

# The Islanded Nasolabial Flap: A Versatile and Reliable Flap for Reconstruction in Cancers of the Oral Cavity

Amar Jain<sup>1</sup> Sandeep Ghosh<sup>1</sup> Deepak Bhojwani<sup>1</sup> Abhishek Sharma<sup>2</sup>

<sup>1</sup>Department of Surgical Oncology, Chirayu Medical College and Hospital, Bhopal, Madhya Pradesh, India

<sup>2</sup>Department of Surgery, Mahaveer Institute of Medical Sciences, Bhopal, Madhya Pradesh, India

**Address for correspondence** Sandeep Ghosh, MBBS, MS, FMAS, MCh, Department of Surgical Oncology, Chirayu Medical College and Hospital, Bhopal, Madhya Pradesh 462030, India (e-mail: sandyppq3@gmail.com).

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### Abstract



Sandeep Ghosh

On the Indian subcontinent, oral cancer represents a significant health burden. Local flaps offer a viable alternative to free flaps in specific reconstructive scenarios where free flaps may not be feasible. The islanded nasolabial flap, based on the facial artery, proves to be a robust and versatile option for single-stage reconstructions of oral cavity defects. In this study, we share our experience employing the islanded nasolabial flap at a high-volume cancer center in Central India for reconstructing buccal mucosa and tongue defects. This prospective observational study focused on approximately 76 patients diagnosed with squamous cell carcinoma of the oral cavity (specifically, the anterior 2/3rd of the tongue and buccal mucosa) at our cancer hospital between August 2021 and January 2023. Initially, 76 patients were included; however, four patients were subsequently excluded due to inadvertent facial vein injury during neck dissection caused by level IB node invasion. Consequently, 72 patients underwent islanded nasolabial flap reconstruction and were monitored for postoperative complications and functional outcomes. Our study's patients fell within the age range of 24 to 81 years, with the majority between 40 and 50 years old. Most of our patients had carcinoma affecting the anterior two-thirds of the tongue (61.11%), followed by carcinoma of the buccal mucosa (38.88%). Surgical site infection occurred in four patients (5.55%) at the donor site, and one patient (1.38%) experienced flap necrosis after tongue carcinoma surgery. However, the majority of our patients (93.05%) experienced no postoperative complications. Speech intelligibility was good for all patients (100%) with buccal mucosa cancer. A significant portion of patients (78.57%) could tolerate a normal diet, while 21.42% required a soft diet. Among patients with tongue carcinoma, 56.81% had good speech intelligibility, and 43.18% had acceptable speech intelligibility. Regarding swallowing capacity assessment, 65.90% of patients tolerated a normal diet, and 34.09% could manage a soft diet. None of our patients had poor speech intelligibility, and none depended on a liquid diet or tube feeding. This study underscores the versatility of the islanded nasolabial flap in oral cancer resection

### Keywords

- ▶ Tongue Cancer
- ▶ buccal mucosa cancer
- ▶ islanded nasolabial flap
- ▶ flap reconstruction
- ▶ oral carcinoma

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reconstruction. The islanded nasolabial flap proves to be a straightforward, effective, and reliable technique with a low incidence of complications and exceptional functional outcomes, establishing it as a valuable reconstructive option for small-to-medium-sized oral defects. This is particularly noteworthy for high-volume centers and regions with limited resource.

## Introduction

On the Indian subcontinent, oral cancer is a major health burden. Ablative defects caused by oral cancer resections present a reconstruction challenge. The primary goals of reconstruction are to preserve function and achieve adequate cosmetic results. It is essential to reconstruct defects, especially in tongue cancer, to provide the bulk required for speech articulation and swallowing. In the majority of centers, free flaps are the preferred reconstructive technique,<sup>1,2</sup> but their use is limited by high patient load, affordability issues, and increased operating and anesthesia time. Local flaps are a viable alternative to free flaps in specific reconstructive situations where free flaps cannot be used.

The islanded nasolabial flap is one that is completely pedicled on the facial vessels. It is a sturdy and versatile flap for single-stage oral cavity defect reconstructions. We present our experience using the islanded nasolabial flap from a high-volume cancer center in Central India to reconstruct defects in the buccal mucosa and tongue.

