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Various flap reconstruction options for tongue defect in oral squamous cell carcinoma

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ABSTRACT

Carcinoma of tongue cases is increasing in number day by day. An earlier diagnosis improves a person's chance of surviving five years after being diagnosed with tongue carcinoma. The primary therapeutic option for tongue squamous cell carcinoma is surgery. When evaluating the treatment plan, it is essential to consider the potential effects of such treatments on speech, swallowing, and cosmetic outcomes to get the first-rate loco-regional control rate. Following primary tumor removal, reconstruction should be done expeditiously. The degree of the residual tumor and the type of tongue replacement used to determine how severe the functional impairment will be. In this case series, we attempt to present our institutional data of 142 retrospective cases to highlight various commonly used flaps for tongue reconstruction based on the size of the defect.

Keywords: Flap, Reconstruction, OSCC, Tongue defect, Tongue carcinoma

1. INTRODUCTION

Carcinoma of the tongue is a typical head and neck tumour representing approximately 50% of all intraoral carcinoma. About half of all intra-oral carcinomas are defined by it. The lateral margin of the movable tongue is where squamous cell carcinoma most frequently develops (Ligier et al., 2011). Malignant tongue carcinomas require resection of the lesion with safe surgical margins leading to various defects of different sizes. Smaller superficial tumours can be removed locally and repaired by split-thickness skin grafting, secondary intention healing, or primary closure. If a soft tissue reconstruction is requested, then there are various options to do so. It could be a local, regional or distant flap. Inferior nasolabial flap tunnelled under the mandible (INFTUM), Pectoralis major myocutaneous flap (PMMC), Radial artery forearm free flap (RAFFF), and Anterolateral thigh flap (ALT) is the most commonly used flap. Vascularized tissue transfer is used to repair larger tumours, and a mandibulotomy may be necessary to provide enough access to large or posterior lesions. Microvascular free flaps on the lateral or radial arm enable exceptional mobility with minimal bulk. The surgeon faces a challenging decision when treating large oral tongue malignancies that transcend the midline. If initial closure or healing by secondary intension is

appropriate, radial forearm or lateral arm flaps work best for reconstructing more minor posterior tongue lesions. A free rectus flap is frequently used to restore more extensive excisions (75 per cent of the total) (Harrison et al., 2003).

2. CASE PRESENTATION

We present to you a case series of retrospective data of the last five years (n = 142) cases of oral squamous cell carcinoma with reconstruction options according to their defect size that is presented to our Institute "Datta Meghe Institute of Higher Education and Research, Sawangi, Wardha" at the Inpatient Department of Oral and Maxillofacial Surgery. We have used the Ansarin et al., (2019) classification to divide various tongue defects according to site and size. All patients were Biopsy proven cases of Squamous Cell Carcinoma of the Tongue according to Broder's classification and presented with ulcero-proliferative or proliferative lesions over the right or left side of the Tongue. The clinical, routine blood and radiographic (MRI Tongue) investigation as per requirement was done. The patient was planned for Surgery under General Anaesthesia. For all cases, a suitable Glossectomy was scheduled according to clinical and radiographical findings, suitable neck dissection and reconstruction. All the clinical details are enumerated in (Table 1).

Table 1 Clinical details and reconstructive options according to defect size of tongue

Cases	Tumor size range	Tumor stage	Type of glossectomy (According to Ansarin et al. classification)	Reconstruction option	Number of cases operated in our institute
I	0.5 to 2 cms	T1 & T2	Partial Glossectomy	Primary Closure	42
II	2 to > 4 cms	T2 & T3	Compartmental Hemiglossectomy	Islanded Nasolabial Flap Tunnelled Under the Mandible	12
III	>4 cms	T3	Compartmental Hemiglossectomy	Radial Artery Based Forearm Free Flap	38
IV	>4 cms	T4	Near Total Glossectomy	Anterolateral Thigh Flap	05
V	>4 cms	T4	Total Glossectomy	Pectoralis Major Myocutaneous flap	45

Through this case series, we attempt to present our institutional data and highlight various commonly used flaps for tongue resection based on the size of the defect. We show each pictorial example of every reconstructive option for tongue defect according to size, including primary closure, Islanded Nasolabial Flap Tunnelled under the Mandible, Radial Artery Based Forearm Free Flap, Anterolateral Thigh Flap and Pectoralis Major Myocutaneous Flap (Figure 1, 2, 3, 4, 5).

