Reconstruction of Defects Involving the Lip and Chin

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KEYWORDS

- Lip reconstruction • Chin reconstruction • Oral reconstruction • Lip defects
- Local reconstructive flaps • Oral cavity defects

KEY POINTS

- The lips are specialized structures that have a vital role in oral function, speech, and animation, and they are also important aesthetic features.
- Reconstruction of lip defects should restore both aesthetics and function.
- Multiple local flaps provide reconstructive options for defects of the lip and chin.
- Secondary reconstruction follows the same principles as primary reconstruction, although hinge flaps play a role in achieving a successful outcome.

INTRODUCTION

Reconstruction of defects involving the lips and chin can present a challenge to even the most experienced surgeon. Thorough assessment of the defect, including size, location, depth, involvement of adjacent subunits, and the effect on function, is critical to the success of the reconstruction. Goals of reconstruction include restoration of normal anatomy, oral competence, lip motion, minimizing secondary deformity, and optimizing the cosmetic result.[1] Perioral and oral tissue are best matched with like tissue from local flaps. Multiple local flaps are described for reconstruction of this region and provide the versatility needed to match individual patient needs. This article focuses on reconstructive options for defects of the lips and chin.

ANATOMY OF LIP AND CHIN

Lips are the prominent feature in the lower third of the face. The lip esthetic units extend vertically from the subnasale to the mental crease and horizontally between the melolabial creases and the labiomental creases. They are composed of skin, muscle, and mucosa (**Fig. 1**). The red line marks the border of the dry vermilion surface and the wet lip mucosa.[2] The transition of the red lip and the skin is the vermilion border. The vermillion is made up of modified mucosa that lacks minor salivary glands, whereas the color of the vermilion is the result of a rich blood supply under a thin epithelial layer.[3] The white roll is the landmark corresponding to the pars marginalis of the orbicularis oris that separates the vermilion from the cutaneous lip.[4] From the oral commissure lateral to medial, the upper lip has a gentle superior medial curvature. The width of the vermilion increases from the oral commissure to the central upper lip with the widest segment present at the crest of Cupid's bow.[4] These peaks correspond to the inferior philtral ridges, and there is then a V-shaped indentation of the mucocutaneous junction, which corresponds with a prominent tubercle of the red lip inferiorly.[3,4] The philtrum is composed of 2 parallel or divergent raised ridges with a central dimple.[5] The ridges of the philtrum are thought to
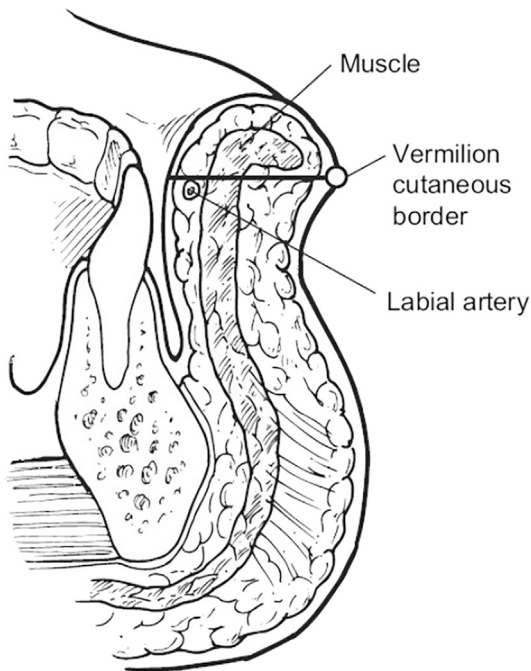
Fig. 1. Cross-sectional anatomy of the lower lip. (*From* McCarn KE, Park SS. Lip reconstruction. Facial Plast Surg Clin North Am 2005;13:302; with permission.)

arise from dermal attachments of pars peripheralis of the orbicularis oris, although this may not be the only structure contributing to the landmark.[5] The cutaneous upper lip is divided into 3 subunits composed of 2 lateral compartments and one philtral (central) segment (**Fig. 2**). The upper lip contrasts with the lower lip, which is a single esthetic subunit.[2,6] The visible lower lip is widest in the central portion with a relative central indentation to correspond to the upper lip tubercle with tapering laterally as it ends at the oral commissure. The orbicularis oris makes up the major muscular component of the lips, which is most commonly thought of as a sphincter due to the orientation of the muscle fibers. However, this muscular compartment can also be considered as 4 independent subunits that interlace, giving the impression of a sphincter.[7] The orbicularis muscle is affixed laterally without a bony attachment but rather inserts at the muscular modiolous.[6]

The adjacent esthetic unit just inferior to the lips is the chin. This convex mound of skin and soft tissue extends from the labiomental crease to the mandibular margin and inferiorly to the submental crease. The muscles of the chin include the mentalis, the depressor labii inferioris, and the depressor angular oris.[8]

The blood supply to the lips is derived from the facial artery, branching into the inferior and superior labial arteries, which supply the upper and lower lips, respectively.[9] The upper lip is also supplied by branches of the angular artery.[9] The chin is supplied by the inferior labial artery and the mental artery, a branch of the inferior alveolar artery.[9]

Sensory innervation to the perioral area and chin comes from the maxillary and mandibular branches of the trigeminal nerve. The infraorbital nerve provides sensation to the upper lip, whereas lower lip and chin sensation is provided by the mental nerve.[2] The motor supply to the lower third of the face arises from the buccal and marginal mandibular branches of the facial nerve.[1]
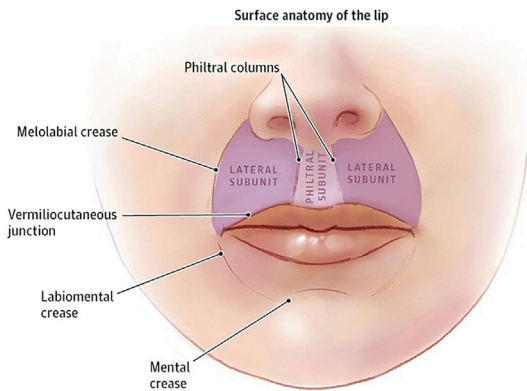
DEFECTS OF THE LIPS AND CHIN: ANALYSIS

Reconstructive decision making for lip defects is commonly based on the horizontal extent of the lip defect. Most often the lip is divided into horizontal thirds in order to further characterize the size of the defect.[6] The depth of the defect in relation to the orbicularis oris is an important consideration. Detailed alignment of the orbicularis oris and the vermilion border are paramount in reconstruction of the lip.[2] In appropriate circumstances, the subunit principle can be applied: maintaining the borders of the subunits and reconstructing the entire subunit if the majority (>50%) has been affected.[6] This concept however must always be balanced with functional considerations. Other principles of wound closure apply, such as incision placement in relaxed skin tension lines as well as conservative debridement and hemostasis.[10]

Chin reconstructive procedures fall within the basic principles of incision planning and wound closure. Whenever possible, the surgeon should use esthetic boundaries when designing flaps, and sacrifice of normal skin should be kept at a minimum to preserve volume for chin projection. Preserving the contour of the chin is more important than the cutaneous scars that may arise from reconstruction.

HEALING BY SECOND INTENTION

Wound healing by second intention is a recognized treatment option in superficial wounds of the lip and chin. Secondary wound healing can be used in defects superficial to the orbicularis oris in the lip mucosa and the vermilion, even with a few millimeters of extension into the cutaneous lip.[11–13] Superficial defects of the upper lip and philtrum can also heal secondarily with

Surface anatomy of the lip

Philtral columns

Melolabial crease

LATERAL SUBUNIT | PHILTRAL SUBUNIT | LATERAL SUBUNIT

Vermiliocutaneous junction

Labiomental crease

Mental crease

Fig. 2. Surface anatomy of the lip. (*From* Pepper JP, Baker SR. Local flaps: cheek and lip reconstruction. JAMA Facial Plast Surg 2013;15(5):378; with permission.)

excellent results, but wounds with significant extension into the vermilion are more likely to heal with an unacceptable result.[11] Secondary healing of deep wounds are more likely to result in depressed or hypertrophic scars. Likewise, deep defects that extend into the vermilion often heal with distortion that may not be acceptable.[11,14] Becker and colleagues[11] further contend that Mohs defects of the chin that heal by second intention may result in a stellate scar

with dimpling; thus, these patients would benefit from primary surgical repair.