## Materials and Methods

### Study Design

This prospective observational study focused on approximately 76 patients with biopsy-proven squamous cell carcinoma of the oral cavity (tongue [anterior 2/3<sup>rd</sup>] and buccal mucosa) at our cancer hospital between August 2021 and January 2023. All procedures performed in this study were done with institutional ethical clearance and in compliance with the 2013 revision of the 1964 Declaration of Helsinki ethical standards.

### Inclusion Criteria

All patients with T1 or T2 buccal mucosa tumors without involvement of the upper gingivobuccal sulcus; involvement of the lower gingivobuccal sulcus with abutment of the mandible requiring marginal mandibulectomy; and T1, T2, and T3 anterior 2/3 tongue tumors, including those abutting the floor of the mouth were included.

### Exclusion Criteria

All patients with bulky tumors involving or eroding the mandible or involving skin (T4a tumors) and/or gross paramandibular disease for buccal cancers were excluded. Bulky carcinoma of the tongue with gross involvement of the floor of the mouth musculature or gross involvement of the posterior one-third of the tongue was excluded from the study for tongue cancer patients.

All patients underwent a single-staged islanded nasolabial flap for small-to-moderate sized defects following neck dissection with preservation of facial vessels and wide local tumor excision.

We initially included 76 patients; however, 4 patients were excluded as, during neck dissection, facial vein was inadvertently injured due to invasion by level IB nodes, and hence 72 patients underwent an islanded nasolabial flap and were followed up for postoperative complications and functional outcomes.

### Surgical Technique

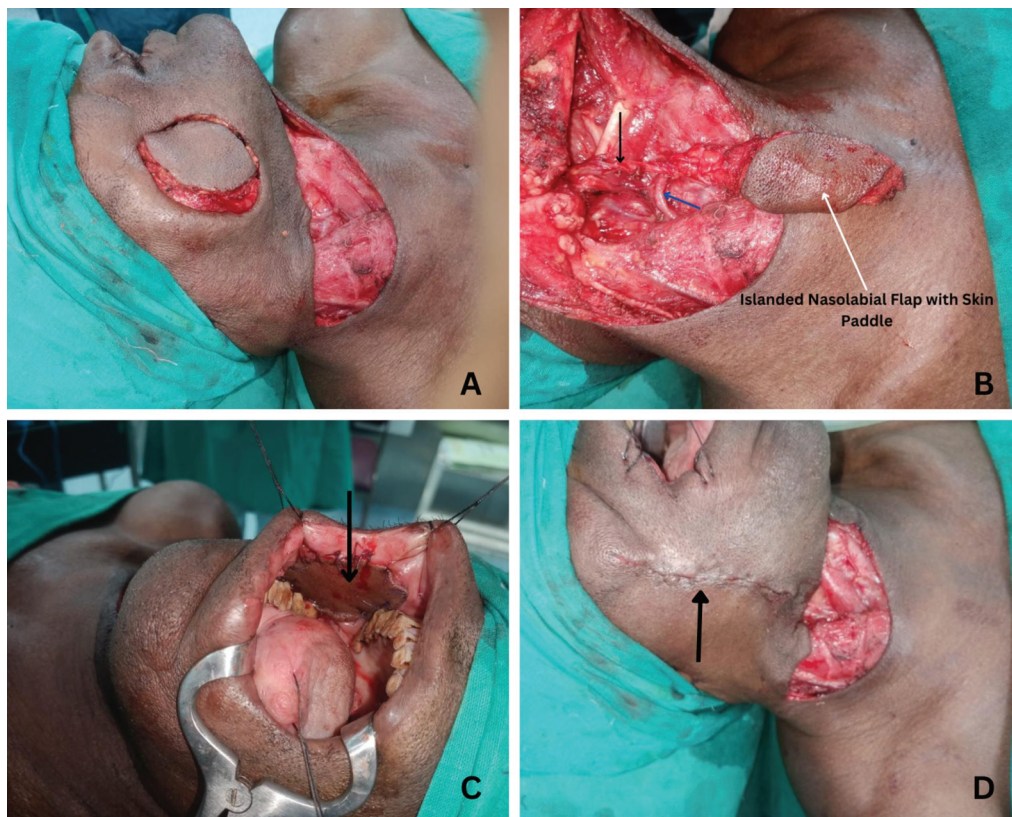
Before surgery, broad-spectrum antibiotics were administered. First, a neck dissection was performed under general anesthesia, followed by a wide local excision of the primary tumor.

