

Original Research

Analysis of Microvascular Anastomotic Coupler Assessment in Head and Neck Reconstruction Surgeries at a Tertiary Care Hospital

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ABSTRACT**Background:** Microsurgical reconstruction is providing new and dramatic treatment options for patients affected by cancer, trauma and paralysis. Free flap achieves repair effectively and faster. The present study was conducted for assessing microvascular anastomotic coupler devices (MACD) in head and neck reconstruction.**Materials & Methods:** A total of 100 patients scheduled to undergo head and neck reconstruction were enrolled. Complete demographic and clinical details of all the patients were obtained. Only those patients were enrolled which underwent microvascular free flap reconstruction using a MACD. The flap donor site, recipient vessels, and anastomotic technique were determined by surgeon preference. Microvascular complications were found to be due to either venous congestion or arterial insufficiency. Free flap complications were classified as either partial failure, late total failure (>5 days), or acute total failure (<5 days). All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software. Univariate analysis was done for evaluation of the level of significance.**Results:** A total of 100 patients were analyzed. The mean age of the patients was 51.8 years. Mean venous couple size was 2.5 mm and 3.5 mm in 33 percent and 56 percent of the patients. Most common recipient vein was external jugular and internal jugular vein found to be present in 33 percent and 55 percent of the patients respectively. Overall complications were seen in 8 percent of the patients. Venous congestion, vessel wall rupture, arterial insufficiency and total flap loss were the most common complications seen.**Conclusion:** There is a significant reliability of MACDs in head and neck reconstruction, even in small-diameter vessel reconstruction.**Key words:** Microvascular, Anastomotic, Reconstruction.

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INTRODUCTION

Microsurgical reconstruction provides new and dramatic treatment options for patients affected by cancer, trauma and paralysis. Free flap achieves repair effectively and faster. In the treatment of cancer, adequate surgical excision of tumour is necessary. Compromise with excision, or due to inadequate excision, recurrence of disease will defeat the purpose of surgery. Nowadays even seemingly inoperable cases can be excised, and reconstruction can be attempted thereby improving the quality of life. Today reconstructive surgery has become part of primary cancer treatment. Maximum reconstructions are performed to treat head and neck cancers.¹⁻³

Maintaining the integrity of the alimentary tract, and as such the patient's ability to eat, is an issue of paramount importance. Reconstruction of the face is essential for a person to communicate through facial expression. Last but not least, coverage of the neck and maintenance of an intact intraoral seal prevents life-threatening complications such as blowout of the great vessels of the neck.^{4,5} The transfer of autogenous, vascularized free-tissue is a cornerstone of modern reconstructive surgery, particularly when dealing with extensive oncological ablations and large post-traumatic defects. A half-century after Jacobson and Suarez described the first sutured microvascular anastomosis, the cumulative efforts of surgeons and researchers have refined free tissue transfer (FTT)

into a reliable modality that often provides excellent cosmetic and functional results.^{6,7}

Hence; the present study was conducted for assessing microvascular anastomotic coupler devices in head and neck reconstruction.

MATERIALS & METHODS

The present study was conducted for assessing microvascular anastomotic coupler devices in head and neck reconstruction. A total of 100 patients scheduled to undergo head and neck reconstruction were enrolled. Complete demographic and clinical details of all the patients were obtained. Only those patients were enrolled which underwent microvascular free flap reconstruction using a MACD. The flap donor site, recipient vessels, and anastomotic technique were determined by surgeon preference. Microvascular complications were found to be due to either venous congestion or arterial insufficiency.

Free flap complications were classified as either partial failure, late total failure (>5 days), or acute total failure (<5 days). All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software. Univariate analysis was done for evaluation of the level of significance.

RESULTS

A total of 100 patients were analyzed. The mean age of the patients was 51.8 years. Mean venous couple size was 2.5 mm and 3.5 mm in 33 percent and 56 percent of the patients. Most common recipient vein was external jugular and internal jugular vein found to be present in 33 percent and 55 percent of the patients respectively. Overall complications were seen in 8 percent of the patients. Venous congestion, vessel wall rupture, arterial insufficiency and total flap loss were the most common complications seen.

