

# Spectrum of Medial Sural Artery Perforator Free Flap for Head and Neck and Lower Extremity Reconstruction - Review of 15 Cases

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**Abstract:** *The present study is to reveal institutional experience of spectrum of usage of MSAP free flap in post oncological resection. Material and methods: 15 cases (one lower extremity, rest head and neck) of post oncological resection were reconstructed with free MSAP flaps. The decision to proceed surgically was based on defect size, requirements, presence of sizeable perforator and clinical expertise. Results: All flaps survived with no major post operative complications. out of 15 cases, three cases require donor site closure with split skin graft while rest of them were primarily closed. Conclusion: Free MSAP flap can be used to reconstruct small to medium size defects of tongue, buccal mucosa, maxilla etc. The exclusion of downside of thickness of Anterolateral thigh flap and donor site morbidity in Radial forearm flap makes this flap much more advantageous for usage in defects mentioned.*

**Keywords:** MSAP flap, head and neck reconstruction

## 1. Introduction

As the constellation of free flap options for reconstructing head and neck defects post oncological resection increases, choosing the right flap for reconstructing a particular subunit of the head and neck region may be difficult. Survival rates for head and neck cancer patients have increased with improvements in surgical technique and oncological management. The ideal reconstructive technique should be focused on regaining both form and function. (1)

The most common flaps for oral reconstruction are free Anterolateral Thigh flap and free Radial Artery Forearm free flap. This time tested flaps have been serving the purpose very well but are accompanied with their drawbacks too. The ALT flap is associated with the downside of its bulk, while the RAFFF 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 RAFFF. (2)

## 2. Background

Head and neck cancer includes malignant tumors that most commonly arise from the moist squamous cell mucosa or lining of the head and neck region. They are characterized according to their primary site of origin which can be nasal cavity and paranasal sinuses, oral cavity, pharynx, larynx etc. (3, 8) Post oncosurgical resection their reconstruction remains a challenge owing to their complex anatomy, limited working space or the reconstructive surgeon besides the responsibility to restore form and function acceptable to patients.

## 3. Review of Literature

In search of reliable free flap donor sites, Taylor and Daniel described in 1975 a "popliteal island flap" supplied by musculocutaneous branches of the medial and lateral sural

vessels. In 1996, Montegut and Allen presented, based on their anatomical studies of the calf, the sural artery perforator flap, primarily as a local alternative to the gastrocnemius flap. In 2001, Hallock and Cavadas et al published a more extensive study about the mapping of the sural artery perforators, where also a series of six successful clinical cases of the medial sural artery perforator (MSAP) flaps (4), including five free flaps and one pedicled flap for ipsilateral lower - leg and foot reconstruction were included. Since then, other manifold studies assessed the anatomical basis of the MSAPs.

This flap has gained substantial popularity and has become one of the primary free flap choices for reconstruction of small - to - medium size postresectional soft tissue defects in the head and neck region. Considering the actual detailed knowledge of the calf perforator anatomy, and possessing adequate microsurgical expertise, this flap can be safely raised and transferred, especially in thin patients, presenting with small - to - moderate size soft tissue defects, where thin pliable skin is needed to achieve optimal postoperative aesthetic and functional results with minimum donor site morbidity. (5 - 7)

### Indications of MSAP Flap

- Small sized soft tissue defects of upper and lower limbs post trauma or oncological resection
- Head and neck reconstruction post trauma or oncological resection

### Contraindications

- Deep vein thrombosis
- Peripheral artery disease
- Previous history of trauma to popliteal region

### Inclusion Criteria

- 1) Operated cases of oral squamous cell carcinoma in the study period having histopathology report available.
- 2) Age between 18 - 75 yrs

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3) Per primum cases.

#### Exclusion Criteria

- 1) Patient with recurrent disease
- 2) Patient underwent NACT
- 3) Patient with other than oral cavity malignancy
- 4) Patient underwent surgery outside hospital

