Aesthetic Repair of Small to Medium-Sized Nasal Defects

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ABSTRACT

Reconstruction of small and medium-sized defects of the nose poses a challenge to the facial plastic surgeon. Flaps for small to medium-sized defects most often are closed in single-staged procedures as opposed to larger-sized defects. A variety of techniques can be used including secondary intention, primary closure, full-thickness skin grafts, composite grafts, rhomboid flaps, bilobe flaps, dorsal nasal flaps, island flaps, and inferiorly based meliolabial flaps.

KEYWORDS: Nasal defect, bilobe, rhomboid, meliolabial

Reconstruction of small and medium-sized defects of the nose poses a challenge to the facial plastic surgeon. Every Mohs repair is inimitable based on the unique characteristics of the defect itself, diversity in skin types among patients and even within the nose itself, variability in structural support, comorbidities, and specific patient aesthetic goals.

The delicate cartilaginous architecture of the nose is easily perturbed by tension vectors and wound contraction. The myriad of local flaps and grafts available to the surgeon, compounded by the specific nuances within each technique, can make repair of a seemingly small, simple defect of the nose extraordinarily complex. Exacerbating these planning dilemmas is the inverse relationship with patient expectations and the size of the defect, with the highest aesthetic expectations reserved for smaller defects. Many of these patients seek single-stage procedures with minimal downtime and a prompt return to their "former self."

Mohs defects of the nose can be classified according to size. Defects less than 1 cm in diameter are considered small. Medium-sized defects are defined as being 1 to 1.5 cm, and those larger than 1.5 cm are considered large.[1] Conceptually, medium-sized defects are those that can be closed with a single-stage local flap, whereas large defects typically may require multistage procedures with regional flaps. In small to medium-sized defects, the subunit principle also may hold less weight than in larger ones. In this article, we will describe important factors to consider in preoperative planning, as well as the main reconstructive options for small and medium-sized nasal defects.

PREOPERATIVE PLANNING

During the planning stage, the surgeon must consider the patient's overall health. Serious comorbidities may preclude multistage operations. In such patients, aesthetic outcomes may be sacrificed for patient safety. However, age alone should not affect the surgeon's decision. In a group of patients over 80 years old who underwent nasal reconstruction, Shumrick, Campbell, and Becker had good to excellent cosmetic results and no flap failure.[2] Chronic malnutrition, bleeding diatheses, uncontrolled hypertension, smoking, and uncontrolled diabetes worsen healing and increase the potential for complications. Patients should be medically optimized as much as possible before the resection/reconstruction.

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Our preoperative planning, in concert with the Mohs surgeons, includes cessation of smoking 3 weeks prior to excision/reconstruction. If the patient has not quit by the time of excision, he or she is advised regarding potential vascular limitations and complications of their reconstruction.

Preoperative assessment should consist of diligent examination of both the defect itself and the surrounding tissues. The location and depth of the defect, along with the destruction of normal skin structures, should be noted. Attention should also be paid to the potential vascularity of the floor of the defect. This is especially important in assessing the suitability of the bed for a potential skin graft.

The subunit principle is mentioned often in repair of nasal defects. Millard divided the face into facial aesthetic subunits and advocated the use of subunits in nasal reconstruction.[3] Burget and Menick further defined the nasal aesthetic subunits (Fig. 1).[4] The reconstructive principle utilizing aesthetic subunits promotes the removal of an entire subunit if 50% or more is absent. However, by removing the remaining half or less of a subunit, the surgeon may unnecessarily resect healthy tissue, which would consequently require a larger coverage area. Rohrich and colleagues suggested that the excision of healthy tissue is unnecessary if a satisfactory scar can be placed within the borders of a subunit.[5]

Burget's concept of nasal skin types is perhaps more significant in nasal reconstruction of small to medium defects than aesthetic subunits. The surgeon must examine the nasal skin and carefully palpate to adequately plan for the most optimal skin match.[5] The upper half of the nose (zone I), which includes the dorsum and nasal sidewall, has very loose, thin, compliant skin. In contrast, the nasal tip (zone II) has skin that is 3-mm thick or more and is covered with pits, which are ducts of the subdermal sebaceous glands. This skin is thick, sebaceous, and unforgiving. Because it so readily reforms its previous shape, it is difficult to contour and reconstruct. Its round convex contour also makes it a difficult area to repair. Zone III is located at the region of the tip halfway down the infratip lobule, where the skin again becomes thin and nonsebaceous. Zone III also extends along the alar margins to include the soft triangle facets and columella in a 4-mm-wide strip. Typically, the skin of zone III is fixed to the underlying cartilages and has scant fibrofatty tissue. In some patients, an intracrural groove can be seen, where the contours of the alar cartilages create a vertical line of shadow (Fig. 2).[6]

The skin color, texture, and porosity of the nasal skin surrounding the nasal defect will play a critical role in ultimately determining the type of reconstruction that will appear most natural. Preoperative planning should also include analysis of previous scars and areas of radiation. A history of nasal tip cyanosis in response to cold temperatures may indicate vascular compromise. However, typically the blood supply to the nose is abundant, with branches from both the external carotid (facial and angular artery) and the internal carotid (ophthalmic artery).

