Triple-Flap Technique for Reconstruction of Large Nasal Defects

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Objective: To determine the usefulness of a triple-flap technique for repair of large zone 2 Mohs defects of the nose.

Methods: The triple-flap technique was performed on 10 fresh adult cadaver heads that had been injected intra-vascularly with blue dye. Two distances were measured and recorded: (1) the distance from the most lateral portion of the alar crease to the transverse facial artery; and (2) the distance from the dorsal nasal artery to the medial canthi. Data were also collected on patient age and sex and on the size of the Mohs defect in a series of 10 patients.

Results: The cadaver study showed that the dorsal nasal artery was located a mean distance of 7.4 mm superior to the medial canthal tendon and that the transverse facial artery was located a mean distance of 19.2 mm lateral to the alar crease. In our series of 10 patients (2 of whom are described herein), zone 2 defects (including full-thickness unilateral alar defects) as large as 3.5 × 5.0 cm were reconstructed in 1 stage using local anesthesia. No flap loss resulted.

Conclusions: Cadaver dissection enabled us to identify the blood supply of the dorsal nasal flap in relation to the medial canthal tendon and the blood supply to the superior melolabial flap in relation to the alar crease. For a select group of patients with large zone 2 Mohs defects of the nose, the use of the triple-flap technique to repair the defect is a viable alternative to the use of a forehead flap technique.

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RECONSTRUCTION of large surgical defects of the nose, particularly those located in zone 2, has usually required the creation of a paramedian vertical forehead flap.1-3 Unilateral alar defects may be repaired using a superiorly based melolabial flap, a bilobed flap, or a large dorsal nasal flap.4 Nasal tip defects usually require the creation of a dorsal nasal flap or a bilobed flap.5,6 Selected central tip defects and supratip defects may also be reconstructed with a modified Rintala flap.7 To our knowledge, a combined triple-flap technique using a superiorly based melolabial flap, ipsilateral dorsal nasal flap, and contralateral cheek advancement flap to reconstruct defects that are too large for either flap alone has not been described. We successfully used this technique in 10 patients and found flap viability to be excellent. The procedure provided coverage for defects as large as 3.5 × 5.0 cm in the middle and distal areas of the nose; these defects included full-thickness alar defects, and reconstruction resulted in excellent match of tissue color, texture, and thickness. Surgical revision is required but usually consists of a single procedure that uses local anesthesia and is done on an outpatient basis. Use of the triple-flap technique is thus an additional option for the reconstruction of midnasal and distal nasal defects in a select group of patients who are not suitable candidates for reconstruction with a forehead flap.

REPORT OF CASES

CASE 1

An 86-year-old man was referred for recurrent basal cell carcinoma of the left side of the nose. Micrographic resection had required the removal of the left nasal bone, most of the upper lateral cartilage, and some of the lower lateral cartilage. The skin and soft tissue of the left side of the nose and 2 × 3 cm of the right lateral nasal skin and soft tissue had been removed. The final defect measured 3.5 × 5.0 cm (Figure 4). One week later, the distal tip of the left cheek flap was excised and used to line the interior surface of the same flap in the area overlying the full-thickness defect in the left side of the nose. A Silastic splint was placed on the left. The splint and sutures were removed after 1 week, without flap loss. Six weeks later, with the patient under local anesthesia, debulking of the flaps and minor scar revisions were performed. The final nasal contour, symmetry, and function (Figure 5) were still excellent when the patient was seen 6 months after surgery.

See also page 22
MATERIALS AND METHODS

CADAVER STUDY

The study included 10 fresh adult cadaver heads from persons who were approximately 60 to 70 years of age at the time of death. Each cadaver head had a neonatal feeding catheter that was connected to intravenous tubing, threaded into the common carotid bilaterally, and secured in place with a 3-0 silk suture. A total of 500 mL of lactated Ringer solution was run through each common carotid artery, and 30 mL of blue dye (No. 896170; Bradley Products, Blooming- ton, Minn) was then injected into each common carotid artery. Each head was fixed in formalin, and flaps were designed and dissected. The distance from the most lateral portion of the alar crease to the transverse facial artery and the distance from the dorsal nasal artery to the medial canthus were measured and recorded (Figure 1). The dorsal nasal artery was located an average 7 to 8 mm above the medial canthal tendon, and the transverse facial artery was located 18 to 20 mm lateral to the alar facial crease.

PROCEDURE

The series of 10 patients included in the study had zone 2 Mohs defects that were considered to be too large for reconstruction by any technique other than a forehead flap.

