Complex Nasal Reconstruction: A Case Study: Composite Defect

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**ANALYSIS OF THE DEFECT AND DECISION MAKING**

On physical examination (Fig. 1), a faint vertical left paramedian forehead scar, which followed the previous reconstruction, is visible. The forehead is otherwise high and expansive.

The left ala appears normal, although it is not. Some years previously, the patient presented with a full-thickness defect of the left entire ala and part of the inferior sidewall. Adjacent lip and cheek were uninjured. The defect had been repaired with a 3-stage folded forehead flap for cover and lining, with a delayed, primary, ear cartilage alar margin buttress graft to support, shape, and brace the left nostril margin.1,2 Following subunit principles of nasal reconstruction, the normal intact right ala had been used as a guide to design a template with the correct dimension and outline of the contralateral normal ala. The right ala was used to plan the exact replacement of the entire left ala and a few millimeters of the left tip subunit with a vertical forehead flap. A distal extension, about 1.5 cm wide and 7 mm long, was added to the distal covering flap. The extension was folded inward to replace the missing lining. During an intermediate operation 1 month later, the covering flap was elevated completely off the nose with 2 to 3 mm of subcutaneous fat. The distal folded lining was now healed to the adjacent residual nasal lining and was no longer dependent on the supratrochlear pedicle for blood supply. The underlying doubly layered excess of subcutaneous fat and frontalis areolar tissue was excised, exposing thin supple vascular lining. The contralateral normal alar template was then used to design a precise alar margin graft to shape the left nostril margin. The graft was fixed to the restored lining. The thin forehead flap was then returned to the recipient site. One month later, the pedicle of the flap was divided. During a subsequent revision, the left alar crease was further refined through a direct incision to sculpt a flat sidewall, a deep alar crease, and a convex alar contour. The slightly thick rim margin was thinned by excising excess soft tissue between the lining and cartilage graft through the old incision present along the nostril margin.

A short transverse scar is visible within the superior dorsum at the site of a previous skin cancer excision that was closed primarily.

The new defect involves several facial units but is more superficial.

Anatomically, the skin is missing over the entire ala, part of the inferior sidewall, and the adjacent medial cheek and lateral lip. Soft tissue within the cheek over the piriform aperture has been excised. The normal fibrofatty middle layer support of the ala is gone. Nasal lining is intact.

Aesthetically, the complex midface has been destroyed. The expected color and texture, landmark outline, and 3-dimensional shape are abnormal. Because the underlying orbicularis muscle is present, if skin is restored to cover the lip, the lip will function normally.

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The face can be divided into geographic areas of characteristic skin quality, border outline, and 3-dimensional contour. The cheek is a peripheral unit, largely flat and expansive with a variable border outline that is not completely seen on frontal view. The nose and upper lip are central units and are exactly contoured and outlined. An abnormality in a part of the lip or cheek is quickly apparent because the contralateral remaining lip or cheek creates a visually disturbing comparison.

The nose sits on a facial platform of the cheek and lip. The nasolabial fold separates the round fullness of the medial cheek and the flat upper lip. The nasolabial fold does not extend into the alar crease but is separated from the crease by a hairless triangle of skin, which lies adjacent to the alar base inset. The nose sits on the facial platform in an exact position and projects with specific angles.3

The nose is divided into subunits.4,5 The flat sidewall is separated from the round convex ala by the alar crease. The alar subunit is outlined by the nostril margin inferiorly, the alar crease superiorly, the slight alteration in contour with the soft triangle and tip subunits medially, and the alar groove laterally where the ala is inset into the lip at the alar base.

Each facial unit must be restored in terms of its own quality, outline, and contour and in relationship to the other facial units. The dimension, volume, position, projection, platform, skin quality,
It is often useful to repair a composite defect of the nose, cheek, and lip simultaneous with platform restoration. If the new platform is unstable and may shift because of gravity, tension, or resolution of edema, the nasal repair should be delayed to avoid late shifting of the nasal reconstruction into an abnormal position on the face. If the defect is more superficial and the platform base is unlikely to become distorted during wound healing, the nose can be repaired simultaneously with platform restoration.

