Chapter 87 – Nasal Reconstruction

Frederic W.-B. Deleyiannis,
Jayakar V. Nayak

The nose is of critical aesthetic and functional significance. Mastery of nasal reconstruction requires not only a knowledge of flaps and grafts but also an appreciation of facial aesthetics and functional rhinoplasty. A skin graft or local flap will close most nasal defects, but without a comprehensive evaluation of the nasal defect and the anticipated reconstructive outcome, re-establishment of facial balance and nasal breathing can be lost.

Nasal defects represent tissue loss, often the result of tumor resection or trauma. To reconstruct a nasal defect aesthetically and functionally, one must understand the layers and volumes missing from the defect, the nasal subunits involved, the cartilage support structures required, and the color and thickness of the proper skin replacement. This chapter describes the basic principles of nasal reconstruction as applied to acquired nasal defects.

PATIENT SELECTION

It is critical to define the extent and significance of an acquired nasal deformity to the patient. As in many aspects of plastic surgery, congruence between what is perceived by the patient and observed by the physician is essential. Discrepancies in form or function are best addressed before any consideration can be given to surgical intervention. Smoking will increase the risk of partial or total loss of a skin flap.[1] This risk should be discussed with the patient. The surgeon should insist that the patient stop smoking at least 3 weeks before surgery, and this should be documented in the patient's record. Preoperative counseling is also crucial to best define the anticipated cosmetic results and limitations. This might include demonstrating certain procedures to the patient by using a mirror and outlining schematic figures of the intended surgery. If multiple, staged surgical procedures are needed, the timing of the procedures should be emphasized.

Because of the importance of the nose for body image, most nasal defects are reconstructed. The patient's age is not generally a contraindication to nasal reconstructive procedures. However, a patient's general medical condition, as well as the extent of the procedure, may influence the decision for or against surgery. Sometimes a nasal prosthesis is a valuable and recommended option (Fig. 87-1). If the nasal defect is a result of tumor resection, the pathology, as well as the need and the timing of any adjuvant therapy (i.e., radiation therapy), should be discussed in the context of tumor surveillance, recurrence, and wound healing.

Figure 87-1 An 83-year-old man after total rhinectomy before (**A**) and after (**B**) coverage with a nasal prosthesis.

In children, reconstruction should be initiated and, if possible, completed before they have attained school age to avoid psychosocial repercussions.[2] The reconstructed nose, with skin, lining, and support, will grow with the child. However, additional surgical procedures to increase the nasal airway, to add cartilage grafts for enhancement of projection or contour, and to revise scars are expected.

PREOPERATIVE PLANNING

Analysis of the Defect by Adjacent and Underlying Facial Structures

Extended nasal defects are those that extend beyond the nose and involve the cheek, upper lip, underlying maxilla, or any combination of these structures. Large cheek and lip defects may require free tissue transfer before nasal reconstruction (Fig. 87-2) to replace missing volume and skin. Small defects of the medial part of the cheek and upper lip can be repaired with cheek advancement flaps or nasolabial flaps at the first stage. A foundation of skin and fat should exist or be reconstructed along the region of the piriform aperture (i.e., the nasal platform) to support the reconstructed alar bases and columella and to position the new nose anterior to the maxilla so that it does not extend beyond its normal borders and flow onto the cheek. Cheek advancement flaps can be used as a foundation for the nasal base before median forehead flap reconstruction and can be used for replacement of the nasal sidewall (Fig. 87-3). The nasal platform and base should be in harmony with the eyes (i.e., the width of the alar base should approximate the intercanthal distance).

Figure 87-2 Reconstruction of the cheek and nose with free tissue transfer. **A,** A 4-year-old girl with total loss of the medial aspect of her left cheek (skin and underlying musculature) and heminose 1 year after an avulsion injury from a motor vehicle acci Intraoperative plan—scar to be excised and reconstructed with a scapular flap. The *stippled* region is the area to be augmented with partial de-epithelization of the scapular flap. **C,** Cheek defect re-created. **D,** Design of the scapular flap. **E,** One year afte reconstruction of the cheek with a scapular flap. **F,** First-stage nasal reconstruction 16 months after cheek reconstruction. The nasal defect is re-created, and a nasal template is designed from the contralateral side of the nose. **G,** First-stage nasal reconst The nasal lining is created with turnover flaps, and conchal cartilage is used for alar and tip grafting. **H,** Forehead flap for cutaneous covering. **I,** Second-stage nasal reconstruction, 4 weeks after the first stage. The forehead flap is bipedicled, and the flap thinned of frontalis muscle and subcutaneous tissue. **J,** Appearance after division and inset of the forehead flap (after the third stage).

