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Original Research Article

Versatility of locoregional flap in oromandibular reconstruction in case of oral cavity malignancy: our experience in tribal region of eastern Gujarat

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ABSTRACT

Background: Oral cavity malignancies frequently require surgical resection, resulting in complex oromandibular defects that impair speech, swallowing, mastication, and facial aesthetics. While microvascular free flaps offer excellent reconstruction, they are often impractical in resource-limited settings. Locoregional flaps provide a reliable and cost-effective alternative. This study aimed to evaluate the versatility, outcomes, and complication profile of locoregional flaps in reconstruction following oral cavity malignancy surgery.

Methods: This prospective observational study included 30 patients with histopathologically confirmed oral cavity malignancies undergoing surgical excision and reconstruction using locoregional flaps at a tertiary care center between January 2024 and June 2025. Patients underwent clinical evaluation, imaging, staging according to AJCC 8th edition, and reconstruction using nasolabial, pectoralis major myocutaneous (PMMC), or Abbe–Estlander flaps. Postoperative functional, cosmetic outcomes, and complications were assessed. Statistical analysis was performed using SPSS version 22 with significance set at $p < 0.05$.

Results: Most patients were males (70%) aged 31–40 years (36.7%), with buccal mucosa as the most common site (86.7%). The PMMC flap was most frequently used (53.3%), followed by nasolabial (43.3%) and Abbe–Estlander flaps (6.7%). Successful flap adaptation occurred in 93.3% of cases. Common complications included intraoral hair growth (26.7%), infection (23.3%), bulky appearance (20%), and fistula formation (16.7%). Cosmetic satisfaction was achieved in 56.7% of patients, and all achieved intelligible speech. Nasolabial flaps demonstrated superior speech outcomes and fewer complications, whereas PMMC flaps showed higher donor-site morbidity and bulkiness.

Conclusion: Locoregional flaps are reliable and versatile options for oromandibular reconstruction. Nasolabial flaps provide better functional and cosmetic outcomes for smaller defects, while PMMC flaps remain useful for larger defects, particularly in resource-limited settings.

Keywords: *Oral Cancer; Surgical Flaps; Reconstructive Surgical Procedures; Pectoralis Muscles; Nasolabial Fold.*

INTRODUCTION

Oral cavity malignancies represent a significant global health burden, particularly in developing countries where risk factors such as tobacco use, alcohol consumption, betel nut chewing, and poor oral hygiene are highly prevalent.[i] Squamous cell carcinoma accounts for more than 90% of these cases and frequently presents at an advanced stage.[ii] Surgical excision with adequate oncological margins remains the cornerstone of management; however, it often results in complex oromandibular defects that compromise speech, mastication, swallowing, and facial aesthetics, thereby adversely affecting quality of life.[iii] Reconstruction is therefore a critical component of treatment, aiming to restore both form and function. Although microvascular free flaps provide excellent versatility for complex defects, their requirement for advanced infrastructure, prolonged operative time, and specialized expertise limits their feasibility in resource-constrained settings.[iv] In such scenarios, locoregional flaps offer a reliable, cost-effective, and technically less demanding alternative, with advantages of robust vascularity and shorter operative duration.[v] Commonly utilized options include the pectoralis major myocutaneous, nasolabial, deltopectoral, temporalis, sternocleidomastoid, and Abbe-Estlander flaps, with selection guided by the size, location, and extent of the defect.[vi] At our institution, buccal mucosa defects—often involving both soft and hard tissues—are reconstructed using appropriately selected locoregional flaps tailored to tumour characteristics.

MATERIALS AND METHODS

This prospective observational study was conducted in the Department of Otorhinolaryngology and Head & Neck Surgery, over 18 months after Institutional Ethics Committee approval, to evaluate the versatility and outcomes of locoregional flaps in oromandibular reconstruction following oral cavity malignancy surgery. A total of 30 patients with histopathologically confirmed intraoral malignancies requiring surgical excision and soft tissue reconstruction were enrolled through purposive sampling, including consecutive eligible cases from January 2024 to June 2025. Patients unfit for general anesthesia, with inadequate donor sites, prior trauma or scars at donor areas, age >70 years, or uncontrolled systemic illnesses were excluded. After obtaining informed consent, all patients underwent detailed clinical evaluation, including history of symptoms and risk factors, general and local examination with cervical nodal assessment, routine preoperative investigations, and incisional biopsy for confirmation. Radiological evaluation with contrast-enhanced CT or MRI of the face and neck was performed to assess tumor extent and nodal status, and tumors were staged as per the 8th edition AJCC TNM classification to guide surgical planning and reconstruction.

Surgical Procedure and Reconstruction

All patients underwent surgical excision of the primary tumor under general anesthesia with oncologically safe margins (≥1 cm where feasible). Procedures included wide local excision, composite resection, or segmental mandibulectomy based on tumor extent, with neck dissection guided by clinical and radiological nodal status. Reconstruction was performed using locoregional flaps—most commonly.

Nasolabial flap

After tumor excision, the post-ablative defect was measured and a nasolabial flap was designed over the nasolabial fold using gentian violet (Figure 1A). The flap was planned as an inferiorly based flap near the angle of the mouth, extending superiorly to 5–10 mm below the medial canthus. Flap dimensions were tailored to the defect, with a base width of 1.5–2.5 cm depending on tissue availability and a length ranging from 6 to 9 cm. Care was taken to position the donor site scar within the natural nasolabial crease. The flap was elevated in the subcutaneous plane superficial to the facial musculature from superior to inferior. In cases requiring tunnelling, the inferior limit of dissection was kept above the oral commissure, whereas for extraoral rotation to reconstruct the lower lip, dissection was extended below the level of the commissure.

Figure 1.Intra op picture of nasolabial flap reconstruction

Pectoralis major myocutaneous (PMMC)

Surface markings of the acromiothoracic artery were outlined, and a skin paddle was designed over the distal portion of the pectoralis major muscle to achieve an adequate arc of rotation. The incision was extended to the axilla and deepened to the muscular plane, with the skin paddle secured to the underlying muscle. During flap elevation, beveling of the edges was performed to preserve myocutaneous perforators while avoiding undermining. The plane between the pectoralis major and minor muscles was developed by dissecting along the lateral border of the pectoralis major, followed by separation of the two muscles. The pectoralis major was then divided lateral to the pedicle, carefully preserving its vascular supply, to free it from the humeral attachment. The flap was subsequently transferred to the neck through a wide subcutaneous tunnel created superficial to the clavicle, ensuring no compression. The flap was inset using 3-0 vicryl sutures, with suction drains placed in both chest and neck, and the wound closed in layers.