Cartilaginous support to the nasal tip and external and internal valves should be assessed preoperatively. Even minimally weak external or internal nasal valves are

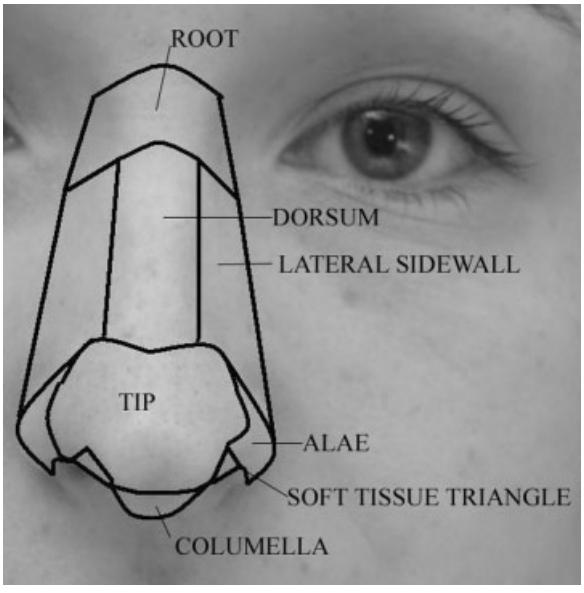

Figure 1 Classically there are nine nasal subunits with some texts describing the root as an additional subunit of the nose.

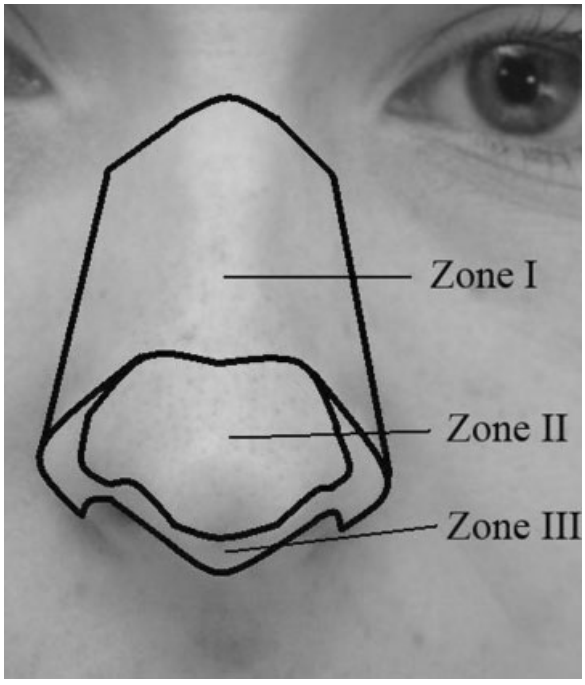

Figure 2 The three zones of nasal skin types have widely divergent differences in skin thickness and mobility.

susceptible to further compromise after Mohs repair. Unfortunately, there is no simple solution to repair and diagnose potential nasal valve incompetence. Some potential solutions include placement of alar batten grafts and of lateral crural strut grafts to support the existing lower lateral cartilages, onlay grafts, alar rim grafts, spreader grafts, and upper lateral cartilage splay grafts. A working knowledge of aesthetic and functional rhinoplasty is required to determine which graft to place and how.

Avoidance of alar displacement is another important assessment, as minimal vectors of wound tension can cause unwanted alar retraction.[7] A surgeon must be able to accurately predict how these forces will affect the position of the ala.

Preoperative consultation plays an important role in managing the patient's expectations of aesthetic outcome. Ideally, preoperative photography is performed prior to Mohs resection to allow for a better concept of the patient's nose. Nasal and alar symmetry must be assessed, documented, and discussed with the patient to prevent any misunderstandings after surgery. As in any facial plastic surgery procedure, patient expectations should be tempered and a typical recovery course outlined. Patients must be counseled on the major risks of reconstructive failure including tissue necrosis, scar formation, infection, hematoma, and wound contraction, any of which may cause disfiguring asymmetry or adverse effects on nasal airflow.

TIMING OF REPAIR

Reconstruction is offered when the defect is deemed unsuitable to heal by secondary intention. Reconstructive procedures help prevent complications of wound contracture. Additionally, for patients who are uncomfortable with open wounds on their face, reconstruction offers immediate coverage and decreases time of healing. In almost all our patients, reconstruction occurs immediately after Mohs surgery. However, in instances when immediate reconstruction is not an option, coverage of the defect is important to prevent desiccation of the wound. Increasing time to reconstruct may limit some reconstructive options at a future date, including the use of full-thickness skin grafts.

SECONDARY INTENTION

Secondary intention is ideally utilized in wounds that are small, shallow, and on concave surfaces. In addition, wounds less than 1 cm in diameter, less than 4 to 5 mm in depth, and greater than 5 to 6 mm in distance from the mobile alar margin will often heal with excellent aesthetic results.[7] In particular, the superficial areas of the alar groove, a concave area, can heal exceptionally well. If a defect of the alar groove is deep enough to extend to the subcutaneous fat and allowed to heal by secondary intention, it may result in a depressed scar, retraction of the alar rim, or nasal valve collapse.[8] The lateral sidewall of the nose, especially near the medial canthus, also heals well with secondary intention. The tight, thin skin in this area with strong underlying bony support fights contraction well without distortion of the surrounding face during secondary intention healing.