Figure 87-3 Reconstruction of the cheek and nose with a cheek advancement flap. **A,** Cheek and nasal defect (skin zone I, lateral nasal sidewall). **B,** Cheek flap. **C,** Appearance 19 months after surgery.

Analysis of the Defect by Nasal Subunits

The nose is often divided into subunits (Fig. 87-4) that define areas of dissimilar skin texture and depth.[3–5] Borders between these areas are sites of shadow and highlights. The convex subunits of the nose are the tip, dorsum, alae, and columella. Application of the subunit principle is practical mainly for reconstruction of the convex subunits with flaps, not for the concave subunits—the nasal sidewalls and soft triangles. As skin flaps heal, they contract secondary to the collagen and myofibroblasts in the recipient bed. This contraction pulls the flap centripetally (i.e., trapdoors) into the convex shape of the unit that it covers. The subunit principle is not suitable for repair with skin grafts because skin grafts do not undergo trapdoor contraction. These grafts lie flat and do not bulge with wound contraction, probably because they lack a layer of subcutaneous fat. If more than 50% of the subunit is missing, the entire subunit (in particular, the tip or ala) should be replaced with a flap.

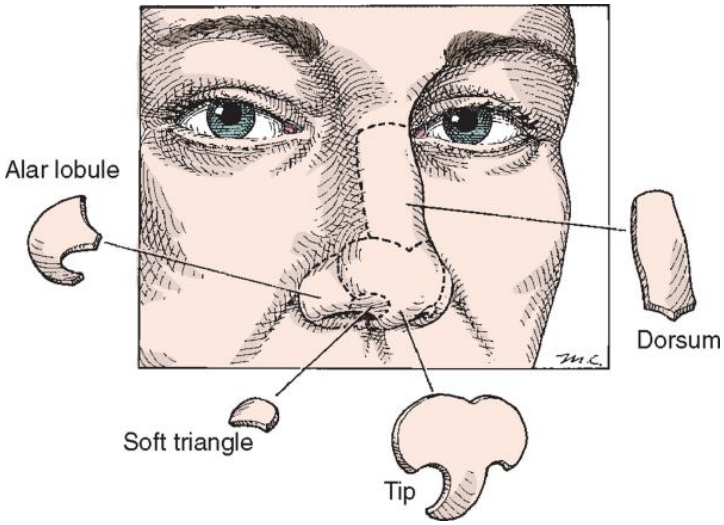

Figure 87-4 Nasal subunits. The surface of the nose can be segmented into distinct anatomic regions that correspond to sites of natural lines of shadow, curvature, and differing skin characteristics. The convex subunits of the nose are the tip, dorsum, alae, and columella.
(From Burget GC: Aesthetic restoration of the nose. Clin Plast Surg 12:463-480, 1985, with permission.)

The nose in a young child is smaller, flatter, and less defined than in an adult.[6] The subunit borders are less distinct, but even in children the subunit principle can be used as a technique to hide scars and harness flap contraction.

Analysis of the Defect by Nasal Layers (Skin, Cartilage, and Mucosa)

Accurate analysis of the defect with regard to the component layers of the nose is essential. In general, when only skin is missing, reconstruction can be done reliably with local flaps, and if the underlying framework is deficient, cartilage grafts are needed. The difficulty of the reconstruction increases as the amount of nasal lining diminishes.

The nose has three distinct zones of skin thickness with differing degrees of subcutaneous fat, sebaceous gland content, and mobility (Fig. 87-5).[7,8] The skin of zone I is nonsebaceous and mobile and covers the upper dorsum and sidewalls of the nose. Zone II contains thick, sebaceous, nonmobile skin and covers the supratip area, tip, and alar lobules. Zone III skin is thin, nonsebaceous, and fixed to the underlying alar cartilage or fibrofatty structures of the alar margin, soft tissue triangles, infratip lobule, and columella.