The authors seldom recommend healing by second intention and typically favor surgical repair, which provides a better and more predictable result.
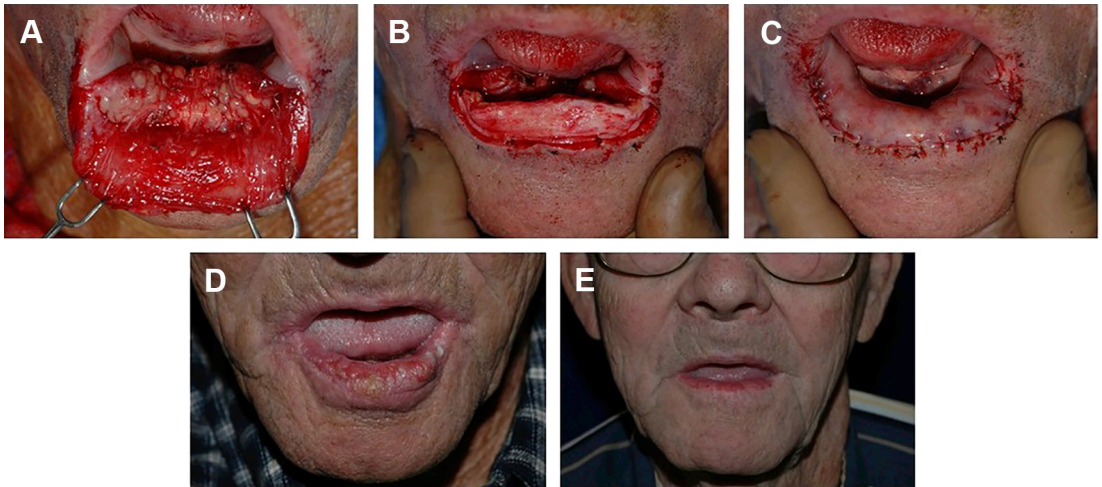
MUCOSAL AND VERMILION DEFECTS
Mucosal Cross Lip Flaps

The mucosal cross lip flap is an interpolated flap that requires a 2-stage reconstruction and is designed for defects isolated to the mucosa and/or vermilion.[8] This flap may be a single pedicle, for smaller defects, or a bipedicle flap, for wider defects. Other variations include incorporation of the orbicularis oris into the flap to match the depth of the defect. The blood supply is derived from the labial artery, which can sometimes be incorporated into a larger flap.[8] The first stage is planned using the labial mucosa immediately posterior to the posterior vermilion line. The flap is elevated in a plane superficial to the orbicularis oris. This tissue is then inset to reconstruct a vermilion defect of the opposite lip. The width of the flap is determined by the defect size, but one must consider closure of the donor site. Division of the pedicle with inset of the flap is performed 3 weeks later.[15]

Fig. 3. Mucosal advancement flap. (*A*) Mohs defect lower lip. (*B*) Elevated mucosal advancement flap. (*C*) Immediate result following reconstruction. (*D*) Postoperative result at 1 month.

Fig. 4. Mucosal advancement flap with primary dermal fat graft. (*A*) Vermilion defect with elevated mucosal advancement flap. (*B*) Dermal-fat graft sutured to underlying orbicularis muscle. (*C*) Immediate result following closure. (*D*) Preoperative photograph with diffuse lower lip lesion (severe dysplasia). (*E*) Postoperative result at 6 months.
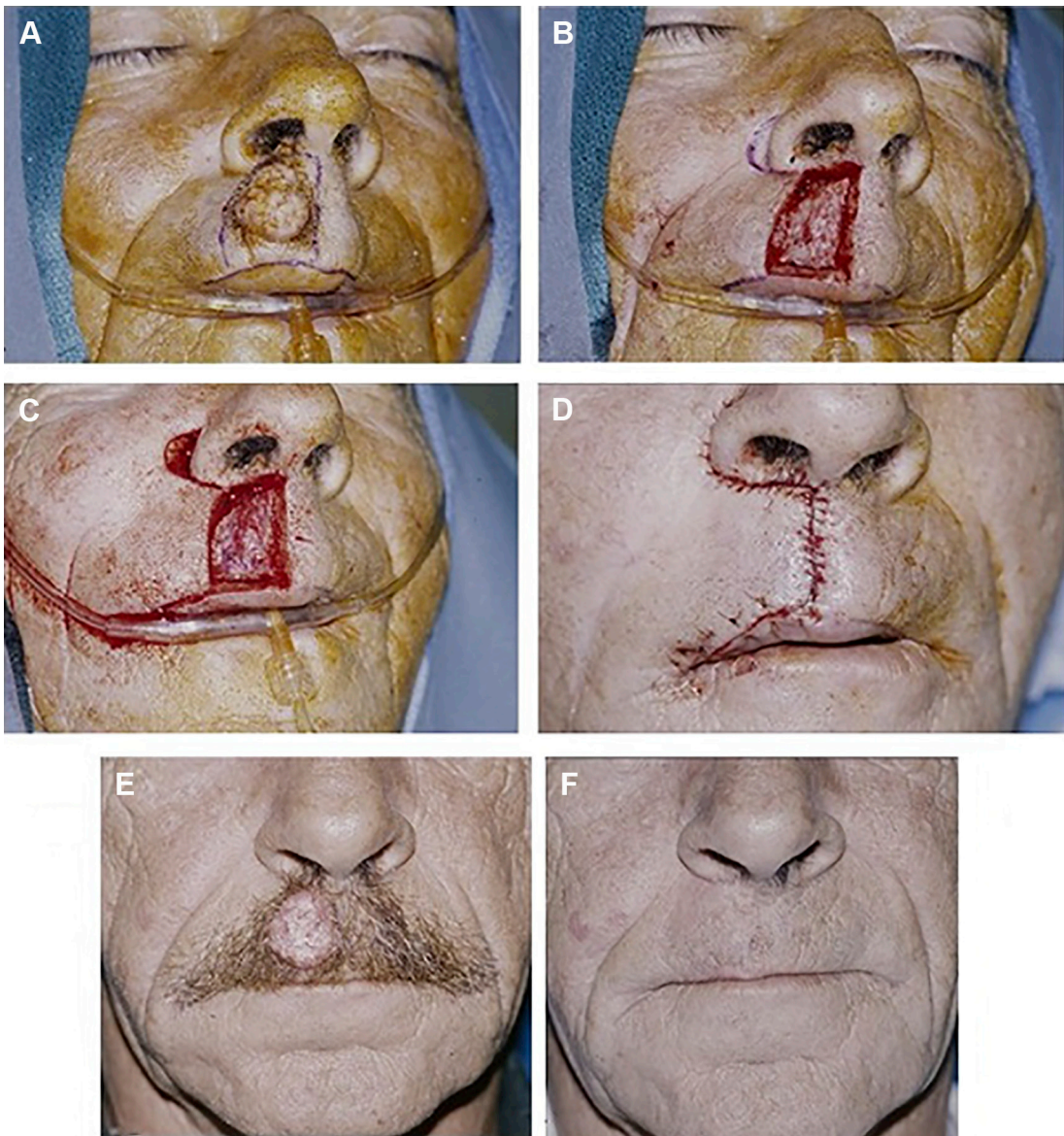
Mucosal Advancement Flap

The mucosal advancement flap is the preferred reconstructive technique following a vermilionectomy for precancerous lesions, carcinoma in situ, or superficially invasive lip cancers (**Fig. 3**). The mucosal advancement flap is elevated in a plane deep to the minor salivary glands and superficial to the orbicularis oris.[8] The width of the flap is designed based on the width of the defect. The flap is typically elevated to the gingivolabial sulcus. The advanced mucosa has a random blood supply but can be used with good reliability. Potential complications include scar contracture, thin lip deformity, retroversion of the lower lip, distortion of the vermilion border, mucosal retraction, decreased sensation, and color mismatch.[1] The senior author has on occasion used a primary dermal-fat graft to augment the lower lip. The dermal fat graft is harvested from the supraclavicular region. The amount of fat necessary can be tailored to the individual defect. The graft is applied as a horizontal strip of tissue over the orbicularis oris, matching the dimensions of the missing vermilion (**Fig. 4**). The graft is situated under the mucosal advancement flap in order to avoid loss of the normal fullness of the lower lip, which often occurs.
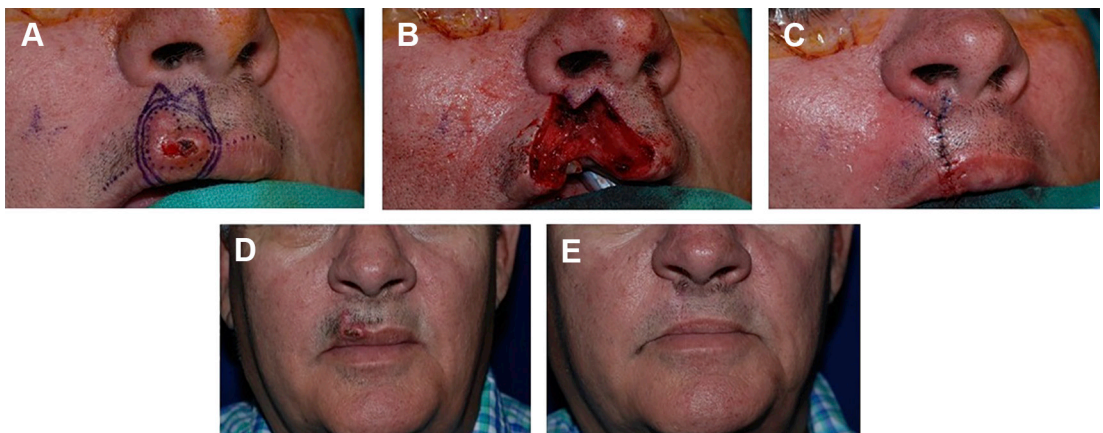
Fig. 5. Wedge excision with M-plasty. (*A*) Proposed excision of squamous cell carcinoma with M-plasty design, to avoid involvement of the nasal sill. (*B*) Defect following excision with negative frozen section margins. (*C*) Immediate result following closure. (*D*) Preoperative photograph, squamous cell carcinoma right upper lip. (*E*) Postoperative photograph at 6 months.