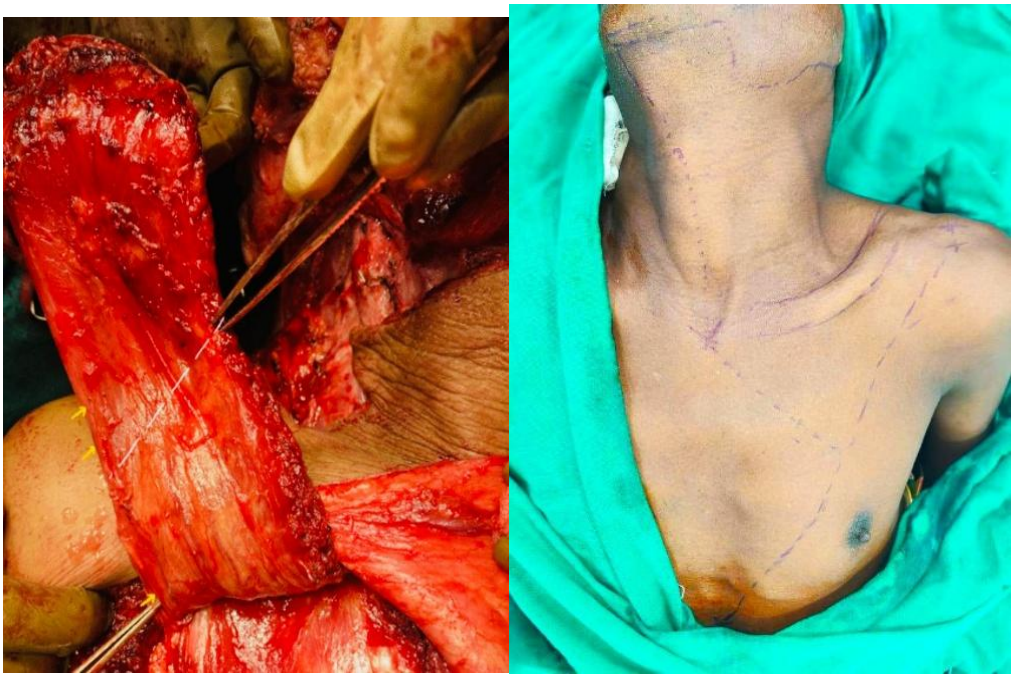


Figure 2.Pre Op And Intra Op Pmmc Flap Reconstruction

Figure 3.Post Operative Follow Up of PMMC Flap Reconstruction

Abbe-Estlander

The Abbe–Estlander flap is designed as a full-thickness, cross-lip flap based on the labial artery to reconstruct commissural and lip defects. After assessment of the defect, a triangular or wedge-shaped flap is marked on the lower lip, typically based laterally near the oral commissure and centered over the course of the inferior labial artery. The flap includes skin, muscle (orbicularis oris), and mucosa, ensuring preservation of the vascular pedicle. Incisions are made through all layers, and the flap is elevated carefully while maintaining continuity with the labial artery. It is then rotated or transposed into the recipient defect of the upper lip or commissure, with meticulous alignment of the vermilion border and muscle to restore oral competence. The donor site is closed primarily. After 2–3 weeks, once adequate vascularization is established, the pedicle is divided in a second-stage procedure and final inset is completed

Flap selected according to defect characteristics and vascular considerations. Standard postoperative care included antibiotics, analgesia, nutritional support, airway monitoring, and oral hygiene maintenance.

Statistical Analysis

Data were compiled using Microsoft Excel and analysed using Statistical Package for Social Sciences (SPSS) version 22. Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages.

Associations between categorical variables were analysed using the Chi-square (χ^2) test or Fisher's exact test where appropriate. Normality of data distribution was assessed using the Shapiro–Wilk test. Non-parametric tests such as the Mann–Whitney U test or Kruskal–Wallis test were applied when required. A p-value of <0.05 was considered statistically significant.

RESULTS

A total of 30 patients with histopathologically confirmed oral cavity malignancies underwent surgical resection followed by reconstruction using locoregional flaps. Most patients were aged 31–40 years (36.7%) with a clear male predominance (70%). The buccal mucosa was the most common site of involvement (86.7%). Mean tumor dimensions on clinical and CT assessment were comparable, with an average volume of 38.8 ± 22.9 cc, indicating moderately advanced disease at presentation. The majority presented with T3 tumors (53.3%), followed by T2 (33.3%) and T1 (13.3%) lesions, with no T4 cases. Nodal involvement was common, predominantly N2 (60%), while all patients were M0. The pectoralis major myocutaneous (PMMC) flap was the most frequently used reconstructive modality (53.3%), followed by the nasolabial flap (43.3%) and Abbe–Estlander flap (6.7%).

Successful flap adaptation was achieved in 93.3% of cases. Common complications included intraoral hair growth (26.7%), flap infection (23.3%), bulky appearance (20%), fistula formation (16.7%), donor site infection (13.3%), and wound dehiscence (10%). Cosmetic satisfaction was reported by 56.7% of patients, while all achieved intelligible speech, though 56.7% required effort. Early recurrence was noted in 3.3% of cases. Comparative analysis revealed that PMMC flaps were associated with significantly higher complication rates, including infection, bulkiness, donor site morbidity, and poorer cosmetic outcomes, whereas nasolabial flaps demonstrated significantly better speech outcomes, with no significant difference between flap types in terms of flap adaptation, fistula formation, or recurrence.

Table 1. Demographic Characteristics of Study Participants (n = 30)

Variable	Category	Frequency (n)	Percentage (%)

Age group (years)	<30	2	6.7
	31–40	11	36.7
	41–50	7	23.3
	51–60	6	20.0
	61–70	4	13.3
Sex	Male	21	70.0
	Female	9	30.0