Surgical staging should be used to advantage. The anatomic and aesthetic needs of the repair, priorities, quality of donor tissues, and ideal timing to transfer and modify materials with safety and precision should be designed. Although Gillies and Millard emphasize the use of “like tissue,” a flat thick forehead flap, an ear cartilage graft, or a cheek flap have little in common with the delicate outline or contour of the midface.

It is often useful to repair a composite defect of the cheek, lip, and nose with individual grafts and flaps to position the final scars in the joins between units and restore 3-dimensional contour.

THE SURGICAL PLAN

The wound is clean, and early reconstruction is appropriate. The defect is debrided, and the wound margins are incised to create clean right-angled skin edges. Templates of the contralateral normal nose and upper lip are used to design the skin replacement and alar margin support and to determine the ideal position, in height and width, of the right alar base after restoration of the cheek and lip platform. The soft tissue deficiency in the medial right cheek is augmented with a Millard flip fat flap. The cheek and lip skin defect is repaired by advancing a cheek flap with a random extension to resurface the upper lip defect. Because this is a relatively superficial defect with intact lining, nasal repair begins simultaneously with the placement of a primary conchal cartilage alar margin cartilage graft and a right paramedian forehead flap to resurface the ala and part of the inferior sidewall. An intermediate operation is planned to allow adjustments and more precise soft tissue contouring before pedicle division. Later, the pedicle is divided and the nasal labial fold recreated. The patient is informed that a late revision some months later may be appropriate to improve the alar crease, revise the forehead scar, thin the nostril margin, and so forth. All surgical procedures are performed under general anesthesia to avoid soft tissue distortion and blanching resulting from the injection of local anesthesia and epinephrine. It is difficult to make precise intraoperative decisions in restoring contour or determining the viability of tissues if they are bloated or chemically constricted.

OPERATION 1

The hairline, frown lines, location of the supratrochlear vessels by Doppler, subunits of the nose, nasolabial folds, philtrum, vermilion, old scars within the forehead and nasal dorsum, midline of the lip, and outline of the old forehead flap that resurfaces the left ala and part of the sidewall are marked with ink (Fig. 2).

The wound does not represent the true tissue loss and is expanded by edema, gravity, local anesthesia, or tension. If such a wound healed by secondary intention or was previously reconstructed, it may be contracted by scar or inadequate tissue replacement. Templates based on the contralateral normal permit exact replacement of missing tissues and dimension, outline, and position.

Quarter-inch Steri-Strips (3M Corporation, St Paul, MN, USA) are applied to the left nose and upper lip to create a paper pattern of the contralateral ala and hemilip. Collodion is applied externally with a Q-tip to further “glue” the paper tape strips together. Each pattern is then elevated. Because the ink applied to the skin subunit surface adheres to the undersurface of the Steri-Strips, the outline and dimension of the
contralateral normal subunits are visible. Excess tape is trimmed, and the contralateral alar and hemilip outlines are transferred to the aluminum foil of a suture pack (Fig. 3).

The right cheek skin, with 2 to 3 mm of fat, is undermined laterally for 5 to 8 cm. The medial border of the flap is incised directly in the residual nasolabial fold, inferiorly, and at the junction of the

Fig. 2. (A–D) Intraoperatively, the important facial landmarks are marked with ink.

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Fig. 3. (A–D) Quarter-inch Steri-Strips are applied to the left ala and left hemilip. The strips are covered with collodion. On tape removal, the exact dimension and outline of the contralateral normal subunits are visible on the deep surface. The excess paper tape is trimmed and the pattern is transferred to the foil of a suture pack (seen in other patient).
cheek and sidewall subunits, superiorly. Residual medial cheek fat, lateral to the piriform soft tissue deficiency, is marked with ink as a medially based hinge-over flap. Subcutaneous fat is hinged over, like a page of a book, and is fixed with absorbable sutures to fill the premaxillary soft tissue loss and reestablish medial cheek fullness in the nasal base platform height (Fig. 4). Dog-ears are excised along the side of the nose and lateral to the commissure after advancement of the flap medially to resurface the cheek with a skin extension that replaces missing lateral upper lip skin. The

