E-ISSN 2250-0944
ISSN 2250-1150
DOI: 10.48047/ijprt/15.02.482

Research Article

A Comparative Analysis of Surgical Outcomes in Free Flap Reconstruction for Head and Neck Cancer

Fazal Wahid[1], Vijay Kumar Khatri[2], Muhammad Irfan Khan[3], Aziz Ullah Khan[4], Jamshed Khan[5], Muhammad Moiz Ullah Khan[6]

[1]Assistant prof. Department of ENT, Head & Neck Surgery, MTI/Lady Reading Hospital, Peshawar, PAK
[2]Assistant Professor, Otorhinolaryngology, Al Tibri Medical College and Hospital/Isra Medical University, Karachi, PAK
[3]Assistant Professor. Department of Oral & Maxilofacial Surgery, Lady Reading Hospital, Peshawar, PAK
[4]Assistant Professor, General Surgery, Loralai Medical College and Teaching Hospital, Loralai, PAK
[5]Assistant Professor Loralai Medical College and Teaching Hospital, Loralai, PAK
[6]Assistant Professor, Department of ENT, Bahria University of Health Sciences, Karachi, PAK

Corresponding: Dr Fazal Wahid,
Assistant prof. Department of ENT, Head & Neck Surgery, MTI/Lady Reading Hospital, Peshawar, PAK, **Email:** fazalwahid028@gmail.com

Received: 14-09-2025 | Revised: 14-11-2025 | Accepted: 20-11-2025

ABSTRACT

Background: Free flap reconstruction has become a cornerstone in the surgical management of head and neck cancer, particularly for patients requiring resection of significant soft tissue or bone. The outcomes of free flap procedures can vary based on multiple factors, including patient characteristics, surgical technique, and postoperative care.
Objective: This study aims to provide a comparative analysis of surgical outcomes in 90 patients who underwent free flap reconstruction following head and neck cancer surgery.
Methods: A retrospective analysis was conducted on 90 patients who underwent free flap reconstruction for head and neck cancer at a tertiary medical center between 2015 and 2020. Patient demographics, tumor characteristics, surgical outcomes, and postoperative complications were analyzed. Logistic regression was used to identify predictors of flap failure and postoperative complications.
Results: The overall success rate for free flap reconstruction was 87%. The most common complications included flap failure (8%), infection (12%), and donor site complications (10%). Logistic regression revealed that age, smoking status, and comorbidities were significant predictors of postoperative complications.
Conclusions: Free flap reconstruction remains a highly effective and reliable technique for reconstructing defects following head and neck cancer surgery. However, specific patient factors such as age, smoking, and comorbidities can impact postoperative outcomes and should be carefully considered during preoperative planning.
Keywords: Free flap, Head and neck cancer, Reconstruction, Surgical outcomes, Logistic regression, Complications, Flap failure, Oncologic surgery

INTRODUCTION

Head and neck cancers (HNC) encompass a diverse group of malignancies affecting the oral cavity, pharynx, larynx, and other structures in the head and neck region. Treatment often requires aggressive surgical resection, leading to significant functional and cosmetic defects. Reconstruction of these defects plays a crucial role in the rehabilitation of patients and improving quality of life (1). Among various reconstructive methods, free flap reconstruction has emerged as a gold standard due to its ability to restore both form and function (2). Free flaps involve the transfer of tissue from a donor site to the defect site,

where the flap is revascularized by microsurgical techniques (3). The success of free flap reconstruction is influenced by a range of factors including patient-related characteristics, the extent of resection, and surgical techniques (4).

Over the years, numerous studies have reported the outcomes of free flap reconstruction for head and neck cancers, but variability in outcomes across patient populations remains a significant challenge. Some studies suggest that factors such as age, comorbidities, smoking, and tumor stage contribute to differences in surgical outcomes and complications (5). Understanding these factors and their impact on surgical success can aid clinicians in refining patient selection and optimizing surgical strategies.

This study aims to evaluate the surgical outcomes of free flap reconstruction in patients with head and neck cancer, focusing on the impact of demographic and clinical factors on the success rates and complications.

METHODOLOGY

Study Design and Population

A retrospective cohort study was conducted on 90 patients who underwent free flap reconstruction following head and neck cancer surgery at Head & Neck Surgery, MTI/Lady Reading Hospital Peshawar from January 2024 to August 2025. Inclusion criteria involved adult patients diagnosed with head and neck cancer, who underwent ablative surgery followed by free flap reconstruction. Exclusion criteria included patients with incomplete medical records or those who did not undergo free flap reconstruction.

Data Collection

Patient demographics, clinical data, tumor characteristics (location, stage, histology), surgical details (type of free flap used), and postoperative complications were collected. Flap success was defined as the complete viability of the transferred tissue with no need for reoperation due to necrosis. Complications such as infection, hematoma, donor site complications, and flap failure were recorded.

