

A Method to Reproduce Symmetry in Midfacial Reconstruction: A Report of 19 Cases

Xiaoli Lou, MD, PhD; Chunyu Xue, MD, PhD; Joseph A. Molnar, MD, PhD, FACS; and Hongda Bi, MD, PhD

ABSTRACT

BACKGROUND: Reconstruction of facial skin defects remains a clinical challenge. With aging, ptosis of tissue over fixed structures creates an important facial feature known as the tear trough. This study aimed to evaluate the efficacy and aesthetic outcome of a novel surgical technique that reproduced this facial feature while avoiding ectropion during midfacial skin defect repair.

METHODS: Nineteen patients with midfacial skin defects received local flap reconstruction combined with an anchoring suture. The flap was designed in a unilateral pedicled V-Y pattern. When the flap was advanced to cover the defect, one or two sutures that connected the dermis of the flap with the infraorbital periosteum were made to reproduce the tear trough line.

RESULTS: Midfacial defects were successfully repaired with the V-Y flap in all 19 patients. No lower eyelid ectropion or conspicuous scars were noted in any of the patients. Further, the tear trough was successfully reconstructed in each patient. Facial symmetry was maintained with static positioning and animation.

CONCLUSIONS: The combination of local V-Y flap reconstruction with anchoring sutures to reproduce facial feature lines is an effective technique in midfacial skin defect repair.

KEYWORDS: aesthetic result, facial defect, facial reconstruction, local flap, symmetry, tear trough, V-Y flap

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INTRODUCTION

Successful repair of facial defects remains a clinical challenge for surgeons. Facial defects, either traumatic or secondary to tumor resection, demand a high standard of reconstruction to optimize coverage of the defect and achieve facial symmetry. Local flaps designed in accordance with the aesthetic facial subunit principle can achieve this favorable result for facial defect reconstruction.^{1,2} However, there is no consensus on the ideal flap design for specific defects. This is especially true for defects located across two or more facial subunits in the midface, where most of the important facial traits exist. For example, ptosis of the lower eyelid with aging forms a facial feature known as the tear trough.³ Extra attention should be paid to this feature during reconstruction to avoid distortion and maintain symmetry of the entire face.

The anatomical basis for aging features is well established because of the demand for cosmetic surgery. It is generally agreed that the tear trough arises from a skin-skeleton adherence induced by a complicated fibrous/ligament system.^{4–7} One of the most important facial lines involved is the eyelid-buccal line, which is generally considered the most prominent feature of the older adult midface. These lines follow the facial muscles (musculus zygomaticus major/minor) and therefore deepen over time with facial expressions such as smiling or yelling. In cosmetic surgery, this groove is filled or smoothed by various means to imitate a younger appearance.⁷ However, for reconstructive procedures in older adults, the tear trough serves as a critical marker that should be reproduced to preserve facial symmetry.

In this study, the authors suggest a new technique for facial defect reconstruction in older adult patients. Using a local advancement flap and an anchoring suture between dermis of skin flap and the periorbital periosteum, surgeons can reproduce the tear trough and eyelid-buccal line to maintain symmetry.

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METHODS

A retrospective review of patients presenting to the Department of Plastic Surgery at Changhai Hospital from February 2012 to October 2015 for reconstructive surgery was performed. During this period, 19 patients with a midfacial defect were candidates for local flap surgery. All patients who developed suspicious malignant skin lesions located across the lower lid and cheek junction between 50 and 85 years old were included in the study. Persons with diabetes and those who were smokers were excluded.

All patients showed significant features of aging including skin laxity of lower lid/midface and a prominent tear trough. The predicted size of defects after lesion removal made them unlikely candidates for direct closure. Preoperative evaluations and data collection included age, sex, body mass index, cardiovascular function, metabolism, and chemical laboratory tests. Written informed consent was obtained from the patients for involvement in this study and reproduction of the images.