Fig. 6. Unilateral advancement flap with perialar crescentic excision. (*A*) Lesion of the right upper lip with marked margins and aesthetic unit boundaries. (*B*) Defect following excision with negative frozen sections. (*C*) Excision of the perialar tissue and elevation of advancement flap. (*D*) Immediate result following closure. (*E*) Preoperative photograph with keratoacanthoma right upper lip. (*F*) Postoperative result at 3 months.

SMALL TO MODERATE DEFECTS

Primary closure after fusiform excision for lip defects superficial to the orbicularis oris can provide excellent esthetic results. Avoidance of crossing an esthetic unit can sometimes be accomplished by using an M-plasty, creating a wider horizontal plane of excision and a shorter vertical plane of excision (**Fig. 5**). Orientation of the fusiform excision should be parallel with the long axis of the relaxed skin tension lines.[2,6,8] Partial thickness defects approaching or involving the vermilion can be converted to full-thickness defects providing an optimal closure. Pepper and Baker[16] recommend that any defect 1.5 to 3 cm in the vermiliocutaneous central lip be converted to full-thickness defects and closed primarily.

Full-thickness defects of up to one-third of the upper lip and one-half of the lower lip can often be closed primarily.[1] The size of the defect that can be closed varies with each patient, but in general, there is more extensibility in older patients, in whom defects up to one-half of the lower lip can
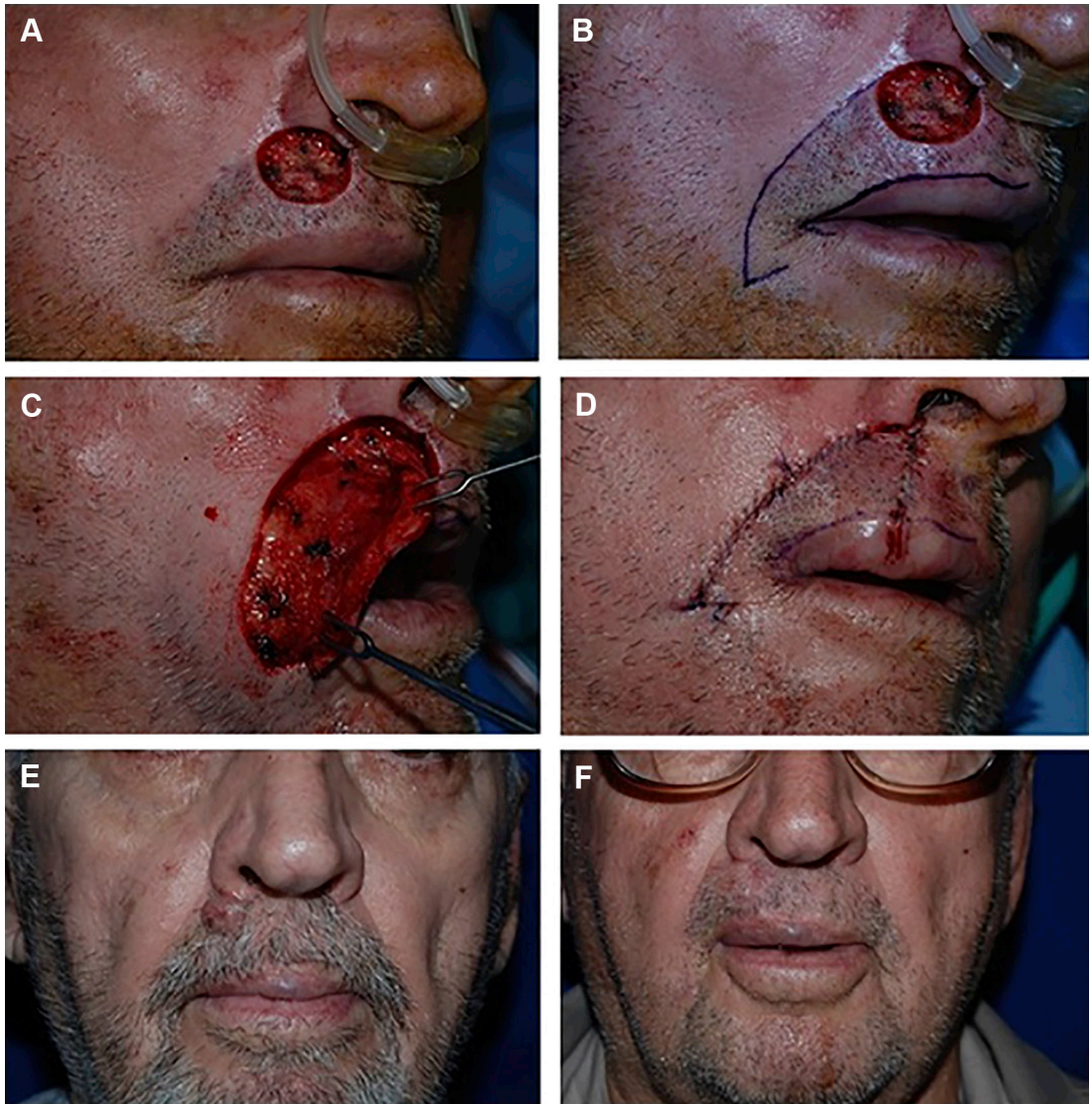
Fig. 7. Lip rotation-advancement flap. (*A*) Right upper lip defect following excision of basal cell carcinoma. (*B*) Proposed advancement-rotation flap with marked vermilion border. (*C*) Elevation of flap in supramuscular plane. (*D*) Immediate result following closure. (*E*) Preoperative photograph with basal cell carcinoma. (*F*) Postoperative result at 2 months.

be closed. The advisability of this reconstructive option still lies with the judgment of the surgeon and is limited by the degree of resulting microstomia, lip distortion, and wound tension.[10]
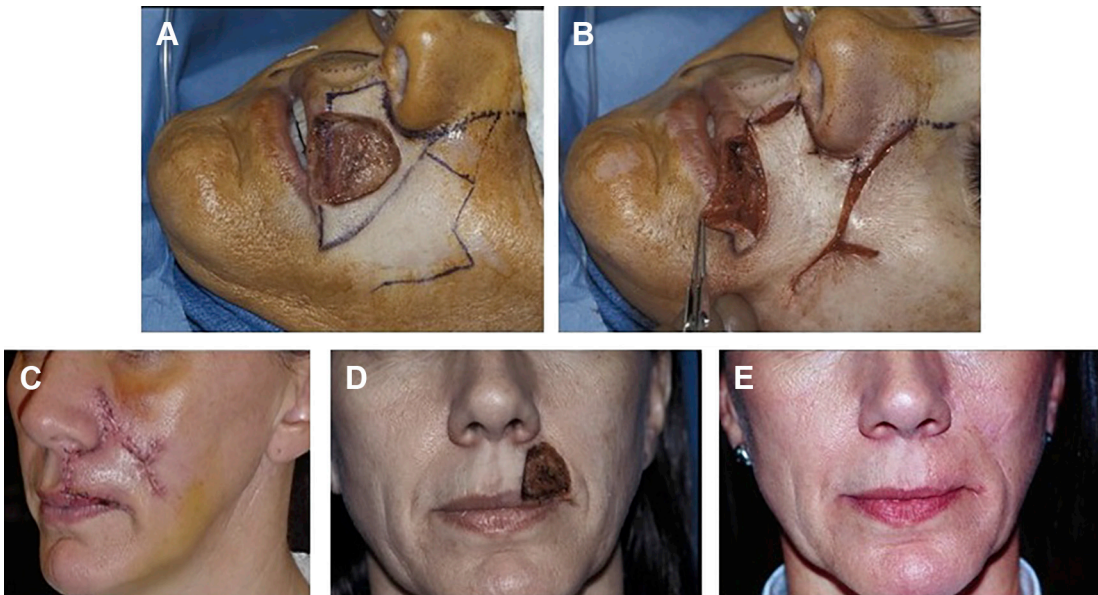
Advancement Flaps

