

A Resource-Conscious Approach to Oral Cavity Reconstruction: Experience with the Island Nasolabial Flap

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Abstract

Background: Reconstruction of oral cavity defects following cancer resection should restore function while remaining practical and cost-effective. The island nasolabial flap (INLF) represents a resource-conscious locoregional reconstructive option for selected oral cavity defects. This study evaluates our institutional experience with its use in oral cavity cancer reconstruction.

Methods: A retrospective review was performed of 12 consecutive patients who underwent immediate INLF reconstruction following oral cavity cancer resection between April 2025 and March 2026. Demographic, operative, postoperative, complication, and functional outcome data, including University of Washington Quality of Life Questionnaire version 4 (UW-QOL v4) scores, were analyzed.

Results: The tongue was the commonest primary site (41.7%). Mean operative time was 198 minutes, median time to oral feeding was 3 days, and mean hospital stay was 5 days. Complete flap survival was achieved in 11 patients (91.7%). One patient developed complete flap failure due to venous congestion and underwent successful salvage with a pectoralis major myocutaneous flap. Two patients developed marginal flap necrosis managed conservatively. Most patients achieved satisfactory speech, swallowing, and esthetic outcomes without significant donor-site morbidity.

Conclusion: The island nasolabial flap is a reliable, versatile, and resource-conscious reconstructive option for selected small- to moderate-sized oral cavity defects, providing satisfactory functional and esthetic outcomes with low morbidity and short hospital stay.

Keywords: Island nasolabial flap, oral cavity cancer, tongue reconstruction, locoregional flap, head and neck reconstruction, oral cavity defects

Introduction

Oral cavity malignancies often necessitate extensive surgical resection, resulting in significant functional and esthetic defects. Reconstruction of these defects aims not only to restore anatomical integrity but also to preserve essential

functions such as speech, swallowing, mastication, and facial appearance. Although microvascular free flap reconstruction has become the standard approach for many complex defects, local and regional flaps continue to play an important role in selected patients because of their shorter operative time, lower donor-site

morbidity, technical simplicity, and cost-effectiveness.^[1-3]

The nasolabial flap is a versatile local flap that derives its reliability from the rich vascular network supplied by the facial and angular arteries. Among its various modifications, the island nasolabial flap offers several advantages, including excellent color and texture match, adequate tissue bulk, and ease of harvest.^[2,3] It can be effectively utilized for the reconstruction of small- to moderate-sized defects of the oral cavity and adjacent head and neck regions.

Islanding the flap on the facial vascular pedicle increases its reach and arc of rotation, allowing transfer into the oral cavity for reconstruction of selected tongue, floor of mouth and buccal mucosal defects.^[4] The present study evaluates our institutional experience with the island nasolabial flap for reconstruction of oral cavity cancer defects, with emphasis on flap viability, complications, hospital stay and postoperative functional outcome.

Materials and Methods

This retrospective observational case series was conducted in the Department of Surgical Oncology at Rajiv Gandhi Cancer Institute & Research Centre, New Delhi, India. After institutional approval, records of patients who underwent oral cavity cancer resection followed by immediate reconstruction using an island nasolabial flap between April 2025 and March 2026 were reviewed.

Patients with biopsy-proven oral cavity squamous cell carcinoma involving the tongue, buccal mucosa, or floor of mouth who underwent curative-intent resection with immediate island nasolabial flap reconstruction were included. Patients with incomplete records, inadequate follow-up, recurrent disease at presentation, previous cheek surgery/scarring compromising flap design, or defects requiring composite

mandibular reconstruction/free tissue transfer were excluded.

Gross level Ib nodal disease, extracapsular nodal disease encasing or threatening the facial vessels, or any situation in which preservation of the facial artery or vein could compromise oncological clearance, was considered a relative contraindication for island nasolabial flap reconstruction.^[5] In such cases, an alternative reconstructive option was preferred.

Demographic, clinical, operative, and postoperative data were collected from hospital records. Variables included age, sex, tobacco use, tumor site, clinical and pathological stage, defect site, flap dimensions, type of neck dissection, operative time, need for tracheostomy, flap-related complications, donor-site complications, infection, wound dehiscence, return to oral feeding, duration of hospital stay and adjuvant treatment.

