RECONSTRUCTION OF THE LIPS

CRAIG L. CUPP, CDR, MC, USNR, WAYNE F. LARRABEE, JR, MD

Procedure selection for surgical reconstruction of lip defects depends on the location and extent of the defect. Seven useful surgical approaches are discussed, and an algorithm to assist in deciding which reconstructive option to use is provided.

The lips are important in both an aesthetic and functional sense. Ancient civilizations including the Egyptians, Assyrians, Sumerians, Etruscans, and Romans all used paints and rouges to tint the lips. Among American women, lipstick has enjoyed wide popularity since the early 1900s. In 1945, American women bought 5,000 tons of lipstick.[1]

In addition to the important aesthetic considerations, the lips are important for oral competence, communication of emotion, deglutition, and speech. The lips are critical in producing the labial sounds "b," "m," "w," "p," as well as the labial-dental sounds "f" and "v." While lip reconstruction attempts to restore all of the functions of this multifaceted region, oral competence is probably the most important.[2]

While numerous operations have been devised to correct lip defects, a practical and reliable approach is outlined below.

ANATOMY

The normal lip is at least 5 to 6 cm long.[3] Blood supply is from the paired superior and inferior labial branches of the facial artery. The labial arteries run submucosal on the intraoral side of the lips, meeting in the midline. Motor supply to the lip muscles is from the facial nerve, primarily the buccal and marginal mandibular branches. The bulk of the lips are composed of the orbicularis oris muscle, which is arranged circularly around the mouth and acts as a sphincter. This muscle has no bony attachments.[4] Many authors have stressed the importance of recreating an intact sphincteric ring when correcting congenital or surgical defects. A second group of dilator muscles are attached in radial manner around the mouth, consisting of the mentalis, depressor anguli oris, depressor labii inferioris, risorius, zygomaticus major and minor, levator anguli oris, and levator labii superioris. The vermilion is dry due to a lack of mucous glands and exposed position outside the oral cavity, whereas the "wet" portion of the lip is well supplied with mucous and minor salivary glands. The red color is due to the rich blood supply to the region. A thin pale junctional zone of skin (sometimes known as the "white line") demarcates the junction between vermilion and skin. This zone is important to align correctly during lip repair.[4]

RECONSTRUCTION OF LIP DEFECTS: ONE HALF OF LOWER LIP

A decision tree used for reconstruction of lower lip defects is illustrated in Fig 1. Lesions involving up to one half of the lower lip can be excised and repaired primarily. Margins should be 0.5 cm for squamous cell carcinoma, as opposed to intraoral lesions, which require margins of 2 cm. The first report of a wedge excision of a lip lesion with direct suture repair was by Louis in 1768.[5] This approach, with some modifications, is still used (Fig 2). The smaller lesions can be excised with a wedge excision. As the size of lesion increases, the wedge can be modified to a "W" to avoid crossing the mentolabial groove onto the chin. The "W" configuration creates a more rectangular defect and keeps wider margins inferiorly. When the lesion involves close to one half of lip, a rectangular excision with advancement flaps is useful (Fig 3). During closure, a strong precise anastomosis of the ends of the orbicularis oris muscle is important to reconstitute the oral sphincter. Aligning the mucocutaneous junction ("white line") should be the first step of the skin

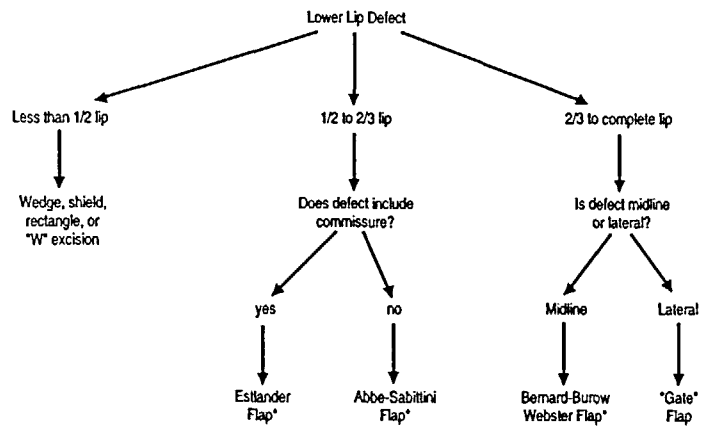

FIGURE 1. Decision tree for management of lower lip defects. *Alternative is Karapandzic flap if the cross-lip flaps are not available for any reason.

From the Department of Otolaryngology—Head and Neck Surgery, University of Washington Medical Center, Seattle, WA.

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Address reprint requests to Craig L. Cupp, CDR, MC, USNR, Assistant Clinical Professor, Department of Otolaryngology—Head and Neck Surgery, Division of Facial Plastic and Reconstructive Surgery, University of Washington Medical Center, Seattle, WA 98195.