#### 4. Surgical Procedure

Marking of the flap was performed in a supine position. A line from the midpoint of the popliteal crease to the tip of the medial malleolus was drawn. The potential perforators were localized with an 8 MHz handheld Doppler following this line from proximal to distal mostly at 8 - 12 cm. The preliminary flap design was based on the dopplered perforators, and was further tailored intraoperatively using a defect template for drawing of the Skin Island. After general anesthesia and perioperative antibiotic single shot, the patient was placed in supine position with the hip and knee flexed at a 90 - degree angle. With the aid of a tourniquet (without exsanguination) and magnification loupes, the planned flap was first incised medially. Flap elevation can be done supra - or subfascial. We prefer the subfascial approach because of easier flap and pedicle dissection. Dissection proceeded subfascially from medial to lateral until all potential perforators had been identified. If a longer pedicle was needed, the flap was tailored so that the perforator entry point was located at the margin of the skin paddle. Frequently, either one branch or an entire segment of the small saphenous vein was included in the flap as safety measure, as a potential additional venous outflow, if the perforator veins proved to be insufficient, or if the main

pedicle vein was either not usable or irreparable injured during anastomosis. The perforator/perforators were dissected through the medial gastrocnemius muscle in a retrograde fashion towards the main vascular pedicle by longitudinally splitting the muscle fibers to "unroof" the perforator vessels. In this way, flap harvesting could be performed with minimal damage to the gastrocnemius muscle, thus avoiding potential postoperative muscle weakness. During dissection, multiple muscle branches were either coagulated or clipped meticulously, thus avoiding potential injury of the perforators or bleeding and consecutive hematoma formation after tourniquet release. Motor nerve branches of the tibial nerve running alongside the pedicle, during dissection were carefully prepared and preserved. After the flap and its main pedicle were completely raised, the tourniquet was released and a thorough evaluation of flap perfusion was performed. To reduce the overall ischemic time, the flap was only clamped when the receptor vessels were properly prepared. All the vessel anastomoses were hand - sewn with separate stitches using 9-0 Nylon. The donor area was either primarily closed (defects < 9cm width) or covered with meshed split - thickness skin graft. The gastrocnemius muscle splitting produced through transmuscular perforator dissection, was closed with running absorbable 3-0 Vicryl sutures. To achieve a tension - free closure of the donor site or to minimize the defect for subsequent skin grafting, the skin and subcutaneous tissues were mobilized in a suprafascial plane for about 3 to 5 cm from the wound margin. All flaps were harvested as fasciocutaneous flaps, from the ipsilateral side, by the same surgeon in a one - team approach.

#### Flap markings –



#### Complications

- Flap necrosis (partial or complete)
- Donor site wound dehiscence, graft loss,

#### Aims and Objectives of Study

Medial sural artery perforator free flap - a novel, yet challenging and versatile free flap for post - oncological defect reconstruction

**Study Type** - Retrospective Study

**Place and Duration of Study-**

The study was conducted in Dept of Surgical Oncology HBCH and MPMMC Varanasi from a period of –April 2020 to March 2021 with follow up period of 3months.

**5. Material and Methods**

All adult patients of either gender, who were admitted to the department and underwent free MSAP flap coverage for their surgical defects, were included in the study. Children

below 14 years of age and those patients who did not consent to participate in the study were excluded.

All the surgeries were performed under aseptic precautions in the operating theatre under general anaesthesia. Postoperatively the flap was monitored for any colour or temperature change and capillary filling time. The primary outcome measure was flap survival and secondary outcome measures included colour match, contour match, donor site morbidity, and functional outcome (in terms of complete wound closure without any of distortion of adjacent facial structures).

**Case 1: Buccal mucosal defect**



**Case 2: Ca Tongue**





Case 3: Medial malleolar defect



Case 4: Ca Maxilla



6. Result Analysis

A total of 15 patients were included in the study. Out of them 1 patient had medial malleolar defect while all other patients were of post head neck oncological resection. Three out of 15 i. e 20% were females while rest other were males. Also 20% were tongue defects while 13% had maxillary defects. Three patients required donor site management with split skin graft because those defects were full thickness requiring outer skin and inner lining reconstruction. Rest

80% donor defects were managed with primary closure. Mean pedicle length was found to be 10.9cm while average distance of perforator located from mid - point of popliteal crease was found to be 12.3cm. Immediate post operative complications were hardly any barring marginal necrosis in one of the flap which was managed conservatively. All flaps survived well and on follow up of 3months post their radiotherapy session, no complications were seen either.