Figure 4. Age distribution

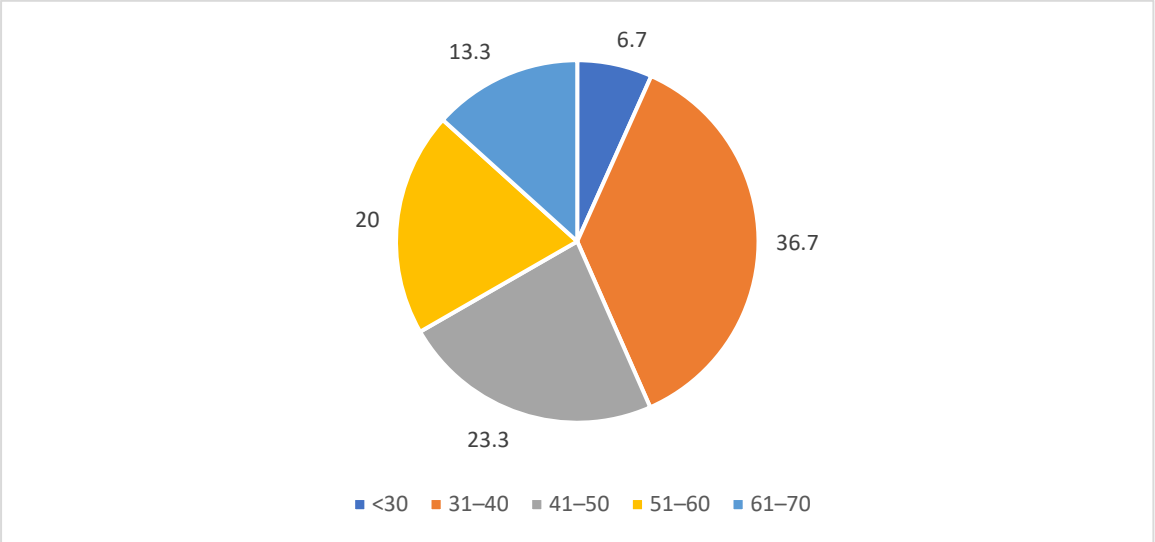


Figure 5. Sex distribution

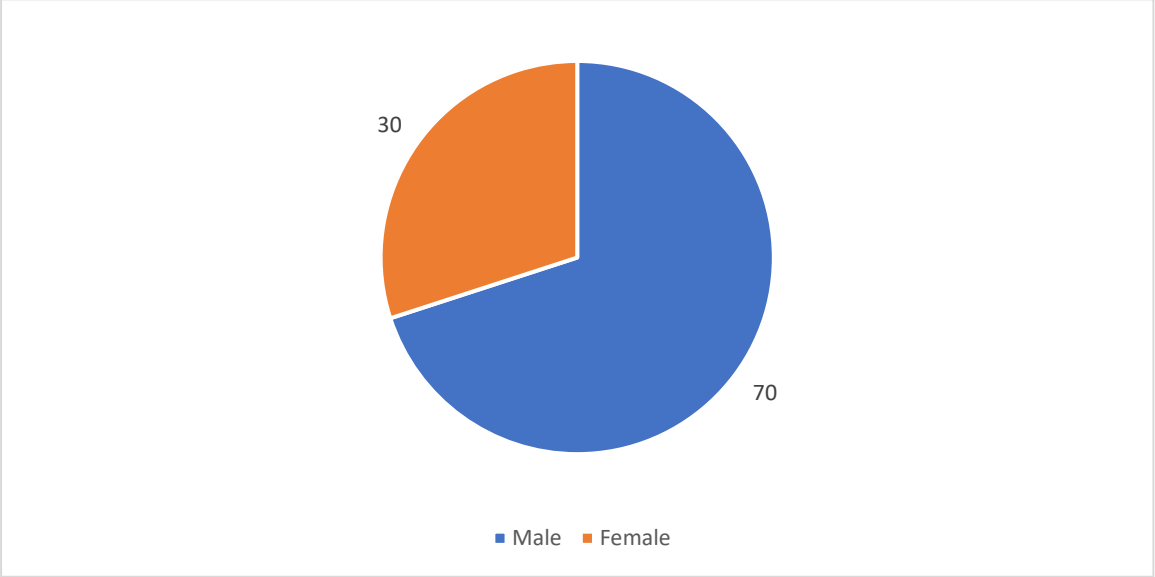


Table 2. Tumor Characteristics of Patients

Parameter	Value (Mean ± SD) / n (%)
Primary site of lesion	
Buccal mucosa	26 (86.7%)
Lower gingivolabial sulcus	1 (3.3%)
Upper gingivobuccal sulcus	1 (3.3%)
Lower gingivobuccal sulcus	1 (3.3%)
Lower lip	1 (3.3%)
Tumor dimensions (Clinical)	
Length (cm)	3.9 ± 1.2
Height (cm)	2.9 ± 0.6
Tumor dimensions (CT scan)	
Length (cm)	3.9 ± 1.2