Wounds should be cleaned twice daily to remove fibrinous debris and covered with ointment to allow for a clean moist wound. Reepthelialization begins within 24 hours at a rate of 0.25 to 0.5 mm per day. Granulation tissue will begin to form within the first 72 hours. Both of these processes allow for wound contracture to start 5 days after creation the defect. Patients should be counseled that wounds take weeks to months to heal depending on the size of the defect, wound care applied, and individual physiological healing capabilities.

Frequent weekly follow-up to ensure appropriate wound healing is prudent. Some patients benefit from external or internal bolsters to prevent irregularities in wound contracture. An internal nasal splint is effective in defects of the alar region when concern over alar retraction and irregular wound healing may occur (Fig. 3). An external bolster is applied to the dorsal sidewall or medial canthus to help reduce the incidence of webbing.

Dermabrasion may be used after 4 weeks if minor contour irregularities exist (Fig. 4A,B). However, large distortions may require excision and replacement of the contracted tissue and may be much more difficult to reconstruct than the initial defect.

Some small (< 1 cm) nasal defects that extend to subcutaneous fat can be closed with a combination of partial primary closure and secondary intention. If the defect is found on the nasal alar groove, two subcutaneous absorbable sutures can be placed in the center of the defect along the direction of the alar groove. No

Figure 3 Intranasal splints can help bolster the nostril and prevent nasal retraction and contour irregularities during secondary intention. The material used in intranasal splints should be stiff enough to resist forces of scar contracture. (Photograph provided by Anil R. Shah, M.D.)

Figure 4 (A, B). This patient had a small, shallow nasal defect. However, the lesion was located 4 mm from the alar margin and on the convex aspect of the ala. Despite this, the patient healed without alar retraction 4 weeks after her Mohs procedure due to strong lower lateral cartilages and alar splinting. She will require a dermabrasion procedure to improve contour irregularities. (Photograph provided by Anil R. Shah, M.D.)

superficial sutures are needed, and the wound will heal by secondary intention.[9]

PRIMARY CLOSURE

In the upper half of the nose, primary closure is possible with small defects. In this area, the skin is usually thin and compliant. In contrast, the skin of the nasal tip of the nose cannot be readily closed primarily due to a lack of laxity.

To avoid dog-ear deformity, most wounds necessitate a length:width ratio of at least 3:1. However, once the surgeon excises extra tissue, some reconstructive options may be lost. A more conservative approach is to undermine the wound and place several large key sutures. If it appears that alar margin and tip distortion will occur after primary closure, an alternative reconstructive technique can be performed without compromise. If the closure allows for an acceptable aesthetic result, excision of the dog-ear can then takes place. The dog-ear can be excised to be hidden along nasal subunits or lines of maximal extensibility for further camouflage. In areas where extra closure length is limited, the surgeon can create an *M* or *W* at the end of the defect rather leaving a simple fusiform. Eversion is especially important in thicker, sebaceous skin due to increased skin rigidity.[10]

Defects of the caudal and middle third of the dorsum will rotate the tip cephallically if repaired in a transverse fashion. This may be aesthetically desirable in some patients with senile tip ptosis. A vertical closure will limit nasal tip rotation. Glabellar defects should be closed horizontally to match the rhytids produced by the procerus muscle contraction. Certain defects may be amenable to vertical oblique closure, matching the action of the corrugators. If not enough skin is available and the patient has a wide and/or large dorsum, reduction rhinoplasty can be performed.[11] Dorsal reduction can be performed either through the wound or via a traditional rhinoplasty approach.

SKIN GRAFTS

Although a split-thickness skin graft is an option, it is rarely a good one. Split-thickness skin grafts avidly contract and undergo thinning and hypopigmentation, resulting in unsightly cosmetic appearances. Although they allow for coverage of a large area, their use is mostly limited to biological dressings. They can play a role in the patient who has a virulent neoplasm and will likely require further resection before a definitive reconstruction.

A full-thickness skin graft is a much more aesthetically viable option than a split-thickness skin graft. A full-thickness skin graft is a good option if the wound

is not amenable to primary closure, closure by secondary intention, or an uncomplicated flap repair. Compared with split-thickness skin grafts, they contract much less and are therefore less likely to result in alar retraction. This type of graft also maintains its color and texture better. The graft must be chosen from an area of the body with similar color and texture. Although these grafts may perform well, random-pattern cutaneous flaps typically offer better aesthetic results. Full-thickness skin grafts work best for shallow defects as the grafts are thinned to maximize their survival during placement.[12]

The vascular demands for full-thickness skin grafts exceed those of split-thickness skin grafts. During the first 24 hours, they survive based on plasma imbibition. In the second 24 hours, vascular inoculation feeds the graft. On day 3, capillary in-growth begins.[13]

