

ORIGINAL ARTICLE

MEDIAL SURAL ARTERY PERFORATOR FLAP: A VERSATILE OPTION FOR SOFT TISSUE RECONSTRUCTION OF HEAD AND NECK AND LIMBS

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Background: To assess the outcome of Medial Sural Artery Perforator Flap (MSAP Flap) as an option for the soft tissue reconstruction of head and neck and limbs. **Methods:** This descriptive case series was conducted at Jinnah Burn and Reconstructive Surgery Center, Lahore during October 2016 to August 2017. All patients in whom MSAP flap (free and pedicled) was performed for reconstruction are included. Patients were followed at one week and one month after the discharge and data was entered into the proformas. **Results:** In total, 18 patients were operated with this flap. Free and pedicled MSAP flap were performed for reconstruction of soft tissue defects in the head and neck and the lower limb. The maximum dimensions of the flap were 14 cm length and 10 cm width. The maximum pedicle length was 16cm. All flaps survived and showed good outcome. There was necrosis of the distal margin of a pedicled flap, but no case of venous congestion and flap failure was observed. The flap donor site was closed primarily in 7 patients while split skin graft was used in the rest of the patients. **Conclusion:** The MSAP flap provides a thin skin paddle and has minimal donor site morbidity as compared to the other options. It is a good addition to the armamentarium of perforator flaps which are thin and pliable, can be harvested by two team approaches, under the tourniquet and has a hidden donor site.

Keywords: Medial Sural artery; Perforator flap; Soft tissue coverage; Reconstruction

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INTRODUCTION

Whenever a defect becomes too large to be reconstructed with options like skin grafts or local flaps, reconstruction with free tissue transfer becomes mandatory. A variety of free tissue transfers have been described each having its own positive and negative aspects.¹

Ideally, resurfacing of soft tissue defects created as a result of burn, trauma or surgical excision of the tumour, need early coverage by a flap which allows early mobilization and recovery, reduces the risk of infection. The distant pedicled flaps have disadvantages of two stages and associated discomfort in the patients.² There are several free flaps which can be used for intra oral and extremity soft tissue reconstruction. The Radial free forearm flap (RFFF) and Anterolateral thigh flap (ALTF) are the main options utilized today.¹ The ALTF has gradually gained popularity since done by Song et al in 1984³ and is done routinely in head and neck soft tissue reconstructions. It has a drawback of being bulky, which is sometimes too much for the defect and needs secondary debulking procedures for contouring.⁴ The other reliable flap, the radial forearm flap, has significant flap donor site morbidity and the donor defect requires closure with split skin grafts in most

cases.⁵ However, the bulk of the flap is suitable for most of the reconstructions. Microsurgeons have been looking for a flap that possesses both the qualities of thin tissue and the low donor site morbidity. The MSAP flap having both these qualities is a possible alternative of these two flaps. Cavadas et al in 2001⁶ described this flap in his paper as a modification of the medial gastrocnemius flap.

The rationale of my study was that no local study has been done to evaluate the MSAP outcome. ALTF was considered to be too bulky and the RFFF was avoided due to its donor site morbidity in cases of oral cavity and extremity soft tissue reconstruction. For lower extremity reconstruction Pedicled MSAP has also been used. This study would evaluate the outcome of the MSAP flap in our settings and if results are satisfactory guidelines can be delineated for oral and extremity surgeries for use of MSAP flap as its outcome has been excellent in international studies.

MATERIAL AND METHODS

This descriptive case series was conducted prospectively at the Jinnah burn and reconstructive surgery centre, Allama Iqbal Medical College, Lahore. All patients between October 2016 and August 2017 having oral and limb reconstruction with the MSAP flap were included.

Consecutive sampling technique was used. The patients included were of all age groups, both males and females. Exclusion criteria included the patients with vascular diseases (e.g. Raynaud's) and who had the history of injury at the donor sites of the MSAP flap.

Eighteen patients fulfilling the inclusion criteria were admitted through OPD and emergency. Photographs were taken and baseline assessment was done before surgery. Proper informed consent was taken. Consultant surgeons performed all the flaps.