Width (cm)	3.2 ± 1.3
Height (cm)	2.9 ± 0.6
Tumor volume (cc)	38.8± 22.9

Figure 6. Tumor site of Patients

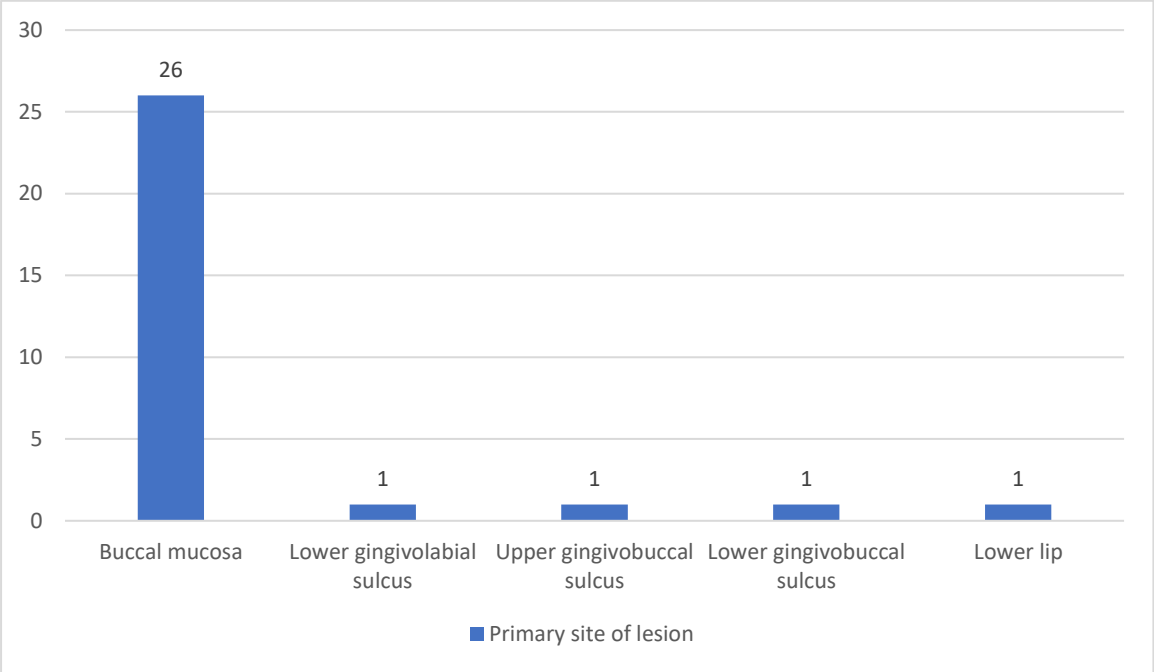


Figure 7. Tumor dimensions

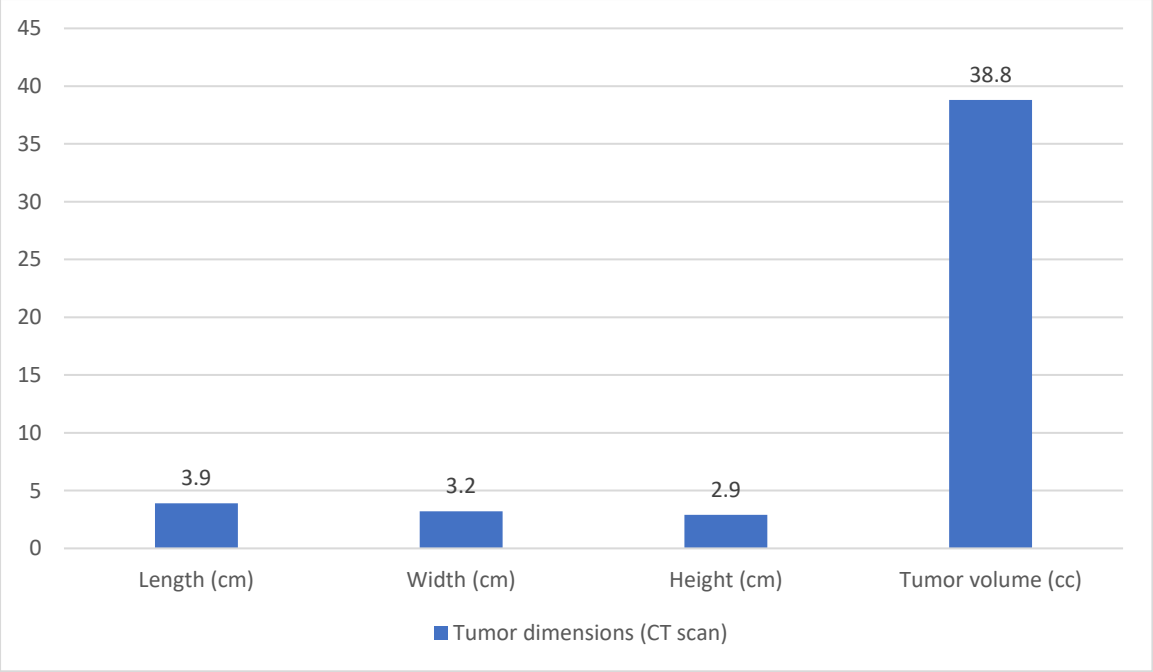
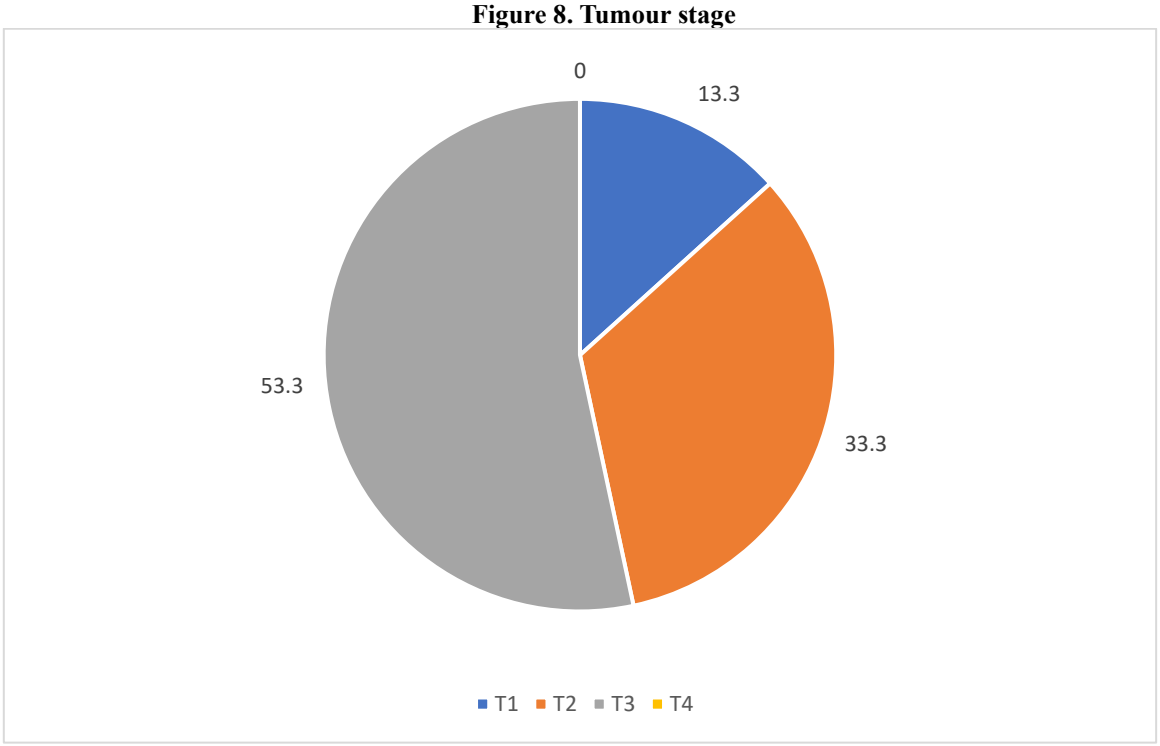


Table 3. TNM Staging Distribution of Patients (n = 30)

Staging Parameter	Category	Frequency (n)	Percentage (%)
Tumor (T)	T1	4	13.3
	T2	10	33.3
	T3	16	53.3
	T4	0	0
Node (N)	N0	4	13.3
	N1	2	6.7
	N2	18	60.0
	N3	5	16.7

