

# A new technique for one-stage total lower lip reconstruction: Achieving the perfect balance

Sandipan Gupta MS MCh, Debarati Chattopadhyay MS, Marang B Murmu MS,  
Souradip Gupta MBBS, Hari S Singh MS

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**BACKGROUND:** Reconstruction of extensive lower lip defects is difficult. The authors describe a new technique of one-stage total lower lip reconstruction, with the ultimate goal being achievement of the delicate balance between adequate mouth opening and competent mouth closure, with satisfactory aesthetic outcome.

**METHODS:** The authors applied their new reconstructive technique in a patient with extensive lower lip defect following excision of squamous cell carcinoma. Bilateral inferiorly based nasolabial flaps were used for reconstruction of lower lip. For vermilion reconstruction, a bucket-handle mucomuscular flap from upper lip was designed primarily using the pars marginalis portion of orbicularis oris. Compared with previously described techniques, this procedure is unique with respect to the alignment of the nasolabial flaps in relation to one another. Furthermore, this technique of vermilion reconstruction is a one-stage procedure with minimal morbidity, enables preservation of the vascular pedicle and innervation and maintains the orientation of orbicularis oris, thus providing a competent oral sphincter. To the authors' knowledge, this mucomuscular upper lip flap has not been described earlier and has definite advantages over the commonly used methods of vermilion reconstruction.

**RESULTS:** The functional and aesthetic outcomes are satisfactory on follow-up, with normal lip movements and sensation, adequate mouth opening and oral competence, good colour and texture match with adjacent tissues, and excellent volume and quality of the vermilion. No subsequent corrective surgery is required.

**CONCLUSIONS:** This technique is simple and achieves the main goals of total lower lip reconstruction in a single stage with minimal morbidity.

**Key Words:** *Lower lip reconstruction; Mucomuscular flap; Nasolabial flap*

The reconstructive surgeon is often faced with the task of reconstructing extensive lower lip defects resulting from the excision of malignant lesions, notably squamous cell carcinoma. A number of techniques have been described, the choice depending on the extent of the defect in addition to the surgeon's expertise. The goals of lower lip reconstruction are: restoration of oral competence; maintenance of adequate oral stoma; to preserve sensation; to maintain speech; to provide both skin cover and oral lining; to provide lower lip vertical height and prevent show of teeth; and to produce an aesthetically satisfying result with good semblance of vermilion. The ultimate aim is to achieve a balance between adequate mouth opening and competent mouth closure, which is vital to the patient.

Local flaps are the mainstays for reconstruction of lip defects, although free flaps may also be used for more extensive defects. Reconstruction using local flaps achieves better functional and aesthetic results compared with free flaps (1). In the present article, we describe a new technique for total lower lip reconstruction, including single-stage reconstruction of the vermilion.

## Une nouvelle technique pour la reconstruction totale de la lèvre inférieure en une étape : l'atteinte de l'équilibre parfait

**HISTORIQUE :** La reconstruction d'importantes anomalies de la lèvre inférieure pose tout un défi. Les auteurs décrivent une nouvelle technique de reconstruction totale de la lèvre inférieure en une étape, dont l'objectif ultime consiste à obtenir l'équilibre délicat entre une ouverture convenable et une occlusion compétente de la bouche, tout en parvenant à un résultat satisfaisant sur le plan esthétique.

**MÉTHODOLOGIE :** Les auteurs ont mis en application leur nouvelle technique de reconstruction chez un patient ayant une importante anomalie de la lèvre inférieure après l'excision d'un carcinome spinocellulaire. Les chirurgiens ont utilisé des lambeaux prélevés sur la partie nasolabiale inférieure bilatérale pour reconstruire la lèvre inférieure. Pour reconstruire le vermillon, les chirurgiens ont préparé un lambeau mucomusculaire en anse de seau extrait surtout de la partie marginale de l'orbiculaire des lèvres. Par rapport aux techniques déjà décrites, cette intervention est unique pour ce qui est de l'alignement des lambeaux nasolabiaux. De plus, cette technique de reconstruction du vermillon se fait en une étape, s'associe à une morbidité minimale, permet de préserver le pédicule vasculaire et l'innervation et préserve l'orientation de l'orbiculaire des lèvres, ce qui assure la compétence du sphincter oral. En autant que le sachent les auteurs, ce lambeau mucomusculaire de la lèvre supérieure n'a jamais été décrit auparavant et comporte des avantages évidents par rapport aux méthodes de reconstruction du vermillon communément utilisées.

