



The supramalleolar flap based on septocutaneous perforators from the peroneal vessels for intraoral soft tissue replacement

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SUMMARY. In cadavers the septocutaneous perforating vessels branching off the distal segment of the peroneal artery were studied. An area of skin approximately 7×12 cm above the ankle was noted to be perfused by these and intraoral defects in 8 patients have been repaired using the supramalleolar flap as a variation of the peroneal flap developed by Yoshimura. Owing to its thinness and the long and wide vascular pedicle, the flap is particularly suitable for reconstructing mobile parts of the oral cavity, and in selected cases may be considered as an alternative to a radial flap.

The anatomy of the distal septocutaneous perforators of the peroneal artery was studied and its suitability for oral reconstruction assessed in cervical cases.

Anatomical observations (Fig. 1)

The locations of septocutaneous branches of the peroneal artery were studied in 50 cadavers to find the most suitable area for raising a purely cutaneous flap. A perforating branch to the skin was found 8-12 cm above the lateral malleolus in all cases (Fig. 2). In 22 cadavers, one or two other vessels were found 3-6 cm from this branch. The vascular diameters were between 0.6 and 1.2 mm (average: 0.9 mm) at the point of ramification from the peroneal artery. In a further 20 cases, a skin area of approximately 7×12 cm (max: 9×22 cm, min: 6×8 cm) was stained by selective ink injection following proximal and distal ligation of the peroneal artery (Fig. 3). In 17 cadavers, the vessels perforated the flexor hallucis longus muscle or the soleus, while purely septocutaneous vessels were found in 33. All vessels perforated the deep fascia and ramified in the subdermal tissue, mainly in a longitudinal direction. In 39 cases, there was an additional branch from the major perforating vessel to the sural nerve. No branch of the sural nerve suitable for flap reinnervation was found.

2-5 perforating branches of the proximal part of the peroneal artery were also found. The major of these was located 4-8 cm below the head of the fibula and had a diameter comparable to that of the supramalleolar branch. However, due to a shorter pedicle and frequent course through muscle rather than septum, it was considered less suitable for a flap.

Clinical experience

Preoperative measures comprised palpation of foot pulses with alternative compression as well as angiography or Doppler studies of tibial arteries. Elevation

of a flap was considered only if all three vessels were present and free of arteriosclerotic changes. The exact location of the supramalleolar perforating vessel was determined by Doppler studies.

With the patient in a lateral position, elevation was begun by subfascial exposure of the perforating vessel(s) from an anterior direction, and subsequent careful detachment of the fascia from the back of the fibula. The perforating vessels were then followed proximally to the peroneal vessels. The pedicle was developed by proximal preparation of the peroneal vessels for the required length. In most cases, one branch supplying the fibula and several smaller branches had to be ligated. The other flap margins were then incised, avoiding exposure of the lateral malleolus or Achilles tendon. The sural nerve was severed between while the short saphenous vein could be preserved due to its more dorsal course. The donor site defect was covered with split skin.

Case reports

The supramalleolar peroneal flap has been used in this unit to reconstruct intraoral soft tissue in 8 patients with carcinoma of the oral cavity. The flap settled with good functional results in all patients except one, in whom it was lost due to massive oedema of the neck and face.

Case 1

A 53-year-old patient with a squamous carcinoma of the left lateral margin of the tongue infiltrating the floor of the mouth and part of the lateral pharynx wall had surgery consisting of functional neck dissection and tumour block-resection. To repair the resulting lining defect (4×6 cm), a supramalleolar peroneal flap with three septocutaneous vessels and a 12 cm long vascular pedicle was raised (Fig. 4). End-to-end anastomosis was performed with the superior thyroid artery and the lingual vein. The flap healed in