Metastasis (M)	M0	30	100

Figure 8. Tumour stage



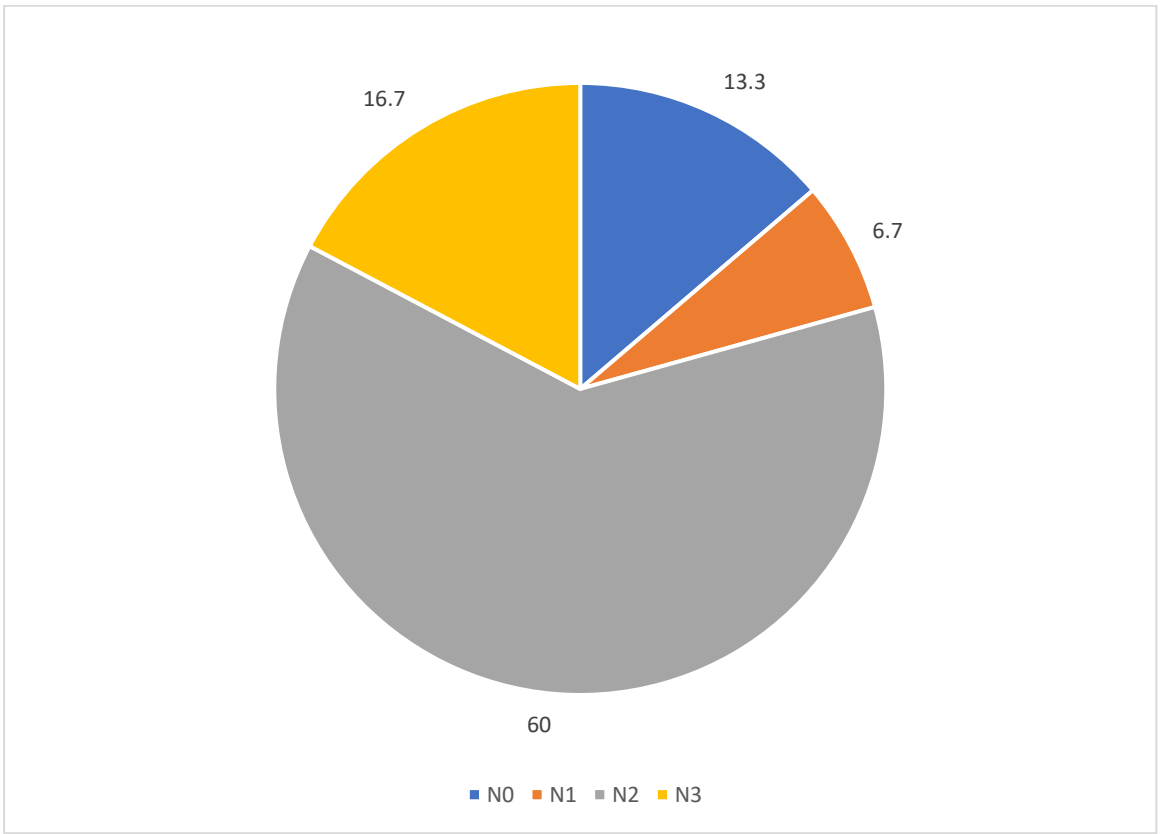


Table 4. Type of Locoregional Flap Used for Reconstruction

Type of Flap	Donor Site	Frequency (n)	Percentage (%)
Nasolabial flap	Nasolabial region	13	43.3
Pectoralis major myocutaneous (PMMC) flap	Pectoral region	16	53.3
Abbe–Estlander flap	Lip	2	6.7

Note: Multiple flaps were used in some patients.

Figure 9. Type of Locoregional Flap Used for Reconstruction

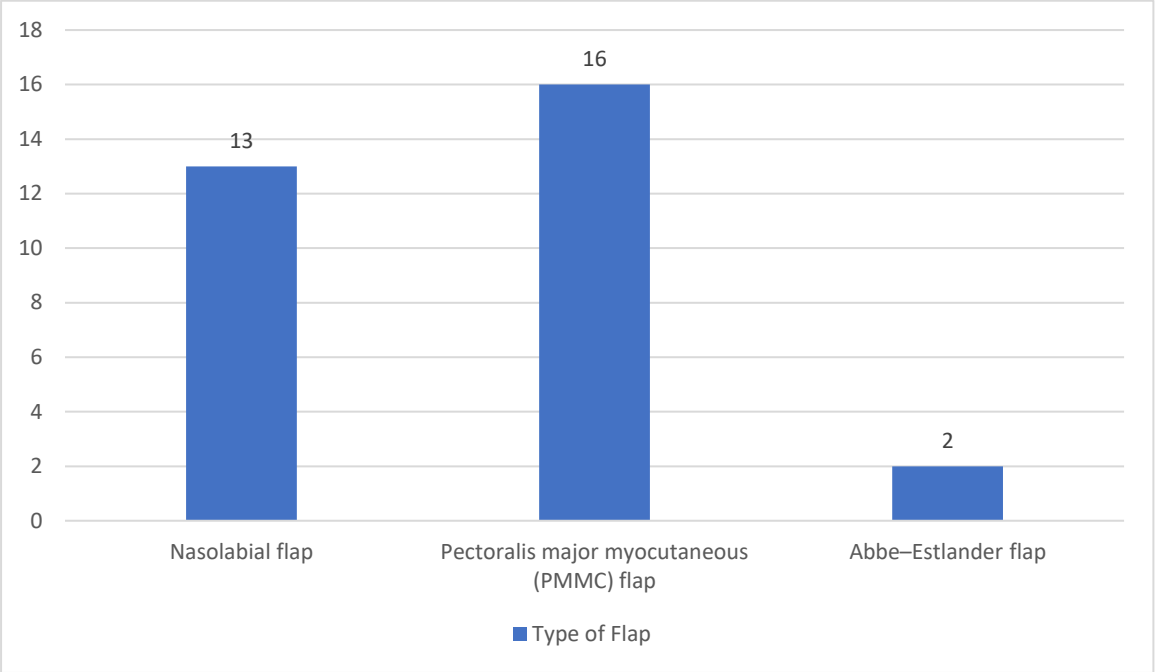


Table 5. Postoperative Outcomes and Complications (n = 30)

Parameter	Category	Frequency (n)	Percentage (%)
Flap adaptation	Yes	28	93.3
	No	2	6.7
Intraoral hair growth	Yes	8	26.7
	No	22	73.3
Flap infection	Yes	7	23.3
	No	23	76.7
Wound dehiscence	Yes	3	10
	No	27	90
Bulky appearance	Yes	6	20
	No	24	80
Donor site infection	Yes	4	13.3
	No	26	86.7
Fistula formation	Yes	5	16.7
	No	25	83.3

Figure 10. Postoperative Outcomes and Complications (n = 30)

