Outcomes Following V-Y Advancement Flap Reconstruction of Large Upper Lip Defects

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Objective: To characterize revision surgery following V-Y subcutaneous tissue pedicle advancement flap repair of large upper lip skin defects.

Methods: Retrospective review of upper lip skin defects at least 3.0 cm² in area that were reconstructed with a V-Y subcutaneous tissue pedicle advancement flap at an academic tertiary care center. Depth and area of the defect, as well as involvement of the vermilion and nasal ala, were recorded as independent variables. Revision techniques were analyzed to identify patterns.

Results: Thirty patients were identified as having upper lip skin defects with a mean (range) area of 7.0 (3.0-14.0) cm² (median, 6.25 cm²). The defect involved the nasal ala in 4 cases and the vermilion in 3 cases. At least 1 revision surgery was performed in 14 patients (47%). Alar or vermilion involvement was a significant factor in revision by \( \chi^2 \) analysis \( (P = .03) \). Larger defect size did not predict a need for revision, even among cases where the defect did not involve the ala or vermilion \( (P = .68) \).

Conclusions: Reconstruction of large upper lip skin defects with a V-Y subcutaneous tissue pedicle advancement flap is associated with a 47% revision rate, and when the defect involves the ala or vermilion, the revision rate is increased. Defect size alone cannot be used to predict the need for revision surgery. Revision techniques are demonstrated.

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The upper lip is functionally and aesthetically important region of the face. Broadly, it comprises cutaneous and vermilion components that are separated by the vermilliocutaneous junction. The cutaneous portion is further divided into 2 paired lateral subunits bounded by the nasal base and melolabial folds and separated by the midline philtrum. The intersection of the philtrum with the red lip creates the delicate “cupid's bow.”

The upper lip is also a relatively frequent site of cutaneous malignancy. Surgical excision is the treatment of choice for most skin cancers of the lip. The technique used to reconstruct the resulting surgical defect depends on location, size, depth, and adjacent subunit involvement. Reconstruction of small (<1 cm) cutaneous defects of the upper lip can be achieved with lip advancement (primary) closure if located in the middle to lower lip, but this might require excising a standing cutaneous deformity of the red lip. Full-thickness skin grafting can always be used for repair of superficial skin defects of the upper lip, regardless of size. This can result in a poor color match between the graft and adjacent lip skin or in a contour depression. Larger cutaneous defects can be converted to full thickness and repaired with lip advancement if perfectly midline or with full-thickness lip switch flaps from the lower lip. However, the latter is a complex surgical option requiring creation of scars in the lower lip and interval pedicle detachment requiring another surgical procedure. The local flaps that can be used in the upper lip are limited because they often distort the nose, vermilliocutaneous junction, melolabial crease, or philtral columns.

A V-Y advancement flap of adjacent upper lip skin based on a subcutaneous tissue pedicle is an excellent technique for reconstructing lateral, skin-only upper lip defects larger than 1 cm². This method places scars along aesthetic borders and advances skin of similar characteristics into the upper lip. Furthermore, this method maintains oral sphincter competence and facial nerve function. Given the robust subcutaneous pedicle, this flap is a reliable option for upper lip reconstruction in most patients, including smokers. Subcutaneous undermining of portions of the flap allows advancement of a skin flap of similar thickness and contour into the upper lip. Mobilizing the island flap solely on the subcutaneous fat adjacent to the modiolus enables advancement of the flap up to and slightly beyond the philtrum, allow-
ing reconstruction of skin defects as large as one-half of the upper lip.

In 1998, our group published our technique and the largest series of V-Y subcutaneous tissue pedicle advancement flaps used for upper lip reconstruction in the literature to date. In that report, 35% of defects at least 4 cm² in area required flap contouring (“debulking”), although this statistic included defects with a significant cheek component. The purpose of this study was to further analyze larger upper lip skin defects repaired with this method in an effort to identify defect characteristics that might predict the need for revision surgery. The aesthetic or functional abnormalities that prompted revision surgery and the specific techniques used to correct them were explored as well.