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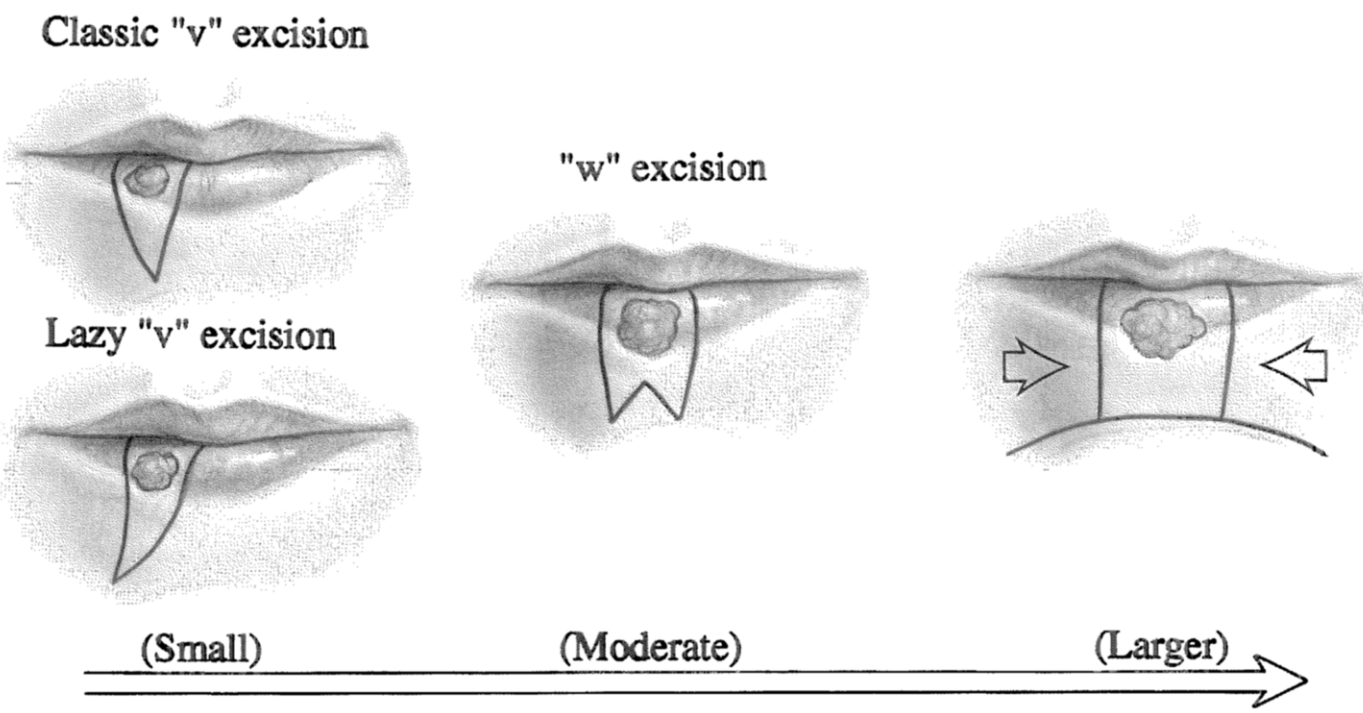

FIGURE 2. Direct excision and repair of lower lip lesions. Lesions up to one half of the lip can be excised and repair primarily. Small lesions can be excised using the "V" excision, and can be angled to blend into the chin-lip crease. Larger lesions can be excised using a "W" pattern. The "W" avoids crossing the chin-lip crease and retains an adequate margin of tissue around the lesion inferiorly. The largest lesions can be excised as a rectangle and incisions made in the chin-lip crease to allow advancement of lateral lip tissue for closure.

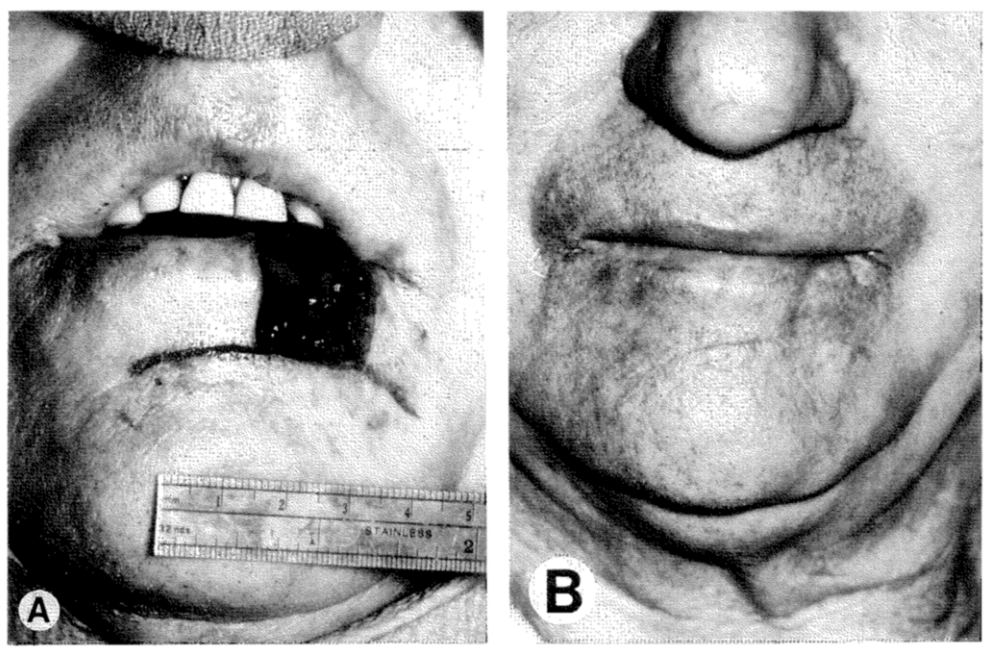

FIGURE 3. Rectangular excision of lower lip carcinoma. (A) Lower lip defect after excision of carcinoma. Proposed advancement incisions outlined. (B) Final result.

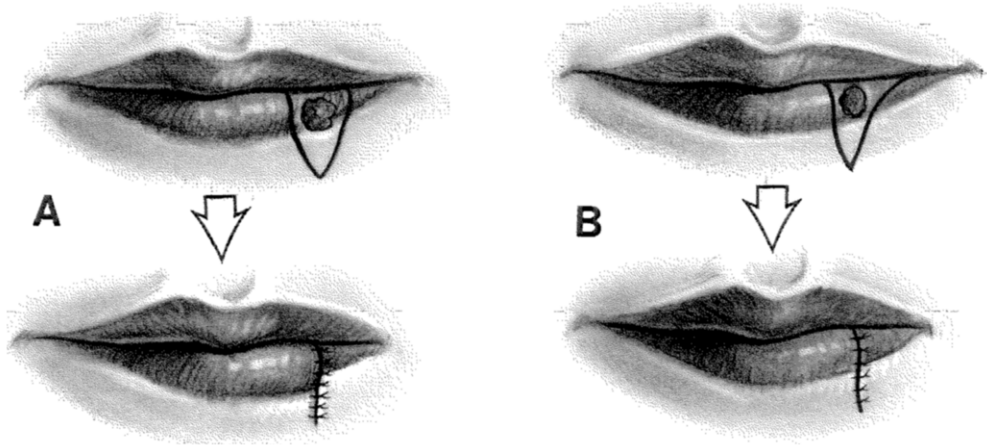

FIGURE 4. Modification of classic "V" excision to improve vermilion-cutaneous matching. (A) Classic "V" excision can result in a noticeable "step off" in the vermilion-cutaneous junction. (B) Slight angulation of lateral incision allows for precise matching of vermilion-cutaneous junction.

closure. Problems locating this junction at the end of a case can be avoided by tattooing with methylene blue and a needle or by placing a small stitch at the junction on either side of the proposed excision at the beginning of the case. Modification of the wedge excision as recommended by Calhoun[6] can assist in obtaining a smooth vermilion-skin contour (Fig 4).

