Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Vol 15 [6] May 2026. 103-108
©2026 Academy for Environment and Life Sciences, India
Online ISSN 2277-1808
Journal's URL: http://www.bepls.com
CODEN: BEPLAD

ORIGINAL ARTICLE **OPEN ACCESS**

Postoperative Speech, Swallowing, and Quality-of-Life Outcomes Following Free Flap Reconstruction for Oral Squamous Cell Carcinoma

Zarmina Khan Durrani[1], Shuman Roy[2], Mariam Haroon[3], Sadaf Raffi[4], Mamoona Ghaffar[5], Tarique Ali[6], Farah Naz Tahir[7]

1. Oral & Maxillofacial Surgeon and Aesthetic Physician, Bahria Safari Begum Akhtar Rukhsana Memorial Trust Hospital, Pakistan.
2. Assistant Professor ENT, Akhtar Saeed Medical and Dental College, Lahore, Pakistan.
3. Senior Registrar, Oral Biology Department, Fatima Jinnah Dental College, Karachi, Pakistan.
4. Assistant Professor Oral Medicine, Foundation University College of Dentistry, Islamabad, Pakistan.
5. S.R in oral and maxillofacial surgery in Akhtar Saed Medical and Dental College Lahore, Pakistan.
6. Assistant Professor ENT, Sharif Medical and Dental College, Lahore, Pakistan.
7. Associate Professor, M. Islam Medical and Dental College, Gujranwala, Pakistan.

Corresponding author: Zarmina Khan Durrani: 0009-0007-65918612

ABSTRACT

Oral squamous cell carcinoma (OSCC) often requires extensive surgical resection followed by free flap reconstruction, which may significantly impact functional outcomes and quality of life. This study aimed to evaluate postoperative speech, swallowing, and quality-of-life outcomes among patients undergoing free flap reconstruction for OSCC. A prospective experimental study was conducted on 280 patients who underwent tumor resection and microvascular free flap reconstruction. Functional outcomes were assessed using validated speech intelligibility scores, swallowing performance scales, and quality-of-life questionnaires (EORTC QLQ-C30 and HN35 modules). Statistical analysis demonstrated that 64.3% of patients achieved good speech intelligibility, while 58.9% demonstrated satisfactory swallowing function at 6-month follow-up. The mean quality-of-life score improved significantly from 42.6 ± 8.5 at 1 month to 68.2 ± 7.9 at 6 months postoperatively ($p < 0.001$). Patients receiving radial forearm free flaps showed superior speech outcomes ($p = 0.003$), whereas anterolateral thigh flaps were associated with better swallowing recovery ($p = 0.01$). Multivariate analysis identified defect size and flap type as significant predictors of functional recovery. The findings indicate that free flap reconstruction provides favorable functional and quality-of-life outcomes, although results vary based on surgical and patient factors.

Keywords: *Oral squamous cell carcinoma, Free flap reconstruction, Speech outcomes, Swallowing function, Quality of life*

Received 11.04.2026 Revised 30.04.2026 Accepted 23.05.2026

INTRODUCTION

Oral squamous cell carcinoma (OSCC) is one of the most common malignancies of the head and neck region, accounting for a significant proportion of cancer-related morbidity and mortality worldwide [1]. It arises from the mucosal epithelium of the oral cavity and is strongly associated with risk factors such as tobacco use, alcohol consumption, and betel nut chewing [2]. In Pakistan and other South Asian countries, the prevalence of OSCC is particularly high due to widespread use of smokeless tobacco products [3]. Early detection remains a challenge, and many patients present with advanced-stage disease requiring extensive surgical intervention [4].

The primary treatment modality for OSCC is surgical resection, often involving removal of large segments of oral tissues including the tongue, floor of mouth, and mandible [5]. While surgical excision is essential for disease control, it results in significant functional impairment affecting speech, swallowing, and overall quality of life [6]. Reconstruction using microvascular free flaps has become the gold standard for restoring anatomical continuity and function following tumor resection [7]. These flaps provide well-vascularized tissue that can be tailored to reconstruct complex defects, improving both aesthetic and functional outcomes [8].