Functional outcome was assessed using the University of Washington Quality of Life Questionnaire version 4 (UW-QOL v4)^[6] at least 3 months after surgery or after completion of adjuvant treatment, whichever was later. Particular attention was given to swallowing, chewing, speech, taste, saliva, pain, appearance, and activity domains. Esthetic outcome was assessed clinically in terms of facial symmetry, donor-site scar, flap contour, and patient satisfaction.

Complications were categorized as flap-related and donor-site related. Flap-related complications included venous congestion, marginal necrosis, partial flap loss, complete flap loss, and flap-site infection. Donor-site complications included wound dehiscence, hematoma, hypertrophic scar, ectropion, and unacceptable facial deformity.

Data were analyzed using descriptive statistics. Continuous variables were expressed as mean with standard deviation or median with range, depending on distribution. Categorical variables were presented as frequencies and percentages.

Given the small sample size and descriptive nature of the study, no comparative statistical testing was planned.

Surgical Technique

The decision to perform an island nasolabial flap (NLF) reconstruction should be made preoperatively, as preservation of the facial artery and vein during neck dissection is essential for flap viability; these vessels are otherwise routinely sacrificed during oncologic surgery.^[3,4,7] Adequate facial skin laxity should also be assessed before selecting this reconstructive option. The flap is typically designed in a fusiform configuration, with dimensions tailored to match the size of the anticipated defect. To minimize the risk of distal flap necrosis, a length-to-width ratio of approximately 2.5–3:1 is recommended.^[3–5,7] Furthermore, flap widths greater than 3 cm are generally avoided, as primary closure of the donor site may be difficult, particularly in younger individuals with limited skin laxity.

The superior border of the flap is marked approximately 1–2 cm below the medial canthus to reduce the risk of postoperative ectropion. The inferior extent is placed at or just below the oral commissure, while the medial border is positioned 2–4 mm lateral to the nasolabial fold to preserve the natural contour and optimize cosmetic outcomes.

Following infiltration of the planned incision lines with a local anesthetic containing a vasoconstrictor, flap elevation is initiated in a superior-to-inferior direction. The skin and subcutaneous tissue are incised until the buccinator muscle is identified. The facial vein is then exposed and ligated at the superior aspect of the flap. Dissection proceeds inferiorly in the plane between the facial vein superficially and the buccinator muscle deeply. After completion of the medial incision, the facial artery is identified, and all arterial branches medial to the flap, including the labial branches, are ligated. Further dissection

is performed beneath the facial artery, which is subsequently clipped at its superior extent within the flap. The lateral incision is then completed, and the flap is elevated from superior to inferior and from medial to lateral in a plane deep to the facial vessels.

Particular attention should be paid to identifying and preserving the marginal mandibular branch of the facial nerve. Careful dissection, preferably under loupe magnification, facilitates nerve preservation while minimizing trauma to the vasa vasorum.

Once completely islanded on the facial vascular pedicle, the flap is carefully tunneled beneath the marginal mandibular nerve and transferred into the oral cavity medial or lateral to the mandible, either through the resected floor of the mouth or by splitting the fibers of the mylohyoid muscle. After intraoral transfer, the distal (superior) portion of the flap is oriented anteriorly. This orientation is preferred because the distal tip, being the farthest point from the vascular pedicle, is most susceptible to ischemia; should vascular compromise occur, the affected portion remains readily accessible for intraoral revision or primary closure.^[7] The donor site is subsequently closed primarily in a tension-free manner (Figure 1a–1d).

Results

A total of 12 patients underwent immediate reconstruction with an island nasolabial flap following resection of oral cavity malignancies. The cohort comprised 9 males and 3 females, with a mean age of 49.9 ± 16.4 years (range, 38–62 years). Tobacco use was present in eight patients (66.6%). The median follow-up duration was 7.5 months (range, 3–12 months).

