The dorsal metatarsal V-Y advancement flap for dorsal foot reconstruction

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SUMMARY. Two cases of dorsal foot reconstruction using dorsal metatarsal V-Y advancement flaps based on dorsal metatarsal vessels are presented. The flap is useful for the repair of small to moderate sized dorsal foot defects.

The advent of the proximally based dorsal metatarsal flap and later the distally based dorsal metatarsal flap supplied by plantar vessels led to a new approach to distal foot reconstruction. An important factor to consider in repair of a soft tissue defect with a flap is the flap donor site. The V-Y advancement flap has the advantages of excellent colour and texture matching and primary donor site closure. We have used the metatarsal flap with V-Y advancement to repair dorsal foot defects and obtained satisfactory results in two cases.

Case reports

Case 1
A 64-year-old man was referred to our hospital with Bowen's disease on the lateral part of the dorsum of his

Figure 1—(A) Design of the dorsal metatarsal V-Y advancement flap based on the 3rd and 4th dorsal metatarsal vessels. (B) The flap elevated. (C) The flap transferred to the defect, and the donor site closed with V-Y advancement. (D) One year and 10 months after the operation, satisfactory result of reconstruction and no signs of tumour recurrence.
left foot. The tumour was excised with a 1 cm margin. It was planned to repair the resulting defect using a proximally based dorsal metatarsal V-Y advancement flap based on the 3rd and 4th dorsal metatarsal vessels (Fig. 1A). The blood supply from the arcuate artery and from the 3rd and 4th deep plantar branches was preserved when elevating the flap. The flap was rotated as well as advanced to facilitate movement of the flap into the defect. The flap was elevated and transferred to cover the defect, and the donor site was closed primarily in a V-Y fashion (Fig. 1B, C). The flap survived completely without any partial necrosis. One year and 10 months after the operation, there were no signs of recurrence and the result of the flap reconstruction is satisfactory (Fig. 1D).

Case 2

A 41-year-old man had a soft tissue defect on the lateral part of the dorsum of his left foot due to a traffic accident (Fig. 2A). A transversely designed dorsal metatarsal V-Y flap was planned to repair the defect. A distally based dorsal metatarsal flap based on the first dorsal metatarsal vessels was transferred to the defect with V-Y advancement (Fig. 2B). The flap survived completely without any partial necrosis. Three months after the operation, there were no signs of recurrence and the result of the flap reconstruction is satisfactory (Fig. 2C).
advancement flap, distally based on the first dorsal metatarsal vessels, was elevated and transferred to the defect, and the donor site was closed primarily in a V-Y fashion (Fig. 2B, C). The flap survived completely and he had an uneventful postoperative course (Fig. 2D).

Discussion

Repair of the leg and foot is challenging for plastic surgeons. Especially when the defects are located more distally, the donor sites for flaps become more limited. Reverse flow flaps taken from the lower leg and free flaps are not suitable, and it is often difficult to select ideal reconstructive procedures.

In 1989, Earley and Milner described a distally based first web flap, supplied by branches of the dorsal and plantar metatarsal arteries and their distal communicating branches, for resurfacing defects on the dorsum of the foot. In 1992, Yoshitake et al. reported on the dorsal metatarsal flap. Hayashi and Maruyama, and Sakai reported on the repair of the distal foot and toe by the reverse dorsal metatarsal flap, stressing its usefulness. The first dorsal metatarsal artery is connected with the dorsalis pedis artery and therefore the reverse first dorsal metatarsal flap can be extended and elevated to the centre of the dorsal foot by including the dorsalis pedis artery. By elevation of this extended reverse first dorsal metatarsal flap, the arc of rotation can reach from the distal one-half of the dorsum to the distal one-third of the sole. However, with these extended flaps the dorsalis pedis artery, an important artery for the foot, must be divided proximally.

In contrast, dorsal metatarsal flaps can be elevated based not only on the first but also the 2nd to 4th dorsal metatarsal vessels. The dorsal metatarsal vessels have branches communicating with the plantar and digital vascular system. This means variations of the dorsal metatarsal flap are possible, similar to the dorsal metacarpal flaps of the hand.

We repaired dorsal foot defects using dorsal metatarsal flaps with V-Y advancement without dividing the dorsalis pedis artery. The V-Y advancement flap has the advantage of an excellent colour and texture because of the proximity of the donor and recipient sites, and the donor site can be closed primarily without requiring a skin graft. The flap can be prepared at any site on the metatarsal region and a large flap can be elevated safely by including more than one dorsal metatarsal artery. The flap can also be elevated with a proximal or distal base. Unlike the dorsum of the hand, the dorsum of the distal foot does not have much skin available for flaps. Relatively long, oblique flaps moved by rotation in addition to the V-Y advancement are preferred, in order to facilitate movement of the flap and ensure easy primary closure of the donor site. In general, both proximally and distally based flaps can be used for defects in the metatarsal region. The procedure is easier when proximally based flaps are used for cases with defects at sites proximal to the centre of the metatarsal bone, and distally based flaps are used for cases with defects at sites distal to the centre of the metatarsal bone (Fig. 3). With this in mind, a proximally based flap was used in Case 1. Both proximally and distally based flaps were applicable for the defect in the metatarsal region in Case 2. A distally based flap, relatively obliquely orientated, was selected for Case 2 since the dorsum of the proximal foot had more skin available for a flap. In conclusion, the advancement flap is useful for the repair of small and moderate sized dorsal foot defects.

References

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Paper received 21 September 1995. Accepted 8 November 1995, after revision.