A Novel T-Shaped Design of the Forehead Flap in Columella Reconstruction

T-Shaped Design of the Forehead Flap

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Abstract: Reconstruction of the columella is challenging because of its unique contours, narrow horizontal dimension, paucity of adjacent soft tissues, and tenuous vascularity. For larger defects or defects with poor outcomes after composite graft or local flap reconstruction, forehead flaps have been used due to their robust blood supply and sufficient tissue. However, we found an increased risk of flap dehiscence between the forehead flap and the upper lip since the connection is only approximately 0.5-cm wide.

In this series, we proposed a novel modification of a T-shaped forehead flap in columella reconstruction. We created a subcutaneous pocket and inserted the distal de-epithelialized part of the flap into the pocket to obtain greater connection and contact between the two tissues. Between February 2017 and June 2023, 23 patients were treated with our proposed surgical method. The mean follow-up time was 34.5 months (range, 7 months to 80 months). All uneven wounds healed uneventfully within 2 weeks. No disruption of the columellar edge or other complications were noted. Our novel T-shaped design for columella reconstruction is a safe, straightforward, and reliable technique. The method is technically simple and has a low learning curve. This approach may decrease the risk of flap disruption in columella reconstruction and yield a superior aesthetic result, with which patients are satisfied.

Key Words: nose, nasal reconstruction, forehead flap, columella

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The columella is a small subunit of the nose, but the loss of this structure has important aesthetic and structural implications. Reconstruction of the columella is challenging because of its unique contours, narrow horizontal dimension, paucity of adjacent soft tissues, and tenuous vascularity.[1–7]

Loss of the nasal columella usually occurs as a result of infection, trauma, ischemic injury, congenital causes, surgical excision of tumors, or excessive skin tension after aesthetic rhinoplasty.[1] Multiple techniques have been proposed for columella reconstruction,[1–13] and forehead flaps have been used for the reconstruction of large and extended columellar defects due to their robust blood supply and sufficient tissue compared to other methods.[1,5,8,14]

Traditionally, we have utilized a forehead flap long enough to reach the columellar base and fixed the distal part of the forehead flap to the upper lip with several skin interrupted sutures and some subcutaneous sutures. However, we found an increased risk of flap dehiscence between the forehead flap and upper lip because the connection is only approximately 0.5-cm wide.

In this series, we proposed a novel modification of the forehead flap in columella reconstruction with a T-shaped design to decrease the chance of flap dehiscence.

METHODS

Between February 2017 and June 2023, 23 patients were treated with our proposed surgical method. Forehead flaps were used for nasal resurfacing in all patients, and free flaps for lining reconstruction were also used in 9 patients. There were 8 total nasal defects, 12 subtotal nasal defects, and 4 pure columellar defects. The patients included 13 males and 10 females with a mean age of 41.6 years (range, 11 years to 70 years). The etiologies of the columellar defects were hemangioma (n = 5), congenital deformity (n = 4), trauma (n = 4), burn (n = 4), cosmetic (n = 4), and malignancy (n = 2).

Traditional three-stage paramedian forehead flap reconstruction was performed.[15–19] The authors modified the methods to complement Asian features.[20] A foil template was designed for the columellar skin and the lining in some patients. Traditionally, direct interrupted sutures are made between the flap edge and the upper margin of the philtrum column to define the columellar base. In our method, we designed the distal part of the forehead flap as a T shape with an extra arm extended at the distal edge of the forehead flap; the flap was de-epithelialized with either a knife or scissors. One horizontal suture was made between the columellar base and the de-epithelialized tissue with 5-O PDS (Supplementary Video 1, http://links.lww.com/SAP/B67). Then, several loose stiches were made for better fixation of the flap according to the circulation of the flap. Topical antibiotic ointments were applied to the wound, and the stitches were removed after 1 to 2 weeks.