The islanded nasolabial flap is an axial flap with a fusiform shape that is based on the facial artery and vein. We typically base the inferior border of the flap on the lower border of the mandible so that the facial artery and vein can be dissected easily in continuity. The flap is marked 3 to 4 cm lateral to the nasolabial fold, where the skin is laxer compared with the classic nasolabial fold, even in younger patients, and where adequate closure of the donor site is possible.

Depending on the cheek laxity and size of the recipient defect, typically 4 to 5 cm of flap is harvested. Preserving the facial artery and vein during neck dissection is a prerequisite for this islanded flap and of the uttermost importance. After clipping and cutting the submental vessels and branches to the submandibular gland during the dissection and removal of the level IB nodal station, the facial vessels must be dissected and preserved with extreme care. The dissection of the vessels is completed up to the intended lower margin of the flap. The marginal mandibular nerve is dissected and preserved.

The flap harvesting is typically initiated from superior to inferior. The skin incision extends through the dermis and subcutaneous fat to the underlying muscle layer. The facial artery is located in a plane below the facial muscles.

The facial vein is defined and ligated at the flap's superior edge. Dissection is performed caudally in a plane between the facial vein on top and the buccinator muscle below. The facial artery follows a tortuous path anterior to the vein and is easily identifiable over the buccinator muscle on the medial side of the flap. All of the artery's medial branches, such as the labial arteries, are ligated and cut. The dissection proceeds in a plane beneath the artery, and the vessel is cut in the flap's uppermost portion. At this point, the lateral incision is made, and the flap is dissected in a plane below the facial vessels from superior to inferior and medial to lateral.



**Fig. 1** Islanded nasolabial flap reconstruction for carcinoma buccal mucosa patient. (A) Incision planning. (B) Nasolabial flap islanded on facial artery (black arrow) and facial vein (blue arrow). (C) Flap inset on buccal mucosa defect indicated by black arrow (by passing the islanded flap lateral to the mandible). (D) Donor site scar indicated by black arrow.

The parotid duct is identified and conserved in the lateral border. The flap is then entirely placed over the facial vessels.

For buccal mucosal defects (**→Fig. 1**), the flap is delivered into the oral cavity over the mandible, and for tongue defects (**→Fig. 2**), the flap is passed medial to the mandible either through the resected floor or by tunneling it posterior to or through the mylohyoid by separating the muscle fibers. Prior to donor site closure, the lateral skin flap is mobilized in a supramuscular plane, taking precautions to prevent accidental injury to the branches of the facial nerve. The donor site is then primarily closed without tension with a 4–0 polyglactin 910 suture providing deep dermal closure and a 4–0 nylon suture to approximate the skin edges.

### Postoperative Follow-Up

All patients were closely monitored for complications such as surgical site infections, orocutaneous fistulas, and flap status. All patients were treated with adjuvant radiation with or without chemotherapy in accordance with the National Comprehensive Cancer Network guidelines. One month after surgery, swallowing function was evaluated based on food consistency, such as soft diet, liquid diet, and tube feeding dependence. Based on the trinary scale designed by Yanai et al,<sup>3</sup> speech intelligibility was categorized as good (comprehensible speech without repeats), fair (hard to comprehend with few repetitions required), or poor (speech only rarely comprehended).

### Results

In our study, patients were in the age group of 24 to 81 years, with the majority between 40 and 50 years. Of the 72 cases, 57 (79.16%) were males and 15 (20.83%) were females. The majority of our patients had carcinoma of the anterior two-third tongue (61.11%), followed by carcinoma of the buccal mucosa (38.88%). All of our patients had squamous cell carcinomas of the oral cavity (**→Table 1**).