![Fig. 4. (A–D) The junction of the right sidewall and cheek units superiorly and the residual nasolabial fold inferiorly are incised. Cheek skin lateral to the defect is elevated superficially for several centimeters. A fat flip flap, based medially, is turned over to fill the premaxillary soft tissue deficiency. The fat donor site is closed by simple advancement of cheek fat. Cheek skin is advanced to resurface the cheek defect. A dog-ear is excised superiorly. Excess skin created by the advancement of the cheek flap within the medial cheek lateral to the nasolabial fold is transposed medially, on a superior-based, randomly based skin extension, to resurface the upper lip defect. Most scars lie within the junction of the sidewall and cheek units and within the nasolabial fold (seen in another patient).](image-url)
deep surface of the flap is fixed with suture to the deep soft tissues along the nasal facial groove and piriform aperture. Any residual cheek soft tissue deficiency left in the area of the donor fat flap is obliterated with a few sutures by the soft tissues, which advance with the cheek flap. The skin is closed with subcuticular and fine skin sutures.

Residual skin within the right alar subunit is excised, and the wound edges are freshened. Because the alar base inset must be precisely positioned, both vertically and laterally, the contralateral left hemilip template is flipped and positioned on the right upper lip. The ideal position of the alar base and nasolabial fold is marked with ink. The cheek had been overadvanced a few millimeters in the area of the alar base. The excess is trimmed (Fig. 5). At this point, the surgeon has repaired the cheek and lip platform, restored soft tissue, and determined exactly where the nose should sit.

The ala normally contains no cartilage, but a reconstructed ala must be supported with a cartilage graft to shape the soft tissues and prevent soft tissue contraction (Fig. 6). Although either ear can be used, the contralateral ear often provides ideal donor material. Through a postauricular incision, the left conchal cartilage is excised. The contour of the harvested cartilage is examined. The contralateral alar template is used to design an alar margin batten with the correct length, shape, and nostril margin outline. Although not required in this case, the shape of the cartilage graft can be modified with permanent half-buried mattress sutures to increase or decrease its convexity. The graft is designed about 3 mm too long on its anterior and posterior ends. Small subcutaneous pockets are dissected within the soft triangle at the nostril margin and alar base. A percutaneous suture is passed from the skin into the pocket and out the wound edge. The suture perforates the end of the cartilage graft and then reenters the wound edge, penetrating the external skin surface just within the nostril margin or nostril floor. The distal ends of the cartilage graft are

![Fig. 5. (A, B) The cheek is advanced with a random skin extension to resurface the upper lip defect. The premaxillary soft tissue deficiency has been filled with a fat flip flap. The ideal position of the right alar base inset and nasolabial fold are marked with ink on the patient based on a template of the contralateral left hemilip.](image-url)
placed within these pockets and securely positioned with these guiding sutures for 1 week. The cartilage graft is also fixed with quilting sutures of 5-0 polypropylene, which pass through the external surface of the cartilage graft into the superficial raw lining surface and back out of the cartilage. The sutures do not pass through the lining into the nasal airway to avoid additional contamination and the possibility of infection.

Several rules should be noted. Although a forehead flap can be designed on either the right or left supratrochlear vessels, a unilateral defect is most easily repaired using an ipsilateral forehead flap because the point of rotation is closer to the defect. A contralateral forehead flap necessitates a longer flap and unnecessarily increases concern about transferring scalp hair to the nose. A midline defect can be resurfaced with a forehead flap based on either pedicle. Paramedian forehead flaps should be designed vertically. Although oblique flaps have been recommended to increase the length of flaps, the blood supply of the forehead is vertical and an oblique flap transects the axial vessels, creating a random distal extension. Oblique flaps significantly increase the risk of eyebrow distortion on donor closure. Most importantly, these flaps transgress multiple vascular territories, leaving scars within most areas of the forehead and making a second flap harvest much more problematic. Because the previous contralateral forehead flap had been designed vertically, the ipsilateral forehead is easily harvested for a second flap.