The donor site must be carefully chosen. To decrease the chance of confusion of recurrence, donor skin must not include any color abnormalities or malignancies. Common donor sites include the preauricular, postauricular, supraclavicular, and clavicular areas. Some surgeons also use the neck, nasolabial folds, eyelids, and upper extremities as potential donor sources.[14] If used for sidewall defects instead of a local flap, postauricular skin is a great match for color, skin thickness, and texture. If the defect is located closer to the medial canthus, the full-thickness skin graft becomes a better option but is still unfavorable compared with a local flap.[1] Many surgeons prefer the conchal bowl skin as a good match for tip or ala defects. For these sites, harvesting the underlying perichondrium with the skin provides for a thicker graft with enhanced ability to rapidly develop a new blood supply from the recipient site. Forehead full-thickness skin grafts can be used in certain cases and have been found to have good functional and cosmetic outcome owing to excellent tissue match.[15]

The success of the graft's "take" depends on several factors. Vascularity of the defect is crucial and dependent on underlying viable muscle, fascia, perichondrium, or periosteum. The graft also should be sutured to the underlying tissue using absorbable sutures so that a hint of concavity exists.[16] A balance of meticulous hemostasis and prevention of cautery damage to the underlying vascularity of the wound bed must be exercised. Marginal quilting sutures will help collapse potential dead space, and central quilting sutures avoid lateral motion. A stent dressing allows pressure between graft and bed to improve vascularization to the graft.

Full-thickness skin grafts on the nasal tip are a tempting choice, but several reconstructive principles should be kept in mind. Nasal subunit technique should be used to prevent a patch effect. Less thinning is needed on full-thickness skin grafts than when used in the upper one third of the nose.

COMPOSITE GRAFTS

Composite grafts contain two or more tissue layers. Due to the metabolic demand of the large bulk of tissue, they heal with great difficulty and are limited to defects less than 1 cm in size.[15] This type of graft requires a nonsmoking patient without systemic illnesses or prior irradiation that would compromise revascularization.

Composite grafts have been used for small (< 1 cm) full-thickness defects of the columella, alar margin, and soft tissue triangle (Fig. 5). The auricular concha is an excellent source for a composite graft. It is well suited for defects in the columella and alar cartilages. Other donor sites include the helix, antihelix, tragus, and antitragus. All these areas contain tight, thin skin overlying cartilage without much subcutaneous fat, making them good donor sites.

Alar wounds, especially those that approach the superior aspect of the ala, are prone to notching and retracting. If designed well, a composite graft can provide structural integrity at the nasal valve. It can also produce the same smooth contour that exists at its auricular donor site. Some authors dismiss composite grafts as an option for alar reconstruction, arguing that composite grafts heal with a shiny, imperfect color match. In addition, alar notching, if it occurs, can be severely disfiguring and difficult to correct.[1]

In an effort to decrease donor site morbidity from an auricular composite graft, Burm advocates the use of a mastoid partial composite graft for reconstruction of the nasal tip including the columella and soft tissue triangle. This is a graft consisting of full-thickness skin peripherally and fascia-fat tissues underneath the skin centrally. The mastoid skin is thicker and more rigid than auricular skin, which makes it less likely to shrink. On the other hand, it is thinner than forehead skin, so it is easier to fold for reshaping the nostril rim.[17]

Harvesting auricular grafts requires maintenance of the tight, thin skin to the overlying cartilage. The authors advocate injecting local anesthetic agents peripheral to the harvest site to maintain tight adherence of skin and cartilage. In addition, one or two central sutures may help prevent disruption of the cartilage and skin. Finally, trimming the underlying cartilage to allow for a slight excess of skin to cartilage can lead to increased uptake of composite grafts.

Composite grafts should be inset with interrupted sutures using as few sutures as possible to enable more abundant vessel growth. If the graft is small, no sutures are needed for the cartilage, and only skin 5–0 polypropylene sutures are necessary. Some advocate the use of stabilizing struts for composite grafts at the alar rim. These are cartilaginous extensions that are placed under skin adjacent to the graft using tongue-in-groove technique.[18] Preoperative corticosteroids have shown improved survival of composite grafts.[19] Ice compresses

Figure 5 (A) Patient is shown with an alar defect secondary to Mohs procedure. She had a nasal turndown flap (B) with alar retraction near the soft tissue triangle of the nose. A subsequent procedure was performed with an auricular composite graft in the soft tissue triangle to improve her alar retraction. (Photograph provided by Minas Constantinides, M.D.)

for the first 3 days to composite grafts have also shown to improve graft survival.[20]

RHOMBOID FLAP (TRANSPOSITION FLAP)

The rhomboid flap is best suited for reconstruction of the lateral nasal sidewall and glabellar areas.[21] In areas near the tip and alar margin, its tension vectors can cause serious distortion. In the sidewall and glabellar areas, the rhomboid flap gives the opportunity to move tissue and reorient tension vectors. Rhomboid flaps are local in nature with minimal impact on the movement of distal skin (Fig. 6A,B).[22]

Limberg originally designed the rhomboid flap. In his design, the location of maximal tension is at the closure point of the donor flap defect.[23]Dufourmentel added a modification that rotates the axis of the donor site by 30 degrees.[24] Webster et al added a further modification of the flap, which he calls the "30-degree transposition flap."[25] In all versions of the rhomboid flap, as long as the flap and the tissue surrounding the flap are adequately undermined, there should be little to no tension on the flap. The Dufourmentel flap makes the closure of the donor site much easier and decreases tension there. However, this is at the expense of increased tension around the transposed flap's borders. If possible, the line of closure of the donor site, which is usually the area of maximal tension, must be placed in a line of maximal extensibility of the face. It also must be placed in an area that will produce the least distortion on the face. Areas that have high risk of distortion are the nasal alae, medial canthus, and oral commissure.

