

The “Frogger Flap”: A Novel Quadruple Rhomboid Flap for Complex Central Upper Lip Reconstruction

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Summary: Upper lip reconstruction represents a unique challenge for the reconstructive plastic surgeon. Given its prominent aesthetic role in addition to its functional role in facial expression, speech, and oral intake, preservation of this region’s natural form and function is paramount. In this report, we present a novel technique for the reconstruction of a complex central upper lip defect, restoring the natural aesthetic of this essential structure. We describe the case of a 51-year-old woman who presented with recurrence of a previously resected basal cell carcinoma center on the upper lip at the level of the white roll and philtral depression. Following surgical resection via Mohs micrographic surgery, a 1.8×1.6 cm partial-thickness defect centered around the Cupid bow involving both cutaneous and vermilion tissues remained. Reconstruction was achieved through a novel quadruple rhomboid flap primarily based on the preservation of the aesthetic subunits of the upper lip. A functional and aesthetic reconstruction was achieved through local tissue rearrangement, restoring the appearance of the white roll and red line. Native perfusion and innervation were preserved during the reconstruction of the Cupid bow, recreating this region’s natural appearance. The design of the flap resembles a jumping frog, which is the etiology of the “Frogger flap” moniker. The Frogger flap recreates the natural aesthetic of the central upper lip through the geometric transposition of tissue commensurate with native anatomy. Through the application of aesthetic subunit principles, it reliably reconstructs central upper lip defects while preserving function and providing an aesthetically pleasing outcome. (*Plast Reconstr Surg Glob Open* 2022;10:e4072; doi: [10.1097/GOX.0000000000004072](https://doi.org/10.1097/GOX.0000000000004072); Published online 9 February 2022.)

INTRODUCTION

Upper lip reconstruction represents a unique challenge for the reconstructive plastic surgeon. The conspicuous location and distinct anatomy of the upper lip underlie its prominent aesthetic role. In addition to its visual importance, the upper lip also contributes to dynamic functions such as facial expression, speech, and oral intake. Therefore, the preservation of its natural form and function through the maintenance of its multiple aesthetic subunits is paramount.^{1,2} Burget and Menick¹ previously described the aesthetic subunits of the upper lip including

the medial subunit (one-half of the philtrum) and lateral subunit (philtral column, nostril sill, alar base, and nasolabial crease). Involvement of both cutaneous and vermilion components requires replacement of “like with like” (cutaneous tissue replaces cutaneous tissue; vermilion tissue replaces vermilion tissue) to achieve a natural appearance. Essential reconstructive principles include the recreation of the Cupid bow, symmetric alignment of critical structures² including the philtrum, philtral columns, and the vermilion border, recreation and proper alignment of the red line and white roll, and the masking of scars within subunits using depressions, lighted ridges, and naturally shadowed furrows.^{1,2}

Current recommendations for the reconstruction of upper lip defects depend on the presence and degree of philtral and vermilion involvement.^{3,4} For skin-only defects involving less than 50% of the philtrum, excision

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with primary closure or full-thickness skin grafting are recommended.³ Full-thickness skin grafting is also recommended for skin-only defects involving more than 50% of the philtrum.³ When skin, vermillion, and less than 50% of the philtrum are involved, a mucosal advancement flap is an additional recommended consideration.^{3,4} A lip-switch flap is recommended for defects involving more than 50% of the philtrum instead of full-thickness skin grafting when skin and vermillion are both involved.^{3,4}

Alternative reconstructive options include wedge excision, local advancement flaps (including O-Z and V-Y flaps), rhomboid/transposition flaps and the Abbe flap.³⁻⁹ Wedge excision and local advancement flaps quickly distort facial symmetry when applied to defects with both vermillion and cutaneous components.⁵ The Abbe flap is an option but requires tissue harvest and complete denervation of a central lower lip segment, creating another potential site of aesthetic distortion and wound healing.⁵ Its greatest utility is for full or nearly full-thickness defects.⁵ It may also require skeletonization of the labial artery, an estimation of tissue attenuation and an additional procedure for secondary division and inset.^{5,6} Much like the pinwheel design described by Vecchione and Griffith¹⁰ for the reconstruction of scalp defects, the “Frogger flap” avoids these pitfalls while preserving the natural function, perfusion, and innervation of the central upper lip. Herein, we describe a novel subunit-based technique for reconstruction of partial-thickness, central upper lip defects that provides a natural and aesthetically pleasing outcome.