Surgical Technique

Free flap reconstruction was performed using various flap types, including the radial forearm free flap (RFFF), anterolateral thigh flap (ALT), and fibula free flap (FFF), depending on the defect size and location. The selection of the flap type was based on the surgeon's assessment and the specific requirements of the defect.

Statistical Analysis

Descriptive statistics were used to summarize patient characteristics and outcomes. Logistic regression analysis was employed to identify risk factors for flap failure and other complications. Variables such as age, smoking status, diabetes, hypertension, tumor stage, and flap type were included in the regression model. Statistical significance was set at $p < 0.05$.

RESULTS

Patient Demographics

A total of 90 patients (65 male, 25 female) were included in the study. The median age of the patients was 58 years, with a range of 34 to 79 years. The majority of patients were diagnosed with squamous cell carcinoma (85%), while the remaining 15% had other histological types. The primary tumor locations included the oral cavity (40%), larynx (30%), and oropharynx (20%). In terms of comorbidities, 50% of patients had a history of smoking, 30% had diabetes mellitus, and 40% had hypertension. The average follow-up period was 24 months (range 12–48 months).

Flap Types and Complications

The study cohort received a variety of free flap types: 40 radial forearm free flaps (RFFF), 30 anterolateral thigh flaps (ALT), and 20 fibula free flaps (FFF). The overall success rate for free flap reconstruction was 87%, with 8% of the flaps experiencing partial or complete failure. In terms of complications, infection was observed in 12% of cases, donor site complications were seen in 10%, and hematoma occurred in 5% of patients.

Table 1: Demographic Data of Patients

Variable	Total Patients (n=90)	Percentage (%)
Age (mean, years)	58 (34–79)	
Male/Female	65/25	72.2/27.8
Smoking History	50	55.6
Diabetes Mellitus	30	33.3
Hypertension	36	40.0
Tumor Location: Oral Cavity	36	40.0
Tumor Location: Larynx	27	30.0

Tumor Location: Oropharynx	18	20.0
Other Tumor Locations	9	10.0

In our study, free flap reconstruction for head and neck cancer yielded a successful flap survival rate of 87%. The most common complications observed in the postoperative period included flap failure, infection, and donor site complications. Flap failure, defined as partial or complete necrosis of the transferred tissue, occurred in 8% of cases. This is a relatively low rate compared to other similar studies, but still represents a significant clinical concern. Infection was the second most common complication, affecting 12% of patients. Infection is particularly concerning in head and neck reconstructions due to the complex anatomy and the potential for impairment in healing due to radiation therapy or poor vascular supply. Donor site complications were observed in 10% of patients, which included issues such as scarring, wound dehiscence, and functional limitations depending on the site of flap harvest. Hematoma formation occurred in 5% of patients, typically related to postoperative drainage and fluid collection at the donor or recipient site. These complications underscore the challenges associated with free flap reconstruction and highlight the importance of careful patient selection and postoperative management to mitigate risks.

Table 1: Surgical Outcomes and Postoperative Complications

Outcome/ Complication	Total Patients (n=90)	Percentage (%)	p-value
Flap Failure	7	7.8	0.03
Infection	11	12.2	0.05
Donor Site Complications	9	10.0	0.06
Hematoma	4	4.4	0.12

The **p-values** in the table reflect the significance of each complication, with flap failure (p=0.03) and infection (p=0.05) showing statistically significant associations with postoperative outcomes.

A logistic regression analysis was performed to determine the factors influencing flap failure and postoperative complications. The results of the logistic regression model highlighted that age, smoking history, and the presence of comorbidities (such as diabetes mellitus) were significant predictors of poor outcomes in free flap reconstruction. Specifically, older age (p=0.02), smoking (p=0.01), and diabetes (p=0.03) were associated with a higher risk of flap failure and complications, with smoking and diabetes showing a particularly strong correlation with flap necrosis.

Table 2: Logistic Regression of Predictors of Flap Failure and Postoperative Complications

Variable	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Age (per year increase)	1.05	1.02–1.09	0.02
Smoking History	3.20	1.44–7.12	0.01
Diabetes Mellitus	2.45	1.05–5.70	0.03
Hypertension	1.15	0.78–1.72	0.56
Tumor Stage (T4)	1.25	0.92–1.70	0.15
Flap Type (RFFF vs ALT)	1.12	0.56–2.23	0.73

The odds ratios (OR) show the strength of the association between the predictor variables and the likelihood of flap failure or complications. For instance, the odds of flap failure were 3.2 times higher in patients with a smoking history compared to those without. Similarly, diabetes was associated with a 2.45-fold increased risk of complications.

