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CASE REPORT
Reconstructive

Subunit Reconstruction of Massive Heel Wounds Using Medial Plantar Artery and Chimeric Thoracodorsal Artery Perforator Flaps

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Summary: Heel wounds in patients with diabetes and peripheral vascular disease present significant reconstructive challenges due to their location on a weight-bearing surface and the high risk of delayed wound healing. These wounds require durable coverage that can withstand mechanical stress. The medial plantar flap is the ideal reconstruction for glabrous defects, but may be limited by insufficient tissue availability and donor site morbidity, which is more significant in patients with compromised healing potential. A 64-year-old man with uncontrolled type 2 diabetes presented with a severe right heel wound, complicated by osteomyelitis and extensive tissue loss. Surgical treatment included excisional debridement, partial calcaneal resection, and reconstruction with a pedicled medial plantar artery flap (MPAF) for the weight-bearing heel subunit. A chimeric thoracodorsal artery perforator (TDAP) flap was used to provide additional coverage for the posterior subunit of the wound and the MPAF donor site. Postoperatively, the patient had no flap-related complications. Two minor areas of wound dehiscence were treated with re-excision and closure. At the final follow-up, the patient demonstrated full wound healing and resumed ambulation without further complications. The combined use of MPAF and TDAP flaps provides immediate, durable coverage for wounds encompassing multiple heel subunits, as well as immediate closure of the high-risk MPAF donor site. The thick back skin of the TDAP is ideal for durability with weight-bearing. This dual-flap approach offers a promising solution for challenging reconstructions in weight-bearing areas and may help prevent complications such as donor site wound breakdown. *(Plast Reconstr Surg Glob Open 2025;13:e6736; doi: 10.1097/GOX.0000000000006736; Published online 1 May 2025.)*

Complex heel wounds present significant reconstructive challenges due to their weight-bearing location. Particularly in the diabetic population, there is a high incidence of concomitant peripheral vascular disease and compromised wound healing.[1] The medial plantar artery flap (MPAF) is particularly suited for the reconstruction of weight-bearing regions due to its specialized glabrous skin.[2] The flap is also sensate, offering protection against wound recurrence.[3]

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However, the MPAF is limited by the size of expendable non–weight-bearing skin and a poor ability to conform to the convex contour of both the plantar and posterior heel.[2,3] Another drawback is inconsistent donor site healing, especially in patients with diabetes where skin grafts of the plantar foot donor site tend to take poorly.[4–6] We present a new technique for reconstructing a massive heel wound using a combination of a pedicled MPAF to cover the weight-bearing area of the calcaneus, and a free flap with 2 skin paddles to cover both the MPAF donor site and the residual posterior subunit of the heel wound that was not covered by the MPAF alone.

CASE REPORT

A 64-year-old ambulatory man with type 2 diabetes mellitus (A1c 5.9 at the time of surgery) and venous

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Fig. 1. Dorsal view of massive right heel wound status postdebridement with extensive exposure of the calcaneus. Photograph of the wound before final debridement in Supplemental Digital Content 1 (**http://links.lww.com/PRSGO/D997**). Preoperative radiograph shown in Supplemental Digital Content 2 (**http://links.lww.com/PRSGO/D998**).

insufficiency presented with a necrotizing infection of a right heel diabetic foot wound, involving extensive exposure of the calcaneus, open calcaneal fracture, and osteomyelitis (Fig. 1). (**See figure, Supplemental Digital Content 1**, which displays a photograph of the wound before final debridement, **http://links.lww.com/PRSGO/D997**.) (**See figure, Supplemental Digital Content 2**, which displays a radiographic view of the ankle, lateral view, **http://links.lww.com/PRSGO/D998**.) After a shared decision-making discussion, limb salvage was attempted.

Following debridement to negative cultures, the patient underwent subunit reconstruction. A pedicled MPAF, selected to reconstruct the glabrous skin of the weight-bearing heel, was harvested from the instep and covered the plantar heel but not the posterior subunit of the heel wound. A free skin flap was planned to address both the flap donor site and the posterior aspect of the heel wound, which would require 2 separate skin paddles with a perforator for each skin paddle (Fig. 2). (**See Video [online]**, which displays the original wound, rotation of the pedicled MPAF, harvesting of a chimeric flap with 1 thoracodorsal artery perforator [TDAP] skin paddle and a second teres major perforator skin paddle, and final contouring for shoe wear.) Given his significant sensory loss

