CASE REPORT

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RECONSTRUCTION OF THE COLUMELLA USING THE PREFABRICATED REVERSE FLOW SUBMENTAL FLAP: A CASE REPORT

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Abstract: Background. The reconstruction of columellar defects is still a challenging procedure because of limited local and regional flap options and the characteristics of the anatomy of this site. Although a number of methods are available to repair nasal columella defects, no treatment of choice ensuring an excellent texture- and color-matched tissue in one stage has been determined to date.

Method. In this case, we used a reverse-flow submental island flap prefabricated with the costal cartilage for the reconstruction of a complex columellar defect.

Result. The flap survived completely with reversible venous congestion. The cosmetic result and nasal respiratory function were acceptable during the follow-up time of 6 months.

Conclusion. We propose that the prefabricated reverse submental flap may be an alternative among the surgical options for columellar defects. This flap may also be considered in the reconstructive repertoire of other composite defects of the head and neck region.

Keywords: columella; prefabrication; submental flap

Prefabricated Submental Flap

The reconstruction of columellar defects resulting from various causes, including congenital absence, trauma, and tumor, remains a challenging procedure for surgeons because of limited local and regional flap options and the characteristics of the anatomy of this site. Although a number of methods are available to repair nasal columella defects, including skin grafts, local flaps, and free flaps, no treatment of choice ensuring an excellent texture- and color-matched tissue in one stage has been determined to date. Submental island flap, described by Martin et al in 1993,1 is an axial skin–muscle flap and has been successfully used in the restoration of lower and midface defects. The flap has also been applied in the manner of reverse flow to extend the pedicle and to allow its transfer to more distant recipient areas.2 In this case, we used this flap by prefabricating with the costal cartilage for the reconstruction of columellar site.

CASE REPORT

A 73-year-old male patient was initially seen in our clinics with the complaint of a tumoral mass located in the columella (Figure 1). Physical examination showed the mass involved the entire columella, obstructing the both external...
nares, leading to unaesthetic appearance and respiratory distress of the nasal pathway without pain or bleeding. Histopathologic examination by incisional biopsy led to the diagnosis of papilloma. Total excision of the mass and reconstruction of the arising defect with submental flap prefabricated by costal cartilage was planned.

**Surgical Technique.** In the first stage, only the prefabrication by harvesting of the cartilage graft was achieved. Cartilage, 3 cm in length, was harvested from the eighth rib at the left site and was inserted into the pocket between the skin and platysma muscle at the distal site of the flap in a vertical fashion for prefabrication.

One month later, the patient underwent the second stage of the operation. With the patient under general anesthesia, he was positioned supine with the slight extension of the head. After facial artery pulsation was palpated and marked over the mandibular rim, the upper limit of the flap was drawn close to the mandibular margin from angulus to angulus, and the inferior limit of the flap was determined by a pinch test to allow for primary closure of the donor site (Figure 1C). The tumor was resected completely (Figure 2A). We then raised the flap from the upper margin. After incising the upper border of the flap, the marginal mandibular branch of the facial nerve just deep to platysma and overlying the facial artery was distinguished and preserved. The submandibular gland was reached, dissecting the facial artery and common facial vein inferiorly and superiorly from the gland. The submental artery and its concomitant (submental) vein were easily determined below and above the gland, respectively. The lower incision was then made, and the flap was raised beginning on the contralateral side in the subplatysmal plane. Last, the submental musculocutaneous island flap, including subcutaneous fat and platysma, was obtained.

To check the flap perfusion by reverse flow, we placed the microvascular clamps on the facial vessels proximal to the origin of the submental branches. After we observed the flap to be well perfused, the facial vessels were tied and divided.
proximally, and the full reverse flap was obtained (Figure 2B). Excess flap tissue to be placed in the tunnel was trimmed to adapt the flap to the columella. The flap was transferred to the columellar defect through the subcutaneous tunnel and sutured in place with absorbable sutures as the cartilage remains behind the skin island to form the columellar support (Figure 2C). The oil dressing nasal packs were placed bilaterally. The donor site was closed primarily. The cervicomental angle was maintained again by suturing the cervical skin to the hyoid bone.

No intraoperative complications occurred. We encountered initial venous congestion in the early postoperative period. However, it subsided rapidly in a week after removing a few sutures. On postoperative day 7, the flap was resutured after the edema and congestion had regressed. The flap survived completely. At the end of 3 months, the flap was still bulky, and a debulking operation was performed to thin the flap by preserving the cartilage. The cosmetic result and nasal respiratory function were acceptable during the follow-up time of 6 months (Figure 3).