Surgical Technique

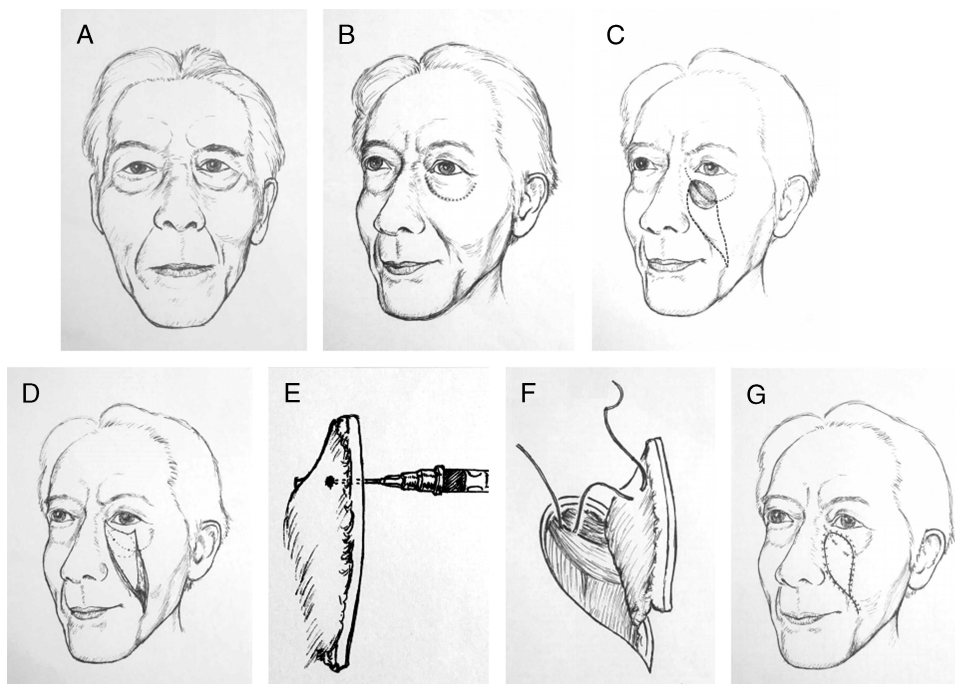
The facial features of each patient were evaluated preoperatively (Figure 1A) for obvious tear trough and lower eyelid-buccal lines. All of the procedures were performed

by the same surgical team under local anesthesia using lidocaine (1%) and epinephrine (1:200,000). The tear trough lines were marked before lesion excision (Figure 1B). The Mohs technique was applied in all the patients to ensure a tumor-free margin, which was confirmed by histologic analysis of the removed tissue.

After removal of the lesion, the tear trough line was marked with methylene blue within the wound, and a unilateral subcutaneous pedicled V-Y flap was designed (Figure 1C) as follows: (1) the middle incision line of the flap was first drawn along the paranasal-nasolabial fold or extended to the marionette line if necessary; (2) a lateral line was drawn to facilitate undermining of the flap and releasing the pedicle; (3) the width of the flap was determined by the width of the defect, the length of the flap was twice the width in a “V” shape. After these steps, the flap was elevated in a medial-to-lateral pattern over a plane above the myocutaneous muscle level to protect the facial nerve branches underneath. The pedicle was further freed by undermining at the subdermal level; this undermining continued until the flap could fully cover the defect without tension (Figure 1D). An initial suture was made to affix the flap to the periosteum and the tear trough, and the lower eyelid-buccal line was drawn over the fixed flap for careful comparison of symmetry to the

Figure 1. DIAGRAM OF THE FLAP

A, Preoperative evaluation of the patient’s facial features. B, Marking the tear trough and lower eyelid-buccal line (dotted line). C, Marking the tear trough and lower eyelid-buccal line after removal of the lesion (dotted line) and design of the unilateral pedicled V-Y pattern local flap (short bar). D, Transferring the flap to cover the defect, marking the tear trough and eyelid-buccal lines on the flap as well as the position for the anchoring suture. E, Penetrating the flap with a 15-gauge needle and marking the anchoring suture points subcutaneously with methylene blue injection. F, Diagram of anchoring suture, taking caution to avoid injury to the maxillary nerve. G, Shaping the flap and wound closure by suture.



patient's contralateral side. Two points over this line were marked to position the anchoring sutures (Figure 1D). To identify the subcutaneous side accurately, the surgeon used a 15-gauge needle to penetrate the flap and mark the anchoring suture points subcutaneously with methylene blue injection (Figure 1E). The temporary suture was then removed, and the marked point was fixed to the periosteum with a 3-0 Prolene anchoring suture in that position (along the tear trough in the defect). The anchoring suture was intended to connect the periosteum to the dermis of the flap to resemble the original dermal-bone connection to reproduce the tear trough and eyelid-buccal line. These anchoring sutures also aimed to reduce the tension of the flap's far rim to the lower eyelid and avoid potential ectropion (Figure 1F).

