International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 14, No. 4, April 2025 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_14.4.2025.64

ORIGINAL RESEARCH

A Prospective Study on Sutural Fixation of Nasogastric Tube via the Membranous Nasal Septum in Free Flap Reconstruction for Oral Cancers at a Tertiary Care Centre in Mumbai

[1]Dr. Yogesh Jaiswal, [2]Dr. Vinay Jacob, [3]Dr. Sanjog Jaiswal

[1,2]Assistant Professor, Grant Medical College and Sir JJ group of hospitals, Byculla, Mumbai, India
[3]Senior Consultant Surgical Oncologist, Shalby Hospital, Indore, India

Corresponding Author
Dr. Yogesh Jaiswal
Assistant Professor, Grant Medical College and Sir JJ group of hospitals, Byculla, Mumbai, India
Email: yogesh.jaiswal0101@gmail.com

Received: 28 February, 2025 Accepted: 23 March, 2025 Published: 05 April, 2025

ABSTRACT

Background: Head and neck cancers, particularly oral squamous cell carcinoma (OSCC), are on the rise in India, with complex resections often necessitating free flap reconstruction. Postoperative enteral nutrition via nasogastric (NG) tube is essential, yet traditional fixation methods like adhesive taping or nasal bridles are associated with tube dislodgement, nasal necrosis, and discomfort. This study evaluates a novel sutural fixation technique using the membranous nasal septum to secure the NG tube in such patients. **Methods:** A prospective cross-sectional study was conducted on 60 OSCC patients undergoing free flap reconstruction between January 2023 and June 2024 at a tertiary care center in Mumbai. NG tube fixation was achieved intraoperatively using an absorbable 2-0 vicryl suture passed through the membranous nasal septum and anchored with a Roman sandal-style knotting technique. Patients were monitored for tube dislodgement, alar or columellar necrosis, and nasal discomfort. Data were analyzed using SPSS version 25. **Results:** The mean age of patients was 52.6 years; 83.3% were male. The anterolateral thigh (ALT) flap was the most commonly used (40%). NG tube feeding was initiated on postoperative day 3 in 61.7% of cases. Dislodgement occurred in only 5 patients (8.3%), and columellar necrosis was seen in 2 (3.3%); notably, no alar necrosis was observed. Nasal discomfort was mild or insignificant in all cases. **Conclusion:** Sutural fixation of NG tubes via the membranous nasal septum is a safe, secure, and low-complication technique, offering a viable alternative to conventional methods in oral cancer reconstruction.

Keywords: Oral cancer, free flap, nasogastric tube, sutural fixation, ALT flap, nasal necrosis, Roman sandal technique.

INTRODUCTION

Head and neck cancers (HNCs) represent a significant global health burden, with an especially high incidence in the Indian subcontinent. These malignancies primarily include cancers of the oral cavity, pharynx, and larynx, with squamous cell carcinoma (SCC) accounting for over 90% of cases due to chronic exposure to tobacco, alcohol, and betel nut use in endemic regions[1,2]. According to the GLOBOCAN 2020 estimates, head and neck cancers are projected to increase by 57.5% in India by the year 2040, underscoring the urgent need for improved therapeutic and perioperative strategies[3].

Oral squamous cell carcinoma (OSCC) arises from the mucosal epithelium and involves complex anatomical areas, often necessitating extensive surgical resections. Reconstruction of these defects is critical to restore function and appearance, with microsurgical free flap reconstruction emerging as the gold standard for advanced-stage oral cancers[4]. Among various free flaps, the anterolateral thigh (ALT) flap is widely considered the workhorse flap due to its versatility, robust vascularity, and low donor site morbidity[5].

Postoperative care of such patients is challenging, particularly in the context of nutrition, as pain, mucosal edema, and impaired swallowing delay oral intake. Enteral nutrition through a nasogastric (NG) tube is commonly employed for nutritional support and medication delivery. NG tubes also help minimize the risk of aspiration in recumbent postoperative

DOI: 10.69605/ijlbpr_14.4.2025.64

patients[6]. However, in patients undergoing free flap reconstruction, improper fixation of NG tubes can result in serious complications such as tube dislodgement, reinsertion trauma, and necrosis of the nasal soft triangle and columella, especially due to prolonged pressure and poorly secured tubes[7].

Various NG tube fixation methods have been described, including adhesive taping, nasal bridle techniques, rubber band pinning, and devices such as the AMT bridle system. Each has associated benefits and drawbacks. Adhesive tape, though simple, often causes skin breakdown and is prone to loosening, leading to dislodgement and alar necrosis. Nasal bridle techniques provide better tube retention but may be uncomfortable and occupy both nostrils, complicating airway management[8].