RECONSTRUCTION OF LIP DEFECTS: ONE HALF TO TWO THIRDS OF LOWER LIP

Defects larger than one half of the lip cannot be closed primarily without undue wound tension. Strategies for closure involve borrowing tissue either from the opposite lip or from the cheek. Tissue borrowing from the opposing lip was first described by Sabattini in 1838,[7] and is commonly known as the Abbe cross lip flap (Fig 5). The flap width should be approximately one half of the width of the excised tissue. This width will reduce the size of both upper and lower lip by the same amount. Two centimeters is the maximum recommended width size of the flap, which is pedicled on the labial artery. The pedicle is divided 10 to 21 days later. A Z-plasty is performed at time of pedicle division to avoid notching at the donor site. The advantage of this flap is that the defect is repaired with like tissue. This flap has been shown to eventually regain both sensory and motor function (Table 1). The major disadvantages of the flap are

TABLE 1. Abbe-Sabattini Flaps Return of Sensory and Motor Function

Type	Initial Return	Near Complete Return
Pain	2 Months	12 Months
Tactile	3 Months	12 Months
Cold	6 Months	12 Months
Hot	9 Months	12+ Months
Motor	6 Months	12 Months

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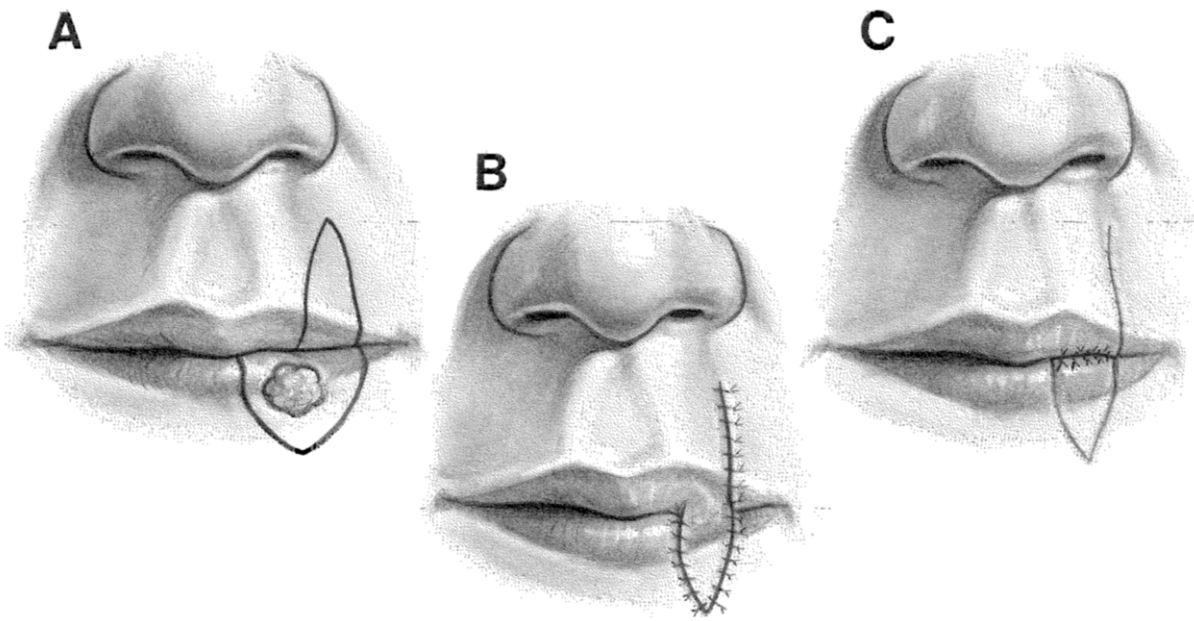
FIGURE 5. Abbe-Sabattini cross lip flap. (A) "V" shaped incision diagramed around lower lip lesion and proposed upper lip flap outlined. (B) Lesion removed, flap transposed and sutured into defect. Flap is designed with same *height* as defect but only 50% of *width*, resulting in equal width reduction of upper and lower lips. (C) Pedicle divided at 2 weeks, with Z-plasty performed at donor site to prevent notching.



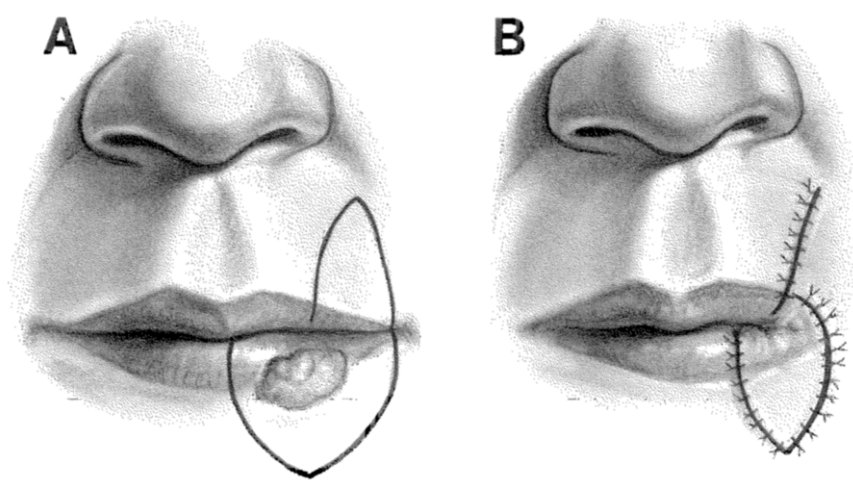


FIGURE 6. Estlander cross lip flap. (A) "V"-shaped incision diagramed around lower lip lesion and proposed upper lip flap outlined. (B) Lesion removed, flap rotated and sutured into defect. Flap is designed with height 1 to 2 mm greater than defect to be reconstructed.