The proformas were used to record age, gender, etiology, comorbidities, location and size of the defect, flap options, the dimensions of the skin paddle, recipient vessels, donor site closure (primary or skin graft), and postoperative complications.

Two-team approach was used. The patient was put in supine position with the hip slightly flexed and abducted and knee flexed (frog-like position). A hand-held Doppler was used to locate the perforators. A line was drawn from the middle of the popliteal crease to the medial malleolus. The main sizeable perforator was located at 9 cm from the popliteal crease on that line. If multiple perforators were found, they were usually located up to 12 cm from the popliteal crease (Figure-1). Flap dissection was started from the medial border, perforators identified; its location and size noted. Flap was then elevated from opposite side. Intramuscular dissection was done to separate the pedicle from the medial gastrocnemius muscle (Figure-2).

Haemostasis was secured with the bipolar cautery. The vascular pedicle was exposed by splitting the fibers of the gastrocnemius muscle fibers as it runs parallel to the fibers. In cases of free flaps, the vascular anastomoses with suitable recipient vessels were done under microscopes. Primary donor site closure was possible in 7 of our cases, the rest were covered with a split skin grafts (Figure-3). Patients were discharged on 7th to 10th post-operative day. They were followed at weekly intervals for another 2 weeks. Reconstructed tongue with the MSAP flap on follow-up at 03 months is shown in figure-4.

Data was entered into S.P.S.S. version 20 and analyzed. Data was stratified for age, gender and location of flap and post stratification Chi square was used to compare the flap survival with $p < .05$ as statistical significant.

RESULTS

Total of 11 male and 7 female patients were treated with the MSAP flap reconstruction. Mean age was 41 years. Tumour resection was involved in 13 cases while 5 defects were post traumatic. Thirteen Flaps were done for the head and neck and 5 for the lower limb reconstruction. Free flap was done in 15 patients

while pedicled flap was used in the other 3 cases of lower limb defects (Table-1). The maximum skin-paddle length was 14 cm and width was 10 cm. The maximum vascular pedicle length was 16 cm. Two to three perforators were found per-operatively. The recipient vessels for anastomosis in free tissue transfer were the facial or superior thyroid artery and the internal jugular vein in the head and neck, while the anterior tibial vessels were used in lower limb cases. Our average flap harvest time was 92 minutes (range 75–115 minutes). There was no flap failure in this series of cases. In one of the pedicled flaps for the coverage of wound on upper 10 cm of exposed tibia, the distal edge (approx. 2 cm) of the flap was necrosed on the fifth post-operative day which was debrided and the resultant wound on non-critical area was covered with the split skin graft. Two free flaps were re-explored, one on 2nd post-operative day due to venous congestion, and another on the 1st post-operative day due to the arterial blockade. Both flaps were salvaged. No other significant complication was observed. No complaints about the donor site regarding the scar or any functional issue were noted at patients follow up.



