



## **Reconstruction of glossectomy defects post oncologic resection**

**Sara Elbaz<sup>1\*</sup>, Shadi Awany<sup>2</sup>, Ashraf Shoma<sup>3</sup>**

<sup>1</sup> Final Year Medical Student, Mansoura Manchester Medical Programme, Faculty of Medicine, Mansoura University.

<sup>2</sup> Surgical Oncology Unit, Oncology Center Mansoura University (OCMU), Mansoura, Egypt.

<sup>3</sup> Prof. of Surgery, Faculty of Medicine, Mansoura University, Mansoura, Egypt.

DOI: 10.21608/mjmu.2021.82992.1028

Submit Date: 07-07-2021

Accept Date: 02-11-2021

Available online: 1-12-2021

### **Keywords**

- Tongue cancer
- Glossectomy
- Tongue reconstruction
- Flaps

### **Abstract**

The tongue is a muscular organ completely covered by mucous membrane and made up of two portions divided by the V-shaped sulcus terminalis: an anterior 2/3 (oral tongue) and a posterior 1/3 (tongue base). The tongue is essential to normal speech as well as swallowing process, and healthy tongue function is vital within the general quality of life. Tongue cancers are aggressive tumors with poor prognosis, so the early detection markedly raises the possibility of cure with minimal impairment and deformity. Management needs a surgical, medical and radiation oncologist in association with speech therapist, physical rehabilitation, and psychologists. In addition to regular follow-up and good family support are leading to better outcomes. The reconstruction of the tongue post oncologic resection results in better speech and swallowing. In addition, there is a variety of flap options, and no one is superior to another, but it depends on the tongue defect size, patient factors, and team expertise. Therefore, the article focuses on tongue reconstruction by using various flap modalities.

## INTRODUCTION

Tongue cancer ranks first among oral cancer patients in Egypt, and its prevalence still increasing. The first study representing the epidemiology of head and neck cancer in Egypt utilized information from Gharbia population-based cancer registry; they discovered a higher prevalence of head and neck cancer among elderly males in comparison with females and higher prevalence in urban population compared to rural one. Only 6% of tongue cancers happen in patients less than 45 years <sup>(1)</sup>.

More than 90% of tongue cancer is squamous cell carcinoma (SCC) and the commonest site is the lateral border of the tongue. <sup>(2)</sup>. Tongue (SCC) mostly involves the older age group exposed to tobacco and alcohol consumption for a long period. On the other hand, many reports show that the worldwide incidence of SCC in young, non-smoker women has been increasing <sup>(3)</sup>.

Oral cancers are considered high malignant tumors with high relapse rate and cervical lymph node (LN) metastasis. At present, surgery associated with post-operative radiotherapy and chemotherapy is considered the most favored therapeutic strategy for tongue cancer management <sup>(4)</sup>.

For instance, early stages of the tongue cancer can be managed properly through the transoral route; On the other hand, in advanced tongue cancer may need resections with reconstruction of the defects by flaps and usually need adjuvant therapy. Also, positive LN affection might necessitate a neck dissection. Mandibulectomy is done when infiltrated by the tumor <sup>(5)</sup>.

Surgeries for tongue cancer maybe partial, hemi, subtotal, or total glossectomy according to the stage <sup>(6)</sup>. Nowadays, the 8<sup>th</sup> edition of the American Joint Committee on Cancer (AJCC8) staging has some changes of the TNM system that includes the

depth of invasion and extranodal extension that are not present in the previous 7th edition <sup>(7)</sup>. Also, the AJCC8 has a role in prognosis <sup>(8)</sup>.

The field of reconstruction of glossectomy defects is a dynamic one. Advances made are mainly due to expanded usage of micro-vascular free flaps. Wound closure isn't the only aim, however speech and swallowing preservation together with the restoration of appearance are the main objective in each reconstruction <sup>(9)</sup>. The tongue is significant for the achievement of basic biological functions in humans like mastication, deglutition, and speech, additionally to its function in taste. The taste buds in the tongue are responsible for the transduction of a taste sensation <sup>(10)</sup>.

In addition, flap donor site morbidity is an important goal when choosing the flap option beside the function and aesthetic outcomes <sup>(11)</sup>.

### **Reconstruction of glossectomy defects post oncologic resection**

After tumor removal, reconstructive surgery is needed for restoration of functions, primarily speaking, swallowing, and aesthetics as close to normal as possible. The reconstruction post glossectomy remains a challenging task as the surgical techniques might have a marked influence on speech as well as on swallowing <sup>(12)</sup>.