The tongue was the most common primary site ($n = 5$), followed by the floor of the mouth ($n = 4$) and buccal mucosa ($n = 3$). According to pathological staging, six patients (50.0%) had T2 disease, five (41.7%) had T3 disease, and



Figure 1: Island nasolabial flap reconstruction following hemiglossectomy. (a) Resected hemiglossectomy specimen. (b) Harvested island nasolabial flap based on a subcutaneous vascular pedicle prior to transfer. (c) Immediate postoperative appearance demonstrating successful inset of the island nasolabial flap into the tongue defect with primary closure of the donor site. (d) Early postoperative follow-up showing complete flap survival, satisfactory donor-site healing, and adequate mouth opening with good functional reconstruction.

one (8.3%) had T1 disease. Neck dissection was performed in all patients, and adjuvant radiotherapy or chemoradiotherapy was administered to 11 patients [Table 1].

The mean flap dimensions were 5.2×3.0 cm, with a mean operative time of 198 minutes. Tracheostomy was required in three patients. The median time to Ryle's tube removal and initiation of oral feeding was 3 days, while the mean postoperative hospital stay was 5 days [Table 2].

Complete flap survival was achieved in 11 patients (91.7%). One patient (8.3%) experienced

complete flap loss secondary to vascular pedicle compression against the mandible, leading to venous congestion. Following flap failure, the necrotic flap was removed, and salvage reconstruction was performed using a pectoralis major myocutaneous (PMMC) flap (Figure 2a and 2b). Partial flap loss or marginal necrosis occurred in two patients (16.6%) and was successfully managed conservatively. No cases of flap-site infection, wound dehiscence, hematoma, donor-site hypertrophic scarring, ectropion, lower eyelid distortion, or orocutaneous fistula were observed. Restriction of tongue movement during protrusion was noted in three patients (25%),

Table 1: Patient demographics and clinical characteristics

Variable	Category	Number (n)
Sex	Male	9
	Female	3
Age (Years)	Mean $\pm$ 2 SD (Range)	49.9 $\pm$ 16.4 (38–62)
Tobacco use	Present	8 (66.6%)
Primary site	Tongue	5
Primary site	Buccal mucosa	3
Primary site	Floor of mouth	4
Clinical/pathological stage	T1	1 (8.3%)
Clinical/pathological stage	T2	6 (50.0%)
Clinical/pathological stage	T3	5 (41.7%)
Neck dissection	Performed	12
Adjuvant RT/CTRT	Required	11
Follow-up duration (months)	Median/range	7.5 (3–12)

Table 2: Operative and reconstructive details

Variable	Number / Value
Mean flap size	5.2 x 3.0 cm
Mean operative time	198 minutes
Tracheostomy	Yes (3 patients)
Ryle tube removal / oral feed (median)	3 rd day
Hospital stays (average)	5 days

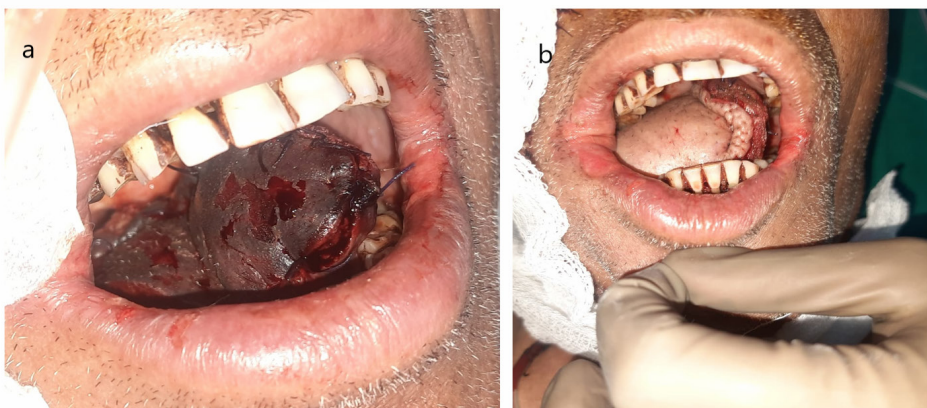


Figure 2: Salvage reconstruction following complete island nasolabial flap failure. **(a)** Complete necrosis of the island nasolabial flap secondary to vascular pedicle compression and venous congestion. **(b)** Salvage reconstruction using a pectoralis major myocutaneous (PMMC) flap following debridement and removal of the failed flap, demonstrating satisfactory coverage of the tongue defect.

predominantly following tongue reconstruction, without significant compromise of speech or swallowing [Table 3].

