Reconstruction of Complex Nasal Dorsal and Sidewall Defects

Is the Nasal Sidewall Subunit Necessary?

Thorsen W. Haugen, MD; John L. Frodel, MD

Objective: To demonstrate that by the extended use of cheek advancement flaps, the need to maintain the nasal dorsal side unit is obviated.

Design: Retrospective case series.

Setting: Tertiary care clinic and hospital.

Patients: Twelve patients aged 48 to 88 years who underwent Mohs micrographic surgery for nasal skin neoplasms, presenting with dorsal sidewall and nasal dorsal cutaneous defects.

Intervention: All patients underwent nasal reconstruction with adjacent tissue cheek advancement flaps with or without contralateral nasal dorsal and sidewall advancement flaps.

Main Outcome Measures: Avoidance of ipsilateral nasal sidewall scars to allow a natural-appearing transition between the cheek and nose and avoidance of forehead flap morbidity.

Results: Satisfactory results were achieved in all but 1 patient who had partial flap necrosis.

Conclusions: To maintain the nasal dorsal sidewall unit, superior, central dorsal, and nasal sidewall defects have traditionally been reconstructed using a variety of techniques, including skin grafts and regional flaps, such as glabellar flaps and frontal flaps. We demonstrate that creation of the nasal dorsal sidewall unit is often not necessary, and excellent results can be achieved through the expanded use of cheek advancement flaps.

Arch Facial Plast Surg. 2011;13(5):343-346

The Nasal Subunit Principle, as put forth by Burg and Menick in 1985, is a well-accepted technique for achieving optimal cosmetic results in nasal reconstruction. These principles include the division of the nasal surface into topographic subunits, namely, the dorsum, tip, columella, paired ala, sidewalls, and soft triangle subunits. This division is based on adjacent topographic areas with characteristic skin quality, border outline, and 3-dimensional contours. It has been advocated that for optimal cosmetic reconstruction in patients with more than 50% subunit loss, the remaining portion of the subunit be removed and the entire subunit replaced. Incisions are placed along nasal subunit borders, which lends to better camouflage of scars in these shadowed regions.

Alone, the nasal subunit principle is insufficient. An experienced surgeon will also take into account other factors, such as skin color, texture, contour, and sun changes. Local flaps, such as the bilobed (Zitelli) flap and the dorsal rotation advancement (Rieger) flap, violate the boundaries of the nasal subunits but provide ideal skin color and texture matches and are thus a mainstay in nasal reconstruction. By learning to balance the doctrine of nasal subunits with these other factors, a surgeon can understand the art of nasal reconstruction.

Since the nasal subunit principle was first put forth, numerous studies have validated its usefulness. Although it is important to keep in mind that other factors should play a significant role in the surgical design, the principles of the nasal subunits remain largely unchallenged as an underlying framework from which to approach nasal reconstruction.

The accepted approach for repair of complex nasal sidewall defects includes advancement flaps from the adjacent skin, as well as skin grafts and regional flaps (eg, glabellar flaps and forehead flaps), all with the aim of maintaining the nasal sidewall subunit as well as additional nasal subunits that may be involved. These options may allow for preservation of the nasal side-
Follow-up for the 12 patients ranged from 3 to 21 months. Although complete healing may not have been adequate in the 3 patients who were followed up for less than 6 months, such initial results provide otherwise adequate evaluation. Six patients were believed to have excellent results, whereas 5 were judged to have satisfactory results. The limitations in the latter were generally due to scar deformities. Two of these patients underwent secondary procedures leading to excellent outcomes. The final patient (case 4) had significant flap necrosis and required secondary forehead flap reconstruction. Four cases were selected to demonstrate both success and failure using this technique in order to provide a complete view of our experience. The medical problems listed with each case are those believed to have potential bearing on flap viability.

**CASE 1**

A 76-year-old man with medical history significant for hypertension and multiple skin neoplasms presented after Mohs excision of a basal cell carcinoma. The defect involved the entire right nasal sidewall subunit and a portion of the right alar nasal subunit, and it extended onto the right cheek (Figure 1A and B). The defect was repaired with a cheek advancement flap with the intention of preserving the dorsal-sidewall subunit junction. As noted on his preoperative views, he already had a lower eyelid ectropion, so as part of his reconstruction, he underwent a tarsal strip lower lid tightening procedure (Figure 1C and D). At a 13-month postoperative follow-up, he was noted to have excellent restoration of nasal contour as well as improved lower lid position (Figure 1E and F).

