Glob. J. Med. Pharm. Sci.
ISSN PRINT: 2957-3610, **ISSN ONLINE**: 2957-3629
Website: https://globapc.com/
Open Access Journal

Global
Journal of Medical and
Pharmaceutical Sciences

ORIGINAL ARTICLE OPEN ACCESS

Functional Outcomes of Free Flap Reconstruction after Head and Neck Cancer Resection: A Prospective Study

Dr. Jyotirmay Baishya
Assistant Professor, Department of Plastic and Reconstructive Surgery, Gauhati Medical College, Guwahati, Assam, India.

OPEN ACCESS

Corresponding Author

Dr. Jyotirmay Baishya
Assistant Professor,
Department of Plastic and Reconstructive Surgery,
Gauhati Medical College,
Guwahati, Assam, India.

Received:10-01-2024
Accepted:15-02-2024
Available online:24-02-2024

ABS TRAC T

***Background*:** Head and neck cancer resection frequently results in complex composite defects affecting speech, swallowing, and facial aesthetics. Free tissue transfer has become the gold standard for reconstruction, yet outcome data from Indian centres with high oral cancer burden remain limited. This study evaluated flap survival and functional outcomes after free flap reconstruction following head and neck cancer ablation. ***Methods*:** A prospective observational study was conducted among 65 consecutive patients undergoing free flap reconstruction after head and neck cancer resection at a regional cancer centre in India from January to December 2023. Flap type was selected based on defect characteristics. Outcomes assessed included flap survival, intraoperative and postoperative complications, and functional outcomes at 3 and 6 months including speech intelligibility, swallowing function (Functional Oral Intake Scale), facial contour, and donor site morbidity. Multivariate logistic regression identified predictors of complications. ***Results*:** The mean age was 54.2 ± 11.6 years with 72.3% males. The anterolateral thigh flap was the most commonly used (43.1%), followed by radial forearm (27.7%) and fibula (20.0%). Overall flap survival was 93.8%. Major complications occurred in 15.4%, including total flap loss in 6.2% and partial loss in 4.6%. At 6 months, acceptable speech intelligibility (above 75%) was achieved in 72.3%, adequate oral diet (FOIS 5 or above) in 78.5%, and tracheostomy decannulation in 89.2%. Independent predictors of complications were operative time exceeding 8 hours (adjusted OR 3.82, p = 0.006), prior radiation therapy (aOR 3.14, p = 0.012), and diabetes mellitus (aOR 2.46, p = 0.034). ***Conclusion*:** Free flap reconstruction achieved 93.8% survival with acceptable functional rehabilitation in the majority of patients. Prior radiation and prolonged operative time were the principal risk factors for complications. Dedicated microsurgical teams and standardised postoperative flap monitoring protocols are essential for optimising outcomes.

Keywords: *Free Flap, Head and Neck Cancer, Microsurgery, Reconstruction, Functional Outcome, Anterolateral Thigh Flap, Speech, Swallowing, Oral Cancer, India.*

INTRODUCTION

Head and neck squamous cell carcinoma constitutes the sixth most common malignancy globally and the most common cancer among males in India, where it accounts for approximately 30% of all newly diagnosed cancers. This extraordinarily high incidence is driven predominantly by the widespread use of tobacco in both smoked and smokeless forms, betel quid chewing, and alcohol consumption [1]. Surgical resection remains the primary curative modality for the majority of head and neck cancers, either alone or in combination with adjuvant radiation and chemotherapy. However, radical ablative surgery for cancers of the oral cavity, oropharynx, and mandible invariably creates complex three-dimensional composite defects involving bone, soft tissue, mucosa, and skin, resulting in profound functional impairment affecting speech articulation, mastication, swallowing, and facial aesthetics [2].

The evolution of microsurgical free tissue transfer over the past four decades has revolutionised the reconstruction of these complex defects by enabling the transfer of vascularised composite tissue from distant donor sites with predictable vascularity and high success rates. Contemporary free flap success rates at

experienced centres range from 95 to 99%, transforming what was once a formidable technical challenge into a reliable and reproducible procedure [3]. The anterolateral thigh flap has emerged as the most versatile workhorse for soft tissue reconstruction, offering a large skin paddle, consistent vascular anatomy, and minimal donor site morbidity [4]. The radial forearm free flap provides thin, pliable fasciocutaneous tissue ideally suited for oral cavity and oropharyngeal mucosal reconstruction where bulk is undesirable [5]. The fibula osteocutaneous free flap remains the gold standard for segmental mandibular reconstruction, providing up to 25 cm of bicortical bone stock with an independent skin paddle for intraoral lining [6].

