

Cutaneous Reconstruction of the Nasal Distal Third: Alternative Local Flaps for a Complex Region

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Summary: Small-to-medium cutaneous defects of the distal nose pose a significant challenge to reconstructive surgeons, and commonly described reconstructive techniques have their limitations. As the skin of this region is characteristically rigid and sebaceous, care must be taken to avoid introducing unfavorable tension vectors that can result in functional or anatomic distortion of the nasal free margins. With this in mind, the authors discuss 3 alternative reconstructive options, the East-West, nasalis sling, and trilobed flaps, which have wide utility in the repair of distal nasal cutaneous defects and can result in excellent cosmesis. The indications, surgical technique, and limitations of each are discussed in detail, and are compared with several of the more commonly described options in the context of distal nasal reconstruction. (*Plast Reconstr Surg Glob Open* 2021;9:e3444; doi: 10.1097/GOX.0000000000003444; Published online 13 May 2021.)

INTRODUCTION

Reconstructing soft tissue defects of the nasal distal third represents a unique surgical challenge. The skin has a thicker, sebaceous quality, and its adherence to the underlying cartilage risks distortion of the distal free margins during even smaller reconstructive procedures. On the more proximal nose, greater tissue laxity allows excellent cosmesis using well-described local flap options.¹⁻⁵ Dorsal nasal, bilobed, V-Y advancement, and single or 2-staged nasolabial flaps are commonly used reconstructive options for the distal nose, but these methods can have significant limitations that reduce their successful use.

A defect on a thick, sebaceous nose may challenge the reach of a bilobed flap without introducing unfavorable tension vectors or contour abnormalities, such as trap-dooring.¹ Dorsal nasal flaps require disproportionately large flaps to cover distal defects, and the flap's design can place suture lines in anatomically unfavorable locations.¹ Standard V-Y flaps, such as that described by Rybka, can be limited in the repair of more medial defects, and placing

the donor site immediately adjacent to the alar groove risks elevation of the alar margin if even a moderately sized flap is designed.⁶ The single-stage nasolabial flap can be used for the repair of lateral alar defects, but the flap predictably obliterates the shadowed concavity of the alar crease. The 2-staged nasolabial flap, which remains an excellent option for alar reconstruction, subjects the patient to an extranasal donor site and inconvenience of a 2-staged procedure.¹ Each of these classically described flaps, along with their variations, can have excellent aesthetic outcomes in the ideal clinical circumstances, but are certainly not sufficient to address all defects of the distal nose.

Ideally, nasal reconstruction utilizes local tissue, conceals suture lines in the natural shadowing between subunits, and provides favorable tension vectors that minimize anatomic or functional distortion. However, as mentioned previously, certain defects challenge these principles when repaired with commonly described methods. Recognizing these challenges, it is crucial for surgeons to have various local tissue options to address every reconstructive need. The purpose of this study is to describe the use of 3 alternative flaps, all of which have been uncommonly described in the plastic surgery literature, for the coverage of small to medium distal cutaneous defects: the East-West, nasalis sling, and trilobed flaps.

METHODS

All procedures were performed at the Duke University Health System. Oncologic resections were performed using the Mohs micrographic surgical technique. Reconstructions

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Fig. 1. The East-West flap. A 67-year-old woman who presented with a 1.0-cm supratip defect after Mohs surgery (A). Immediate post-procedure results after reconstruction with an East-West flap, demonstrating mild bilateral symmetric alar flaring (B), which has completely resolved on 4-month follow-up (C).

were performed the same day after tumor-free margins were confirmed in an outpatient clinic with the exclusive use of local anesthetic. Photographic consent was obtained from each patient, complying with Duke University Hospital guidelines. Preoperative, immediate postoperative, and 4-month follow-up images were obtained.

CASE 1: EAST-WEST FLAP

Patient Presentation

A 67-year-old woman presented with a basal cell carcinoma of the lateral nasal supratip. Mohs resection of the tumor resulted in a 1.0-cm defect with exposed perichondrium. Clinical examination after tumor removal revealed mildly sebaceous skin with sparse laxity. The defect was reconstructed with a horizontal advancement flap, commonly referred to as the East-West flap. Immediate postoperative results and the results on four-month follow-up are shown (Fig. 1).

