

## ORIGINAL ARTICLE

## EXPERIENCE OF INITIATING MICROVASCULAR SURGERY WITH LIMITED RESOURCES

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**Background:** Microvascular surgery is an imperative part of reconstructive armamentarium. At times, reconstructing a post-surgical or post traumatic defect is not potentially possible with loco-regional flaps and good function and aesthetics can be achieved with free tissue transfer. For last few decades, the revolutionary microvascular reconstructive techniques have brought a paradigm in the field of plastic surgery, rendering major debilitating defects to be dealt with, which were previously considered inoperable. **Methods:** This study is conducted at the department of Plastic Reconstructive surgery, Liaquat University of Medical and Health Sciences, Jamshoro from February 2022 to July 2023. The aim of this study is to share our experience and lessons learnt initiating microvascular surgery at a tertiary care center in the city of Hyderabad, Pakistan.

**Keywords:** Free flap; Microvascular surgery; Limited resources; Head and neck reconstruction

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## INTRODUCTION

Microvascular surgery is an imperative part of reconstructive armamentarium. At times, reconstructing a post-surgical or post traumatic defect is not potentially possible with loco-regional flaps and good function and aesthetics can be achieved with free tissue transfer. For last few decades, the revolutionary microvascular reconstructive techniques have brought a paradigm in the field of plastic surgery, rendering major debilitating defects to be dealt with, which were previously considered inoperable.<sup>1</sup> Plastic reconstructive surgical expertise is usually required in head and neck, musculoskeletal, breast and gynaecological malignancies.<sup>1-4</sup>

Occasionally, reconstruction is required in thoracic, gastrointestinal, and neuro-malignancies.<sup>1</sup> The common workhorse free flaps used for reconstruction are radial forearm free flap (RAFF), free fibular osteo-cutaneous flap (FF), anterolateral thigh free flap (ALTF), deep inferior epigastric artery perforator flap (DIEP), gracilis free flap, and latissimus dorsi (LD) free flap<sup>1,5</sup> and as a microvascular surgeon, we must be well versed in the above procedures. The aim of this study is to share our experience and lessons learnt initiating microvascular surgery at a tertiary cancer centre in the city of Hyderabad, Pakistan.

## MATERIAL AND METHODS

**Setting:** The study was conducted at the department of Plastic Reconstructive surgery unit of Liaquat University of medical and health sciences, Jamshoro. This is a retrospective study of patients reconstructed with free flaps. The study was conducted from February 2022 to

July 2023. Patients who had free flap reconstruction at the Liaquat University of Medical and Health Sciences Department of Plastic Surgery in Jamshoro were monitored for at least six months. Demographic information about the patients, including their age and sex, was gathered. Other details acquired included the patient's present and previous medical conditions, the defect's anatomical location, and the flaps used to restore the form and function (Tables 1 and 2). In cases of malignancy, the tumour was resected by the oro-maxillofacial surgery team along with neck dissection. The recipient vessels were isolated and preserved by both the teams. The surgical procedures used on the patients included end-to-end arterial anastomosis with prolene 8/0 interrupted, end-to-end or end-to-side venous anastomosis with prolene 8/0, topical application of heparin in a ratio of 100 units/mL of normal saline, and loupe magnifications for dissection and anastomosis of the vessels.

**Intermittent Injection** Each person received 1ml of heparin intraoperatively, before the pedicle division. If a bed was available, patients were nursed in the intensive care unit for at least 24 hours and occasionally systemic heparin was used postoperatively via infusion pump. Following surgery, the total duration of surgery, the first postoperative evaluation and its frequency was documented. All patients received oral aspirin until the 14th postoperative day, intravenous antibiotics up until the seventh postoperative day, and some patients received subdermal clexane for three days following surgery. There have been reports of flap-related problems including arterial impairment, venous obstruction, hematoma, infections, and necrosis. The evaluation of

donor site morbidity included skin graft failure, infection or wound dehiscence.