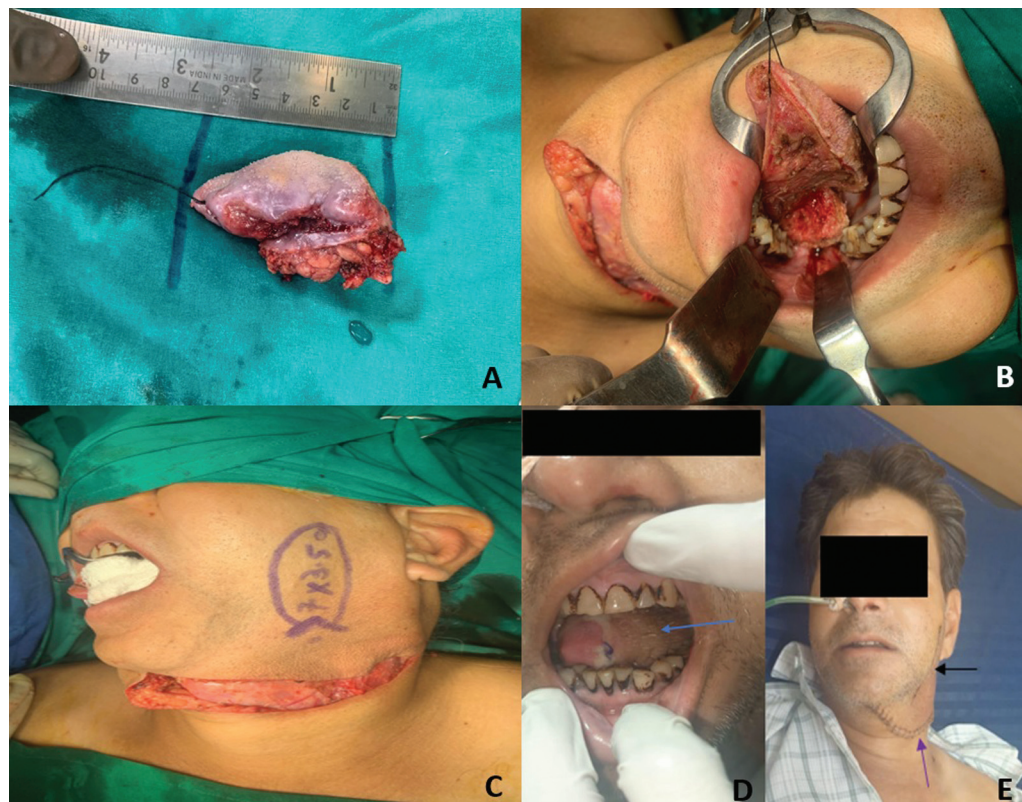
The tumor-node-metastasis staging of tongue and buccal mucosa carcinoma patients is highlighted in **→Fig. 3**.

### Postoperative Complications

Four patients (5.55%) developed surgical site infections at the donor site, which were managed conservatively with regular dressings and intravenous antibiotics. One patient (1.38%) had developed flap necrosis in a tongue cancer patient, which was managed by debridement of the necrosed flap, and the tongue defect (around  $\frac{1}{3}$  tongue resected) was left open to heal secondarily. However, the majority of our patients (93.05%) developed no postoperative complications.

Some proliferation of hair over the flap was observed in 15 cases (21.42%), particularly in male patients. However, these hair diminished over time, with some patients losing them entirely within 2 months, and mucosalization was initiated (**→Table 2**).





**Fig. 2** Islanded nasolabial flap reconstruction for carcinoma tongue patient. (A) Excised carcinoma left lateral border of anterior two-third tongue en bloc with floor of mouth margin. (B) Residual defect after excision. (C) Incision planning. (D) Flap in situ (blue arrow) 2 weeks post-reconstruction. (E) Donor site scar (black arrow) with no deviation of angle of mouth (purple arrow shows neck dissection scar) 2 weeks post-surgery.

**Functional Assessment**

For all patients (100%) with buccal mucosa cancer, speech intelligibility was good. The majority of patients (~22, 78.57%) were able to tolerate a normal diet, while 6 (21.42%) consumed

a soft diet (→Table 3). All patients who underwent reconstruction of buccal mucosal defects had a mouth opening wider than two fingers.

