

Adipofascial Flap Cover for Medial Malleolus Defect

Nareshkumar Codandabany^{1,*}, Ravi Kumar Chittoria²

Abstract

Soft tissue defects in the lower third of the leg, particularly over the medial malleolus, pose significant challenges due to poor vascularization and the limited availability of reliable local flaps. Over the past two decades, free tissue transfer has emerged as the preferred option for covering such defects. However, in certain cases, free flap transfer is not feasible due to patient-specific factors, cost constraints, or donor site morbidity. Traditional pedicled fasciocutaneous flaps, though effective, often result in significant donor site complications and suboptimal cosmetic outcomes. In this case report, we present the use of an anterior tibial artery perforator-based adipofascial flap to cover a post-traumatic defect over the medial malleolus in a 27-year-old male patient. The defect involved an exposed medial malleolus with periosteal loss and surrounding skin damage. This alternative approach minimizes donor site morbidity, preserves function, and improves aesthetic outcomes. Following the flap transposition, a split-thick skin graft was applied to complete the reconstruction. The procedure proved to be a viable option for managing soft tissue defects in the distal leg, combining simplicity, cost-effectiveness, and improved cosmetic results. This technique can serve as a valuable alternative for cases where free flaps or other local flaps are unsuitable.

Keywords: Adipofascial flap, anterior tibial artery perforator, medial malleolus defect, lower limb reconstruction, soft tissue coverage, split-thickness skin graft, donor site morbidity, post-traumatic ankle defect

INTRODUCTION

Cutaneous injuries of the lower third of the leg and dorsum of the foot represent a great challenge for orthopedic and plastic surgeons. The poor vascularization and subsequent poor healing encountered in these regions demand detailed knowledge of the local anatomy to select the best surgical alternative for each patient. The free flaps are usually the first choice for soft tissue coverage in the distal leg [1].

Several pedicled flaps such as the dorsalis pedis island flap, the reversed soleus muscle flap, the extensor digitorum brevis island flap, the medial plantar island flap, and free flaps have been described for repairing defects around the ankle joint [2].

*Author for Correspondence

Nareshkumar Codandabany
E-mail: cnkplastic@gmail.com

¹Consultant, Department of Plastic Surgery, Sri Narayani Hospital and Research Centre, Sripuram, Vellore, Tamil Nadu, India.

²Professor of Plastic Surgery, Jawaharlal Institute of Postgraduate Medical Education & Research (JIPMER), JIPMER Campus 605006, Puducherry, India.

Received Date: December 17, 2024

Accepted Date: January 10, 2025

Published Date: February 11, 2025

Citation: Nareshkumar Codandabany, Ravi Kumar Chittoria. Adipofascial Flap Cover for Medial Malleolus Defect. Research & Reviews: Journal of Surgery. 2025; 14(1): 6–10p.

In this case report, we discuss an adipofascial flap from dorsum of foot of same leg based on anterior tibial artery perforator for coverage exposed medial malleolus defect.

MATERIALS AND METHODS

This study was conducted at a tertiary care hospital after obtaining approval from the departmental scientific and ethical committee. Informed consent was obtained from the patient. It is a prospective, descriptive, non-randomized case study involving a 27-year-old male with a post-traumatic lower limb defect over the medial malleolus on the left side [3, 4].

Upon evaluation, the patient presented with a wound in the lower third of the left leg, characterized by an exposed medial malleolus with loss of periosteum and epidermal loss in the surrounding skin. Both local flaps and free flaps were considered as potential options for reconstruction in this case [5].

To address the defect, we utilized an anterior tibial artery perforator-based agitophasia flap, followed by a split-thickness skin graft (SSG). This approach was chosen to balance the patient's affordability, reduce donor site morbidity, and achieve improved cosmetic outcomes in the recipient area.



Figure 1. wound preoperative left lower third leg.



Figure 2. Raising the adipofascial flap.



Figure 3. Postoperative view of the inset adipofascial flap.



Figure 4. SSG over the flap after inset.



Figure 5. Donor area after wound closure.



Figure 6. donor area after healing.