Table 1: Variables associated with microvascular flap reconstruction

	Variable	Number	Percentage
Venous couple size	2 mm	3	3
	2.5 mm	33	33
	3.5 mm	56	56
	4 mm	8	8
Recipient vein	Anterior jugular	5	5
	External jugular	33	33
	Internal jugular	55	55
	Facial	7	7
Recipient artery	Facial	61	61
	Lingual	18	18
	Superior thyroid	12	12
	Stump off external carotid	9	9

Table 2: Complications

Complications	Number	Percentage
Venous congestion	3	3
Vessel wall rupture	2	2
Arterial insufficiency	2	2
Total flap loss	1	1
Total	8	8

DISCUSSION

Cancers of head and neck are very common in India. Out of 50,000 new cases, 8000 are head and neck patients every year. Over 2000 major surgeries and about 800 reconstructions are performed every year at Tata Memorial Hospital, Mumbai. Tumours in this area lead to cosmetic and functional deficits. The overall survival for patients with head and neck is promising and has remained static for the last 35 years. Studies based on a large series have helped to develop reconstruction algorithms for different defects of the head and neck region. Newer endoscopic laser-assisted techniques, advances in radiotherapy techniques like intensity modulated radiotherapy or image-guided radiotherapy are reducing damage to tissues without compromising treatment arm. In established disease, primary reconstruction with

pedicle or free flaps offers reasonable function and aesthetic outcome. Advances in microvascular techniques have allowed for improvements in flap survival and overall favorable outcomes. While the incidence of free tissue transfer failure is low, typically between 3% and 5%, reasons for failure are most often technical. This reflects that microvascular anastomosis remains one of the most technically challenging and crucial portions of free tissue transfer procedures.⁸⁻¹⁰ Hence; the present study was conducted for assessing microvascular anastomotic coupler in head and neck reconstruction.

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be present in 33 percent and 55 percent of the patients respectively. Overall complications were seen in 8 percent of the patients. Venous congestion, vessel wall rupture, arterial insufficiency and total flap loss were the most common complications seen. In a review of 1235 flaps in the head and neck with 42 failures (3.4%), Wei et al performed a second free flap in 40% of patients, regional flaps in 36% of patients, and treated conservatively in 24% of patients. The mean time between failure and second free tissue transfer was 12 days. They noted that 47% of regional flaps failed, and 40% of patients treated conservatively developed complications that required additional procedures, often in the form of free tissue transfer. These authors concluded that, in the head and neck, a second free tissue transfer was a more reliable and effective procedure for treatment of flap failure.¹¹

Grewal et al examined the utility of the microvascular coupler in free tissue transfer. A comprehensive database search was performed to identify eligible publications. Inclusion criteria were anastomotic coupler utilization and free-tissue transfer. Recorded information from eligible studies included patient age, follow-up, radiation history, number of free-flaps and failure rates, reconstruction subsites, number of coupled venous and arterial anastomoses, coupling time, conversion to sutured anastomosis, coupler size and thrombosis rates. Twenty-five studies reporting on 3207 patients were included in the analysis. A total of 3576 free-flaps were performed within the following subsites: 1103 head and neck, 2094 breast, 300 limb or body, and 79 nonspecified. There were only 26 reported flap failures (0.7%). A total of 3497 venous and 342 arterial coupled anastomoses were performed. The primary outcome measure was thrombosis rates, and there were 61 venous (1.7%) and 12 arterial (3.6%) thromboses reported. Mean coupling time was 5 min, and 30 anastomoses (0.8%) were converted to suture. Flap survival and revision-free application of the microvascular coupler occurred in more than 99% of cases.¹² Adam D et al performed a PRISMA-guided systematic review (PROSPERO-registered) and identified reports using a search algorithm in MEDLINE/EMBASE. The rate of arterial thrombosis was set as the primary outcome. Secondary outcomes included flap survival, failure rates, and comparison of MACD and the conventional hand-sewn technique. Of the 17 studies identified, 2672 free flap reconstructions were performed and 640 arterial anastomoses with MACD attempted (622 completed, 97.2%). The pooled incidence of arterial thrombosis was 2.1% (13/622), and overall flap failure rate 4.34% (116/2672). The total number of arterial MACD procedures performed for the first time, with no perioperative complications, revisions, or thrombosis, was 88.9% (569/640). Grading of Recommendations, Assessment, Development and Evaluation (GRADE) quality analysis revealed low quality and significant heterogeneity. The use of arterial MACD is a safe and