Twenty-five patients (56.81%) with tongue carcinoma had good speech intelligibility, while 19 patients (43.18%) had acceptable speech intelligibility. On swallowing capacity assessment, 25 patients (65.90%) tolerated a normal diet, and 15 patients (34.09%) tolerated a soft diet (→Table 4).

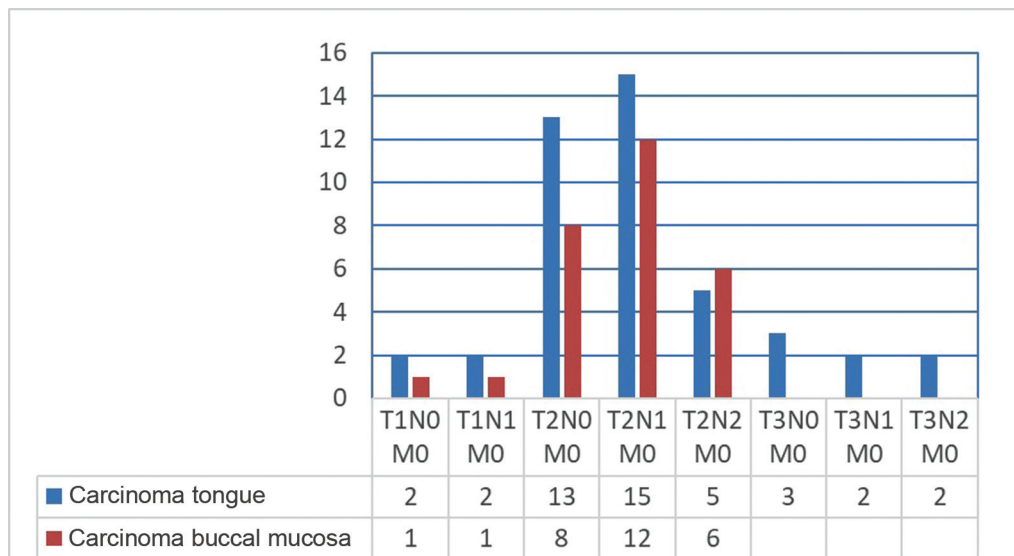
None of our patients had poor speech intelligibility, and none were liquid diet or tube feed dependent.

**Table 1** Patient characteristics

| Clinical features of patients        | Total patients (n) | Percentage (%) |
|--------------------------------------|--------------------|----------------|
| <b>Age</b>                           |                    |                |
| ≤ 50 years                           | 54                 | 75             |
| > 50 years                           | 18                 | 25             |
| <b>Sex</b>                           |                    |                |
| Male                                 | 57                 | 79.16          |
| Female                               | 15                 | 20.83          |
| <b>Location</b>                      |                    |                |
| Tongue (anterior 2/3 <sup>rd</sup> ) | 44                 | 61.11          |
| Buccal mucosa                        | 28                 | 38.88          |
| <b>Histopathology</b>                |                    |                |
| Squamous cell carcinoma (SCC)        | 72                 | 100            |
| Well differentiated                  | 46                 | 63.88          |
| Moderately differentiated            | 23                 | 31.94          |
| Poorly differentiated                | 3                  | 4.16           |

**Discussion**

To restore functionality, small-to-moderate soft tissue defects of the head and neck necessitate reconstruction. Free flaps are preferred because they are flexible, do not impede oncologic disease clearance, and two teams can harvest the flap simultaneously. In the Indian healthcare system, their use is limited by high patient load, affordability issues, and increased operating and anesthesia time. The pectoralis major myocutaneous flap is a rather voluminous flap that is challenging to inset into such small-to-moderate intraoral surgical defects<sup>4</sup> and also adds additional soft tissue volume to the neck. In such instances of small- and moderate-sized defects, attempts at primary closure or skin grafting cause tissue contracture and restrict oral opening. In such instances, a free radial artery forearm flap with microvascular anastomosis is the treatment of choice.<sup>5</sup> Local flaps, on