The choice of the flap to reconstruct a tongue defect mainly depends on four parameters: the tongue defect size, existence of neck donor vessels, floor-of-mouth affection, or existence of mandible or oropharyngeal defects <sup>(13)</sup>.

The reconstructive ladders begin from healing by secondary intention, to primary closure, skin grafting, loco-regional flaps and lastly free tissue transmission (figure 1). Generally, immediate reconstruction at the time of tumor excision induces optimum functional outcomes because one can predict marked volume loss over time post-radiation therapy <sup>(13)</sup>.



**Figure 1** Reconstructive ladder <sup>(13)</sup>.

Usually, small defects can heal by secondary intention, primary closure, or reconstruction with skin grafts with accepted outcomes (figure 2) or with submental island flap. On the other hand, Large defects like a subtotal glossectomy, or those

comprising the mouth floor or the oropharyngeal need reconstruction which involves vascularized tissue replacement to sufficiently restore bulk and swallow function <sup>(14)</sup>.



**Figure 2** Closing small defects (a) Primary closure, (b) Skin graft <sup>(13)</sup>.

### Local flaps

Firstly, buccinator myomucosal flap, posteriorly based only on buccal artery which is a division of the internal maxillary artery, is a local flap characterized by natural color and flexibility. This

flap can be harvested easily and the donor site can be closed primarily without an external scar, so it is highly recommended for lateral tongue defects (Figure 3) <sup>(15)</sup>.



**Figure 3** Right posteriorly based buccal myomucosal flap preparation for right partial glossectomy defect. <sup>(15)</sup>.

### Regional Flaps

Secondly, the submental island flap, pectoralis major myocutaneous flap (PMMF), and Supraclavicular artery island flap (SCAIF), are regional flaps which could be employed to reconstruct the tongue especially in case of free tissue transfer is contraindicated <sup>(16)</sup>.

The merits of regional flaps involve shorter surgical duration, potent reliability, and capability to harvest with no additional operational team. In addition, they could be utilized after the failure of free tissue transfer <sup>(14)</sup>.

For instance, using submental island flap for reconstruction of glossectomy defects, it is not

advised by many authors due to sharing of the same lymphovascular tissue of the tongue <sup>(17)</sup>.

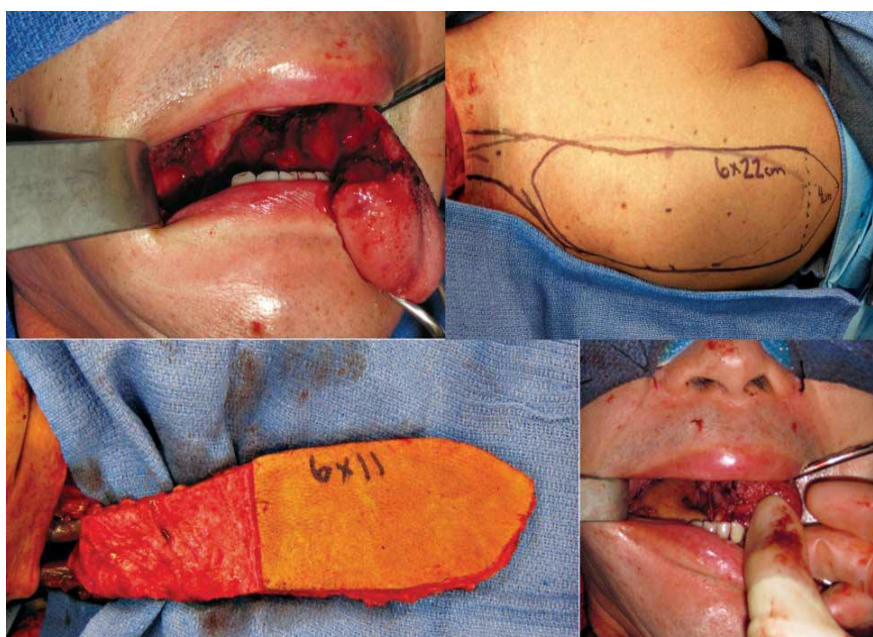
The pectoralis major myocutaneous flap (PMMF), based on the pectoral branch of the thoracoacromial artery, is a good option for reconstruction after mandible resection or extensive oral defects. Also, this flap decreases the risk of ischemia with more time for the development of micro anastomosis and has abundant soft tissue volume. Also, in patients with poor neck donor vessels, a pectoralis flap is a good choice (figure 4) <sup>(18)</sup>.