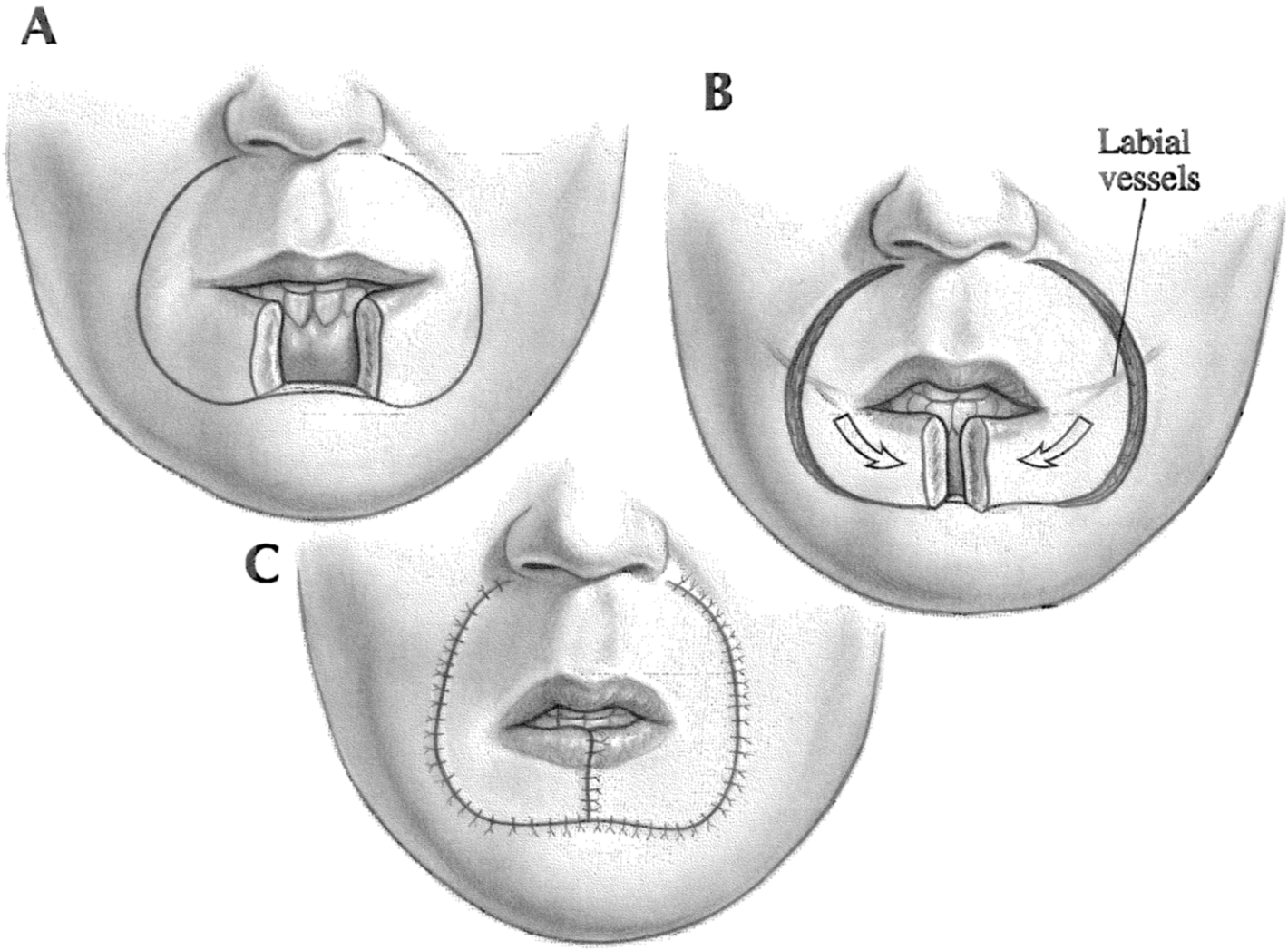


FIGURE 7. Karapandzic flap. (A) Lower lip defect after resection of carcinoma. Proposed incisions outlined. (B) Incisions made through skin. Buccal branches of facial nerve and labial artery branches preserved to greatest extent possible. (C) Tissue advanced and defect closed.

the necessity of two stages, the intervening risk of the patient injuring the flap by opening the mouth widely, and the relative microstomia it creates.

The Estlander[8] flap is similar to the Abbe flap, but involves rotating the upper lip tissue around the lateral edge of the mouth (Fig 6). It is best used in situations where the defect involves the oral commissure, so that the flap not only repairs the lower lip defect, but is the first step in commissure reconstruction. The incision should be placed in the melolabial crease and the flap designed 1 to 2 mm longer than the defect to be reconstructed. The pedicle is divided at 2 weeks. Some angling and advancement of mucosa may be required to align the mucosa of the two lip segments. A commissure plasty is performed at 3 months using the technique as designed by Converse.[9]

In situations where the Abbe and Estlander flaps cannot be used, the Karapandzic flap (Fig 7) is a good alternative. This flap was first described by Von Bruns[10] over 100 years ago. A complete lip is formed by rotating upper lip and perioral tissue down and around. The incisions are made through skin and muscle down to, but not through, mucosa. Karapandzic modified the creation of the flap in that he carefully dissected and preserved nerves and blood vessels. He described this approach as a useful one in cases where radiation had been previously used and arterial blood supply was poor.[11] Use of this technique for larger defects results in severe microstomia.

RECONSTRUCTION OF LOWER LIP DEFECTS: TWO THIRDS TO COMPLETE

Lesions involving from two thirds to the entire lip are best reconstructed by using adjacent cheek tissue. If the lower lip defect is centered in the midline, the Webster modification of the Bernard-Burow repair is used (Fig 8). When possible during the excision of the lip lesion, a segment of labial mucosa is left attached along the labioalveolar groove centrally. This mucosa helps preserve the sulcus and allows a tension-free closure to the flap mucosa. The Burow's triangles are designed bilaterally with each base equal in width to one half of the lip defect. A line is first drawn horizontally and slightly superiorly from the oral commissure. The Burow's triangle are designed at their apexes at the melolabial fold, their medial sides at the melolabial fold, and their lateral sides connecting the apex to the horizontal line drawn from the commissure. The designed Burow's triangles are then modified to a half-crescent configuration. The half cres-