Rhomboid flaps can move smoothly into position when there is adequate laxity of the donor area. The mathematical analysis of rhomboid flaps by Koss and Bullock concluded that the rhomboid flap allows for exactly the same area of tissue coverage for the defect for which it is designed.[26] However, skin allows for flexibility, and the areas need not be anatomically exact. Because the skin is elastic in nature, rhomboid flaps can be used for defects that are not rhomboid in nature. Rhomboid flaps may even be combined with nasolabial flaps for the repair of lateral nasal defects.[26]

BILOBED FLAP

The bilobed flap is a double transposition flap first described by Esser to reconstruct nasal tip defects.[28] It is a random pattern, single-stage flap, lacking a large-caliber vessel in its base. A bilobed flap uses two adjacent lobes/flaps that are rotated around a pivot point. The primary lobe, usually the same size as the defect, is used

Figure 6 (A, B) Patient with lateral nasal wall defect bordering cheek subunit. A rhomboid flap was designed and hidden within the nasolabial fold to close this defect. (Photograph provided by Anil R. Shah, M.D.)

Figure 7 (A–C) A medium-sized defect involving the left supra-alar crease and left nasal sidewall. A medially based flap was chosen for this case because a laterally based flap would have limited rotation secondary to pivotal restraint at the medial canthus. Limitation of nostril movement is essential in the planning of bilobe flaps. (Photograph provided by Anil R. Shah, M.D.)

to restore the defect. The secondary lobe is used to repair the donor site of the primary lobe. The donor site of the secondary lobe is closed primarily. Flaps based laterally on the sidewall of the nose are best for defects near the nasal tip, and medially based flaps are better for repair of lateral alar defects.[27] Flaps based laterally may be limited by tension at the medial canthus and may need to be medially based to facilitate closure (Fig. 7A–E).

The flap's design is highly flexible. Esser, in his initial description, stated that the angle of tissue transfer had to be 90 degrees.[28] However, subsequent authors have found that the angle can be decreased significantly to suit the situation.[29] Perhaps the most significant modification was by Zitelli[27], who adjusted the rotational angle to 50 degrees each, decreasing the buckling around the pivot point and the distal distortion from previous bilobed flap designs.

The bilobed flap is the reconstruction of choice for most small to medium-sized defects of the lower third of the nose, especially the lateral tip, supratip, or ala near the tip. Because it takes skin from adjacent areas, it provides excellent color match and is relatively free from distortion.[1] Ideal patient candidates for the bilobe flap have thin and mobile skin. Thick, sebaceous skin has less mobility for transfer and an increased risk of complications such as necrosis, trapdoor deformity, and depressed scars. The lax donor skin of the upper nose limits the flap to areas less than 1.5 cm.[30]

To ensure a safe blood supply, the width of the second flap should approach the width of the first flap. Undersizing the primary or secondary lobe may result in increased tension, scarring, and distortion. Oversizing may lead to trapdoor deformity and uneven contours. In cases of thick donor site skin, the primary lobe should be the same size as the defect due to limited ability to stretch the primary lobe.

The length of the bilobe flap also plays a significant role in its design. Cho and Kim used fresh cadavers to demonstrate that the primary lobe in a bilobe should be designed with a 10% longer flap than the defect to decrease the incidence of alar distortion.[31] Zitelli's recommendations for use of a longer primary lobe are limited to instances when there is skin that is too tight for rotation of the flaps and closure of the secondary flap donor site. This type of situation exists at the immobile skin of the inner canthus, where there is little loose skin.[32]

The thickness of the bilobe flap may vary depending on the defect and location within the flap. At the base of the flap, it is important to lift the flap in a supraperichondrial plane to maximize blood supply and allow for venous and lymphatic outflow from the flap. A superficial layer of elevation at the bilobe flap's base risks pincushioning to the flap. The distal edge of the flap may need to be thinned to create a better match with the remaining nose skin. A flap that is too thick may push the unsupported alar rim inferiorly. This is especially true at distal flaps near the alar rim. However, overzealously thinning the flap may compromise blood flow to its distal part. To prevent this, the surgeon may choose to instead deepen the defect when possible.

When designing the bilobe flap, the location of the dog-ear can also effect alar displacement. Placement of the dog-ear within the supra-alar crease is preferred rather than in the convexity of the nasal ala.[21] Dog-ear designs further from the alar rim may lead to less alar displacement as well. Dog-ears within the supra-alar crease also lead to less visible scars.

The secondary lobe may play a larger role in alar displacement than previously thought in laterally based bilobe flaps.[33] The secondary lobe may exert wound vector forces, which may influence alar displacement, which was recently suggested by a fresh cadaveric study. Vector alignment of the secondary lobe perpendicular to the alar margin decreased the amount of alar displacement, and alignment of the secondary lobe 45 degrees to the nostril margin created alar retraction (Figs. 8A,B and 9A, B).

