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Varied uses of the medial sural artery perforator flap

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Summary *Background and aim:* The aim of the study was to demonstrate how the medial sural artery perforator flap can be used in a wide range of settings and not focused on one area, as previous papers have done. We also wanted to demonstrate that larger flaps can be harvested from the donor site and still closed directly to optimise the appearance of the donor site.
Methods: We describe the use of the medial sural artery perforator flap in 18 patients with defects of the head and neck, upper and lower limbs.
Results: All 18 flaps survived, although one suffered some delayed partial loss due to pressure damage. All donor sites were closed directly to optimise the appearance of the donor site. There were complications with the donor site wound in 2 patients. This resulted in further surgery in one case.
Conclusion: The advantages of the flap are discussed over some of the more commonly used options for reconstruction of these areas. It is a good source of thin, pliable soft tissue with a long pedicle, which makes it very adaptable. The skin paddle is small but if designed appropriately allows the donor site to be closed directly, leaving an aesthetically good result.

Introduction

The medial sural artery perforator free flap was described in 2001 by Cavadas et al.[1] and is an elaboration of the gastrocnemius myocutaneous flap.[2—4] This perforator flap has the advantage over the original of being a thinner flap with a donor site which has little functional deficit and closure with a linear scar. Reports of use of this flap by individual surgeons are mostly small series from Asia which describe its use in intraoral malignancy reconstruction,[5,6] other head and neck reconstructions[7,8] and closure of traumatic defects of the distal upper and lower limb.[9—14] The benefits of using this very thin flap in the Caucasian

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population, often with a more generous body mass index, have not been fully exploited, probably because of concern about the donor defect on the visible posterior leg, particularly in women.

This study reports the results of a further 18 medial sural artery perforator free flaps used for reconstruction of various defects in a British population, mostly Caucasian.

Patients and methods

Patients were selected for use of this flap according to the size of the defect, in order to be able to close the donor site directly. Consequently, this technique was deemed unsuitable for defects wider than 8 cm.

At operation, the dimensions of the skin paddle and the length of pedicle were measured. Postoperatively, short-term problems mobilising and dehiscence, or infection, of the wound in the early post-operative period were recorded.

The length of follow-up of these patients was determined by their primary pathology. However, the donor site was assessed routinely at a minimum of 3 months. Re-admission for revision of the flap inset or thinning of the flap was recorded. The width of the donor site scar was also recorded at a minimum of three months. Patients were asked if they suffered any altered sensation and/or nerve pain/discomfort at the donor site, or more distally, and if they had any problems of gait at their last, or most recent follow-up.

Surgical technique

Preoperatively, the flap and the position of the perforator were marked with the patient in the operative position, viz.: with the patient supine, the hip flexed and externally rotated and the knee also flexed. To mark the perforator, a line is drawn from the medial malleolus to the midpoint of the popliteal fossa posteriorly. A handheld Doppler (10 mHz) is then moved along this line to identify any perforators. It is possible to be misled by identifying the sural artery itself. However, by looking for a clear, distinct signal that localises to a fixed point on the calf we found this accurately represented the location of the perforator at the time of surgery. The main perforator usually lies about 8 cm from the midpoint of the popliteal fossa posteriorly.[1] Occasionally there are two perforators.

Under general anaesthesia, a thigh tourniquet was used in all cases with approximately one minute of simple elevation to exsanguinate the limb. The leg was placed in the position previously described and a flap of the same dimensions as the recipient defect is drawn on the leg, with the perforator positioned centrally. An exploratory incision is made along the anterior margin of the flap. The flap is raised deep to the fascia, falling away from the operator, until the perforator(s) is identified. The perforator is dissected out of the gastrocnemius muscle by splitting the muscle longitudinally. The perforator is often very small as it perforates the fascia and enters the flap: care is required in its dissection. The vessel is taken proximally as far as necessary to achieve adequate pedicle length and to match the vessel size to the needs of each recipient site. This never needs dissection as far as the parent popliteal artery. After dissecting the pedicle, the initial incision is re-sutured to avoid tension on the perforator while the posterior part of the flap is dissected to the perforator. Following transfer of the flap to the recipient site, the donor site is closed without delay and before significant swelling occurs following reperfusion of the limb. Therefore, the tourniquet is released, haemostasis achieved, exsanguination re-established and the defect closed with an absorbable subcuticular suture over a suction drain.

More recently, in patients whose donor site has been very tight to close, two or three 0 nylon loop mattress sutures[15] have been inserted to avoid any tension on the suture line and dehiscence. These large sutures are removed at 7–10 days after surgery. Patients were allowed to mobilise normally after 3–5 days, unless other considerations prevented this.

Post-operatively, patients were not routinely given antibiotics, although all had intra-operative antibiotics and, in some, this was continued post-operatively to avoid problems at the primary site.

Results

The demographics of the patients, their pathologies and the details of the flaps are summarised in Table 1.

Patients ranged from age 11–87 (mean = 55.7 years old). There were nine females within our group and nine males. Four flaps were used to resurface defects on the lower limb Figure 1. Five were used on the external head and neck Figure 2. Eight flaps were used to reconstruct internal head and neck defects. One flap was used on the upper limb.

No flaps required a return to theatre in the early post-operative period and all of the flaps survived in their entirety up until the patient's discharge. The patient who had his right scalp resurfaced with a medial sural artery flap was discharged from hospital 1 week following surgery with a healthy flap. He returned to a routine outpatient appointment several weeks later with partial necrosis of the flap. On further questioning it transpired the patient had been lying on the flap and as result an area of pressure necrosis developed.

The dimensions of the skin paddle and the length of pedicle of each flap are recorded in Table 1. The pedicle length was a mean of 11.1 (range 7–15) cm, with the longest pedicle being 15 cm in length. One flap with a pedicle of 14 cm was used to reconstruct the orbit and lateral nose, following enucleation of the eye, with the pedicle anastomosed to vessels in the neck. No patient required re-admission for revision of the flap inset or thinning of the flap.

It was possible to close all of the donor defects after harvesting flaps of a mean width of 5.28 (range 3–8) cm. One donor site suffered edge necrosis, then infection, and required debridement and subsequent skin grafting. One donor site sutured without the back-up loop to mattress sutures dehisced slightly in the central part of the suture line and required a longer period of wound dressings than normal, but went on to heal without any further surgery. There were no problems mobilising post-operatively.

The longer follow-up shows that these donor sites heal with a scar which is only slightly stretched, and once colour