

# Outcomes of Microvascular Free Flap Reconstruction after Major Head and Neck Ablative Surgery at a Tertiary Teaching Hospital in Eastern Nepal

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## ABSTRACT

### Background

Reconstruction with free flaps has significantly changed the outcome of patients with head and neck cancer. Microsurgery is still considered a specialized procedure and is not routinely performed in the resource-constrained environment of developing country like Nepal.

### Objective

To evaluate the clinical outcomes in patients who underwent different microvascular free flap reconstructions of head and neck defects after major ablative surgery.

### Method

A retrospective study was conducted to review and analyze the data of patients with head and neck cancer who underwent microvascular free flap reconstruction after major ablative surgery from November 2017 to April 2021. The descriptive statistics were calculated using Microsoft Excel 2010.

### Result

Out of 207 patients, 129 (62.32%) were males. Mean age was of 55.17±13.44 years. About 133 (64.25%) tumors were on gingivobuccal complex. Anterolateral thigh flap was the most common flap 112, (54.11%) used for the reconstruction. Facial artery was used in 174 (84.06%) patients for anastomosis. The overall success rate was 97.5%. Re-exploration was done in 22 (10.63%) cases out of which 11 (50%) cases were having flap compromise. Delayed flap failure occurred in 5 cases (2.5%) and salvage surgery was done with pectoralis major myocutaneous flap with a salvage rate of 54%. Minor complications were observed in 39 cases (18.84%) out of which donor site graft loss was observed in 19 (9.18%) patients.

### Conclusion

In spite of advanced set up, with trained dedicated manpower the microvascular free flap reconstruction of head and neck defects is safe with high success rate even in resource constrained country like Nepal.

## KEY WORDS

*Free flap, Head and neck cancer, Microsurgery, Reconstruction*

## INTRODUCTION

Head and neck cancers (HNC) are the heterogeneous collection of malignancies of the upper aerodigestive tract, salivary glands, thyroid and parathyroid glands, sino-nasal tract and the skin of the head and neck region.<sup>1,2</sup> HNC was the seventh most common cancer globally in 2018 and accounted for 3% of all cancers.<sup>3</sup> It is one of the leading causes of death in developing countries like Nepal.<sup>4-6</sup>

Tissue defect around the head and neck region due to cancer cause significant functional and cosmetic deformity and is a challenge for reconstructive surgeons. Microvascular free flap reconstruction has become the gold standard for reconstruction of the defects following cancer ablation in head and neck region.<sup>7-11</sup> Microsurgery free flap is still considered a specialized procedure and is not routinely performed in the resource-constrained environment of developing country like Nepal. There is paucity of data on the outcomes of microvascular free flap reconstruction in head and neck region in resource constraints country like Nepal. Objective of the study was to evaluate the clinical outcomes in patients who underwent different microvascular free flap reconstructions of head and neck defects after major ablative surgery.

## METHODS

A retrospective study was conducted at Otorhinolaryngology and Head & Neck Surgery (ORL and HNS), BPKIHS. The patients aged >18 years of either gender who underwent different microvascular free flap reconstructions of head and neck defects after major ablative surgery were enrolled. The sample size was calculated to be 187 using the formula  $Z^2 * P * Q / L^2$  with a reference to the findings of a study in which perioperative complications occurred in 36.1% of all cases of microvascular free flap procedures in head and neck region in a study conducted in the USA.<sup>12</sup> Ethical approval was obtained from Institutional Review Committee, BPKIHS (IRC/2085/020).

A self-designed Performa was used to collect the relevant data after reviewing and analyzing the data of patients with head and neck cancer who underwent microvascular free flap reconstruction after major ablative surgery retrospectively from November 2017 to April 2021 at ORL and HNS. Data were entered in Microsoft Excel 2010 and descriptive statistics like mean, standard deviation, frequency and percentage were calculated. The findings were presented as tables and graphs.

## RESULTS

A total of 207 cases were included in the study and 129 (62.32%) were males. Mean age of the patients was of  $55.17 \pm 13.44$  years (Table 1).

