



## Reconstruction Options of Lower Lip

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### Abstract

Lip reconstruction can generate a considerable challenge to the plastic surgeon because of their role in aesthetic balance, facial expression, speech and deglutination. The goals of lip reconstruction are to provide adequate replacement of external skin, oral lining and vermilion while maintaining the aesthetic balance of the vermiliocutaneous junction and to maintain the competence of the orbicularis muscle sphincter, the adequate diameter for oral aperture and the adequate labial sulcus depth. This chapter presents techniques for vermilion, perioral cutaneous, and full-thickness lip reconstruction. Traditional techniques were summarized and some new techniques were broadly described to optimize the functional and cosmetic outcome.

### Introduction

Lip reconstruction can generate a considerable challenge to the plastic surgeon in that the lips are the primary aesthetic and dynamic center of the lower third of the face. Their role in aesthetic balance, facial expression, speech, and deglutination is not replicated by any other tissue substitute. The goals of lip reconstruction are to provide adequate replacement of external skin, oral lining and vermilion while maintaining the aesthetic balance of the vermiliocutaneous junction and to maintain the competence of the orbicularis muscle sphincter, the adequate diameter for oral aperture and the adequate labial sulcus depth. Ideally, cutaneous sensation is preserved or reestablished to provide proprioceptive feedback for speech, animation, and management of secretions [1,2]. Lower lip reconstruction is more significant, because oral competence depends greatly on a functional lower lip having good muscular function, adequate height and sensation.

### Anatomy and Etiology

The lips consist of four basic components: external skin, vermilion, the mucosa and the muscle. The vermilion separates the skin of the external lip and the mucosa of the inner lip. It is composed of keratinizing glabrous epithelium with numerous sebaceous glands. The primary muscles of the lip, the orbicularis oris muscles, maintain the oral competence by acting as a circumoral sphincter. They are paired, horizontally oriented muscles that link the modiolus and philtral columns producing a tightening of the lip. The orbicularis is acted upon by the surrounding elevating and depressing mimetic musculature. The levator labii superioris, levator anguli oris, and the zygomaticus major and minor elevate the upper lip, and the mentalis, depressor labii inferioris, and the depressor anguli oris draw the lip inferiorly [3]. The main arterial blood supply to the lips is from the facial artery with the inferior labial artery supplying the lower lip and the superior labial artery and branches from the angular artery supplying the upper lip [3,4]. Motor innervation of the lip is provided by the buccal and marginal mandibular branches of the facial nerve; sensory innervation of the upper lip is derived from (V2) the infraorbital nerve and the the lower lip receives its sensibility from (V3) the mental nerve [3,4]. The etiologies of acquired lip defects are mostly oncologic resection and trauma. Tumors are usually basal cell carcinoma in the upper lip and squamous cell carcinoma in the more sun-exposed lower lip. Melenoma is also quite common on the lip. Traumatic defects are usually seen in young, healthy patients [5].

### Vermilion Defects

Small, superficial lateral vermilion defects can be left to heal by secondary intention. For the small central defects, primary closure is more suitable than healing by secondary intention in order to prevent depression or notching. For larger vermilion defects, flaps are indicated. These flaps are; V-Y advancement flaps from inside the vermilion, vermilion advancement flaps, vermilion switch flaps or nonlip flaps such as mucosal flaps and tongue flaps [6].

### Cutaneous Defects

Partial-thickness lower lip defects are treated in same fashion as full thickness defects. The

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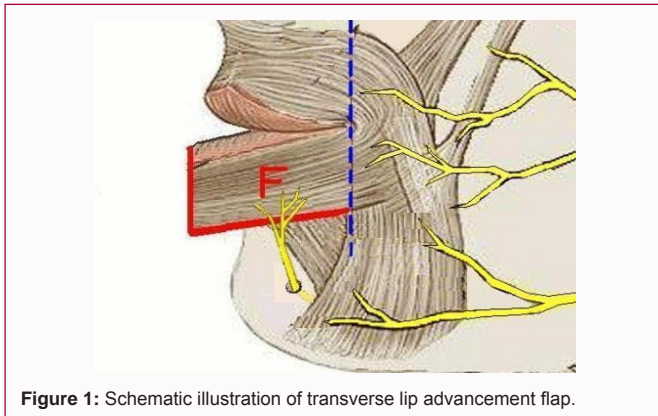


Figure 1: Schematic illustration of transverse lip advancement flap.



Figure 2: (a) Patient with lower lip squamous ca. (b) Excision, flap elevation and mental nerve dissection. (c,d) Three months postoperative view.