Indications and Surgical Technique

The East-West flap is primarily suited for paramedian defects of the nasal tip and supratip. It is best employed for defects <1.5 cm in breadth, though it has been described for the repair of defects up to 2 cm.⁷ It is highly useful in patients with thick, sebaceous skin that may preclude the use of a bilobed or dorsal nasal flap.⁷⁻¹⁰

The East-West flap relies on the horizontal advancement of dorsal nasal skin coupled with the excision of two Burow's triangles: 1 immediately superior to the primary defect and 1 inferiorly, transposed to the nasal midline (Fig. 2A). A transverse incision extends from the inferior aspect of the defect to the medial triangle. The width of the superior triangle corresponds to the width of the

primary defect, with a generous vertical height to avoid introducing a standing tissue cone deformity along the nasal dorsum. For broader defects in patients with thinner columellae, the width of the inferior triangle can be undersized as much as 50% to ensure that there is adequate remaining columellar tissue to prevent deformity.¹⁰

When mobilizing the flap for advancement, dissection proceeds under the nasalis muscle to preserve maximum vascularity (Fig. 2B). Undermining circumferentially ensures that flap inset occurs with minimal tension. The resultant triangular-shaped flap is then advanced horizontally to fill the primary defect. Excision of the superior and inferior triangles ensures that there is no tissue redundancy at the apices. The repair results in 3 perpendicular lines (Fig. 2C). Superiorly, the suture line is camouflaged at or near the junction of the dorsum and sidewall, inferiorly it is hidden in the shadowing of the infratip lobule or columella, and transversely it blends with the tip-supratip or tip-columellar junctions.¹⁰

CASE 2: NASALIS SLING FLAP

Patient Presentation

A 45-year-old woman presented with a 1.0 cm left supralar defect after Mohs resection of a basal cell carcinoma. The defect was reconstructed with a superiorly-based nasalis myocutaneous island flap, colloquially referred to as the nasalis sling flap. Immediate postoperative results, as well as results on 4-month follow-up examination are shown (Fig. 3).

Indications and Surgical Technique

The nasalis sling is a superiorly-based myocutaneous island flap that is pedicled laterally on the transverse