**RÉSULTATS :** Les résultats fonctionnels et esthétiques sont satisfaisants au suivi. Les mouvements et les sensations de la lèvre sont normaux, l'ouverture et la compétence de la bouche sont convenables, la couleur et la texture s'agencent bien avec les tissus adjacents et le vermillon est d'une excellente qualité et d'un volume parfait. Il n'est pas nécessaire de procéder à d'autres chirurgies correctives.

**CONCLUSIONS :** La présente technique, très simple, permet de procéder à une reconstruction totale de la lèvre inférieure en une seule étape, tout en s'associant à une morbidité minime.

## CASE PRESENTATION

A 41-year-old man presented with a fungating lesion involving almost the entire lower lip (Figure 1), and palpable cervical lymph nodes bilaterally. Biopsy of the lip tumour revealed well-differentiated squamous cell carcinoma. There was no evidence of distant metastasis. The TNM stage was T4N2cM0. Surgical excision and lower lip reconstruction, together with bilateral modified radical neck dissection, were planned.

## Technique

Wide local excision of the lower lip tumour was performed under general anesthesia. The resulting defect (5 cm × 3 cm) included almost the entire lower lip excluding the commissures (Figure 2). Reconstruction was undertaken after the margins were shown to be free of tumour by frozen sectioning. Bilateral inferiorly based nasolabial flaps islanded on subcutaneous pedicles were raised and placed on one another in a sandwich-like fashion, such that the skin of the two flaps formed the outer and inner lining of the newly reconstructed lower lip (Figures 3A, B and C).

Department of Plastic Surgery, Medical College Kolkata, Kolkata, West Bengal, India

Correspondence: Dr Debarati Chattopadhyay, 90/1/1, Chowringhee Road, 5th Floor, Kolkata 700020, West Bengal, India.

Telephone 91-943-383-4487, fax 91-332-223-2478, e-mail debarati1981@gmail.com



Figure 1) Preoperative photograph

Two parallel incisions were made on the inner aspect of the upper lip – the inferior incision 1 mm above the junction between dry and wet vermilion, and the superior incision at 1.5 cm above the inferior one. The two incisions converged on either side at approximately 1 cm away from the angle of the mouth. From these convergence points, incisions were made in the mucosa through the angle of mouth up to the excised margins of the lower lip (Figure 4A). Inner and outer mucosal flaps were raised in this area exposing the orbicularis oris (Figure 4B). A bucket handle mucomuscular flap was then raised (Figure 4C and Figure 5) by coronally splitting the pars peripheralis of orbicularis oris muscle through intramuscular dissection, preserving the superior labial artery within the flap and saving the pars marginalis of the orbicularis oris. Thus the mucosal part of this bucket handle flap was islanded based on the muscular pedicle with the superior labial artery on either side.

The muscular pedicles were teased down an additional 0.5 cm and twisted 180° to set on the upper raw border of the sandwiched nasolabial flaps (Figure 4D). The mucosal flaps around the angles of mouth were sutured back over this muscular pedicle. The donor area on the upper lip was closed by advancement and mobilization of the inner mucosa with direct interrupted sutures (Figure 4E).

## RESULTS

The postoperative period was uneventful and the early postoperative appearance was satisfactory. No subsequent corrective surgery was required. At one-year follow-up, the patient is doing well with excellent functional and aesthetic outcome (Figure 6). Lip movements are normal, with adequate mouth opening and oral competence, good colour and texture match with adjacent tissues, and excellent volume and quality of the vermilion (Figures 7A, 7B). Speech has not been altered. The sensation of the reconstructed lip was assessed by testing two-point discrimination, which was found to be normal (6 mm to 7 mm) in all four lip quadrants. The patient is extremely pleased with the outcome.

## Anatomical basis of the lip-sharing procedure

The shape and function of lips is controlled by a complex arrangement of muscles around the mouth, of which the orbicularis oris is of prime importance (2).

The orbicularis oris is made of several strata of muscle fibres that converge and interlace in the modiolus at each of the two angles of the mouth. The muscle consists of four quadrants, each quadrant consisting of a larger pars peripheralis and a smaller pars marginalis. The apposition of marginal and peripheral parts is indicated by the junction between the red lip area and the skin externally. The pars marginalis is developed to a unique extent in humans and is closely associated with speech.