Table: Analysis of outcomes of MSAP free flap reconstruction for post oncological resection with 3 months followup

S. No	Gender	Defect location	Size of MSAP flap	Pedicle length	Perforator dist. from pop crease MP	Recipient vessels	Donor site	Post op Complication	F/U on 3months
1	Male	Tongue	10*6cm	10cm	12cm	FA, FV	PC	NONE	NONE
2	Male	BM	10*7cm	12cm	14cm	FA, FV	PC	NONE	NONE
3	Female	Tongue	8*6cm	12cm	12cm	FA, FV	PC	NONE	NONE
4	Male	BM	15*8cm	13cm	15cm	FA, FV	SSG	NONE	NONE

5	Male	BM	9*7cm	12cm	13cm	FA, FV	PC	NONE	NONE
6	Male	Tongue	7*5cm	10cm	10cm	FA, FV	PC	NONE	NONE
7	Female	Maxilla	9*6cm	10cm	12cm	FA, FV	PC	NONE	NONE
8	Male	Tongue	12*6.5cm	12cm	14cm	FA, FV	SSG	NONE	NONE
9	Male	BM	9*7cm	10cm	13cm	FA, FV	PC	NONE	NONE
10	Male	BM	10*7cm	10cm	10cm	FA, FV	PC	NONE	NONE
11	Male	Maxilla	8*6cm	13cm	14cm	FA, FV	PC	NONE	NONE
12	Female	BM	15*7cm	12cm	14cm	FA, FV	SSG	NONE	NONE
13	Male	BM	8*6cm	10cm	12cm	FA, FV	PC	NONE	NONE
14	Male	BM	9*6cm	10cm	10cm	FA, FV	PC	NONE	NONE
15	Male	MM	11*4.5cm	10cm	12cm	DPA/DPV	PC	NONE	NONE

Abbreviation: - BM - buccal mucosa, FA/FV - facial artery/facial vein, MM - medial malleolus, PC - primary closure, SSG - split skin graft, MP - midpoint, DPA/DPV - dorsalis pedis artery/vein

## 7. Conclusion

The MSAP flap has been shown to work well for hemi to near total glossectomy defects, besides buccal mucosa and maxilla defects. The advantages are its thin and pliable skin, good vascular pedicle length, less operating time, low blood loss and hairless flap with minimal donor site morbidity. An acceptable outcome and restoration can be expected with the use of such flaps for the defects mentioned above. The disadvantage on other side is long operative learning curve due to inconsistent location of perforators, tedious intramuscular dissection. (9, 10) The usage of Doppler, CT angiography or magnetic resonance angiography could provide some idea of perforator location thus facilitating harvest of the flap.

reconstruction to achieve predictable and improved functional and aesthetic outcomes. *Plast Reconstr Surg* 2010 Dec; 126 (6): 1967 - 77

- [9] Saba L, Atzeni M, Rozen WM, Alonso - Burgos A, Bura R, Piga M, et al. Vascular imaging in perforator flap surgery. *Acta Radiol*, 2013 Feb 1; 54 (1): 89 - 98 PMID: 23125392
- [10] Baas M, Duraku LS, Corten EM, Mureau MA. A systematic review on the sensory reinnervation of free flaps for tongue reconstruction. *J Plast Reconstr Aesthet Surg*.2015 Aug; 68 (8): 1025 - 35. PMID: 2604408

## References

- [1] Shao - Yu Hung, Charles Yuen Yung Loh, Soo - Ha Kwon, Huang - Kai Kao,, Research article 2017 Assessing the suitability of medial sural artery perforator flap in tongue reconstruction - An outcome study
- [2] Farrukh Aslam Khalid, Saif - ur - rehman, Ata Ul Haq, Ahsaan Riaz, Muhammad Saleem, Research Article 2018 Medial sural artery Perforator flap; a versatile option for soft tissue reconstruction of head and neck and limbs
- [3] American Cancer Society 2016, Cancer facts and figures Atlanta
- [4] Cavadas PC, Sanz - Giemenes - Rico JR, la Camara AG, Soler - Nomdedeu S, Martinez - Soriano F. The medial sural artery perforator flap. *Plast Reconstr Surg*.2001; 108: 1609 - 1615, PMID: 11711936
- [5] Zaher Jandali, Martin C. Lam, Kiomars Aganloo, Benedikt Merwart, Clinical Article - The free medial sural artery perforator flap; versatile option for soft tissue reconstruction in small to moderate size defects of foot and ankle 2016
- [6] Kao HK, Chang KP, Wei FC, Cheng MH. Comparison of the medial sural artery perforator flap with the radial forearm flap for head and neck reconstruction. *Plast Reconstr Surg* 2009 Oct; 124 (4): 1125 - 32
- [7] Kao HK, Chang KP, Wei FC, Cheng MH. Anatomical basis and versatile application of the medial sural artery perforator flap for head and neck reconstruction. *Plast Reconstr Surg* 2010 Apr; 125 (4): 1135 - 45
- [8] Engel H, Huang JJ, Lin CY, Lam W, Kao HK, Gazyakan E, et al. A strategic approach for tongue