One hundred and eighty three (88.41%) and 24 (11.59%) patients stayed in the ward for 6-10 days and 11 to 15

**Table 1. Socio-demographic characteristics of the patients with head and neck cancer (n=207)**

Variables	Frequency	Percentage	
Gender	Male	129	62.32
	Female	78	37.68
Age groups (years)	18 – 30	11	5.31
	31 – 45	47	22.71
	46 – 60	79	38.16
	> 60	70	33.82
	Occupation	Employed	113
	Unemployed	94	45.41
Educational level	Literate	163	78.74
	Illiterate	44	21.26
Alcoholic	Yes	151	72.95
	No	56	27.05
Smoker	Yes	160	77.29
	No	47	22.71
Tobacco chewer	Yes	174	84.06
	No	33	15.94
Co morbidities	Hypertension	94	45.41
	Diabetes	57	27.54
	COPD	8	3.86
Previous surgery in head and neck region	Yes	21	10.14
	No	186	89.86

days respectively. Similarly, 198 (95.65%), 6 (2.9%) and 3 (1.45%) patients stayed in ICU for 1-5 days, 6-10 days and 11-15 days respectively. Out of 207, 199 (96.14%) cancers were squamous cell carcinoma followed by adenoid cystic carcinoma 5 (2.42%) and ameloblastoma 3 (1.45%). Staging of the cancers were stage 2 (8, 3.86%), stage 3 (69, 33.33%) and stage 4 (127, 61.35%). One hundred and thirty-three (64.25%) cancers were on gingivobuccal complex followed by tongue/floor of the mouth (41, 19.81%), retromolar trigone (13, 6.28%), sinonasal (9, 4.35%), lip (4, 1.93%) and others (7, 3.38%).

Anterolateral thigh flap was the most common flap (54.11%) (Fig. 1) used for the reconstruction of the surgical site followed by free fibula flap (22.22%) (Fig. 2), radial arm free flap (20.29%) (Fig. 3) and medial Sural artery perforator Flap (3.38%) (Fig. 4).



**Figure 1. Reconstruction with Free Anterolateral thigh microvascular Flap of huge defect after ablative surgery of Carcinoma left Buccal mucosa**



**Figure 2.** Reconstruction with Free Fibula Microvascular Flap of Lower central arch mandible and Chin skin defect after Ablative surgery of Carcinoma lower Gingivolabial Sulcus with skin Involvement



**Figure 3.** Total lip reconstruction with forearm Radial microvascular free flap with Palmaris tendon sling for carcinoma lower Lip after Ablative surgery



**Figure 4.** Tongue reconstruction with Medial Sural Artery Perforator flap after ablative surgery of left carcinoma Tongue

Tracheostomy was done in 15 (7.25%) patients. Facial artery and Common facial vein were used in 174 (84.06%) and 140 (67.63%) patients for anastomosis (Table 2).

**Table 2.** List of artery and veins used for anastomosis (n=207)

	Variables	Frequency	Percentage
Arteries for Anastomosis	Facial artery	174	84.06
	STA	28	13.53
	ECA	3	1.45
	LA	2	0.97
Veins for Anastomosis	Common Facial vein	140	67.63
	IJV	67	32.37
	EJV	179	86.47

Out of 207, 202 (97.58%) flaps survived and 97.32% of free anterolateral thigh flap were survived (Table 3). Five flap surgeries were failed. Causes of the flap were arterial blockage (1 case), venous blockage (2 cases) and infection (1 case). Postoperative revisions of anastomosis were done in 11 (5.31%) cases.

**Table 3.** List of the flap survival rate in the patients (n=207)

Types of free flap	Number of flap survived	Percentage
Free fibula flap (n=46)	44	96.65
Free anterolateral thigh flap (n=112)	109	97.32
Free Radial Forearm flap (n=42)	42	100.0
Free medial sural artery perforator Flap (n=7)	7	100.0

Out of 207 flaps, re-exploration was done in 22 cases (10.63%) out of which 11 cases were having flap compromise. Salvage surgery was done with pectoralis major myocutaneous flap in the patients with flap compromise and its success was 54% (six out of 11 cases). Delayed flap failure occurred in five cases (2.5%) due to infection.

