



Solving the Dilemma of Reconstructing Full Thickness Lower Lip Defects: Our Experience with the Sandwiched Nasolabial Flaps

Pranav Mohan Singhal¹ · Pinakin Patel¹ · Kamal Kishor Lakhera¹ ·
Agil Babu¹ · Aishwarya Chatterjee¹ · Suresh Singh¹ ·
Bhoopendra Singh Gora¹ · Naina Kumar Agarwal¹

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Abstract

Introduction The reconstruction of lip defects while maintaining its functional and esthetic properties serves a daunting challenge to the surgeon. Various surgeons have described variety of techniques, ranging from local composite flaps to free flaps. But not one single procedure has fulfilled all requirements. We describe a novel method of using bilaterally harvested subcutaneous naso-labial (NL) flaps sandwiched onto each other with a bucket handle mucosal transfer from upper lip to reconstruct full thickness lower lip and vermilion defects in 10 patients.

Materials and Methods A retrospective review of the data of 10 patients of carcinoma of the lower lip reconstructed with this technique between April 2019 and May 2022 was done. Patient- and disease-related factors along with flap-related complications were analyzed.

Results The bilateral NL flaps were used for construction of lower lip defects in 10 male patients. Mean age of the study population was 49.7 years (41–60 years). Major or minor complications were seen in 5 patients (50%). Complete flap loss was seen in one patient; three patients suffered from partial necrosis of the distal end of the outer flap. Two patients developed oral incontinence and two patients were referred to a speech therapist for partially unintelligible speech.

Conclusion Ease of harvest, short learning curve, similar skin color as of the lost skin, a versatile blood supply with minimal morbidity and satisfactory outcomes makes the bilateral subcutaneous NL flaps sandwiched onto each other a potentially acceptable method of reconstructing full thickness lower lip defects.

Keywords Nasolabial flap · Carcinoma of the Lip · SCC · Reconstruction · Head-and-neck surgery

✉ Pranav Mohan Singhal
06.pranav@gmail.com

Pinakin Patel
drpinakinp@gmail.com

Kamal Kishor Lakhera
drkk.bhu@gmail.com

Agil Babu
agilbabup143@gmail.com

Aishwarya Chatterjee
smiledoctor32@gmail.com

Suresh Singh
drsureshsingh@gmail.com

Bhoopendra Singh Gora
Bhoopendrambbs17@gmail.com

Naina Kumar Agarwal
nainakumar2017@gmail.com

¹ SMS Medical College, Jaipur, Rajasthan, India

Introduction

The growing volumes of Indians affected by the cancers of the lip and oral cavity does not come as a surprise considering the increasing number of Indian men and women addicted to tobacco consumption in various forms. These cancers constitute the most common cancers affecting men and the fourth most common cancers affecting women in India [1, 2].

Reconstruction of oral cavity defects after excision of cancers of the lip and commissure is an extremely arduous task [3, 4]. Lips form an integral part of a system which is imperative to maintain the oral competence, oral stoma function, speech and basic facial cosmesis and symmetry. Local flaps like the ones described by Estlanders, Gille's

and Karapandzic have been popularized by surgeons from all over the world [5–7]. For patients needing reconstruction of larger defects, these flaps lead to suboptimal functional and cosmetic outcomes like microstomia, insensate lips, oral incompetence and problems with oral hygiene [8, 9]. Free flaps are an appealing option for reconstruction of larger defects, but poor functional and esthetic results and resource constrained settings like non availability of a microvascular surgeon and high procedural costs have led to free flaps not being a commonly used procedure for such defects [10, 11].

Described by Sushruta in 600 BC, the nasolabial flap has been used by various authors in different ways to reconstruct the oral cavity defects [12]. The pedicled nasolabial flap can be inferiorly or superiorly based or if used with a wide base can be even used as a random pattern flap [13].

