Expanded Applications of the Dorsal Nasal Flap

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Objective: To describe new applications for the dorsal nasal flap technique of facial reconstruction.

Methods: Retrospective review of surgical records of patients in whom the dorsal nasal flap technique was used.

Results: The dorsal nasal flap technique was used in 61 patients to repair defects ranging in size from $12 \times 17$ mm to $35 \times 40$ mm.

Conclusion: The dorsal nasal flap technique is more versatile than has been traditionally appreciated and can allow single-stage reconstruction of many sizes of defects affecting various areas of the nose.

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The dorsal nasal flap was introduced into the repertoire of the facial reconstructive surgeon in 1967 by Rieger, who described the creation of a random skin flap based at the lateral nasal margin and formed by an incision extending from the medial brow area at the flap base upward into the glabellar skin and downward along the contralateral nasobuccal sulcus almost to the alar rim and then medially to the defect. The flap was described as useful for repairing defects of the lower half of the nose—particularly the tip—that measure 2 cm or less in diameter. This flap technique has become a standard option for reconstructing defects of the nasal tip.

Modifications of the dorsal nasal flap were subsequently described in the surgical literature. Soon after publication of Rieger’s report, Marchac described the flap as axial (instead of random) and based on a vascular pedicle emerging near the inner palpebral ligament. This clarification allowed a narrower pedicle and therefore greater flexibility, thus permitting the use of the flap for repairing defects of the lateral as well as the medial aspects of the nasal tip. Subsequent publications focused on improving the cosmetic outcome. All of these reports, however, agreed on the indication initially described by Rieger and then expanded by Marchac: reconstruction of defects of the lower half of the nose that measure 2 cm or less in diameter and are located 5 mm or more from the alar rim.

At the Mohs surgery center in the Kaiser Permanente San Rafael Medical Center in California, we have reconstructed more than 10,000 Mohs defects in the past 17 years, including more than 3800 nasal defects. We have found the dorsal nasal flap technique to be useful for repairing a variety of defects that differ from historic indications for the flap. We describe our experience using this flap in situations that fall outside of Rieger’s initial indication.

METHODS

To identify all patients who underwent repair of nasal or medial canthal defects at the Mohs surgery center, we queried a Microsoft Access database containing the records for procedures performed both in the operating room and in the clinic during the 17-year period extending from 1988 through 2005. The database inquiry identified 3823 patients with nasal lesions; 3721 of these patients had lesions of the nasal ala, nasal tip, nasal bridge, alar rim, alar groove, or medial canthus or in a nasal location not otherwise specified. Of these 3721 patients, 374 received flap closure or unspecified repair for defects measuring 15 mm or more in one dimension and 10 mm or more in the other dimension. Operative notes for these patients were reviewed to identify the cases in which the dorsal nasal flap technique was used for facial reconstruction.

The dorsal nasal flap (Figure 1 and Figure 2) is created by making the initial inferior incision laterally from the edge of the defect to the nasofacial groove on the side of the pedicle. The vertical limb on this side is then drawn slightly lateral to the groove upward to-
ward the medial canthus (Figure 1B), stopping short of the medial canthus to preserve the pedicle. Two oblique glabellar incisions are extended downward on each side, each to a point 1 cm superior to the canthal tendon (Figure 1B). The vertical incision on the side contralateral to the pedicle is extended from the glabellar incision down to the alar groove. This incision is then connected to the defect with an incision along the alar groove. These incisions are designed to allow rotation of the glabellar apex downward to the medial canthal tendon. The flap is elevated in a plane immediately superficial to the periosteum (Figure 1C) and includes the procerus muscle. The medial canthal tendon is identified, and 7 to 10 mm of tissue superior to the tendon is bluntly dissected directly on the periosteum of the nasal bone to avoid transecting the arterial supply of the flap. Doppler location of the artery may be helpful but is not required. Bipolar cautery is used to ensure meticulous maintenance of hemostasis. The glabellar apex is sutured down to the canthal tendon (Figure 1D) to avoid webbing and to reduce tension at the distal tip. The glabellar defect (Figure 1E) is closed in an A-T fashion (Figure 1F) after excision of excess subcutaneous tissue to reduce blunting of the nasofrontal angle. The flap becomes pallid after rotation but reperfuses well after several hours.

Rotation of a large flap often creates a secondary defect in the nasofacial groove area. This secondary defect is closed by a cheek advancement procedure that may necessitate excision of a crescent of skin lateral to the ala and an incision in the superior nasolabial fold to allow advancement of the flap. To avoid tenting, the cheek flap is sutured to the soft tissue or periosteum of the lateral nasal wall. Defects in the upper half of the nasal dorsum are addressed by creating a “truncated” dorsal nasal flap (Figure 3), the design of which differs from the basic design as follows: The ipsilateral oblique incision is begun at the superior border of the defect and is carried into the glabellar skin, and the contralateral limb is carried downward to a point just superior to the opposite medial canthus. The flap may be elevated as a skin-only flap, but the procerus is usually left in place to ensure viability. Closure for the truncated dorsal nasal flap is the same as for the basic flap.