efficient alternative to hand-sewn anastomosis, with more recent literature showing excellent results.¹³

CONCLUSION

There is a significant reliability of MACDs in head and neck reconstruction, even in small-diameter vessel reconstruction.

REFERENCES

1. Fennis JP, Stoelinga PJ, Merkx MA, Jansen JA. Reconstruction of the mandible with a poly D (L-lactide) scaffold, autogenous corticocancellous bone graft, and autogenous platelet-rich plasma: An animal experiment. *Tissue Eng.* 2005;11:1045–53.
2. Rai R, Ranade AV, Prabhu LV, Pai MM, Madhyastha S, Kumaran M. A pilot study of the mandibular angle and ramus in Indian population. *Int J Morphol.* 2007;25:353–6.
3. Wei F C, Jain V, Celik N, Chen H C, Chuang D C, Lin C H. Have we found an ideal soft-tissue flap? An experience with 672 anterolateral thigh flaps. *PlastReconstr Surg.* 2002;109:2219–26.
4. Lin Y T, Lin C H, Wei F C. More degrees of freedom by using chimeric concept in the applications of anterolateral thigh flap. *J PlastReconstrAesthet Surg.* 2006;59:622–7.
5. Koshima I, Yamamoto H, Hosoda M, Moriguchi T, Orita Y, Nagayama H. Free combined composite flaps using the lateral circumflex femoral system for repair of massive defects of the head and neck regions: an introduction to the chimeric flap principle. *PlastReconstr Surg.* 1993;92:411–20.
6. Jacobson JI, Suarez EL. Microsurgery in anastomosis of small vessels. *Surg Forum.* 1960;11:243–45.
7. Koshima I, Hosoda S, Inagawa K, Urushibara K, Moriguchi T. Free combined anterolateral thigh flap and vascularized fibula for wide, through-and-through oromandibular defects. *J ReconstrMicrosurg.* 1998;14:529–34.
8. O'Malley BW, Jr, Weinstein GS, Snyder W, Hockstein NG. Transoral robotic surgery (TORS) for base of tongue neoplasms. *Laryngoscope.* 2006;116:1465–72.
9. Leonhardt FD, Quon H, Abrahão M, O'Malley BW, Jr, Weinstein GS. Transoral robotic surgery for oropharyngeal carcinoma and its impact on patient-reported quality of life and function. *Head Neck.* 2012;34:146–54.
10. Hurvitz KA, Kobayashi M, Evans GR. Current options in head and neck reconstruction. *PlastReconstr Surg.* 2006;118:122e–33.
11. Wei F C, Demirkan F, Chen H C, et al. The outcome of failed free flaps in head and neck and extremity reconstruction: what is next in the reconstructive ladder? *PlastReconstr Surg.* 2001;108:1154–60.
12. Grewal, A. S., Erovic, B., Strumas, N., Enepekides, D. J., & Higgins, K. M. The utility of the microvascular anastomotic coupler in free tissue transfer. *The Canadian journal of plastic surgery = Journal canadien de chirurgie plastique* 2012; 20(2): 98–102.
13. Adam D, Broderick D, Kyzas P, Vassiliou L. Microvascular anastomotic coupler devices versus hand-sewn technique for arterial anastomosis: a systematic review. *Br J Oral Maxillofac Surg.* 2021 Jun;59(5):524-33.