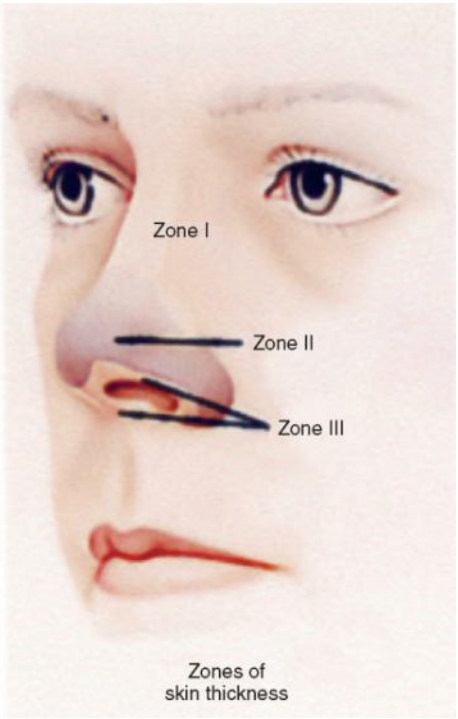

Figure 87-5 Depiction of the three zones of nasal skin types.
(Reprinted from Burget GC: Modification of the subunit principle for reconstruction of nasal tip and dorsum defects [commentary]. Arch Facial Plast Surg 1:16-18, 1999, with permission.)

SURGICAL APPROACH

Reconstruction of the nose begins with an analysis of the defect. With a diagnosis of the facial and nasal subunits involved and the nasal layers missing, one can now evaluate the various reconstructive options and plan the surgical approach.

Nasal Lining Options

Thin, vascular, and supple nasal lining remains the goal in reconstruction. Thick, bulky flaps, such as a nasolabial flap, will block the nasal airway.[9] Cartilage grafts placed on poorly perfused flaps will necrose and extrude. Lining flaps that are highly vascular and thin can be taken from multiple donor sites within the nose (Fig. 87-6).[9,10] Menick's technique of performing a folded forehead flap procedure in three stages offers a new, refined method of replacing nasal lining, and transfer of free fasciocutaneous flaps enables reconstruction of total or near-total defects.[11,12]

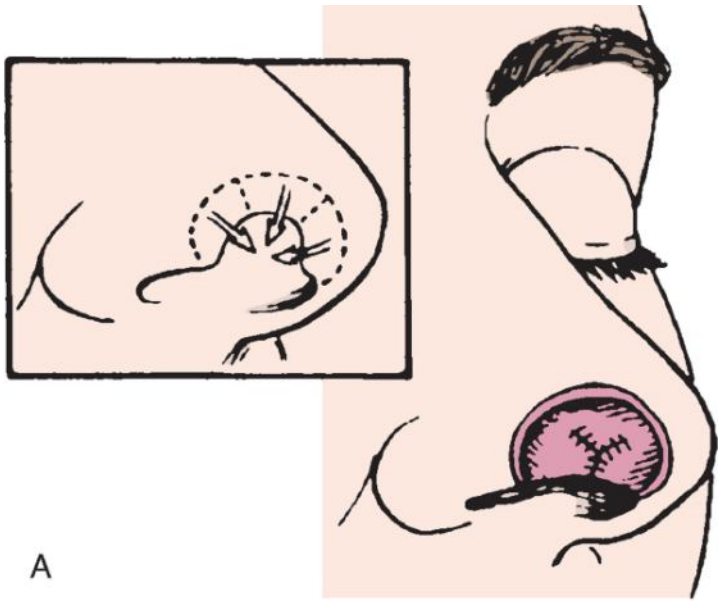

Figure 87-6 Nasal lining. Options for nasal lining include (**A**) the turnover/turn-in flap, (**B**) the septal mucoperichondrial flap, and (**C**) the bipedicled flap interposition.
(A and C, Reprinted with permission from Burget GC: Aesthetic reconstruction of the nose. In Mathes SJ [ed]: Plastic Surgery, vol 2. Philadelphia, Elsevier, 2006, p 578; and B, reprinted with pern and blood supply. Plast Reconstr Surg 84:189-202, 1989.)

Turnover Flaps

Turnover flaps are small flaps of skin surrounding a defect that are turned over like the pages of a book into the nasal airway. Because they are based on scar, their blood supply can be tenuous and their length is limited. If their blood supply appears inadequate at the time of reconstruction, cartilage grafting should be done secondarily.

