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Case report: Total cutaneous harvesting from an amputated foot—two free flaps used for acute reconstruction

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Summary—Loss of weight-bearing skin of the foot produces a difficult reconstructive problem. A case is presented of severe bilateral lower limb trauma in which the right leg was amputated below the knee and two free flaps taken from the amputated foot were used for cover of the damaged left foot and the amputation stump.

Advances in microsurgery have significantly changed the management of major limb trauma. On many occasions sub-total or complete amputations are replanted or revascularised with satisfactory functional results. There are, however, instances where the clinical situation demands completion of amputation.

At these times, the managing surgeons must not overlook the possibility of using available material in the amputated segment for reconstruction and soft tissue coverage.

Case report

A 37-year-old male was trapped for more than 1 hour with both lower limbs pinned beneath the wheels of a train. Despite considerable blood loss his general condition was good and there was no trauma to areas other than the lower limbs.

The right leg had suffered a major crush injury to its mid-portion with loss of 20 cm of tibia and fibula associated with crushing of muscle and loss of skin up to the tibial condyle. The anterior and posterior tibial vessels were damaged over a 15 cm segment, as was the popliteal nerve. The foot was undamaged.

The injury to the left leg was limited to the foot which had suffered an amputation of the fifth metatarsal and toe and had lost the skin of the lateral two-thirds of the heel and sole. The calcaneum and fourth metatarsal were exposed but the circulation and sensation to the remaining toes was unimpaired (Fig. 1).

Surgery performed

The right leg was considered unsalvageable and was amputated 10 cm below the knee joint (Fig. 2). A large skin defect of the anterior and distal surfaces of the tibial stump could not be covered by local tissue and, as further shortening would produce an inadequate stump, it was decided that a free flap should be taken from the amputated foot (Fig. 3). A dorsalis pedis flap, using the total area of the dorsum of the foot, was lifted and the anterior tibial vessels at the amputation site resected until good forward flow was obtained. End-to-end anastomosis of the dorsalis pedis to the anterior tibial vessels resulted in immediate perfusion of the transferred flap. The flap provided good cover for the tibial stump and healing proceeded uneventfully.

The damaged left foot wound was debrided, leaving a defect over the lateral border of the foot extending from the dorsum to include almost the entire heel and the posterior portion of the exposed calcaneum up to the tendo Achilles insertion. The viability of the remaining sole skin could not be adequately assessed but perfusion was certainly reduced.

From the amputated foot the entire sole and heel were harvested as a flap based on the posterior tibial vessels including both the medial and lateral plantars. The flap was transferred to the left foot and the skin loosely sutured in place. On the medial side of the ankle, a longitudinal incision was made to expose the posterior tibial vascular bundle and the donor pedicle was passed between the posterior aspect of the tibia and anterior aspect of the tendo Achilles. An end-to-end anastomosis of the venae comitantes was performed and the flap artery sutured end-to-side to the posterior tibial. Brisk perfusion of the entire transplanted heel and sole was observed on removal of the vascular clamps.

Postoperatively the patient remained on intravenous antibiotics and was heparinised. In the early postoperative period significant inflammation of both trauma sites was encountered. One week post-trauma the patient was returned to the operating room where revision of the left foot involved debridement of now necrotic native sole skin. A small purulent collection was drained and the transferred sole advanced to fill the defect adequately.

Subsequent progress was that of gradual resolution of inflammation with continued flap survival and healing.