Functional outcomes were satisfactory in the majority of patients. Based on postoperative functional assessment, 11 patients achieved satisfactory speech and swallowing, while one patient had poor functional recovery following complete flap failure. Three patients experienced mild restriction of tongue protrusion; however, this did not significantly compromise oral intake or speech. Esthetic outcomes were favorable in all surviving flaps, with good color match, satisfactory contour, and well-concealed donor-site scars within the nasolabial crease [Table 4]. Detailed demographic, operative, functional, and complication data are presented in Tables 1–4.

Discussion

The nasolabial flap originated from descriptions by the ancient Indian surgeon Sushruta around 600 BC for nasal reconstruction. It was later popularized by Guillaume Dupuytren and Johann Friedrich Dieffenbach in the 19th century. Improved understanding of facial vascular anatomy during the 1980s led to the development of the island nasolabial flap, providing greater mobility, a wider arc of rotation, and reliable vascularity for oral cavity and head and neck reconstruction.^[8]

Lazaridis et al. reported their experience with island nasolabial flap reconstruction in a series of nine patients in 2008.^[9] Their study demonstrated that flap survival was not influenced by the orientation of the vascular pedicle, whether superiorly or inferiorly based. Furthermore, they observed no cases of flap infection, wound dehiscence, or partial/full-thickness necrosis. Based on their findings, the authors concluded that the island nasolabial flap is a reliable reconstructive option for small- to intermediate-sized defects of the buccal mucosa.^[9]

More recently, Sharma et al. published a retrospective analysis in 2021 evaluating the use of island nasolabial flaps for tongue reconstruction in 11 patients treated for tongue carcinoma between January and August 2019.^[7] The authors highlighted the excellent arc of rotation and reach of the flap, which allowed reconstruction of defects extending to the contralateral tongue and tongue base. They reported satisfactory postoperative tongue function with favorable speech and swallowing outcomes. In addition, their results compared favorably with those reported for free flap reconstruction, leading them to advocate the island nasolabial flap as a preferred local reconstructive option for selected tongue defects. Our findings closely parallel their results, with the majority of patients achieving satisfactory functional recovery and favorable esthetic outcomes. Unlike their study, however, our series included a broader spectrum of oral cavity subsites, including the tongue, floor of mouth, and buccal mucosa, thereby expanding the applicability of the island nasolabial flap beyond tongue reconstruction alone.

Although microvascular free tissue transfer remains the standard reconstructive option for large and composite oral cavity defects, its routine use in low- and middle-income countries is often limited by cost, prolonged operative time, the need for specialized infrastructure, and availability of experienced microsurgical teams. Furthermore, free flap failure in low-volume or developing centres may substantially increase

Table 3: Postoperative complications

Complication	Number
Complete flap failure	1 (8.3%)
Partial flap loss / marginal necrosis	2 (16.6%)
Flap-site infection	0
Wound dehiscence	0
Hematoma	0
Donor-site hypertrophic scar	0
Ectropion / lower eyelid distortion	0
Orocutaneous fistula	0
Restriction of tongue movement	3 (25%)

Table 4: Functional assessment using UW-QOL v4

UW-QOL domain	Assessment time point	Best response category/score	Number of patients
Pain	>=3 months after surgery/ adjuvant treatment	I have no pain.	12
Appearance	>=3 months	There is no change in my appearance.	3
		The change in my appearance is minor.	6
		My appearance bothers me, but I remain active	3
Activity	>=3 months	I am as active as I have ever been.	12
Recreation	>=3 months	There are no limitations to recreation at home or away from home.	12
Swallowing	>=3 months	I can swallow as well as ever.	3
		I cannot swallow certain solid foods.	8
		I can only swallow liquid food.	1
Chewing	>=3 months	I can chew as well as ever.	8
		I can eat soft solids, but cannot chew some foods.	3
		I cannot even chew soft solids.	1
Speech	>=3 months	My speech is the same as always.	1
		I have difficulty saying some words, but I can be understood over the phone.	11
Taste	>=3 months	I can taste food normally.	2
		I can taste most foods normally.	9
		I can taste some foods.	1
Saliva	>=3 months	My saliva is of normal consistency.	2
		I have less saliva than normal, but it is enough.	9
		I have too little saliva.	1
Mood/anxiety	>=3 months	My mood has been excellent and unaffected by my cancer.	6
		My mood has been generally good and only occasionally affected by my cancer.	3
		I have been neither in a good mood nor depressed because of my cancer.	2
		I have been somewhat depressed because of my cancer.	1
Overall functional outcome	>=3 months	Satisfactory	12