Septal Mucoperichondrial Flaps: Ipsilateral and Contralateral

An ipsilateral septal flap, based anteriorly on the septal branch of the superior labial artery, has been described by Burget and Menick.[9] The flap pivots on an anterior-inferior point near the nasal spine and folds outward to provide lining for the nasal domes. The exposed septal cartilage is either harvested as a graft or left to remucosalize.

A contralateral septal flap can be harvested with or without septal cartilage.[9,13] This technique involves harvesting the contralateral septal mucoperichondrium and swinging it like a trapdoor underneath the nasal dorsum through a dorsal perforation in the septum. The flap can reach the nasal sidewalls but not the alar margins.

Bipedicled Lining Flaps

The nasal lining of the alar margin can be successfully reconstructed with a bipedicled lining flap (Fig. 87-7).[13] The flap is based medially on the septum and laterally on the vestibule and is pulled down to the alar margin. The secondary lining defect made above the alar margin can be covered with a contralateral (or ipsilateral) septal mucoperichondrial flap.

Figure 87-7 Superiorly based, two-stage nasolabial flap. **A,** Defect of the soft tissue triangle, frontal view. **B,** Oblique view. **C,** First stage: nasal lining reconstructed with a bipedicled lining flap (retracted downward with the skin hook, refer also to Figure septal cartilage used to buttress the soft tissue triangle. **D,** Superiorly based nasolabial flap used for cutaneous coverage. **E,** Second stage: nasolabial flap divided and inset, oblique view. **F,** Basal view. **G,** Appearance 1 week after the second stage, fro

Menick's Technique for Nasal Lining: The Folded Forehead Flap, Skin Grafts, and Three-Stage Nasal Reconstruction

To provide nasal lining, Menick has advocated folding the forehead flap on itself and insetting it into the defect (Fig. 87-8).[11,12] At a second operation 3 weeks later, the covering portion of the flap is separated from the nasal lining portion of the flap and lifted entirely off the nose. The nasal lining flap is now thinned by removal of the frontalis muscle and excess subcutaneous tissue. Cartilage grafts are placed at this second stage. The covering portion of the forehead flap is also thinned and then reattached to the nose. At a third stage 3 weeks after the second stage, the pedicle is divided. For large nasal defects, a full-thickness skin graft can be sewn to the edges of the mucosal defect and to the frontalis muscle layer of the forehead flap in the first stage. Wound healing and contracture are not initiated until the subcutaneous and frontalis planes are surgically injured. Therefore, the reconstructed lining of the folded flap or skin graft remains supple and soft until supported by the delayed placement of cartilage grafts during the second stage. Reconstruction in three stages with a folded forehead flap or a forehead flap with a skin graft offers an excellent

option for reconstructing a nasal defect with missing internal nasal lining.

Figure 87-8 Three-stage nasal reconstruction with a forehead flap. **A,** Alar defect, frontal view. **B,** Oblique view. **C,** First stage: design of a folded forehead flap for nasal lining and cutaneous coverage. **D,** Immediate postoperative appearance. **E,** Seco flap divided along the alar margin and nasal and cutaneous flaps thinned of frontalis muscle and subcutaneous tissue. **F,** Conchal cartilage harvested. **G,** Conchal cartilage graft to the ala. **H,** Third stage: division of the forehead pedicle and flap inset. **I,** Ap months after pedicle division, frontal view. **J,** Oblique view.

Microvascular Free Tissue

Free tissue transfer of a fasciocutaneous flap, usually a radial forearm free flap, can be done to reconstruct the nasal lining vault for total or subtotal loss of the nose (Fig. 87-9).[14,15] However, a bulky free flap will obstruct the nasal airway unless supported on the nasal septum. When the anterior nasal septum is present, Burget and Walton advocate rotating it forward as a septal pivot flap (Fig. 87-10).[16,17] This septal flap has the ability to support the length and projection of the nose without obstructing the airway. The raw external surface of the free flap is skin-grafted. At a second stage 5 to 6 weeks later, the skin graft and subcutaneous fat of the free flap are removed, and formal nasal reconstruction with cartilage grafting and a paramedian flap is carried out.