Gupta et al. in 2013 described a novel way of sandwiching the bilaterally raised NL flaps onto each other to reconstruct full thickness defects of the lower lip. They reported extremely successful patient- and flap-related outcomes in their study [14].

In this present study, we did a retrospective review of our experience of using the subcutaneously raised bilateral nasolabial flaps along with a bucket handle mucosal transfer from the upper lip to reconstruct the lower lip and vermilion defects post-excision for cancers of the lower lip.

Materials and Methods

Retrospective analysis of the data of 10 male patients who underwent reconstruction of full thickness defects created after resection for cancers of the lower lip (Fig. 1) was done.

In all of these cases, post-resection more than 60–100% of the full thickness original lip length was lost. All patients were reconstructed using bilateral sandwiched NL flaps with vermilion constructed using bucket handle mucosal transfer from the upper lip. After obtaining an approval from the institutional ethics committee, the review was conducted in the Department of Surgical Oncology between January 2020 and January 2023.

Inclusion Criteria

Patients included in the study had OSCC of the lower lip involving more than 60% of the lower lip length and patients with oral commissure disease without extension of the disease to the nasolabial fold or the chin.

Exclusion Criteria

Patients with mandibular/paramandibular space invasion requiring a segmental/marginal mandibulectomy, those having a disease at sub sites of the oral cavity other than lip/oral commissure, patients who have received previous



Fig. 1 Cancers of the lower lip included in our study. Post-resection of such growths more than 60% of the lip length was lost

anti-cancer therapy like radiotherapy in the concerned field or had undergone previous surgery including ipsilateral neck dissection and patients with a metastatic disease were excluded from the study.

All patients were staged using the AJCC/TNM 2018 classification for head-and-neck tumors using clinical and radiological means including CECT and CE-MRI and underwent a wide local excision along with neck dissection (levels 1–4). Although attempts were made to preserve the facial artery along with its venae comitantes in all cases, the vessel was ligated in three cases during neck dissection due to technical- and disease-related complications like a large node densely adhered to the vessel. The facial vein was sacrificed in all cases, and a wide base was kept to allow for drainage through the submucosal venous plexus. Patients were reconstructed in the same sitting immediately after resection of the primary.

Patients were followed up according to institutional protocols. Post-operative assessments were made of the status of the flap and complications of the procedure like partial and complete flap necrosis, oro-cutaneous fistula and surgical site infections (SSI) and functional results like speech, swallowing and mouth opening.

Patient-reported cosmetic satisfaction after the procedure was also analyzed.

Patients with a complete necrosis of the flap needed a thorough debridement of the entire flap and an alternative reconstructive procedure, whereas patients with partial flap necrosis like those with the necrosis of the distal tip of the flap could be salvaged by minimal debridement and resuturing.

Surgical Technique

Procedure starts with a neck dissection from level 1–4 with attempted preservation of the facial artery along with its venae comitantes. Facial vein was sacrificed in all cases, and the venous drainage was dependent on the submucous plexus draining the flap and the venae comitantes of the facial artery. Wide local excision of the OSCC of the lip/oral commissure is then performed ensuring adequate margins.

After resection, size of the defect is measured and nasolabial flaps are marked on both sides (Fig. 2). A subcutaneous nasolabial flap with a wide base of about 3–3.5 cm is raised superficial to the facial musculatures and the facial vessels. The distal tip of the flap is kept at a minimum distance of 1 cm from the lower eyelid and is tapered to ensure a primary closure of the donor wound and avoid unnecessary stretch and distortion of the lower eyelid. Flaps from both the sides are transferred into the surgical defect after creating a subcutaneous tunnel underneath the bridge of skin adjacent to the base of the flap. The portion of the flap underlying the bridge of skin and over the orbicularis oris muscle is de-epithelialized. Flaps from both sides are delivered into the surgical defect through this route. Both the flaps are sandwiched onto each other with one flap creating the inner mucosal lining and the other providing the outer cutaneous cover of the defect. The donor site is closed.