**METHODS**

Patients with upper lip skin defects at least 3.0 cm² in area that were reconstructed with V-Y subcutaneous tissue pedicle advancement flaps were identified from the senior surgeon’s (S.R.B.) prospective skin cancer reconstruction database. Inclusion criteria were at least 2 months of follow-up and cutaneous neoplasm as the cause of the defect. Defects with greater than 5-mm extension onto the cheek aesthetic unit (lateral to the melolabial fold) were excluded. All patients provided appropriate consent for preoperative, intraoperative, and postoperative photography, and this study received institutional review board approval from the University of Michigan. Variables extracted from patients’ medical records included cause of the defect, sex, age, size of the defect, and depth of the defect (divided into skin, subcutaneous tissue, or involving the orbicularis oris muscle). Postoperative queries included presence or absence of flap necrosis, wound infection, wound dehiscence, and need for secondary procedures. Defects were measured after resection of the primary lesion and freshening of any post-Molts wound margins, and before undermining, in all cases.

Our surgical technique is as follows. After confirmation of tumor-free margins, reconstruction was performed in the operating room under intravenous sedation and local anesthesia. The face was then prepared and draped in the usual sterile fashion. All flap incisions were then made through the skin excision were rarely used (twice each). Vermilionectomy, scar contouring (11 times) and Z-plasty (9 times) were the most commonly used techniques. Vermilionectomy, scar revision, and removal of a standing cutaneous deformity were each used 6 times. Vermilion advancement and skin excision were rarely used (twice each).

**RESULTS**

From January 1, 1994, through December 31, 2011, we identified 30 patients fitting the inclusion criteria, with upper lip defects with a mean (range) area of 7.0 (3.0-14.0) cm² (median, 6.25 cm²). Eighteen patients (60%) were women. Age at the time of reconstruction ranged from 34 to 86 years. The malignancy was basal cell carcinoma in 16 cases, whereas the rest were atypical junctional melanocytic hyperplasia or melanoma in situ. There were no instances of wound dehiscence or partial flap loss. One patient received a course of oral antibiotics for skin erythema and presumed cellulitis that resolved without any adverse consequences. The defect involved the nasal ala in 4 cases and the vermilion in 3 cases. At least 1 revision surgery was performed in 14 of the 30 patients (47%). Four of these patients (13%) underwent a second revision, and 1 of these (3%) required a third revision. During these 19 revision surgical procedures, flap contouring (11 times) and Z-plasty (9 times) were the most commonly used techniques. Vermilionectomy, scar revision, and removal of a standing cutaneous deformity were each used 6 times. Vermilion advancement and skin excision were rarely used (twice each).

Logistic regression analysis was used to model defect depth (skin, into subcutaneous tissue, or into muscle), size (in square centimeters), vermilion involvement, and alar involvement in relation to revision surgery. Backward variable selection identified vermilion involvement as the only predictor of undergoing revision surgery. Because the $R^2$ (a measure of statistical power) for this model was only 0.2, regression was underpowered to detect whether vermilion involvement was a significant predictor of needing revision surgery. A 2-tailed $t$ test to explore the hypothesis that increasing defect size would be a predictor of revision surgery showed that this was not the case ($P = .55$). Individual $\chi^2$ analysis was then performed for each categorical independent defect variable (depth, alar involvement, and vermilion involvement). Vermilion involvement showed a trend toward significance ($P = .09$), whereas the other individual variables were clearly not significant. The Fisher exact test was used instead of the $\chi^2$ test for analysis of alar and vermilion involvement because of small sample sizes. Defect involvement of...
the nasal ala or vermilion was found to increase the likelihood of undergoing revision surgery (n=7) (83% remission rate, \(P = .03\)). We then performed a 2-tailed \(t\) test for just the subset of cases without alar or vermilion involvement, and defect size remained nonsignificant (n=23) (30% revision rate, \(P = .68\)).
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found to be important. Defect size alone, either in-
cluding or excluding subjects with alar or vermilion in-
volvement, was also not a significant factor (P > .5). Thus,
our results suggest that even very large upper lip defects
without alar or vermilion involvement can be recon-
structed with good results in just 1 stage. This makes sense
because V-Y subcutaneous tissue pedicle advancement
flaps can resurface the entire hemilip. However, once a
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The V-Y subcutaneous tissue pedicle advancement flap
has been previously described in upper lip reconstruc-
tion. To our knowledge, Zook et al3 in 1980 were the first
to report using the V-Y island advancement flap for up-

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sented an excellent discussion of the anatomy of the up-

per lip and reported 4 upper lip defects closed with V-Y
subcutaneous tissue pedicle advancement flaps. That same
year, Hurwitz2 described a technique that advanced both
upper lip skin and vermilion to close defects involving
the red lip. Carvalho et al8 later described modifications
allowing reconstruction of full-thickness upper lip de-
fects using V-Y flaps.