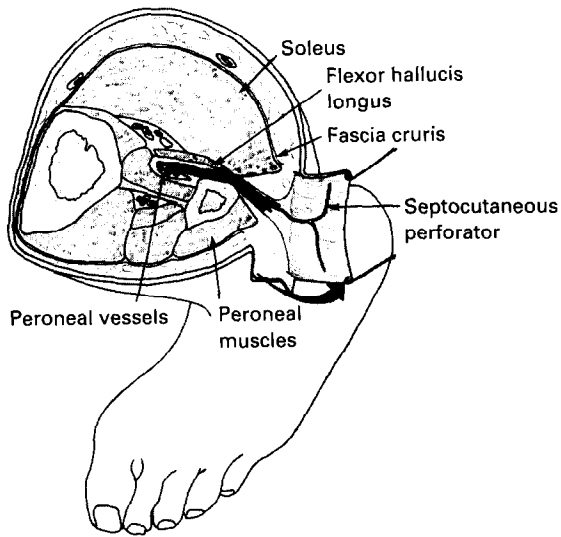


Fig. 1



Fig. 2



Fig. 3

Figure 1—Cross-section of the lower leg and posterior intermuscular septum including the branch supplying the supramalleolar skin. **Figure 2**—Preparation in the cadaver demonstrating the supramalleolar perforating branch (large arrow) and peroneal vessels detached from the deep flexor bed. The sural nerve (small arrow) is vascularised by a nearby cutaneous vessel. **Figure 3**—Ink injection shows the skin area supplied by a single supramalleolar perforating branch.



Fig. 4



Fig. 5

Figure 4—Supramalleolar peroneal flap with three perforating vessels (small arrows). The peroneal vessels (large arrow) are ligated distally and detached in a proximal direction. **Figure 5**—Transplant after settling, with extension to the lateral pharynx wall and root of the tongue.

completely, and the patient was able to eat a soft diet on the 12th postoperative day and has satisfactory speech (Fig. 5).

Case 2

A 59-year-old patient with a squamous carcinoma affecting the anterior floor of the mouth underwent functional neck

dissection and partial resection of the floor of the mouth. The 4 × 5 cm supramalleolar peroneal flap used for reconstruction was supplied by a single septocutaneous vessel (Fig. 6) and anastomosed to the superior thyroid artery and vein. The mobility of the tongue was well restored with this thin and pliable flap. Wound healing was normal, and the patient was discharged on the 14th postoperative day (Fig. 7).



Fig. 6



Fig. 7

Figure 6—Flap well supplied by a single septocutaneous perforator (arrow). The sural nerve is still attached proximally. **Figure 7**—The thin and pliable flap ensures good mobility of the tongue.



Fig. 8

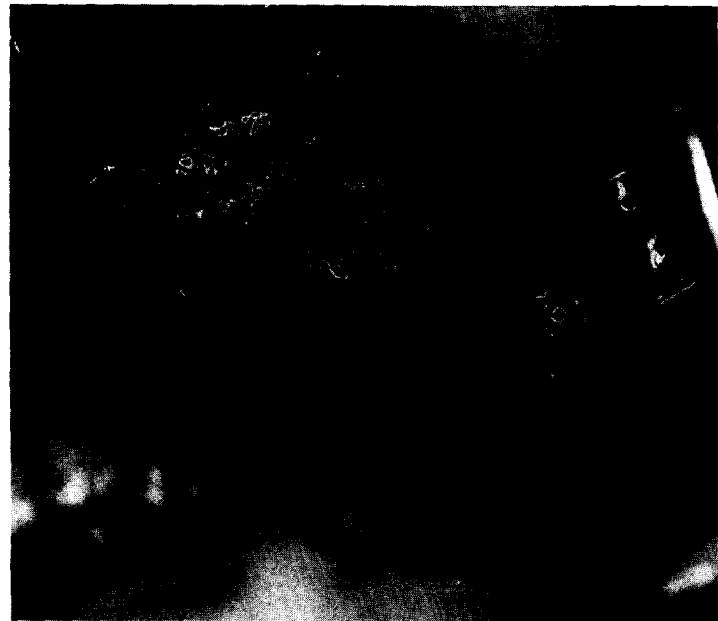


Fig. 9

Figure 8—Supramalleolar peroneal flap with fully prepared vascular pedicle (arrow) immediately prior to elevation. The fibula remains intact. **Figure 9**—Flap for reconstruction of the lateral floor of the mouth, the edge of the tongue, and part of the soft palate.