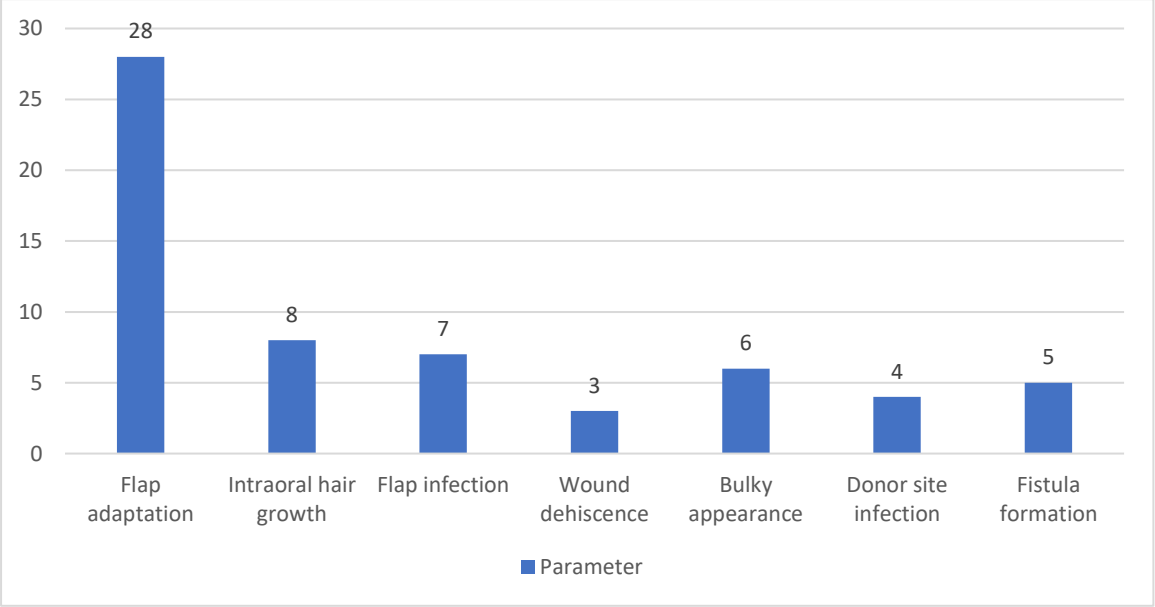
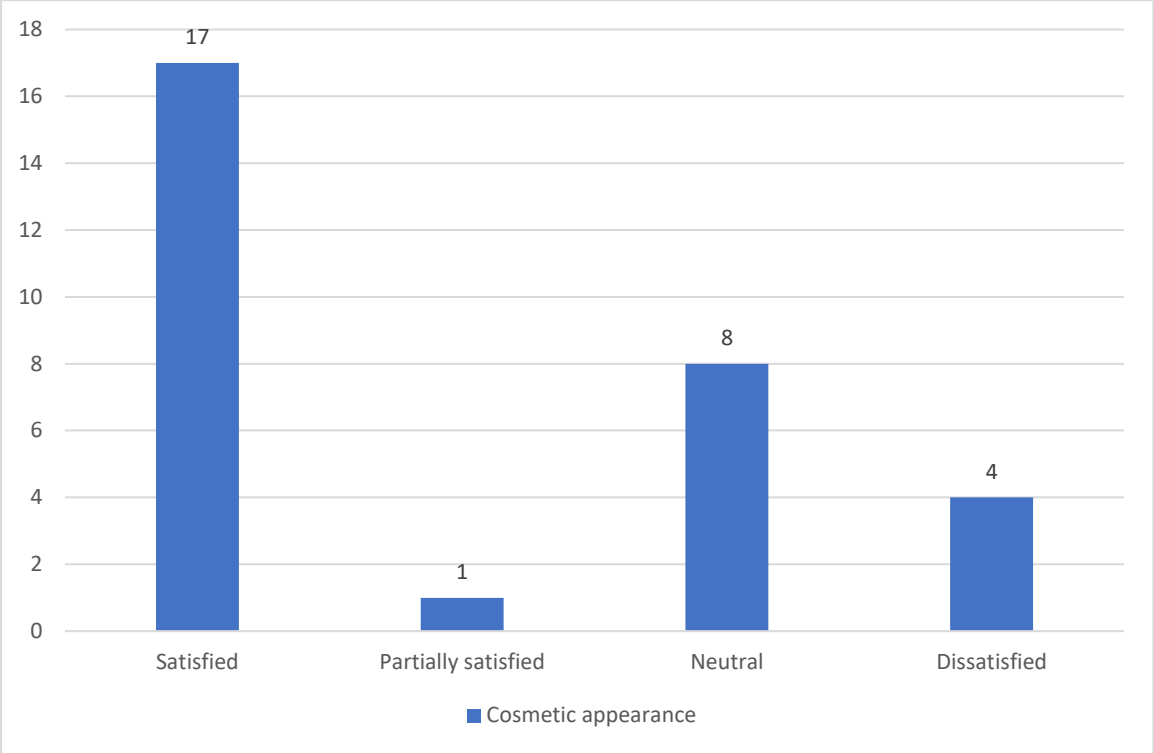
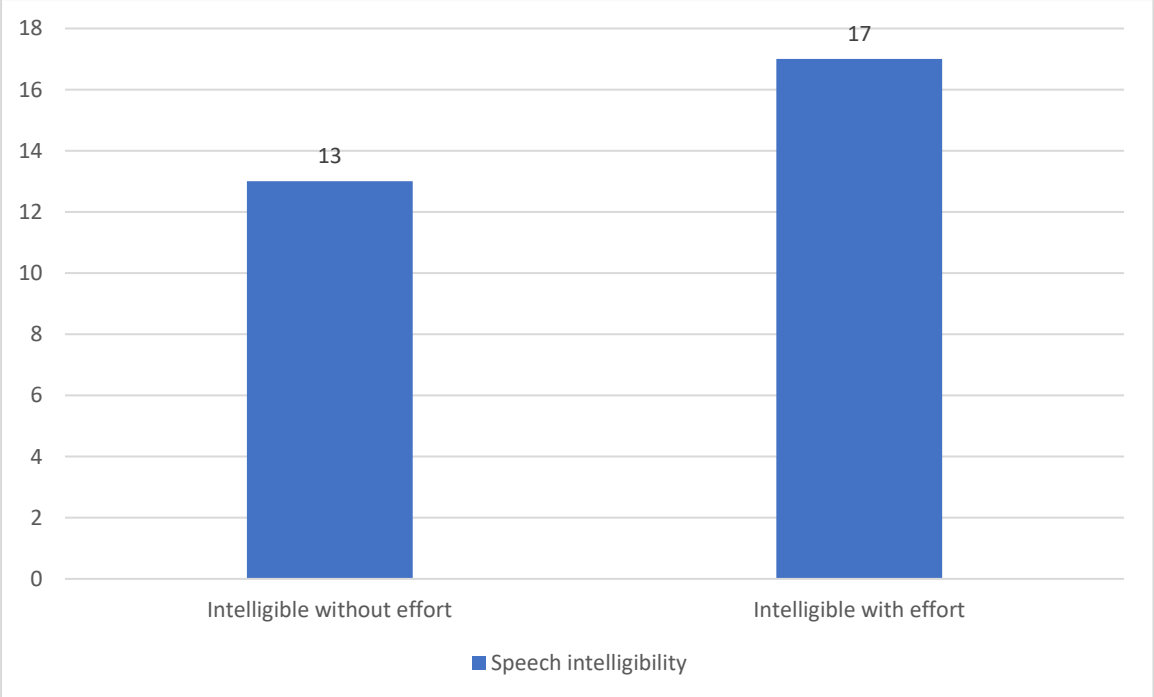