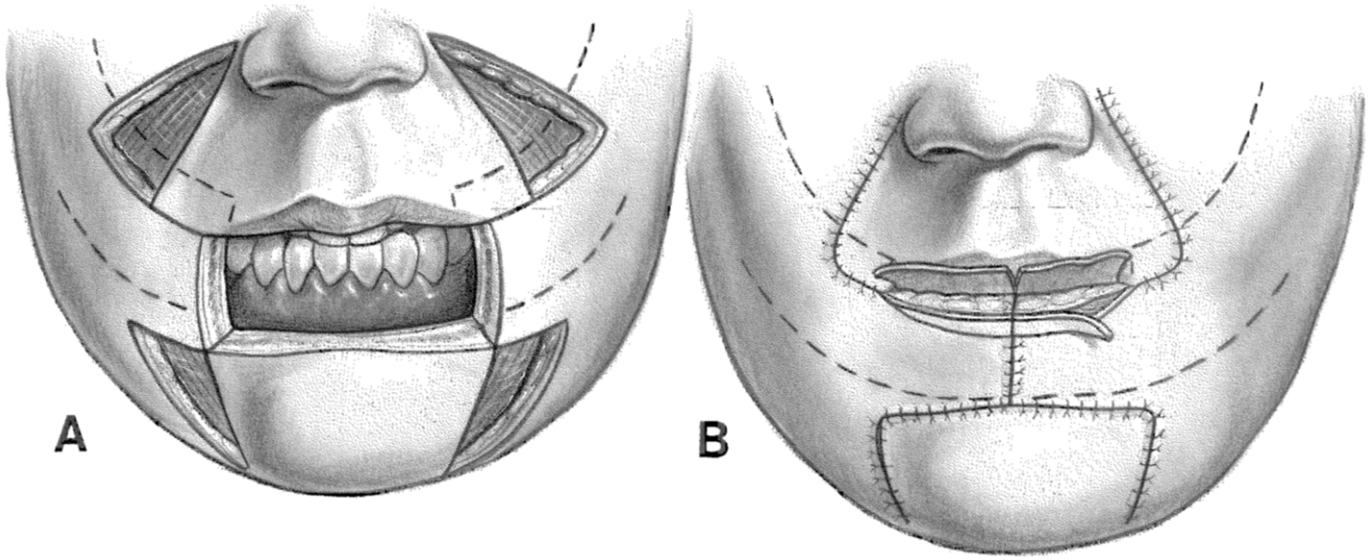
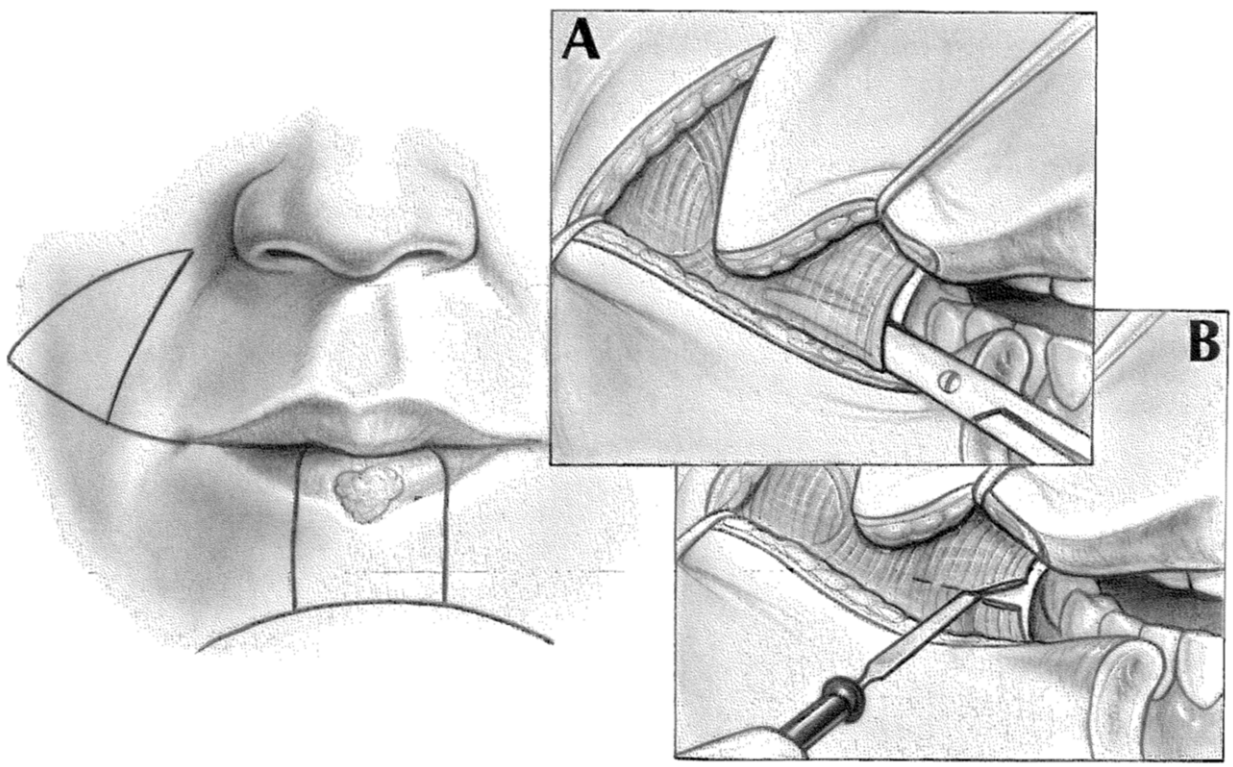
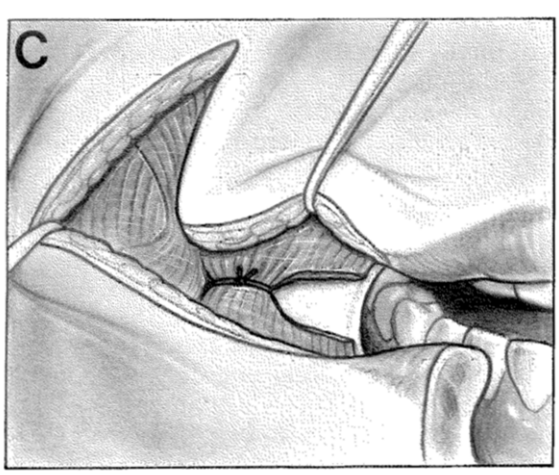


FIGURE 8. Bernard-Burow flap (Webster modification). (A) Complete lower lip defect following resection of carcinoma. Horizontal incisions through skin from the commissure to melolabial fold created and triangles/crescents of skin and subcutaneous tissue excised adjacent to melolabial fold. Facial muscle is not excised. Triangles/crescents also excised lateral from mental-labial groove as required. Intraoral mucosal advancement flaps created as noted by broken lines. (B) Flaps advanced and sutured. Small ellipse of skin removed from superior portion of flap and mucosa advanced to create new lower lip vermillion.





