

Reconstruction of Anterior Neck Scar Contracture Using A Perforator-Supercharged Transposition Flap

Yoshihiro Noda, MD
Hiroaki Kuwahara, MD
Maya Morimoto, MD
Rei Ogawa, MD, PhD, FACS

Summary: Reconstruction of the anterior neck requires attention to both aesthetic and functional outcomes. In general, skin grafts are not suitable for anterior neck reconstruction in Asian patients, even when artificial dermis is used before skin grafting. Therefore, we have employed various types of thin flaps for anterior neck reconstruction, including the cervico-pectoral flap. However, we have realized that, to fully release neck contractures and therefore achieve the full range of neck extension, the skin pedicle must be sufficiently wide. Therefore, we have started reconstructing anterior neck scar contractures using wide, thin, and long flaps that are harvested from the anterior chest wall. In this article, we describe the case of a 71-year-old man who presented with a neck contracture and tracheal fistula after receiving extensive burns. A transposition flap bearing the internal mammary artery perforator was harvested from the anterior chest wall to repair the neck wounds that were left after removing the scar. At the same time, the tracheal fistula was covered by the flap. The aesthetic and functional results were acceptable. The effectiveness of supercharged transposition flaps from the anterior chest wall for reconstructing anterior neck scar contraction is discussed. (*Plast Reconstr Surg Glob Open* 2018;6:e1485; doi: 10.1097/GOX.0000000000001485; Published online 8 February 2018.)

Reconstruction of the anterior neck requires good outcomes in both aesthetics and function. Asian patients appear to be more prone to severe scar contracture than Caucasian patients, possibly because they tend to have greater skin inflammation after wounding. In general, skin grafts are not suitable for anterior neck reconstruction in Asian patients, even when artificial dermis is used before skin grafting. Therefore, to reconstruct the anterior neck, we have employed various types of thin flaps, including the occipito-cervico-dorsal flap¹ and the cervico-pectoral (CP) flap.^{2,3} However, we have realized that, to release neck contractures and therefore achieve the full range of neck extension, the skin pedicle should be sufficiently wide. Therefore, we started reconstructing anterior neck scar contractures by harvesting wide, thin, and long flaps from the anterior chest wall. In this article,

we describe the case of a 71-year-old man who presented with a neck contracture and tracheal fistula after receiving extensive burns and undergoing a number of initial treatments. The neck wounds left after removing the scar were covered using a transposition flap that was harvested from the anterior chest wall and attached to the internal mammary artery perforator (IMAP). The tracheal fistula was covered at the same time. Since the aesthetic and functional results were acceptable, the details of this case are reported here. In addition, we will discuss the usefulness of perforator-supercharged transposition flaps from the anterior chest wall for reconstructing anterior neck scar contractures.

CASE

The patient was a 71-year-old man who sustained extensive burn injuries from a gas explosion 2 years before he presented to our clinic. Shortly after the injury, the patient was brought to another hospital, where he underwent initial treatment. This treatment included a split-thickness skin graft (STSG) for his entire body, including the anterior neck, and a tracheotomy. After being discharged from the hospital, the anterior neck scars began contract-

From the Department of Plastic, Reconstructive and Aesthetic Surgery, Nippon Medical School, Tokyo, Japan.

Received for publication May 24, 2017; accepted July 19, 2017.

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DOI: 10.1097/GOX.0000000000001485

Disclosure: *The authors have no financial interest to declare in relation to the content of this article. The Article Processing Charge was paid for by the authors.*

ing. Since the scar contractures continued to worsen over time, the patient visited our clinic. At presentation, the patient had a severe neck contracture and a tracheal fistula.

We planned to cover the anterior neck and the tracheal fistula simultaneously by applying a wide, thin, and long perforator-supercharged transposition flap that was harvested from the anterior chest. Before surgery, we checked for the existence of IMAP using multidetector computed tomography. This imaging analysis showed that there were 2 IMAPs in the first intercostal space (diameters of 2.0 and 2.5 mm in the right and left intercostal spaces, respectively) and facial vessels on both sides. We

designed the flap on the right anterior chest. A fin-shaped piece of skin that would cover the tracheal fistula was also designed on the flap (Fig. 1). Intraoperatively, the scar tissue was removed and the contracture was thereby released almost completely. The tracheal fistula was then closed by the hinged flap using the surrounding tissues. Elevation of the transposition flap was then started. The first IMAP was attached to the flap and had a vascular pedicle of 4 cm in length above the costal bone. The flap size was 28 × 6 cm, and the proximal skin pedicle bore some of the platysma. The flap was then transferred to the anterior neck; the subcutaneous side of the hinged flap that was used to