Defects that affect the alar rim are repaired using a flap designed similarly to the basic flap but with some modifications (Figure 4): At the rim defect, the graft is thinned to a skin-only flap and is folded back on itself; the double-sided flap is then secured to the alar remnant with 6-0 polygalactin subcuticular and 6-0 mild chromic skin sutures. To stent the opening, folded Silastic sheeting measuring 0.1 cm in thickness and coated with mupirocin ointment is sutured in the naris and left there for 7 days. Further modification is needed for repair of large defects (ie, those measuring ≥35 mm in greatest dimension) such as that shown in Figure 5. Rotation of the flap into the defect leaves a defect with a maximum dimension as great as 1 cm located in the lateral aspect of the dorsum superior to the alar groove. Closure of the glabellar defect created by a flap this large requires resection of a large midline dog-ear, which

Figure 1. Schematic drawings illustrate the basic procedure for creating dorsal nasal flap. A, Uncorrected defect. B, Skin incisions (for detailed description, see the “Methods” section). C, Resultant flap is elevated, and the medial canthal tendon is identified. D, The glabellar apex is sutured to the canthal tendon. E, Glabellar defect resulting from suturing the apex to the tendon. F, A-T closure of glabellar defect.
is corrected primarily. The associated skin is harvested as a full-thickness skin graft that is thinned and sutured into the superior aspect of the dorsal defect. Creation of any of these dorsal nasal flaps may result in a dog-ear at the point of rotation. This dog-ear may be revised if necessary in the office 3 to 4 weeks after completion of the primary procedure.

Figure 2. Photographs show nasal defect that was repaired using the most common (basic) type of dorsal nasal flap. A, Intraoperative view of defect. B, Intraoperative demarcation of proposed incision. C, Postoperative view of completed reconstruction.

Figure 3. Photographs show nasal defect that was repaired by using a “truncated” dorsal nasal flap. A, View of defect in upper half of nasal dorsum. B, Intraoperative demarcation of proposed incision. C, Intraoperative view of flap positioned over defect. D, Intraoperative view of flap and its donor site prepared for final closure. E, Postoperative view of completed reconstruction.
RESULTS

One dorsal nasal flap was created in each of 61 patients (26 men and 35 women; age range, 29-87 years). In these 61 patients, the defects resulted from basal cell carcinoma (n=46), squamous cell carcinoma (n=8), lentigo maligna (n=3), or microcystic adnexal carcinoma (n=1). The smallest defect measured 12 × 17 mm; the largest, 35 × 40 mm. Follow-up time ranged from 3 months to 17 years. Complications, which were minor in all patients, included a small stitch abscess (n=2) and hypertrophic scar formation (n=2). Sixteen years after undergoing reconstruction, 1 patient presented with alar stenosis, which was successfully revised. This patient’s initial defect had not included the alar rim. No flap loss was observed, but 1 patient with a combined flap had loss of the full-thickness skin graft. One recurrence, or second primary lesion, was observed at the excision site at 10 months.

Postoperative follow-up showed good cosmetic outcome (Figures 6, 7, 8, and 9). Color match was good or excellent. Telangiectasias at the flap tip were a common finding and responded well to laser treatment. At 8 months after surgery, the patient with a truncated dorsal nasal flap had scars that were scarcely visible (Figure 7). She also had no distortion of the lower eyelid or alar rim (Figure 7). At the follow-up examination, the patient who received reconstruction of the alar rim defect had good color match, minimal scarring, and no alar stenosis (Figure 8). The patient with the composite flap (Figure 9) had slight hypertrophy of the scar along the left superior edge of the flap but had overall good match of color and texture.

COMMENT

The dorsal nasal flap was first described in 1960 as a skin flap used to reconstruct defects located on the superior aspect of the nose.3 This flap (which we have named the truncated dorsal nasal flap) is essentially a rhomboid flap that draws its material from excess glabellar skin and uses the vertical glabellar furrows to hide the scars created by closure of the donor site. As a skin-only flap, the truncated dorsal nasal flap represents a random flap that avoids the “pincushioning” effect (often seen with the bilobed flap), distortion of the nose (as can result from a nasally based rhomboid flap), and potential ectropion (as can result from a cheek-based rhomboid flap).