<table>
<thead>
<tr>
<th>Patient No./Age, y/Sex</th>
<th>Defect Size, cm</th>
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<tr>
<td>1/70/M</td>
<td>3.0 x 4.0</td>
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<tr>
<td>2/86/M</td>
<td>3.5 x 5.0</td>
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<td>3/80/F</td>
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</tr>
<tr>
<td>5/72/F</td>
<td>3.0 x 4.0</td>
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<tr>
<td>6/73/F</td>
<td>3.5 x 4.0</td>
</tr>
<tr>
<td>7/50/M</td>
<td>3.0 x 4.0</td>
</tr>
<tr>
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<td>9/56/F</td>
<td>2.5 x 3.5</td>
</tr>
<tr>
<td>10/85/M</td>
<td>3.5 x 5.0</td>
</tr>
</tbody>
</table>

In most of the 10 patients, tumor extirpation required resection of portions of the upper or lower lateral cartilage, septal cartilage, or nasal bones to ensure clear margins. Large dorsal nasal humps were resected to provide an additional deep margin and to enhance the final cosmetic result. If bone was removed, both the dorsal nasal and melolabial flaps were partially elevated and replaced at this time to take advantage of the delay phenomenon while bone was being processed. The patients were returned to the operating room after 2 to 7 days, when the final paraffin sections were tumor-free. Three flaps were created for each patient: the dorsal nasal flap, the melolabial flap, and the cheek advancement flap (Figure 2).

CASE 2

An 82-year-old woman was seen for a second recurrence of basal cell carcinoma of the nasal tip. Mohs excision resulted in a 2.5 x 3.5-cm defect that affected the right ala, nasal tip, and distal half of the nasal dorsum (Figure 6). Ten weeks after reconstruction was performed with a triple-flap technique, a debulking procedure was performed with the patient under local anesthesia. Photographs were taken 13 weeks after the reconstructive procedure (Figure 7).

The dorsal nasal flap is designed to be as large as technically feasible. The initial inferior incision is taken directly lateral from the lower edge of the defect to the nasofacial groove, and the vertical limb is drawn in (or slightly lateral to the groove) up to the medial canthus. The oblique gabellar incisions are designed to allow rotation of the gabelellar apex down to the canthal tendon (so which the gabelellar apex is sutured to avoid webbing) and to reduce tension at the distal tip. The flap is elevated just above the periosteum (including the procerus muscle) and incised down to a point 1 cm above the opposite canthal tendon on the base side of the melolabial flap. Great care is taken to avoid injury to the canthal vessels at the base of the flap, and meticulous hemostasis is obtained using bipolar cautery. The gabellar defect is closed in a V-Y fashion. This flap becomes pallid after rotation but reperfuses well in several hours.

The superiorly based melolabial flap is then elevated, with care taken to avoid injury to the transverse facial arterial branch. Full-thickness alar defects are repaired by thinning the distal flap to dermis and by folding the tip to provide lining. Thin cartilage grafts may be obtained from the septum or auricle, and folded flaps are supported by rolled silicon sheeting (0.020-0.040 mm) covered with mupirocin (Bactroban) and sutured to the columella and sill. Where possible, the undersurface of the flap is sutured to the lateral nasal wall or periosteum with 5-0 monofilament polybutester sutures to avoid tenting.

For defects of the magnitude described here, rotation of the large dorsal nasal flap creates a secondary defect in the nasofacial groove area that is closed by a cheek advancement flap (Figure 3). This defect may require excision of a lateral alar crescent (ie, to allow advancement of the flap) and an incision in the inferior nasofacial fold. The flap is sutured to the soft tissue or periosteum of the lateral nasal wall with 5-0 monofilament polybutester sutures to avoid tenting.

Before final closure, all wound edges are precisely trimmed with a microblade to remove granulations. All flaps are then approximated with 5-0 monofilament polybutester inverted sutures in the deep layer, and the skin is closed using either a running, locking 6-0 mild chromic suture with a needle (CE-20 Sherwood-Davis & Geck; American Home Products, Madison, NJ) or a 6-0 monofilament polybutester suture. The junctional “dogear” between the dorsal and melolabial flaps is not excised until revision, about 3 to 4 weeks later. The flaps are dressed with antibiotic ointment and a non-adhesive, absorbent, sterile gauze pad. Splints and sutures are removed in 5 to 7 days, and incisions are taped with wound-closure strips for another week. We believe that an exact closure technique results in inconspicuous scars.