The vermilion reconstruction is done using a bucket handle mucosal tissue transfer from the upper lip. Two incisions are used. First incision is made on the inner aspect of the

upper lip just above the junction of the dry and wet vermilion. The second horizontal incision is made about 1.5–2 cm above the first incision. The incisions are slowly tapered toward each other on both sides as they are extended laterally. The incisions finally meet each other at the margins of the excised lower lip. This ensures a wide base of the mucosal flap which is lifted. This mucosal flap was placed over the uncovered raw area between the two nasolabial flaps and was sutured to the edges of both the flaps to create the new vermilion. The donor mucosal site of the upper lip was closed primarily with or without the help of mucosal advancement flaps.

Figure 3 shows the immediate post-operative picture after the reconstruction.

Results

The above-mentioned technique was used to reconstruct the lower lip and the vermilion in 10 patients with OSCC of the lower lip. In all of these patients, more than 60% of the lip length was lost post-resection of the growth on the lower lip.

The study consisted of 10 male patients and the mean age of study population was 49.7 years. Eight patients (80%) were staged as T2, whereas 2 patients (20%) were staged as T3 according to the AJCC/TNM 2018 classification. Lower lip was the only site involved in eight patients, whereas disease extended onto the commissure in two other cases. All patients underwent a wide local excision of the primary tumor taking a minimum of 1 cm margin along with a neck dissection of lymph nodes from level 1–4 as per institutional protocols. Eight patients (80%) had a node negative neck whereas 2 patients (20%) had a N1 disease. Four patients (two with positive nodes and two with T3N0) received adjuvant radiotherapy. No patient reported any disease recurrence at 1 year of follow-up after completion of treatment. As no patients were reported to have a positive surgical margin or extra nodal extension, adjuvant chemotherapy was not administered to any patient.



Fig. 2 The defect of the lower lip created post-resection with the marked bilateral nasolabial flaps. To be used for reconstruction



Fig. 3 The immediate post-operative picture after the reconstruction

Flap- and procedure-related complications were seen in 5 patients (50%) in our study. The most common complication recorded was that of distal partial flap loss of the outer flap. This complication was seen in 3 patients (30%). All of these patients were managed conservatively and did not require any secondary reconstruction.

Flap- and Procedure-related Complications

One patient (10%) suffered from a complete failure of the reconstruction, with complete necrosis of the inner and outer flaps. This patient underwent complete debridement of the necrosed flaps and was eventually reconstructed with a radial artery forearm free flap on post-operative day (POD) 5 of the initial procedure.

None of our patients reported any instances of flap congestion even after the facial vein was sacrificed in all cases. Although most of our patients did not report a loss of bulk after radiotherapy, one patient suffered from flap shrinkage post-radiotherapy and complained of relative loss of bulk. No further corrective surgery was needed, and patient was managed conservatively. No patient developed an oro-cutaneous fistula (OCF) or a surgical site infection.

All of our patients were started oral feeds on POD-2. We first allowed patients to drink clear water and coconut water per orally till day 7. On POD-8, the nasogastric tube was removed and patients were allowed orally. All patients tolerated their oral feeds well.

Functional and Cosmetic Outcomes

Two patients (20%) complained of drooling of saliva from the oral commissure. One patient was treated using a commissuroplasty procedure about 2 months after the initial procedure, and the other was treated a month after completion of adjuvant radiation therapy. Although none of our patients complained of difficulty in speaking or swallowing, 2 patients (20%) were assessed to have partially intelligible speech postoperatively and were referred to speech therapists.

None of the patients postoperatively complained of decreased mouth opening.

Three of our patients (30%) were not satisfied with the post-operative cosmetic outcome of the procedure, whereas 70% patients were satisfied with their appearance (Fig. 4). Of the three patients who underwent adjuvant radiotherapy, none of the patients complained of any difficulty in speaking, swallowing or overall cosmesis.

Table 1 describes the patient-, disease-related and procedure-related details of the study population.