Minor complications were observed in 39 (18.84%) cases out of which 19 (9.18%) complication was donor site graft loss followed by wound dehiscence (3.86%).

**DISCUSSION**

To our knowledge, this is the first study to focus on the clinical outcomes in patients who underwent different microvascular free flap reconstructions of head and neck defects after major ablative surgery in Eastern Nepal. Reconstruction of a surgical defect is an important part of the management of head and neck cancers and microvascular free flap reconstruction provides a better functional and cosmetic outcome for the same.<sup>13</sup> It is a challenging task to perform microvascular surgical free flaps for reconstruction in developing countries like Nepal as the resources are limited here. In spite of these constraints, it was interesting to find out a high success rate (97.58%) of microvascular free flap surgery in the present study. This finding was similar to Liang et al. (90.3%), Kim et al (98.8%), Brennan et al (96%), Shunyu et al (91.8%), and Shanker et al (98.1%).<sup>14-18</sup> The results of the present study confirmed the high degree of reliability of microvascular head and neck reconstruction on resource-limited settings like Nepal. Very strong teamwork as well as education and training of the surgeons and nurses are needed to make these surgeries more successful.<sup>19</sup> In the present study, a single qualified and trained surgeon performed all of the surgical procedures over the defined study duration avoiding the influence of differences in the technical skill of multiple centers or multiple surgeons and hence the outcomes of the surgery showed consistency.

The most common cancer location was gingivobuccal complex (64.25%) and similar finding was also reported by Shunyu et al. (24.1%).<sup>17</sup> In contrast to this, tongue was the most common site of cancer in a study by Liang et al. (24.73%).<sup>14</sup> Majority of the cancers (96.14%) were squamous cell carcinoma in the present study and similar finding was also reported in other study (89.2%).<sup>14</sup> Anterolateral thigh (ALT) flap was used in more than half of the patients (54.11%) for the reconstruction of the surgical site and this finding was similar to a report by Katna et al. (64.69%).<sup>20</sup> In contrast to this, radial arm free flap (45.75%) was the most commonly used flap for the reconstruction by Shunyu et al. (51.3%) and Rai et al. (48.2%),<sup>17,21</sup> Radial arm free flap is more popularly used for the reconstruction of the orofacial region in the other studies due to the reliability of its pedicle and the versatility in design.<sup>22</sup> These commonly used free flaps have long vascular pedicles containing large caliber blood vessels having an external diameter > 1 mm and hence microvascular anastomoses are much less prone to thrombosis. A major artery is not killed and the scar can be easily hidden in ALT flap compared to radial arm free flap and hence ALT flap have also gained widespread use by many surgeons including our study.<sup>23</sup>

Facial artery (84.06%) and common facial vein (67.63%) were the most common vessels for anastomosis in the present study. In contrast to this, the most common recipient vessels were the superior thyroid artery (77.4%) and the internal jugular vein (91.4%) in another study.<sup>14</sup> Venous blockage was the most common cause of surgical re-exploration of the free flaps in the present study and this findings was in consistent with Shanker et al.<sup>18</sup> Venous blockade is the mechanical obstruction caused by twisting, kinking, stretching, and compression of veins.

In the present study, surgical re-exploration was done in 10.63% cases which was similar to Liang et al. (9.67%).<sup>14</sup>

A lower number of compromised flaps (4.5%) required surgical re-exploration in another study.<sup>18</sup> In our study successful salvage rate was 54.5% which was lower than Katna et al. (88.88%), Shanker et al. (57.7%) and higher than Shunyu et al. (35.71%).<sup>17,18,20</sup>

The present study had zero mortality rate within three months of follow-up. In contrast, mortality rate was 3.5% in a study by Rai et al.<sup>21</sup>

We had performed elective tracheostomy in very few selective patients 15 (7.25%) to decrease the morbidity which was very unique as most of the center routinely does elective tracheostomy in patient with free flap reconstruction.