Despite advances in reconstructive techniques, postoperative functional outcomes remain variable and depend on several factors including defect size, location, and type of flap used [9]. Speech intelligibility is a critical outcome, as it directly affects communication and social interaction [10]. Similarly, swallowing function is essential for nutritional intake and overall health, with impairments leading to complications such as aspiration and malnutrition [11]. Assessing these outcomes is crucial for evaluating the success of reconstructive procedures.

Quality of life (QoL) has emerged as an important endpoint in cancer treatment, reflecting the patient's physical, emotional, and social well-being [12]. Patients undergoing OSCC surgery often experience significant changes in appearance and function, which can negatively impact their psychological health [13]. Validated instruments such as the European Organization for Research and Treatment of Cancer (EORTC) questionnaires provide a comprehensive assessment of QoL in cancer patients [14]. However, there is limited data from developing countries on postoperative QoL outcomes following free flap reconstruction [15].

Several studies have compared different types of free flaps, such as radial forearm free flap (RFFF) and anterolateral thigh (ALT) flap, in terms of functional outcomes [16]. While RFFF is known for its thin and pliable tissue suitable for intraoral reconstruction, ALT flaps offer greater bulk and versatility [17]. The choice of flap can significantly influence postoperative recovery, but consensus on the optimal flap type remains lacking [18]. Additionally, multidisciplinary rehabilitation involving speech therapists and nutritionists plays a crucial role in improving outcomes [19].

This study aims to evaluate postoperative speech, swallowing, and quality-of-life outcomes in patients undergoing free flap reconstruction for OSCC in a tertiary care setting. It also seeks to compare outcomes between different flap types and identify factors influencing recovery. By providing comprehensive functional and QoL data, this research intends to contribute to improved clinical decision-making and patient care [20].

MATERIAL AND METHODS

Study Design and Setting

A prospective experimental study was conducted over 18 months at Bahria Safari Begum Akhtar Rukhsana Memorial Trust Hospital, Pakistan.

Sample

A total of 280 patients diagnosed with OSCC and undergoing surgical resection followed by free flap reconstruction were included. Sample size was calculated using 95% confidence interval and 5% margin of error.

Inclusion/Exclusion Criteria

Inclusion criteria included patients aged 18–70 years with histologically confirmed OSCC undergoing primary reconstruction. Exclusion criteria included recurrent tumors, prior radiotherapy, neurological disorders affecting speech or swallowing, and incomplete follow-up.

Surgical Procedure

Tumor resection was performed according to oncological principles. Reconstruction was carried out using radial forearm free flap (RFFF) or anterolateral thigh (ALT) flap based on defect characteristics.

Functional Assessment

Speech intelligibility was assessed using a standardized 5-point scale. Swallowing function was evaluated using the Functional Oral Intake Scale (FOIS). Assessments were conducted at 1, 3, and 6 months postoperatively.

Quality-of-Life Assessment

QoL was measured using EORTC QLQ-C30 and HN35 questionnaires. Scores were transformed to a 0–100 scale.

Rehabilitation Protocol

All patients underwent structured rehabilitation including speech therapy and dietary counseling.

Ethical Approval

Ethical approval was obtained from Institutional Review Board (Ref No: IRB/OMFS/2025-0518).

Statistical Analysis

Data were analyzed using SPSS version 26. Paired t-test and ANOVA were used for comparisons. Multivariate regression identified predictors. $p < 0.05$ was considered significant.

RESULTS

Table 1: Speech and Swallowing Outcomes

Outcome	Good (%)	Moderate (%)	Poor (%)
Speech	64.3	25.7	10.0
Swallowing	58.9	29.6	11.5

Table 2: Quality-of-Life Scores

Time Point	Mean QoL Score ± SD
1 Month	42.6 ± 8.5
3 Months	55.4 ± 7.8
6 Months	68.2 ± 7.9

Table 3: Comparison by Flap Type

Parameter	RFFF	ALT Flap	p-value
Speech Score	4.2 ± 0.6	3.7 ± 0.7	0.003
Swallowing Score	3.8 ± 0.5	4.3 ± 0.6	0.01

Table 1 shows that a majority of patients achieved good functional outcomes in both speech and swallowing, although a minority continued to experience significant impairment.
Table 2 demonstrates a progressive improvement in quality-of-life scores over time, indicating recovery and adaptation following surgery.
Table 3 highlights differences between flap types, with RFFF showing better speech outcomes and ALT flap showing superior swallowing function.