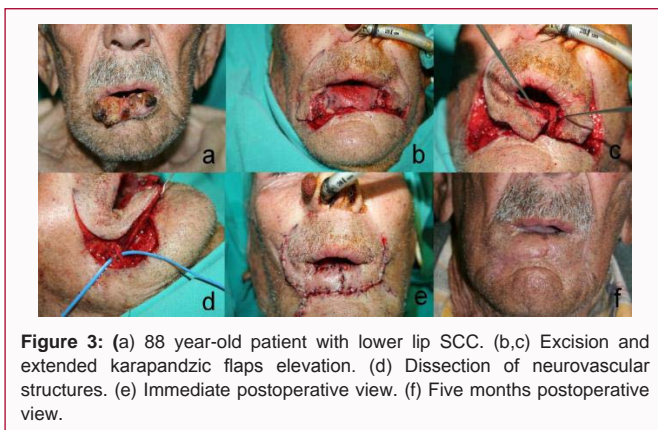


Figure 3: (a) 88 year-old patient with lower lip SCC. (b,c) Excision and extended karapandzic flaps elevation. (d) Dissection of neurovascular structures. (e) Immediate postoperative view. (f) Five months postoperative view.

lower lip can tolerate wedge excision for the majority of defects. If the superficial defect is not amenable to the wedge excision, a skin graft or local transposition flaps from the chin and submandibular region are appropriate. Larger defects can be reconstructed with bilateral inferiorly based melolabial flaps [7].

### Full-Thickness Defects Less Than One Third Total Lip Length

Defects of up to 30% of the transverse width of the lip in adults can typically be closed primarily without significant decrease in oral opening. Full-thickness defects are closed in three-layer of mucosa, muscle, and skin. The mucosal closure must provide a watertight mucosal seal. The deep and superficial fibers of the orbicularis muscle must be reapproximated to allow tension-free muscle coaptation and

avoid attenuation. Alignment of the vermilion requires meticulous attention in order to avoid a noticeable vermilioncutaneous mismatch or notch. Incisions that cross the white roll should be oriented perpendicularly to allow precise realignment of the white roll. Subtle misalignment of the lip can be aesthetically distracting, even in the absence of significant soft tissue loss. Some authors suggest that all of the deficiencies less than one-half the lip width can be repaired by primary closure. A recent publication by Soliman et al. [8] emphasized the superior functional and aesthetic results obtained with primary closure of full-thickness lower lip defects which comprise 50% of the lip and argued that local flaps are often overused in lip reconstruction. These size rule was especially applicable to elderly patients with greater tissue laxity.

### Full-Thickness Defects between One Third and Two Thirds Lip Length

Central defects between 30% and 50% of the lower lip can be reconstructed with the Schuchardt procedure which facilitates primary closure with skin excision around labiomental fold. Recently, we described a new flap modification named transverse lip advancement flap for larger defects [9]. While designing the transverse lip advancement flap, a full thickness incision is made following the natural labiomental crease. The incision is ended at the level of commissure not to disturb the buccal and marginal mandibular branches of the facial nerve. The mental nerve was dissected and preserved to keep the sensorial innervation of the lower lip (Figure 1). Thus, the flap that includes the orbicularis oris with intact neurovascular supply is freed to provide the desired advancement (Figure 2). Utilizing the tremendous flexibility and expandability of the lip tissue, we tried to minimize the incisions and scar, and maximize the sensation and function with this flap. In planning a lip reconstruction, we think that transverse lip advancement flap should be considered as a second ladder after primary closure. Other two major techniques to reconstruct the defects between one third and two thirds lip length are lip-switching procedures, Abbe and Estlander flaps. Abbe flap is used for reconstruction if the commissure has not been resected and the Estlander flap is used if the commissure has been resected. One advantage of the cross-lip flap is the ability to replace a vertical segment of both vermilion and cutaneous lip tissue. The most significant disadvantage of these flaps is that they are denervated. Return of sensory function may begin after several months. Hypersensitivity of the flap may also occur but usually resolves after the first year. Fan-shaped orbicularis oris musculocutaneous flaps have been the mainstay of lip reconstruction, after Gillies introduced "fan flap" in 1920. This denervating reconstruction that gives form but no function was popularized and modifications were added periodically. In 1974, Karapandzic principle was introduced, modifying the former into an innervated orbicularis oris myocutaneous flap. Reconstruction with Karapandzic flaps has the advantage of being a single-stage technique that replaces the missing lower lip with like tissue, maintains an intact oral sphincter, and preserves sensation and blood supply to the lips. However, use of Karapandzic flaps is usually restricted to reconstructing defects comprising two-thirds of the lip or less to avoid microstomia [10]. McGregor suggested a rectangular modification of the Gilles' flap in 1983 to reconstruct the full thickness lip defects even up to entire lip [11]. Nakajima et al. [12] in 1984, proposed a modification for McGregor's flap, based on the facial artery instead of labial artery. In addition to giving a more robust blood supply, the preservation of motor and sensory innervation to flap was superior.