Figure 87-9 Radial forearm free flap (RFFF) for internal nasal lining. **A,** Near-total nasal defect, frontal view. **B,** Lateral view. **C,** Basal view. **D,** Template for the design of an RFFF for internal nasal lining. **E,** Harvest site and RFFF design. **F,** RFFF inset; forearm skin used for internal lining. **G,** Skin graft applied to the raw (i.e., external) surface of the RFFF. **H,** Postoperative appearance, frontal view. **I,** Lateral view. The patient will undergo removal of the skin graft, flap thinning, placement of a rib graft, and coverage with a forehead flap.

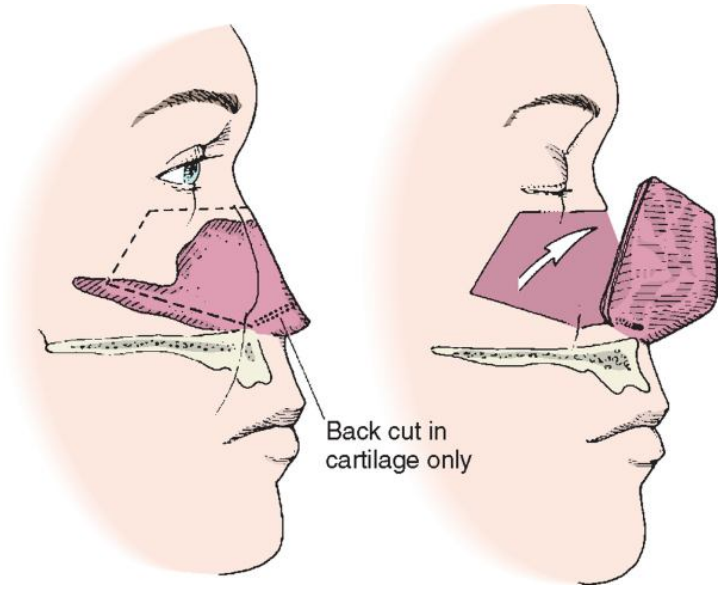

Figure 87-10 Septal pivot flap. To provide dorsal and caudal support, the central cartilaginous/bony septum can be pivoted or swung anteriorly. The blood supply of the septal pivot flap is centered over the septal branches of the superior labial arteries.

Without a septal pivot flap a single-paddle free flap will collapse against the piriform aperture. For correction of this problem, a double-paddle radial forearm free flap can be used to create double-vaulted nasal lining and columellar lining.

Skeletal Support

As the local flaps used for nasal reconstruction heal, the collagen and myofibroblasts within the flap and wound contract and pull the flap toward a center of centripetal contraction. Grafts of cartilage and bone support the skin flaps from contraction and after a few months show through the covering flap to give the reconstructed nose a normal shape. Cartilage and bone from the septum, the concha of the ear, or the ribs (sixth through ninth ribs) are the best donor sites.[18] Because the septum is a possible growth center, the ear and costal cartilage are better options for sources of cartilage grafts in children. Grafts will survive only if placed on a well-vascularized bed, such as that provided by septal flaps. With use of the folded forehead flap or microvascular free flaps, secondary placement of grafts is preferred.

To provide midline nasal support, there are several well-accepted options. A cantilevered bone graft can be harvested either from the skull outer calvaria or from rib as an osteochondral segment (Fig. 87-11).[18] A sturdy longitudinal segment can then be crafted to extend from the nasion to the superior aspect of the nasal lobule as an onlay or cantilevered graft. It can be secured in place by suture to the underlying cartilaginous dorsum or plated/wired to the frontal bone or nasal bones as needed. Smaller segments of calvarial bone, rib, or septal cartilage can be carved into longitudinal struts for more limited reconstructions, such as for the nasal sidewall.

Figure 87-11 Structural support of the nasal midline/dorsum. **A,** Costochondral graft carved into a "L" strut with alar battens. **B,** Cantilevered cranial bone graft to be fixed to the frontal skull with a miniplate.

For reconstruction of alar cartilage, strips of cartilage 4 to 5 mm in width and 1.5 to 2.0 cm long are harvested from the concha of the ear, septum, or rib (Fig. 87-12). To make an arch, one weakens or scores the cartilage in the area destined to be the lateral genu, and the cartilage is bent into a curve with one or two spanning mattress sutures. The intrinsic curves of conchal cartilage make it ideal for alar batten grafts, but conchal cartilage may be too weak to support a scarred nasal skin envelope. Septal and costal cartilage is stiffer than conchal cartilage and will better tolerate the compressive force of a contracted skin envelope. A separate cartilage graft should be used to brace the soft tissue triangle.