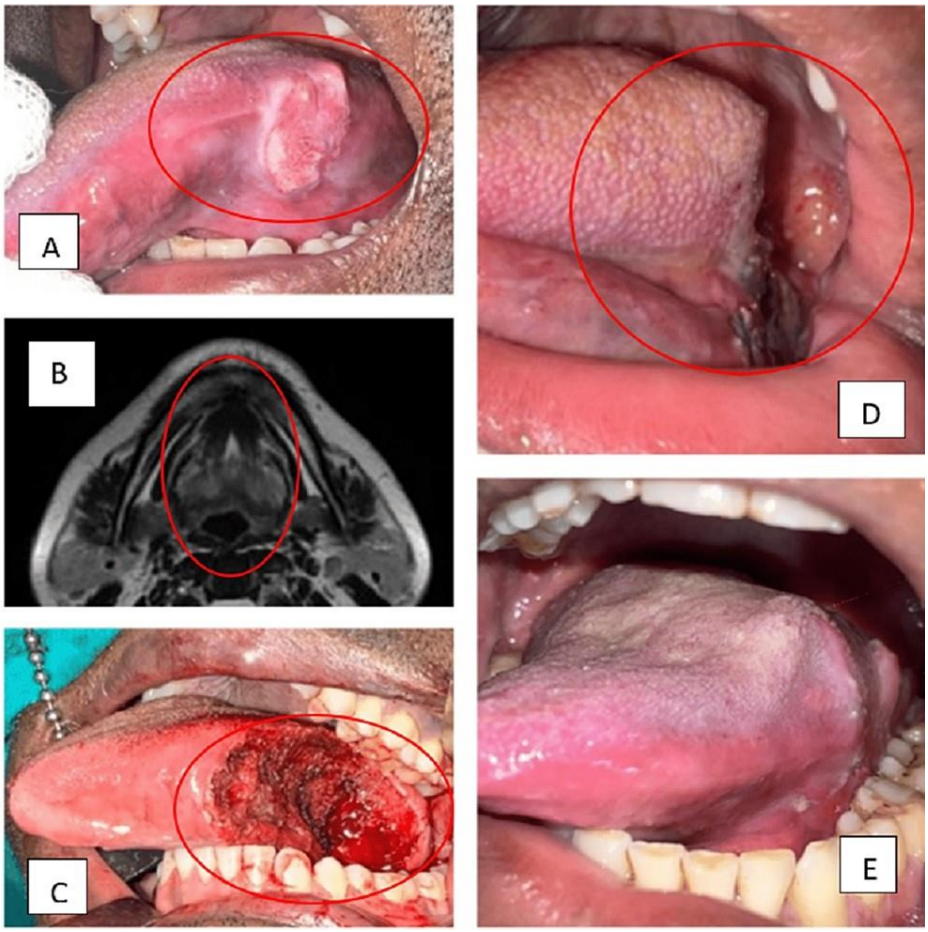

Figure 1 Showing clinical photo of lesion, radiological investigation (MRI), surgical defect of tongue, primary closure and follow up photograph (A: Ulceroproliferative lesion present over lateral border of tongue, B: MRI tongue showing extension of lesion, C: Defect created after resection of lesion i.e., Partial Glossectomy, D: Primary Closure, E: 6 months follow up photo)