Advancement flaps with perialar crescentic excision can be used for cutaneous defects involving the upper lip. Bilateral flaps are primarily used for central cutaneous defects. For defects just off the midline, a unilateral flap may suffice. This flap is designed with placement of incisions along the

boundaries of subunits of the lip; however, the flaps can be of differing lengths. In the upper lip, incisions are placed just inferior to the nasal sill and at the vermilion-cutaneous border. Crescentic skin excision along the alar-facial sulcus allows room for the advancement of skin to occur (**Fig. 6**). In the lower lip, the incisions are placed along the vermilion-cutaneous border and the mental crease. The plane of dissection is superficial to the orbicularis oris muscle. The distribution of tension between the 2 flaps (instead of one) is advantageous for central defects in order to lessen tissue distortion and improve flap perfusion.
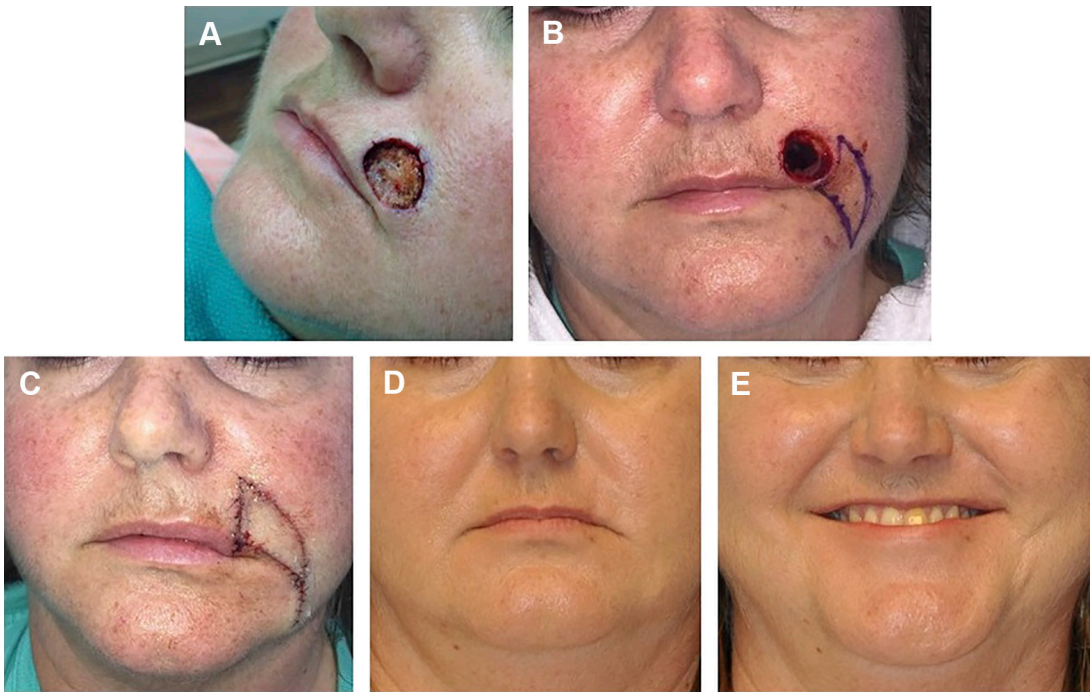
Fig. 8. V-to-Y advancement flap. (*A*) Mohs defect involving lateral segment of upper lip, sparing the adjacent vermilion. Note, less than 50% of the lateral lip segment. (*B*) Flap marked, preserving the vertical height of the medial side of the defect, and following the contour of the melolabial fold and the oral commissure. (*C*) Immediate result. Note slight overcorrection of height. (*D*) Reconstructive result at 6 months, repose. (*E*) Reconstructive result at 6 months, smiling.

Fig. 9. Melolabial transposition flap and mucosal advancement flap with primary fat graft. (*A*) Mohs defect involving lateral segment of upper lip and adjacent vermilion. Proposed melolabial transposition flap for replacement of the entire lateral subunit. (*B*) Flap partially sutured into position, highlighting the extent of the vermilion defect. (*C*) Result at 1 week following reconstruction. Mucosal advancement flap with primary fat graft used to reconstruct vermilion defect. Note the skin fold left oral commissure. (*D*) Mohs defect involving the left upper lip. (*E*) Reconstructive result at 1 year, which included revision of deformity seen in panel (*C*).
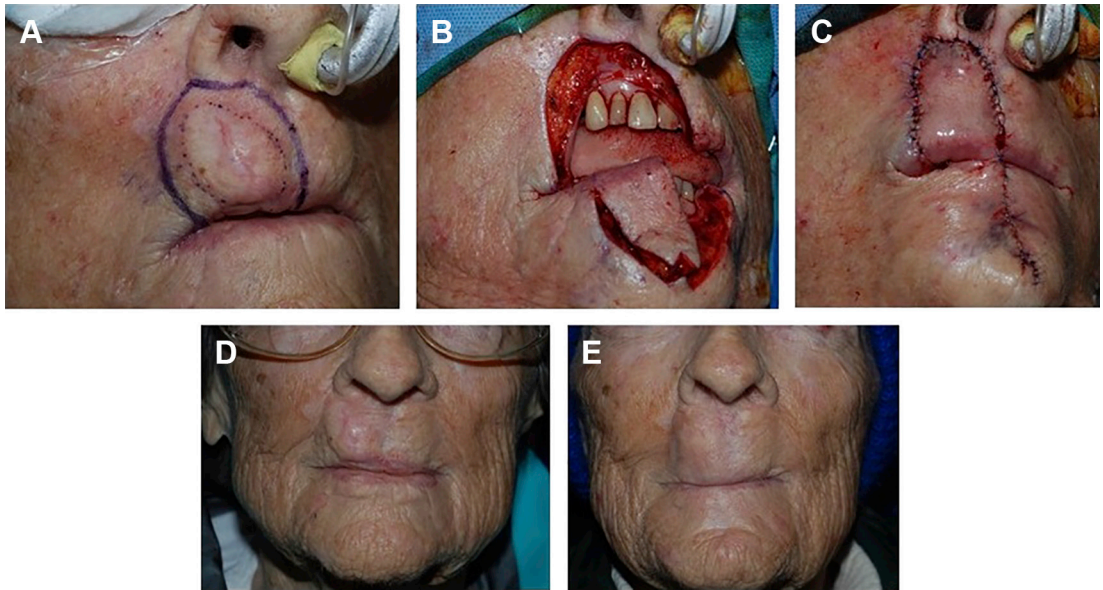
Fig. 10. Abbe flap. (*A*) Low-grade sarcoma right upper lip. (*B*) Defect following resection with Abbe flap incised. (*C*) Abbe flap sutured into position with pedicle from lower lip intact. (*D*) Preoperative photographs demonstrating mass right upper lip. (*E*) Postoperative result at 9 months.

Rotation advancement flaps can also be used effectively for small to moderate lip defects[17,18] (**Fig. 7**).

O-to-T Plasty

The O-to-T plasty can also be a useful technique for small cutaneous lip defects. Wide undermining can assist in the soft tissue advancement and help to decrease the tension and risk of distortion of surrounding structures. The "T" design closure leaves 3 standing cutaneous deformities. The vertical limb of the T is created from excision of a standing cutaneous deformity and should be placed along a natural skin crease or a subunit boundary. This technique results in a trifurcation that requires careful approximation. The O-to-T is a versatile closure technique for lateral upper lip defects, central and lateral lower lip defects with incisions placed along the vermilion-cutaneous border.[17,18]

V-to-Y Island Advancement Flaps

Defects in the lateral cutaneous lip larger than 1 cm^2 are amenable to closure with a V-to-Y flap.[19] This flap is a subcutaneous pedicle advancement flap with incisions placed adjacent to the alar-facial sulcus and along the vermilion border, designed in the shape of a V with the defect present at the base of the flap (**Fig. 8**). This flap provides advancement of the mobile skin and soft tissue of the inferior medial cheek.[17] With the pedicle

anchored to the soft tissue and fascia adjacent to the modiolus, the soft tissue can be mobilized to the philtrum.[19] In planning the flap, the width is equal to the height of the defect and the length of the incisions is 2 times the width of the defect, equal in distance and tapered to a point.[19] The pedicle can be narrowed, leaving at least the central one-third of the total flap surface attached to the underlying subcutaneous tissue for adequate blood supply. Closure of the donor site is completed with care to ensure no deformity of the vermilion border or surrounding structures. Defects as large as 3 cm^2 have been reconstructed with this technique with a 47% revision rate. Defects with alar or vermilion involvement were most likely to require revision.[19] For larger defects, the flap design is modified to include skin lateral to the melolabial crease and includes a superior peninsula of skin to re-create the alar-facial sulcus.[19]

Melolabial Flaps

Cutaneous lip defects can be restored with transposition or advancement of skin from the medial cheek or melolabial fold.[8] These flaps can be designed as transposition flaps or as V-to-Y subcutaneous tissue pedicled melolabial advancement island flaps.

