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Medial Plantar Artery Perforator Flap Cover in Large Diabetic Foot Ulcer

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Abstract

Reconstructing the heel's soft tissue is challenging due to its weight-bearing role and the unique properties of the skin on the sole. The medial plantar artery perforator (MPAP) flap is a well-established option for these defects, providing tissue similar in structure to the plantar foot. This report describes a case of successful reconstruction of a heel defect in a diabetic woman using an MPAP flap. This case highlights the effectiveness of the MPAP flap for medium to large-sized plantar defects with weight bearing, offering benefits such as excellent tissue match, minimal donor site complications, and consistent vascular anatomy.

Keywords: *Diabetic Foot Ulcer, Medial Plantar Artery Perforator Flap.*

Introduction

The reconstruction of soft tissue on the heel poses a notable Obstacle for plastic surgeons due to its weight-bearing role and the unique characteristics of sole skin. The medial plantar artery perforator (MPAP) [1] flap is recognized as an effective option for addressing soft tissue defects in this area [2]. This flap is particularly beneficial for weight-bearing regions of the sole as it provides sensitive, glabrous skin that closely mimics the plantar foot structure. It consists of thick glabrous skin, Fibro-adipose tissue for shock absorption, and the plantar fascia.

Defects in the hindfoot, especially those exposing tendons and bones, present significant challenges, often complicated by conditions such as diabetes mellitus, peripheral vasculopathy, or trauma. The lateral and medial plantar arteries originate from the division of the posterior tibial artery. The medial plantar artery courses between the abductor hallucis and flexor digitorum brevis muscles, supplying blood to the instep region through perforating vessels. Retrograde communication with the deep plantar arch ensures blood flow preservation to the forefoot even if the distal part of the medial plantar artery is compromised.

Case Report

A 43-year-old diabetic woman developed bullae on her right heel, which progressed to an open wound (Figure 1, 2) requiring multiple debridements. This resulted in a 10x8 cm defect exposing the calcaneum (Figure 3). After regular debridement wound healed with good granulation (Figure 4). Pre-operatively patency of the Tibialis anterior and posterior artery and dorsalis pedis artery were checked using arterial Doppler and found to be patent. Pre-op planning is done. The medial plantar artery flap, measuring 6.5 by 5.5 centimetres together with its perforators and nerve was meticulously dissected from the distal to the proximal end (Figure 5), was harvested and utilized to cover the defect. An SSG was placed over the donor site and on a non-weight-bearing site, The

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Immediate postoperative period was uneventful (Figure 6). The patient was discharged on the tenth postoperative day (Figure 7). On 6 month follow up flap settled well patient was able to bear the weight well

Figure 1. Pre-Op Photos

Figure 2. Pre-Op Photos

Figure 3. Debridement Photos

Figure 4. Debridement Photos.

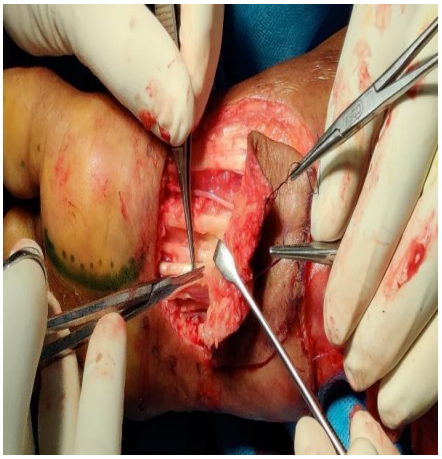

Figure 5. Intra Op Picture

Figure 6. Immediate Post Op Picture

Figure 7. Post Op Picture

Discussion

Reconstructing soft tissue abnormalities in the sole is challenging due to the thick and durable nature of the skin, which endures daily stresses and weight-bearing loads. Various techniques using local and free flaps aim to replicate the properties of the original skin. The MPAP flap is becoming more valuable and gaining popularity in heel defect reconstruction [3]. It uses perforators from the medial plantar artery's superficial branch to supply the flap with a stable blood supply [4]. An important advantage of the MPAP flap is its ability to maintain sensory function in the reconstructed area, crucial for weight-bearing regions like the heel. Its design flexibility allows it to cover various sizes of heel defects, including those larger than the flap itself. Careful planning based on perforator location and preserving vascular connections ensures reliable flap survival and functionality. Moreover, the MPAP flap minimizes donor site complications by harvesting tissue from non-weight-bearing areas of the foot and provides sensation to the area, leading to quicker patient recovery [5].

The normal length of the flap is 5-7 cm in length and 3-4 cm in breadth. In these cases where the defect exceeds the flap's dimensions, the flap can cover the Weight-bearing area, while the non-weight-bearing area can be managed with an SSG.

The MPAP flap is reliably raised using perforators present in between the adductor hallucis and flexor digitorum brevis muscles, near the navicular bone [6]. These perforators, typically 0.4 to 0.8 mm in size, vary in number and size, Because it is closest to the defect, the proximal perforator is usually used for reconstructing the heel, though the second perforator can be used if necessary. When designing a distally based MPAP flap, it is imperative to maintain the connecting branches that run from the dorsal to the plantar foot.

Choosing the right patients is essential to getting the best results. Doppler evaluations of the dorsalis pedis artery (DPA), perforators from the superficial branch of the medial plantar artery (MPA), and posterior tibial artery (PTA) should be performed prior to surgery. Candidates with peripheral vascular disease may not be suitable. In this instance, the MPAP flap exhibited ideal thickness, colour, and texture for reconstructing the plantar foot, with minimal complications at the donor site and consistent vascular structure [7].

Conclusion

The MPAP flap is a very useful technique for filling minor to medium-sized lesions in the heel, midfoot sole, and forefoot plantar region and to provide stable and sensitive cover. It offers several advantages, such as minimal donor site complications, a wide rotation arc, and the potential to include a cutaneous nerve for sensation. This flap can successfully manage defects larger than its dimensions suggest and should be considered whenever feasible for reconstruction.

In summary, the MPAP flap is a dependable choice for reconstructing heel defects, offering sensory preservation, minimal donor site impact, and adaptable design capabilities to suit different defect sizes.

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Conflict of Interest

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We have no conflicts of interest to disclose.

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