The present study has some limitations. The study had small sample size. We could not review cosmesis, patient satisfaction or functional improvement in quality of life. Lastly, the median follow-up time of this study was rather short.

## CONCLUSION

The present study confirms that microvascular free flap is extremely reliable, safe and gold standard modality in achieving successful reconstruction of the head and neck surgical reconstruction in a resource-constrained environment. A team that is dedicated and motivated to provide the necessary efforts for good outcome should be established.

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## REFERENCES

- Mehanna H, Paleri V, West CM, Nutting C. Head and neck cancer- Part 1: Epidemiology, presentation, and prevention. *BMJ*. 2010 Sep 20;341:c4684. doi: 10.1136/bmj.c4684. PMID: 20855405.
- Chettri ST, Bhandary S, Singh RK, Sinha AK, Karki S, Nepal A, et al. Pattern of head and neck malignancies in eastern part of Nepal. *Nepal Med Coll J*. 2013 Mar;15(1):34-6. PMID: 24592791.
- Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*. 2018 Nov;68(6):394-424. doi: 10.3322/caac.21492. Epub 2018 Sep 12. Erratum in: *CA Cancer J Clin*. 2020 Jul;70(4):313. PMID: 30207593.
- Neupane PR, Poudel KK, Huang ZB, Steel R, Poudel JK. Distribution of Cancer by Sex and Site in Nepal. *Asian Pac J Cancer Prev*. 2017 Jun 25;18(6):1611-5. doi: 10.22034/APJCP.2017.18.6.1611. PMID: 28670003; PMCID: PMC6373810.
- Pradhananga KK, Baral M, Shrestha BM. Multi-institution hospital-based cancer incidence data for Nepal: an initial report. *Asian Pac J Cancer Prev*. 2009;10(2):259-62.
- Trivedi NP, Trivedi P, Trivedi H, Trivedi S, Trivedi N. Microvascular free flap reconstruction for head and neck cancer in a resource-constrained environment in rural India. *Indian J Plast Surg*. 2013;46(1):82-6.
- Pohlentz P, Klatt J, Schön G, Blessmann M, Li L, Schmelzle R. Microvascular free flaps in head and neck surgery: complications and outcome of 1000 flaps. *Int J Oral Maxillofac Surg*. 2012;41(6):739-43.
- Franke A, Hentsch S, Bieler D, Schilling T, Weber W, Johann M, et al. Management of Soft-Tissue and Bone Defects in a Local Population: Plastic and Reconstructive Surgery in a Deployed Military Setting. *Mil Med*. 2017 Nov;182(11):e2010-e2020. doi: 10.7205/MILMED-D-16-00372. PMID: 29087873.
- Abemayor E, Blackwell KE. Reconstruction of soft tissue defects in the oral cavity and oropharynx. *Arch Otolaryngol Head Neck Surg*. 2000 Jul;126(7):909-12. doi: 10.1001/archotol.126.7.909. PMID: 10889009.
- Xiao Y, Zhu J, Cai X, Wang J, Liu F, Wang H. Comparison between anterolateral thigh perforator free flaps and pectoralis major pedicled flap for reconstruction in oral cancer patients-a quality of life analysis. *Med Oral Patol Oral Cir Bucal*. 2013 Nov 1;18(6):e856-61. doi: 10.4317/medoral.19276. PMID: 24121914; PMCID: PMC3854077.
- Weaver TS, Wester JL, Gleysteen JP, Peck JJ, Wax MK. Surgical outcomes in the elderly patient after osteocutaneous free flap transfer. *Laryngoscope*. 2014 Nov;124(11):2484-8. doi: 10.1002/lary.24762. Epub 2014 May 30. PMID: 24891207.