**RESULTS**

A total of 12 free tissue transfers were performed in the period of one and a half year. Out of 12, 7 (58.3%) were male and 5 (41.6%) were female. The age range from 10 years to 56 years (mean=37.41). 2 patients were hepatitis C positive. The reconstruction in 3 (25%) patients was done with radial forearm free flap, 2 (16.7%) osseocutaneous free fibula and one (8.3%) osseous free fibula flap was used. In rest of the 6(50%) patients, free anterolateral thigh flap was used for reconstruction.

One out of 12 flaps, osseo-cutaneous fibula free flap required re-exploration for venous congestion within 36 hour and survived. One radial forearm flap required re-exploration due to venous thrombosis within 24 hours

and came out to have about 500ml of hematoma in the neck region which was drained and flap salvaged. One patient expired 4 days postoperatively due to urosepsis in ICU. Two anterolateral thigh flaps sustained marginal necrosis of about 1cm margin which was debrided after 48 hours and the remaining defect was left to heal with secondary intention in one patient and skin grafted in other patient.

Donor sites healed with minor graft losses in radial forearm donor sites which eventually healed by secondary intention. One ALTF donor site required re-grafting. One ALTF donor site had Pus discharge managed on dressings. One ALTF donor site developed profunda femoris artery aneurysm after 28 days post operatively which was managed by vascular surgery team. (Table 1)

**Table-1**

Flap	Gender	Age (year)	Comorbid	Duration of surgery	Flap Complications	Donor Site Complications
RFFF	Female	40	-	7 hours	-	-
RFFF	Male	25	-	7.5 hours	-	-
RFFF	Female	45	HCV+ve	7 hours	Re-exploration for Venous congestion	Partial graft loss-healed by secondary intention
FFF	Male	30	-	8 hours	-	-
OCFF	Male	56	DM, HTN	11 hours	Re-exploration for Venous congestion	-
OCFF	Female	18	-	5 hours	-	Donor site Hematoma 4 months postoperatively
ALTF	Male	40	-	7.5 hours	Pus under flap (Pseudomonas)-managed conservatively on dressings and antibiotics	-
ALTF	Male	50	HCV+ve	5 hours	-	Pus discharge from wound-managed conservatively on dressings
ALTF	Male	45	-	7.5 hours	-	-

**Table-2**

ALTF	Female	52 years	5 hours	-	Partial graft loss-healed by secondary intention
ALTF	Male	10 years	5 hours	Marginal Necrosis	Profunda Femoris Artery Aneurysm- Managed by Vascular surgery
ALTF	Female	30 years	10 hours	Marginal Necrosis	Complete graft loss-Regrafting



**Figure-1: A. BCC Right side face, B. After resection and exenteration, C. ALTF flap marking, D&E. Flap at 3- weeks follow-up**



**Figure-2: A&B: Lesion on left commissure and buccal mucosa (biopsy proven squamous cell carcinoma), C: Radial forearm flap harvested, D: Flap at 4 days follow up, E: Flap at 2 weeks follow up.**

## DISCUSSION

Local flaps or skin grafts are an option for simpler defects and regional or distant flaps for other larger defects but a thorough knowledge of complete reconstructive armamentarium is mandatory for every plastic surgeon practicing reconstructive surgery. Since the advent of microvascular free tissue transfer forty years ago, it's been in usage for reconstruction of various complex defects. It was initially started in well-settled centers in developed countries but currently most of the centers are routinely performing free tissue transfers procedures.<sup>6</sup> For microvascular surgeries to be a success, a well-trained and determined surgical team, vigilant perioperative care and monitoring of the patient and the flap, availability of theatre and equipment as per need, a bed in intensive care unit, and urgent laboratory services and nursing staff support for long hours are an essential requirement.<sup>6</sup> The conditions are however not promising in most of the developing countries as most of the facilities are not available many a-times. Whereas the need for free flap surgeries is higher than in the developed countries.<sup>6</sup>