Two representative cases from our series, which involved 10 patients with an average age of 72 years, are reported to illustrate the surgical outcome.

RESULTS
vertical junctional scar between the dorsal and melolabial flaps is the only scar that does not conform to subunit lines; we do not believe that this junctional scar is a major disadvantage in this subset of patients.

**COMMENT**

The cadaver dissections showed the blood supply of the dorsal nasal flap to be an anastomosis of the dorsal nasal artery and supratrochlear artery and an axial pattern of medium-sized, unnamed branches distributed along the flap and providing excellent blood supply. The medial canthal tendon is an essential landmark for identifying this blood supply: First, the medial canthal tendon is identified; then, 7 mm of tissue superior to the tendon is bluntly dissected directly on the periosteum of the nasal bone to avoid transecting the artery. Too superficial a dissection is likely to transect the blood supply to the flap.

The blood supply to the superior melolabial flap is the transverse facial artery. In our study, this artery was located a mean lateral distance of 19.2 mm from the most lateral aspect of the alar crease. The location of this artery should therefore be estimated before dissection of the lateral limb of the flap to avoid transecting the blood supply.

From 1978 to 1998, we reconstructed all large surgical defects of the nose with paramedian forehead flaps, a technique that continues to be commonly used for very large defects. Since 1998, however, the combined use of 3 facial flaps (which we call the triple-flap technique) has been used to repair large zone 2 nasal defects and may be extended to include unilateral full-thickness alar defects. All 10 patients were satisfied with the cosmetic results after flap revision.

The forehead-flap technique is the best choice for repairing large nasal defects (>3.5 × 5.0 cm) that extend over the entire nose, especially when these defects include both alae, the columella, or all 3 structures (Table). However, the necessity of using the forehead flap for repairing selected smaller nasal defects has recently been questioned. Recommended use of the triple-flap technique is limited to the repair of central or distal na-
Figure 4. Preoperative photographs show the surgical defect in case 1. A, View from right side. B, Frontal view. C, View from left side.

Figure 5. Postoperative photographs of the patient shown in Figure 4. A, View from right side. B, Frontal view. C, View from left side.

Figure 6. Preoperative photographs show the surgical defect in case 2. A, View from right side. B, Frontal view.
sal defects, the repair of defects measuring $3.5 \times 5.0$ cm or less, and the unilateral repair of alar defects. However, the triple-flap technique has 2 distinct advantages over the forehead flap technique: (1) it uses local tissue and therefore provides excellent match of color, texture, and thickness and creates no risk of hair transfer, whereas the forehead flap technique may produce differences in skin color and texture as well as unwanted hair transfer if a large flap is rotated; and (2) it is performed in a single stage and usually requires no delay (or only a brief delay) while bone or cartilage is being processed, whereas the forehead flap technique requires 3 weeks or more between flap rotation and division of the pedicle. This 3-week delay makes wearing eyeglasses impossible, and patients who have only a marginal social support system find the disfigurement emotionally difficult. The primary disadvantage of our triple-flap technique is a junctional flap scar that may not conform to subunit lines.

CONCLUSIONS

For a select group of patients with Mohs nasal defects in zone 2, the triple-flap technique is a viable alternative to the forehead flap technique. Using these well-known, reliable flaps in combination provides an additional surgical option for the reconstruction of nasal defects that result from tumor extirpation.

 Comparison of Forehead Flap Technique and Triple-Flap Technique for Repair of Zone 2 Mohs Nasal Defects

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<tr>
<th></th>
<th>Forehead Flap Technique</th>
<th>Triple-Flap Technique</th>
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<tr>
<td>Maximum reparable area</td>
<td>Defects $&gt;3.5 \times 5.0$ cm located in any area of nose, including bilateral alae and columnella</td>
<td>Defects $\leq 3.5 \times 5.0$ cm located in distal third to half of nose, nasal dorsum, or unilateral ala</td>
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<tr>
<td>Resultant color and texture match</td>
<td>Poor; may require hair removal</td>
<td>Excellent; no hair removal required</td>
</tr>
<tr>
<td>Time required</td>
<td>Pedicle separation must be delayed; $\geq 2$ revisions required</td>
<td>No delay and usually $1$ revision required</td>
</tr>
<tr>
<td>Psychological/lifestyle effects</td>
<td>Stress to patient awaiting pedicle separation; patient cannot wear glasses</td>
<td>Well tolerated; patient can wear glasses immediately</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>Does not prevent use of forehead flap at later date; center junctional flap scar may violate subunit lines</td>
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REFERENCES