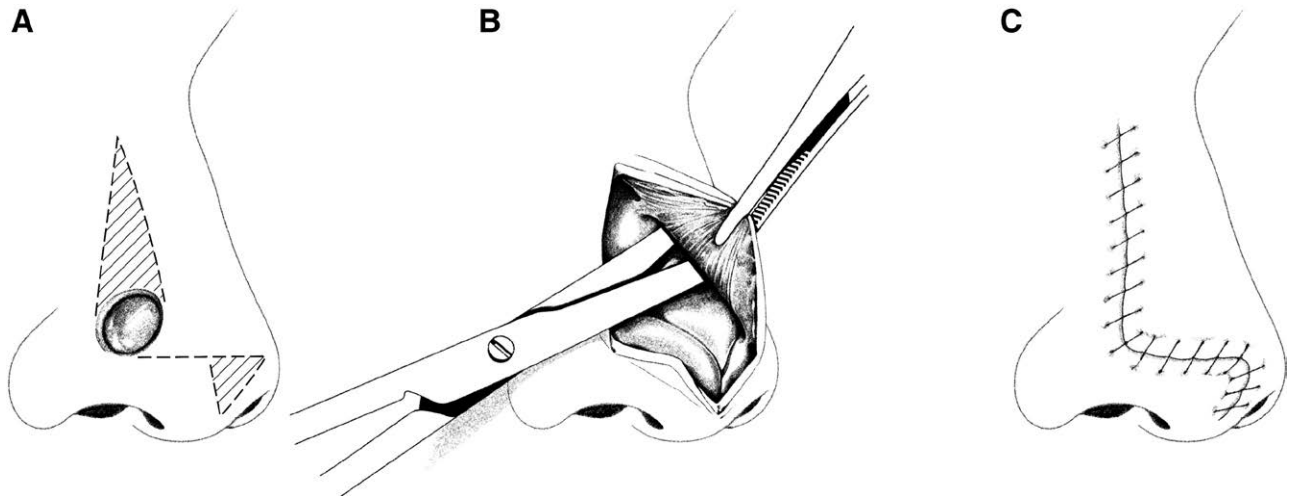


Fig. 2. The East-West flap. Markings showing superior and inferior Burow's triangles, connected via a transverse incision (A). Circumferential undermining beneath the nasalis muscle allows sufficient flap advancement with minimal distortion of the nasal free margins (B). The resulting perpendicular line repair, with the suture lines concealed in the natural shadowing of the nasal subunits (C).

nasalis muscle. It has an axial blood supply based on the lateral nasal artery that perforates the muscle base and provides multiple musculocutaneous perforators that contribute to the flap's rich vascularity.¹¹⁻¹⁴ It is, in essence, a V-Y advancement flap that can be used for defects up to 2 cm in width. With the laterally based "sling," the flap has tremendous arcing mobility and can be used for midline and lateral defects of the supratip, tip, and infratip regions, including those involving the soft triangle and anterior alar margin. Additionally, rotating the flap 90 degrees, thereby placing the broad side of the flap parallel to the alar margin, can yield coverage of wide alar defects over a cartilage batten graft.^{11,13}

The V-Y design is marked with the base of the triangle at the superior margin of the defect (Fig. 4A). The flap is frequently undersized by 10%–15% to minimize the risk of trapdooring and account for a purse-string effect, whereby the size of the primary defect effectively diminishes as the secondary defect is closed.¹¹ The flap relies on the principle of bilevel undermining, described by Papadopoulos and Trinei in 1999, to develop the lateral pedicle (Fig. 4b).¹² Medially, the incision is carried down through the transverse nasalis muscle to the perichondrium. Laterally, only the skin and subcutaneous tissues are incised, and undermining takes place in the subcutaneous plane to preserve the lateral attachments to the transverse nasalis musculature. Submuscular dissection then proceeds in a medial to lateral direction, mobilizing the cutaneous island on its lateral pedicle, which will serve as the "sling" during advancement.^{11,12} The superior and inferior attachments to the nasalis muscle are then carefully divided, and the flap is easily advanced into the defect (Fig. 4C).

CASE 3: TRILOBED FLAP

Patient Presentation

An 82-year-old man presented with a basal cell carcinoma of the nasal infratip, resulting in a 1.1 cm defect after Mohs resection. An oblique pinch test over the

dorsum revealed little laxity and resulted in displacement of the alar margins. The defect was reconstructed with a trilobed flap. His immediate postoperative results and the results on 4-month follow-up are shown in Figure 5.

Indications and Surgical Technique

The trilobed flap is a valuable option for the reconstruction of cutaneous defects up to 1.5–2 cm of the distal tip, extending as far as the infratip lobule.¹⁵ It can be used as an alternative to the bilobed flap in patients with rigid, sebaceous noses, or if the donor site pinch test yields reduced laxity or causes anatomic distortion.^{15,16} The flap is designed in a similar manner to the flap described by Albertini and Hansen, which follows the same basic biomechanics as the bilobed flap.^{15,17} The addition of a third lobe extends the arc of rotation from 90 degrees to 120–150 degrees, as each lobe rotates 45–50 degrees, to allow transposition into the defect under minimal tension.¹⁷ Furthermore, the addition of the tertiary lobe moves the most cephalic aspect of the flap's donor site into the more mobile areas of the proximal nasal dorsum, which dramatically improves mobility and prevents the distal distortion that would inevitably be seen in the use of a similarly designed bilobed flap in patients with thick, less mobile nasal skin.