Figure 87-12 Reconstruction of cartilage support. If lining is created or preserved, cartilage from numerous sources (above: septum) can be tailored to restore the nasal contour and curvature. A cap graft or tip graft can be used to promote lobule projection.
(From Burget GC, Menick FJ: Nasal reconstruction: Seeking a fourth dimension. Plast Reconstr Surg 78:145-157, 1986, with permission.)

Nasal Skin Coverage

The size of the defect and the zone of nasal skin thickness can serve as a useful guide for selecting the appropriate skin cover. Because the skin of zone I is mobile, local rotation advancement flaps or primary closure can successfully reconstruct small defects (<1.5 cm). Zone II contains thick, sebaceous, nonmobile skin. The only donor skin that matches zone II is the remaining skin of zone II (i.e., transposed with a bilobed flap) or the forehead skin with its dense subcutaneous fat. Zone III skin is thin, nonsebaceous, and fixed to the underlying alar cartilage or fibrofatty structures. Composite grafts from the ear (<1.5 cm) and preauricular full-thickness skin grafts can blend well in zone III.

For large defects (>1.5 cm), a paramedian forehead flap is the preferred coverage for all zones. Columellar defects present a reconstructive challenge. A distal extension of the forehead flap provides an optimal solution when the columellar defect is a missing element of a larger defect. Other options, in particular for isolated columellar defects, include superiorly or inferiorly based nasolabial flaps.

Full-Thickness Skin Grafts

Because the skin of the upper two thirds of the nose (zone I) is thin with few sebaceous units, full-thickness skin grafts blend well in this area. Possible sites of harvest include the preauricular area, postauricular area, nasolabial fold, and supraclavicular area. The forehead has also been found to be an excellent site of graft donor skin. Skin and a few millimeters of subcutaneous fat can be transferred from the forehead for superficial defects of the alae and tip. A skin graft should not be harvested from an area that is a possible site for a forehead flap. Because of the temporary period of ischemia during wound healing, the melanocytes of a skin graft may be injured and cause the final graft to appear hypopigmented or hyperpigmented.

Composite Chondrocutaneous Grafts

A composite chondrocutaneous graft can be an option for reconstructing a nasal skeleton with defects that also include nasal skin or inner nasal lining, or both. Composite grafts can be harvested from the root of the helix or from the conchal bowl (Figs. 87-13 and 87-14).[9,18,19] Survival of the composite graft depends mainly on the size of the graft and the vascularity of the recipient bed. Diffusion from the recipient bed is the only source of nutrients for the composite graft in the early postoperative period. Several authors have reported complete healing of composite grafts after partial necrosis. In general, to minimize the possibility of necrosis, graft size should not exceed 1.5 cm, and if possible, composite grafts should be placed under or on well-vascularized tissue. Grafts may be harvested as two layers (skin-cartilage) or as three layers (skin-cartilage-skin). Composite grafts are used mainly for reconstruction of the alae and columella.

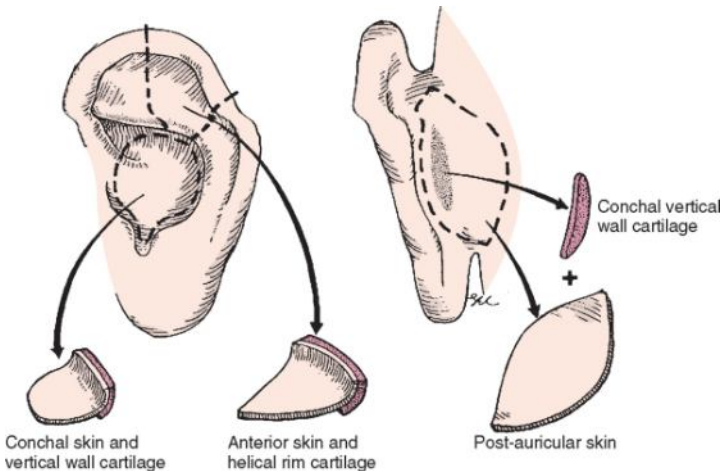

Figure 87-13 Composite graft. The ear is an ideal donor site for nasal reconstruction, including full-thickness chondrocutaneous grafts. Donor sites from the helical root or posterior aspect of the ear can be closed primarily with undermining. Anterior donor sites from the conchal bowl may require a skin graft for closure.
(From Barton FE Jr: Aesthetic aspects of partial nasal reconstruction. Clin Plast Surg 8:177-191, 1981, with permission.)