Table 6. Functional and Cosmetic Outcomes

Outcome Parameter	Category	Frequency (n)	Percentage (%)
Cosmetic appearance	Satisfied	17	56.7
	Partially satisfied	1	3.3
	Neutral	8	26.7
	Dissatisfied	4	13.3
Speech intelligibility (6 weeks)	Intelligible without effort	13	43.3
	Intelligible with effort	17	56.7
Recurrence (6 weeks)	Yes	1	3.3
	No	29	96.7

Figure 11. Functional and Cosmetic Outcomes





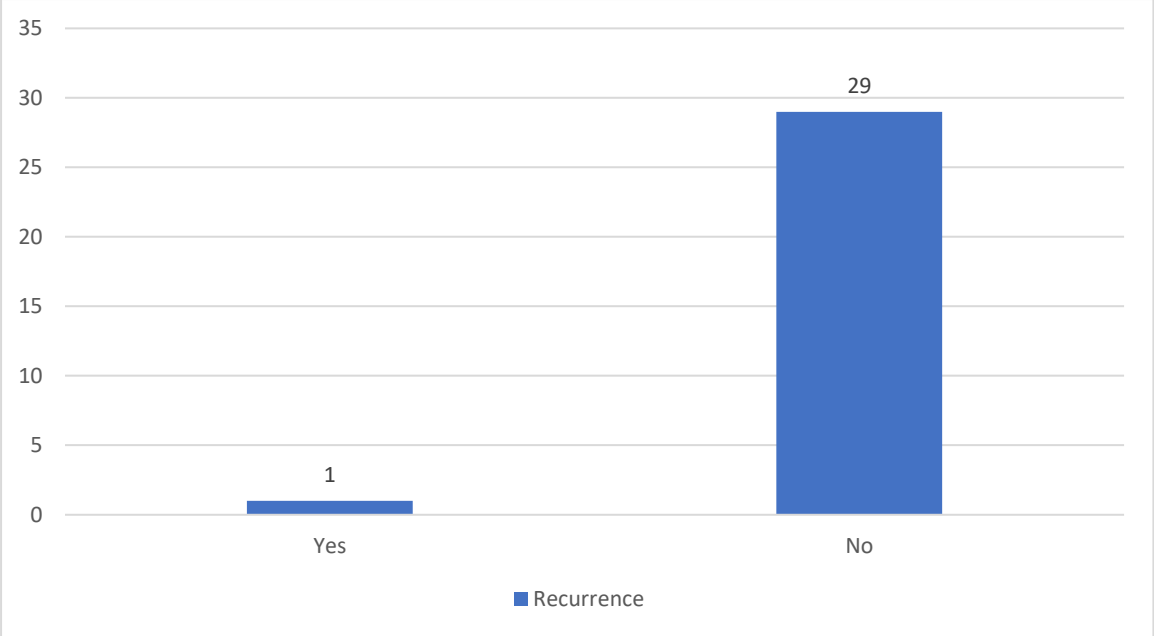
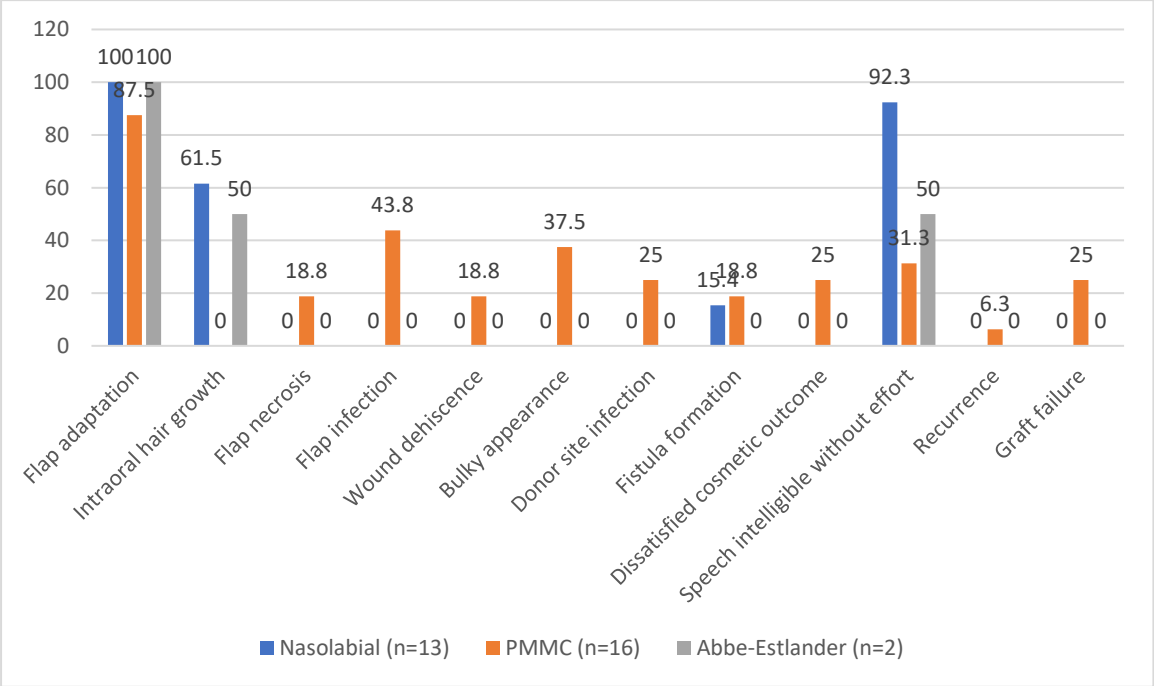