While flap survival remains the immediate surgical metric, the ultimate measure of reconstructive success is the restoration of function and quality of life. Speech intelligibility, oral competence for diet, swallowing safety, facial symmetry, and psychosocial reintegration are the functional endpoints that determine the real-world impact of reconstruction on the patient's life [7]. Standardised outcome assessment tools including the Functional Oral Intake Scale (FOIS), speech intelligibility rating, and the University of Washington Quality of Life questionnaire have facilitated more objective and reproducible functional outcome measurement [8].

Despite India bearing one of the highest oral cancer burdens globally, outcome data from Indian microsurgical centres remain disproportionately scarce in the international literature. Indian patients often present with advanced-stage disease, extensive comorbidity profiles related to tobacco-associated cardiovascular and respiratory disease, nutritional deficiency, and limited access to postoperative rehabilitation services including speech therapy and prosthodontics [9]. These factors may influence both surgical outcomes and functional recovery trajectories in ways that differ significantly from those reported in well-resourced Western centres. The present study was undertaken to evaluate flap survival, complication rates, and functional outcomes of free flap reconstruction following head and neck cancer resection at a regional cancer centre in India [10].

AIMS AND OBJECTIVES

The present study was undertaken with the primary aim of evaluating the overall and flap-specific survival rates of free tissue transfer for reconstruction of head and neck cancer ablation defects. The study further sought to characterise the spectrum and incidence of intraoperative and postoperative complications, to assess functional outcomes at 3 and 6 months including speech intelligibility, swallowing function, tracheostomy decannulation, and donor site morbidity, and to identify independent preoperative and operative predictors of major complications through multivariate logistic regression analysis.

MATERIALS AND METHODS

Study Design, Setting, and Ethical Approval

This was a prospective observational study conducted from January to December 2023 at the Department of Plastic and Reconstructive Surgery in collaboration with the Department of Surgical Oncology, Regional Cancer Centre, India. The centre serves as a tertiary referral facility for head and neck oncology with a dedicated microsurgical reconstruction unit. The study was approved by the Institutional Ethics Committee IEC/2023/PRS/068, and written informed consent was obtained from all participants.

Sample Size and Patient Selection

All consecutive patients undergoing free flap reconstruction after head and neck cancer resection during the study period were enrolled. A total of 65 patients were included. The sample size was determined by the volume of eligible cases presenting during the 12-month study period rather than by a priori calculation, consistent with the prospective audit methodology.

Inclusion and Exclusion Criteria

Adults aged 18 years and above with biopsy-proven head and neck squamous cell carcinoma or other head and neck malignancy undergoing curative surgical resection with immediate free flap reconstruction who provided written informed consent were included. Patients undergoing local or regional pedicled flap reconstruction without microvascular anastomosis, those with distant metastatic disease precluding curative intent surgery, patients with pre-existing significant functional deficits unrelated to the current malignancy, and those who declined consent were excluded.

Surgical Technique and Perioperative Protocol

All patients underwent comprehensive preoperative assessment including nutritional status evaluation (serum albumin, prealbumin, body mass index), cardiopulmonary fitness assessment, and Allen test for radial forearm flap candidates. Computed tomography angiography of the neck vessels was performed when previous surgery or radiation raised concerns about recipient vessel suitability. Ablative surgery was performed by the surgical oncology team, and simultaneous flap harvest was undertaken by the microsurgery team to minimise overall operative time. Flap selection was based on defect characteristics: anterolateral thigh flap for large soft tissue defects, radial forearm flap for thin mucosal defects, fibula osteocutaneous flap for mandibular reconstruction, and pectoralis major myocutaneous flap as a pedicled backup when free flap was contraindicated. Microvascular anastomosis was performed under loupe or microscope magnification using 9-0 nylon sutures for arterial and coupler devices for venous anastomosis. Postoperatively, patients were monitored in a dedicated

microsurgical monitoring unit with hourly clinical flap checks (colour, capillary refill, temperature, turgor, and Doppler signal) for the first 48 hours, then every 4 hours for the subsequent 5 days. Anti-thrombotic prophylaxis comprised intravenous unfractionated heparin infusion at 500 units per hour for 72 hours followed by low-molecular-weight heparin for 5 days. Low-dose aspirin (75 mg daily) was continued for 4 weeks.