The contralateral template is positioned just under the hairline, directly over the supratrochlear vessels (Fig. 7). The inferior pedicle of the template is marked inferiorly and passes through the medial eyebrow. The inferior pedicle width is approximately 1.2 cm. Because the inferior pedicle is narrow, the inferior forehead can always be closed without distortion of eyebrow position. Any gap that remains in the superior forehead after flap transfer is allowed to heal secondarily.

The forehead skin is thicker than nasal skin. Traditionally, forehead flaps are transferred in
2 stages. During the first stage, frontalis muscle and subcutaneous fat are excised distally from the deep surface of the flap to remove unneeded bulk. The thinned flap is inset at the recipient site. Several weeks later, once healed to the nose, the proximal pedicle, which provided blood supply initially, can be divided and partially reelevated superiorly and additional debulking can be performed, before the completion of skin inset. Although quite safe and satisfactory for smaller, less-contoured defects, the author prefers to resurface the nose with a full-thickness forehead flap in 3 stages when the defect is large, complexly contoured, or of full thickness. The flap is transposed without thinning. After 4 weeks, the flap skin is effectively “surgically delayed.” The vascularity of the flap was not diminished by initial frontalis excision and is now augmented by physiologic delay. At the intermediate operation, forehead skin with 2 to 3 mm of subcutaneous fat is completely reelevated off the defect. This operation exposes the underlying excess subcutaneous fat and frontalis muscle, which is now adherent to previously placed cartilage grafts and underlying lining. These soft tissues are directly excised, sculpting fat, frontalis, and cartilage graft, as necessary, into a nasal shape. The alar crease can be better defined. An old cartilage graft could be repositioned if poorly designed initially or distorted by scar. An additional cartilage graft can be added (eg, tip graft) depending on the defect. If the defect is of full thickness, the 3-stage modified fold forehead flap technique is used to provide lining (previously used for a left alar defect).

A full-thickness right paramedian forehead flap is incised and elevated inferiorly over the periosteum. The inferior pedicle of the flap passes through the medial brow, which effectively lengthens the flap, lowers the pivot point, and brings the flap closer to the defect. Most foreheads do not require preexpansion to avoid transferring hair to the nose.

The supratrochlear vessels are not directly visualized (see Fig. 7). The flap is rotated medially toward the nose and released until it reaches the

Fig. 7. (A–E) The foil template is also placed directly under the hairline above the supratrochlear vessels. The goal is to resurface the entire right alar subunit and part of the inferior sidewall. The left alar template provides the dimensional width of the skin required to resurface the ala and the exact border outline of the nostril margin. The pattern does not have to reflect the superior-inferior dimension of the defect exactly because the dimension can be accurately determined at the time of pedicle division and completion of flap inset. The pedicle is drawn inferiorly through the brow toward the medial canthus. The pedicle is 1.2 cm in width, which allows easy closure of the inferior forehead in almost all circumstances. Despite having already undergone a left alar repair with a forehead flap, the forehead donor site was closed completely in this case. The forehead flap was elevated with all layers; the frontalis muscle or subcutaneous fat was not excised distally. The flap was inset with a single layer of fine sutures. A quilting suture fixes the flap gently to the recipient site in the vicinity of the future alar crease.
defect without tension. Fibrous bands and corrugator muscle fibers are spread and clipped. The skin excision is extended inferiorly toward the medial canthus as necessary. The flap was then inset with a single layer of fine skin sutures. One or two percutaneous quilting sutures of 5-0 polypropylene can be used to apply the superior aspect of the flap to the side of the nose for 48 hours. The raw surface of the pedicle is covered with a full-thickness skin graft, harvested from the groin crease, to minimize oozing and establish a cleaner wound. The forehead is undermined bluntly into both temples, advanced, and closed in layers with an occasional 4-0 polypropylene tension suture through all layers, 4-0 slowly dissolving suture for the frontalis, 5-0 subcuticular, and 6-0 sutures for the skin. Despite a previous forehead flap, the patient’s forehead was closed primarily. The dog-ear, within the hairline, was excised and closed with a running 4-0 polypropylene suture.