There is, however, limited literature exploring surgically anchored fixation techniques utilizing the membranous nasal septum, especially in the context of oral cancer surgeries. Sutural fixation offers a stable, low-cost alternative, especially when performed intraoperatively under direct visualization. Our proposed technique uses an absorbable 2-0 vicryl suture passed through the membranous septum with a Roman sandal-style crossing for reinforcement. This method aims to balance secure fixation while minimizing pressure necrosis and nasal discomfort. To date, few studies have evaluated NG tube fixation methods specifically in the setting of oral cancer patients undergoing free flap reconstruction. Given the anatomical complexity and reconstructive challenges involved, it is essential to investigate techniques that ensure secure fixation, minimize nasal and flap-related complications, and improve patient comfort. This study evaluates a novel sutural fixation method and compares its outcomes with traditionally reported techniques such as adhesive tape and bridle fixation, thereby contributing to safer perioperative protocols for oral cancer management.

METHODS

This was a prospective, cross-sectional study conducted at the Department of Plastic and Reconstructive Surgery, Grant Government Medical College and Sir JJ Group of Hospitals, Mumbai, between January 2023 and June 2024. The study aimed to evaluate the safety, efficacy, and complication profile of sutural fixation of nasogastric (NG) tubes using the membranous nasal septum in patients undergoing microsurgical free flap reconstruction for oral squamous cell carcinoma (OSCC).

A total of 60 consecutive patients with biopsy-proven OSCC requiring free flap reconstruction were enrolled in the study. Patients were included if they were aged ≥18 years, medically fit for surgery, and had no history of flap failure or re-exploration. Only those undergoing primary reconstruction with microsurgical free flaps (e.g., ALT, FRAPF, FOCFF) were included. Patients reconstructed with pedicle flaps, those unfit for microvascular reconstruction, or lost to follow-up were excluded. Ethical clearance for the study was obtained from the Institutional Ethics Committee, and written informed consent was taken from all participants.

All surgeries were performed by a team of experienced plastic surgeons following oncologic resection by head and neck surgeons. After tumor resection and neck dissection, the selected free flap was harvested and inset using standard microsurgical techniques. NG tube insertion was carried out under general anesthesia, and correct placement was confirmed by the anesthesiologist.

The sutural fixation technique involved passing a 2-0 vicryl round-bodied suture through the membranous nasal septum from the nostril bearing the NG tube to the contralateral nostril. The suture was then returned through the septum, creating a U-shaped anchor. A square knot was placed 1 cm away from the septum to prevent vascular compromise. Subsequently, the suture was looped horizontally across the tube in a Roman sandal configuration five times, and secured with a final double square knot. Care was taken to avoid oblique looping, as this has been associated with loosening and subsequent tube dislodgement.

Postoperatively, patients were monitored in a high-dependency unit for the first 48 hours, followed by step-down care. Hourly flap monitoring was done for the initial 2 days, every 2 hours for the next 2 days, and then every 4 hours thereafter. NG tube feeding was initiated between postoperative days 3 and 5, depending on the clinical condition. Patients were typically discharged around postoperative day 8, and oral feeds were commenced by day 14 following NG tube removal.

Detailed records were maintained regarding the day of NG tube initiation, day of removal, any episodes of dislodgement or expulsion, and associated complications such as alar necrosis, columellar necrosis, nasal discomfort, or flap-related issues. In cases of dislodgement, the timing, cause, and corrective intervention (e.g., re-insertion, re-anchoring) were noted.

Data were collected in a master chart using Microsoft Excel, and statistical analysis was performed using SPSS version 25. Categorical variables such as sex, flap type, and complication rates were expressed as frequencies and percentages, while continuous variables such as age and duration to NG tube removal were expressed as means ± standard deviation. Comparative analytical tables and chi-square tests were used to evaluate associations between flap type, NG tube fixation timing, and complication rates, with p-values < 0.05 considered statistically significant.

RESULTS

A total of 60 patients undergoing free flap reconstruction following oral cancer surgery were enrolled in the study. The study cohort consisted

DOI: 10.69605/ijlbpr_14.4.2025.64

predominantly of males (n=50; 83.3%), with females accounting for 16.7% (n=10). The mean age of patients was 52.6 ± 6.2 years.

