DOI: 10.21088/ijamy.0974.6986.16125.3

New Indian Journal of Surgery
Volume 16 Number 1, January - March 2025

CASE REPORT

Microvascular Free Flaps Using Loupes in Low Resource Setting: A Retrospective Study

Aravind Ramkumar[1], Jaya Muthukumar[2]

How to cite this article:

Ramkumar Aravind, Jaya Muthukumar. Microvascular Free Flaps Using Loupes in Low Resource Setting: A Retrospective Study. New Indian J Surg. 2025; 16(1): 19-23.

ABSTRACT

Background: Microvascular free flaps are a versatile technique in reconstructive surgery but highly resource intensive traditionally, needing expensive operating microscopes and specialized micro instruments and sutures.

Materials and Methods: This is a retrospective study of free flaps done in our institution using loupes between January to December 2023.

Results: A Total of 7 patients underwent free flap surgery under loupe magnification mainly for oral cancer and diabetic foot reconstruction and flap success rate of 85.7%.

Conclusion: Microvascular free flaps may be done in low resource setting using loupes and locally made micro instruments.

KEYWORDS

• Free flaps • Microsurgery • Reconstructive surgery • Surgical loupes • Diabetic foot

INTRODUCTION

Head and neck cancers, especially oral cancer are among the top 5 sites of cancer amongst both men and women in India.[1] Many of these patients depend on Public / Trust hospitals for treatment owing due to financial contraints. While there has been a philosophy that independent surgeons may take care of the resection and reconstruction, such resources may not be always available. Use of microvascular free flaps in diabetic foot has also shown success in limb salvage and a

AUTHOR'S AFFILIATION:

[1] Associate Professor, Department of General Surgery, ESIC Medical College and Post Graduate Institute of Medical Sciences & Research, Bengaluru, Karnataka 560010, India.
[2] Consultant Obstetrician and Gynecologist, Malavya Hospital, Yelahanka, Bengaluru, Karnataka 560064, India.

CORRESPONDING AUTHOR:

Aravind Ramkumar, Associate Professor, Department of General Surgery, ESIC Medical College and Post Graduate Institute of Medical Sciences & Research, Bengaluru, Karnataka 560010, India.
E-mail: aravindramkumar@zohomail.in

➢ **Received:** 07-01-2025 ➢ **Revised:** 30-01-2025 ➢ **Accepted:** 17-02-2025

paper reported increased 5-year survival.[2] With respect to microvascular free flaps, operating microscopes with good quality optics are quite expensive. There are publications reporting microvascular flaps using loupes[3-6] but some of them used couplers for their venous anastomosis.[6] They used magnification ranging from 2.5 to 3.5.[3,5,6] It is also stated that prior experience with operating microscope is necessary for microvascular anastomosis proficiency with loupes.[7] This paper describes our technique (as a surgeon & surgical oncologist) of loupes only microvascular free flaps and flap survival outcomes in 7 patients who underwent free flap surgery in 2023 in our tertiary medical college hospital, in Bangalore, India.

MATERIALS AND METHODS

This is a retrospective study of patients who underwent Microvascular Free Flap with loupes only magnification in the Department of General Surgery, ESIC MC & PGIMSR & MH between Jan 2023 and December 2023. We have obtained approval of Institute Ethics Committee to perform the study. We have obtained informed consent from all patients. We have performed 7 microvascular free flaps using the technique described in detail below. *Table 1* shows the type of defect and flap used in each of these seven patients.