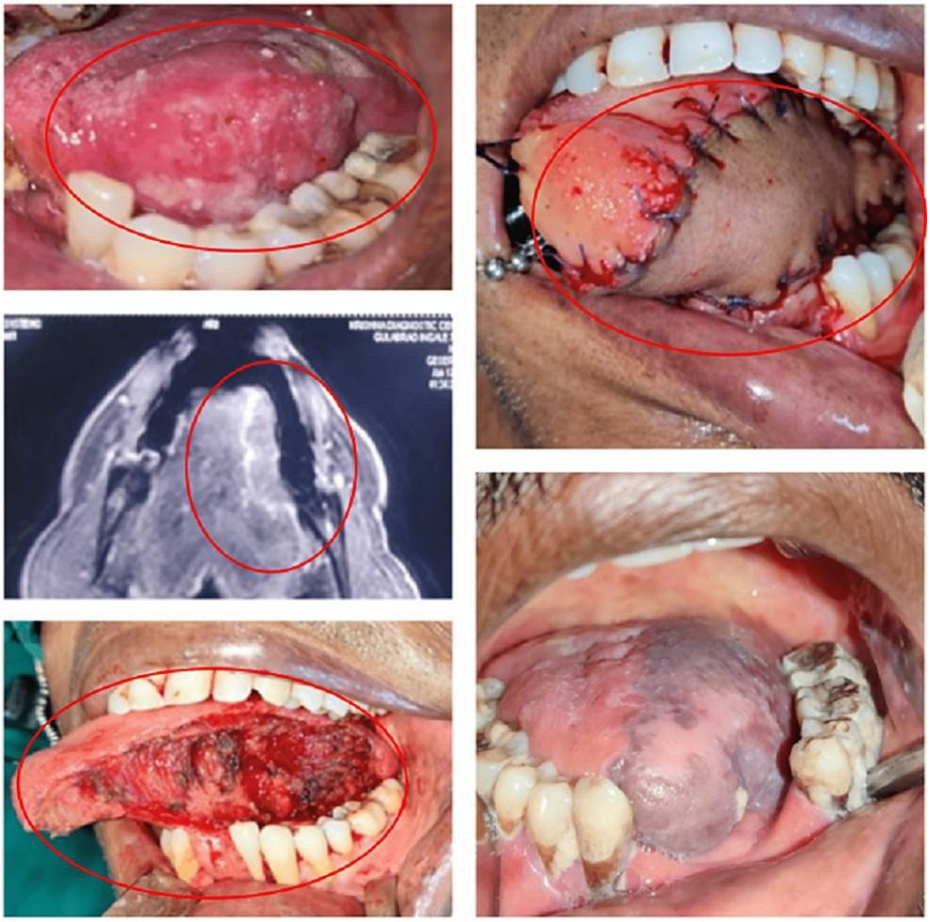

Figure 2 Showing clinical photo of lesion, radiological investigation (MRI), surgical defect of tongue, reconstruction with islanded nasolabial flap tunnelled under the mandible, and follow up photograph (A: Ulceroproliferative lesion present over lateral border of tongue, B: MRI tongue showing extension of lesion, C: Defect created after resection of lesion i.e. Compartmental Hemiglossectomy, D: Reconstruction with Islanded Nasolabial Flap tunnelled under the Mandible, E: 6 months follow up photo)