**Figure 4** Harvesting pectoralis major myocutaneous flap <sup>(13)</sup>.

The supraclavicular artery island flap (SCAIF) is a fasciocutaneous flap supplied by supraclavicular artery which is a division of the transverse cervical

artery. This flap is characterized by minimal donor-site morbidity (Figure 5) <sup>(19)</sup>.



**Figure 5** Reconstruction of the oral tongue with the supraclavicular Artery Island Flap <sup>(20)</sup>.

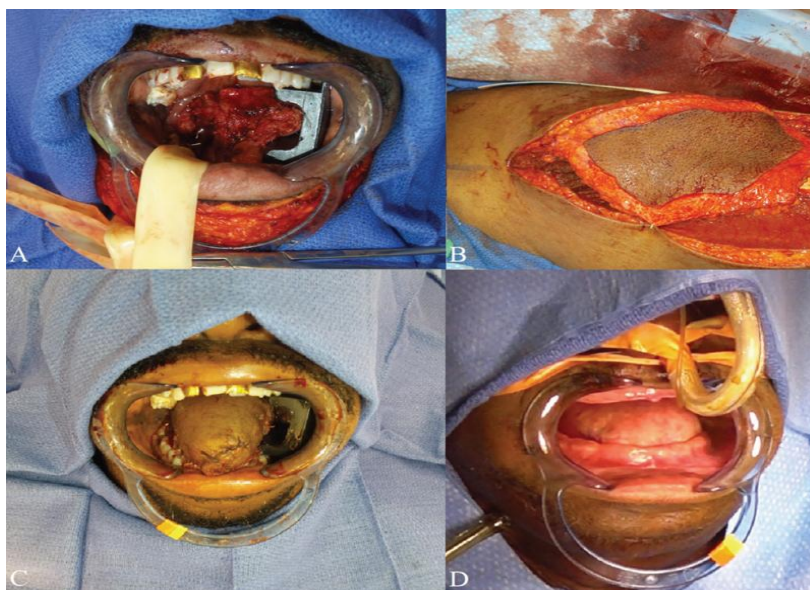


### Free flaps

Thirdly, 40 years ago, pedicled flaps were the cornerstone of reconstruction. On the other hand, with the development of free flaps, modalities for reconstruction are increased. Thus, the free tissue transmission is considered the backbone of the reconstruction of major tongue defects with success rate to 95-100%. The commonest utilized flaps involve anterolateral thigh free flap (ALTFF) and the radial forearm free flap (RFFF) <sup>(21)</sup>.

Several researches demonstrated that reinnervated free flaps have great outcome compared with their non reinnervated one without recovery of taste functions. In addition, RFFF and ALTFF demonstrated to recover better sensations in comparison with different flap kinds with the improved movement of the neotongue <sup>(22)</sup>.

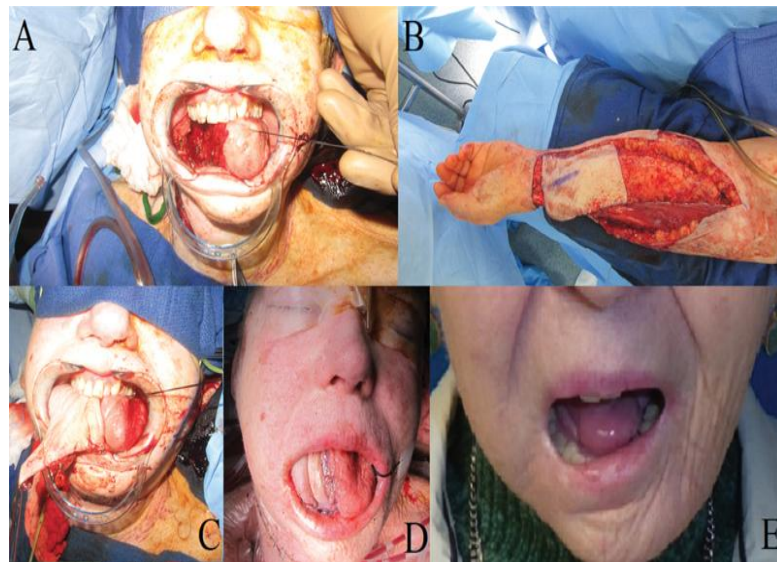
The first reconstructive option is an anterolateral thigh free flap (ALTFF), which gives a bulk of tissue that is used for larger glossectomy defects typically more than half of the tongue and it is supplied by the descending branch of the lateral femoral circumflex artery (figure 6). On the other hand, its anatomy is a less consistent result in a sophisticated harvest in certain patients. In addition, its pedicle is not bigger than that of an RFFF. However, it is a superior choice to the RFFF for tongue reconstruction due to minimal donor-site morbidity. The most common complication of ALTFF is marginal necrosis, but overall flap failure is infrequent <sup>(23)</sup>.