The V-Y subcutaneous tissue pedicle advancement flap
is our preferred technique for closing most upper lip skin
defects larger than 1 cm in diameter that are not mid-
line, full thickness, or centered on the red lip. In a prior
publication from our group,2 large upper lip and medial
cheek defects closed with this technique were associ-
ated with a 35% revision rate. The purpose of this re-
port was to further investigate this statistic.

We found a 47% revision rate in this updated series
that included cheek defects. Alar or vermilion involve-
ment by the defect had a statistically significant associ-
ation with revision surgery. The depth of the defect was
not found to be important. Defect size alone, either in-
cluding or excluding subjects with alar or vermilion in-
volvement, was also not a significant factor (P > .05). Thus,
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structed with good results in just 1 stage. This makes sense
because V-Y subcutaneous tissue pedicle advancement
flaps can resurface the entire hemilip. However, once a
natural aesthetic boundary is crossed (onto the nose or

lip), the likelihood of needing further refinement sur-

gery increases. It should be emphasized that the island
advancement flap is not used to reconstruct an adjacent
alar defect. These are either left to heal by secondary in-
tention if minimal, skin-grafted if appropriate, or recon-
structed with a different flap. We typically close adja-
cent vermilion defects with a separate vermilion
advancement flap, but the Hurwitz modification7 could
be used as well.

In our series, 7 different revision techniques were nec-
essary: flap contouring (debulking), Z-plasty, vermilion-
ectomy, scar revision, removal of standing cutaneous de-
formity, vermilion advancement, and skin excision.
Further analysis revealed certain patterns. With large lip
defects, the medial flap border is often placed on signifi-
cant wound closure tension, and as a consequence, the
scar along the medial aspect of the flap frequently wid-
ens or thickens over time. Also, the red lip can become
elevated from scar contracture at its junction with the flap’s medial border. A common and effective solution
to this problem is to perform a multiple Z-plasty along
the vertical axis of the scar with excision of the vermil-
on that has been elevated by scar contracture (Figure 3).

A second common problem area is along the lateral
half of the vermilionocutaneous border. The distance be-
tween the melolabial crease and the red lip decreases as
the crease descends from the nose toward the lateral com-
misure. When one is performing V-Y subcutaneous tis-
sue pedicle advancement flaps for large lip defects, tis-
uce can accumulate above and medial to the commissure,
causing fullness and a depressed vermilion. This redund-
ant tissue represents a standing cutaneous deformity that
develops as the flap is advanced and to some degree piv-
oted toward the defect. We typically perform a skin ex-
cision from the inferior border of the flap along the ver-
ilionocutaneous border and debulk the area of fullness
through this opening before closing the skin. Some-
times vermilion advancement is required in addition to
skin excision from the flap to optimize the vermilionocu-
taneous junction (Figure 4).

Lastly, a standing cutaneous deformity often forms along
the flap’s trailing edge, where the “Y” is formed upon clo-

Figure 3. Typical causes for revision along the medial suture line.
A, Widened vertical scar with shortening of the upper lip and elevation of the
C, Immediately after revision. D, Six months after revision. Reprinted with
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Figure 4. Typical causes for revision along the inferior suture line and
trailing edge of the flap. A, Patient B (from Figure 1) 11 months following
reconstruction. B, Planned excision of hypertrophic medial and melolabial
scars, removal of excess skin along the lateral vermilion, and excision of a
standing cutaneous deformity along the trailing edge of the flap on the chin.
C, Immediately following excision. D, Ten months after revision.
sure of the donor site. This problem is solved by excising a small ellipse of skin oriented along the axis of the relaxed skin tension lines (Figure 4).

To our knowledge, this is the first in-depth analysis of large upper lip defects closed with a V-Y subcutaneous tissue pedicle advancement flap. Reports such as this can help to counsel patients preoperatively about the likelihood of needing revision surgery. Large upper lip defects are relatively rare, and this information can serve as a resource when planning initial or revision surgery using this technique. Perhaps most important, by identifying the areas that most commonly require refinement, we hope to develop modifications of the initial procedure that can reduce the need for revision surgery.

In conclusion, partial-thickness defects of the upper lip at least 3.0 cm² in area that were reconstructed with a V-Y subcutaneous tissue pedicle advancement flap had a 47% revision rate. Alar or vermilion involvement by the defect was associated with an increased rate of revision surgery (86%). The areas that will require revision are predictable, and there are straightforward techniques to optimize the final result. Recognizing common problem areas might allow the surgeon to modify the primary surgery, thus reducing the revision rate.

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REFERENCES