In a full-thickness section of upper lip at right angle to the red lip margin, the cylindrical bundles of pars peripheralis form an S-shape with an external convexity above and an internal convexity below.



Figure 2) Defect after excision of the lesion

Beyond the pars peripheralis lies the triangular pars marginalis, which occupies the core of red lip, with its base adjacent to pars peripheralis and its apex reaching toward the junction of red lip and skin (Figure 8). Thus, the upper lip has a bulbous asymmetrical profile and the pronounced internal convexity creates a mucomuscular shelf on the lower part of internal mucosal surface.

The flap used in the present case involves a small part of pars marginalis and a larger portion of pars peripheralis from the above-described mucomuscular shelf of upper lip, thus preserving the remaining fibres of orbicularis oris and their orientation intact.

## Vascular basis and innervation

It has been found that the superior labial artery enters the orbicularis oris at approximately 1 cm above the oral commissure. It runs along the upper lip, anastomosing with the artery of the opposite side (3). Along the upper lip, the superior labial artery always runs a course within 10 mm of the inferior border of upper lip with a mean of 5.3 mm on the midline (4). The superior labial artery lies either within the orbicularis oris, or between the mucosa and the muscle. The mucomuscular upper lip flap used in this technique is designed in such a manner that the superior labial artery lies within the flap.

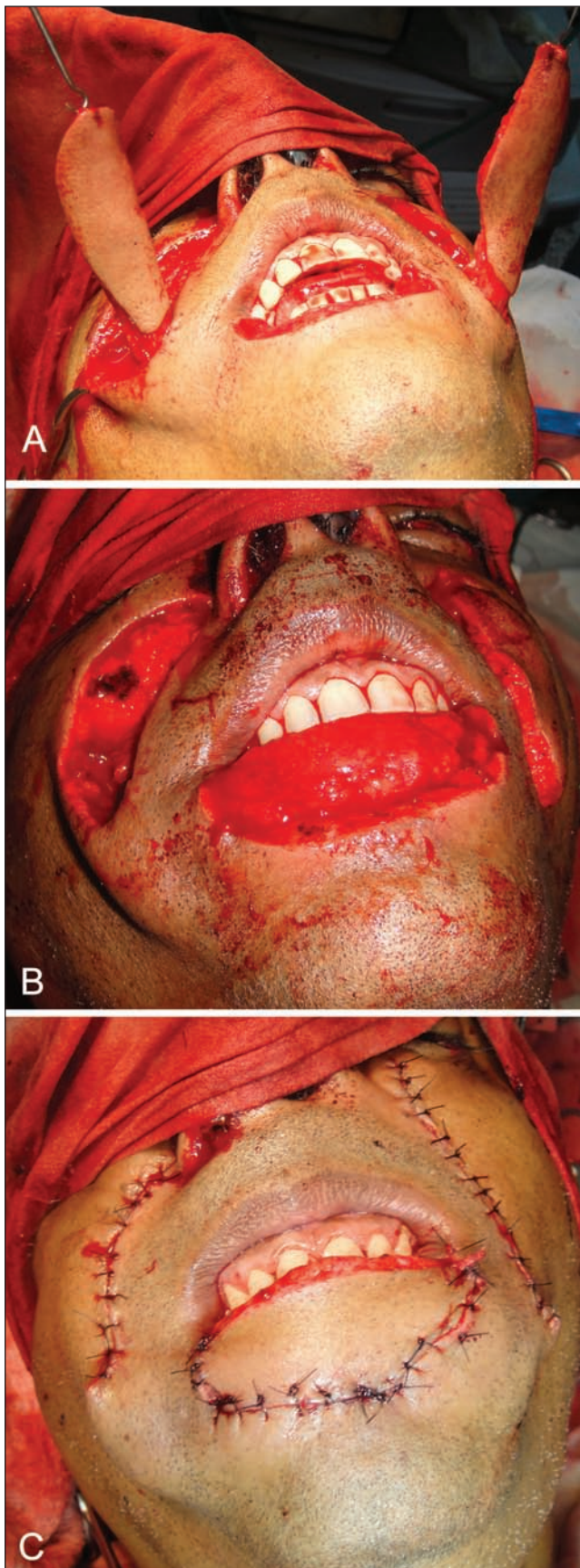
Sensory innervation of upper lip is derived from superior labial branches of the infraorbital nerve; these are joined by the buccal branches of facial nerve to form the infraorbital plexus. The nerve fibres from this plexus enter the upper lip near the angle of mouth. The design of the mucomuscular flap used in the present case enables preservation of its nerve supply.