The design starts with a lateral Burow's triangle (Fig. 6A). This triangle, or standing cone, is typically 1–1.5 times the diameter of the defect, directed toward the ipsilateral medial canthus, and placed superior to the alar crease. The primary, secondary, and tertiary lobes are angled 45–50 degrees from both the defect and from one another. The primary lobe is equivalently sized to the primary defect, with the secondary and tertiary lobes undersized by 10%–15% and 20%, respectively.^{15,16} It is important that the flap is designed in such a way that the tertiary lobe is oriented parallel to the long axis of the nose. The space occupied by the tertiary lobe, which will become the terminal defect after flap transposition, will bear much of the tension after closure and should be oriented vertically to prevent upward



Fig. 3. The nasalis sling flap. A young woman presented with a left supra-alar defect (A) that was reconstructed with a nasalis sling flap. Immediate post-procedure (B) and results on 4-month follow-up (C) are shown.

forces that could displace and distort the nasal free margins. The flap is elevated in the sub-nasalis plane (Fig. 6B) to incorporate richly-perfused nasalis musculature in the flap's base, and is transposed into the defect (Fig. 6C).

DISCUSSION

Small to moderate cutaneous defects of the distal nose pose unique challenges to reconstructive surgeons. The skin in this area can be thick, highly sebaceous, and quite immobile, which risks distortion of the nasal free margins if even modest tension is encountered during closure.

Reconstructive options with excellent cosmesis are those that use local tissue, place incision lines favorably within subunit junctions, and preserve nasal contour and symmetry. While descriptions of many local repair options exist, 3 alternative flaps are detailed here that can be used in nearly all patient populations and skin types for the reconstruction of small- to moderate-sized defects.^{1-3,5,9,18-21} As shown in the representative clinical images, these flaps offer excellent, predictable results and can be used to avoid some of the limitations encountered with more commonly described reconstructive options.

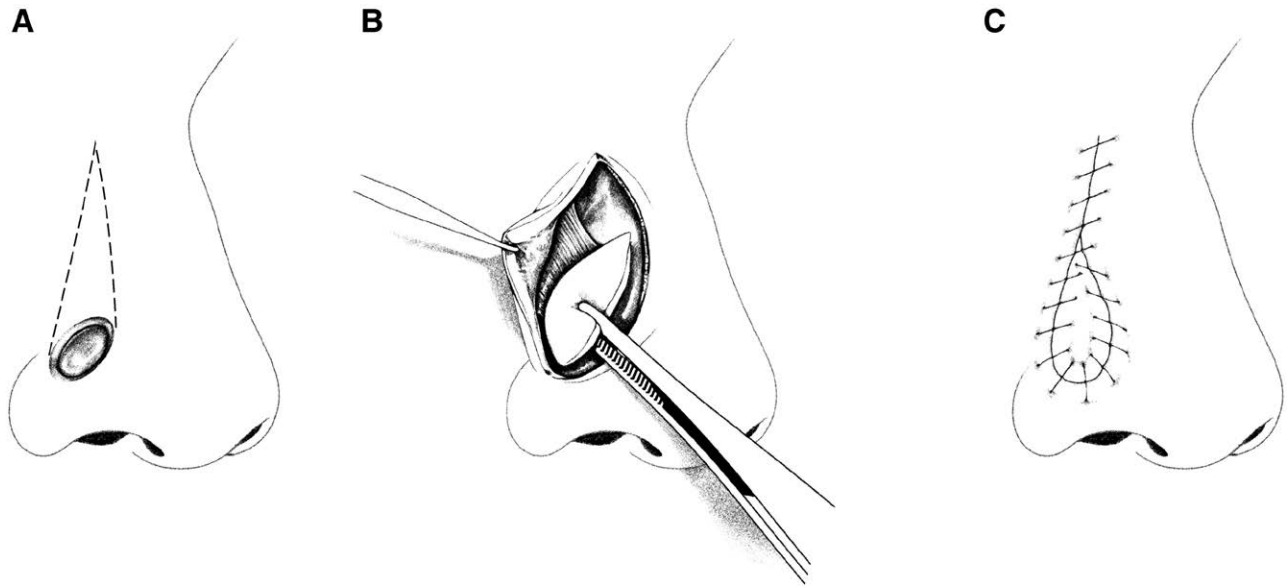


Fig. 4. The nasalis sling flap. The superiorly-based skin island is marked, and can be slightly undersized to allow for the “purse-string” effect (A). Differential undermining, whereby the flap is islandized on a lateral slip of nasalis muscle (B). The flap is advanced toward the defect, with tension vectors directed horizontally over the loose skin of the proximal nasal dorsum (C).