**Figure 6** Anterolateral thigh free flap for total glossectomy (A) Defect. (B) ALTFF harvesting. (C) Flap inseting. (D) Neotongue 1 year postoperatively <sup>(14)</sup>.

The radial forearm free flap (RFFF), a fasciocutaneous free flap which is supplied by radial artery, has the merit of consistent anatomy, has a long pedicle, and has wider caliber vessels to permit more accessible microvascular anastomosis (figure 7). Overall, the RFFF is recommended in defects less than hemiglossectomy defects.

However, The RFFF can leave an apparent scar on the wrist but seldom can result in hand weakness. In addition, with RFFF harvest, there is a potential risk of ischemia due to damage of the primary arterial supply to the hand. Thus, preoperative evaluation with Allen's test is necessary to avoid hand ischemia. <sup>(21)</sup>.



**Figure 7** Patient with a lateral oral tongue squamous cell carcinoma. (A) Defect after partial glossectomy. (B) Left radial forearm fasciocutaneous free-flap harvest. (C) Immediate postoperative flap inset. (D) Tongue appearance 2 years post reconstruction and radiotherapy. (E) Significant flap volume loss <sup>(14)</sup>.

The bony free flap is needed in patient of a mandible bony defect with tongue reconstruction and the most common one used is fibula free flap. In addition, defects in the oral cavity or dentition might need prosthetic devices, like obturators, dentures, or implants <sup>(24)</sup>.

### Conclusion

Reconstruction of the tongue defects after oncologic resection of malignant tumors represents a surgical challenge in spite of the wide variety of available options. In trans-oral glossectomy, the defect can be closed by 1ry closure or reconstruction with skin grafting or with myomucosal flap. However, in compartmental tongue resection, the free flaps are the best with higher functional outcomes, but in patients with poor performance status or neck depleted vessels; free flaps would not be a suitable option and better to use pedicled flaps. Also, in case of mandibulectomy with tongue resection, the bony free flap could be used.

### References

1. **Hamdy O, Saleh MM, Ros MH, Mosaad A, Awany S, Abo-Elnaga EM, et al.** Epidemiology and predictors of survival of tongue cancer among Egyptians in the Delta region. *memo-Magazine of European Medical Oncology*. 2020;13(1):118-25.
2. **Myers D, Allen E, Essa A, Gbadamosi-Akindele M.** Rapidly Growing Squamous Cell Carcinoma of the Tongue. *Cureus*. 2020;12(3).
3. **Choi G, Song JS, Choi S-H, Nam SY, Kim SY, Roh J-L, et al.** Comparison of Squamous Cell Carcinoma of the Tongue between Young and Old Patients. *Journal of pathology and translational medicine*. 2019;53(6):369.
4. **Tang M, Dai W, Wu H, Xu X, Jiang B, Wei Y, et al.** Transcriptome analysis of tongue cancer based on high-throughput sequencing. *Oncology Reports*. 2020;43(6):2004-16.