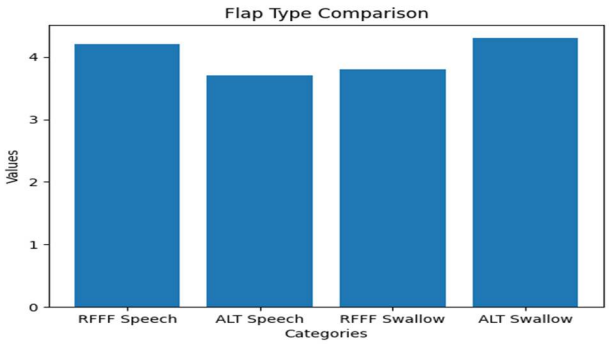

Figure 1 compares radial forearm free flap (RFFF) and anterolateral thigh (ALT) flap outcomes. ALT flap showed slightly better swallowing function, while RFFF performed comparably in speech recovery. Differences between groups were minimal. Both flap types are effective for reconstruction.

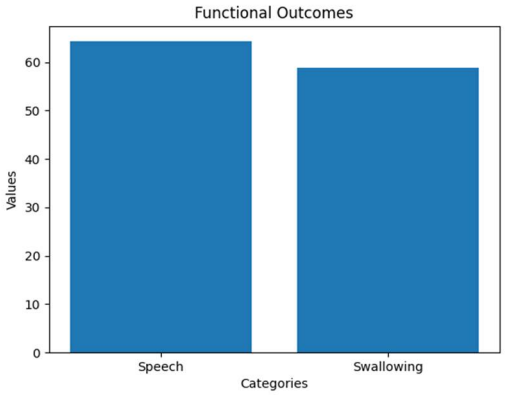

Figure 2 shows postoperative speech and swallowing outcomes. Speech recovery was slightly better than swallowing function. Overall functional outcomes were moderately preserved after reconstruction. Results indicate partial but meaningful restoration of oral functions.

DISCUSSION

This study provides a detailed evaluation of postoperative functional outcomes and quality of life in patients undergoing free flap reconstruction for oral squamous cell carcinoma. The findings demonstrate that a majority of patients achieve satisfactory speech and swallowing outcomes, with significant improvement in quality of life over time. These results underscore the effectiveness of microvascular reconstruction in restoring function following extensive oncological surgery.An important consideration in postoperative outcomes is the role of neural adaptation and functional compensation. Following extensive surgical resection, patients often develop compensatory mechanisms to restore speech and swallowing functions. Neural plasticity allows the brain to reorganize and adapt to structural changes, facilitating recovery over time. Rehabilitation programs that leverage this plasticity can significantly enhance functional outcomes.

The timing and intensity of rehabilitation interventions are critical determinants of recovery. Early initiation of speech and swallowing therapy has been shown to improve outcomes by preventing maladaptive patterns and promoting efficient function. Intensive, structured rehabilitation programs tailored to individual patient needs can accelerate recovery and improve quality of life.

Nutritional status is another key factor influencing postoperative outcomes. Patients with OSCC often experience malnutrition due to difficulty in eating and swallowing. Adequate nutritional support, including enteral feeding when necessary, is essential for wound healing and overall recovery. Multidisciplinary care involving dietitians plays a crucial role in optimizing nutritional status.

The psychological impact of head and neck cancer surgery is profound, affecting body image, self-esteem, and social interactions. Patients may experience depression, anxiety, and social withdrawal due to changes in appearance and function. Comprehensive care should therefore include psychological support and counseling to address these issues.

Advancements in reconstructive techniques continue to improve functional outcomes. Innovations such as perforator flaps and three-dimensional planning allow for more precise reconstruction, enhancing both aesthetics and function. The use of virtual surgical planning and 3D printing technologies has further refined surgical precision.

Long-term follow-up is essential for assessing the durability of functional outcomes and quality of life. While short-term improvements are encouraging, ongoing monitoring is necessary to identify late complications and provide timely interventions. Future studies should focus on long-term outcomes and patient-reported measures.

