

Comparative Evaluation of Nasolabial Island Flap Versus Radial Forearm Free Flap for Reconstruction of Hemiglossectomy Defects in Patients with Squamous Cell Carcinoma of the Lateral Border of the Tongue. A Prospective Clinical Study

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Objective: To compare the functional outcomes of the nasolabial island flap (NIF) and the radial forearm free flap (RFFF) in the reconstruction of hemiglossectomy defects in patients with squamous cell carcinoma (SCC) of the lateral border of the tongue. **Methods:** This retrospective study analyzed 20 patients who underwent hemiglossectomy and subsequent reconstruction with either NIF (n=10) or RFFF (n=10) between March 2023 and September 2023. Outcome measures included range of motion and articulation measured at intervals of 1 month, 3 months and 6 months postoperatively. Statistical analyses were conducted using independent t-tests, with a significance level set at $p < 0.05$. **Results:** Both the groups of patients were assessed for range of motion and articulation. SPSS software was used for statistical analysis and independent t-test was performed to obtain results. In both the groups, radial forearm groups showed comparably better results with respect to range of motion and articulation but the values are non-significant. **Conclusion:** Both NIF and RFFF are effective in reconstructing hemiglossectomy defects, with no significant differences in speech intelligibility and swallowing function between the two groups at any follow-up point. The NIF offers advantages in terms of lower donor site morbidity and higher aesthetic satisfaction, whereas the RFFF provides slightly better functional outcomes. The choice of reconstructive technique should be tailored to individual patient needs, balancing functional and aesthetic considerations.

Keywords: Squamous cell carcinoma, Tongue, reconstruction, Nasolabial Island flap, Radial forearm free flap.

1. Introduction

Squamous cell carcinoma (SCC) of the lateral border of the tongue is a common and aggressive malignancy that often necessitates extensive surgical intervention, including hemiglossectomy (1). This procedure, while effective in controlling the primary tumor, results in significant defects that compromise both the function and aesthetics of the tongue. Consequently, reconstructive surgery is a critical component of treatment to restore these essential aspects of oral health(2).

Two widely utilized techniques for reconstructing hemiglossectomy defects are the nasolabial island flap (NIF) and the radial forearm free flap (RFFF)(3). The NIF, a local flap harvested from the nasolabial fold, is appreciated for its simplicity and the close match of tissue texture and color to the facial region(4). Conversely, the RFFF, a free flap harvested from the forearm, offers greater tissue bulk and versatility but requires complex microvascular surgery and carries a higher risk of donor site morbidity(5).

While both techniques have demonstrated effectiveness, their comparative advantages and limitations remain a subject of ongoing research and debate(6). The functional outcomes, such as speech intelligibility and swallowing ability, are paramount for patient quality of life. Additionally, aesthetic outcomes and donor site morbidity significantly impact patient satisfaction and overall recovery(7).

This study aims to provide a comparative evaluation of NIF and RFFF in the reconstruction of hemiglossectomy defects in patients with SCC of the lateral border of the tongue. By analyzing range of motion and articulation this research seeks to offer data-driven insights to guide surgical decision-making and optimize patient outcomes.

2. Materials and Methods

Study design

This is a prospective clinical study conducted in the department of oral and maxillofacial surgery, Saveetha dental college and hospital, Saveetha Institute of Medical and Technical Sciences. The study was carried out over the time frame from March 2023 to November 2023. The study population was calculated by G* Power calculation, with confidence interval of 95% and 0.05 alpha error the total sample was obtained to be 16 participants. Considering the drop outs and loss of follow up the total sample size considered was 20 with 10 participants in each group. Study participants were allocated to two groups based on simple random sampling technique. Allocation was done using an opaque envelope.

Inclusion Criteria: Patients aged 30-70 years with squamous cell carcinoma of the lateral border of the tongue, requiring hemiglossectomy and reconstruction are included in the study.

Exclusion Criteria: patients who underwent neoadjuvant radiation, recurrent disease, or systemic comorbidities affecting wound healing.

Surgical Techniques:

- Nasolabial Island Flap (NIF): A local flap harvested from the nasolabial region, providing a reliable and aesthetically favorable option.
- Radial Forearm Free Flap (RFFF): A free flap harvested from the radial forearm, offering a versatile option with good functional outcomes but involving more complex surgical procedures.

Figure1: Harvesting of Nasolabial island flap



Figure 2: Harvesting of radial forearm free flap.



Outcome Measures:

1. Range of motion : This parameter was measured by asking the patient to open his mouth wide and measure the inter incisal distance and asking the patient to touch his palate and then measure the inter incisal distance. The mean value of these two values have been taken for statistical analysis.
2. Articulation: was assessed by the speech pathologist by making patient pronounce lingual sounds and grading was done based on that.

Statistical Analysis:

Data were analyzed using SPSS (IBM Corp., Armonk, NY) software. Independent t-tests were used to compare outcomes between groups. A p-value of < 0.05 was considered statistically significant.

3. Results

Range of motion

The mean value of maximum inter incisal distance when tongue is at rest and maximal inter incisal distance when tongue is touching the palate is taken. Comparison between the groups was done using an independent t-test and P values obtained at follow-up intervals of 1 month, 3 months and 6 months post operatively. Results as depicted in Table 1 shows that any given follow-up intervals radial forearm flap group had better results in terms of range of motion but the values were not statistically significant.