**Fig. 3** Tumor-node-metastasis (TNM) staging of tongue and buccal mucosa carcinoma patients.

**Table 2** Postoperative complications

| Postoperative complications | Total patients (n) | Percentage (%) |
|-----------------------------|--------------------|----------------|
| Surgical site infection     | 4                  | 5.55           |
| Flap necrosis               | 1                  | 1.38           |
| Flap congestion             | Nil                | Nil            |
| Bleeding                    | Nil                | Nil            |
| Orocutaneous fistula        | Nil                | Nil            |
| None                        | 67                 | 93.05          |

**Table 3** Functional outcomes for buccal mucosa cancer patients

| Speech intelligibility | Total patients (n) | Percentage (%) |
|------------------------|--------------------|----------------|
| Good                   | 28                 | 100            |
| Acceptable             | Nil                | Nil            |
| Poor                   | Nil                | Nil            |
| Swallowing capacity    | Total patients (n) | Percentage (%) |
| Normal diet            | 22                 | 78.57          |
| Soft diet              | 6                  | 21.42          |
| Liquid diet            | Nil                | Nil            |
| Tube feed              | Nil                | Nil            |

the other hand, if properly selected and tailored, can provide suitable aesthetic as well as functional outcomes, particularly in situations where resources are limited.

Numerous authors have documented the vascular foundation of the islanded nasolabial flap. This flap can be harvested with minimal technical skill, in less time, and with minimal complications. It can be used as a viable

**Table 4** Functional outcomes for tongue cancer patients

| Speech intelligibility | Total patients (n) | Percentage (%) |
|------------------------|--------------------|----------------|
| Good                   | 25                 | 56.81          |
| Acceptable             | 19                 | 43.18          |
| Poor                   | Nil                | Nil            |
| Swallowing capacity    | Total patients (n) | Percentage (%) |
| Normal diet            | 29                 | 65.90          |
| Soft diet              | 15                 | 34.09          |
| Liquid diet            | Nil                | Nil            |
| Tube feed              | Nil                | Nil            |

alternative to a free flap in patients with small-to-moderate defects after oral cancer resection, particularly in centers with limited technical expertise.<sup>6</sup>

In the study by Kallappa and Shah,<sup>7</sup> 25 patients with head and neck defects were treated with a nasolabial flap. Out of which, two cases had defects in the floor of the mouth, eight cases had lesions in the lower lip, nine cases had lesions on the tongue, five cases had lesions on the buccal mucosa, and one case had an ala defect. In this study, the majority of patients (44/72; 61.11%) had carcinoma of the anterior two-thirds of the tongue, followed by carcinoma of the buccal mucosa (28/72; 38.88%).

For islanded nasolabial flap harvesting, it is crucial to understand the normal drainage of the common facial vein. In the majority of instances, the common facial vein drains into the internal jugular vein. Additionally, one should be aware of the anatomical variation in facial vein drainage. Infrequently, the common facial vein is observed to drain directly into the subclavian vein. It can also empty directly into the external jugular vein in approximately 8.57% (3 of 35 specimens), according to a study by Bertha and Suganthy.<sup>8</sup>

We also observed anomalous drainage of the common facial vein into the external jugular vein in six cases (8.33%); therefore, it is of the utmost importance to safeguard the external jugular vein along with the common facial vein during neck dissection, keeping in mind the anomalous drainage of the common facial vein, as a prerequisite for the harvesting of the islanded nasolabial flap.

The flap only needs to be monitored for 12 to 24 hours for early venous congestion caused by strain over the pedicle or a narrow tunnel. This can be handled by releasing the distal flap inset sutures.<sup>9</sup> During the course of our study, a single patient manifested flap duskiness within this temporal span. Unfortunately, despite intervention attempts like the release of flap inset sutures, the compromised flap's viability could not be restored. It was left in place for the formation of the line of demarcation and then debrided.