DORSAL NASAL FLAP/RIEGER FLAP (ROTATIONAL FLAP)

The dorsal nasal flap can be used for medium-sized defects of the nose. This flap was originally described by Rieger[35] and has been subsequently modified.[34] Due to its large size, the glabellar flap has the potential risks of distortion and flap necrosis. The flap recruits skin from the more mobile glabella and transfers it caudally to the less mobile tip by incorporating a V to Y advancement cephalically. Thus, a long incision is created from the glabella to the nasal tip with undermining as far wide as midcheek (Fig. 10A–C).

To decrease the likelihood of tension on the medial canthus or the alar margin, the arc of rotation of the flap can be elongated. Equally important in the design of the dorsal nasal flap is extension of the leading edge along the primary defect, which is distinct from a traditional rotation flap design. The modification minimizes the influence of pivotal restraint on the flap. The mobility of the flap is dramatically enhanced with a significant back cut in the area of the glabella. The back cut can be extended to the area of the medial canthus, and it produces a flap that is mobile because of a narrow pedicle.[35]

Once the flap has been elevated, broad undermining occurs laterally. Deep sutures to stabilize the flap to the underlying periosteum will help minimize unwanted vector pulls. Buried vertical mattress sutures can also help anchor the flap.[34,35] In the dorsum and supratip regions, this flap causes less local distortion than the bilobed flap. Due to risk of alar retraction, it should be used cautiously in unilateral alar rim or dome defects.

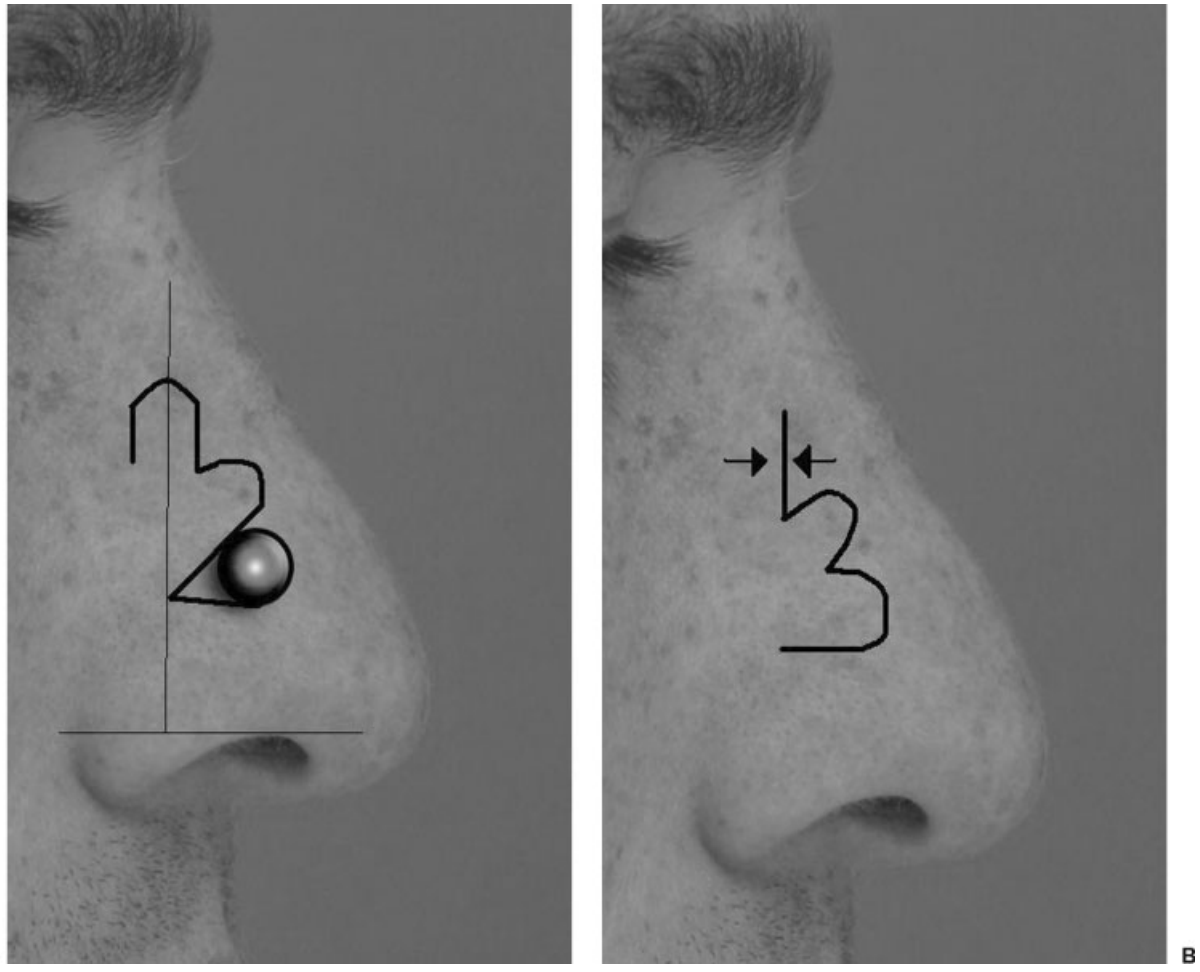

Figure 8 (A, B) In a laterally based bilobed flap, the secondary lobe should be designed perpendicular to the nostril to account for wound contracture.