Fig. 4 Appearance of the patient 2-week post-completion of the procedure

Discussion

Complex reconstructions of the lip, especially for large sized full thickness defects, have been a challenge for the surgeons. This has led to a plethora of options available for reconstruction of oral cavity defects affecting the lips and the commissure. No one technique has gained wide spread acceptability or has demonstrated enough versatility in all aspects to help restore the function of the lips and achieve acceptable facial cosmesis and symmetry [5, 15].

Rotation-based techniques using the remaining lip tissue like Karapandzic and Estlanders can be used for reconstructing lip defects and have the advantage of providing a sensate lip. But if used to reconstruct larger defects, these techniques inevitably result in microstomia, which is further exaggerated by post-surgery and post-radiotherapy perioral scarring. This leads to problems with oral intake of food, denture placements and removal and maintenance of basic oral hygiene. These complications force the surgeon to perform a secondary commissuroplasty effectively denervating the orbicularis oris muscle [3, 9].

A variety of other methods has been described like the Webster Bernard flap which utilizes the technique of cheek

Table 1 Demographic, disease and complication profiles of our patients

S. no.	Age/sex	Site	TNM	Complications	Management
1	45/M	Lower Lip	T2N0M0	None	–
2	47/M	Lower Lip	T2N0M0	None	–
3	41/M	Lower Lip	T2N1M0	None	–
4	54/M	Lower Lip + Commissure	T2N0M0	Complete flap necrosis	Debridement, FRAFF
5	43/M	Lower Lip	T2N1M0	None	–
6	55/M	Lower Lip	T3N0M0	Distal tip necrosis, oral incontinence	Debridement/Re-suturing, Commissuroplasty
7	60/M	Lower Lip	T3N0M0	None	–
8	58/M	Lower Lip	T2N0M0	Distal tip necrosis, partially unintelligible speech	Debridement/Re-suturing, Speech Therapy
9	46/M	Lower Lip	T2N0M0	Distal tip necrosis	Debridement/Re-suturing
10	48/M	Lower Lip + Commissure	T2N0M0	Oral incontinence, partially unintelligible speech	Commissuroplasty Speech Therapy

advancement but is complicated by the excessive loss of tissue around the submental and nasolabial regions. The flap is further complicated by perioral scarring. As a result, the patient is left with a tight lower lip and a disfigured contour. This limits the usage of the flap to patients having significant cheek skin laxity and redundant skin like the elderly [3, 16]. Similarly, the Gilles fan flap is an excellent option for lower lip reconstruction as it brings in more tissue which is available for reconstruction. But, the excessive tissue again leads to commissural distortion and a shorter lower lip [14].

First described by Von Bruns for lower and midfacial reconstruction [17], the subcutaneous NL flaps provide a robust, easily accessible, easy to harvest and a dependent option for reconstructing large lower lip defects. In a short learning curve, shorter operating times, and minimum donor site morbidity, an ability to provide the patient with a decent post-operative oral orifice makes the NL flap an attractive option for reconstructing such defects [12, 18]. Added advantage of using this flap is that in most patients, the NL flap provides hairless skin for reconstructing the lips and being a good match with the skin color and skin textures of the perioral areas makes it a cosmetically ideal flap for reconstructing the lip and perioral defects [19].

The NL flap has got a diverse blood supply. Cormack et al. in while studying the arterial anatomy of flaps in 1994 reported that the NL flap gets its supply mainly through the facial artery and its branches. While alar branches from the superior labial artery support the flap inferiorly, superiorly the flap gets its supply from the terminal branch of the facial artery called as the angular vessel and some nourishment is also provided by branches of the infraorbital artery, which is itself a branch of the maxillary artery and the transverse facial artery which is a branch of the superficial temporal artery. This large network of vessels supplying the flap allow us to harvest the flap based on vessels superiorly or inferiorly [13].