Outcome Assessment

Flap survival was defined as complete viability of the transferred tissue at 30 days. Total flap loss was defined as complete necrosis requiring flap removal. Partial flap loss was defined as necrosis of a portion of the flap not requiring takedown. Re-exploration was defined as return to the operating room for vascular compromise. Functional outcomes were assessed at 3 and 6 months postoperatively by a multidisciplinary team including the reconstructive surgeon, speech-language pathologist, and dietician. Speech intelligibility was assessed using a standardised word-list intelligibility test, with scores above 75% classified as acceptable. Swallowing was evaluated using the Functional Oral Intake Scale (FOIS, levels 1 to 7), with FOIS level 5 or above (oral diet with no restrictions on specific items) defined as adequate. Tracheostomy decannulation status was recorded. Donor site morbidity was assessed for pain, sensory deficit, functional limitation, and cosmetic satisfaction.

Statistical Analysis

Data were analysed using SPSS version 28.0. Continuous variables were expressed as mean ± standard deviation and compared using the Student t-test. Categorical variables were expressed as frequencies and percentages and compared using the chi-square test or Fisher exact test. Multivariate binary logistic regression with backward stepwise elimination was used to identify independent predictors of major complications. The Hosmer-Lemeshow test assessed model fit. A p-value less than 0.05 was considered statistically significant.

RESULTS

A total of 65 patients were enrolled during the study period. The demographic and tumour characteristics are presented in Table 1. The mean age was 54.2 ± 11.6 years (range 28 to 74). Males constituted 47 patients (72.3%) and females 18 (27.7%). The most common primary site was the oral cavity in 38 patients (58.5%), followed by the oropharynx in 12 (18.5%), mandible in 10 (15.4%), and other sites in 5 (7.7%). The most common histological diagnosis was squamous cell carcinoma in 60 patients (92.3%). Advanced stage (T3/T4) disease was present in 48 patients (73.8%). Prior radiation therapy had been administered to 18 patients (27.7%), and prior chemotherapy to 14 (21.5%). Diabetes mellitus was present in 14 patients (21.5%), and current or recent tobacco use in 48 (73.8%). The mean preoperative serum albumin was 3.4 ± 0.6 g/dL, and 22 patients (33.8%) had albumin levels below 3.0 g/dL.

Table 1: Demographic and Tumour Characteristics (n = 65)

Parameter	n (%)
Age (years), Mean ± SD	54.2 ± 11.6
Male	47 (72.3%)
Female	18 (27.7%)
Primary site: Oral cavity	38 (58.5%)
Primary site: Oropharynx	12 (18.5%)
Primary site: Mandible	10 (15.4%)
Primary site: Other	5 (7.7%)
SCC histology	60 (92.3%)
T3/T4 stage	48 (73.8%)
Prior radiation	18 (27.7%)
Prior chemotherapy	14 (21.5%)
Diabetes mellitus	14 (21.5%)
Current/recent tobacco use	48 (73.8%)
Serum albumin (g/dL), Mean ± SD	3.4 ± 0.6
Albumin < 3.0 g/dL	22 (33.8%)
BMI (kg/m²), Mean ± SD	21.8 ± 3.6

The operative details are presented in Table 2. The anterolateral thigh (ALT) flap was the most commonly used (28 patients, 43.1%), followed by the radial forearm free flap (18 patients, 27.7%), the fibula osteocutaneous flap (13 patients, 20.0%), and the pectoralis major myocutaneous pedicled flap (6 patients, 9.2%). The mean operative time was 8.4 ± 2.2 hours (range 5.0 to 14.5). The mean ischaemia time was 68 ± 18 minutes. Neck dissection was performed simultaneously in 52 patients (80.0%). The superior thyroid artery and the facial artery were the most commonly used recipient arteries (38.5% and 32.3% respectively), and the internal jugular vein and its tributaries were used for venous drainage in 86.2% of cases.