In certain instances, the authors have designed this flap within the nasal tip subunit by removing the dog-ear at the lateral portion of the nasal tip rather than within it. Improved shadowing camouflages scars with this design and improves wound contraction, with less nostril distortion. However, given its tension can pull the tip dorsally, it can cause symmetrical upward tip rotation.[1]

SINGLE-STAGE MELOLABIAL FLAP

With a single stage, an inferiorly based melolabial flap can provide an excellent option for full-thickness, medium to large alar defects. It is most ideal for defects in the lateral alae or in the lateral alar groove.[36] Also referred to as the *nasolabial flap*, it consists of cheek tissue surrounding the melolabial crease from the ala to the oral commissure.

The melolabial flap can be performed in one or two stages. The two-staged flap has the advantage of better creation of the alar crease. The single-stage flap can blunt the alar groove.[39] However, not all patients are amenable to multiple stages, and other options should be available. An advantage of the flap is that the donor site is well camouflaged in the melolabial crease. Drawbacks of the flap are the risks of pincushioning and trapdoor formation when performed as a single stage.[37]

The technique involves a long incision in the melolabial fold. Pivotal restraint shortens the rotated flap, and this must be taken into account when designing the length of the flap. However, oversizing the flap can lead to trapdoor deformity. The flap is widely undermined in the central cheek to allow for rotation and transposition. Deep tacking sutures in the nasofacial sulcus are used to create adequate concavity. Dog-ear deformities are excised at the area superior to the surgical defect and the melolabial groove. Buried sutures are used to anchor the flap, and incisions are closed with running sutures. Revision procedures can be performed in the future to contour the alar groove.

For columella reconstruction, unilateral or paired nasolabial flaps can be used for reconstruction. Total columellar reconstruction is well performed with pair

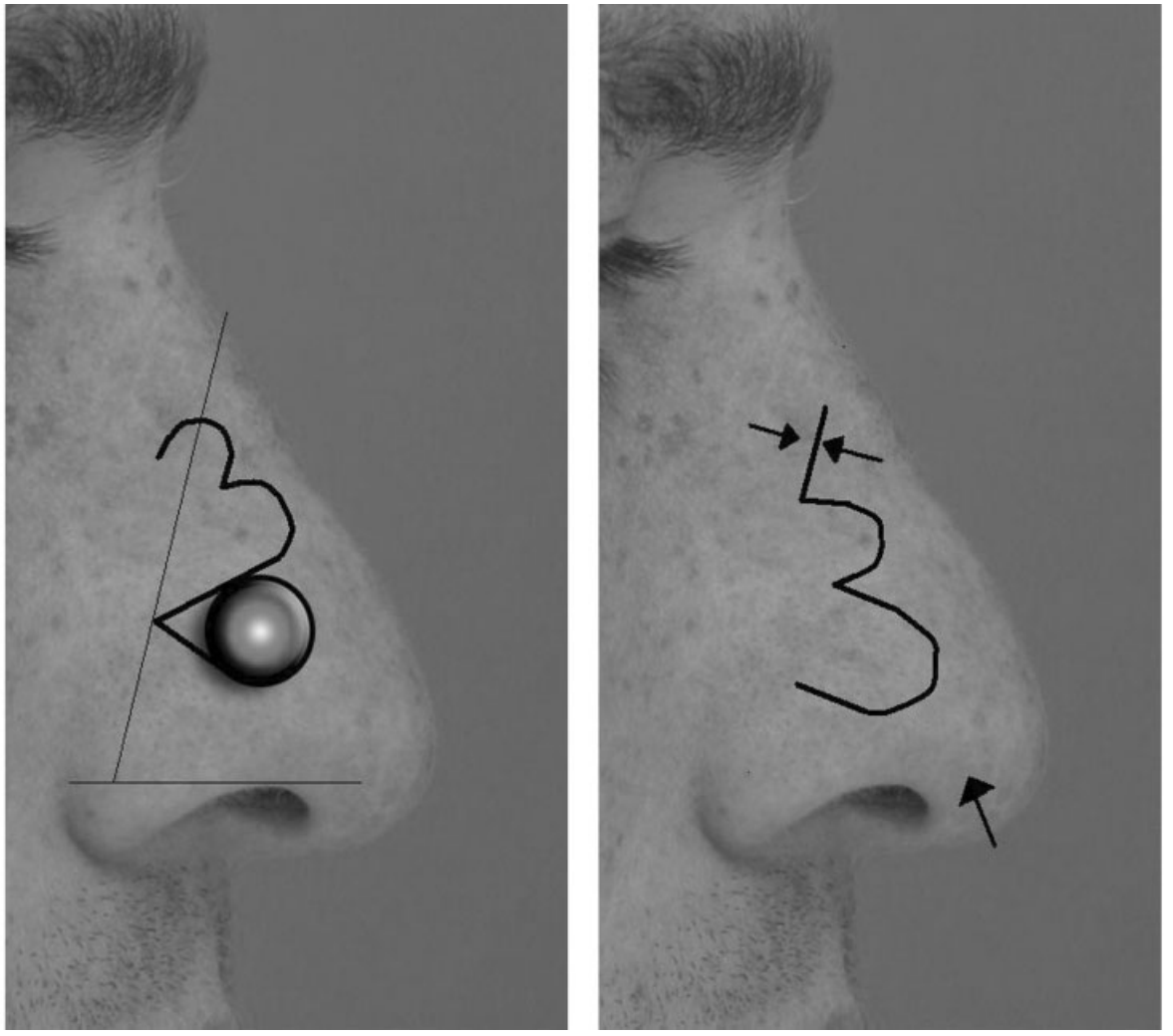

Figure 9 (A, B) In a laterally based bilobed flap, if the secondary lobe is designed with an acute angle in relation to the plane of the nostril, alar retraction may occur postoperatively.