**CASE 2**

A 50-year-old otherwise healthy woman presented after Mohs excision of a basal cell carcinoma. The nasal defect involved the dorsum and the right nasal sidewall (Figure 2A and B). It was initially believed that a paramedian forehead flap would be required, but an extended cheek flap was first attempted, which ultimately produced excellent results. A conchal cartilage graft was used to provide support to the middle cartilaginous vault. Wide undermining in a deep subcutaneous plane into the medial cheek and medianmost portion of the right lower eyelid was performed. Similar undermining was performed on the contralateral right lateral sidewall and dorsum. Closure was achieved with bilateral advancement of the flaps, with the intention of placing the scar at the ipsilateral dorsal and sidewall subunit junction (Figure 2C and D). The

---

**METHODS**

All patients were referred to the senior author for repair of nasal defects after Mohs micrographic surgery. There were 12 patients included in this retrospective review. All patients in this series had a defect that covered more than 50% of the nasal sidewall subunit, and in many patients this defect was more extensive, involving the adjacent nasal dorsal subunits and the medial cheek skin as well. In particular, patients who were selected for this series might normally undergo reconstruction using cheek advancement flaps to reconstruct the lateral aspect of the nasal sidewall subunit, followed by the use of other techniques, such as full-thickness skin grafts and/or other regional flaps (eg, glabellar, dorsal nasal, or paramedian forehead flaps). Repair with extended cheek flaps and/or advancement of contralateral nasal dorsal and contralateral nasal sidewall skin was selected in each of these cases. Key techniques include the placement of cheek advancement flap incisions in the melolabial crease and at the junction of the eyelid and cheek subunit, as well as the placement of sutures from the deep dermis to the pyriform aperture periosteum to create the proper contour transition from the cheek onto the lateral sidewall of the nose.
The patient underwent an operation again at a later date for further work secondary to scarring at the right lateral canthus, brow ptosis, and nasal obstruction. The nasal obstruction was believed to be caused by a deviated septum and the loss of structural support at the time of nasal reconstruction with sidewall collapse. Nasal obstruction resolved with septoplasty. The final result is shown in Figure 2E and F.

CASE 3

An 88-year-old woman with medical history significant for hypertension, type 2 diabetes mellitus, cerebrovascular accident, and coronary artery bypass graft presented after Mohs excision of a basal cell carcinoma. The defect was full thickness and not only involved the right nasal sidewall but also extended into adjacent nasal subunits, including the dorsum, tip, and right ala (Figure 3A and B). The patient was noted to have a very low hairline, making a paramedian forehead flap suboptimal (vertical forehead height, 4-5 cm). We hoped to keep morbidity to a minimum because of her age and fragile health. Reconstruction of an internal lining was achieved using a septal flap, with septal and conchal cartilage used to provide structural support. Wide undermining was performed in the ipsilateral cheek as well as the contralateral sidewall and dorsum, and closure was accomplished with bilateral advancement of the flaps (Figure 3C). After the operation, the patient developed an anterior inferior necrosis of the distal portion of the right flap (Figure 3D). At 13 days after the operation, the wound was debrided and the flap readvanced with use of local anesthesia in the clinic, with successful closure of the defect. The result was acceptable but limited by scar violation of the tip subunit and blunting at the alar-cheek junction (Figure 3E and F). Further revision could improve these issues, but she declined this option.

CASE 4

A 61-year-old woman with medical history significant for hypertension, hyperlipidemia, and tobacco dependence presented after Mohs excision of a basal cell carcinoma. Of note, the patient continued to smoke before and after surgery. The defect involved the entire left sidewall onto the medial cheek, as well as most of the dorsal subunit with involvement of the left ala and most of the contralateral right lateral sidewall subunit (Figure 4A and B). The defect was superficial and did not involve nasal cartilage. Repair was performed with bilateral cheek flaps with closure at the junction of the dorsal subunit and left sidewall subunit (Figure 4C and D). On follow-up, the patient developed significant partial flap necrosis, which was debrided (Figure 4E). Following failure of the initial repair, the patient underwent reconstruction with a paramedian forehead flap. Subsequent healing was improved, but this remained an unsatisfactory result because of persistent poor scarring. The result might have been more optimal with inclusion of the tip subunit in the forehead flap reconstruction (Figure 4F).