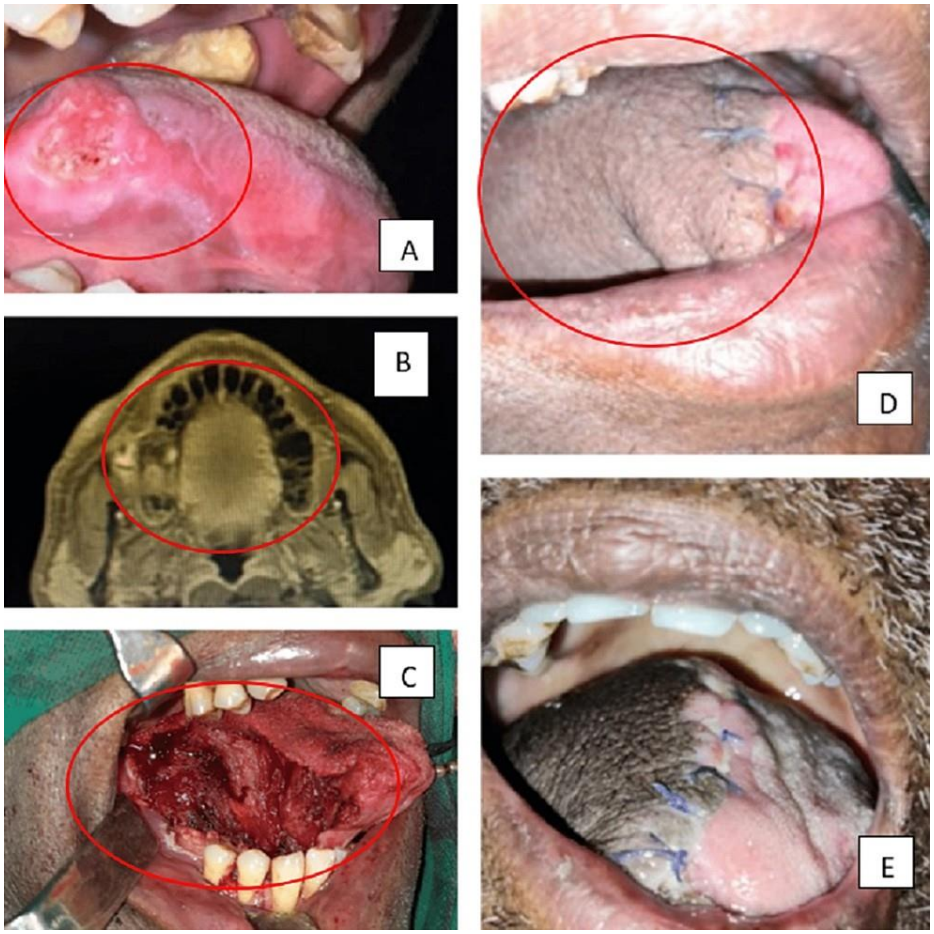

Figure 3 Showing clinical photo of lesion, radiological investigation (MRI), surgical defect of tongue, reconstruction with Radial Artery based Forearm free flap and 2 months follow up photograph. A: Ulceroproliferative lesion present over lateral border of tongue, B: MRI tongue showing extension of lesion, C: Defect created after resection of lesion i.e., Compartmental Hemiglossectomy, D: Reconstruction with Radial Artery based Forearm free flap, E: 2 months follow up photo

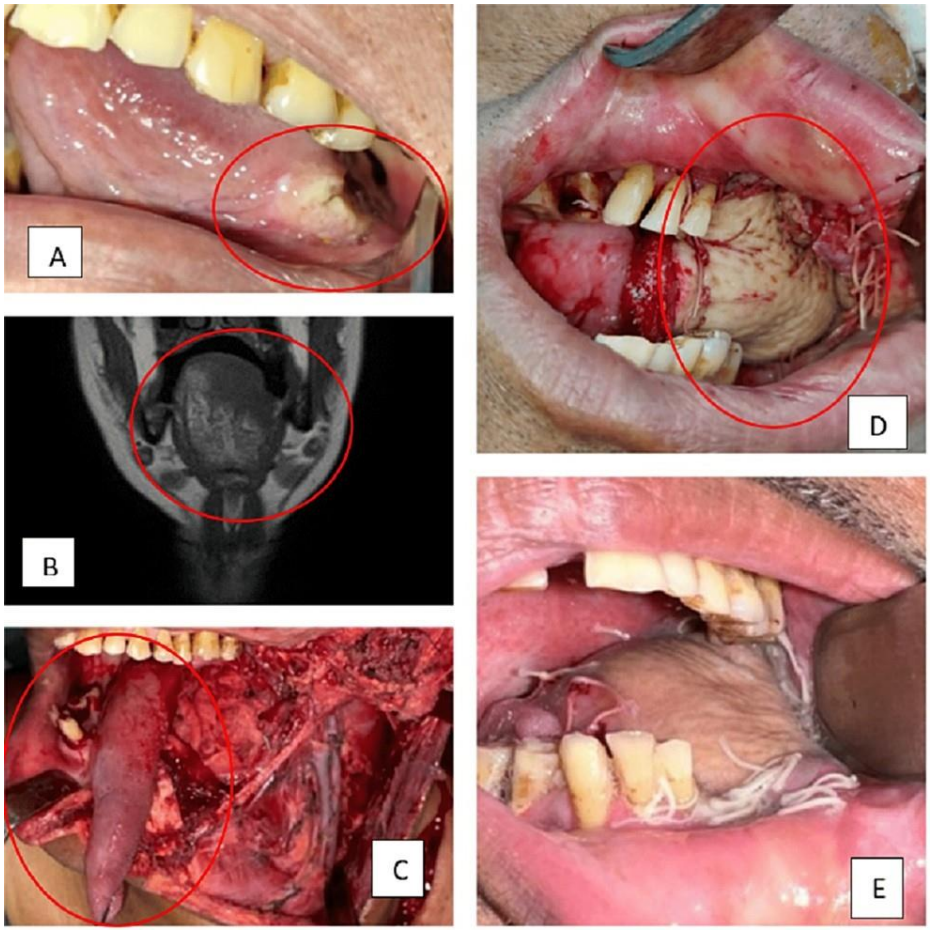

Figure 4 Showing clinical photo of lesion, radiological investigation (MRI), surgical defect of tongue, reconstruction with Anterolateral Thighflap and follow up photograph (A: Ulceroproliferative lesion present over lateral border of tongue, B: MRI tongue showing extension of lesion, C: Defect created after resection of lesion i.e., Near total glossectomy D: Reconstruction with Anterolateral Thigh flap, E: 1 month follow up photo)