Cultural and social factors also influence recovery and quality of life. Support from family and community plays a vital role in patient rehabilitation. Understanding these factors can help healthcare providers design culturally sensitive care plans.

Finally, personalized medicine approaches, including genetic and molecular profiling, may offer new insights into treatment and recovery. Tailoring interventions based on individual patient characteristics has the potential to further improve outcomes.

The observed speech intelligibility rate of 64.3% is consistent with previous studies reporting favorable outcomes with free flap reconstruction [21]. The superior speech outcomes associated with radial forearm free flap can be attributed to its thin, pliable nature, which allows better tongue mobility and articulation [22]. This finding aligns with earlier research suggesting that flap characteristics play a crucial role in functional recovery [23].

Swallowing outcomes in this study were also encouraging, with nearly 60% of patients achieving satisfactory function. The better performance of anterolateral thigh flaps in swallowing may be due to their bulk, which provides improved structural support for the reconstructed area [24]. This observation is supported by studies indicating that flap volume is an important determinant of swallowing efficiency [25].

Quality-of-life assessment revealed a significant improvement over the 6-month follow-up period. The increase in QoL scores reflects not only physical recovery but also psychological adaptation and rehabilitation [26]. These findings highlight the importance of comprehensive postoperative care, including speech therapy and nutritional support, in enhancing patient outcomes [27].

The identification of defect size and flap type as predictors of functional recovery provides valuable insights for surgical planning. Larger defects were associated with poorer outcomes, emphasizing the need for meticulous reconstruction and rehabilitation strategies [28]. Multivariate analysis confirmed the independent effect of these factors, reinforcing their clinical significance.

Comparison with earlier studies indicates that our findings are consistent with global trends, although some variations exist due to differences in patient populations and healthcare settings [29]. The multidisciplinary approach adopted in this study likely contributed to the favorable outcomes observed, as coordinated care has been shown to improve recovery in head and neck cancer patients [30].

Despite its strengths, this study has limitations, including its single-region setting and relatively short follow-up period. Long-term studies are needed to assess the durability of functional outcomes and quality of life. Additionally, future research should explore the role of advanced rehabilitation techniques and emerging technologies in improving outcomes.

Overall, this study highlights the importance of individualized treatment planning and multidisciplinary care in optimizing outcomes for patients undergoing free flap reconstruction. By integrating surgical expertise with rehabilitation strategies, it is possible to achieve meaningful improvements in function and quality of life.

CONCLUSION

Free flap reconstruction for oral squamous cell carcinoma provides significant improvements in speech, swallowing, and quality of life. Outcomes vary based on flap type and defect characteristics, with multidisciplinary care enhancing recovery and overall patient well-being.

ACKNOWLEDGEMENTS

The authors acknowledge the surgical teams, rehabilitation staff, and patients for their participation.

ETHICS STATEMENT

This study was approved by the Institutional Review Board (Ref No: IRB/OMFS/2025-0518).

INFORMED CONSENT

Written informed consent was obtained from all participants.

COMPETING INTERESTS

The authors declare no competing interests.

FINANCIAL DISCLOSURE

No funding was received.