12. Suh JD, Sercarz JA, Abemayor E, Calcaterra TC, Rawnsley JD, Alam D, et al. Analysis of outcome and complications in 400 cases of microvascular head and neck reconstruction. *Arch Otolaryngol Head Neck Surg*. 2004 Aug;130(8):962-6. doi: 10.1001/archotol.130.8.962. PMID: 15313867.
13. Başaran B, Ünsaler S, Kesimli MC, Aslan İ. Free Flap Reconstruction of the Head and Neck Region: A Series of 127 Flaps Performed by Otolaryngologists. *Turk Arch Otorhinolaryngol*. 2021 Jun;59(2):103-10. doi: 10.4274/tao.2021.2021-1-9. Epub 2021 Jul 30. PMID: 34386796; PMCID: PMC8329401.
14. Liang J, Yu T, Wang X, Zhao Y, Fang F, Zeng W, et al. Free tissue flaps in head and neck reconstruction: clinical application and analysis of 93 patients of a single institution. *Braz J Otorhinolaryngol*. 2018 Jul-Aug;84(4):416-25. doi: 10.1016/j.bjorl.2017.04.009. Epub 2017 May 13. PMID: 28571928; PMCID: PMC9449187.
15. Kim HS, Chung CH, Chang YJ. Free-flap reconstruction in recurrent head and neck cancer: A retrospective review of 124 cases. *Arch Craniofac Surg*. 2020 Feb;21(1):27-34. doi: 10.7181/acfs.2019.00738. Epub 2020 Feb 20. PMID: 32126617; PMCID: PMC7054190.
16. Brennan M, Wong S, Faringer PD, Lim JH. Head and Neck Tumor Resection and Free Flap Reconstruction in Low-Volume Center. *Ear Nose Throat J*. 2021 Nov;100(9):647-50. doi: 10.1177/0145561320923835. Epub 2020 May 4. PMID: 32364445.
17. Shunyu NB, Chakraborty S, Ronrang L, Lynrah Z, Aktar H, Medhi J, et al. Microvascular free flap for head and neck reconstruction: our experiences with 218 free flaps for head and neck reconstructions. *Int J Otorhinolaryngol Head Neck Surg*. 2021;7:1868-76.
18. Shanker MK, Rajan A, Hemant B, Kumar DA. Outcome of 1000 free flap head and neck reconstructions at a tertiary cancer care institute in India. *Eur J Plast Surg*. 2021 Feb;44:25-32.
19. Silinzieds A, Simmons L, Edward KL, Mills C. Nurse education in developing countries-Australian plastics and microsurgical nurses in Nepal. *Plast Surg Nurs*. 2012 Oct-Dec;32(4):148-55. doi: 10.1097/PSN.0b013e3182728267. PMID: 23188146.
20. Katna R, Naik G, Girkar F, Deshpande A, Chalke S, Bhosale B, et al. Clinical outcomes for microvascular reconstruction in oral cancers: experience from a single surgical centre. *Ann R Coll Surg Engl*. 2023 Mar;105(3):247-51. doi: 10.1308/rcsann.2021.0295. Epub 2022 Feb 17. PMID: 35175143; PMCID: PMC9974342.
21. Rai SM, Grinsell D, Hunter-Smith D, Corlett R, Nakarmi K, Basnet SJ, et al. Microsurgical free flaps at Kathmandu Model Hospital. *J Nepal Health Res Counc*. 2014 May-Aug;12(27):100-3. PMID: 25575001.
22. Vandersteen C, Dasonville O, Chamorey E, Poissonnet G, Nao EE, Pierre CS, et al. Impact of patient comorbidities on head and neck microvascular reconstruction. A report on 423 cases. *Eur Arch Otorhinolaryngol*. 2013 May;270(5):1741-6. doi: 10.1007/s00405-012-2224-z. Epub 2012 Oct 19. PMID: 23081673.
23. Mäkitie AA, Beasley NJ, Neligan PC, Lipa J, Gullane PJ, Gilbert RW. Head and neck reconstruction with anterolateral thigh flap. *Otolaryngol Head Neck Surg*. 2003 Nov;129(5):547-55. doi: 10.1016/S0194-59980301393-7. PMID: 14595278.