Fig. 1. A, Flap design. A 28 × 6 cm supercharged transposition flap that was based on the second IMAP was designed on the right anterior chest. On the figure, the right cranial black dot was the first IMAP, and the right caudal black dot was the fourth IMAP. A small fin-shaped piece of skin that would cover the tracheal fistula was included on the right-hand side of the flap. B, Intraoperative view. The flap was elevated and transposed to the anterior neck. C and D, Postoperative view at 6 months. The neck contracture was released almost completely because the extendable flap achieved sufficient skin pedicle width during the postoperative course.

close the tracheal fistula was then covered by the flap at the same time. The IMAP and the facial vessels were then anastomosed under a microscope. Two-thirds of the flap donor site was closed directly. However, the proximal third of the donor site required closure with an STSG that was harvested from the same donor sites that were used for the previous STSG. The width of the flap pedicle was extended from 6 to 9 cm during the postoperative course (i.e., an increase in width of 1.5-fold). The neck contracture was released almost completely. Six months after surgery, the aesthetic results were also good.

DISCUSSION

The method that is used to reconstruct anterior neck contractures depends on the size of the defect. Many methods for reconstructing neck contractures have been reported: They include free flaps, local flaps, and free skin grafts.^{4,5} In the past, we reconstructed scar contractures on the neck and lower face using CP flaps.^{2,3}

The CP flap is one of the “super-thin flaps”.⁶ It is elevated from the anterior pectoral area and is vascularized by transverse cervical or superthyroid perforators in its skin pedicle. Such a flap is particularly suitable for anterior neck reconstruction because the anterior chest skin has the same color and texture as neck skin. However, the anterior chest skin can also be used to generate a wide, thin and long flap for anterior neck reconstruction: in this case, perforator supercharging can be used. For this, the IMAP, which is located around the first or second intercostal space, is always a reliable and safe option. Angio-CT such as multidetector computed tomography is useful for detecting the precise position and course of the flap perforator.⁷

Along with obtaining good aesthetic outcomes, reconstruction of anterior neck scar contractions should also aim to normalize the ability of the patients to extend their necks fully. In the present case, we ensured almost complete release of the skin contracture and normalization of neck movement by using a 28×6 cm perforator-supercharged transposition flap from the anterior chest that was based on the IMAP. During the postoperative course, the width of the skin pedicle extended from 6 to 9 cm and the patient became able to extend his neck almost completely. This and other experiences with these flaps have made us realize the importance of having a wide flap: we observed that the wider the flap is, the more extendable the skin will be and the more effectively the contracture is released. Therefore, we design these flaps to be as wide as possible. This notion is supported by Coleman et al.,⁸ whose work suggested that similar platysma musculocutaneous flaps can be substantial.

Another advantage of relatively wide IMAP-based perforator-supercharged transposition flaps from the anterior chest is that their good extendability further alleviates tension on the edges of the flap. This reduces the risk of contracture recurrence and the development of other fibroproliferative disorders of the skin, including keloids and hypertrophic scars. Indeed, scar contractures develop as a result of the tension on the edges of the wounds/

scars. If this tension is released, angiogenesis halts, which in turn stops the fibroblasts from secreting collagen.^{9,10} Therefore, when dealing with scars, in particular scar contractures, keloids, and hypertrophic scars, it is important to consider effective ways of releasing the tension on the scar edges.^{9,10}

In relation to this, free flaps are sometimes used to reconstruct anterior neck defects because they can be harvested from unaffected areas and can cover relatively large defects. However, all free flaps are island flaps, and therefore their skin extension during the postoperative course is smaller than that of skin-pedicled flaps. Thus, transposition flaps are superior to free flaps in terms of anterior neck scar contracture release.

Our case presented with a tracheal fistula as well as anterior neck scar contracture. This reflects the fact that, like many severe burn patients, the patient required intensive care with an artificial respirator and thus developed a tracheal fistula. The fact that we could cover the tracheal fistula with the flap as well as the wounds left by contracture removal shows that this flap is of great clinical usefulness.

Rei Ogawa, MD, PhD, FACS

Department of Plastic, Reconstructive and Aesthetic Surgery
Nippon Medical School
1-1-5 Sendagi Bunkyo-ku
Tokyo 113-8603
Japan
E-mail: r.ogawa@nms.ac.jp

PATIENT CONSENT

The patient provided written consent for the use of his image.

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