Table 7. Comparison of Flap Types with Postoperative Outcomes

Parameter	Nasolabial (n=13)	PMMC (n=16)	Abbe-Estlander (n=2)	p-value
Flap adaptation	13 (100%)	14 (87.5%)	2 (100%)	0.171
Intraoral hair growth	8 (61.5%)	0 (0%)	1 (50%)	<0.001*
Flap necrosis	0	3 (18.8%)	0	0.088
Flap infection	0	7 (43.8%)	0	0.005*
Wound dehiscence	0	3 (18.8%)	0	0.088
Bulky appearance	0	6 (37.5%)	0	0.010*
Donor site infection	0	4 (25%)	0	0.044*
Fistula formation	2 (15.4%)	3 (18.8%)	0	0.743
Dissatisfied cosmetic outcome	0	4 (25%)	0	0.044*
Speech intelligible without effort	12 (92.3%)	5 (31.3%)	1 (50%)	0.001*
Recurrence	0	1 (6.3%)	0	0.341
Graft failure	0	4 (25%)	0	0.044*

Statistically significant

Figure 12. Comparison of Flap Types with Postoperative Outcomes



DISCUSSION

The present study evaluated the versatility, efficacy, and complication profile of locoregional flaps in oromandibular reconstruction following surgical management of oral cavity malignancies. Reconstruction in this region remains challenging due to the need to restore both function and facial aesthetics. In this prospective observational study of 30 patients, locoregional flaps provided reliable reconstruction with high rates of successful flap adaptation (93.3%) and acceptable functional and cosmetic outcomes. The majority of patients were in the 31–40-year age group with a mean age comparable to previous studies, although relatively younger presentation in our cohort may reflect increasing tobacco and betel nut use among younger individuals. A clear male predominance (70%) was observed, consistent with existing literature, likely due to higher exposure to risk factors such as tobacco and alcohol.

The buccal mucosa was the most commonly involved site (86.7%), in line with other studies, reflecting the habitual placement of tobacco or betel quid in the buccal vestibule.[vii] The mean tumor size (3.9 × 2.9 cm) and average volume (38.8 cc) indicated moderately advanced lesions, suitable for reconstruction using locoregional flaps. The pectoralis major myocutaneous (PMMC) flap was the most frequently utilized technique, followed by the nasolabial and Abbe–Estlander flaps. Previous studies have similarly demonstrated the reliability of these flaps, particularly the nasolabial flap for small-to-moderate defects, with consistently high flap survival rates and favourable reconstructive outcomes.[viii]

Postoperative complications included intraoral hair growth, flap infection, wound dehiscence, donor site infection, and fistula formation. Intraoral hair growth was more commonly associated with nasolabial flaps, while infection rates were slightly higher in our study compared to some reports, possibly due to patient-related factors such as oral hygiene and nutritional status.[ix] Despite these complications, cosmetic outcomes were satisfactory in the majority of patients, and functional recovery—particularly speech intelligibility—was encouraging, with most patients achieving understandable speech within six weeks. These findings are consistent with existing literature and support the continued use of locoregional flaps as a reliable and effective option for reconstruction in oral cavity malignancies.[x]

CONCLUSION

The present study demonstrates that locoregional flaps are reliable and versatile reconstructive options for oromandibular defects following surgical management of oral cavity malignancies. Among the flaps used, the nasolabial flap provided superior functional and cosmetic outcomes, particularly in smaller intraoral defects, with better speech intelligibility and patient satisfaction. In contrast, the pectoralis major myocutaneous (PMMC) flap remained an important reconstructive option for larger defects, although it was associated with a higher incidence of complications such as bulky appearance, infection, and donor site morbidity. Therefore, locoregional flaps showed high rates of flap adaptation and acceptable complication profiles, making them valuable alternatives to free flaps, especially in resource-limited settings. Careful selection of the appropriate flap based on defect size, location, and patient factors is essential to achieve optimal functional and aesthetic outcomes in oral cavity reconstruction.

REFERENCES

i Hu M, Chen H, Wang R, Zhang R, Yao J, Qiu X, et al. Global, regional, and national burden of lip and oral cavity cancer and its attributable risk factors from 1990 to 2021: an analysis of the Global Burden of Disease study 2021. Int J Clin Pharm. 2026;48(1):93–106.

ii Johnson DE, Burtness B, Leemans CR, Lui VW, Bauman JE, Grandis JR. Head and neck squamous cell carcinoma. Nat Rev Dis Primers. 2020;6(1):92.

iii Mehta S, Kuriakose MA. Principles of surgical management of oral cancer. In: Oral and maxillofacial surgery for the clinician. Singapore: Springer Nature Singapore; 2021. p. 1869–1891.

iv Louizakis A, Antoniou A, Kalaitsidou I, Tatsis D. Free tissue transfer versus locoregional flaps for the reconstruction of small and moderate defects in the head and neck region: a narrative review. Cureus. 2025;17(5).

v Thomaidis VK. Cutaneous flaps in head and neck reconstruction: from anatomy to surgery. Springer; 2014.

vi Boyette J, Robb PK Jr, Kim IA. Flaps and grafts. In: Facial plastic and reconstructive surgery: a comprehensive study guide. Cham: Springer International Publishing; 2020. p. 75–105.

vii Bhat S. Clinicopathological spectrum of oral cavity and oropharyngeal malignancies [dissertation]. India: Rajiv Gandhi University of Health Sciences; 2010.

viii Kudva A, Saha M, Singh A, Roy S, Gadicherla S, Karnataki S. Minimally invasive local flaps for the reconstruction of oral soft tissue ablative defects: clinical pointers and an algorithm based on our experience. J Maxillofac Oral Surg. 2026;1–1.

ix Thankappan K, Patel T, Menon LR, Balasubramanian D, Iyer S. Reconstruction of lateral gingivobuccal defects after oral cancer resection: a systematic approach based on a novel classification. Oral Maxillofac Surg Clin. 2026.

x Galviz Tabares B, Ruiz Geithner CM, Pierpoline J, Mosquera C. Long-term functional outcomes of free flaps versus locoregional flaps in soft tissue reconstruction for oral cavity cancer: a systematic review. J Craniofac Surg. 2025;36(4):1278–85.