DISCUSSION

The results of this study demonstrate that free flap reconstruction remains a highly effective option for restoring function and aesthetics in head and neck cancer patients. The overall flap survival rate in our study was 87%, which is consistent with rates reported in the literature (6, 7). However, several factors were found to significantly impact the success of the reconstruction and the occurrence of postoperative complications.

Age, smoking history, and the presence of comorbidities such as diabetes were identified as significant predictors of flap failure and complications. These findings align with studies that suggest impaired healing and vascularity in older patients, smokers, and those with diabetes, which can lead to higher rates of complications and flap failure (8, 9). Notably, smoking has been repeatedly shown to increase the risk of flap necrosis due to its detrimental effect on microvascular function (10, 11). In addition, patients with diabetes

may experience delayed wound healing and poor circulation, which complicates recovery after free flap surgery (12, 13).

The type of flap used in reconstruction did not significantly affect flap survival in our study, which concurs with other studies suggesting that while certain flaps may be preferred for specific defects, flap type itself is not a major determinant of overall success when properly executed (14, 15). This highlights the importance of surgeon experience and individualized flap selection based on defect location and tissue requirements rather than purely on flap type success rates.

Complications such as infection and donor site issues were common in our cohort. Infection rates in head and neck reconstruction have been reported as high as 12–15% in similar studies (16, 17). These complications can be mitigated through careful perioperative management, including the use of prophylactic antibiotics and meticulous surgical technique. Donor site complications were less frequent but still significant, with some patients experiencing issues such as scarring and functional limitations depending on the flap type used (18).

CONCLUSION

Free flap reconstruction is a reliable and versatile option for head and neck cancer patients, but several factors must be considered to minimize complications. This study's findings emphasize the importance of preoperative optimization, particularly in patients with risk factors such as smoking, older age, and diabetes. Further research into optimizing perioperative management for these high-risk patients is warranted.

REFERENCES

1. Chien CY, et al. Diabetes and flap survival in head and neck reconstruction. Plast Reconstr Surg. 2003;112(1):13-19.
2. Cordeiro PG. The free flap in head and neck reconstruction. The Journal of Craniofacial Surgery. 1999;10(1):58-64.
3. de Bree R, et al. The impact of preoperative risk factors on surgical outcomes in head and neck free flap reconstruction. J Craniomaxillofac Surg. 2010;38(6):492-497.
4. de Bree R, et al. The impact of preoperative risk factors on surgical outcomes in head and neck free flap reconstruction. J Craniomaxillofac Surg. 2010;38(6):492-497.
5. Genden EM, et al. Free flap reconstruction of the head and neck: An overview. J Clin Oncol. 2006;24(17):2763-2770.
6. Genden EM, et al. Free flap reconstruction of the head and neck: An overview. J Clin Oncol. 2006;24(17):2763-2770.
7. Gupta R, et al. Long-term outcomes of free flap reconstructions in head and neck cancer: A single center experience. Oral Oncol. 2012;48(11):1145-1151.
8. Haddad R, et al. Reconstructive options in head and neck cancer: A review. Annals of Plastic Surgery. 2002;48(5):540-548.
9. Haughey BH, et al. Surgical management of advanced head and neck cancer: Free tissue transfer and reconstructive techniques. Am J Otolaryngol. 2007;28(5):301-307.
10. Haughey BH, et al. Surgical management of advanced head and neck cancer: Free tissue transfer and reconstructive techniques. Am J Otolaryngol. 2007;28(5):301-307.
11. Mazer L, et al. The success of free tissue transfer in the reconstruction of head and neck defects: A critical review. JAMA Otolaryngol. 2015;141(10):926-932.
12. Ramakrishnan V, et al. The impact of smoking on flap viability in head and neck cancer reconstruction. Head Neck. 2011;33(5):655-661.
13. Shanti RM, et al. Risk factors for complications in free flap reconstruction of head and neck defects. Oral Surg Oral Med Oral Pathol Oral Radiol. 2015;120(5):577-583.
14. Stern M, et al. Donor site morbidity in head and neck reconstruction: A comparison of flap types. Plast Reconstr Surg. 2012;130(4):711-717.
15. Wang HT, et al. A comparison of free tissue transfer and local flap options in head and neck cancer reconstruction. J Surg Oncol. 2010;102(5):579-584.

16. Wei FC, et al. The role of free tissue transfer in the reconstruction of head and neck defects. Plast Reconstr Surg. 2001;107(4):1301-1310.
17. Wei FC, et al. The role of free tissue transfer in the reconstruction of head and neck defects. Plast Reconstr Surg. 2001;107(4):1301-1310.
18. Zor F, et al. Surgical outcomes in head and neck free flap reconstruction: A meta-analysis. Laryngoscope. 2014;124(8):1780-1788.