The transposition flap can have a superior or inferior pedicle depending on the location of the defect.[8] An inferior pedicled flap can be considered for lateral upper or lower lip defects, whereas
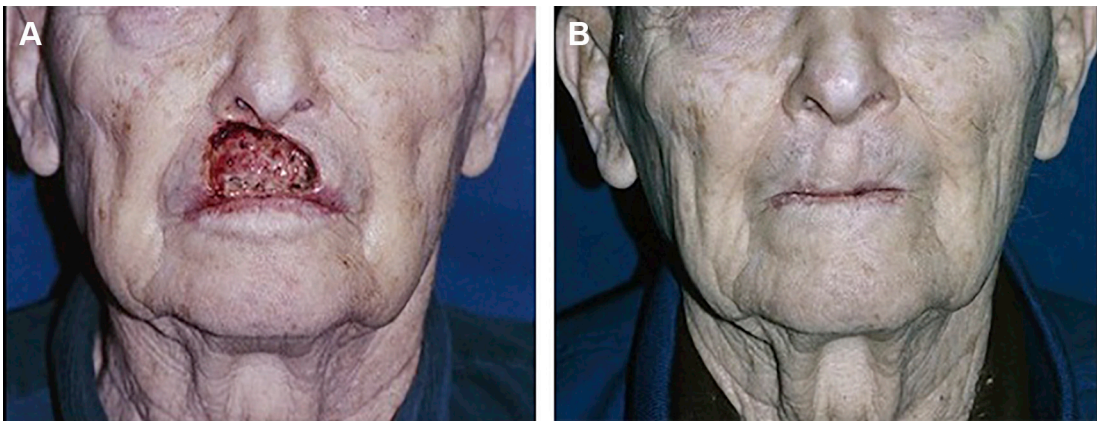
Fig. 11. Bilateral advancement flaps with perialar crescentic excision and Abbe flap. Demonstrates bilateral advancement flaps and Abbe flap reconstruction of central lip defect. (*A*) Defect involving right, left, and central upper lip. (*B*) Postoperative result at 6 months, following perialar crescentic excision, bilateral advancement flaps and Abbe flap.

a superiorly based pedicle is often considered in the reconstruction of the central upper lip.[8] As in any reconstruction, use of the contralateral normal anatomy can provide the template for incision planning. The flap is designed with the medial incision along the melolabial crease (**Fig. 9**). The transposed tissue is only slightly wider than the defect to allow for wound contracture.[8] The distal portion of the transposition flap can be thinned to match the thickness of the surrounding tissue. Revision of the pedicle in a second stage may be completed

to align the scars parallel to the melolabial crease.[8] Burget and Hsiao[20] have described their experience with a similar flap for reconstruction of large cutaneous defects of the upper lip but refer to it as a nasolabial rotation flap. This flap is rotated from a vertical orientation to a transverse orientation with the medial border of the flap becoming adjacent to the vermilion and the lateral border the nasolabial sulcus. The secondary defect can be closed with undermining and advancement or a Burow's triangle. Considerations when using
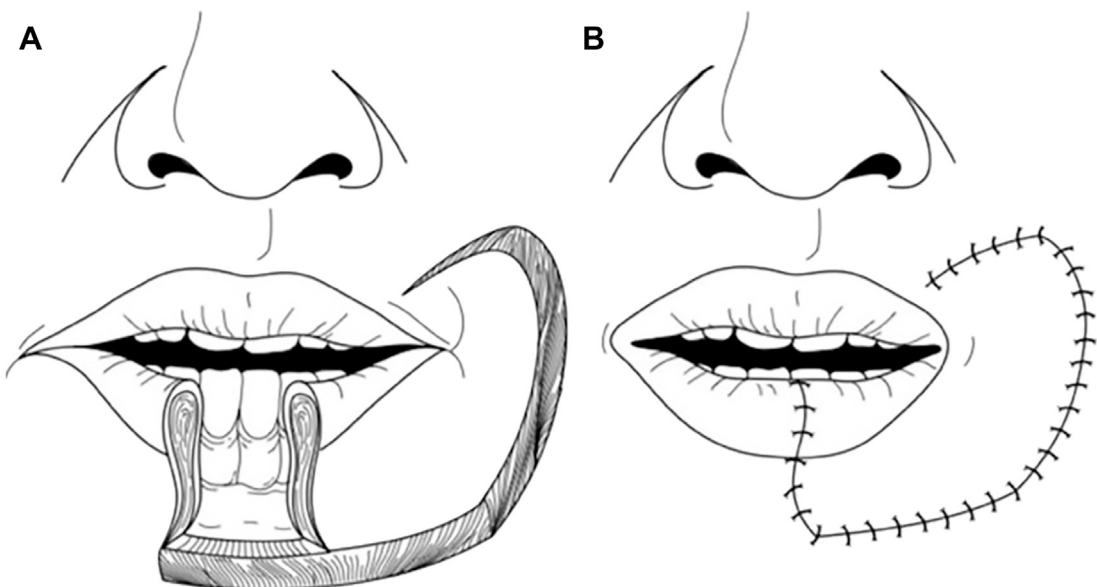
Fig. 12. Gilles fan flap. (*A*) Lower lip defect with flap incised. (*B*) Flap sutured into position. (*From* Ishii LE, Byrne PJ. Lip reconstruction. Facial Plastic Clin North Am 2009;17:451; with permission.)
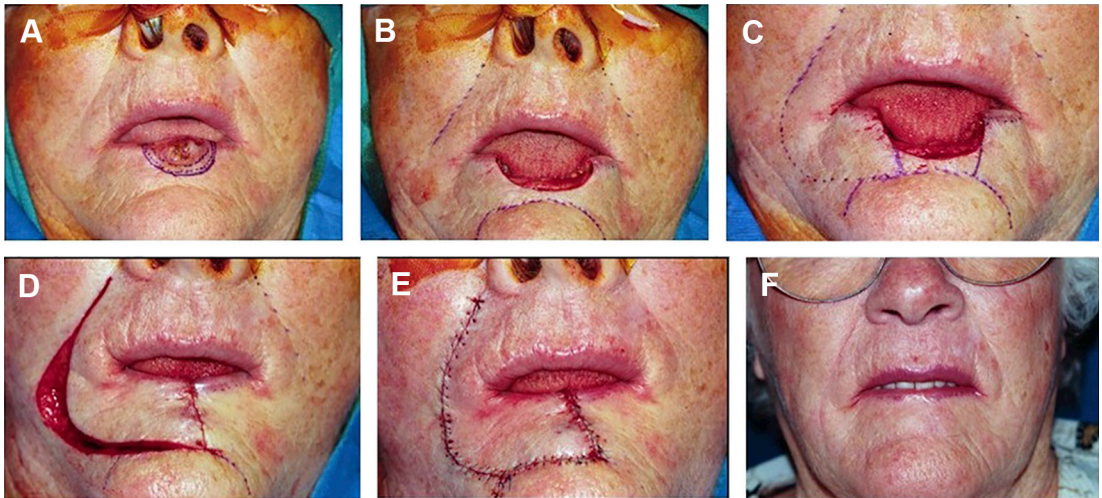
Fig. 13. Unilateral Karapandzic flap. (*A*) Squamous cell carcinoma lower lip with marked proposed excision. (*B*) Defect mid lower lip after resection with negative margins. (*C*) Proposed Karapandzic flap with marked boundaries of chin. (*D*) Dissection with rotation-advancement flap in position. (*E*) Immediate result following closure. (*F*) Result at 4 months.

these flaps include the risk of trapdoor deformity, flattening of the melolabial fold, and transposition of hair-bearing skin in an altered orientation.[8] Transposition of hair-bearing skin into non-hair-bearing regions should be avoided.

Another option for large (≥2 cm) lateral upper lip cutaneous defects is the V-to-Y subcutaneous tissue pedicled melolabial advancement island flap (Baker book). The principles of this flap are those as described previously in the V-to-Y Island Advancement Flaps.[19]

FULL-THICKNESS DEFECTS
Abbe and Estlander Flaps

The Abbe and Estlander flaps are ideal choices for reconstruction of full-thickness defects involving 30% to 60% of the lip.[8] They both allow transfer of the skin, muscle, and mucosa, thus restoring all layers with the goal of maintaining lip competence and function.