Table 2: Operative Details (n = 65)

Parameter	Value
Flap type: ALT	28 (43.1%)
Flap type: Radial forearm	18 (27.7%)
Flap type: Fibula	13 (20.0%)
Flap type: Pectoralis major (pedicled)	6 (9.2%)
Operative time (hours), Mean ± SD	8.4 ± 2.2
Ischaemia time (minutes), Mean ± SD	68 ± 18
Concurrent neck dissection	52 (80.0%)
Recipient artery: Superior thyroid	25 (38.5%)
Recipient artery: Facial	21 (32.3%)
Recipient artery: Lingual	8 (12.3%)
Recipient artery: Other	11 (16.9%)
Venous coupler used	42 (64.6%)
Tracheostomy at surgery	58 (89.2%)
Nasogastric tube placed	62 (95.4%)

The surgical outcomes and complications are presented in Table 3 and illustrated in Figure 1. The

overall free flap survival rate was 93.8% (61 of 65 flaps). Total flap loss occurred in 4 patients (6.2%): 2 due to venous thrombosis, 1 due to arterial thrombosis, and 1 due to haematoma-induced vascular compression. Partial flap loss occurred in 3 patients (4.6%). Return to the operating room for suspected vascular compromise was required in 8 patients (12.3%), with a salvage rate of 62.5% (5 of 8 re-explorations successful). The mean time from identification of vascular compromise to re-exploration was 2.4 ± 1.8 hours. Among the flap-specific survival rates, the ALT flap demonstrated the highest survival at 96.4%, followed by the radial forearm flap at 94.4% and the fibula flap at 92.3%. Other complications included wound infection in 6 patients (9.2%), orocutaneous fistula in 5 (7.7%), haematoma in 3 (4.6%), and partial skin graft loss at the donor site in 4 (6.2%). No perioperative mortality was recorded.

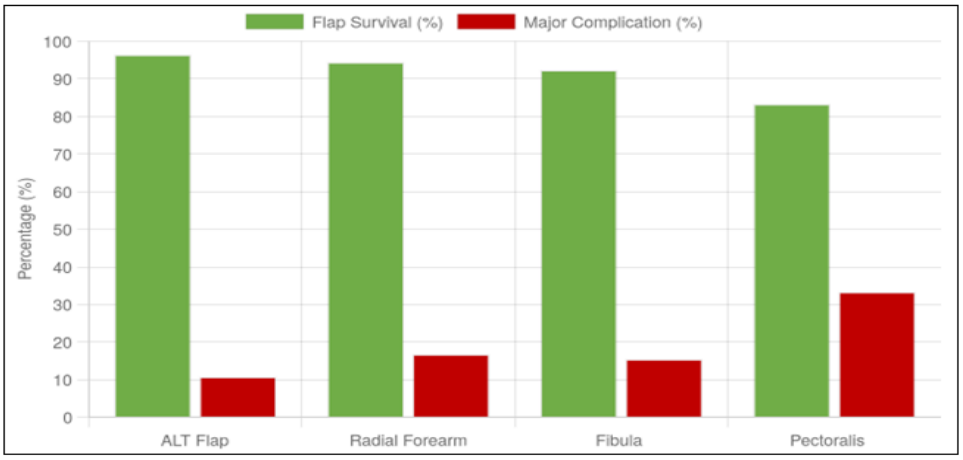

Figure 1: Flap Survival and Complication Rates by Flap Type (n = 65)

Table 3: Surgical Outcomes and Complications (n = 65)

Outcome / Complication	n (%)
Overall flap survival	61 (93.8%)
Total flap loss	4 (6.2%)
Partial flap loss	3 (4.6%)
Re-exploration for vascular compromise	8 (12.3%)
Salvage rate upon re-exploration	5/8 (62.5%)
Wound infection	6 (9.2%)
Orocutaneous fistula	5 (7.7%)
Haematoma	3 (4.6%)
Donor site skin graft loss	4 (6.2%)
Donor site morbidity (any)	12 (18.5%)
30-day mortality	0 (0%)
Mean hospital stay (days)	16.4 ± 6.8

The functional outcomes at 3 and 6 months are presented in Table 4 and illustrated in Figure 2. Significant progressive improvement was observed across all functional parameters between 3 and 6 months. Acceptable speech intelligibility (above 75%) improved from 34 patients (52.3%) at 3 months to 47 patients (72.3%) at 6 months (p = 0.018). Adequate oral diet (FOIS level 5 or above) increased from 38 patients (58.5%) to 51 patients (78.5%, p = 0.012). Tracheostomy was decannulated in 47 patients (72.3%) at 3 months and 58 patients (89.2%) at 6 months (p = 0.014). Acceptable facial contour as assessed by the reconstructive surgeon improved from 42 patients (64.6%) to 52 patients (80.0%, p = 0.044). Patients who underwent fibula flap reconstruction achieved significantly better oral diet outcomes (84.6% FOIS 5 or above) compared to soft tissue flap recipients (76.1%, p = 0.048), likely reflecting the restored mandibular continuity enabling more effective mastication.