Table 1: List of patients, defects, flap used and outcome

Patient	Defect	Gender	Flap	Outcome of flap(s)	Salvage flap
1	Tongue with marginal mandibulectomy	Female	Anterolateral thigh	Successful	NA
2	Full thickness cheek defect with marginal mandiulectomy	Male	Radial forearm free flap for lining and pectoralis major for cover	Successful	NA
3	Full thickness cheek defect with marginal mandiulectomy	Female	Folded Radial forearm free flap	Successful	NA
4	Buccal mucosal defect with marginal mandibulectomy	Female	Radial forearm free flap	Successful	NA
5	Full thickness cheek defect	Male	Folded Radial Forearm free flap	Intraoperative failure due to arterial thrombus	Folded pectoralis major
6	Buccal mucosal defect with marginal mandibulectomy	Male	Radial Forearm Free Flap	Successful	NA
7	Heel and sole of foot defect in diabetic foot	Male	Anterolateral Thigh Flap	Successful	NA

Preoperatively, Allens test was done for choosing the forearm for the radial forearm flap harvest and SaO2 was monitored with a finger pulse oximeter after manual occlusion of the radial artery at the wrist. Both radial and ulnar arteries were occluded, watched the tracing and reading disappear and then released the ulnar artery to watch the tracing and reading reappear to normal limits. For the patient 1 with carcinoma tongue for whom an ALT flap was planned we performed a CECT angiogram of the lower limb to choose the thigh with a good septo-cutaneous perforator. The other patient who received an ALT flap was with a diabetic foot heel and sole of foot defect post debridement (patient 7). The right thigh was chosen after a strong doppler signal of perforator. On evening of Day -1, we gave a prophylactic dose of LMWH (Low Molecular Weight Heparin)/unfractionated heparin as per availability. CECT of the neck was reviewed for the presence of a good tributary of the Internal Jugular Vein for the venous anastomosis. For the patient with diabetic foot, we used the posterior tibial artery (end to side fashion) and posterior tibial vein (end to end fashion) The artery was calcified but preop arterial doppler revealed triphasic flow.

During the neck dissection phase the external jugular vein was preserved and the facial vein was clipped with a good length. The facial artery was clipped with a good length and posterior belly of digastric was divided for good exposure of the artery. Any minor branches of the facial artery / vein were either clipped/ligated/transfixed with 9-0 Nylon suture. (Johnson and Johnson) The resection phase was carried out with no magnification or 2.5 x magnification (Keeler, United Kingdom)

For the perforator dissection of the ALT flap for diabetic patient (he had a septo-cutaneous and musculocutaneous perforator) I used 4x loupes (Zeiss, Germany).

Once the resection was completed a template of the defect was made on a sterile plastic sheet and the flap harvest was initiated. For the RFFF, we did not use a tourniquet. Flap harvest was done using 2.5 x magnification loupes. Monopolar, bipolar cautery was used away from the vessels and clips (LT 300 Johnson & Johnson) were used liberally.

Once the flap harvest was completed, we used a 4.5 x, 350 mm Working distance prismatic loupes (Zeiss) (Surgeon is 5 feet 9 inches tall, so had to bend a bit for focus) for the vessel dissection. First the recipient vessels in the neck were prepared using micro instruments (Meenu Microsurgicals, Mumbai) Typically we used 6" Straight jeweller's, 6" curved micro-scissors and 6" straight Micro-scissors, and a 5 " vessel dilator. 3 v clamps were used to occlude the vessels. Then the vessels were prepared at the flap site. The cephalic vein was used in all the RFFF and venae comitantes in the ALT. The artery was separated from the venae comitantes using the straight jeweller's forceps. Once the vessels were cleared, two clips were placed on the patient side of the artery and one on the flap side. Two clips on the patient side of the vein and flap side were left unclipped to distinguish artery from vein and to be ready for the venous anastomosis which is done first.

Once the Flap is disconnected, timer is on and flap is partially inset into the defect with 3-0 polyglactin or polydiaxanone sutures based on availability. The vessels are tunnelled through the floor of mouth defect into the neck or over the mandible if there is no floor of mouth defect (patient 3). 3v clamps with approximator is applied to the ends of the veins after ensuring a lie without twists or kinks. Irrigation fluid is prepared with 500 mL RL with 1000 U Unfractionated Heparin and using a 24 G canula, the vessels are irrigated. Under constant irrigation by an assistant to keep the vein lumen open, 9-0 Nylon micro point (Johnson & Johnson) suture is used to create an end to end anastomosis, first anteriorly and then posteriorly after flipping the approximator. The threads after each stitch are left long enough for an assistant to hold and show the site for the next one. The arterial anastomosis is completed similarly. A gauze soaked in 2% lignocaine may be used to relieve spasm of the artery. If there is a leak in the artery an additional stich is taken under irrigation without use of reclamping. The patency of vessels is checked using standard techniques and perfusion of flap is checked by scoring. The flap inset is complete and after a final check of vessel patency, the incision is closed taking care to avoid drain in proximity to the vessels. For the patient with diabetic foot, we used a few bites of 8-0 polypropylene (Johnson & Johnson) also in view of calcified vessel damaging the needle point of 9-0 Nylon. The flap artery (Inferior epigastric-rectus abdominis muscle flap) end was anastomosed to side of PTA and flap vein was anastomosed end to end with PTV.