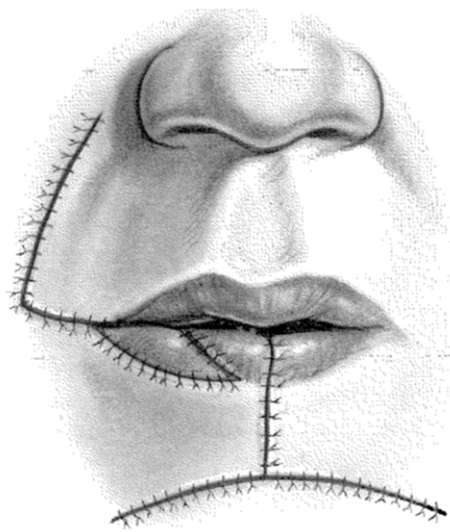


FIGURE 9. Closeup of unilateral Bernard-Burow flap. (A) Horizontal incision made, triangle of skin and subcutaneous tissue excised, with sparing of underlying facial musculature. Mucosa undermined with scissors. (B) Incision of muscle lateral to commissure (not through mucosa) as needed to assist in advancement of flap. (C) Suture around lateral muscle to assist in creation of new commissure. (Adapted from Freeman B: Myoplastic modification of the bernard cheiloplasty. Plast Recon Surg 21:453-460, 1958.)

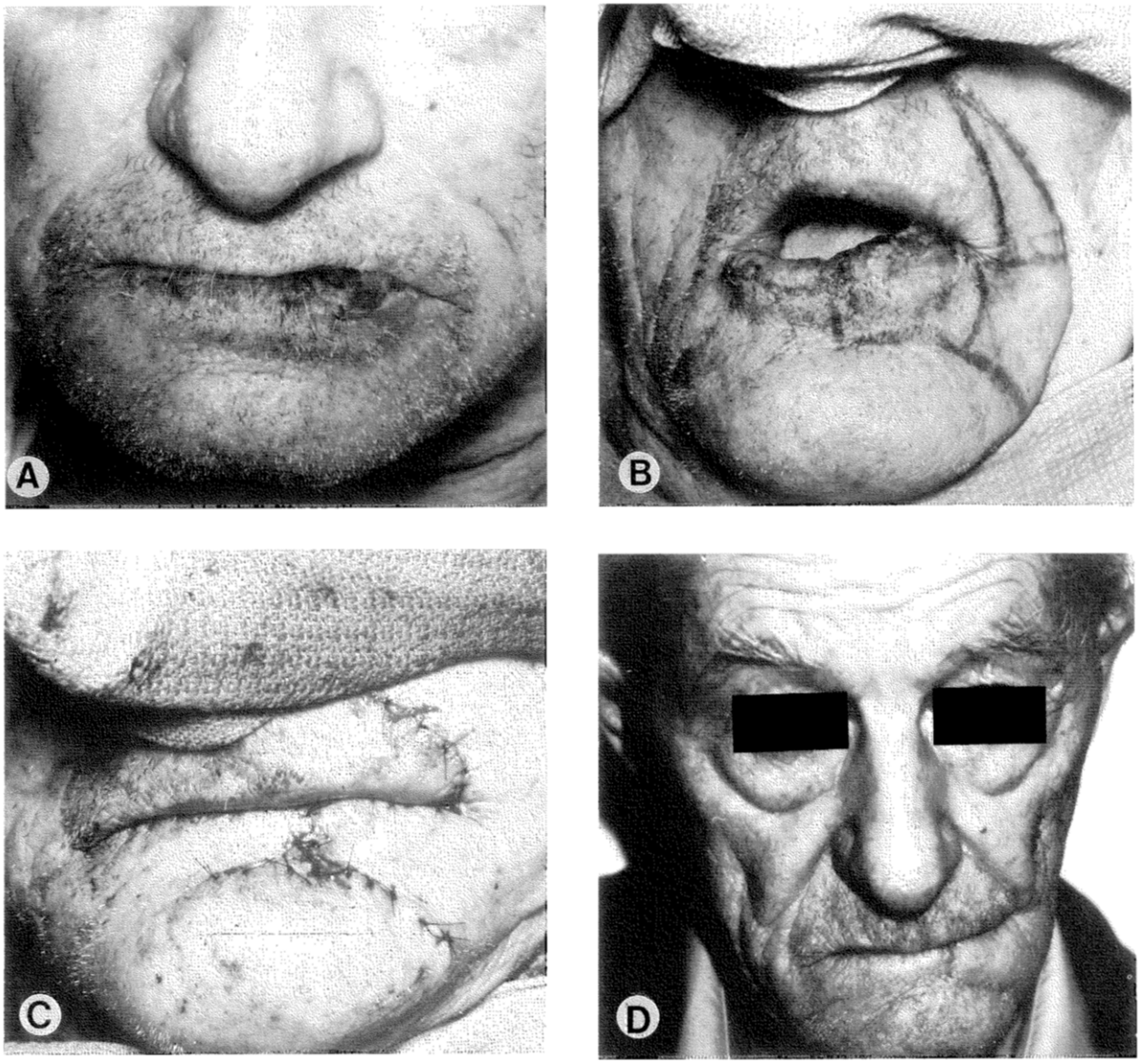


FIGURE 10. Clinical example of unilateral Bernard-Burow flap. (A) Squamous cell carcinoma of left lower lip. (B) Proposed excision and Bernard-Burow advancement flap outlined. (C) Lesion excised, flap advanced into place and sutured. (D) Early postoperative result.