Figure 87-14 Composite chondrocutaneous graft for nasal stenosis. **A,** Bilateral nasal stenosis after necrosis of the nasal tip. **B,** Defect of the ala and tip re-created. **C,** Harvest of a composite auricular graft. **D,** Inset of the composite graft. **E,** Immediate postoperative appearance.

Bilobed Flaps

The bilobed flap as described by Zitelli[20] (Fig. 87-15) is the most suitable method to repair small (<1.5 cm), superficial defects of zone II (tip or ala, Fig. 87-16). It moves the nasal defect from the zone of thick, immobile skin (zone II) to the zone of thin, mobile skin (zone 1). Fundamentals of this transposition flap are the following:

1. The arc of rotation can vary between 90 and 180 degrees, but it is generally designed to be between 90 and 100 degrees. The radius will usually approximate 1.5 diameters of the defect.
2. The first lobe should be the same size as the defect. The second lobe is smaller and just narrow enough to allow primary linear closure of the donor defect.
3. For medial defects, laterally based flaps should be designed.
4. Closure of secondary defects should not distort normal landmarks, such as the lower eyelid.

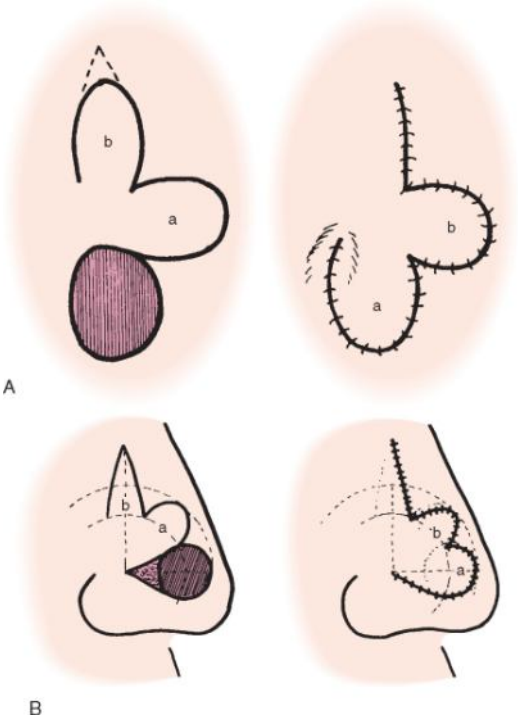

Figure 87-15 Zitelli modification of the bilobed flap. When compared with the original design of a 180-degree arc of rotation, which typically produces a dog-ear deformity at the rotational point (**A**), the modified transposition flap creates a smaller defect by using a 90-degree arc of rotation and minimizing dog-ear and trapdoor formation
(***B***). *(From Zitelli JA: The bilobed flap for nasal reconstruction. Arch Dermatol 125:957-959, 1989, with permission.)*

Figure 87-16 Nasal tip defect reconstructed with a bilobed flap. **A,** Bilobed flap design. **B,** Closure. **C,** Early postoperative appearance.

Potential disadvantages of the bilobed flap are trapdooring (convex bulging) and obliteration of the alar groove.

Nasolabial Flaps

Based either superiorly or inferiorly, the nasolabial flap relies on a random blood supply derived from facial artery perforators and takes advantage of the abundance of mobile, non–hair-bearing skin in the medial part of the cheek. Primary closure of the defect within the nasolabial fold creates a minimal postoperative deformity. Reconstruction involves first tracing an outline of the cutaneous defect on the donor site and then elevating the flap in a subcutaneous plane (Fig. 87-17; also see Fig. 87-7).[21–24] A superiorly based nasolabial flap is good for reconstruction of the entire alar subunit, the inferior aspect of the nasal sidewall, and the nasal platform on which the alar base rests. An inferiorly based nasolabial flap is most useful for defects of the upper lip, floor of the nose, and columella. A nasolabial flap folded to create both internal and external lining produces a bulky alar rim that will require subsequent revision.