CASE REPORT

A 51-year-old woman with a history of a previously resected basal cell carcinoma presented with a new lesion centered on the upper lip at the white roll of the philtral depression. Biopsy revealed infiltrative morpheiform basal cell carcinoma. Resection was achieved through Mohs micrographic surgery with subsequent referral to our clinic for reconstruction.

Following surgical resection, a 1.8×1.6 cm partial-thickness defect of the central lip centered on the Cupid bow remained, involving comparable extents of cutaneous and vermillion tissue (Fig. 1). Reconstruction with a novel quadruple rhomboid flap was planned. The technique emphasizes the preservation of the aesthetic subunits of the upper lip and the application of geometric principles.^{1,2} Its design resembles a jumping frog, which is the etiology of the Frogger flap moniker.

OPERATIVE TECHNIQUE

The procedure was performed under general anesthesia with endotracheal intubation. The white roll, philtral columns, and central depression of the lip were marked out before injection of epinephrine to avoid distortion of cutaneous tissue and effacement of the subunit structures. One-percent lidocaine with epinephrine was subsequently injected for local anesthesia and vasoconstriction.

Design of the four rhomboid flaps began with conversion of the defect into the shape of a double-layered Chevron, resembling the American oil company logo

Takeaways

Question: What is the optimal technique for the repair of central upper lip defects involving both cutaneous and vermillion components?

Findings: The “Frogger flap” successfully applied subunit principles to obtain a functional and cosmetically satisfying surgical outcome in the reconstruction of the central upper lip defect described herein.

Meaning: For central upper lip defects involving both cutaneous and vermillion components, this technique may offer superior aesthetic outcomes with lesser morbidity when compared to extant alternatives.

(Fig. 2). This required excision of two triangles from the upper lip and one triangle from the central vermillion (Fig. 3). (See figure, Supplemental Digital Content 1, which shows the stepwise progression of the Frogger flap technique: 1. Depiction of clean edges and wound base, 2. Surgical marking of “Frogger” aligned with subunit anatomy, 3. Incisions made along surgical markings, 4. Cutaneous flaps transposed into defect, 5. The results of transposition of cutaneous flaps, 6. Vermillion flaps transposed into defect, 7. The results of transposition of vermillion flaps, 8. Final appearance after placement of external stitches. <http://links.lww.com/PRSGO/B906>.) The edges of the chevron were aligned with the philtral columns in keeping with the subunit principle. The two cutaneous

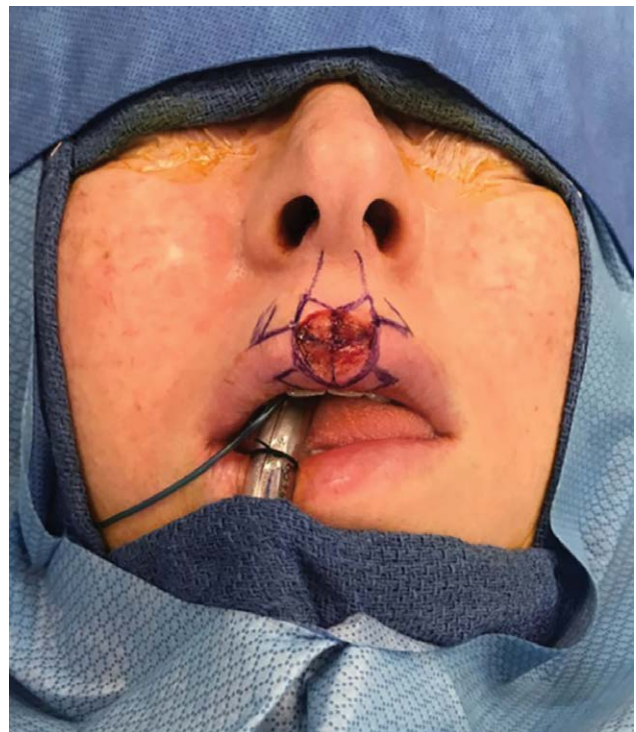


Fig. 1. Photograph of the central upper lip defect following Mohs resection of the patient’s basal cell carcinoma and illustration of the rhomboid based “Frogger” aligned with the relevant subunit features of the central upper lip.