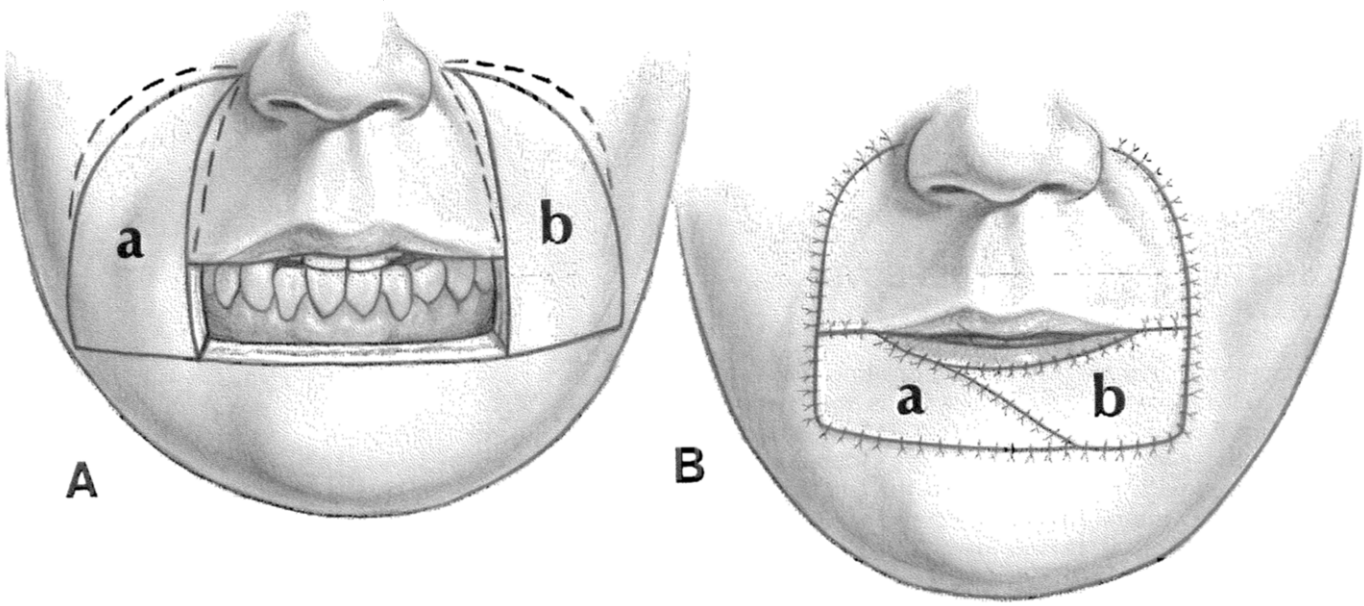


FIGURE 11. "Gate" flap. (A) Complete lower lip defect with proposed flaps outlined. Mucosal incisions represented by broken lines. Medial incisions and most of lateral incisions are full thickness. Horizontal cutaneous incision is not deep to preserve blood supply. (B) Flaps rotated and sutured. This technique is especially useful for large, unilateral lower lip defects.

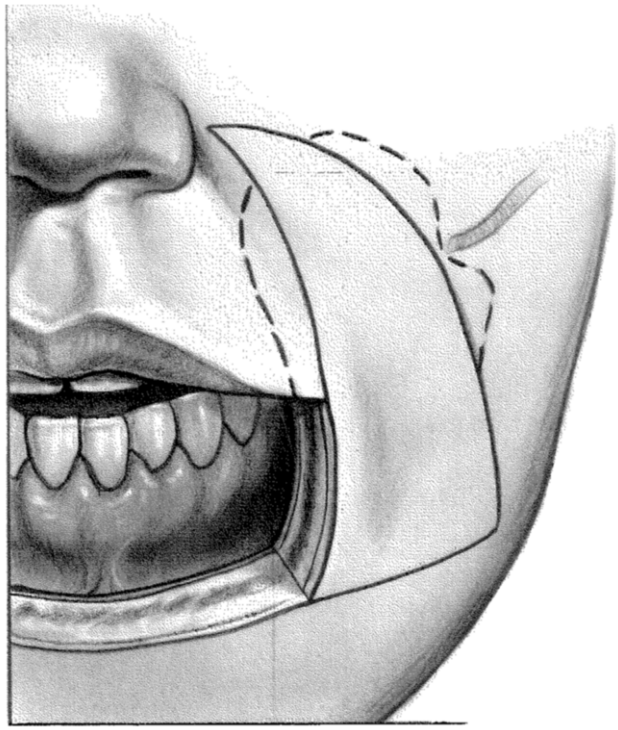


FIGURE 12. Modified mucosal incisions for "gate" flap. Mucosal incisions diagramed by broken lines. Design avoids Stensen's duct opening and obtains mucosa from areas of maximum availability. (Adapted from Gurel.[12])

cents of skin (Burow's triangles) are then excised, preserving the underlying muscle. Facial musculature along base of the triangle is incised as far laterally as necessary to obtain a closure of muscle in the midline (Fig 9). Mucosa is incised intraorally slightly superior to the incision through muscle to preserve a cuff of mucosa to help reconstruct the vermillion. Half crescents of skin are also removed as needed from the lower portion of the chin at the chin-cheek junction. Intraoral mucosal advancement flaps are also created as diagramed to create a new lip (as in a lip shave). After closure, a portion of skin is excised and intraoral mucosa advanced to create a new vermilion border. The Bernard-Burow's technique can be unilaterally as well as bilaterally (Fig 10).

In those cases where a defect does not involve the entire lip and is laterally located, a melolabial flap or "gate" flap is indicated. This useful technique advances and rotates tissue from the melolabial groove (Fig 11). A modification in design of the intraoral mucosal incisions has been recently proposed by Gurel[12] (Fig 12).

RECONSTRUCTION OF LIP DEFECTS: UPPER LIP

While malignancies of the lower lip are almost always squamous cell carcinoma, the upper lip is much more likely to develop basal cell carcinoma. Mohs surgical treatment of these lesions usually leaves a cutaneous defect that is closed with a local flap. For the less common squamous cell carcinoma involving up to 50% of lip tissue, primary closure (as in the lower lip) is preferred. A decision tree for upper lip lesions is illustrated in Fig 13.

Defects involving one half to two thirds of the upper lip

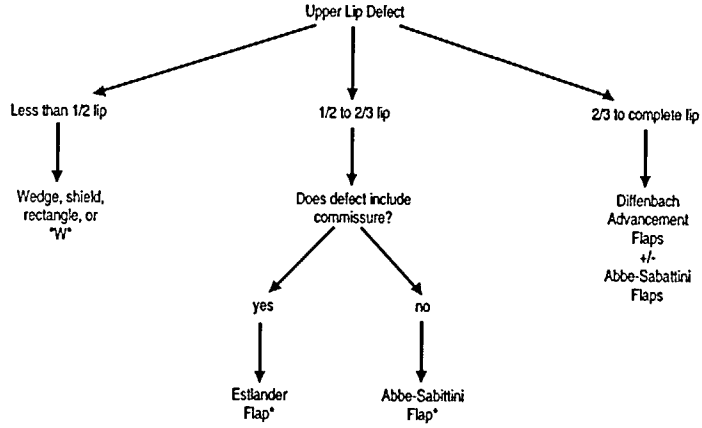


FIGURE 13. Decision tree for management of upper lip defects.