Table 1: Sex Distribution of Study Participants

Sex	Frequency	Percentage (%)
Male	50	83.3%
Female	10	16.7%

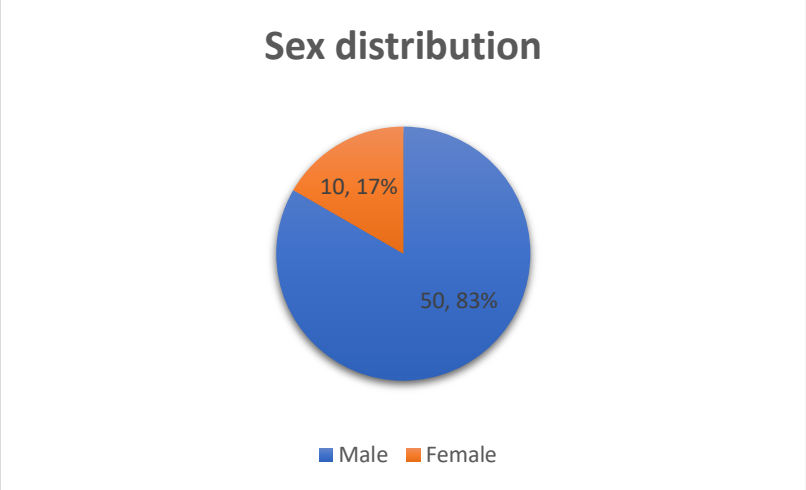

Figure1: Sex Distribution of Study Participants

In this study, the most frequently used flap for reconstruction following oral cancer resection was the anterolateral thigh (ALT) flap, utilized in 26 patients (43.33%). Additionally, the bipedal ALT flap, a modification designed for complex composite defects, was used in 17 patients (28.33%). Taken together, ALT-based flaps were employed in 43 out of 60 patients (71.66%), highlighting their dominance and reliability in oral cavity reconstruction. These flaps were primarily selected for their versatility, long vascular pedicle, dual-skin paddle capability, and low donor site morbidity, making them ideal for both intraoral and external soft tissue coverage.

The free radial artery perforator flap (FRAPF) was used in 8 cases (13.33%), and its variant, the bipdeal FRAPF, in 1 case (1.67%), bringing the total FRAPF-based reconstructions to 9 patients (15%). These were typically used for intraoral lining or in patients with specific vessel requirements or donor site preferences. The fibular osteocutaneous free flap (FOCFF) was used in 6 patients (10%), primarily for mandibular bony reconstructions, and combined flap techniques such as FOCFF with ALT were employed in 2 cases (3.33%) for more extensive defects requiring both soft tissue and bone reconstruction.

Table 2: Flap Type Distribution

Flap Type	Frequency	Percentage (%)
ALT (Anterolateral Thigh)	26	43.33
Bipedal ALT	17	28.33
FRAPF (Free Radial Artery Perforator Flap)	8	13.33
FOCFF (Fibular Osteocutaneous Free Flap)	6	10
FOCFF and ALT	2	3.33
Bipdeal FRAPF	1	1.67
Total	60	100

NG tube feeding was initiated between postoperative days 3 to 5 in all patients. The majority (61.7%) were started on day 3, and the NG tube was typically removed by postoperative day 14 to 16.

Table 3: NG Tube Feeding Initiation

NG Start Day	Frequency	Percentage (%)
Day 3	37	61.7%
Day 4	20	33.3%
Day 5	3	5.0%

DOI: 10.69605/ijlbpr_14.4.2025.64

Among the 60 patients studied, nasogastric (NG) tube dislodgement was observed in 8 cases (13.3%), while no dislodgement occurred in the remaining 52 patients (88.7%). Of the dislodgements, partial expulsion occurred in 5 patients (8.3%), and complete expulsion was noted in 3 patients (5%).

Table 4: NG Tube Dislodgement Incidence

Dislodgement Type	Frequency	Percentage (%)
Nil	52	88.7%
Partial Expulsion	5	8.3%
Complete Expulsion	3	5%

Table 5: Columellar Necrosis Events

Columellar Necrosis	Frequency	Percentage (%)
No	58	96.7%
Yes	2	3.3%

Nasal discomfort was reported as mild or insignificant in 100% of cases. This contrasts favorably with nasal bridle and tape methods reported in other literature where discomfort rates range from 20–30%.ALT flap was the most common flap used, supporting its role as a reconstructive workhorse in oral cavity cancers.