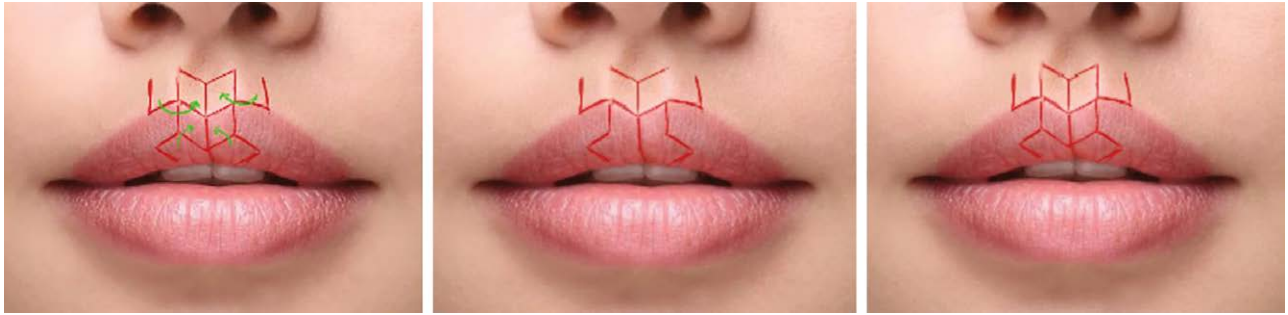


Fig. 2. Intraoperative photographs and diagram depicting the incisions and tissue approximation used for the Frogger technique.

flaps were designed symmetrically along the white roll of the upper lip. The two vermilion-based flaps were designed symmetrically along the junction of the dry and wet vermilion (the red line). The flaps were then incised, and the upper cutaneous flaps transposed into the central defect using interrupted, 5-0 Monocryl sutures, thus reconstructing the central, cutaneous aspect of the Cupid bow. Care was taken to ensure symmetric length and alignment of the philtral columns. The donor sites were then closed in a similar fashion. The vermilion flaps situated along the red line were subsequently dissected free from the underlying muscle and reapproximated to the epidermis along the vermilion border with 4-0 chromic suture. The epidermis along the white roll and the cutaneous portions of the skin were also reapproximated with 6-0 Prolene suture (Fig. 2).

Once transposed, the cutaneous flaps recreated the superior aspect of the Cupid bow with the scar at the junction of the cutaneous and vermilion components recreating the white roll. The vermilion flaps replaced the defect's absent vermilion tissue, completing the reconstruction of the Cupid bow and reforming the "M" contour of the Cupid bow. The red line was carefully realigned to ensure an aesthetic reconstruction. The reconstruction of essential anatomic landmarks through local tissue rearrangement preserved native perfusion and innervation while recreating this region's natural appearance. (See figure, Supplemental Digital Content 2, which shows the postoperative photographs displaying the progression of healing over several postoperative visits. <http://links.lww.com/PRSGO/B907>.)



Fig. 3. Flow diagram depicting the procedural steps of the Frogger flap technique: 1. Depiction of clean edges and wound base, 2. Surgical marking of Frogger aligned with subunit anatomy, 3. Incisions made along surgical markings, 4. Cutaneous flaps transposed into defect, 5. The results of transposition of cutaneous flaps, 6. Vermilion flaps transposed into defect, 7. The results of transposition of vermilion flaps, 8. Final appearance after placement of external stitches.

CONCLUSIONS

Reconstruction of the central upper lip can be an arduous undertaking due its unique anatomy and essential aesthetic function. The Frogger flap (a novel quadruple rhomboid flap) recreates the natural aesthetic of the central upper lip through the geometric transposition of tissue commiserate with native anatomy through the application of subunit principles. It provides a reliable technique for the reconstruction of central partial-thickness defects of the upper lip, avoiding undue morbidity during the reconstruction of this vital anatomic region.

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