With an islanded nasolabial flap, the rate of complications is low. In the series by Kallappa and Shah<sup>7</sup> of 25 nasolabial flap patients, four experienced complications. One-hundred percent of flaps survived, with complications including flap tip necrosis in two patients, ectropion in one patient, and orocutaneous fistula in one patient. Using nasolabial flaps, 26 patients with oral cancer underwent reconstruction of oral defects in the study by Singh et al<sup>4</sup> between 2006 and 2010. One patient developed an orocutaneous fistula, and three patients developed wound dehiscence. In our series, four patients (5.55%) developed surgical site infection at the donor site, which was treated conservatively with regular dressings and intravenous antibiotics; one patient (1.38%) developed flap necrosis resulting in flap loss in a carcinoma tongue patient, which was treated by debriding the necrotic flap and leaving the tongue defect (approximately one-third of the tongue resected) open to heal and mucosalize. In our series, the flap survival rate was 98.61%. None of our patients developed an orocutaneous fistula, ectropion, or bleeding. In the retrospective analysis of 27 patients with an islanded nasolabial flap by Chakrabarti et al,<sup>10</sup> no patient experienced flap loss, orocutaneous fistula, or donor site wound dehiscence. One subject had a clearly deviated angle of mouth. In nine patients (33.33%), intraoral hair growth on the flap was observed postoperatively. In our series, however, there was no deviation in the angle of the mouth, and 15 cases (21.42%) had hair growth over the flap, which diminished over time, with some patients losing them entirely within 2 months, and mucosalization was initiated.

In the study by Shah,<sup>11</sup> on an islanded nasolabial flap for tongue reconstruction in 11 patients, 5 patients had speech of grade II and 6 patients had speech of grade I. On functional evaluation, the majority of our patients (53/72; 73.61%) in our series had good speech intelligibility, while 19 patients (26.38%) had acceptable speech intelligibility, and none had poor speech. The majority of our patients (51/72; 70.83%) could tolerate a normal diet.

In a study by Cai et al,<sup>12</sup> 21 patients were treated with a radial forearm free flap (RFFF) for tongue reconstruction, and postoperative functional evaluations revealed that 47.6% of the patients had normal speech, 47.6% of the patients had near-normal speech, 61.9% of the patients ingested a regular diet, and 23.8% of the patients received soft foods. In our

series of 44 patients who underwent islanded nasolabial flap for tongue reconstruction, 56.81% (25 patients) of the patients had good speech, and 43.18% (19 patients) of the patients had acceptable speech intelligibility. Upon evaluation of swallowing capacity, 29 patients (65.90%) could tolerate a normal diet, while 15 patients (34.09%) could tolerate a soft diet. Thus, islanded nasolabial flap reconstruction had similar functional outcomes in terms of speech intelligibility and swallowing capacity when compared with RFFF reconstruction for tongue cancer (T1-T3 tumors).

Large defects and those necessitating the excision of skin on the face are unequivocal contraindications (T4 cancers involving skin). Also, in cases of T3 buccal mucosa cancers with a depth of invasion (DOI) greater than 10 mm, we avoided this flap because it necessitates the excision of the buccinator and facial vasculature forming the base of the specimen for adequate oncologic clearance. Due to the need to preserve the facial vasculature in the cheek for flap retrieval, this flap should be avoided in patients with T3 and T4 buccal cancers. All of our buccal mucosa cancer patients had T1 to T2 tumors. Significant metastatic lymph nodes in the neck, especially in level IB (submandibular triangle), that prevent the preservation of facial vessels are an additional contraindication.

The observational nature of the study, with no direct comparison to the RFFF reconstruction, is a limitation.

## Conclusion

This study emphasizes the versatility of the islanded nasolabial flap in reconstruction following oral cancer resection. The islanded nasolabial flap is a simple, efficient, and reliable flap with a low incidence of complications and outstanding functional outcomes, which makes it a valuable reconstructive tool for small-to-medium-sized oral defects, particularly in high-volume centers and limited-resource scenarios.

### Authors' Contributions

Sandeep Ghosh and Amar Jain conceptualized the study. Sandeep Ghosh and Amar Jain helped in methodology. Sandeep Ghosh, Amar Jain, Deepak Bhojwani, and Abhishek Sharma contributed to data collection. Sandeep Ghosh helped in original draft preparation. All authors have read and agreed to the published version of the manuscript.

### Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

### Informed Consent

Written informed consent was obtained from the patients for publication of this work.

### Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

#### Conflict of Interest

None declared.

#### Acknowledgments

None.

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