Anterior Neck-scar Contracture Reconstruction Using a Long Skin-pedicled Flap

Akatsuki Kondo, MD
Teruyuki Dohi, MD, PhD
Nikki Izumi, MD
Tomohiro Ochi, MD
Rei Ogawa, MD, PhD, FACS

Summary: We previously reported cases of anterior-neck reconstruction using super-thin and perforator-supercharged skin-pedicled flaps harvested from the pectoral area and back. Here, we reconstructed a neck-scar contracture with a long skin-pedicled flap from the pectoral area that survived without congestion despite not being supercharged with a perforator, as planned. The patient, a 67-year-old man, was admitted to our hospital due to neck-scar contracture after a chemical burn 3 years previously. During surgery, the scar was resected above the platysma. A large, 19 × 6-cm skin-pedicled flap was elevated from the left pectoral area. We planned to supercharge the flap by anastomosing the second intercostal perforator to the flap periphery but could not confirm the perforator intraoperatively. To promote flap survival, we did not elevate the flap pedicle more than absolutely necessary and then manipulated the flap very carefully. The flap survived fully and the contracture was effectively released. Thin flaps are useful for reconstructing exposed areas such as the face, neck, and dorsum of the hands that require good outcomes in terms of both function and aesthetics. However, if the flap is too large, ischemia/congestion could arise in the periphery unless the blood flow is stabilized by attaching a perforator. In our case, supercharging was not possible and we had to resort to careful intraoperative maneuvers to ensure flap survival. This approach was successful and suggests that although supercharging of thin and large flaps is preferred, unexpectedly unsuperchargeable flaps can be rescued by careful and finely tuned surgical judgment and techniques. (Plast Reconstr Surg Glob Open 2021;9:e3404; doi: 10.1097/GOX.0000000000003404; Published online 17 February 2021.)

When reconstructing cervical-scar contractures, it is necessary to find an acceptable balance between the functional and aesthetic outcomes. In cases where the scar is completely excised, free flaps are often used because they are easy to plan and design. However, they always develop some encircling scar contracture after surgery. We have previously described alternatives to free flaps for cervical-scar contractures, namely super-thin flaps and perforator-supercharged skin-pedicled flaps from the pectoral and back areas. In this article, we describe a case of neck-scar contracture that was reconstructed with a large 19 × 6-cm flap that was harvested from the pectoral area and survived completely even though it could not be supercharged. This case is informative because it shows that when careful intraoperative maneuvers are applied, such a long flap can survive on the basis of its skin pedicle only.

CASE REPORT

A 67-year-old man was exposed to a mixture of caustic soda and 50% sulfuric acid and incurred chemical injuries that were treated conservatively and he later developed scar contractures. At the first visit, the contracture extended laterally from the chin and mandible to the cervical region and downward to the larynx ridge (Fig. 1A). The patient exhibited dysfunctional lateral bending, flexion, and extension of the neck. We conducted contracture excision and reconstruction in Nippon Medical School Hospital in 2019. Before surgery, the excision site and the pectoral flap for reconstruction were designed (Fig. 1B). During surgery, the neck scar was partially excised over the platysma such that the parts with strong traction were removed and the contracture was released. A large 19 × 6-cm skin-pedicled flap was elevated from the left pectoral area. We had planned to anastomose a second intercostal perforator branch to the peripheral...
portion of the flap; the flow of this perforator branch on the pectoralis major fascia had been detected before incision by Doppler ultrasound. However, we could not confirm the perforator intraoperatively. We had no choice but to lift the flap without adding the perforator branch. To ensure flap survival, the skin pedicle was dissected as little as possible, and the perforator branch of the platysma muscle was preserved as much as possible. Consequently, the elevation was stopped when the flap reached the recipient site. The wounds were then closed primarily (Fig. 1C). The flap survived completely. The postoperative course was uneventful and there was little postoperative scarring. Six months after the operation, the neck contracture and the patient’s range of neck motion had improved markedly (Fig. 1D).

**DISCUSSION**

Asians tend to be more prone to contractures and develop severe contractures more often than Westerners. Releasing neck-scar contractures results in a large skin defect. Because full-thickness skin grafts often produce secondary contractures, especially in Asian patients, their outcomes are often poor. Instead, large and thin flaps (also known as super-thin flaps) should be used to reconstruct exposed areas like the neck (and the face and back of hands) that require good functional and aesthetic outcomes.

When thinking of using a thin flap for cervical reconstruction, a few points should be considered. First, if the thin flap is too large, ischemia or congestion could arise in the periphery. This problem can be overcome by anastomosing...
A perforating branch to the flap periphery, thereby creating a supercharged flap that has stable blood circulation.\textsuperscript{1,5} Second, in cases that require contracture release, the cutaneous pedicled flap is superior to the island flap because the latter will always develop some circular scar contraction around the flap.\textsuperscript{3} Third, when dealing with contractures in the cervical region, it is better to design the flap in the craniocaudal direction because this flap will extend well after the surgery.\textsuperscript{4} Fourth, the body areas around the neck differ in skin thickness, which means that some body areas are more suitable for cervical reconstruction than others. Moreover, there are gender differences in skin thickness. Anatomical data from Asians\textsuperscript{5} show that in Asian men, the thickness of the anterior neck skin is closer to the thickness of the anterior thoracic skin (a ratio of 1–0.9) than to the thickness of the back skin (ratio of 1–1.5). Because the best aesthetic results are obtained when the skin thickness of the flap is similar to that of the recipient site, it is recommended that flaps should be harvested from the chest in men. In contrast, in women, the anterior neck:anterior thoracic skin and anterior neck:back skin ratios are both 1–1.2. Because harvesting skin from the anterior thoracic area could lead to left-right asymmetry in the position of the breasts, it is therefore recommended to harvest flaps from the back in women.

In our case, we designed a long thin flap on the anterior chest with the intention of supercharging it with the perforator branch on the pectoralis major fascia. However, we could not confirm this perforator intraoperatively, possibly because of perforator spasm. To enhance flap survival, the flap pedicle was dissected as little as possible and carefully manipulated. We were prepared for the possibility that the flap would not be well perfused after surgery; in this case, we would have cut its distal area and reconstructed that area with a full-thickness skin graft. However, this option was not needed because the flap survived completely.

Several studies have examined the conditions that promote platysma-flap survival. Thus, Hurwitz et al reported in 1983 that flaps harvested from the platysma region contain branches from the carotid and occipital arteries, the facial and mandibular arteries of the upper medial neck, the superior thyroid artery in the middle of the neck, and the subclavian artery in the lower medial neck.\textsuperscript{6} The authors suggested that a platysma skin flap will survive if it contains branches from the inferior labial artery, the superficial carotid artery, or the carotid transverse artery; as these perforating branches will maintain the blood flow in the flap. Moreover, studies by Coleman et al in 1982 and 1983 suggested that a platysma flap with a 5- to 6-cm skin pedicle and several perforators will survive.\textsuperscript{7,8} Finally, a report by Vinh et al in 2007 suggested that neck skin flaps will survive if they are nourished by the carotid transverse artery or the internal thoracic artery.\textsuperscript{3} In our case, we suspect that a perforator of the lower platysma (a branch of the transverse cervical artery) nourished our flap (despite it being adjacent to this perforator’s territory) because it had dilated a choke vessel.\textsuperscript{9} Our report shows that a large and long (19 × 6 cm) anterior chest skin-pedicled flap that was elevated to cover the defect after neck-scar contracture excision could survive completely without supercharging if its skin pedicle was minimally dissected and the perforator branch of the platysma muscle was preserved as much as possible.

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