COMMENT

An understanding of the nasal subunit principle is readily accepted as a key technique for obtaining optimal nasal reconstructive results. Although numerous authors have debated the usefulness of the nasal subunit principle, there has been little debate on the necessity of individual subunits. Our experience with reconstruction of complex nasal sidewall defects with adjacent cheek advancement flaps, with or without contralateral nasal dorsal and sidewall advancement flaps, is presented as a valuable reconstructive option, but more significantly, our experience challenges the need for separation of the nasal sidewall subunit in all cases. The contour and topography of the nasal sidewall unit is the least distinct and its projection is the least prominent of the nasal subunits. These features make the boundaries of the nasal sidewall unit less visually defined, and because of this, we have found that disregard to the preservation of this unit generally has little consequence when the cheek skin is carefully advanced toward the dorsal subunit junction. Local flaps using adjacent tissue offer numerous advantages, including optimal color, texture, and skin thickness matches. The most adjacent tissue to the nasal sidewall subunit is the cheek, and the use of extended...
check flaps provides an ideal tissue match. Cheek flaps are superior to forehead and glabellar flaps as well as to skin grafts in these respects.

Perhaps more important is the contour advantage provided by cheek advancement flaps. An analysis of the normal anatomy of most noses shows that there is not a distinct transition between the sidewall of the nose and the medial cheek soft tissue. Although there is a sharp separation between the ala and cheek, superior to this junction, the nasofacial sulcus is generally a relatively gentle transition from the cheek to the nasal sidewall. This explains the often obvious scars that result from wound closures placed too laterally on the nasal sidewall or medial cheek. For example, this deformity has been seen when elective Weber-Fergusson incisions are made in surgical oncology if the incision is placed too laterally within the nasal sidewall subunit. Because of the relatively indistinct border at the junction of the sidewall subunit and cheek subunit, even wound closures placed in accordance with the subunit principle may produce conspicuous scars.

Our experience, as seen in this series of patients, has shown that the use of cheek flaps for repair of nasal sidewall defects can be expanded to include the repair of complex nasal dorsal sidewall defects involving adjacent subunits. Traditionally, defects of this size have been repaired with either paramedian forehead flaps or skin grafts. As already noted, cheek flaps provide a tissue match superior to both paramedian forehead flaps and skin grafts and also provide an advantage over a paramedian forehead flap by being a single-stage procedure. Perhaps more important is the smooth transition created between the cheek and nose when using this technique. Patients who have a more distinct transition from the medial cheek onto the sidewall of the nose will require the subcutaneous “pexing” sutures to create some angulation of the flap between the cheek and nose. However, it is our experience that even an overly flat transition is preferable to a distinct scar angulation that is sometimes created by a flap closure placed too lateral on the nasal sidewall. Finally, an additional advantage in our series is that a satisfactory outcome was achieved in a patient who was a suboptimal candidate for a paramedian forehead flap because of a very low hairline. With the use of extended cheek flaps, a hair-bearing flap and a staged procedure were both avoided.

Undoubtedly, the random blood supply of an extended cheek flap with advancement of contralateral nasal skin is less robust than that of other flaps, such as the axial-supplied paramedian forehead flap. The main complication we experienced was primarily related to tension and blood supply in a patient who was a smoker at the time of surgery. In retrospect, a paramedian forehead flap would have been a more optimal choice. The other complication in our series was partial necrosis of the distal portion of an extended cheek flap, which was successfully repaired with readvancement of the flap (case 3).

The comparatively tenuous blood supply, especially in the leading edge, of an advancement flap may limit its application, but in many patients without significant vascular risk factors, an extended cheek flap with advancement of contralateral nasal skin may be considered the preferred reconstructive method. In support of this, the inherent morbidity of a 2-stage procedure is avoided and a potentially superior cosmetic outcome can be achieved. This is especially true in patients with a low hairline, such as in case 3, because a paramedian forehead flap may not be a viable option.

In conclusion, for simple and complex nasal dorsal defects, cheek flaps with advancement of contralateral nasal skin is an alternative method of reconstruction and, in many cases, superior to traditional methods. In addition, we question the inclusion of the nasal sidewall subunit in the nasal subunits.

Accepted for Publication: June 3, 2011.
Correspondence: John L. Frodel, MD, Department of Otolaryngology—Head and Neck Surgery, Geisinger Medical Center, 100 N Academy Ave, Danville, PA 17822 (jlfrodel@geisinger.edu).

Author Contributions: Study concept and design: Haugen and Frodel. Acquisition of data: Haugen and Frodel. Analysis and interpretation of data: Haugen and Frodel. Drafting of the manuscript: Haugen and Frodel. Critical revision of the manuscript for important intellectual content: Frodel. Statistical analysis: Haugen and Frodel. Administrative, technical, and material support: Haugen and Frodel. Study supervision: Frodel.

Financial Disclosure: None reported.
Previous Presentation: This study was presented at the 2010 Combined Otolaryngology Spring Meeting and Triological Society Annual Meeting as a poster presentation; April 28-May 2, 2010; Las Vegas, Nevada.

REFERENCES