Fig. 1

Fig. 2

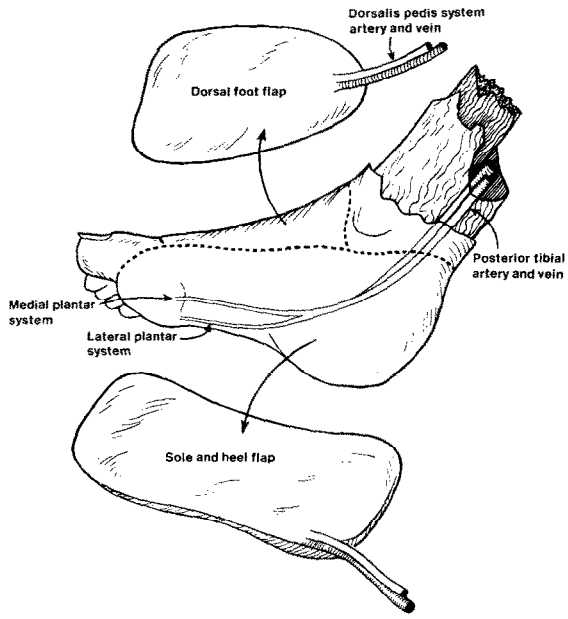

Fig. 3

Fig. 4

Figure 1—Left foot sole and heel wound showing the extent of soft tissue loss and degloving. The entire fifth ray is missing. Figure 2—Right foot after completion of amputation. Posterior tibial vascular bundle is held in forceps. Medial surgical incision has been made. Figure 3—Diagram of flaps harvested from amputated foot. Figure 4—Healed dorsal foot flap providing excellent coverage of below-knee amputation stump. Anterior and inferior aspects.

Fig. 5

Fig. 6

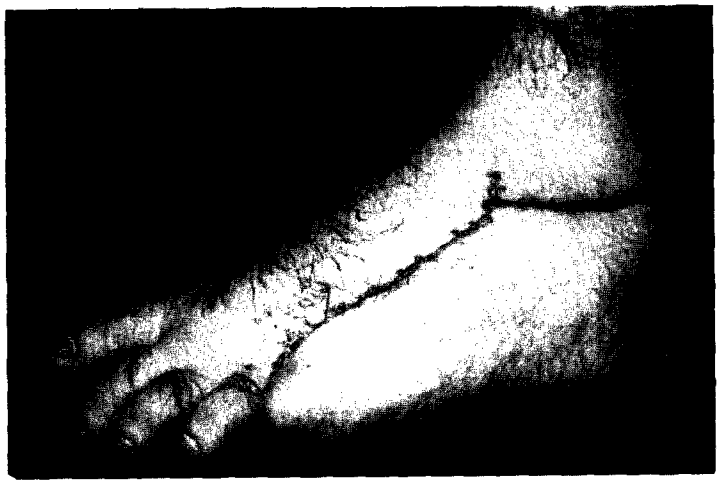

Fig. 7

Fig. 8

Figure 5—Healed free plantar flap to left foot. Posterior inferior view. Figure 6—Left heel; weight-bearing surface. Scarring on heel midpoint from operative percutaneous pin stabilisation of heel pad. Figure 7—Lateral aspect of left foot. Figure 8—Patient weight-bearing at 4 months. He could walk unaided. There was no flap ulceration or abrasion.

One month following injury and free flap transfers the right below-knee amputation had healed with full survival of the dorsal foot transferred (Fig. 4).

The sole and heel transferred to the left foot had completely survived, providing excellent coverage of the heel, sole and lateral border of foot (Figs 5, 6 and 7). Mobilisation was commenced at that stage with weight-bearing allowed on the left foot and prosthetic fitting to the right leg amputation.

By 3 months the patient was ambulant on a right below-knee prosthesis, requiring no support (Fig. 8). There was no breakdown of either flap despite weight-bearing in both cases. Sensation had not yet returned to the flaps.

Discussion

Loss of the sole of the foot, in particular the heel, provides a major reconstructive problem. The specialised nature of this skin and subcutaneous tissue precludes entirely satisfactory reconstruction with any other tissue.

In this case, the availability of the entire sole and heel of the amputated foot provided an ideal indication for immediate free transfer (Morrison *et al.*, 1979, 1983). In this instance its use in the immediate setting provided the best possible cover. Unfortunately, since there was no significant nerve division in the recipient foot, satisfactory reinnervation of this transferred sole was not possible. It is anticipated that deeper sensation will provide adequate protection for the transfer.

Despite adequate bone length, a below-knee amputation stump may be functionally unsatisfactory if soft tissue and skin cover is inadequate. Here the dorsal foot flap (O'Brien and Shanmugan, 1973; McCraw and Furlow, 1975; Daniel *et al.*, 1976; Robinson, 1976) allowed immediate coverage and closure of this below-knee stump and provided excellent reconstruction of this weight-bearing area.

Conclusion

Presented is a case where the entire cutaneous covering of an amputated foot was transferred as two free flaps to traumatic wounds of both legs. The unique opportunity to use otherwise discarded material to assist in reconstruction must be seized.

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