The flap was then shaped with a scalpel according to the defect and closed without tension; the donor site was closed by primary intention (Figure 1G). All of the incisions were closed in two layers, with 5-0 clear nylon for the deep layer and 6-0 nylon for the skin. Stitches were removed 5 to 7 days later. Surgical scar assessment using the Vancouver Scar Scale (including pigmentation, vascularity, pliability, and scar height) was conducted by

the same doctor in the same room with the same light when the patients came back for their 3- and 6-month follow-up appointments.

RESULTS

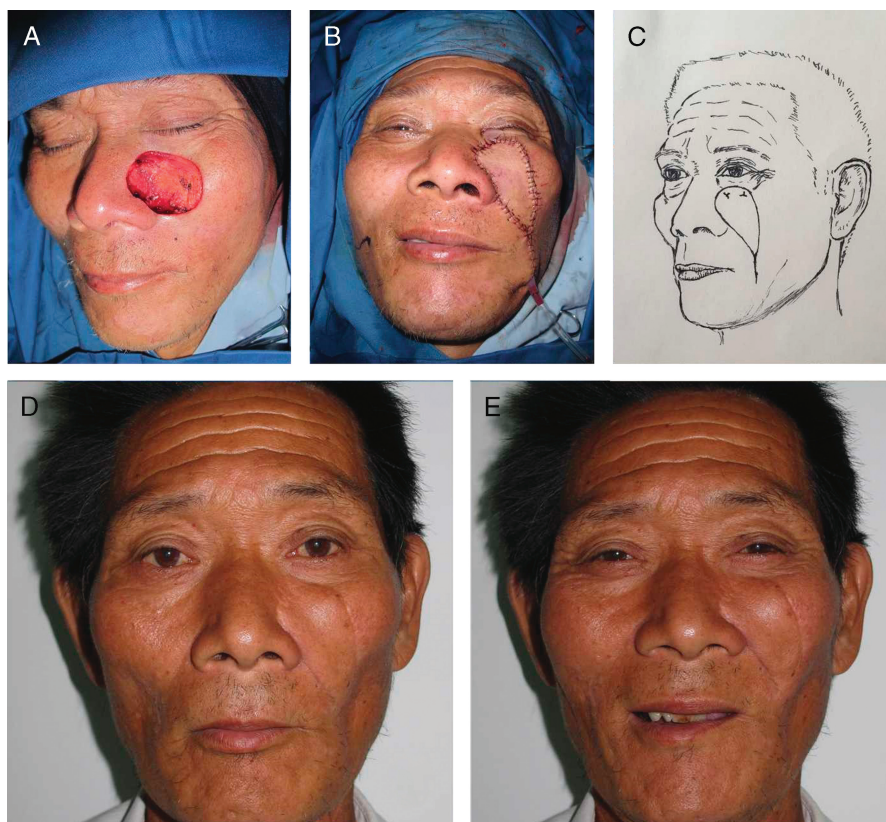
From February 2012 to October 2015, 19 patients received the described flap reconstruction following skin tumor dissection. The mean age of the patients (12 male and 7 female patients) was 68.3 years (range, 62–81 years). All participants were nonsmokers, and none of them had facial scars that influenced the choice of reconstruction.

Facial defects were the result of skin tumor excision including basal cell carcinomas ($n = 15$) and squamous cell carcinomas ($n = 4$). The reconstruction took place immediately following excision in all 19 patients. The size of the defects ranged from 1.8×2.6 cm to 3.4×4.0 cm (mean, 2.6×2.8 cm). For most of the patients ($n = 17$), the superficial myocutaneous system was left intact. In the other two cases, the facial muscle was excised, resulting in bone exposure.

Histopathologic evaluation of the excised specimens revealed tumor-free margins. No prophylactic antibiotics were used. No tumor recurrence was noted during

Figure 2. CASE 1

A, Midfacial skin defect immediately following basal cell carcinoma removal. B, Reconstruction of the defect by V-Y flap. C, Illustration of the position of anchoring suture. D, 12-month postoperation anterior view, static. E, 12-month postoperation dynamic anterior view (smiling).