## DISCUSSION

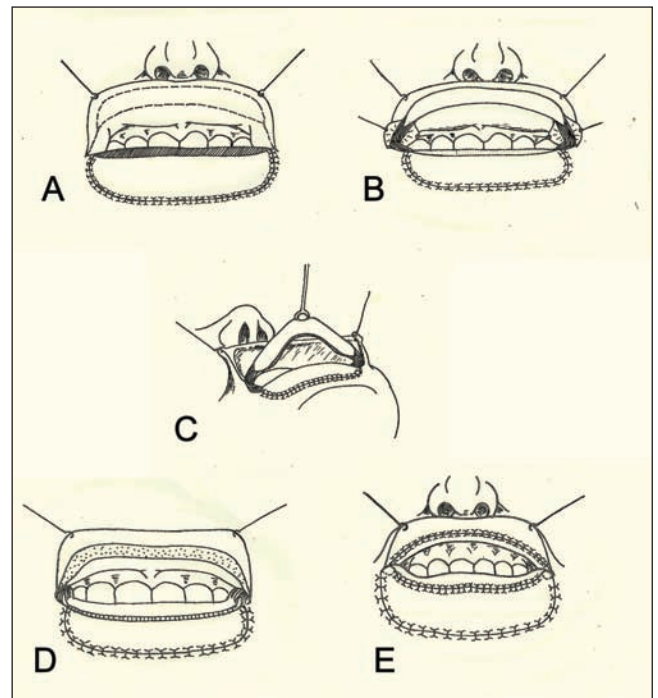
Many surgical techniques for reconstruction of the lower lip have been reported. Only a handful of these are applicable for extensive defects involving almost the entirety of the lower lip, each of them having its own merits and demerits. Most of these techniques restore lip continuity, but compromise mouth opening (cause microstomia) or sphincter function (poor continence), or cause significant perioral scarring and poor aesthetic outcome (5).

The local flaps that are used for extensive lower lip defects (more than two-thirds) are mainly the Gillies fan flap, Karapandzic flap, McGregor and Nakajima flap, and the Webster-Bernard flap (6-10). Nasolabial flaps and their modifications have also been used for this purpose (11-13). The Gillies fan flap brings more tissue into the lip area but the commissure is distorted and the lower lip is shortened (14). The Karapandzic flap can achieve a functional lip with preserved

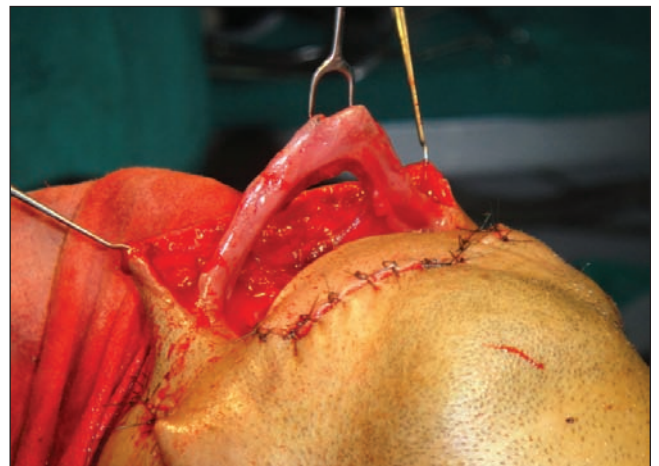




**Figure 3)** A Bilateral inferiorly based nasolabial flaps are raised. B One nasolabial flap forming the inner lining of the reconstructed lip. C Second nasolabial flap placed on the first and donor sites closed primarily



**Figure 4)** Schematic diagram of the operative steps. A Two parallel incisions are made on the inner aspect of the upper lip. B Mucosal flaps are raised exposing the orbicularis oris. C The bucket handle mucomuscular flap from the upper lip is raised. D The muscular pedicles are teased down and twisted 180° to set on the upper raw margins of the sandwiched nasolabial flaps. E The mucomuscular flap is sutured with the free margins of the nasolabial flaps, and the upper lip defect is closed



