

# The Versatility of Nasolabial Flaps in Maxillofacial Surgery

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## Abstract

**Introduction** The nasolabial flap can be used for reconstruction of the orofacial region. The procedure is of a short duration and treats orofacial soft tissue defects of small to moderate size, especially when microsurgical free flaps are less feasible due to lack of infrastructure, expertise or financial constraints.

**Aims and Objectives** To study the effectiveness of the nasolabial flaps in reconstruction of orofacial defects of various origins.

**Materials and Methods** In this prospective study, 10 patients (18 nasolabial flaps) were selected randomly regardless of age, sex and need for reconstruction—whether it being requirement of tissue coverage following traumatic loss of soft tissue, soft tissue coverage after resection of a benign or malignant tumor, or resection of soft tissue defects after excision of submucous fibrosis bands. Patients were treated under general anesthesia following routine investigations, using either inferiorly or superiorly based, unilateral or bilateral nasolabial flaps for local extraoral and intraoral reconstruction. Patients were evaluated for postoperative complications, flap uptake, donor site morbidity and postoperative extraoral scarring.

**Results** In all cases, postoperative complications were relatively minor except in one flap where total flap loss was encountered. The average time taken for preparation of recipient site, flap elevation and closure was 72 min. The

nasolabial flap proved itself to be extremely vascular and thus safe and suitable with satisfactory cosmetic outcomes.

**Conclusion** The nasolabial flap proves to be a versatile flap with a proven blood supply from the facial, transverse facial and infraorbital vessels. It establishes itself as a simple procedure to execute to reconstruct the various defects of the anterior orofacial region. It is considered to be a safe flap with a low complication rate, and most importantly it offers a cosmetically pleasing and functionally satisfactory solution.

**Keywords** Nasolabial flap · Oral and maxillofacial reconstruction · Complications of nasolabial flaps

## Introduction

Reconstruction of defects in the oral and maxillofacial region has entered an era of sophistication where defects of any size and complexity can be corrected with the use of musculocutaneous flaps and microsurgical free flaps. However, at times these techniques appear inappropriate because either the defect is too small, or the subject's age, medical condition or financial status does not permit a lengthy anesthetic or complex surgical procedure. The nasolabial flap is a well-known method for reconstruction [1] of orofacial defects. It was originally described by Dupuytren and popularized by Diffenbach (1833) [2]. Thiersch used a superiorly based flap in 1868 that tunneled through the cheek for closure of a palatal fistula [1, 2, 4], and Esser devised an inferiorly based flap [1, 2, 4]. The first one-stage, de-epithelialized nasolabial flap was described by Wallace (1966) for the closure of a palatal defect [5]. In order to avoid the bulk of the de-epithelialized pedicle in the tunnel and to provide more mobility, a one-step

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arterialized island flap was designed (Rose 1981) [5]. The nasolabial flap has been utilized extensively as a subcutaneous pedicled “random flap” [6].

## Aim

To study the effectiveness of the nasolabial flaps in reconstruction of oral and maxillofacial defects.

## Objectives

1. To evaluate the flap design, technique and complications.
2. To restore the pre-existing anatomical form, function and esthetics.
3. To study the donor site morbidity.

## Materials and Methods

### Subject Selection Criteria

1. The study includes subjects:
2. Subjects suffering from oral submucous fibrosis with minimal mouth opening.
3. Subjects having intraoral benign/malignant lesions requiring coverage after surgical resection.
4. Subjects requiring coverage following soft tissue loss.

The study excludes subjects:

1. Unfit to undergo surgery under GA.
2. With inadequate/loss of nasolabial fold.
3. Burns patients.
4. Immunocompromised subjects.

Selection of subjects was done based on the size of the surgical defect—small to moderate size ( $3 \times 5$  cm) in the orofacial region. A total of 10 subjects were taken up for the study. Incisional biopsy was done, and clinical diagnosis was confirmed with histopathological reports.

## Surgical Procedure

### Inferiorly Based Nasolabial Flap

After the surgical excision, the design of the flap to be raised is first marked on the skin of the nasolabial region with Bonney's blue solution. Lignocaine with adrenaline (1:80,000) is injected to achieve hemostasis and tissue ballooning for better and easy dissection of tissue (Fig. 1).



**Fig. 1** Incision and elevation of an inferiorly based nasolabial flap

Appropriate measures are taken with a gauge to ensure that the flap is of adequate length and will rotate without kinking and minimum standing cutaneous deformity (dog ear). The lateral dimensions of the flap are outlined for maximum cosmetic results. The width of the flap at the base is usually 1.5–2.5 cm depending on the nasolabial fold and the cheek adjacent to it, and maximum tissue is available just above the angle of the mouth. The length was kept at 5–8 cm. The medial and lateral limbs of the incision tapered together superiorly approximately 2–2.5 cm anteroinferiorly to the medial canthus. The elliptical design of the flap avoided puckering or standing cutaneous deformity formation in the closure of the donor nasolabial area. The flap was raised from superior to inferior in a supramuscular plane using dissecting scissors. When used intraorally, a transbuccal tunnel is created with dissecting scissors at the level of the lateral commissure of the mouth 2 cm away from the corner of the mouth. The caudal base of the flap was de-epithelized in a rectangular fashion, area determined by the required area of the transbuccal tunnel. This epidermal removal is the key for a one-stage operation. There is no need for a pedicle detachment later. The transbuccal tunnel was made large enough (1–1.5 cm). The flap was then transferred to oral cavity in a tension free manner and inserted into the defect with a series of simple interrupted sutures using 3-0 resorbable polyglactin (Fig. 2).