The Abbe flap is used for defects medial to the commissure, and the Estlander flap is used for defects involving the oral commissure. These cross
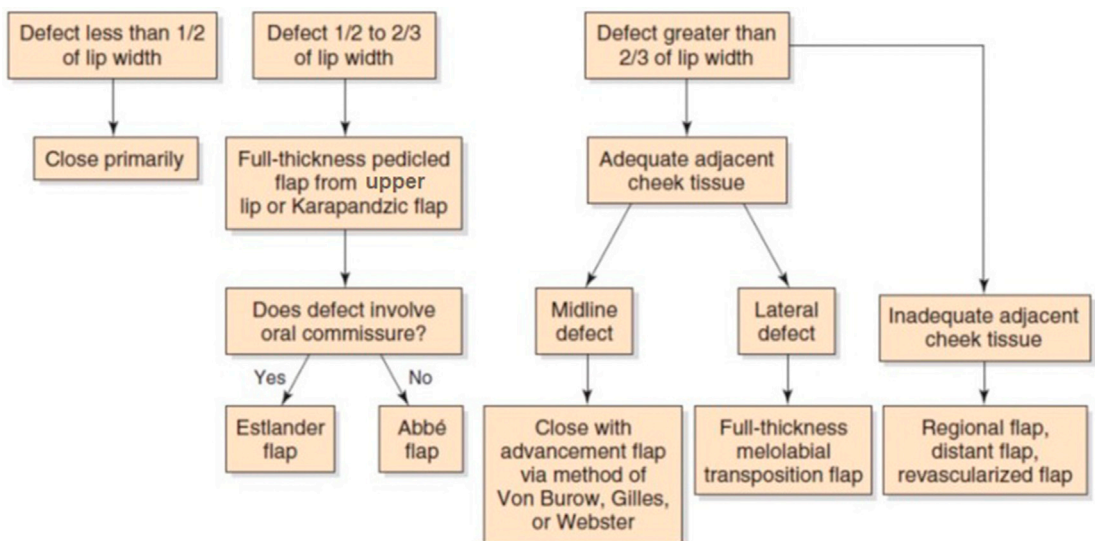
Fig. 14. Algorithm for repair of full-thickness lower lip defects. (*Adapted from* Baker S. Reconstruction of facial defects. [Chapter 24]. In: Flint PW, Haughey BH, Lund V, et al, editors. Cummings otolaryngology—head and neck surgery. 6th edition. Philadelphia: Elsevier Saunders; 2015. p. 363; with permission.)
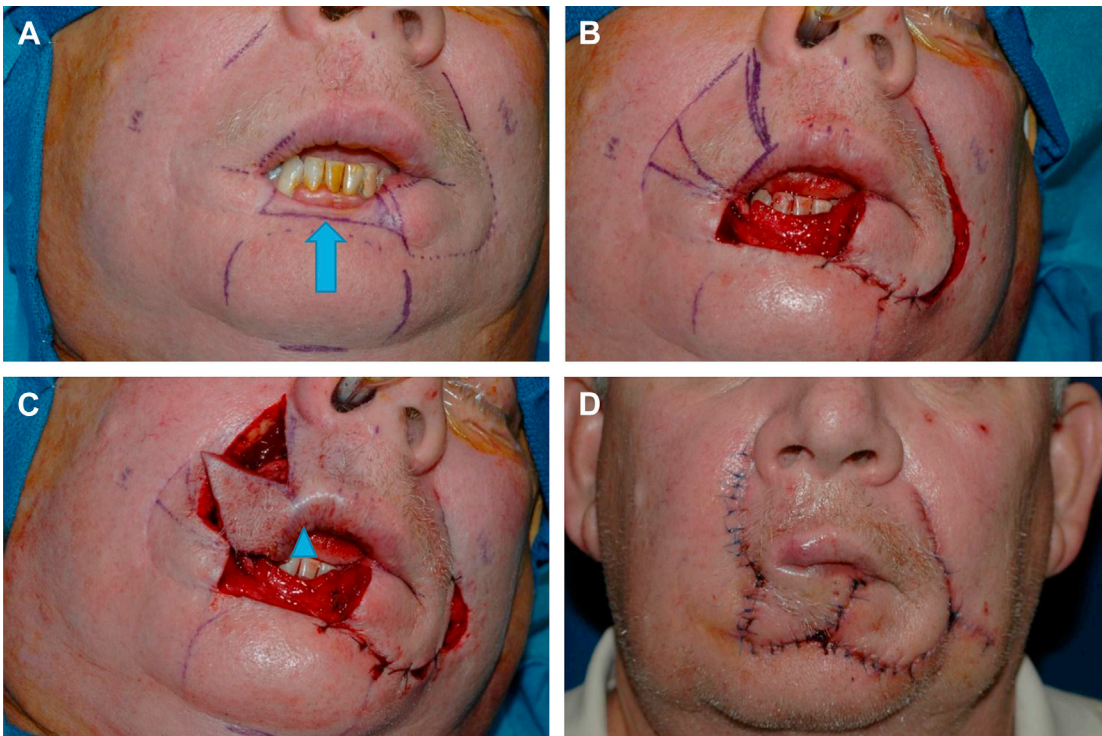
Fig. 15. Secondary reconstruction technique: Estlander and Karapandzic flaps. (*A*) Lower lip defect following failed prior Karapandzic flap performed elsewhere after resection and extensive squamous cell carcinoma of the lower lip. Proposed hinge flap (*arrow*) marked to re-create the gingivolabial sulcus. Markings for revision left Karapandzic flap. (*B*) Hinge flap elevated into position and attached to adjacent mucosa. Left Karapandzic flap in position. (*C*) Right Estlander flap has been designed, incised, and partially rotated. Triangle denotes site of new oral commissure. (*D*) Result at 1 week following hinge flap, Karapandzic flap, and Estlander flap.

lip flaps are designed of equal height of the defect; however, the width is approximately one-half to two-thirds of the defect (**Fig. 10**). Both flaps are designed with a lateral labial artery pedicle.[17] A vertical labiomental branch off the inferior labial artery supplies the lower lip and chin all the way into the submental region.[21] Thus, an extended Abbe flap can be designed for patients with large composite defects involving the upper lip. The extended Abbe flap is useful for lip defects involving the central face, such as the columella, perialar, or premaxillary regions, especially for those who lack adequate adjacent cheek tissue for defect closure.[21]

With the Estlander flap, the height and width dimensions are planned as in the Abbe flap. However, the lateral incisions are designed to include the oral commissure and to lie in the melolabial sulcus.[8] The flap is rotated 180° with the new oral commissure now residing at the pivot point of the flap.

The Abbe flap is a 2-stage flap with the pedicle remaining in place for approximately 14 to 21 days before division and inset. For upper lip

defects, it is typically designed so that the flap donor site is centered on the midpoint of the lower lip (**Fig. 11**). With both flaps, the transferred tissue is temporarily denervated with a return of innervation, motor, and sensory, in about 1 year.[22] In an Abbe flap, the motor supply is replaced through the same facial nerve branches that supplied the original upper lip, and the lip function returns normally without the need for special training.[22] In an Estlander flap, the modiolus is displaced, and although the facial nerve innervation has not been transected, the muscles of the lower lip have been replaced into the upper lip, so retraining is a part of recovery.[22]

Gilles Flap

The Gilles flap is a rotation advancement flap that ultimately restores the continuity of the orbicularis oris (**Fig. 12**). It can be used to reconstruct defects involving 70% to 80% of the lower lip.[17] It is a composite flap based on the superior labial artery and is created parallel to the orbicularis oris. Incisions are full thickness from the inferior edge of

Fig. 16. Secondary reconstruction results: Karapandzic and Estlander flaps. (*A*, *C*) Preoperative photograph after failed Karapandzic flap reconstruction of extensive lower lip defect, performed elsewhere. Exposure of teeth with significant oral incompetence. (*B*, *D*) Postoperative result at 18 months, following reconstruction with right Estlander flap and left Karapandzic flap.

the defect lateral then, superior lateral around the commissure into the melolabial crease with an incision toward the upper lip vermilion border. Once the flap is rotated into position, it is closed in a multilayer fashion. The Gilles flap can be unilateral or bilateral. Disadvantages of this repair include potential microstomia, vermilion deficiency, and blunted oral commissure.[2,10] Oral incompetence may result from denervation of the orbicularis oris.[3] However, this denervation is often temporary with a gain partial reinnervation at 12 to 18 m postoperatively.[3,10]

Karapandzic Flap

The Karapandzic flap is a bilateral rotation-advancement flap that maintains the continuity of the orbicularis oris. It works best in reconstruction of major lower lip defects but can be inverted for upper lip defects.[2] Incisions are planned in a curvilinear fashion from the inferior edge of the defect superolaterally into the melolabial crease and nasolabial crease. The width of the flap corresponds to the height of the lip. Meticulous dissection is needed to ensure uniform thickness of the flap and preserve the neurovascular supply to the flap, which includes the superior and inferior labial artery branches and branches of the buccal nerve.[9] The neurovascular bundle is found near the oral commissure between the orbicularis oris and the underlying facial musculature and soft tissue.[1] Preservation of the neurovascular bundle maintains lip mobility and sensation.[1] Maintaining symmetric vertical height of both flaps is an important principle that affects both function and cosmesis. Once the flap is fully incised and dissected, it is rotated into position and closed in a layered fashion. The disadvantages are microstomia and blunted commissures.[8] The senior author has applied the concept of the "sequential Karapandzic flap" for moderate lower lip defects. In this situation, a unilateral Karapandzic flap is created on the side with the most intact native tissue and advanced into position. If the closure is on too much tension or creates a short lower lip, the contralateral Karapandzic flap is dissected (**Fig. 13**).