Figure-1: Flap marking

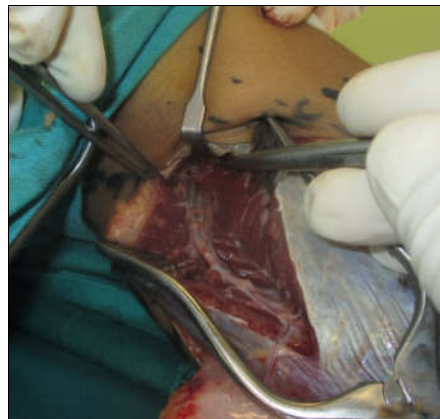


Figure-2: The pedicle running parallel to the muscular fibres



Figure-3: Primarily closed donor site



Figure-4: Follow-up of reconstructed tongue with MSAPF

Table-1: Data of Flaps

Age/Gender	Indication of Flap	Free / Pedicle flap	Flap Dimension	Pedicle Length	Duration of flap elevation	Outcome
47y/F	SCC tongue+ floor of mouth	Free Flap	10×6.5 cm	9 cm	102mins	Survived
48y/M	SCC tongue	Free Flap	10×5 cm	16 cm	115 mins	Survived
47y/M	SCC tongue	Free Flap	5×8 cm	10 cm	98 mins	Survived
65y/M	BCC nose	Free Flap	7×13 cm	13 cm	110 mins	Survived
46y/F	SCC tongue	Free Flap	5×6 cm	8 cm	86 mins	Survived
29y/M	High voltage electrical injury knee	Pedicle Flap	10×12 cm	8 cm	75 mins	Survived
30y/M	Synovial Cell CA left knee	Pedicle Flap	14×10 cm	9 cm	88 mins	Partial Flap loss
12y/M	Degloving Rt. Foot dorsum	Free Flap	10×8 cm	8 cm	96 mins	Survived
24y/F	SCC tongue	Free Flap	8×6 cm	15 cm	82 mins	Survived
52y/F	SCC tongue	Free Flap	7×5 cm	11 cm	101 mins	Survived
39y/M	SCC tongue	Free Flap	5×8 cm	10 cm	86 mins	Survived
45y/M	SCC tongue + floor of mouth	Free Flap	7×13 cm	13 cm	94 mins	Survived
53y/F	SCC tongue	Free Flap	5×6 cm	8 cm	97 mins	Survived
30y/M	Right knee degloving injury	Pedicle Flap	10×12 cm	8 cm	84 mins	Survived
36y/M	Dorsum of foot wound	Free Flap	10x6 cm	9 cm	80 mins	Survived
55y/F	SCC cheek mucosa	Free Flap	8×6 cm	10 cm	86 mins	Survived
42y/F	SCC tongue	Free Flap	9×5 cm	12 cm	82 mins	Survived
38y/M	SCC tongue + floor of mouth	Free Flap	10×7 cm	9 cm	94 mins	Survived

DISCUSSION

The required soft tissue for reconstruction in the head and neck region, particularly for lesions in the oral cavity, should be thin and pliable. It should be robust and capable of resisting infections for the soft tissue defects of limbs. Our aim was to restore function and to provide aesthetic improvement to the affected area with minimum donor site morbidity.

The most common flaps for oral reconstruction are ALT and RFFF flaps. These time-tested flaps have been serving the purpose well, but have their drawbacks as well. The ALT flap is associated with the downside of its bulk, and the RFFF has significant donor site morbidity. The MSAP flap can be the best alternative to these flaps

as the donor site morbidity is quite low like ALT flap, and the flap thickness is as good as, if not better than, the RFFF.

In a study by Choi *et al*⁷, MSAP flap was used for intra oral reconstruction and the overall flap survival was 90.0% in his study. In another study Kao *et al*⁸ wrote his experience of 26 MSAP flaps with the success rate of 96.1% and one flap failed because of the venous problem on the second postoperative day. In another study by Ozkan *et al*⁹ shared his experience of 11 patients where MSAP was used for post cancer surgery reconstruction in the head and neck region with the success rate of 90.9% and one flap loss due to arterial insufficiency.

Toyserkani and Sorensen described a case series of 10 patients in which eight MSAP free flaps were done to cover post oncological intraoral defects¹. In two cases, MSAP flap was used for plantar reconstruction. Mean age was 52 years with 9 males and 1 female patient. Maximum flap dimensions were length 14 cm and width 8 cm. The flap artery diameter was 1–1.5 mm, and the vein diameter was 1.5–2.5 mm. The mean pedicle length of the flap was 10cm and the mean thickness was 5 mm. There were two flap failures, one was salvage after venous congestion and one flap was abandoned intraoperatively as the perforator was tiny.

CONCLUSIONS

MSAP Flap provides a thin and pliable soft tissue and is a good addition to the armamentarium of perforator flaps which can be harvested simultaneously with the preparation of the recipient area by two teams easily and under tourniquet control. It can also be used as a pedicled flap. It has a relatively hidden donor site with no compromise of any major vessel of the donor leg; hence the morbidity is very low.

Ethical standards: Approval from the ethical committee was taken for this study.

Conflict of interest: Authors declare that they have no conflict of interest.

Patient consent: Informed consent has been obtained prior to the use of the photographs.

AUTHORS' CONTRIBUTION

FAK, SUR, AUH, AR: conceived, designed and did statistical analysis and editing of manuscript. MS, MJR, MA, AMM: Data collection. HFA, MNT: Final review.

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