Generous undermining of the donor site was performed in the subcutaneous plane, and layered closure of the donor defect was then performed using vicryl 3-0 sutures for the deeper layer and Prolene 5-0 for final skin closure.

### Superiorly Based Nasolabial Flap

Following resection or creation of the surgical defect, the nasolabial flap is designed with its proximal base adjacent



**Fig. 2** Incision of inferiorly based nasolabial flap and tunneling it into the oral cavity

to the lateral aspect of the nose with its tip facing postero-inferiorly. Dissection is the same as the inferiorly based flap. The flap is raised beginning distally in the soft tissue plane approximately two-thirds in depth between the facial musculature and deep dermis. This ensures adequate vascularity without adding to the bulk of fatty tissue. The flap is then sutured to the defect using Prolene 4-0. The soft tissue of the cheek is then widely undermined and advanced toward the nose for closure in the nasolabial line.

Dressing was done with paraffin-impregnated tulle to promote moist healing. All subjects received intravenous antibiotics and analgesics for two days followed by oral medications for five days. Subjects were put on nasogastric tube feeding for duration of 7 days.

Extraoral sutures were removed by the end of 7th day. Subjects in whom the nasolabial flap was used for the treatment of oral submucous fibrosis, were started on mouth opening exercises (using Heister jaw opener) from the 2nd postoperative day (Fig. 3).

Subjects were advised to apply a topical Allantoin, Cepae and Heparin preparation (Contractubex gel)



**Fig. 3** Postoperative intraoral take-up of the nasolabial flap on the buccal mucosa used for reconstruction after fibrotomy in oral submucous fibrosis

beginning 2 weeks after the surgery, 3–4 times daily, for 3 months.

All the subjects were evaluated for the above-mentioned parameters preoperatively, 1st and 6th months postoperatively with statistical evaluation.

## Results

### Sex and Age Group

In our study, out of the group of 10 patients 6 were male patients and 4 were female patients. Age range we encountered in our study was between 21 and 60 years with most of the patients falling within 21–40 years age group.

### Location of the Defect

In our study, out of 10 subjects 7 subjects had defects in the bilateral buccal mucosa. One subject had a defect in the anterior floor of the mouth, 1 subject had a defect in the maxillary alveolar mucosa, and 1 subject had a defect of the upper lip.

### Flap Uptake and Viability

Out of the 10 subjects treated under this study, nine subjects with 17 flaps (94.4%) showed excellent uptake and viability of flap with complete closure of the defect in long-term follow-up. One unilateral flap (5.5%) had necrosis of the flap leading to complete flap loss.

### Esthetics

Scarring reduced from moderate to mild in 8 subjects, whereas it reduced from severe to moderate in 2 subjects.

## Duration

The mean duration of surgery for 18 flaps was 72 min.

## Postoperative complications

Ingrown hair in 1 flap (5.5%) and bulky appearance in 4 flaps (22%) were noted (Fig. 4, Table 1).

## Discussion

The past few decades have witnessed a vast change in the usage of various reconstructive surgical techniques for oral and maxillofacial reconstruction, from use of distant flaps to present-day microsurgical free flaps. The rationale for this study is based on the desire to bring out a solution that is simple, less technique sensitive and gives good esthetic results with minimum number of complications, thereby satisfying both the subject and the surgeon (Fig. 5).

The multiple branches passing from the facial, transverse facial and angular, infraorbital, infratrochlear artery and the free anastomosis between the terminal branches overlying the nasolabial skin affords the versatility in flap design [2, 3, 8]. Defects of the palate, upper alveolus, and replacement of the cheek, side or dorsum of nose, ala, columella, lower eyelid and upper lip are closed by superiorly oriented flap as this avoids twisting of the pedicle [5]. Similarly, the reverse is true for lesions of the floor of the mouth [4], lower alveolus [4], lower lip and buccal mucosa [5, 6]. There is no color mismatch with other facial tissue. The flap thickness is determined by the need of the defect as well as thickness of the donor tissues. The flaps can be as thin as deep to the subdermal plexus or as thick as

superficial fascial musculature with their nerve supply intact. The flap can be transposed intraorally by a transbuccal canal near the commissure of the mouth with no tension [7]. When used intraorally, the flaps are replaced by mucosa in approximately 2 years. The postoperative extraoral scars are hidden in the nasolabial folds, more acceptable in older subjects [6, 7]. Therefore, the nasolabial flap either inferiorly or superiorly based can be used unilaterally or bilaterally for local extra- and intraoral reconstruction purposes [3]. Ioannides and Fossion [6] described the single-stage reconstruction as opposed to the traditional two-staged procedure for moderately sized defects. Kelman Cohen [9] showed the use of the flap for reconstruction of small defects of anterior floor of the mouth. The use of the flap for reconstruction after fibrotomy of oral submucous fibrosis is well known [10] (Fig. 6).