Photos courtesy of Hongda Bi, MD, PhD, and Xiaoli Lou, MD, PhD.

a mean follow-up of 9 months (range, 6–18 months). Postreconstruction healing was uneventful in all the patients, and all of the flaps survived without any complications. The contour of the reconstructed tear trough reappeared gradually after regional edema faded away and mature scarring appeared, 3 to 6 months postoperation. Lower eyelid ectropion was not seen in any of the patients. Postoperative surgical scars were concealed within the nasolabial fold (Vancouver Scar Scale total sum = 0),⁸ and the flap color matched the adjacent skin. Satisfactory symmetry of the bilateral midface was achieved not only statically, but also dynamically when the patients smiled (Figures 2D, E; Figures 3D, E). None of the patients required another operation to correct secondary deformity.

DISCUSSION

Reconstruction of midfacial skin defects remains a challenge for plastic surgeons. This study presents a method to restore age-appropriate features while avoiding ectropion based on a combination of V-Y flap and anchoring suture.

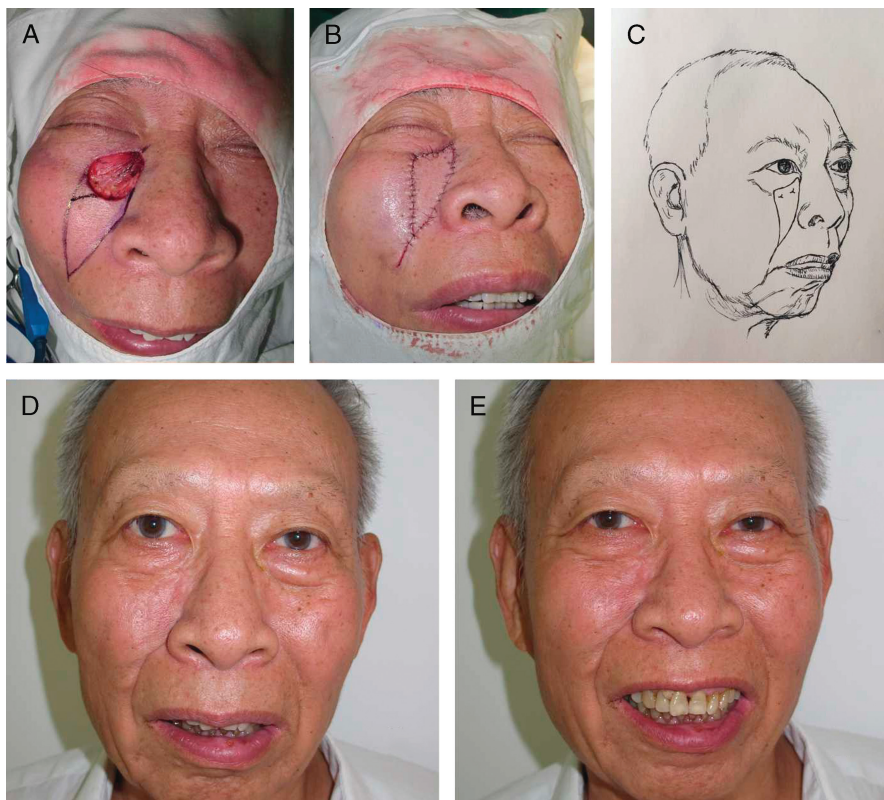
The anchoring suture for fixation of the dermis to deep structures is a common practice in many reconstructive

procedures.^{9–14} In breast reconstruction, it is a crucial step to reproduce submammary folds by holding the inserted flap or implant to gain a favorable aesthetic result.^{9–11} For buried penis correction, anchoring the dermis in the penis root to the deep ligament plays an essential role in maintaining the static length of the penis.¹² In aesthetic blepharoplasty, the anchoring suture is well established in the literature as an important means to prevent ectropion.^{13,14} These above examples make the anchoring suture a reasonable approach for flap surgery.^{15–20}