## Total Lip Defects

For subtotal or total lip defects, non-lip techniques must be employed. The Webster- Bernard technique is essentially an cheek advancement flap to create a new lip [13]. Excision of tissue at the nazolabial fold allows for this advancement. Although these were originally described as full-thickness excisions, these are generally performed as cutaneous excisions only. The vermilion is reconstructed with mucosal sliding flaps simultaneously. Reconstruction with this technique is adynamic and results in drooling. Hanasano et al. [14] recently reported a modification of the Karapandzic flap for near total or total lip full-thickness lip defects. Instead of joining up the circumoral incision to the border of the lip defect, Hanasano et al. [14] described extending the circumoral incisions inferolaterally in the cheek tissue adjacent to the labiomental grooves. This cheek tissue is then used to reconstruct the central component of the lower lip. This modification provides additional tissue recruitment compared with the traditional Karapandzic method. We agree that this technique is very useful because of being sensate and having good colour matching with adjacent tissue. Especially, the old patients with high tissue laxity and patients who are not appropriate to microvascular free-tissue transfer operations with high morbidity are proper candidates for this technique (Figure 3).

Free-flap reconstruction is often required for large-scale defects with associated loss of mucosa, cheek, nasal, and chin skin that exceed the availability of local soft tissue. This can be due to paucity of available soft tissue, previous radiation therapy, or previous surgery. While free-tissue transfer can provide an abundance of soft tissue, care must be taken in selecting a donor site with an appropriate match in color, texture, and pliability. The most commonly used free flap to reconstruct total or near-total lip defects is the radial forearm free flap [15-17]. To provide static support for oral competence and to help prevent drooling, this flap is usually transferred with the palmaris longus tendon. Additional static support can also be obtained through the use of a fascia lata graft. This flap can also be transferred as a sensate free flap by performing anastomosis of the lateral antebrachial cutaneous nerve to the mental nerve. Another composite flap for lip reconstruction is anterolateral thigh-fascia lata flap [18]. However, these flaps do not have their own motility, and the color and texture match is not perfect. To restore the dynamic sphincter function of the lower lip, neighbouring muscles have been included. Combinations with a depressor anguli oris [19] and with a masseter muscle [20] have been described. However, their functions were not synchronised. For more synchronous and stronger functions, forearm flap was combined with a free gracilis muscle transfer and achieved good sphincter function but still poor color matching is a problem [21,22]. Ninkovic et al. [23] used functional gracilis muscle transfer covered a graft and local mucosal flap without combined a radial forearm flap to improve the functional/aesthetic result, with minimal donor-site morbidity and reported good results of two cases. We recently presented our experience in reconstruction of total or subtotal lower lip defects due to SCC excision with functional gracilis muscle flap covered STSG in our series of 8 cases [24]. After tumor resection on the lower lip, the facial artery, vein and marginal mandibular nerve are prepared as recipient vessels and nerve. The free gracilis muscle is harvested from the contralateral thigh. The pedicle includes the branch of the obturator nerve to the muscle. The gracilis muscle flap was divided and trimmed to the required width and length. The flap pedicle is anastomosed to the facial artery and vein, then the marginal branch of the facial nerve is coapted to the motor



**Figure 4:** (a) 57 year-old patient with lower lip SCC. (b) Excision tumor. (c) The gracilis muscle free flap. (d) Dissection of facial artery, vein, marginal mandibular nerve. (e) Immediate preoperative view after covering muscle flap with the split-thickness skin graft. (f) Six months postoperative view.



**Figure 5:** (a) The patient with lower lip SCC. (b) Excision of tumor. (c,d) 2 years postoperative view after reconstruction with functional free gracilis muscle flap.

nerve of the gracilis muscle A split-thickness skin graft is used to cover the whole inner and outer surface of the gracilis flap which will form mucosal surface and skin surface. Skin graft is harvested from thigh and sutured to the remaining mucosa for reconstruction of the lining. In a second stage, vermilion reconstruction with a facial arter musculomucosal flap is performed (Figure 4 and 5). In our series, the patients were happy with the functional and aesthetic results. There were no problems with normal word articulation, mouth opening, or eating. Oral continence was perfect, the mouth sphincter function has been restored completely. The color match of the grafted skin gave a pleasing cosmetic result. Presently, there is no universally accepted technique for subtotal or total reconstruction of the lower lip. According to our personal experience; extended karapandzic flap is a good choice for old patient who has lip enough tissue laxity fort his flap or who has comorbidities for long microvascular operations. Other patients with subtotal or total lower lip defects may benefit from free gracilis muscle flap transfer.

## Conclusion

While planning a lip reconstruction, as far as possible, dynamic reconstruction should be attempted for restoration of facial expression, speech, and eating. Patient characteristics like local tissue laxity, age, comorbidities, previous treatment (surgery and/or irradiation) also must be paid attention before the final surgical plan. We think that planning a reconstruction regarding the patient characteristic and also considering new concepts, will allow the surgeon to reach the best results both aesthetically and functionally.

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