**Figure 5)** Intraoperative photograph. Bucket handle mucomuscular flap is raised

sensation and competence, but reconstruction of large defects inevitably results in microstomia, necessitating secondary commissuuroplasty. The McGregor and Nakajima flaps pivot around the commissure, thus maintaining intercommissure distance, but new vermilion is required and muscle fibre direction is altered (15). Ther Webster-Bernard procedure using cheek advancement flaps can produce good lip reconstruction but involves a large amount of perioral tissue loss, resulting in a tight lower lip and significant perioral scarring with contour deformity (16). The Fujimori nasolabial 'gate flaps' achieve lip reconstruction in a single stage with acceptable functional and cosmetic results, but retouch operations are often necessary (15). Distant free flaps (eg, the composite radial forearm-palmaris longus tendon free flap) are suitable for reconstruction of total lower lip and chin defects





Figure 6) Follow-up photograph one-year postoperatively



Figure 7) Photograph at one year showing adequate mouth opening (A) and preserved sphincter competence on blowing of mouth (B)

due to more soft tissue availability; however, the aesthetic outcomes are less satisfactory because the flaps lack the harmony of the face. Furthermore, it is difficult to create a functional oral sphincter, and a static or dynamic sling procedure is required for oral competence. The operative time is longer and there is risk of donor site morbidity (16).

The technique described in the present article is unique with respect to the alignment of the two nasolabial flaps in relation to one another. While the previously described techniques tend to abut the end of one nasolabial flap against the other either in a straight line (17) or a staggered line closure (13), or place one flap on top of the other (12,18), we have apposed two comparatively wider nasolabial island flaps together in a sandwich-like manner, providing both the inner and outer lining of lower lip as well as achieving good lower lip vertical height and thickness.

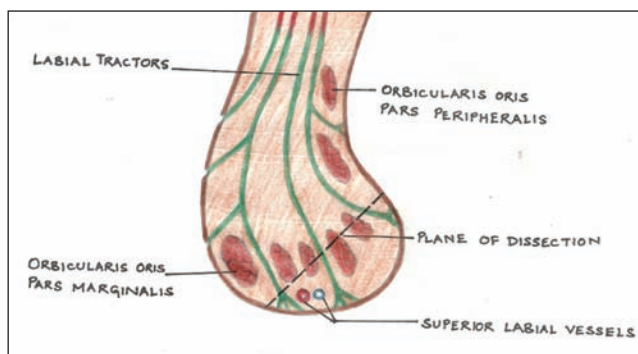


Figure 8) Full-thickness section (schematic) of upper lip at right angle to the red lip margin showing anatomy of orbicularis oris

The mucomuscular upper lip flap used for vermillion reconstruction in our technique is based on a thorough understanding of anatomy of the lip and, to our knowledge, has not been described previously. The methods commonly used for vermillion reconstruction, namely mucosal advancement and tongue flap, have their drawbacks. Intraoral mucosal advancement is not adequate for extensive vermillion defects. Reconstruction using tongue flap can provide vermillion volume but it has many disadvantages. It is a two-stage procedure, uncomfortable for the patient, lip continence and colour match may be suboptimal and, because tongue mucosa is never a true substitute for lip mucosa, scaling and drying are frequent. Our technique of vermillion reconstruction using an upper lip mucomuscular flap is a one-stage procedure with minimal morbidity compared with that associated with tongue flap; it provides good vermillion volume, perfect colour and texture match, preserves the vascular pedicle and innervation, and maintains the orientation of orbicularis oris, thus providing a competent oral sphincter.

Overall, the procedure described herein is suitable for reconstruction of extensive defects involving the entire lower lip. The advantages are as follows: it is a one-stage procedure; the reconstructed lip is sensate; speech is retained; competence of oral sphincter is maintained; allows adequate mouth opening; maintenance of lower lip vertical height, with no show of teeth; excellent reconstruction of vermillion; and aesthetically satisfying results. There is no obvious disadvantage on follow-up.

## CONCLUSION

Our technique achieves the main goals of successful lower lip reconstruction, which is the delicate balance between adequate mouth opening and competent mouth closure and, ultimately, acceptable aesthetic appearance. Our technique definitely appears to be advantageous in terms of decreased operative morbidity, minimal scarring, excellent vermillion quality and preserved function of the reconstructed lower lip.

**DISCLOSURES:** The authors have no financial disclosures or conflicts of interest to declare.

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