First the anterior tibial artery and dorsalis pedis artery were palpated and marked on handheld doppler. In mid dorsum a lazy S incision extending from proximal border of extensor retinaculum to metatarsophalangeal joint. Reverse flow fasciocutaneous flaps, including the anterior tibial, posterior tibial, and peroneal flaps, can be used for Adipofascial flaps raised above paratenon including the superficial from distal to proximal up to the proximal border of external retinaculum. At this stage with one of the perforators is seen dissection is completed. Then the flap is transposed, tunneled and adapted into the defect. A Split thickness Skin graft is placed over the defect (Figures 1–6).

RESULTS

Patient compliance was good. The flap was healed well. Graft loss present over the flap which was regrafted later and wound healed well (Figure 7).



Figure 7. Secondary grafting over graft loss area.

No complications noted with the above procedures.

DISCUSSION

All defects around the ankle can be closed using the dorsalis pedis flap. But sacrifice of dorsalis pedis artery and need for skin grafting on the donor area are the major disadvantages of this flap [6].

The flap provided stable coverage for different defects with few complications. Even should the flap fail, all the other surgical options remain viable

There is a 50% chance of donor morbidity in dorsalis pedis fasciocutaneous flap but in our case raising skin flap with subdermal plexus decreased the morbidity, allowing the donor area to close primarily without skin graft.

Reverse flow fasciocutaneous flaps, including the anterior tibial, posterior tibial, and peroneal flaps, can be used for reconstruction of soft tissue defects of the ankle. But these flaps need to sacrifice an important artery in the leg, and skin grafting is necessary for resurfacing the donor defect. A wide donor scar, serious contour deformity, and adherence between the skin graft and the underlying muscle or tendon are the other important disadvantages of these flaps.

To minimize the donor-site morbidity, the fasciocutaneous flaps have been modified and used as adipofascial flaps.^{3–11,13} The advantages of adipofascial flaps have been well described [5–11]. Elevation of the flap is relatively easy and rapid. The flap is thin, soft, and pliable, so it provides a natural contour for the reconstructed area. This flap gives a superior cosmetic appearance at both donor and recipient regions to any other flap [7]. It saves the major vessel of the leg, if it is used as perforator-based flap. The flap can be used to cover the exposed bone or tendon. The blood supply of the flap is rich. The vessels form 4 vascular plexuses within the flap.¹² It permits the tendons and muscles to move freely because it does not adhere to underlying moving structures. The donor site can be closed primarily with preserved dermal flaps. There is no donor-site morbidity except for a minimal scar and temporarily impaired sensation [12–15].

El-Khatib⁵ used dorsalis pedis perforator-based adipofascial turnover flaps for coverage of forefoot defects. These flaps were elevated from the same region as the flap we describe here, but they were distally based. The flap we used is proximally based, and its blood supply is provided by perforators of the anterior tibial artery. The anterior tibial artery gives 1 or 2 perforators in the distal lower leg just above the extensor retinaculum. Then it gives off the anterolateral and anteromedial branches and continues as the dorsalis pedis artery. There is a connection between the ascending branch of the dorsal tarsal artery or the dorsal pedis artery and anterior branch of the tibialis anterior artery [2]. It is known that flaps are reliable, if they involve 1 or 2 perforators [5, 7]. In addition, pedicles 2–5 cm in width allow venous drainage [7]. The flaps we harvested were 3.5–4.5 cm in width and involved 1 or 2 dominant perforators. As a result, there was no flap necrosis or problem with venous drainage

CONCLUSIONS

Adipofascial flaps offer a reliable, versatile, and less morbid alternative to fasciocutaneous flaps for soft tissue reconstruction, particularly around challenging areas like the ankle and foot. These flaps preserve the integrity of major vascular structures, as they are perforator-based, and avoid the need for skin grafting on donor sites, thereby reducing morbidity. Their thin, pliable, and well-vascularized structure provides excellent coverage for exposed bones, tendons, and other critical structures while maintaining a natural contour at the recipient site. Moreover, donor-site healing is enhanced, with minimal scarring and negligible functional compromise. In the present case, the anterior tibial artery perforator-based adipofascial flap demonstrated successful coverage with favorable cosmetic and functional outcomes, even when minor graft loss required secondary intervention. Given the ease of elevation, superior blood supply, and minimal complications, adipofascial flaps represent a promising

option for reconstructive surgeons aiming to balance optimal outcomes with donor-site preservation.

Availability of Data and Materials

Not applicable.

Financial Support and Sponsorship

None.

Consent for Publication

Not applicable.

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