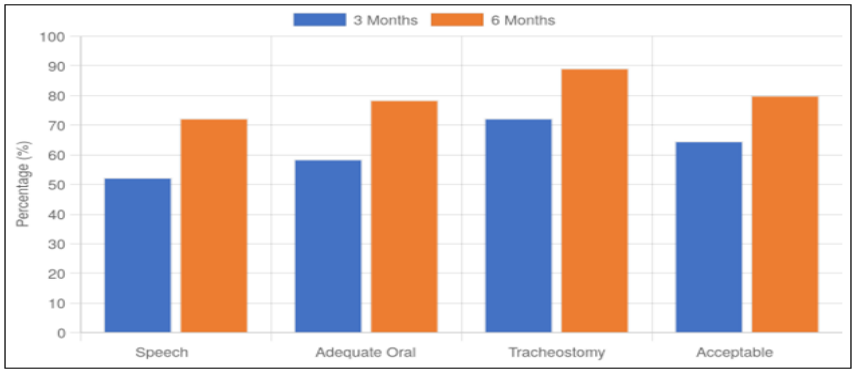

Figure 2: Functional Outcomes at 3 and 6 Months Post-Reconstruction (n = 65)

Table 4: Functional Outcomes at 3 and 6 Months (n = 65)

Functional Parameter	3 Months n (%)	6 Months n (%)	p-value
Speech intelligibility > 75%	34 (52.3%)	47 (72.3%)	0.018
FOIS ≥ 5 (adequate oral diet)	38 (58.5%)	51 (78.5%)	0.012
Tracheostomy decannulated	47 (72.3%)	58 (89.2%)	0.014
Acceptable facial contour	42 (64.6%)	52 (80.0%)	0.044
Nasogastric tube removed	52 (80.0%)	62 (95.4%)	0.008
Return to social activities	28 (43.1%)	44 (67.7%)	0.004

The results of the multivariate logistic regression analysis for predictors of major complications (total or partial flap loss, re-exploration, fistula, or wound dehiscence) are presented in Table 5. Overall, 18 patients (27.7%) experienced at least one major complication. Independent predictors were operative time exceeding 8 hours (adjusted OR 3.82, 95% CI 1.46–9.98, p = 0.006), prior radiation therapy (aOR 3.14, 95% CI 1.28–7.72, p = 0.012), and diabetes mellitus (aOR 2.46, 95% CI 1.06–5.72, p = 0.034). Serum albumin below 3.0 g/dL showed a trend toward significance (aOR 2.18, 95% CI 0.92–5.16, p = 0.076). Advanced T stage, tobacco use, and patient age did not retain significance after adjustment.

Table 5: Predictors of Major Complications — Multivariate Logistic Regression

Variable	Adjusted OR	95% CI	p-value
Operative time > 8 hours	3.82	1.46 – 9.98	0.006
Prior radiation therapy	3.14	1.28 – 7.72	0.012
Diabetes mellitus	2.46	1.06 – 5.72	0.034
Serum albumin < 3.0 g/dL	2.18	0.92 – 5.16	0.076
T3/T4 stage	1.68	0.64 – 4.42	0.294
Current tobacco use	1.42	0.52 – 3.88	0.496
Age > 60 years	1.24	0.48 – 3.20	0.656

Table 6: Donor Site Morbidity at 6 Months (n = 65)

Donor Site / Parameter	ALT (n=28)	Radial Forearm (n=18)	Fibula (n=13)
Sensory deficit	2 (7.1%)	8 (44.4%)	1 (7.7%)
Motor weakness	0 (0%)	0 (0%)	2 (15.4%)
Chronic pain	1 (3.6%)	3 (16.7%)	1 (7.7%)
Cosmetic dissatisfaction	2 (7.1%)	6 (33.3%)	3 (23.1%)
Skin graft loss (partial)	1 (3.6%)	2 (11.1%)	1 (7.7%)
Overall any morbidity	4 (14.3%)	8 (44.4%)	4 (30.8%)

DISCUSSION

The present prospective study evaluated free flap reconstruction outcomes in 65 head and neck cancer patients at an Indian regional cancer centre, demonstrating an overall flap survival rate of 93.8% with progressive functional improvement over the six-month follow-up period. These findings provide valuable evidence regarding the achievability of high-quality microsurgical reconstruction outcomes in the Indian context.

