle and lower face, and the cervical region with a perfect match in color, elasticity, texture, and thickness. It also can be used for the repair of wounds on the lateral and posterior neck, and shoulders. In our experience, this perforator flap is very safe and has few complications. All the reconstructive cases have had satisfactory results in terms of appearance and functional recovery, especially because there have been no complaints of secondary deformities at the donor sites, which can be sutured directly after expansion leaving only linear scars.

PREOPERATIVE PLANNING AND PREPARATION

Before the operation, the perforator site of the TCA should be detected and determined by Doppler ultrasonography. The flap is designed according to the dimensions of the defect. However, severe scar contractures become larger than was estimated following the release. By referring to the unaffected region, a corresponding flap should be outlined. To some extent, a slightly larger flap is mapped. Depending on the actual and potential defects, a larger filling expander is placed at the first stage. If the defect is much larger, bilateral pre-expanded TCAP flaps could be designed to repair or reconstruct the a defect.

PATIENT POSITIONING

During the operation, patients are maintained in a supine position with the head positioned backward. The arms are kept away from the body,

ideally at 80° to 85° to reduce the chance of neurologic injury.

PROCEDURAL APPROACH

During the first stage, the pre-expanded region is marked. In order to avoid possible damage to the large supplying vessels, Doppler is performed preoperatively to identify the perforator site of TCA and the main anterior branches (**Fig. 1A**). The vertical incision is made lateral to the expander pocket area. The dissection is made down to the deep fascia. The expander is placed superficial to the major pectoral muscle. The rectangular expander is placed in the pocket and the filling valve is immobilized. The expander inflation is begun 10 days later when the stitches are removed. With saline added 2 times a week, the duration averages 3 months.

During the second procedure, when the perforator site of TCA is reconfirmed by the Doppler probe, the dimensions and boundary of the flap, including the identified branch and the pedicle, are outlined and marked (**Fig. 1B**). The pedicle is located at the sternocleidomastoid trailing edge, 1.8 cm above clavicle, the front is the trapezius's leading edge, the lateral edge is 2 to 3 cm from the acromion, the inner circle is the middle of the sternum, and the lower border is 3 to 4 cm below the nipple. The largest size of the flap is 13 × 22 cm. With the head in a tilted position and normally leaning to the side that has the largest area of tissue defect, the pattern is cut open again along the operative scar from the first procedure. The expander is taken out, the scar is excised, and its surrounding contracture is released. There is no need to dissect the perforator vessel. Care should be taken to preserve the perforator and branches, which not only provide sufficient blood supply but also are elevated with free or minimal tension. The incision is made along the marked line, down to the deep fascia layer (**Fig. 1C**). The route of the vessels that enter the flap is identified definitely in the clavicle region. The perforator branches originating from TCA are separated carefully. Tissue that includes vein and nerve surrounding the pedicle should be preserved (**Fig. 1D**). When the island flap is entirely raised, turned, and easily rotated by 180° or more to the recipient site, the donor site is closed directly or covered by split skin graft (**Fig. 1E and F**).

POTENTIAL COMPLICATIONS AND THEIR MANAGEMENT

The potential complications include bleeding, hematoma, infection, injected fluid leaking, expander

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