Bernard-von Burow Flap

The Bernard-von Burow flap can be considered in near-total lower lip and total lip defects sparing the
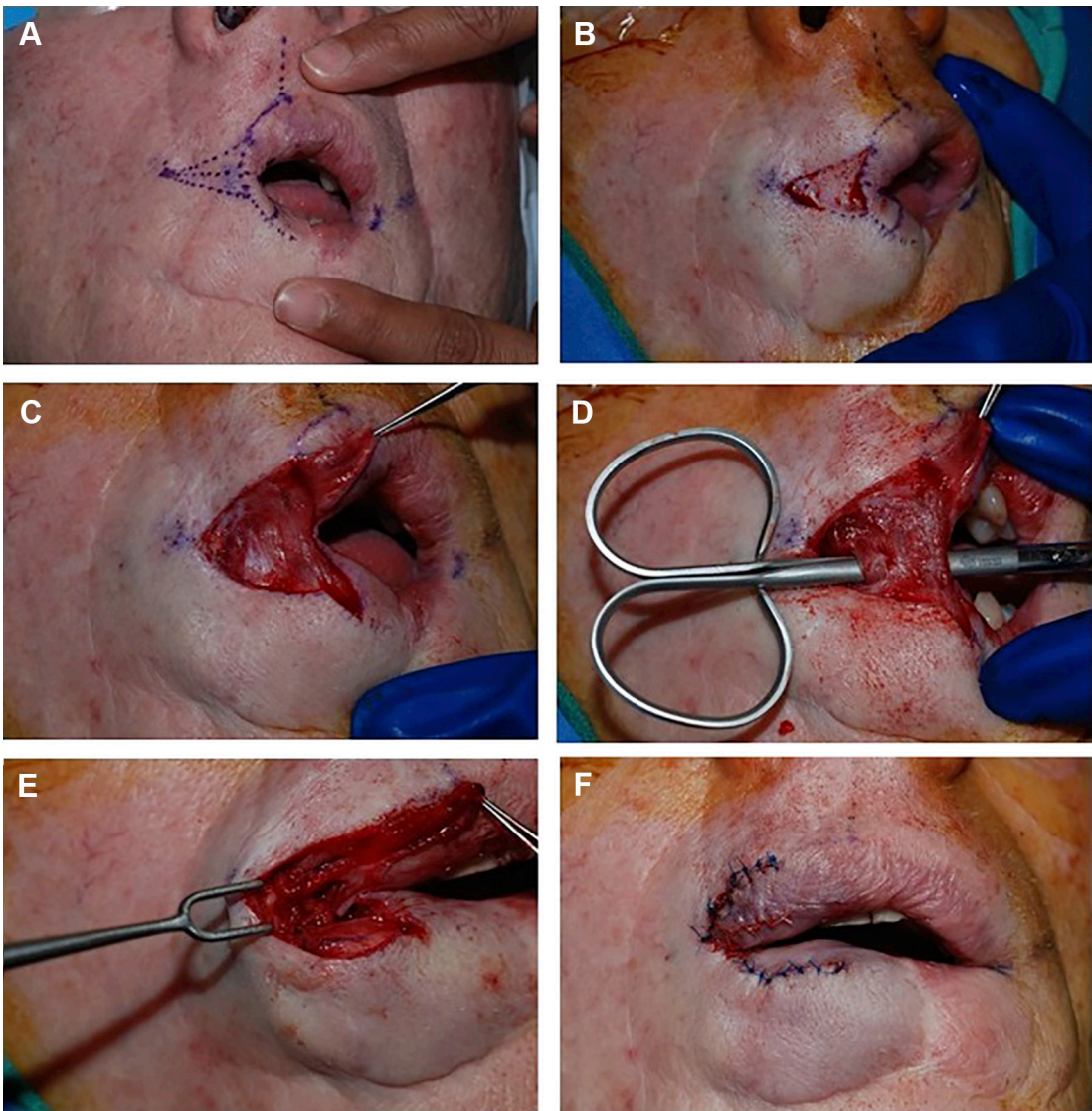
Fig. 17. Commissuroplasty technique. (*A*) Proposed excision of skin with site of new oral commissure at apex of triangle. (*B*) Triangle of skin excised. (*C*) Superiorly based vermilion flap onto lower lip. Point of flap goes to new oral commissure. (*D*) Exposure of orbicularis oris muscle, before transection. (*E*) Two ends of orbicularis muscle sutured to new oral commissure. (*F*) Immediate result following closure, demonstrating vermilion flap as well as mucosal advancement flap.

oral commissure. A brief description is included here, but other texts and articles can be sought for detailed explanation and illustration. Conceptually, this is a bilateral advancement flap of medial cheek soft tissue (which lacks orbicularis oris) and mucosa into a central defect. The horizontal length of each opposing cheek limb is half of the desired horizontal length of the reconstructed lip.[8] The height of each opposing cheek limb is the height of the desired reconstructed lip. In upper lip reconstruction, the soft tissue is advanced from the tissue adjacent to the melolabial sulcus, and in the lower lip, the soft tissue is

advanced from the tissue adjacent to the labiomental sulcus. To accomplish the amount of soft tissue advancement needed, a configuration of triangles, both superior and inferiorly based, is excised to minimize the secondary deformities. There have been many modifications described for this technique. One must consider the perfusion from the facial artery in patients with a history of neck dissection or radiation therapy.[9] These flaps are associated with significant neuromuscular dysfunction and facial deformity so they are typically a "last resort" in the reconstructive algorithm.
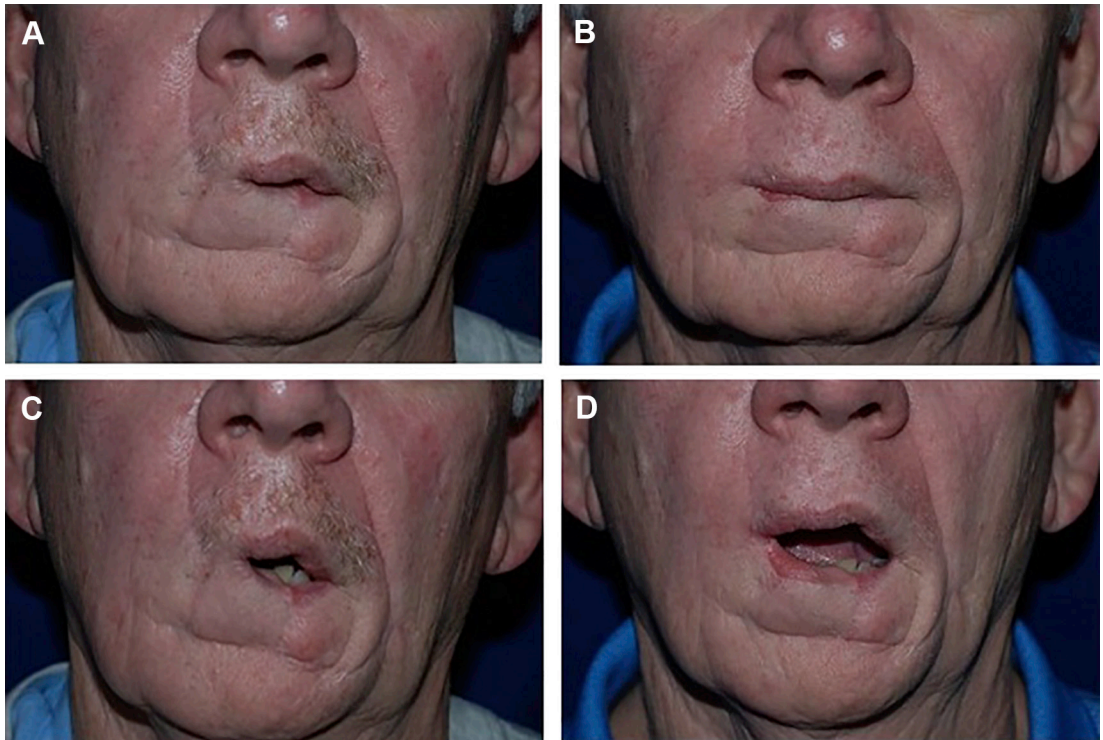
Fig. 18. Commissuroplasty results. (*A*, *C*) Relative microstomia, blunted oral commissure, and short lower lip following extensive reconstruction of lower lip defect. (*B*, *D*) Postoperative result at 3 months demonstrating improved symmetry of oral commissure, better lip contour, and longer lower lip.

Full-thickness defects of the lip offer a significant reconstructive challenge. **Fig. 14** represents the algorithm proposed by Baker for full-thickness defects of the lower lip.[23] In general, the authors prefer to avoid the use of an Abbe flap when the upper lip serves as the donor site. Instead, they would perform a Karapandzic flap for reconstruction of an extensive defect.

SECONDARY RECONSTRUCTION
### Full-Thickness Defects

There are many circumstances in which secondary reconstruction of lip defects may be necessary. Whether the defect arises from cancer, trauma, burns, radiation, or failed reconstruction, the reconstructive techniques remain the same. The authors emphasize one technical point that applies to this set of patients. In lower lip defects, it is supremely important to try to maintain an intact labiogingival sulcus, thus minimizing the risk of postoperative salivary leakage. For this reason, hinge flaps are often used so that a new suture line does not exist at the inferior aspect of the sulcus. Instead, adjacent mucosa or skin is elevated as a hinge flap, and thus, there is a much lower likelihood there will be leakage because the sulcus

is intact. A case example is presented in **Figs. 15** and **16**.