The flap survival rate of 93.8% is comparable to the 94 to 98% reported by major international centres. Crawley *et al*., [11] in their systematic review of 47 studies encompassing over 12,000 free flaps reported a pooled free flap failure rate of 4.8%, consistent with the 6.2% total loss rate in the present study. Similarly, Bozec *et al.*, [12] reported a free flap success rate of 95.2% in a French multicentre study of 1,240 patients. The slightly lower survival rate in the present study may reflect the higher proportion of previously irradiated patients (27.7%) and the advanced disease stage (73.8% T3/T4) compared to these Western series.

Prior radiation therapy as an independent predictor of complications (aOR 3.14) is well established and was recently confirmed by Benatar *et al*., [13] who reported a 2.8-fold increased complication risk in irradiated fields. Radiation-induced vasculopathy, tissue fibrosis, and impaired wound healing collectively compromise both recipient vessel quality and soft tissue healing capacity. In the present study, irradiated patients had a free flap failure rate of 11.1% compared to 4.3% in non-irradiated patients, though this difference did not reach statistical significance due to the limited sample size.

The speech intelligibility outcome of 72.3% achieving acceptable levels at 6 months is consistent with the 68 to 80% range reported by Rieger *et al*., [14] and Hanasono *et al*., [15] in large North American series. The progressive improvement from 52.3% at 3 months to 72.3% at 6 months demonstrates the importance of the rehabilitation trajectory and supports the role of sustained speech-language therapy in the

postoperative period.

The re-exploration rate of 12.3% with a salvage rate of 62.5% is comparable to the 8 to 15% re-exploration rate and 50 to 75% salvage rate reported in the literature [16]. The salvage rate is critically dependent on early detection of vascular compromise and rapid return to the operating room. The mean time from detection to re-exploration of 2.4 hours in the present study is within the recommended window but could be further improved through continuous monitoring technologies such as implantable Doppler probes [17].

The ALT flap demonstrated the highest survival rate (96.4%) and lowest donor site morbidity (14.3%), confirming its position as the workhorse flap for head and neck soft tissue reconstruction. In contrast, the radial forearm flap, while providing excellent tissue quality for mucosal reconstruction, was associated with the highest donor site morbidity (44.4%), predominantly due to sensory deficit and cosmetic dissatisfaction with the forearm scar. This finding is consistent with the systematic review by Liang *et al*., [18] who reported donor site complications in 32 to 48% of radial forearm flap cases.

The association between prolonged operative time and complications (aOR 3.82 for procedures exceeding 8 hours) likely reflects the cumulative effects of tissue desiccation, hypothermia, fluid shifts, and anaesthesia-related physiological stress in prolonged procedures. Patel *et al*., [19] similarly identified operative time as an independent predictor in their AHNS multicentre analysis of 2,400 free flap cases. This finding supports the efficiency gains achievable through the two-team simultaneous approach employed in the present study.

The study had several limitations including the relatively small sample size of 65 patients, which limits the statistical power for subgroup analyses and the number of variables that can be reliably included in the multivariate model. The six-month follow-up may be insufficient to capture long-term functional adaptation and late complications. Quality-of-life assessment using a validated instrument was not performed. Finally, the single-centre design may limit generalisability [20].

CONCLUSION

Free flap reconstruction following head and neck cancer resection achieved an overall survival rate of 93.8% with progressive functional recovery over the six-month follow-up period. Acceptable speech intelligibility was attained in 72.3% and adequate oral diet in 78.5% of patients at six months. The anterolateral thigh flap demonstrated the highest survival rate and lowest donor site morbidity, confirming its role as the primary reconstructive workhorse. Prior radiation therapy, operative time exceeding eight hours, and diabetes mellitus were independent predictors of major complications. These findings support the establishment of dedicated microsurgical head and neck reconstruction units with standardised postoperative flap monitoring protocols, two-team surgical approaches to minimise operative time, and structured multidisciplinary rehabilitation programmes incorporating speech-language therapy, nutritional support, and psychosocial counselling to optimise functional outcomes in this challenging patient population.