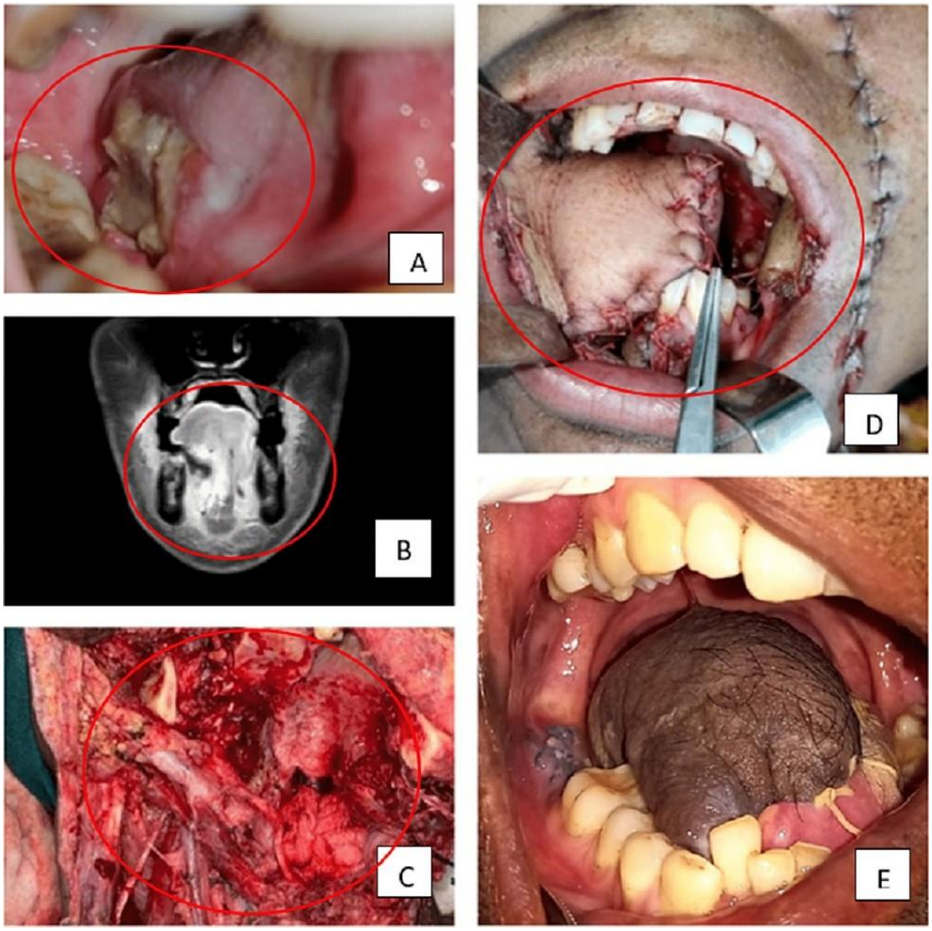

Figure 5 Showing clinical photo of lesion, radiological investigation (MRI), surgical defect of tongue, reconstruction with Pectoralis Major Myocutaneous flap and follow up photograph (A: Ulceroproliferative lesion present over lateral border of tongue, B: MRI tongue showing extension of lesion, C: Defect created after resection of lesion i.e., Total Glossectomy, D: Reconstruction with Pectoralis Major Myocutaneous flap, E: 2 month follow up photo)

3. DISCUSSION

The tongue, an organ of speech and articulation, is the main structure that shapes and regulates the food bolus during chewing and swallowing. Physically, it is a dual system of muscles, veins, arteries, and nerve supplies that converge at the lingual septum. It is a multi-layered muscular structure. Additionally, a specific mucosal layer covers it. Downward from the tongue's surface are the intrinsic and extrinsic muscles, whose fibres have insertions just into the tongue and surrounding anatomical tissues. The best tissue for tongue reconstruction should have a broad and long pedicle, be adaptable in design, have an appropriate tissue stock, and give uniform texture with less donor site morbidity. Harvesting should be simple, quick, and secure. Surgery to treat tongue cancer presents several difficulties. Speech, swallowing, and airway protection are three essential functions of the tongue, making it one of the more challenging structures of oral cavity and oropharynx to reconstruct. It takes a significant amount of regenerated tissues with minor scarring and residual mass to make up for term shrinking to restore speech and swallowing. Reconstruction options should therefore preserve mobility or offer bulk (Neligan et al., 2003; Lu et al., 2015).