5. **Carta F, Quartu D, Mariani C, Tatti M, Marrosu V, Gioia E, et al.** Compartmental Surgery With Microvascular Free Flap Reconstruction in Patients With T1–T4 Squamous Cell Carcinoma of the Tongue: Analysis of Risk Factors, and Prognostic Value of the 8th Edition AJCC TNM Staging System. *Frontiers in Oncology*. 2020;10:984.
6. **Ansarin M, Bruschini R, Navach V, Giugliano G, Calabrese L, Chiesa F, et al.** Classification of GLOSSECTOMIES: Proposal for tongue cancer resections. *Head & neck*. 2019;41(3):821-7.
7. **Almangush A, Salo T.** The 8th Edition of the American Joint Committee on Cancer (AJCC8) Staging Manual: any improvement in the prognostication of oral tongue cancer? *Chinese clinical oncology*. 2019;8(Suppl. 1):8.
8. **Moeckelmann N, Ebrahimi A, Tou YK, Gupta R, Low TH, Ashford B, et al.** Prognostic implications of the 8th edition American Joint Committee on Cancer (AJCC) staging system in oral cavity squamous cell carcinoma. *Oral Oncol*. 2018;85:82-6.
9. **Gilbert RW.** Reconstruction of the oral cavity; past, present and future. *Oral Oncology*. 2020;108:104683.
10. **Alaoui F, Souissi A, Jendoubi F, Mokni M.** Caviar tongue: A lingual physiological variation. *Presse Med*. 2018;47(10):925-6.
11. **Rayan YMSAER, Khairallah SM, Mousa AK, Alsharkawy KAAMH, Kabbash MM.** Pedicled Versus Microvascular Free Flaps Used for Reconstruction of Oral Cavity Defects Following Cancer Ablative Surgery: A Prospective Comparative Study. *The Egyptian Journal of Hospital Medicine*. 2020;78(1):101-9.
12. **Arrangoiz R, Cordera F, Caba D, Moreno E, de León EL, Muñoz M.** Oral Tongue Cancer: Literature Review and Current Management. *Cancer Rep Rev*. 2018;2(3):1-9.
13. **Chala A.** Modalities and State of Art in Oral Cancer Reconstruction. In: Sridharan G, Sukumaran A, Ostwani AEOA, editors. *Oral Diseases*. 1st ed. London, England: IntechOpen; 2020. p. 3802–3805.
14. **Vincent A, Kohlert S, Lee TS, Inman J, Ducic Y,** editors. *Free Tissue Transfer Reconstruction: Free-Flap Reconstruction of the Tongue*. *Seminars in plastic surgery*. 2019;33(1):38-45.
15. **Karabulut B, Avcı H.** The Buccal Myomucosal Flap for Reconstruction of the Oral Cavity Cancers. *Southern Clinics of Istanbul Eurasia*. 2020;31(2):113-116.
16. **Hanna TC, Lubek JE.** The hybrid submental flap for tongue reconstruction. *Journal of Oral and Maxillofacial Surgery*. 2015;73(9):1876.
17. **Cariati P, Cabello Serrano A, Marin Fernandez AB, Perez de Perceval Tara M, Juliá MA, Ildefonso Martinez Lara M.** Is submental flap safe for the oncological reconstruction of the oral cavity? *Journal of Stomatology, Oral and Maxillofacial Surgery*. 2018;119(4):284-7.

- 
18. **Davudov MM, Rahimov C, Fathi H, Mirzajani Z, Aliyeva M.** The Use of Pectoralis Major Musculocutaneous and Deltopectoral Flaps in Oromandibular Defects Reconstruction. *World Journal of Plastic Surgery.* 2019;8(3):401.
  19. **Lekawale HS, Gaidole RV.** Supraclavicular artery island flap in the reconstruction of oral cavity cancer defects. *International Surgery Journal.* 2019;6(10):3733-8.
  20. **Kokot N, Mazhar K, Reder LS, Peng GL, Sinha UK.** The supraclavicular artery island flap in head and neck reconstruction: applications and limitations. *JAMA Otolaryngology–Head Neck Surgery.* 2013;139(11):1247-55.
  21. **Baas M, Duraku LS, Corten EM, Mureau MA.** A systematic review on the sensory reinnervation of free flaps for tongue reconstruction: does improved sensibility imply functional benefits? *Journal of Plastic, Reconstructive & Aesthetic Surgery.* 2015;68(8):1025-35.
  22. **Manrique OJ, Leland HA, Langevin C-J, Wong A, Carey JN, Chen H-C, et al.** Optimizing outcomes following total and subtotal tongue reconstruction: a systematic review of the contemporary literature. *Journal of Reconstructive Microsurgery.* 2017;33(02):103-11.
  23. **Bagadia RK, Kudpaje AS, Rao VU.** From compartmental to anatomically based circumferential resection-Is the reversal of trend justified? *Head & Neck.* 2020;42(9):2764-2765.
  24. **Prelec J, Laronde DM.** Treatment modalities of oral cancer. *Can J Dent Hyg.* 2014;48(1):13-9.