patient morbidity, treatment cost, and hospital stay.^[10]

In carefully selected patients with small- to moderate-sized oral cavity defects, the island nasolabial flap offers a reliable, technically straightforward, and cost-effective alternative while providing satisfactory functional and esthetic outcomes with minimal donor-site morbidity.^[3-5] However, the conventional nasolabial flap is limited by its arc of rotation and tissue reach, which may restrict its use for defects located deeper within the oral

cavity. To overcome these limitations, several modifications of the flap have been described, culminating in the development of the island nasolabial flap. By completely islanding the skin paddle and skeletonizing the dominant vascular pedicle, comprising the facial artery and vein, surgeons are able to achieve greater mobility, improved maneuverability, and an increased arc of rotation without distortion or tethering of the proximal skin. These modifications substantially enhance the versatility of the flap and expand its reconstructive applications.^[3-5,7]

Today, the island nasolabial flap is widely utilized in head and neck oncologic reconstruction. Owing to its extended reach, the flap can be tunneled beneath the mandible and reliably transferred to reconstruct defects of the tongue, floor of mouth, retromolar trigone, oropharynx, and palate in a single-stage procedure, thereby eliminating the need for subsequent pedicle division. Furthermore, flap harvest does not compromise cervical lymph node dissection or oncologic clearance, making it particularly suitable for patients undergoing simultaneous neck dissection. These advantages, combined with favorable functional and esthetic outcomes, continue to make the island nasolabial flap an attractive reconstructive option in carefully selected patients.^[3,4,10]

In the present series, satisfactory esthetic outcomes were achieved in all patients with surviving flaps. The donor-site scar remained well concealed within the nasolabial crease, producing minimal facial deformity. Functional assessment using the UW-QOL version 4 questionnaire demonstrated satisfactory postoperative recovery in the majority of patients, with preservation of speech, swallowing, chewing, taste, and salivary function. Restriction of tongue protrusion was observed in three patients following tongue reconstruction, most likely due to flap bulk or postoperative scar contracture; however, this did not significantly compromise speech or oral intake. These findings are comparable to those reported in previous Indian series evaluating island nasolabial flap reconstruction.^[7]

Complete flap survival was achieved in 91.7% of patients. One patient developed complete flap loss secondary to vascular pedicle compression against the mandible, resulting in venous congestion, requiring salvage reconstruction with a PMMC flap. Two additional patients developed marginal flap necrosis that healed with conservative management. The observed complication profile is comparable to previously published Indian series, where flap survival rates have consistently exceeded 90%, and major flap loss remains uncommon. Furthermore, the short

hospital stay observed in all patients highlights the feasibility and cost-effectiveness of this reconstructive technique.^[4,5,7]

The present study is limited by its retrospective design, relatively small sample size, and short duration of follow-up. Nevertheless, the inclusion of a standardized postoperative functional assessment using the UW-QOL version 4 questionnaire and comparison with contemporary Indian series provides a more comprehensive evaluation of clinical outcomes. Larger prospective studies with longer follow-up and direct comparison with microvascular free flap reconstruction are warranted to further define the role of the island nasolabial flap in oral cavity reconstruction.

Conclusion

The island nasolabial flap is a reliable and cost-effective option for selected small- to moderate-sized oral cavity defects following oncologic resection. In this series, it provided acceptable functional and esthetic outcomes with low donor-site morbidity and short hospital stay. Careful patient selection, preservation of the facial vessels when oncologically safe, and avoidance in gross level Ib nodal disease are essential for optimal outcomes.

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