Figure 87-17 Superiorly based, single-stage nasolabial flap. **A,** Alar defect. **B,** Nasolabial flap inset.

Forehead Flaps

A forehead flap transfers skin of ideal quality to reconstruct the nasal skin defect in patients of all ages. The forehead heals well with minimal scars even in donor sites left to heal secondarily. Midline or paramedian forehead flaps can be raised on either the supratrochlear or supraorbital vessels.[25] Most surgeons elevate a paramedian flap based on an ipsilateral, supratrochlear vascular pedicle that is located approximately 1.5 cm from the midline. Doppler ultrasound can be used to locate the pedicle, but even if no Doppler signal is found, a flap with a pedicle based almost anywhere along the midline of the forehead will probably survive. To avoid strangulation caused by twisting of a wide pedicle, the pedicle width of a paramedian flap should be about 1.5 cm. To gain length for a paramedian flap, one can extend the flap into the hair-bearing scalp or extend the flap 1.5 cm below the orbital rim, or both.

The pattern of the nasal defect should first be designed from the contralateral normal side of the patient's face as a model. If the contralateral side is also injured, a plaster or clay model of an ideal nose can serve as the template. Local anesthesia with epinephrine should not be injected into the forehead flap so that the blood supply can be evaluated intraoperatively. The forehead flap is elevated in a distal-to-proximal direction with all layers of the scalp (skin, subcutaneous tissue, and frontalis muscle) except periosteum. The forehead flap is thinned only at the columellar inset and along the alar rim. Closure of the donor site should be done over the periosteum with subgaleal undermining of the forehead. Any gaps that cannot be closed should be kept moist with antibiotic ointment, covered with Vaseline gauze, and allowed to heal secondarily. The pedicle of the paramedian forehead flap in the glabellar region is typically covered with a split-thickness skin graft to decrease bleeding and oozing.

Menick advises that only pristine, unexpanded forehead skin be transferred.[26] An expanded forehead flap can contract after the completion of nasal reconstruction and produce inferior aesthetic results. If necessary, tissue expansion can be done secondarily after nasal reconstruction to close the forehead donor site or to perform forehead scar revision.

POSTOPERATIVE MANAGEMENT

Patients undergoing first-stage nasal reconstruction with a forehead flap should stay in the hospital overnight. Any blanching of the flap or signs of venous congestion can potentially be reversed with removal of sutures or reinsetting of the flap. Doyle splints or intranasal packs are not generally used unless there is concern for the formation of synechiae. Because external dressings may compromise flap circulation, they are not placed on a flap used for nasal reconstruction. Skin sutures, as well as any external bolster placed on a skin graft, are removed 5 to 7 day after surgery. Postoperative parenteral antibiotics are not routinely prescribed.

PEARLS

- When designing a flap to reconstruct a defect or subunit, one should use a template based on the contralateral, uninjured side.
- If a forehead flap is to be used in a smoker, transfer of the flap should be delayed for 3 weeks by incising the perimeter without elevating the flap.
- Reconstruction with a forehead flap should be done in three stages, with secondary cartilage grafting and flap thinning performed during the second stage.
- Even though a normal alar lobule contains little cartilage, a reconstructed ala should contain a cartilage graft (i.e., in an nonanatomic position) that spans the entire lobule to prevent soft tissue contraction.
- Consideration of the subunit principle is useful only for reconstruction of the convex subunits of the nose (i.e., the tip, dorsum, alae, and columella) with local flaps because as a local flap heals, it contracts centripetally and pulls the flap into a convex shape.

PITFALLS

- If the first step in nasal reconstruction is not recreation of the defect (i.e., excising old scar and contractions), the final result will be a reconstruction and flap design that are too small.
- If nasal reconstruction is done at the same time as lip and cheek reconstruction, subsequent wound settling can shift the lip-cheek platform and cause a reciprocal shift in the position of the reconstructed nose.
- Reconstruction of missing nasal lining with bulky flaps, such as a nasolabial or free flap, can lead to nasal obstruction.
- When greater than 50% of a nasal convex subunit is missing, patching the nasal defect with a local flap without replacing the entire nasal subunit may worsen the aesthetic outcome.
- In a child, delaying nasal reconstruction until nasal growth is complete may lead to worsening psychosocial concerns.