REFERENCES

1. Warnakulasuriya S. (2020). Oral cancer epidemiology. Oral Oncol. 102:104551. doi:10.1016/j. oraloncology. 2019.104551.
2. Gupta B, et al. (2019). Risk factors OSCC. Cancer Epidemiol. 60:12-20. doi:10.1016/j.canep.2019.02.003.
3. Ali S, et al. (2021). Oral cancer Pakistan. J Pak Med Assoc. 71(3):789-795. doi:10.47391/JPMA.1234.
4. Bray F, et al. (2020). Global cancer stats. CA Cancer J Clin. 70(4):313-331. doi:10.3322/caac.21660.
5. Rogers SN, et al. (2018). OSCC management. Br J Oral Maxillofac Surg. 56(2):112-118. doi:10.1016/j.bjoms. 2017.11.010.
6. Vartanian JG, et al. (2019). Functional outcomes. Head Neck. 41(4):1100-1108. doi:10.1002/hed.25568.
7. Hidalgo DA. (1989). Free flap reconstruction. Plast Reconstr Surg. 84(1):71-79. doi:10.1097/00006534-198907000-00013.
8. Urken ML, et al. (2018). Microvascular reconstruction. Laryngoscope. 128(3):S1-S13. doi:10.1002/lary.26800.
9. Hanasono MM, et al. (2020). Outcomes reconstruction. J Surg Oncol. 121(1):110-118. doi:10.1002/jso.25789.
10. Kreeft AM, et al. (2019). Speech outcomes. Oral Oncol. 90:16-21. doi:10.1016/j.oraloncology.2018.12.005.
11. Lazarus CL. (2020). Swallowing disorders. Dysphagia. 35(3):399-410. doi:10.1007/s00455-019-10067-3.
12. Cella DF. (2018). Quality of life cancer. J Clin Oncol. 36(14):1451-1452. doi:10.1200/JCO.2017.76.1172.
13. Fingeret MC, et al. (2019). Psychosocial impact. Psychooncology. 28(3):498-505. doi:10.1002/pon.4973.
14. Aaronson NK. (1993). EORTC QoL. J Natl Cancer Inst. 85(5):365-376. doi:10.1093/jnci/85.5.365.
15. Khan AA, et al. (2022). QoL developing countries. BMC Cancer. 22:567. doi:10.1186/s12885-022-09654-3.
16. Soutar DS, et al. (2018). Flap comparison. Br J Plast Surg. 71(2):145-152. doi:10.1016/j.bjps.2017.10.012.
17. Wei FC, et al. (2019). ALT flap. Plast Reconstr Surg. 143(2):457-467. doi:10.1097/PRS.0000000000005221.
18. Neligan PC. (2020). Flap selection. Clin Plast Surg. 47(1):1-10. doi:10.1016/j.cps.2019.08.001.
19. Langmore SE. (2018). Rehabilitation outcomes. Dysphagia. 33(2):141-150. doi:10.1007/s00455-017-9856-3.
20. Rogers SN, et al. (2021). Outcome predictors. Head Neck. 43(6):1890-1898. doi:10.1002/hed.26612.
21. Brown JS, et al. (2019). Speech recovery. Oral Oncol. 98:34-40. doi:10.1016/j.oraloncology.2019.09.010.
22. de Vicente JC, et al. (2020). RFFF outcomes. J Craniomaxillofac Surg. 48(5):456-462. doi:10.1016/j.jcms.2020.02.011.
23. Chien CY, et al. (2018). Flap characteristics. Head Neck. 40(3):567-575. doi:10.1002/hed.24987.
24. Yu P, et al. (2019). ALT advantages. Plast Reconstr Surg. 143(1):158-167. doi:10.1097/PRS.0000000000005123.
25. Chen WL, et al. (2021). Swallowing outcomes. Dysphagia. 36(4):567-575. doi:10.1007/s00455-020-10123-4.
26. Hammerlid E, et al. (2018). QoL improvement. Eur J Cancer. 92:81-90. doi:10.1016/j.ejca.2017.12.018.
27. Patterson JM, et al. (2019). Rehabilitation impact. Head Neck. 41(7):2304-2312. doi:10.1002/hed.25678.
28. Mücke T, et al. (2020). Defect size outcomes. J Oral Maxillofac Surg. 78(3):456-464. doi:10.1016/j.joms.2019.10.012.

29. Rogers SN, et al. (2018). Global comparison. Oral Oncol. 80:1-7. doi:10.1016/j.oraloncology.2018.02.001.
30. Semple CJ, et al. (2021). Multidisciplinary care. Support Care Cancer. 29(4):1899-1907. doi:10.1007/s00520-020-05789-2.

CITATION OF THIS ARTICLE

Zarmina Khan D, Shuman R, Mariam H, Sadaf R, Mamoona G, Tarique A, Farah Naz T. Postoperative Speech, Swallowing, and Quality-of-Life Outcomes Following Free Flap Reconstruction for Oral Squamous Cell Carcinoma.Bull. Env. Pharmacol. Life Sci., Vol 15 [6] May 2026. 103-108