Although a variety of techniques have been suggested, there is no consensus on the best operation for midfacial defects. For medium-sized defects located across the lower eyelid and cheek region (as described in this study), the preferred reconstructive strategies include direct closure, skin graft, forehead flap, free flap, or cheek or Mustardé flap.^{21–23} Direct closure is limited by tension in larger defects and possible distortion of facial structure. Skin grafting may result in depressions in the skin, as well as hypertrophic scarring or hyperpigmentation in people with darker skin. Forehead flaps are often criticized for the resulting prominent scar of the donor site, as well as the relatively thick texture of the flap compared with the

Figure 3. CASE 2

A, Midfacial skin defect immediately following basal cell carcinoma removal. B, Reconstruction of the defect by V-Y flap. C, Illustration of the position of anchoring suture. D, 12-month postoperation anterior view, static. Tear trough and eyelid-buccal junction reproduced. E, 12-month postoperation dynamic anterior view (smiling).



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lower eyelid area; it also requires a second procedure to correct the flap pedicle. In addition, the typical cheek flap reconstruction may result in a relatively “younger” appearance of the operated side of the face, leading to significant facial asymmetry.

Cheek or Mustardé flaps are common, but they are random rotation flaps that borrow tissue laterally to the defect rather than below it.^{24–29} This technique relies on vast undermining to mobilize skin and is fraught with potential complications such as hematoma and distal flap necrosis. This technique also renders it especially difficult to reach inner canthus region defects such as those described in this article. Multiple variations have been described in the literature,^{30–36} but they all share the common trait of rearranging local tissue to reconstruct “like with like.” Despite rotation advancement to minimize the inferior tension placed on the lid margin, there is a continued risk of ectropion. To achieve a favorable aesthetic outcome, it is usually necessary to excise large “dog ears” in cheek flaps that result in an additional scar.

In order to overcome these deficiencies, the authors combined the V-Y flap with the anchoring suture technique. Because the V-Y flap can be adapted to the defect, theoretically this technique can be applied to midfacial defects of any size. The movement of the flap is merely direct advancement to the wound. It is ideal for restoring symmetrical facial motion because the skin moves upward during facial expressions. This reconstruction uses a loose region of skin as a donor site and minimizes skin waste so it does not interfere with the general facial symmetry. With the anchoring suture, tension on the flap is released, and natural folds are reproduced, helping to both prevent ectropion and restore age-appropriate features. Other advantages of this method are as follows:

- (1) it is a one-stage outpatient operation;
- (2) the design of the flap and positioning of anchoring suture point can be adjusted based on the position and size of the defect, so it is relatively easy to apply;
- (3) the unilateral pedicle design makes it easy to achieve vertical mobility whereby the medial part of the flap is rotated to the donor site to further increase facial mobility without sacrificing blood supply, which further renders it a safe procedure under local anesthesia with low risk of flap loss;
- (4) it preserves the unique color, texture, and contour of the local skin, camouflaging surgical scars; and
- (5) it mimics important facial features, lending itself to static and dynamic facial symmetry.

However, there are limits to the application of this technique in facial reconstruction. In larger defects that include a larger vertical portion of the eyelid above the lid-cheek junction, additional reconstructive techniques may be needed to avoid ectropion. That said, it is possible to advance this flap to the ciliary margin because the

anchor stitches and V-Y advancement minimize the risk of ectropion.

Although the authors believe this method has advantages over the traditional methods of facial reconstruction, it is still far from perfect. The procedure may result in hypertrophic scarring and trap door deformity. The anchoring suture also requires excellent comprehension of facial anatomy to avoid a possible maxillary nerve injury. In cases that only require advancement to the lid-cheek junction, surgeons could possibly obtain similar results without the anchor stitches. However, there remains an increased risk of ectropion and blunting of the groove, possibly resulting in a less favorable aesthetic and functional result. Because the anchor stitches are low risk and may prevent ectropion, it is prudent to incorporate them in this type of reconstruction.

Finally, the authors performed all of these surgeries under local anesthesia instead of using a regional nerve block. If driving the needle through the periosteum caused pain for the patients, it would have been an indication of possible injury to the nerve and the need to change the deep suture to another location.

CONCLUSIONS

For facial skin defects caused by tumor removal, ideal reconstruction may require tear trough reproduction to achieve facial symmetry. The authors introduced an anchoring suture to recreate these lines in facial reconstruction with a V-Y advancement flap in older adult patients and achieved acceptable results. This technique may help to improve aesthetic outcomes for facial reconstruction in older adults while minimizing ectropion. ●

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