Deficiency of essential equipment and lack of basic microvascular surgery training and skills are the reasons primarily forwarded in support of low rate or non-existence of these procedures in developing countries in many centers. However, as described in a study by Wanjala F. Nangole *et. al.*, microvascular surgeries can be easily carried out using basic loupes and being as effective as using microscope. It also adds that there's the need for basic microsurgical training only, to execute free tissue transfer procedures and practicing make it to perfection.<sup>6</sup> At our center, however, surgical loupes of 4x magnification was available only with the author who was the only surgeon trained to perform microvascular surgery and was responsible for any re-exploration if required overnight.

Anterolateral thigh flap was the go-to flap in our center for reconstruction mainly because of ease of two team approach and secondly for larger defects in 2 of the patients. Due to non-availability of hand held doppler, the perforator was searched intra-operatively with subfascial dissection. However, one flap was raised supra fascially after dissecting the perforators. Two of the flaps had marginal necrosis of about 0.5 to 1 cm. Many studies has shown its effectiveness in reconstructing head and neck region but has a drawback of having unreliable location of perforator and procedures sometimes has to be abandoned in non-availability of one, though this didn't happen in our series.<sup>7-9</sup>

Radial forearm flap was the first flap done by the author because of ease of harvest, longer pedicle

length and large diameter making anastomosis fairly easy for initiating microvascular surgery in an underdeveloped setup for such procedures. This flap is considered gold standard for most oral cavity reconstructive surgeries but with a downside of extensive donor site scarring.<sup>10-12</sup>

Free fibula was used with a large skin paddle in one patient, a 1cm skin paddle in other patient for monitoring purpose only and bone only free fibula in one patient in whom monitoring was done with periodic doppler ultrasound of the pedicle. All of these were done for mandibular reconstruction, two for post resection defect of benign disease and one for squamous cell carcinoma of mandible. It is now cited as a gold standard for reconstruction of mandible however skin paddle was found to be unreliable for monitoring purpose.<sup>10, 13-19</sup>

For postoperative monitoring of the flap, we kept one postgraduate trainees on call on rotation basis and monitoring was done every hour with respect to vitals, input output and flap viability including colour, temperature, turgor and speed of bleed on scratch. The major task in postoperative care is timely detecting any signs of flap failure. In our series, the trainees were advised to report to the author (operating surgeon) every hour regarding the flap and the patients overall condition. Re-explorations at 4am after vigorous efforts of arranging the emergency operation theatre and hardly available 8/0 suture makes it a hard job. Contemporary techniques of monitoring flaps without the surgeon's presence<sup>20</sup>, are beyond our reach because of the cost.

Due to the issues countered in arranging emergency services overnight in case of re-explorations, we were extra precautions regarding the anastomosis. If the anastomosis was doubtful, it was revised without a delay which saved us many a-times. We relied mostly on single venous anastomosis unless there was equally good flow in the other vein in which case it was also anastomosed.

## CONCLUSION

In conclusion, microvascular free tissue transfers are the need of the day and are a workable option even in the wake of limited resources. Fairly good surgical results can be demonstrated even with the use of basic surgical loupes. The essential requirement is satisfactory training of surgical team in microsurgery via fellowships in departments conducting these procedures on regular basis or by visiting faculties from other centers where these surgeries are a norm. Starting with an easier fascio-cutaneous flap with large caliber vessels, boosts the confidence of the surgical team. Vigilance in recognizing signs of failure on table and postoperatively cannot be overemphasized. In author's limited experience, the most important and

mandatory requirement for a successful free tissue transfer is team-work and support in every possible event as this is the only way to continue providing this imperative service to our community at-large.

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## AUTHORS' CONTRIBUTION

AS: Concept, write-up, lead author. SS: Data collection. SIP: Data analysis. ZAQ: Data analysis.

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