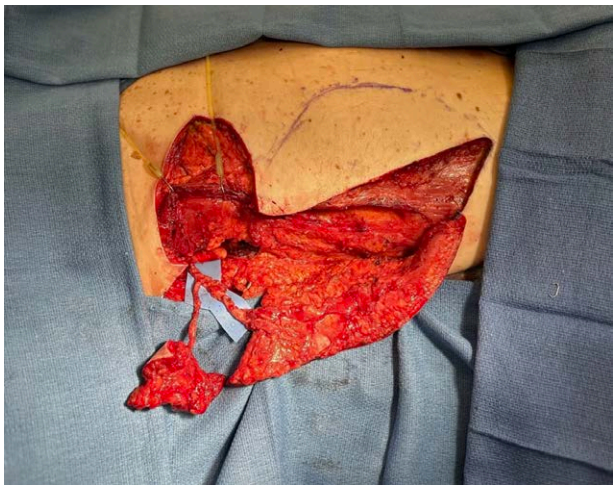

Fig. 2. Thoracodorsal flap design. Intraoperative view of the chimeric flap with 2 skin paddles.

and a positive Tinel sign at the tarsal tunnel, a complete tarsal tunnel decompression was also performed.

Initially, a TDAP flap was planned, with separate perforators for 2 separate skin paddles. However, the perforator anatomy was unfavorable, and an optimal perforator was noted to be piercing the teres major. Therefore, a chimeric flap was harvested with 1 TDAP skin paddle and a second teres major perforator skin paddle. Based on the configuration of the perforators, the teres major perforator flap was used to provide a skin paddle for the posterior heel wound, whereas the TDAP covered the MPAF donor site and the vascular anastomoses at the medial ankle (Fig. 3) (**see Video [online]**).

The flap artery was anastomosed end-to-side to the posterior tibial artery. The flap vein was anastomosed to a branch of the posterior tibial veins draining the lateral plantar system, preserving medial plantar drainage. The flaps were trimmed and contoured for proper foot shape for shoe wear (Fig. 3) (**see Video [online]**).

Postoperatively, there were no complications. Four weeks later, 2 small areas of dehiscence were noted—one along the medial junction of the TDAP flap and the native medial ankle skin, and the other at the junction of the second perforator flap and the posterior heel native skin. Both were debrided and closed and healed without further complications (Fig. 4) (**see Video [online]**).

DISCUSSION

Traditionally, massive heel wounds with extensive bone exposure would be treated with below-knee amputation.[7] Partial or complete calcanectomy can close such a wound, but significantly compromises ambulatory function.[8] The combination of the MPAF and TDAP flap offers significant advantages for limb salvage. The MPAF provides durable, specialized tissue for the weight-bearing heel while preserving sensory function, essential for preventing future ulceration.[2,7] The TDAP flap enables immediate closure of both the posterior heel wound and the MPAF donor site.[9,10] This immediate coverage is especially beneficial in

Fig. 3. Rotation of the MPAF and the addition of a thoracodorsal artery perforator flap to cover the donor site and the remainder of the wound.

Fig. 4. Postoperative follow-up showing well-healed flap with good contour of the foot allowing for weight-bearing and wearing shoes.

high-risk patients, where skin grafts are likely to fail partially or completely, resulting in prolonged wound healing times, potential reinfection, and the need for further operations, such as repeat skin grafting.[4] Harvest of perforator flaps from the back (without removing muscle or nerve) carries very little morbidity, with harvest incisions usually healed in 2 weeks, versus split-thickness skin graft donor sites, which may remain delicate for months.[10]

Although the MPAF provides optimal specialized tissue for weight-bearing areas, its size is limited to the non–weight-bearing instep.[2] Because of the limited size of the MPAF, and because of our experience with donor site morbidity with this flap, it was necessary to pursue subunit reconstruction with a free flap. The thick back skin of the TDAP flap, when compared with other flaps (ie, anterolateral thigh), offers resilience against friction and pressure, especially on the posterior heel, where it must withstand the stress of shoe wear.[10] The combination of the MPAF and TDAP flap ensures that both the weight-bearing and non–weight-bearing areas of the heel are well protected, reducing the risk of complications.

The dual-flap technique, while promising, presents notable challenges. This combination flap demands advanced microsurgical expertise and planning, as it increases both operative time and the complexity of vascular anastomoses. This high level of technical proficiency may restrict widespread adoption to specialized centers with significant experience in complex lower extremity reconstructions. Moreover, although the short-term outcomes in this case were positive, heel reconstructions are especially susceptible to failure due to the mechanical stresses in the region, necessitating further research to determine if the durable skin from the TDAP flap offers greater long-term durability than other reconstructive options.[2,9,10] This single case report, although inadequate to provide robust information about the outcomes of this procedure, demonstrates an elegant solution to complex, limb-threatening heel wounds that can be used by other surgeons facing a similar scenario.

CONCLUSIONS

This case demonstrates the successful reconstruction of a massive heel wound using a subunit approach. The pedicled MPAF provides an ideal reconstruction of the weight-bearing subunit, whereas a free TDAP flap resurfaces the remaining subunit of the heel wound and MPAF

donor site. This is a technically demanding solution but is indicated for massive heel wounds that would otherwise result in major limb amputation.

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DISCLOSURES

The authors have no financial interest to declare in relation to the content of this article.

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