Case 3

A 67-year-old patient with an extensive carcinoma of the left alveolingual sulcus infiltrating the margin of the tongue and the retromolar triangle had a partial resection of the tongue, floor of the mouth and mandible, including radical neck dissection on the left. A 4 × 6 cm supramalleolar peroneal flap with three perforating branches was anastomosed to the superior thyroid artery and external jugular vein to line the defect (Fig. 8). The flap settled fully, and the patient could

eat again on the 12th postoperative day. His speech was clear (Fig. 9).

Donor site

In all patients, the donor site defect was initially covered with split skin from the thigh fixed by continuous suture and a pressure bandage. An elastic bandage was applied to the lower leg for 1 week.

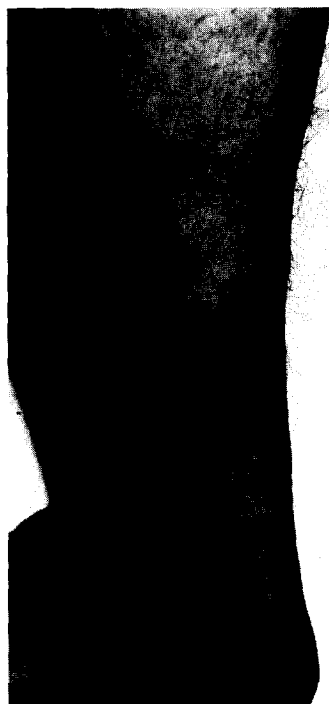


Fig. 10



Fig. 11



Fig. 12

Figures 10–12—Donor sites of the supramalleolar peroneal flap in three different patients after 3 (Fig. 10), 5 (Fig. 11), and 7 months (Fig. 12). Perfusion and mobility of the foot are unimpaired, while the cosmetic defect is negligible.

Immobilisation was not necessary. The split skin graft took in all cases, and the patients were able to walk without restriction. One patient had persistent slight oedema on the back of the foot which disappeared within 3 weeks with further bandaging. The donor site results are shown in Figures 10–12.

Discussion

The peroneal flap and its various applications as an osteocutaneous or septocutaneous graft were described in 1984 by Yoshimura *et al.*,¹ who raised the cutaneous part from the proximal or intermediate segment of the lower leg. Although their study demonstrated the benefits of the peroneal flap as a purely cutaneous flap, it is now used mainly as an osteocutaneous flap to reconstruct extremities,^{1–5} or as a vascularised bone graft raised without a skin island.^{6–8}

The reconstruction of intraoral soft tissue defects with purely septocutaneous peroneal flaps has not been reported so far, perhaps because the consistency of the perforating vessels may have been considered unsatisfactory, or the preparation of peroneal vessels whilst leaving the fibula intact as too difficult. However, in all the cadavers in this anatomical study, at least one good perforator in the supramalleolar segment of the lower leg supplied a skin area sufficient for reconstruction of intraoral defects. Preparation of peroneal vessels is easier in the slender distal segment of the lower leg than more proximally, particularly if the patient is positioned adequately. However, there are some other factors which determine the suitability

of this flap. In older patients especially, careful palpation of foot pulses, angiography and angiography of calf vessels are indispensable. Approximately one fourth of patients over 60 investigated with a view to this flap were found to be ineligible because of atherosclerotic changes, so its use is to some extent limited and preoperative assessment rather complex. Specific anatomic variations preventing the use of the flap (*e.g.*, absence of the anterior or posterior tibial artery, or of the distal septocutaneous branches of the peroneal artery) were not found in any case.

In some patients, strong hair growth on the lower leg limits the suitability of this flap for intraoral application. The donor site of the peroneal flap always has to be covered with split skin, whereas other sites have the advantage of primary healing. However, these limitations aside, the supramalleolar flap is another alternative to the forearm flap, being thin and pliable with a less exposed donor site.

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