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The medial sural artery perforator flap in intra-oral reconstruction: A Northeast experience[☆]



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KEYWORDS

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Summary *Background:* The medial sural artery perforator (MSAP) flap is a fasciocutaneous flap that is gaining popularity for intra-oral reconstructions. The aim of this two-centre review was to evaluate the use of the MSAP flap in intra-oral reconstructions and report our experiences. *Methods:* Data were collected prospectively on 35 consecutive intra-oral reconstructions using the free MSAP flap. Patient details and intraoperative flap details were recorded.

Results: Thirty-five patients underwent intra-oral reconstruction with a free MSAP flap (26 males and nine females). The average flap dimensions were a length of 8.03 cm, a width of 5.0 cm and a thickness of 7.1 mm. Twenty-two flaps had two perforators, and the average pedicle length was 11.1 cm. There were no flap losses. Ninety-one per cent of donor sites were closed primarily. There were two minor complications related to donor-site wound dehiscence, which required delayed skin grafting. The overall complication rate was 5.7%.

Conclusions: The MSAP flap is a good choice for intra-oral reconstruction. It has reliable anatomy and provides thin, pliable skin with a long pedicle. In addition, donor morbidity is low as the donor site can be closed directly in most cases. It is currently our flap of choice for small intra-oral soft tissue defects.

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Introduction

Microvascular free tissue transfer is now the gold standard to reconstruct defects following resection of intra-oral cancers. Current workhorse flaps include the radial forearm free flap (RFFF) and the anterolateral thigh flap (ALT) for soft tissue defects and the free fibula osseocutaneous flap when bony reconstruction is required.^{1–3} With further understanding of perforator vascular anatomy, the use of alternative flaps in head and neck reconstruction can be explored.

The ideal attributes for most intra-oral soft tissue flaps include the availability of thin pliable skin, a long vascular pedicle with predictable anatomy, a concealed donor site with minimal morbidity and the opportunity for a two-team approach, thereby allowing resection and flap elevation to occur concurrently. The RFFF offers an unparalleled skin paddle in terms of thinness and pliability, a long and predictable pedicle and ease of raising. Its main limitation is related to functional and aesthetic complications arising from the donor site.¹ The ALT flap offers not only a long pedicle but also abundant skin. The donor site is well concealed and has minimal morbidity if closed primarily. Donor morbidity is increased in terms of delayed healing, contour deficit and poor aesthetic outcome in cases of grafting.² In addition, perforator dissection can be challenging and, in the Western population, the flaps can be bulky. Both flaps allow a two-team approach with concurrent flap elevation and tumour excision.

Both workhorse flaps mentioned earlier are not without their limitations; hence, alternative fasciocutaneous flaps were sought. The superficial circumflex iliac artery perforator flap (SCIP) has been reported as one such alternative flap.⁴ Whilst the SCIP flap has favourable donor-site morbidity, the dissection can be challenging and involves small-calibre vessels of variable sizes.⁵

The medial sural artery perforator (MSAP) flap is another fasciocutaneous flap that provides a reliable and safe alternative to the workhorse flaps in intra-oral reconstruction. This flap was first described in 2001 by Cavadas et al.,⁶ and has established itself within our units as an alternative to the free radial forearm flap when a thin, pliable flap is required. The ability to primarily close the secondary defect in almost all cases implies that its donor-site morbidity profile is an improvement on the free radial forearm flap.

We present a prospective case series of the use of the free MSAP flap for soft tissue intra-oral reconstructions following cancer excision from two large head and neck cancer centres in the Northeast of England. The aim of the series was to document the anatomical variations encountered in the raising of the free MSAP flap and to report our experience of the flap for soft tissue intra-oral reconstructions.

Methods

A prospective two-centre case series between the Newcastle and Sunderland teams was performed to evaluate the use of the MSAP flap. All cases were initially assessed and examined by the relevant head and neck

multidisciplinary teams. MSAP flap reconstruction was offered to patients requiring a relatively small intra-oral soft tissue reconstruction. Alternative flap options were also discussed as part of the consultation process. Details were recorded prospectively within a secure free flap database. Patient demographics, diagnosis, treatment and outcomes were recorded (Table 1). Intraoperative details such as flap dimension, number of perforators, pedicle length and vessel diameter were also recorded.

Anatomy

The medial and lateral sural arteries arise from the popliteal artery immediately superior to the articulation of the knee joint and constitute the major arterial supply to the respective heads of the gastrocnemius muscle. Traditional pedicled reconstruction using either the medial or lateral head of the gastrocnemius utilises these sural artery branches. The size of the artery is usually between 1 and 2 mm and that of the accompanying veins up to 4–5 mm.^{6,7} The primary venous drainage route is via paired venae comitantes, whilst secondary venous drainage occurs through superficial veins, such as the short saphenous vein. The medial sural artery enters the medial gastrocnemius proximally and has been described as having three types of intramuscular branching patterns.⁸ Type I (31%) exhibits a single main branch, Type II (59%) a double branching pattern and Type III (24%) three or more branches. A dominant medial sural artery perforator can be identified in 86% of cases.⁸

Cavadas et al.⁶ first described the use of the intramuscular medial sural artery perforators in free flap reconstruction of six lower limb defects. In the cadaveric study, they identified an average of 2.2 perforators per leg located at an average of 11.8 and 17 cm from the popliteal crease. In another cadaveric and clinical study, Kim et al.⁹ found that they were able to predict the location of the main perforating vessel along a line drawn from the midpoint of the popliteal fossa to the midpoint of the medial malleolus (the path of the medial sural artery). The first perforating vessel was identified along this line at approximately 8 cm from the popliteal crease within a distal semicircle drawn with a radius of 2 cm. The clinical series reported the reconstruction of seven hand and 14 lower limb defects with 18 free flaps and three pedicled MSAP flaps.

In a case series of 29 head and neck patients, Kao et al.⁷ described preoperative markings of the MSAP flap with the patient standing. First, a horizontal line in the popliteal crease is marked followed by a line from the midpoint of the crease to the Achilles tendon (the posterior calf midline). A third curved line is drawn along the distal border of the medial gastrocnemius with the final line drawn from the medial tibial condyle to the midpoint of the medial malleolus. They identified that within these boundary lines, in 68.3% of clinical cases, the main perforator was located with a handheld Doppler ultrasound at approximately 8–12 cm from the popliteal crease. In this series, it was worth noting that in three cases, no perforating vessels were observed and a free radial forearm flap was raised instead.

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