flaps anchored to a cartilage columella strut graft. The columella strut must be sturdier than conchal cartilage. Septal and costal cartilage grafts are ideal.

For alar defects from 8 mm to 2 cm, the use of a superiorly based nasolabial flap may be preferred. This flap usually requires a second stage. Supra-alar and posterior alar defects can be performed with a single stage.[1]

ISLAND FLAPS (V TO Y FLAPS)

The island pedicle flap is also known as the V-Y flap. It uses an underlying subcutaneous pedicle to advance soft tissue into a defect while maintaining a healthy blood supply from its former location. The pedicle also includes venous and lymphatic drainage over most of its length.[38] In the nasal region, it should be considered a musculocutaneus flap. It is a good flap for reconstruction of small to medium defects of the alar crease (Fig. 11A–D). It has also been used in defects of the sidewall, dorsum, and glabella.[39] For small defects of the nasal tip, the nasalis myocutaneous island pedicle flap may be used to advance tissue inferiorly. This flap is a superiorly based flap from the nasal dorsum.[40]

Key to the use of a pedicle is an understanding of the model of axial and perforating vessels. Located in the subcutis and superficial fascia, axial vessels lie in a horizontal network. The vessels that feed the axial vessels are the vertical perforators that are located within the muscle. The blood supplying the skin comes from smaller subdermal vessels that are perforators from the axial vessels. Undermining the subcutaneous fat will preserve some of the axial vessels. Thinning of the flap will sacrifice more of these vessels and make the flap more reliable on the subdermal plexus.[41,42]

An incision is made through the dermis, and blunt scissor dissection is used to dissect the flap from its attachments to determine where the flap is being tethered. The incision is carried to the subcutaneous fat,

Figure 10 (A–C) A medium-sized defect that was deemed too large for a bilobed flap based on the location of the defect and the anticipated changes in nostril symmetry. A Rieger flap was designed within the nasal tip subunit and along the dorsal subunit to improve shadowing of scars postoperatively. (Photograph provided by Anil R. Shah, M.D.)

Figure 11 (A–C) Patient with a defect at the alar crease. An island flap was designed in part due to patient desire to avoid a pedicled flap. (Photograph provided by Anil R. Shah, M.D.)

thus separating the island's dermis and epidermis from the surrounding tissue. The pedicle is subcutaneous and is located inferior to or underneath the flap, and it may or may not include muscle. To improve mobility and survival, the length should be at least three times the diameter of the defect. When one increases the flap length, there is greater potential surface area of the underlying pedicle. Thicker tissue under the flap allows for more mobility because more of the pedicle can be narrowed for movement.[43]

The V-Y flap allows the transfer of tissue over a distance and diminishes tension. It also does not leave dog-ears, which may require subsequent management. For defects of the ala and lateral surfaces of the nose, the V-Y flap can be taken from the nasolabial fold or from the cheek. Some surgeons advocate tunneling the flap subcutaneously to reach the alar defect. The flap may also be slid beneath the ala to close a defect. The resulting scar is placed in the nasolabial fold. Defects of the middorsum can be closed with bilateral V-Y flaps from the lateral nose and cheek. Midline defects of the tip, dorsum, and glabella can be managed with midline flaps.[4]

POSTOPERATIVE CARE

Following the reconstructive procedure, a generous amount of antibacterial ointment is placed on the suture line. Postoperative oral antibiotics are given to patients with cartilage grafts, diabetics, immunocompromised patients, and smokers. A nonadhesive dressing is place over the area and secured using paper tape for the first 24 hours. Using cotton tip applicators soaked with saline, patients are taught to gently clean the wound and to reapply ointment three times a day. Sutures are removed on postoperative day 7. They are instructed to keep out of the sun, use sunscreen with a sun protection factor of at least 30 for the following year, and wear a protective hat whenever possible.

Patients are followed closely postoperatively. Unless refused by the patient, all scars are dermabraded 6 to 8 weeks postoperatively to improve scar cosmesis. The authors prefer the use of diamond burrs on low-speed rpm for precise removal of scar to the level of the papillary dermis. Rohrich et al promote primary dermabrasion or laser resurfacing at the wound margins in almost every nasal reconstruction. Some cases may require revision secondary dermabrasion for optimal contour.[1]

CONCLUSION

The reconstructive options for small and medium-sized nasal defects are many. Within each reconstructive option, there are multiple planning decisions that must be made. Success in reconstruction lies in preoperative planning and a strategy that will predict the dynamic nature of soft tissue and its effects on underlying architecture.

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