

Medial Sural Artery Perforator Flap Aided by Ultrasonic Perforator Localization for Reconstruction After Oral Carcinoma Resection

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Purpose: To evaluate the application of the medial sural artery perforator flap (MSAPF) aided by preoperative ultrasonic perforator localization for postsurgical reconstruction of oral carcinoma.

Materials and Methods: From November 2013 to August 2014, 25 patients with oral carcinoma underwent postsurgical reconstruction after oral carcinoma resection using MSAPFs. To explore and locate the perforators, preoperative vascular ultrasound localization was used to find the MSAPs. The number and location of the perforators, length of the vascular pedicle, and thickness of the MSAPF were measured. Thirty-eight patients who underwent reconstruction with a radial forearm flap (RFF) and 21 patients who underwent reconstruction with an anterolateral thigh flap (ALTF) were selected for comparison.

Results: The number of MSAPs ranged from 1 to 4, and 52 perforators were found accurately using preoperative ultrasonic localization (92.86%). The distance from the perforator to the popliteal crease ranged from 6.2 to 17.1 cm (10.70 ± 2.31 cm); the distance from the perforator to the midline of the back of the calf ranged from 0.1 to 3.5 cm (1.83 ± 0.81 cm); and the pedicle length ranged from 6.8 to 12.5 cm (10.14 ± 1.51 cm). Compared with the RFF and ALTF, the thickness, postoperative oral sensation, and function of the MSAPF were similar to those of the RFF but better than those of the ALTF. In appearance and function of the donor site, the MSAPF was similar to the ALTF but better than the RFF.

Conclusion: The MSAPF is a good alternative for postsurgical reconstruction of oral carcinoma, because of its anatomic structural stability, suitable thickness, minimal donor-site scar, and ideal functional recovery after surgery. Preoperative vascular ultrasonic localization is a feasible and advantageous method for preoperative mapping of the MSAP because of its high accuracy.

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Vascularized free flaps are the primary reconstructive method after postsurgical resection of oral carcinoma to achieve functional and esthetic restoration. Of these, the radial forearm flap (RFF) and anterolateral

thigh flap (ALTF) are the most widely used. The RFF has a consistent anatomy that provides a long pedicle with a thin and pliable skin paddle. However, the drawbacks include obvious scarring and functional

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donor-site morbidity. The functional morbidities include numbness of the palm and finger, limited flap volume, and tendon exposure, which is usually caused by partial skin graft loss.^{1,2} Although the incision of the ALTF is hidden and the donor-site can be closed primarily, the layer of subcutaneous fat is thick. This results in a thick flap, which is more suitable for a wide range of tissue defects with a larger volume.³ The medial sural artery perforator flap (MSAPF) is a perforator flap that allows the use of skin and subcutaneous fat without sacrificing muscle. In 2001, Cavadas et al⁴ first introduced the MSAPF for the reconstruction of lower limb skin defects, achieving a satisfactory clinical effect. However, there is a lack of detailed research in its application for the reconstruction of defects after oral carcinoma resection. From November 2013 to August 2014, the authors treated 25 patients with oral carcinoma resection defects that were successfully repaired with an MSAPF aided by preoperative vascular ultrasonic localization. The number and location of perforators, vascular pedicle length, and MSAPF thickness were measured.

Materials and Methods

GENERAL INFORMATION

Ethical approval for this study was obtained from the research ethics board of the ethics committee of the First Affiliated Hospital, Zhejiang University (Hangzhou, China). This study complied with the Declaration of Helsinki, and each participant signed a detailed informed consent form.

In this retrospective study, from November 2013 to August 2014, 25 patients (16 men, 9 women) with oral carcinoma were admitted to the First Affiliated Hospital of Zhejiang University for tumor resection and reconstruction with an MSAPF. All patients underwent resection of oral carcinoma. The resultant defects were small to medium and the patients had not undergone any previous surgery, radiotherapy or chemotherapy. The method of reconstruction was randomly chosen for each patient.

Patients' ages ranged from 37 to 68 years (median age, 52 yr), and the clinical history ranged from 2 to 9.5 months. In these cases, the tumor was located at the tongue in 12, at the floor of the mouth in 8, at the buccal mucosa in 4, and at the gingiva in 1. Tumor size ranged from 2.0 × 3.0 to 4.0 × 4.5 cm and the TNM staging was T2N1M0 in 5 cases, T3N1M0 in 7 cases, T3N2M0 in 3 cases, T4N2M0 in 2 cases, and T4N2M0 in 1 case.

During the same period, 38 patients underwent reconstruction with the RFF and 21 patients underwent reconstruction with the ALTF and constituted the control group. In the RFF group, there were 21 cases of tongue carcinoma, 9 cases of buccal

carcinoma, 6 cases of gingival carcinoma, and 2 cases of carcinoma of the floor of the mouth. In the ALTF group, there were 11 cases of tongue carcinoma, 7 cases of carcinoma of the floor of the mouth, and 3 cases of gingiva carcinoma.

SURGICAL METHOD

MSAP Location

Preoperatively, handheld Doppler ultrasonic detection was used to trace the MSAP and the location of the perforator piercing the deep fascia was detected and marked (Fig 1). The number of perforators was recorded and marked.

Before Doppler detection of the perforator, 3 lines were marked in the calf region. The first line was made along the popliteal crease, the second was made from the midpoint of popliteal crease to the Achilles tendon (posterior midline), and the third was made along the distal border of the medial gastrocnemius muscle. Usually, the main perforator of the medial sural artery can be detected within the boundaries of these 3 lines. The distance from the perforator to the posterior midline was named Y, and distance from the perforator to the popliteal crease was named X (Fig 2).

Tumor Resection

Patients underwent tumor resection under general anesthesia (Fig 3). Of these, 7 patients with CN0 underwent supraomohyoid functional neck dissection and the other 18 patients with lymph node metastasis underwent unilateral radical neck dissection. During the neck dissection, the external maxillary artery (or superior thyroid artery) and the external jugular vein (or common facial vein) were dissected and protected for vascular anastomosis.



FIGURE 1. The medial sural artery perforator flap was traced by handheld Doppler detection preoperatively, and the location of the perforator piercing the deep fascia was detected.

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