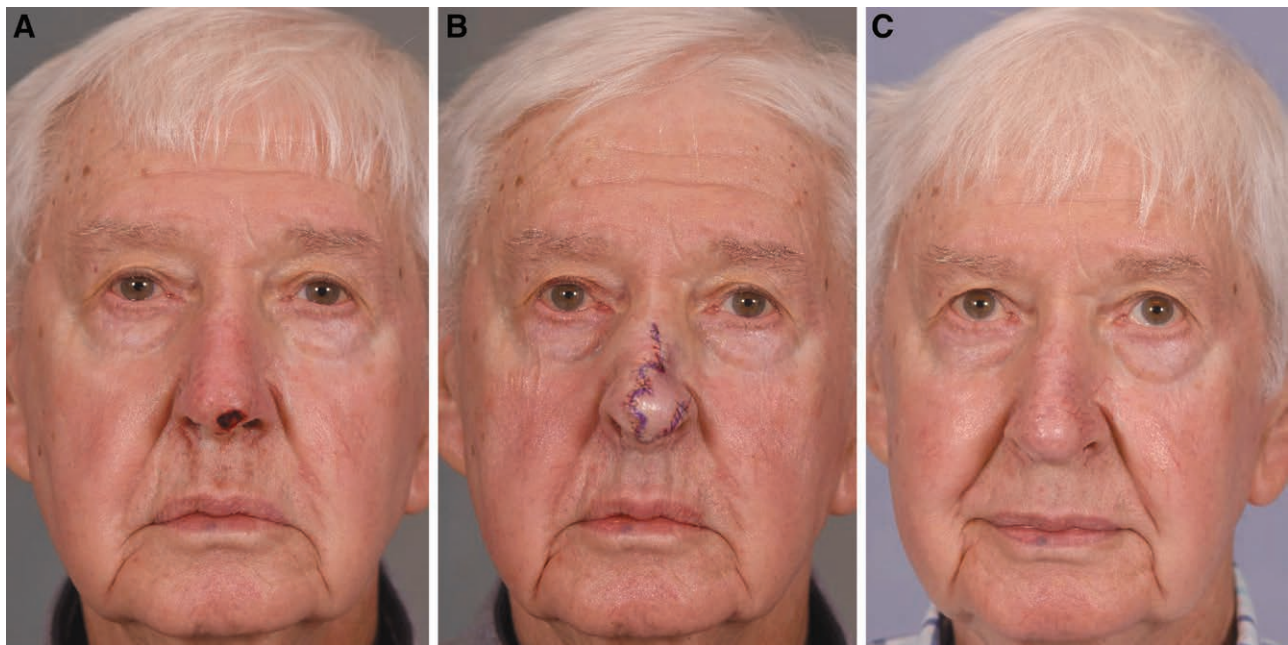


Fig. 5. The trilobed flap. An infratip defect (A) that was reconstructed with a laterally-based trilobed flap (B). Nasal symmetry and contour are maintained on 4-month follow-up (C).

The East-West flap is ideally suited for off-midline defects of the nasal tip and supratip in patients with thick, sebaceous skin. The horizontal advancement recruits tissue with excellent color and texture match, as these qualities vary little from side to side versus dramatically from cephalad to caudal.¹⁰ Trapdooring and pincushioning, contour deformities that commonly plague transposition flaps and can be exaggerated in thickly-skinned patients, are almost nonexistent. The flap, in essence, is a modified primary closure with displacement of the inferior dog-ear to a more

anatomically favorable location. The resultant broken line closure is well concealed in the natural shadowing of the nasal subunits. Draping of the flap over the dorsal midline reinforces the dorsal nasal profile and also results in a symmetrical distribution of tension exclusively in the horizontal vector.¹⁰ While this can initially result in symmetric bilateral alar flaring, this almost universally resolves once edema subsides and ensuing tissue creep occurs. Lambert and Dzubow performed the East-West flap in 30 patients with lateral tip defects 0.5–2 cm in diameter. In their series,