Adding to the versatile nature of the blood supply of the flap, various authors have documented a wide-based random pattern subcutaneous NL flap which gets its supply from the subdermal plexus of vessels. This random pattern flap can be an acceptable alternative to harvesting the pedicled flap along based on the facial artery and the underlying facial musculature. Various authors have suggested that if the flap length: width ratio is kept at or less than 3:1, the vascularity is maintained and even the most distal tip of the harvested flap has extremely less chances of undergoing a partial/complete necrosis [3, 20].

A few authors have attempted to reconstruct full thickness lower lip defects with U/L or B/L NL flaps. Series reported by Rudkin et al. [3], Tsai et al. [8] and Pradhan et al. [21] consisted 5–8 patients with full thickness lower lip defects reconstructed with a NL flap. Although none of the authors reported any instance of a complete flap loss, Pradhan et al. reported just one case of partial flap loss which was removed and the flap was resutured [21]. Tsai et al. reported one case of OCF formation which was managed conservatively, and one patient reconstructed for an oral commissure defect who developed oral incompetence which did not affect their oral feeds or feeding habits [8].

In the present series of patients, we noted that 1 patient (10%) suffered a complete failure of reconstructive effort with both, the inner and outer flaps becoming completely necrosed by the next morning of surgery. The only explanation that we could gather was that patient was on treatment for diabetes mellitus for the last 15 years which was controlled but may have affected the quality of the vasculature supplying the flap. Apart from this comorbidity, on detailed analysis, we could not find any deviations in the technique, disease factors or pre-operative or post-operative management which might have influenced the outcome.

Three of our patients suffered a partial loss of the distal tip of the outer flap which was managed conservatively.

None of our patients reported any instances of OCF formation. Two patients suffered from oral incompetence severe enough meriting secondary commissuroplasties.

Although we noticed only two patients as having partially intelligible speech who according to our subjective opinion needed therapy and were referred to a speech therapist, rest of our patients were satisfied with the quality of their speech postoperatively. None of the other studies reported any instance of difficulties with articulation [3, 8, 14, 21]. Three (30%) of our patients were not satisfied with the esthetic and cosmetic outcomes post-surgery. Other authors reported almost complete patient and surgeon satisfaction with post-operative esthetics.

One of the most common complications seen with the NL flaps is the ectropion of the lower eyelid on the side from where the flap is harvested [22]. Two of our patients reported with a slight pull on the lower eye lid which was managed conservatively with methylcellulose eye drops and local care. The patients eventually settled down after 1–2 weeks. No corrective surgery was needed.

Strengths

The present study describes a novel method of reconstructing large full thickness defects of the lower lip with the sandwiched NL flaps. The NL flaps are versatile, easy to harvest reconstructive options with a short learning curve. With excellent functional and cosmetic outcomes as reported in the study, this technique offers an attractive alternative as a reconstructive option for large full thickness lower lip defects.

Limitations

Large full thickness defects of the lower lips post-radical resections for cancer are not a frequently encountered entity in our community setting. Therefore, as the present study describes a novel way of reconstructing such defects, it suffers from a small sample size where the data were collected retrospectively. Post-operative objective functional analysis and a detailed analysis of the post-operative recovery of the patients were therefore not possible. Small sample size and the retrospective nature of the study further compromised our ability to study the effect of comorbidities and neo-adjuvant therapy on the procedure.

Conclusion

The bilaterally harvested NL flaps along with the mucosal transfer from the upper lip to reconstruct the vermilion are a versatile and successful technique to reconstruct large full thickness defects of the lower lip and the oral commissure.

This technique helps us achieve acceptable functional and cosmetic outcomes while limiting major flap-related complications.

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Declarations

Conflict of interest The authors have no conflicts of interests to declare.

Ethical Approval The present study was conducted after obtaining clearance from the institutional ethics committee. No source of external/internal funding was utilized to conduct this study.

Informed consent An informed consent was obtained from every participant before enrolling them in the study.

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