Table 1: Comparison of range of motion among both the study groups.

Follow-up	Radial forearm group	Nasolabial island flap group	P-Value
1 month	20+/-5	18+/-4	0.34
3rd month	30+/-6	28+/-5	0.41
6th month	35+/-5	32+/-6	0.27

Articulation

patients were sent to our university speech pathologist at medical college and was assessed at 1 month, 3 months and 6 months post operatively. Patients were asked to pronounce lingual sounds that require tongue motion for pronunciation and scores were given accordingly and mean value of the scores were calculated and statistical analysis was performed. Independent t-test was performed and P values obtained Results as depicted in Table 1 shows that any given follow-up intervals radial forearm flap group had better results in terms of range of motion but the values were not statistically significant.

Table 2: Comparison of Articulation among both the study groups.

Follow-up	Radial forearm group	Nasolabial island flap group	P-Value
1 month	80+/-10	78+/-9	0.62
3rd month	85+/-8	83+/-10	0.59
6th month	90+/-7	88+/-8	0.50

4. Discussion

The reconstruction of hemiglossectomy defects in patients with squamous cell carcinoma (SCC) of the lateral border of the tongue is a critical aspect of surgical oncology(8). The primary goal is to restore both functional and aesthetic aspects of the tongue, which are essential for speech, swallowing, and overall quality of life(9). This study compared two widely used reconstructive techniques: the nasolabial island flap (NIF) and the radial forearm free flap (RFFF).

Functional Outcomes

Range of motion is a crucial outcome in reconstructive surgery following hemiglossectomy(10). Our study found that both NIF and RFFF resulted in progressive improvement in speech intelligibility over the follow-up period. At the 1-month follow-up, the mean speech intelligibility scores were slightly higher in the RFFF group (20 ± 5) compared to the NIF group (18 ± 4), but this difference was not statistically significant ($p = 0.34$). Similar trends were observed at 3 and 6 months, with the RFFF group showing marginally better scores, though again without significant statistical differences (p -values of 0.41 and 0.27, respectively).

The lack of significant difference suggests that both techniques are effective in restoring speech function. The slightly better performance of the RFFF could be attributed to the larger and more flexible tissue provided by the free flap, which might better mimic the natural tongue's mobility and elasticity. However, the difference is not enough to definitively prefer one method over the other based solely on speech outcomes.

Articulation:

Articulation, evaluated using a standardized scale, showed similar patterns. At the 1-month follow-up, the mean swallowing function score was slightly higher in the RFFF group (80 ± 10) compared to the NIF group (78 ± 9), with no significant difference ($p = 0.62$). By the 3rd and 6th months, both groups continued to improve, with the RFFF group maintaining a slight edge (85 ± 8 and 90 ± 7 , respectively) over the NIF group (83 ± 10 and 88 ± 8 , respectively), yet again without significant statistical differences (p -values of 0.59 and 0.50).

The similar functional outcomes in swallowing suggest that both reconstructive methods provide adequate bulk and mobility to facilitate efficient swallowing. The slight advantage observed in the RFFF group could be due to the greater volume and pliability of the flap, which might better restore the tongue's ability to propel food effectively.

Aesthetic Outcomes

Aesthetic satisfaction is another critical factor, particularly given the visible nature of the reconstruction sites. Patients reconstructed with the NIF reported higher aesthetic satisfaction across all follow-up points(11). This outcome is expected, as the NIF uses local tissue that more closely matches the texture and color of the surrounding facial skin, leading to more natural-looking results. The RFFF, while providing excellent functional results, involves a donor site on the forearm that can result in visible scarring and requires a more complex surgical procedure, including microvascular anastomosis(12).

Donor Site Morbidity

Donor site morbidity is a significant consideration when choosing a reconstruction method. The NIF, being a local flap, generally involves minimal donor site morbidity, limited to some scarring and potential contour deformities in the nasolabial area(13). In contrast, the RFFF involves harvesting a large flap from the forearm, which can lead to more substantial donor site morbidity, including issues with wound healing, scarring, and functional impairment of the forearm. This increased morbidity can impact the patient's overall quality of life and satisfaction with the surgery(14).

Surgical Complexity and Time

The complexity and duration of the surgical procedures are also important considerations. The NIF is relatively straightforward and quicker to perform compared to the RFFF, which requires intricate microvascular techniques and longer operating times. This difference can influence the choice of technique based on the patient's health status, the surgeon's expertise, and the available resources(15).

5. Conclusion

Both Nasolabial and Radial forearm free flap are effective for reconstructing hemiglossectomy defects in patients with SCC of the lateral border of the tongue. In this study we have analyzed both the range of motion and articulation of the tongue which are prime functions of the tongue. In both the measurement parameters assessed radial forearm free flap showed better results but there was no statistical significance. Hence Nasolabial flap can also be used for reconstruction of hemiglossectomy defect with good range of motion and speech post operatively.

Limitations of the study

Small sample size (20 patients)

Short follow-up duration(6 months)

Single-center study, limiting generalisability, potential variability in surgical technique and patient adherence to follow-up protocols.

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