The dorsal nasal flap was first popularized in 1967, when Rieger1 described it as useful for repairing defects 2 cm or less in diameter located in the lower half of the nose. The author described a random skin flap that as such required a base extending along the entire length of the nose. In contrast, a modified flap that was de-
scribed in 1970 in the French-language literature\(^2\) was a pedicled flap based on the vessels of the medial canthus (branches of the anastomosis of the angular and supra-trochlear vessels), allowing a much narrower base and consequently freer rotation and more precise refinement than was possible with the random skin flap.\(^2,4\) The results of cadaveric dissection by the senior author (C.P.H.) showed that this arterial supply is located a mean of 7 to 8 mm above the medial canthal ligament.\(^5\)

Cosmetic improvements for the flap were suggested in later publications. In 1993, de Fontaine et al\(^6\) applied the subunit principle by suggesting the use of an ipsilaterally based pedicle in repairing lateral defects (to avoid creation of a dorsal nasal scar) and placement of the inferior incision in the alar crease (instead of extending the incision across the alar subunit). Reports published in the past 15 years have focused on patient selection as a way to gain optimal cosmetic outcome. In 1999, Rohrich et al\(^7\) suggested that if the use of the flap is limited to reconstructing defects less than 2 cm in diameter located in the distal half of the nasal dorsum and 1 cm or more from the rim and extending to (but not beyond) the tip-defining point, the surgeon can avoid making a glabellar incision and creating tip elevation and alar asymmetry. In 2000, Zimbler and Thomas\(^8\) suggested that the use of the flap be limited to the reconstruction of defects affecting the distal third of the nose and located 5 mm or more from the alar rim and that the surgeon should avoid extending incisions above the medial brow area. Each of these modifications functions to select patients for whom the creation of a dorsal nasal flap would provide the best possible cosmetic outcome for the nasal defect.

Although these authors raise valid points with regard to the optimal aesthetic outcome that is achievable with the flap, we have faced different dilemmas. For the most part, our population cannot afford extended time away from work as may be required by a temporarily disfiguring multistaged procedure such as the forehead flap procedure. Other patients have refused use of the forehead flap technique out of concern about its effect on others, particularly small children, who may be frightened by the flap’s appearance before revision surgery. Moreover, many of our patients are elderly persons who must travel to the medical center from considerable distances and cannot reliably find the necessary transportation for

Figure 5. Photographs show large nasal defect that was repaired using a "composite" dorsal nasal flap technique. A, Intraoperative frontal view of defect. B, Lateral view of defect. C, Intraoperative superior view of defect and demarcation of proposed incision. D, Intraoperative view of flap rotated into defect. E, Full-thickness skin graft sutured into superior aspect of dorsal defect.
this long trip. For these patients, a single-stage procedure is a very attractive option.

Our experience shows that, with the modifications described above, the dorsal nasal flap can be used to reconstruct a variety of nasal defects. The modified flap has several distinct advantages. It is essentially a single-stage procedure that allows patients a quick return to normal work and social situations, even when the proce-
dure results in a dog-ear that requires revision 3 to 4 weeks later. Creating the flap from nasal and glabellar skin affords excellent color and texture match, even with the full-thickness skin grafts used in reconstructing large defects. Using the modified flap technique avoids the creation of a large forehead scar (as results from creation of a forehead flap), and the glabellar scar is well hidden in the vertical furrows of the brow. Hair removal at the flap margin may be necessary for creating the forehead flap but is not necessary for creating the dorsal nasal flap. Also, whereas recipients of the modified dorsal nasal flap can resume wearing glasses immediately after the procedure, the forehead flap may interfere with this activity between operative stages. Moreover, when an alar defect is present, the folded flap is the only flap needed to repair the dorsum and ala; a second flap is not needed for repairing the alar rim. Use of the folded flap has not resulted in clinically significant notching of the rim.

The disadvantages of the composite flap are few and are relatively minor. Use of the flap can result in minor elevation of the nasal tip, and patients with a dorsal nasal hump may have an improved cosmetic outcome if the hump is reduced during the primary procedure. Also, the inferior scar and any necessary full-thickness skin graft may violate subunit lines. Defects larger than $35 \times 40$ mm cannot be reconstructed using the composite flap and instead require creation of a forehead flap.

In conclusion, we describe modified dorsal nasal flap techniques that are suitable for single-stage reconstruction of various types of nasal defects. These techniques produce good cosmetic results and have many advantages and few disadvantages. When contemplating options for nasal reconstruction, surgeons should consider using these modified flaps.

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Author Contributions: Drs Bitgood and Hybarger had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Figure 8. Photographs show patient in Figure 4 at postoperative follow-up examinations. Note good color match, minimal scarring, and absence of stenosis. A, Frontal view 8 months after surgery. B, Frontal view 7 years after surgery. C, Lateral view 7 years after surgery.

Figure 9. Photographs show patient in Figure 5 at postoperative follow-up examination 10 months after surgery. A, Frontal view of entire healed site. B, Left lateral view shows slight hypertrophy of scar along left superior edge of flap. C, Right lateral view shows healed graft donor site.
sibility for the integrity of the data and the accuracy of the data analysis. **Study concept and design:** Bitgood and Hybarger. **Acquisition of data:** Hybarger. **Analysis and interpretation of data:** Bitgood and Hybarger. **Drafting of the manuscript:** Bitgood. **Critical revision of the manuscript for important intellectual content:** Hybarger. **Study supervision:** Hybarger.

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## REFERENCES


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**Announcement**

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