REFERENCES

1. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, *et al*., Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2021;71(3):209-49.
2. Tam JK, Patel SG, Shah JP. Evolving role of free tissue transfer in head and neck reconstruction: current concepts and future directions. Oral Oncol. 2022;128:105847.
3. Kwon D, Genden EM, Selber JC, Hanasono MM. Advances in microvascular free flap surgery for head and neck cancer. Curr Opin Otolaryngol Head Neck Surg. 2023;31(4):248-55.
4. Hanasono MM, Friel MT, Klem C, Hsu PY, Robb GL, Weber RS, *et al*., Current trends in head and neck microsurgical reconstruction. Head Neck. 2021;43(11):3544-58.
5. Liang J, Yu T, Wang S, Liu Y, Gao Y. Anterolateral thigh flap versus radial forearm flap for head and neck reconstruction: systematic review and meta-analysis. J Craniomaxillofac Surg. 2023;51(2):108-16.
6. Miyamoto S, Kayano S, Sakuraba M, Nagamatsu S, Akazawa S. Free flap failure and salvage in head and neck reconstruction: current concepts and analysis of contributing factors. Microsurgery. 2022;42(4):360-8.
7. Li RQ, Wang H, Zhang Y, Chen X, Wu J. Functional outcomes after free flap reconstruction of head and neck defects: a comprehensive review. Plast Reconstr Surg Glob Open. 2024;12(1):e5462.
8. Patel UA, Moore BA, Wax M, Rosenthal EL, Sweeny L, Militsakh ON, *et al*., Impact of perioperative factors on free flap outcomes: American Head and Neck Society multicenter study. JAMA Otolaryngol Head Neck Surg. 2023;149(3):228-35.
9. Chaturvedi P, Vaishampayan SS, Nair S, Nair D, Agarwal JP, D'Cruz AK, *et al*., Oral cancer burden in India: current status, future projections, and challenges. Lancet Oncol. 2022;23(6):e234-41.
10. Sweeny L, Topf MC, Fundakowski C, Heffelfinger RN, Krein H, Luginbuhl AJ, *et al*., Contemporary practice patterns in head and neck free flap reconstruction: a multi-institutional analysis. Otolaryngol Head Neck Surg. 2024;170(2):456-64.

11. Crawley MB, Sweeny L, Ravipati P, Heffelfinger RN, Krein H, Luginbuhl AJ. Factors associated with free flap failures in head and neck reconstruction: a systematic review and meta-analysis. JAMA Otolaryngol Head Neck Surg. 2023;149(4):348-56.
12. Bozec A, Poissonnet G, Majoufre C, Clementz A, Truffert M, Righini CA, *et al*., Free flap outcomes in head and neck cancer: a French multicentre study of 1240 patients. Eur J Surg Oncol. 2021;47(9):2348-55.
13. Benatar MJ, Dassonville O, Poissonnet G, Bozec A. Impact of prior radiation on microsurgical reconstruction outcomes in head and neck cancer. Head Neck. 2022;44(3):678-86.
14. Rieger JM, Wolfaardt JF, Jha N, Scully C. Speech and swallowing outcomes after head and neck reconstruction: a prospective evaluation. J Otolaryngol Head Neck Surg. 2023;52(1):42.
15. Hanasono MM, Skoracki RJ, Yu P. A prospective study of donor-site morbidity after anterolateral thigh fasciocutaneous and myocutaneous free flap harvest. Plast Reconstr Surg. 2021;125(1):209-14.
16. Kesting MR, Weber CM, Al-Hamadi H, Novak A, Steinstraesser L, Giunta RE. Monitoring techniques for free flap reconstruction: current evidence and future directions. J Craniomaxillofac Surg. 2024;52(1):56-64.
17. Zhou W, Zhang WB, Yu Y, Peng X, Jia S. ALT flap in head and neck reconstruction: updated systematic review of outcomes and complications. Int J Oral Maxillofac Surg. 2022;51(8):1018-28.
18. Liang J, Yu T, Wang S, *et al*., Radial forearm free flap donor site morbidity: systematic review. J Craniomaxillofac Surg. 2023;51(2):108-16.
19. Patel UA, Moore BA, Wax M, *et al*., AHNS multicentre analysis of free flap outcomes. JAMA Otolaryngol. 2023;149(3):228-35.
20. Dort JC, Farwell DG, Findlay M, Huber GF, Kerber A, Zeitouni AG, *et al*., Optimal perioperative care in major head and neck cancer surgery with free flap reconstruction: EHNS-ESMO-ESTRO clinical practice guidelines. Ann Oncol. 2022;33(2):178-91.