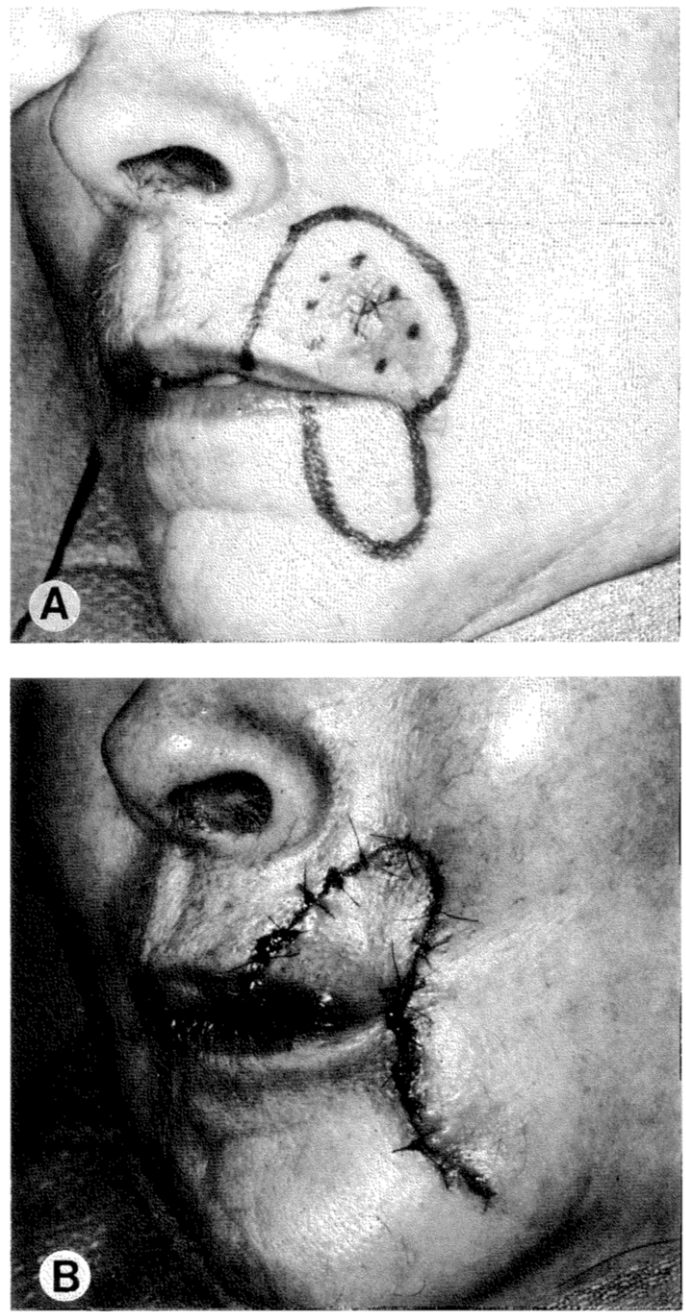


FIGURE 14. Estlander flap. (A) Proposed excision and repair of large squamous carcinoma of upper lip using Estlander flap. (B) Carcinoma excised and defect reconstructed with Estlander flap. (Reprinted with permission.[3])

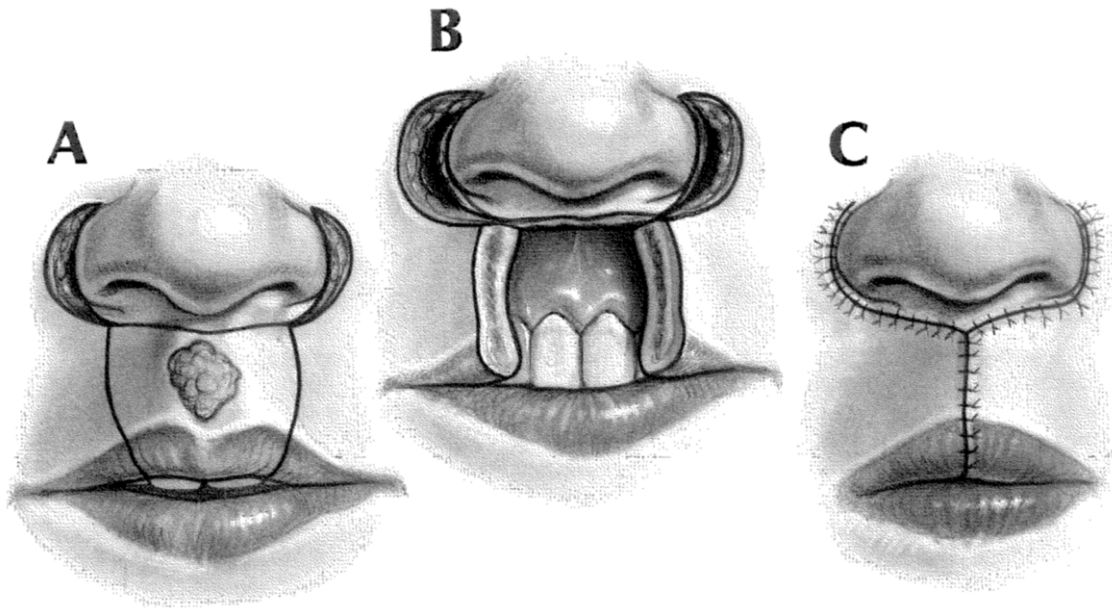


FIGURE 15. Modified Burow technique for upper lip reconstruction. (A) Proposed excision of tumor and perialar incisions. (B) Lesion excised and perialar crescents excised. (C) Closure of defect.

are repaired using either the Abbe-Sabattini or Estlander cross lip flaps (Fig 14).

Those defects involving two thirds or more of the upper lip are repaired by the method of Burow-Diffenbach, which uses perialar crescentic excisions and laterally based advancement flaps (Fig 15). This repair can be augmented by an Abbe-Sabattini flap to the central portion of the lip.

CONCLUSION

The challenge of lip reconstruction has resulted in a large number of potential reconstruction options. The methods and applications that have worked well for the authors were presented.

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