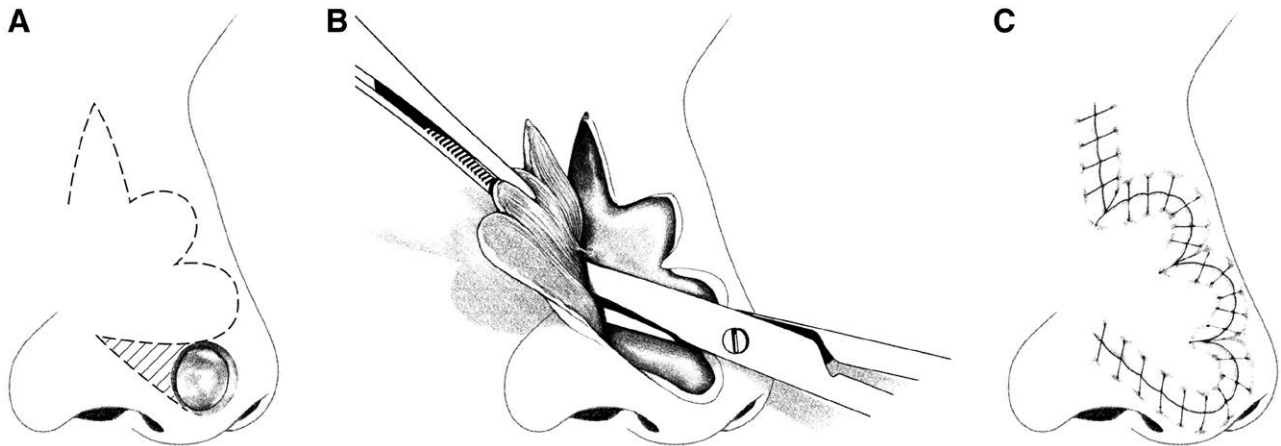


Fig. 6. The trilobed flap. Markings showing the standing cone directed toward the ipsilateral medial canthus and a vertically-oriented tertiary lobe (A). Sub-nasalis flap elevation with circumferential undermining (B). The flap after rotation and inset (C).

there were no cases of persistent alar elevation or permanent distortion of the dorsal nasal profile.⁷

The East-West flap does have a tendency to narrow the nasal tip slightly, but this is generally not bothersome to patients and, in some, may actually be an aesthetic improvement.^{8,10} The flap can be used for more lateral defects near the alar groove, but use should be restricted to 5 mm from the nostril margin to avoid alar buckling by the horizontal tension vectors.¹⁰ Furthermore, by nature of its design, the flap is only applicable to off midline defects. Those defects that are precisely midline and not amenable to primary closure may be best managed with a bilobed, dorsal nasal, or other random pattern flap, though this may be at the expense of unaesthetic incision lines and anticipated contour deformities in the thick skin of the distal nose. Rohrich et al proposed a modification of the dorsal nasal flap that abandons the potentially unsightly vertical glabellar scar and can be applied to supratip defects with good results.^{4,22}

The superiorly-based nasalis myocutaneous island flap, or nasalis sling flap, has wide utility in the distal third of the nose. With a pedicle perpendicular to the axis of advancement, the flap has excellent mobility with less secondary motion than comparable flaps, such as the Rybka V-Y advancement flap.^{11,13} Traditional V-Y flaps rely on a preserved central pedicle that can be stiff, bulky, and relatively immobile, which would nearly always cause undesirable anatomic distortion if used on the distal nose. In contrast, the nasalis sling flap can be used nearly everywhere on the supratip, tip, infratip, and distal ala. By tailoring the orientation and shape of the flap, the donor site closure can be placed laterally in the dorsal subunit, a distinct advantage over the bilobed and Rybka flaps, which often traverse multiple subunits. The inferior advancement of the island flap directs tension horizontally in the more forgiving skin of the proximal nose. This minimizes the nasal tip or alar elevation that can be encountered when using rotation or transposition flaps for the repair of distal defects.^{7,15} For wide alar defects, the flap can be advanced and rotated 90-degrees to place the broad side of the flap parallel to the alar margin, potentially sparing

the patient a staged nasolabial flap. In the largest study to date, Willey et al performed the nasalis sling island flap in 61 patients, with the majority of the defects measuring 1–2 cm and located on the tip and anterior portion of the distal ala. They observed only 1 mild case of alar notching, which was early in their series and attributed to not rotating the flap as previously described.¹³