All 18 nasolabial flaps in 10 subjects of our series underwent a single-stage repair with a very satisfactory outcome. Nine out of ten subjects underwent inferiorly based transposition flap for reconstruction of different orofacial regions, de-epithelization and transbuccal tunneling were done, and the flap was transposed as an island flap. The superiorly based nasolabial flap was used in one subject who had soft tissue defect of upper lip. The versatility of the flap design is well demonstrated by its use in different anatomical locations (Fig. 7).

In our study, there was total failure in one flap where the nasolabial flap was placed in anterior floor of the mouth. The cause of the flap failure was attributed to excessive tongue movement, poor oral hygiene leading to infection and subsequent necrosis leading to its removal in 3 weeks.

## Conclusion

The nasolabial flap proved itself to be extremely vascular and thus a safe flap to use. This can be attributed to extensive vascular anastomosis involving the facial, transverse facial and infraorbital arteries. Even considering the few complications, the one-stage reconstruction can be safely completed by de-epithelization and transbuccal tunneling (when indicated for intraoral use). It is a safe minor procedure done under general anesthesia with which good results can be achieved in small to moderately sized defects in oral and maxillofacial region. Proper attention to flap design, operative technique, and postoperative management are useful in reducing the incidence of complications. In conclusion, the nasolabial flap is the choice for immediate reconstruction of anterior oral and maxillofacial defects following resection.



**Fig. 4** Postoperative bulky appearance of flap on the right side of the cheek in an operated case of OSMF

**Table 1** Postoperative complications and their incidence in the study

| Case no. | No. of flaps | I/O hair growth | Infection | Orocutaneous fistula | Obstructive sialadenopathy | Wound dehiscence | Flap necrosis | Hypertrophic scar (6 months) | Bulky appearance |
|----------|--------------|-----------------|-----------|----------------------|----------------------------|------------------|---------------|------------------------------|------------------|
| 1        | 2            | N               | N         | N                    | N                          | N                | N             | N                            | N                |
| 2        | 2            | N               | N         | N                    | N                          | N                | N             | N                            | N                |
| 3        | 1            | N               | Y         | N                    | N                          | N                | Y             | N                            | N                |
| 4        | 2            | N               | Y         | N                    | N                          | N                | N             | N                            | Y                |
| 5        | 2            | Y               | N         | N                    | N                          | N                | N             | N                            | N                |
| 6        | 2            | N               | N         | N                    | N                          | N                | N             | N                            | N                |
| 7        | 1            | N               | N         | N                    | N                          | N                | N             | Y                            | N                |
| 8        | 2            | N               | N         | N                    | N                          | N                | N             | N                            | Y                |
| 9        | 2            | N               | N         | N                    | N                          | N                | N             | N                            | N                |
| 10       | 2            | N               | N         | N                    | N                          | N                | N             | N                            | N                |

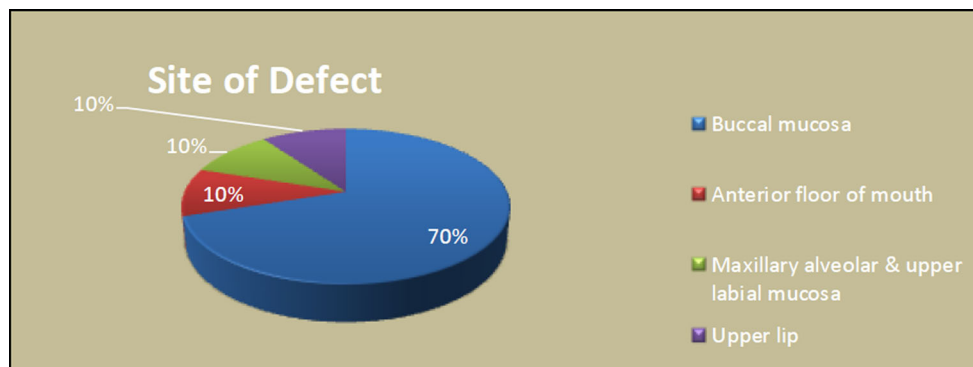
Y yes, N no

**Fig. 5** Traumatic loss of upper lip tissue reconstructed with superiorly based nasolabial flap with moderate scarring postoperatively

**Fig. 6** Postoperative inconspicuous scarring in elderly subject treated with bilateral nasolabial flap for the reconstruction after resection of squamous cell carcinoma of maxillary anterior alveolus



**Fig. 7** Graph showing the sites of defects in 10 subjects with 18 nasolabial flap reconstructions



### Compliance with ethical standards

**Conflict of interest** Authors declare that they have no conflict of interest.

**Ethical approval** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee.

**Informed consent** Individual informed consent was taken for every subject for inclusion in the study.

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