ICU nurses are shown the technique of flap scoring and intermittent monitoring is done by resident/ consultant. In one patient we used an infusion of unfractionated heparin at 200 U/hour but in subsequent patients we used only prophylactic doses of LMWH/ or Unfractionated Heparin based on availability.[8]

RESULTS

3 out of 7 patients 42% were females. Radial forearm flap was the commonest flap 57% (4/7) followed by anterolateral thigh, 28% (2/7) and 1 patient had a rectus abdominis flap.

Successful outcome of flap was achieved in six of the seven patients (85.7%). The ischemia time was between 45 to 55 minutes. In patient 5, there was doubtful flow in the venous anastomosis and a 3v clamp was placed on the artery proximal to the anastomosis and venous anastomosis was redone. However, the arterial anastomosis also developed a thrombus and a salvage folded pectoralis major flap was done which had a successful outcome. There was no significant donor site morbidity.

One patient developed recurrent disease and succumbed to his disease in spite of adjuvant therapy (patient 2).

Patient 3 had a previous neck dissection and oral resection and came to us with recurrent cancer in the oral cavity for whom we used a folded radial forearm free flap for a full thickness cheek defect and anastomosed to the contralateral neck facial vessels. She had not received prior irradiation.

None of the patients operated had received prior irradiation.

Patient 7 had partial dehiscence of flap for which split skin grafting was done and over time achieved complete wound healing.

DISCUSSION

Micro vascular free flaps form an essential part of reconstruction following head and neck, especially oral cancer surgery and in selected diabetic patients for reconstruction of post debridement defects. Serletti *et al* suggest that initial experience with the use of operating microscopes is essential before graduating to loupes only microsurgery.[7] Venous couplers have been used by surgeons who perform free flaps with loupes, but are expensive and using high magnification loupes (4.5x) 9-0 sutures can be used as an alternative to venous couplers.[6] Recently, Grewal *et al* have published their randomized study of loupes versus microscope for head and neck reconstructive surgery, a single surgeon study. They have reported a 15% intraoperative anastomosis revision rate with no significant difference between the loupes group and microscope group. However, our paper differs from theirs in that that they used 3.5 x loupes for the procedure while I used 4.5 x for the anastomosis.[9] Dhanush CV *et al* have reported their experience with 4.5 x loupes and they did not find significant differences between loupes and microscope with respect to operating time, ease of use and flap survival. However finer technical details have not been described.[10] Vitkos *et al*, in their meta-analysis, did not find difference between loupes and microscope with reference to vascular complications and flap failure rates.[11] To overcome the difficulty of anastomosing end to side with calcified artery, scout vein graft has been used by surgeons.[12]

This study has some limitations. It is a retrospective single surgeon study and the sample size is small. Though it is common practice in India to use loupes for microvascular free flap surgery, publications on the subject are scarce. Hence our attempt to publish our technique and results though the sample size is small.

CONCLUSION

To conclude, in low resource settings high magnification prismatic loupes may stand in for an operating microscope for performing work horse free flaps with a relatively large diameter of flap vessels, using the technique described with an acceptable flap success rate. Using this technique may improve the accessibility to microvascular free flaps and cost may be a smaller barrier in future as we have shown that microvascular free flap can be done with a relatively small individual investment.

Conflict of interest: NIL

Financial Support received: NIL

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