In our case series, we demonstrated various flap reconstruction option for tongue defect which was created after surgical resection of lesion. T2 lesion according to AJCC 8th edition for which defect created after resection of tumor corelate with Ansarin type II glossectomy and primary closure was done. McConnel et al., (1998) done a prospective case comparison study in which he compared three methods (Primary closure versus Distal myocutaneous flap versus microvascular flap) of reconstruction with respect to speech and swallowing function in Oropharyngeal Reconstruction. So, he concluded in individuals tongue base reconstruction, primary closure produced an equivalent or better function than flap reconstruction.

In Al-Halabi, (2018) studied the quality of life between primary closure and free flap reconstruction in tongue cancer patients. The author came to the conclusion that primary closure helps to keep the residual tongue more mobile, which improves speech. On the other hand, free flap reconstruction enables changes to the remaining tongue's volume and bulk that are necessary to improve

swallowing. Therefore, while choosing a reconstruction technique for partial or hemiglossectomy defects, primary closure and free flap reconstruction should be taken into account.

A nasolabial flap tunnelled under the mandible (NLFTUM) or a radial forearm flap (RFFF) can be used for hemiglossectomy or compartmental hemiglossectomy reconstruction. Excellent movement is provided by NLFTUM, which is comparable to a free flap. The tongue's posterior one-third part deformity is adequately covered by its optimum pedicle length. The primary drawback of this flap is a scar that develops after surgery, but this becomes unnoticeable with time (Dupoirieux et al., 1999). To assess the quality-of-life results between RFFF and nasolabial flap in adult OSCC patients, Molly White and Mairi McKinley conducted a study in 2022 (White and McKinley, 2022). The authors concluded that RFFF has more donor site issues than NLFTUM regarding surgical outcomes. However, Free Flap, the Gold Standard, has a superior recovery of speech and deglutition function.

Partial glossectomies caused by defects are frequently plaid with split thickness grafts or largely closed, resulting in either a long, linear lizard tongue or a tiny, rounded tongue that causes speech and swallowing issues. NLFTUM are a straightforward alternative for rebuilding such deformities because they reduce the morbidity associated with problems speaking and swallowing. It also has the added benefit of covering the defect in hairless skin and lowering donor site morbidity linked to other flaps. It also provides appropriate mass at the recipient site, simplifying postoperative rehabilitation. It is also simple and rapid to harvest, shortening the surgical procedure (Varghese et al., 2001).

The superficial side of the RFFF is a viable alternative due to its anatomical consistency, long vascular pedicle, thick diameter, and ease of cutting. The perforator flap technique has significantly improved reconstruction surgery and the ALTFF is quickly becoming a preferred option for uncalcified body tissue reconstruction. In Yuan et al., (2016), investigated the oral functioning of tongue cancer patients who had either RFFF or ALTFF. Surgical reconstruction for tongue cancer aims to maximise aesthetic outcomes, provide reliable coverage, and preserve or restore oral functioning. The author concluded that keeping the remaining tongue mobile was crucial when there were partial tongue deformities. The RFFF is more appropriate because a narrow flap is preferable. Increased flap size will impair oral function and restrict tongue motion. For complete or partial glossectomy, the defect is always substantial.

Hence a flap with sufficient mass is needed. It is preferable to use a thicker flap, such as the ALTFF. Research in 2018 Yuan et al., (2016) concluded that the RFFF was superior to the ALTFF for the restoration of hemiglossectomy deficits due to its ability to restore oral functions like chewing, speech, and swallowing. The PMMC flap is a trustworthy, adaptable flap with few donor flaws. It is the assembly line of pedicled flaps and is still a viable choice when vascularized soft tissue coverage is needed because it is quickly mobilized, technically sound, and straightforward. The standard reconstruction approach for many head and neck abnormalities in the modern era is free tissue transfer. However, due to its speed, the PMMC is still a viable option to consider when vascularized soft tissue coverage is needed (Gangiti et al., 2016).

4. CONCLUSION

Based on our own experience and the published research regarding the various forms of reconstruction possibilities in tongue cancer assists in supplying the appropriate bulk of tissue with the restoration of speech, swallowing and feeding. A systematic approach of varying flap selections based on diverse tongue abnormalities may generate reliably superior functional and aesthetic outcomes.

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Author Contributions

Sanjana Narendra Wadewale devised the study, collected the data and wrote the manuscript. Anchal Agarwal revised and edited the manuscript. Nitin Bhola completed critical revisions and proofread the manuscript. All authors have read and approved the final manuscripts.

Ethical Approval

Not applicable

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Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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