Patient satisfaction was assessed at least half a year postoperatively using a 5-point Likert scale. Images were examined by facial plastic surgeons blinded to the cases and were rated on a 10-cm visual analog scale (VAS).

RESULTS

The mean follow-up time was 34.5 months (range, 7 months to 80 months). All uneven wounds healed uneventfully within 2 weeks. No disruption of the columellar edge or other complications were reported. The average patient satisfaction score was 4.3 (range, 3–5). The average VAS score for images was 8.2 (range, 6–9).

CASE REPORT

A 44-year-old female patient was treated with a staged forehead flap for columellar defect reconstruction due to complications after multiple cosmetic rhinoplasties (Fig. 1A, B). Our T-shaped columellar

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FIGURE 1. (A, B) A 44-year-old female patient with a columellar defect after multiple cosmetic rhinoplasties. (C, D) Our T-shaped forehead flap was utilized for columella reconstruction. The patient was satisfied with the 18-month results.

design was utilized for reconstruction. The patient was satisfied with the 18-month results (Fig. 1C, D).

DISCUSSION

The nasal subunit principle, as proposed by Burget and Menick in 1985, is a well-accepted technique for achieving optimal cosmetic results in nasal reconstruction.[15–19] The columella is the subunit between the two nostrils that provides support and projection to the nasal tip and has a functional role in the nostrils, as well as an aesthetic role.[1,15] The nasal columella is often described as one of the most difficult nasal subunits to reconstruct.[1–7]

Reconstruction of the columella presents unique difficulties and requires reconstruction of both the cartilaginous strut and the overlying skin to obtain good results.[6] Different techniques have been proposed previously, including chondrocutaneous grafts, nasolabial flaps, paramedian forehead flaps, and free flaps[1–13]; the choice of technique depends on various factors in each case, such as the characteristic columellar shape, color match, texture, patient age, original disease, and surrounding scars.

For larger defects or defects with poor outcomes after composite graft or local flap reconstruction, a forehead flap for the overlying skin of the entire columella or an additional free flap for lining restoration is indicated.[1,5,8,14] However, there is only a small connection approximately 0.5 cm in width between the flap and the columellar base. Suture tension or frequent manipulation during wound care, including cleansing of the blood clot or wound discharge, especially during the first week after surgery, may lead to wound disruption and flap dehiscence. This complication was sometimes identified incidentally at the clinic 1 week after surgery, and the distal end of the flap had re-epithelialized in some patients, resulting in a floating columella. In this situation, secondary surgical revision may be needed to reattach the flap and the columellar base, which is quite challenging for both the patient and doctors, and the time course of staged reconstruction, which is already long, may be delayed. No previous studies have mentioned this problem, and no solutions have been proposed. In certain cases, although dehiscence of the columellar flap does not occur, stretching tension from the pedicle may pull the columellar flap upward and result in a wide columellar-labial angle.

Here, we present a novel technique based on Menick's principle[15–19] involving a T-shaped design of the distal part of the forehead flap for columella reconstruction. We created a subcutaneous pocket and inserted the distal de-epithelialized part of the flap into the pocket to obtain greater connection and contact between the two tissues, similar to a ground pile. With this modification, no additional flap disruption occurred in our clinical experience. Postoperative wound healing was uneventful, and scheduled staged nasal reconstruction could be performed on time. In addition, greater mastery of the junction can lead to a more natural and beautiful columellar-labial angle.

In terms of the donor site, we usually need to extend the wound to the forehead or scalp to correct a dog ear if primary closure of the wound is planned. The extra arm of the T-shaped flap converts waste into useful material and does not cause larger wounds. For complex nasal reconstruction in which the donor site is left for secondary healing, the extra arm of the T-shaped flap can also be partially closed easily.

Our novel T-shaped design for columella reconstruction is a safe, straightforward, and reliable technique. The method is technically simple and has a low learning curve. No complications were observed in our series. This approach may decrease the risk of flap disruption in columellar reconstruction and yield a superior aesthetic result, with which patients are satisfied.

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