The nasalis sling flap, however, can be associated with an increased risk of pin-cushioning. This can be minimized by not over-sizing the flap, and can often be addressed with corticosteroid injections in the early post-operative period. Larger, multi-subunit defects of the nasal ala, those involving the more posterior margin, or those requiring entire alar subunit reconstruction are still best managed with staged nasolabial or forehead flaps.^{1,3,4,19,21} For isolated defects of the infratip, skin grafts can provide good results if the defect is sufficiently shallow with a vascularized wound bed.¹

The trilobed flap is a departure from previously stated reconstructive principles, in that it always requires violating aesthetic subunits. However, as with the nasalis sling flap, a trilobed flap could spare the patient a staged interpolation flap in the repair of certain defects involving the distal tip and ala. Harvest of the more lax, proximal nasal skin makes it an attractive option for patients with rigid, sebaceous noses or for distal defects where a bilobed flap may have limited utility.^{1,2} In their retrospective study of 185 patients undergoing bi- or trilobed flaps for nasal reconstruction, Knackstedt et al found that trilobed flaps were preferred in more distal defects, particularly the tip and infratip, despite the bilobed flap being more frequently used overall.²³ According to Albertini and Hansen, the increased arc of rotation and decreased pivotal restraint account for its applicability to these regions, and both are directly attributed to the addition of the third lobe.¹⁵ Decreasing pivotal restraint reduces the upward forces that may elevate the alar margin. The increased arc of rotation allows placement of the terminal defect vertically in the lax proximal skin while still maintaining the standing cone in a tilted position that respects the alar groove.¹⁵ Attempts to achieve a vertical terminal defect using the bilobed flap in an inappropriately

distal defect require either orienting the standing cone horizontally or increasing the inter-lobe angles. Orienting the standing cone too horizontally risks crossing the alar groove, potentially disrupting this important landmark. Increasing the inter-lobe angles correspondingly lengthens the Z-plasty effect and can result in the caudal distortion, which Albertini and Hansen refer to as “bulldozing” of the ipsilateral ala.^{15,23} More often than not, overstretching the capacity of a bilobed flap results in a terminal defect draped obliquely across the dorsum of the nose. Besides being cosmetically distracting, this can cause alar elevation.¹⁵

Like other transposition flaps, the trilobed flap carries similar risks of trapdooring and pin-cushioning. In the aforementioned study by Knackstedt et al, these contour deformities were observed in 22.5% and 25.6% of bi- and trilobed flaps, respectively, and were more common in the alar region.²³ A trilobed flap results in a larger flap with a longer suture line; so it should be reserved only for situations where insufficient laxity or unfavorable orientation of the terminal defect or standing cone preclude the use of a bilobed flap.²³ As stated previously, certain alar defects may be best approached with a nasolabial flap, as the contour deformity can be used to advantage to help define this subunit, and the staged approach affords the ability for secondary thinning.

CONCLUSIONS

Reconstructing the distal third of the nose represents a challenge for facial surgeons, and commonly described reconstructive techniques have their limitations. Invariably, the size, shape, and skin quality of each nose is unique, and so a “one size fits all” approach to reconstructing soft tissue defects of the nasal distal third is hardly appropriate. The East-West, nasalis sling, and trilobed flaps are 3 techniques for reconstructing defects of the nasal distal third that are poorly described in the plastic surgery literature, but, as described herein, are rather simple in their design and execution. When better understood, they should play a strong role in any facial surgeon’s armamentarium of reconstructive techniques.

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PATIENT CONSENT

Patients provided written consent for the use of their images.

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