I have most patients stay overnight. The patients may shampoo and shower the following day, and their pedicle is often covered with a small dressing.

**OPERATION 2**

After 4 weeks, the wounds are healed. Landmarks are marked with ink, the left nasolabial fold; right residual nasolabial fold and border of the advancing cheek flap, which resurfaced part of the upper lip; borders of the forehead flap; and, based on the contralateral normal alar template, the general vicinity of the desired future right alar crease. The medial extension of the ear cartilage graft is visible as a small bulge within the soft triangle. This distortion is dotted with ink. The skin of the soft triangle is undermined and the external surface of the cartilage graft shaved to decrease its bulk (**Fig. 8**).

The border edges of the forehead flap are incised, and it is completely reelevated with 2 to 3 mm of subcutaneous fat. The flap is temporarily placed on the forehead within a wet 4 × 4 gauze. All tissue layers have now healed together and can be carved "like a bar of soap." The underlying excess subcutaneous fat and frontalis muscle are completely exposed, which are excised, with a knife, to create the round convex fullness of

**Fig. 8.** (A–D) One month later, an intermediate operation is performed. The alar subunits and the borders of the forehead and cheek flap are outlined with ink.
the alar lobule, a defined alar crease, and a flat sidewall subunit contour symmetric to the contralateral normal. The underlying cartilage graft is also reshaped by direct excision, if appropriate (Fig. 9). Now forehead skin of nasal “thinness” is reapplied to the contoured recipient site with a few quilting sutures of 5-0 polypropylene, which fix the skin flap to the underlying recipient bed but do not pass into the airway, and a single layer of fine skin sutures (Fig. 10).

Fig. 10. (A–E) Excess subcutaneous bulk and the underlying skin graft, now healed to lining, are excised to sculpt a flap sidewall, distinct alar crease, and alar shape. The uniformly thin forehead flap is returned to the recipient site with several quilting sutures in a single layer of peripheral sutures.
One month later (2 months after initiating repair), the patient returns to the operating room for pedicle division and recreation of the right nasal labial fold. Although the cheek skin that was advanced into the lip defect has the correct skin quality, the right nasolabial fold was obliterated by its transposition across the cheek-lip junction and the border scar of the flap is visible as a curvilinear scar under the right alar base. The inferior forehead scar, the peripheral outline of the forehead flap, the position of the ideal alar crease and nasal labial fold, the lip units, and a planned excision of a recently diagnosed basal cell carcinoma above the right lip vermilion is marked with ink. The scar of the cheek extension within the lip is crosshatched. The ideal alar crease and nasolabial fold positions were determined by templates based on the contralateral normal.

The forehead pedicle was divided, debulked approximately, trimmed, and inset as a small inverted “V” within the medial brow. Distally, forehead skin was elevated with a few millimeters of subcutaneous fat below the ideal alar crease position. Excess soft tissue and scar were excised to create a defined alar crease, a round superior ala, and a flap sidewall. Skin was reapproximated to the recipient site with quilting sutures. A direct incision was made at the location of the ideal nasolabial fold. Skin was elevated medially with a few millimeters of subcutaneous fat. Excess subcutaneous bulk was excised over the underlying orbicularis oris muscle to sculpt a flat upper lip and hairless triangle. Skin was then reapproximated to the lip recipient site with quilting sutures and the nasolabial fold incision closed in layers. The fullness of the lateral cheek was maintained.
OPERATION 3

The essential facial landmarks are largely restored (Fig. 11). The right nostril margin is pulled a millimeter or two superiorly and the medial brow inferiorly by the contraction on the undersurface of the forehead pedicle. The right nasal labial fold has been obliterated by the extension of the advanced cheek flap. The border scar of the fold is visible within the right upper lip subunit.

The inferior forehead scar, borders of the old left and new right forehead and cheek flaps, and nasal and lip subunits are marked with ink. The advanced cheek flap scar within the right upper lip is crosshatched. The ideal right alar crease and nasolabial folds are marked based on templates of the contralateral left normal subunits. A newly diagnosed basal cell carcinoma just above the right vermilion of the upper lip is marked for excision.