DISCUSSION

The reconstruction of a columellar defect remains a concern because of its complex anatomic structure and localization. The columella is located between the nostrils and over the caudal site of the septal cartilage, consisting of a pair of fine-textured crural cartilages and thin skin coverage anatomically. Thus, the tissue used for its reconstruction should meet these anatomic requirements, including both cartilage and skin. Another challenge is the feature of the localization that does not allow the ideal reconstruction with local flaps. Flap choices in this area are limited, and flaps cannot be transferred to the columella in one stage without disfigurement.

The various local or distant flaps that can be used for nasal columella reconstruction, including composite grafts from the ear, Abbe flaps, nasal septal flaps, nasolabial flaps, labial mucosa

FIGURE 2. (A) The anterior aspect after tumor was removed. (B) Full reverse-flow submental flap is shown. A wide pivotal movement was achieved by dividing both the facial vessels proximal to the origin of the submental branches. (C) Inset of the flap as the cartilage remains behind the skin island to form the columellar support. The flap was transferred to the columellar defect through the subcutaneous tunnel. [Color figure can be viewed in the online issue, which is available at www.interscience.wiley.com.]
flaps,\textsuperscript{7} internal nasal vestibular flaps,\textsuperscript{8} forehead flaps,\textsuperscript{9} and microvascular composite free flaps from the ear,\textsuperscript{10} have been described in the literature.

Since first described by Martin et al in 1993, the submental flap has proved to be versatile for use in reconstruction of various head and neck defects. Yilmaz et al\textsuperscript{11} used it as a composite osteomyocutaneous flap by including a bone segment from the mandibular rim for maxilla defects in their series. Koshima et al\textsuperscript{12} combined this flap with a free toe-web flap for the restoration of the lip and oral commissure. Vural and Suen\textsuperscript{13} also mentioned the successful use of this flap for intraoral defects, including the tongue, floor of the mouth, and cervical esophageal stenosis. Recently, it was reported that the pharyngocutaneous fistulas were repaired successfully with the submental flaps in a series of nine cases.\textsuperscript{14}

The submental island flap is superior to other local, regional, and free flaps in the soft tissue reconstruction of the head and neck region because of its many advantages of perfect color match and texture for the facial skin, a constant and safe pedicle, wide pivotal movement, well-hidden scar in the donor area, versatile use (fascioplatymsal, osteocutaneous, distal-based, and free submental flap), and completion without need for microsurgery. By means of the reverse flow, the pedicle can be extended and reach distant defects more easily. Sterne et al\textsuperscript{15} recommended a supplemental venous anastomosis in the reverse-flow submental flap to make the consistent valves in the facial vein ineffective. Kim et al\textsuperscript{2} performed nasal reconstruction using this reverse submental flap by including the superficial vein that drains into the common facial vein, without additional venous anastomosis. They believed that the tiny comitant submental vein cannot provide enough venous drainage in the reversed flap, and thus the larger superficial vein must be included in planning the reverse submental island flap. In contrast to the other authors, we think that the reverse flow submental flap is reliable and that an additional vein to support the venous drainage is not needed. In our opinion, the transient venous congestion in this case may have resulted from the flap being wrapped around the cartilage or the

\textbf{FIGURE 3.} (A) Patient’s anterior view at 6 months after surgery. An acceptable cosmetic result was obtained. (B) Left-sided appearance of the same patient. (C) The inferior view of the patient with the well-hidden donor site scar 6 months after operation. [Color figure can be viewed in the online issue, which is available at www.interscience.wiley.com.]
flap’s pedicle being tightened in the tunnel. The venous congestion rapidly subsided after a few sutures were removed.

Barthélemy et al.16 restored the total cheek defects caused by noma with prefabricated superficial temporal fascia flap combined with the submental flap. However, to the best our knowledge, prefabrication of the submental flap has not been reported in the literature. The prefabrication of this flap with cartilage enables the submental flap most convenient for composite tissue defects such as the columella. We experienced that the cartilage in the flap ensured an adequate support to the columella and clinically did not show an obvious resorption after 6 months.

This technique has two main disadvantages. First, the flap is bulky for a columella and hairy in male patients. However, spontaneous atrophy may be expected, and if it does not occur, a debulking procedure as in our case may be considered. Second, the procedure is two-staged, as with all prefabricated flaps. We believe that, by prefabricating various tissues such as skin and bone according to the requirements, this method can be used for the other composite middle and lower facial defects.

In conclusion, we propose that the prefabricated reverse submental flap may be an alternative among the surgical options for columellar defects. This flap may also be considered in the reconstructive repertoire of other composite defects of the head and neck region.

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