Figure 2: Intraoperative Photograph Showing Sutural Fixation of Nasogastric Tube via Membranous Nasal Septum

DISCUSSION

In the present study, a significant male predominance (83.3%) was observed, consistent with the well-documented gender disparity in head and neck cancers (HNCs). This is attributable to the higher prevalence of risk factors such as tobacco use, alcohol consumption, and betel nut chewing in males in the Indian subcontinent[9]. Similar demographic trends have been observed in previous epidemiological studies, including those by Chaturvedi et al. and ICMR reports, which highlight that over 70–80% of oral cancer cases in India occur in males[10]. This reaffirms the relevance of targeted prevention strategies focused on high-risk male populations.

The present study reinforces the versatility and dominance of the anterolateral thigh (ALT) flap in oral cavity reconstruction. A total of 43 out of 60 patients (71.66%) received ALT-based reconstructions, including 26 standard ALT flaps (43.33%) and 17 bipedal ALT flaps (28.33%). This affirms the ALT flap's status as a reconstructive workhorse in oral cancer surgery due to its adaptability, long vascular pedicle, generous skin paddle, and favorable donor site profile[5,11]. The bipedal ALT, in particular, was effectively utilized in complex defects involving external skin, commissure, or cheek, where dual paddle design provided enhanced flexibility and coverage.These findings align with studies by Wei et al. and Chen et al., where ALT-based reconstructions were preferred in over 60% of complex oral cavity cases[12,13]. Additionally, FRAPF-based reconstructions accounted for 15% of cases, while FOCFF and its combinations were used in another 13.3%, especially for mandibular bony defects. The consistent use of ALT flaps across defect types supports their universal applicability and surgeon familiarity, further contributing to lower complication rates and improved functional outcomes.

DOI: 10.69605/ijlbpr_14.4.2025.64

In our cohort, NG feeding was initiated predominantly on postoperative day 3 (61.7%), which aligns with standard postoperative recovery timelines following major head and neck surgery[4,13]. Early enteral feeding has been shown to enhance wound healing, maintain mucosal immunity, and reduce infection rates, as supported by findings from Schaller et al., where initiation between day 2–4 demonstrated reduced sepsis and pneumonia rates[14]. However, care must be taken to ensure secure tube fixation during early feeding, especially in patients with perioral or palatal flaps, where even minor movement can disrupt microvascular anastomoses.

NG tube dislodgement was observed in 8 out of 60 patients (13.3%), comprising 5 cases of partial expulsion (8.3%) and 3 cases of complete expulsion (5%), while 52 patients (88.7%) experienced no dislodgement. These results indicate a strong fixation profile for the sutural method using the membranous nasal septum, especially when compared to traditional adhesive tape methods, which show dislodgement rates as high as 30–40%[15].Dislodgement in our study was associated primarily with technical factors, such as oblique knot placement in the Roman sandal pattern, which led to reduced suture tension over time. These incidents underscore the importance of horizontal, secure crossing patterns for reliable fixation. Most dislodged tubes were managed successfully with re-advancement or reinsertion, and no secondary complications such as aspiration or infection were recorded.Compared to nasal bridles, which though more secure (reported dislodgement <5%) can cause significant nasal discomfort, epistaxis, or skin irritation, our method had the advantage of minimal discomfort and no alar necrosis, making it not only effective but also well tolerated by patients[7,8,16]. These findings validate the sutural approach as a low-cost, low-morbidity alternative, especially in resource-constrained environments or high-volume oncologic centers.

Only 2 patients (3.3%) in our study developed columellar necrosis, both of whom had preceding NG tube dislodgement. No cases of alar necrosis were recorded, underscoring the relative vascular safety of suturing through the membranous nasal septum. In contrast, adhesive taping methods—particularly in humid environments or over prolonged use—have been shown to result in alar and nasal soft triangle necrosis in 10–20% of cases due to constant pressure and shearing[17]. Even nasal bridles, although superior in tube retention, may cause local necrosis when not repositioned regularly[16]. Our findings thus support that trans-septal sutural fixation provides a safe zone for anchorage, avoiding the richly vascularized alar region, and may therefore be superior in long-term use.

CONCLUSION

This prospective clinical study highlights the effectiveness of sutural nasogastric tube fixation through the membranous nasal septum as a secure, low-complication alternative in patients undergoing microsurgical free flap reconstruction for oral cancer. The method demonstrated a high retention rate (91.7%), minimal nasal trauma, and no alar necrosis, which are significant improvements over traditional methods such as adhesive tape and nasal bridle fixation.