The forehead pedicle is transected. Superiorly, the skin graft on the proximal pedicle is excised and the inferior forehead reopened. The medial brow is repositioned after excision of excess subcutaneous soft tissue and inset of the proximal pedicle of a small inverted “V.” The excess skin graft, soft tissue, and proximal skin are discarded. The inferior distal flap inset is elevated with 2 to 3 mm of subcutaneous fat inferior to the new ideal alar crease. The underlying soft tissue excess is excised to create a flat sidewall contour, deeper alar crease, and full convex superior ala. The skin is reapproximated to the newly established recipient contour with quilting sutures and sutured peripherally with a single layer of 5-0 sutures.

To better define the nasolabial fold, a direct incision was made within the advanced cheek skin at the position of the ideal nasal labial fold, disregarding old scars (Fig. 12). The skin was elevated medially over the lip with 2 to 3 mm of subcutaneous fat. Excess soft tissue was excised to create a flat upper lip surface, while maintaining the fullness of the cheek. The cheek flap was fixed to the underlying tissues with quilting sutures and

Fig. 13. (A–D) After closure, the medial eyebrow has been returned to its normal position and the inferior forehead scar appears as a small inverted “V,” simulating the frown line. The contour of a flat sidewall and convex ala, separated by the alar crease, and the full cheek and flat upper lip, separated by the nasolabial fold, had been restored in symmetry to the contralateral normal. Full-thickness forehead skin, harvested from the residual pedicle, was applied as a graft to the upper lip defect, which followed the lip basal cell excision.
Fig. 14. (A–D) Nonsynchronous defects of the left ala with missing lining and composite defect of the right ala, cheek, and lip.
the new nasal labial fold was repaired with subcuticular and fine skin sutures. The basal cell carcinoma of the lip was excised, and its margins verified by frozen sections. The defect was repaired with a nonsubunit full-thickness forehead skin graft that was available from the discarded forehead pedicle. The graft was fixed to the lip recipient site with quilting sutures and peripheral sutures and covered with a foam bolus for 1 week (Fig. 13).

After 6 months or more, the patient’s second forehead flap nasal reconstruction of bilateral nasal defects (Fig. 14), appearance, and function were very good. Forehead scarring is minimal. Her left eyebrow is minimally elevated compared with the right, its natural position before either reconstruction. The inset of the pedicle into each medial brow simulates a frown crease. The patient’s facial and nasal scars are virtually invisible (Fig. 15). Although a direct incision was made within the advanced cheek flap to recreate the right nasolabial fold, it cannot be seen. Because the cheek and lip contours are correct, the scar created by the advancement of the cheek flap into the lip subunit has disappeared. The complex contours of the nose, cheek, and lip are restored (Fig. 16). The patient looks normal, after 2 significant nasal defects and

Fig. 15. (A–D) Postoperatively, the patient’s appearance is normal, and her nasal function is good. Despite 2 forehead flaps, there is minimal scarring visible within the forehead donor site. The dimension, volume, position, projection, quality, outline, and contour of the nose, lid, and cheek are good. Also, multiple facial scars are largely invisible.

Fig. 16. (A, B) Although subtle, re-creation of the right nasolabial fold has contributed to the restoration of normal facial landmarks. The curvilinear scar, which followed the nonsubunit advancement of cheek skin into the lip, is much less apparent because the contour of the upper lip has been restored.
2 forehead flaps! If ever necessary, a third forehead flap can be harvested with or without preexpansion.

This reconstruction was successful because

- Both the patient and the surgeon wished to restore the normal.
- Time was taken to analyze the defect, establish priorities, formulate a plan to solve each clinical problem, and perform careful intraoperative steps.
- The best technique, not the easiest or quickest, was chosen.
- Principles and techniques were applied to reestablish the facial units, rather than close the wound or fill “the hole.”
- Tissues were transferred or modified to recreate “like” tissue, whether quality, contour, or outline.

REFERENCES