Commissuroplasty

One may consider a commissuroplasty in patients with a blunted, round commissure after Estlander flap reconstruction. One method involves a full-thickness incision laterally from the blunted commissure ending at the point of the new apex of the commissure with advancement of the labial mucosa to restore the vermilion. A triangle of skin and subcutaneous tissue may be excised laterally to accommodate the new apex of the commissure.[8]

Another method is described as a vermilion and orbicularis muscle flap.[8] To create this, a triangle of skin and subcutaneous tissue is excised lateral to the blunted commissure. Here, the apex of the triangle is the new apex of the commissure, and the inferior and superior incisions should align with the level of the contralateral commissure. Then, a vermilion flap is elevated from the orbicularis muscle, and the length of this flap is that of the distance to the apex of the new commissure. A transverse incision is then completed through the orbicularis muscle at the level of the new commissure. The superior and inferior muscle ends are
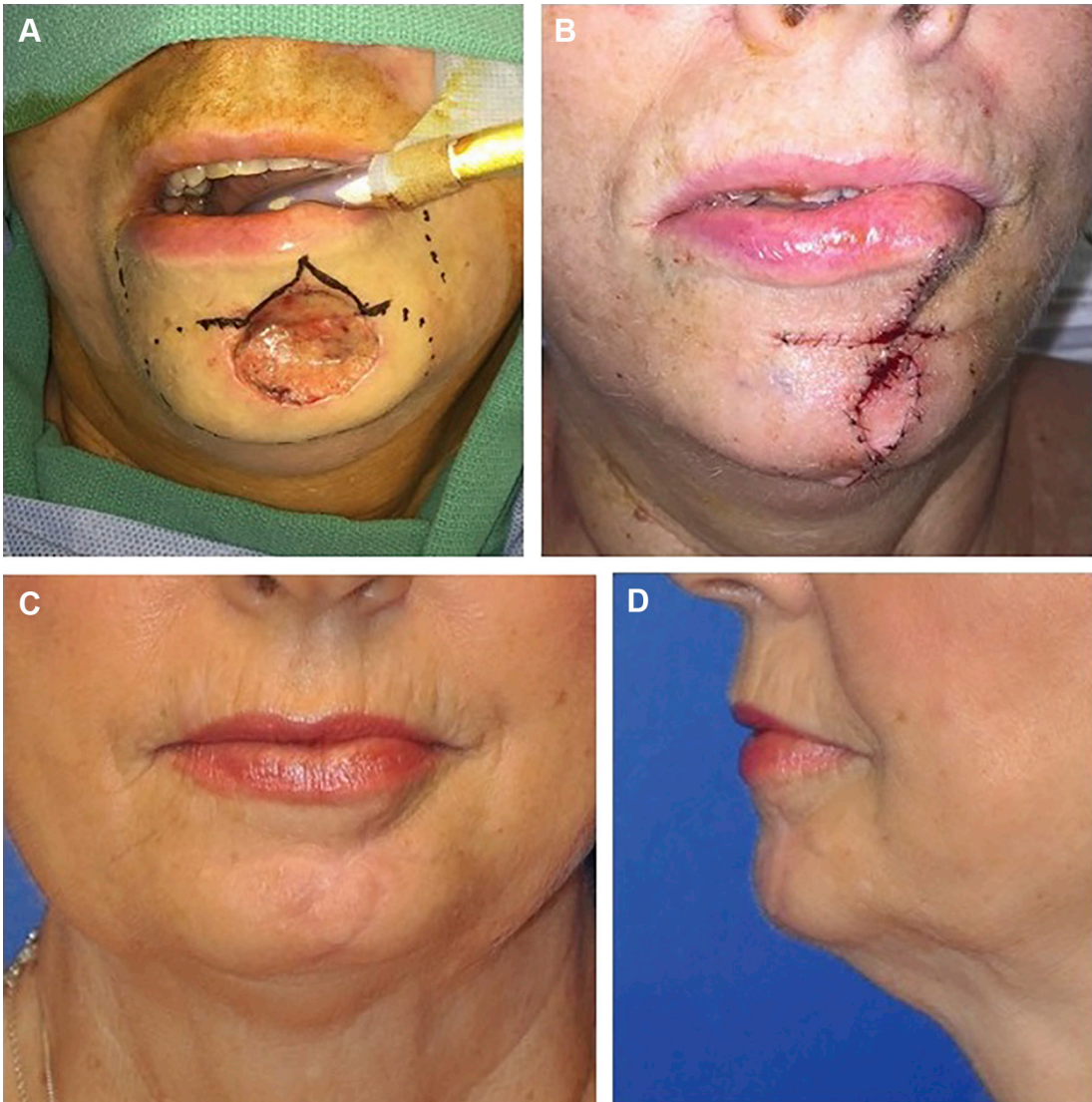
Fig. 19. Reconstruction of chin defect with bilateral advancement flaps and submental island flap. (*A*) Mohs defect involving 50% of chin skin and soft tissue as well as a segment of lower lip beyond the mentolabial sulcus; lip advancement flaps (A-to-T closure) marked dividing the defect into 2 defects involving 2 facial units. (*B*) Lower lip flaps advanced using the mentolabial crease. Island flap transposed from below the submental crease. (*C*) Reconstructive result at 18 months: frontal view. (*D*) Reconstructive result at 18 months: lateral view. Note preservation of chin projection.

then advanced into the point of the new commissure. The vermilion flap is the placed over the muscle, and a mucosal flap is elevated and advanced to restore the inferior vermilion.[8] This latter technique is favored by the authors (**Figs. 17** and **18**).
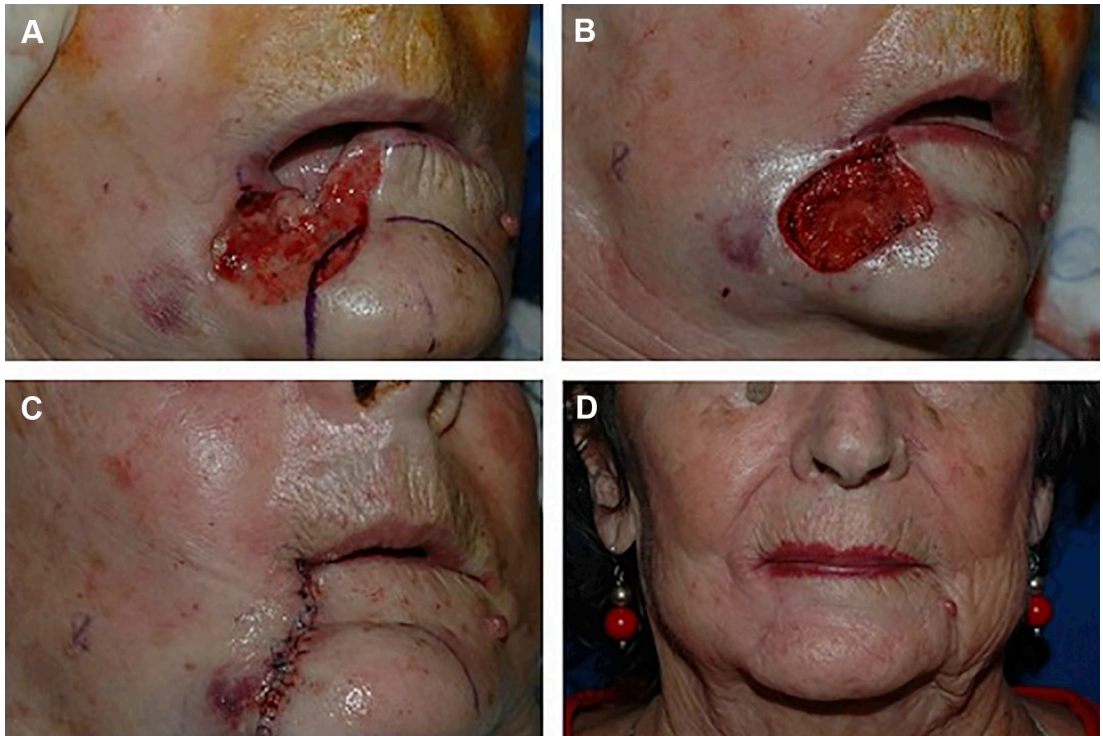
CHIN RECONSTRUCTION
H-Plasty, O-to-T, and V-to-Y Flaps

H-plasty is an ideal method to reconstruct defects of the central chin.[17] Incisions are placed parallel to the vermilion border to avoid distortion, and if possible, in the mental crease to retain this facial landmark. Burow triangles maybe excised laterally. The tissue is then advanced into the central defect.

The O-to-T flap is particularly useful for defects of the central or lateral chin. The flaps are designed with a vertical limb to excise a standing cutaneous deformity. The lateral limbs can be placed along the mandibular margin or along the boundary of the chin. Larrabee and Moyer[17] describe an asymmetric O-to-T used for defects of the lateral chin to allow for more lateral advancement of tissue.

Fig. 20. Reconstruction of lip and chin defect with cheek advancement flap. (*A*) Mohs defect involving full-thickness lower lip and partial thickness of chin. Aesthetic boundaries of chin delineated. (*B*) Closure of muscle, vermilion, and mucosa. (*C*) Immediate result following closure of lip and chin defect, using cheek advancement flap. (*D*) Postoperative result at 5 months.

Lateral chin defects can also be reconstructed with a V-to-Y flap. When possible, the incisions are placed in the melolabial crease using the subunit principle.

Submental Island Flap

The submental island flap is a reliable flap for soft tissue reconstruction of the face and can be considered for the reconstruction of chin defects. It can be a cutaneous, musculocutaneous, musculofascial, or composite flap.[24,25] The blood supply for this flap is the submental artery, a branch of the facial artery, and the submental vein, which drains into the facial vein.[24] A Doppler can be used in planning, and the flap is designed with the arch of the mandible in the submentum, and the inferior extent (width of the flap) is largely based on the ease of closure after the flap has been elevated.[24] The subcutaneous adipose tissue, platysma, and mylohyoid can be harvested as well to provide a convexity for the chin.[25] In general, the laxity of the skin in this area and the cervical rhytids camouflage the incisions well. Also, the skin and soft tissue can be approximated to the hyoid to create a sharp cervicomental angle after the flap elevation and inset. **Fig. 19** demonstrates the use of

bilateral advancement flaps in combination with a submental island flap for reconstruction of a subtotal chin defect.

Fig. 20 demonstrates the use of a unilateral cheek advancement flap for an extensive defect of the lip and chin.

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