The partial and complete dislodgement rates observed were low (5% and 3.3% respectively), and were largely associated with technical errors in knot orientation rather than inherent flaws in the method itself. Additionally, only two cases of columellar necrosis were reported, both linked to prior dislodgement, indicating that when performed correctly, the technique is both safe and reliable.

Importantly, the technique enabled early initiation of enteral nutrition (majority on day 3) without increasing complications, thereby supporting faster recovery and better postoperative outcomes. The ALT flap, as expected, remained the most frequently used and reliable reconstructive option, reinforcing its role as a workhorse flap in oral oncology.

This study, while promising, is limited by its single-center design and modest sample size, which may affect the generalizability of the results. Additionally, the absence of a comparative control group using adhesive or bridle fixation techniques restricts the ability to draw direct statistical comparisons. The short-term postoperative follow-up did not allow assessment of long-term complications such as late-onset nasal deformities or chronic nasal discomfort.

REFERENCES

1. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. *Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries*. CA Cancer J Clin. 2018;68(6):394–424.
2. Dikshit R, Gupta PC, Ramasundarahettige C, Gajalakshmi V, Aleksandrowicz L, Badwe R, et al. *Cancer mortality in India: a nationally representative survey*. Lancet. 2012;379(9828):1807–16.
3. Ferlay J, Ervik M, Lam F, Colombet M, Mery L, Piñeros M, et al. *Global Cancer Observatory: Cancer Today*. Lyon, France: International Agency for Research on Cancer; 2020.
4. Rogers SN, Lowe D, Brown JS, Vaughan ED. *Health-related quality of life and clinical function after primary surgery for oral cancer*. Br J Oral Maxillofac Surg. 2002;40(1):11–6.
5. Wei FC, Jain V, Celik N, Chen HC, Chuang DC, Lin CH. *Have we found an ideal soft-tissue flap? An experience with 672 anterolateral thigh flaps*. Plast Reconstr Surg. 2002;109(7):2219–26.
6. Zhen L, Zhu H, Zhang Y, Zhang Z. *Enteral nutrition versus parenteral nutrition after major oral and maxillofacial surgery: systematic review and meta-analysis*. J Craniomaxillofac Surg. 2013;41(7):e317–26.
7. Soh C, Jackson T, Tan F, Tan W, Koong H, Low TH. *Reducing nasogastric tube dislodgement: a quality*

DOI: 10.69605/ijlbpr_14.4.2025.64

improvement project using nasal bridles in head and neck surgery. BMJ Open Qual. 2019;8(2):e000398.
8. Pillai JB, Sadasivan A, Bhanu K. *Complications of nasogastric tube placement in patients with maxillofacial trauma and surgery*. J Oral Maxillofac Surg. 2009;67(5):1023–7.
9. Chaturvedi P, Pai PS, Nair S, Chaturvedi M, Chaukar D, Epari S, et al. *Head and neck cancer: a global perspective on epidemiology and prognosis*. Anticancer Res. 2013;33(7):3645–9.
10. National Centre for Disease Informatics and Research (NCDIR). *Three-year report of the population-based cancer registries: 2012–2014*. Bengaluru: Indian Council of Medical Research; 2016.
11. Lonie S, Herle P, Paddle A, Pradhan N, Birch T. *Anterolateral thigh flap—revisited: a review of 653 cases*. Plast Reconstr Surg. 2013;131(4):847–55.
12. Chen HC, Tang YB, Mardini S. *Anterolateral thigh flap: an ideal soft tissue flap*. Clin Plast Surg. 2003;30(3):383–401.
13. Penel N, Fournier C, Lefebvre D, Mallet Y, Lefebvre JL. *Nutritional support during the management of patients with head and neck cancer: can we improve the routine strategy?*. Support Care Cancer. 2005;13(4):242–8.
14. Schaller M, Fink U, Reith W, Kirsch CM. *Early enteral nutrition in medical intensive care patients: a prospective study*. Clin Nutr. 1996;15(2):75–9.
15. Campillo B, Paillaud E, Uzan I, Merlier I, Abdellaoui M, Bories PN. *Value of nasal bridle for preventing nasogastric tube dislodgement in geriatric patients*. Clin Nutr. 2004;23(3):423–8.
16. Rassias AJ, Ball PA, Corwin HL. *A prospective study of nosocomial bacteremia in critically ill patients with nasogastric tubes*. Arch Surg. 1998;133(6):639–43.
17. Sriram K, Meguid MM. *Nutritional support in head and neck cancer patients: a review of the evidence*. World J Surg. 2013;37(3):575–83.