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Original Research Article

Lateral Calcaneal Artery Skin Flap for Coverage of exposed Tendoachhillis

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Abstract:

Aim: Experience of five patients with exposed tendoachhillis treated with the lateral calcaneal artery skin flap.

Methods: Case series was conducted at department of Plastic Surgery PMCH Patna, from October 2018 to march 2021. Five patients with soft-tissue defects over the tendoachhillis underwent reconstruction using a lateral calcaneal artery skin flap. The etiology was, post burn chronic ulcer in two and surgical wound dehiscence in three. The flap sizes ranged from 3.5 × 2.0 cm to 6.5 × 3.5 cm and the mean follow up was 6 months.

Results: All five flaps survived completely with no subsequent breakdown of the skin. The skin flap donor sites were grafted with split thickness skin grafts in all patients. Donor site healed well in all patients. One patient showed marginal flap skin desquamation.

Conclusion: The lateral calcaneal artery skin flap is reliable and sensate and can be used safely to provide sensory skin coverage to exposed tendoachhillis.

Keywords: Exposed Tendoachhillis, Soft Tissue Defect, Lateral Calcaneal Artery Skin Flap.

Introduction

Soft tissue defects of the posterior heel with or without exposure of the tendoachilles, whether from recent trauma or from chronic lesions, presents difficult reconstructive problems due to the bony prominence, limited availability of local tissue, requirement for specialized tissue, and the limitations imposed by donor site morbidity[1]. This area is subject to weight-bearing and shearing forces that exceed those of any other area of the body. Therefore a defect of the heel can be a difficult problem for the patient because of the inability to wear normal shoes. On the other hand, reconstruction of a defect on the heel has been a challenging problem to the plastic surgeon. Many reconstructive options for soft tissue defect of the heel, which include skin grafts, local skin flaps, cross-leg flaps, muscle flaps, musculocutaneous flaps, and free flaps[2].

The basic principal is," tissue defects should be replaced with like tissue". This is very difficult in the case of heel because of paucity of expandable local tissue. Skin grafts may not take or may be inappropriate. Local rotation, advancement, and transposition flaps are limited by the availability of mobile skin. Several types of reverse flow island flaps have been developed in the form of fasciocutaneous or cutaneous flaps but they require sacrifice of an important leg artery and create obvious contour deformities at the donor site[3-6]. The use of free flaps has improved the ability to cover soft tissue defects. However, the flap bulk, the need for secondary procedures, and the risk of vascular failure are considerable drawbacks[7]. For larger defects free flaps may be required but there are other options for smaller defects. One of these is the neurovascular lateral calcaneal flap, first described by Grabb and Argenta in 1981[8].

A lateral calcaneal artery skin flap is an axial pattern flap that includes the lesser saphenous vein, the sural nerve and the lateral calcaneal artery[9,10]. Since its development, this flap has been demonstrated to be both an effective and reliable local flap for reconstructing soft tissue defects about the posterior heel and both malleoli[11]. Modifications of this flap include island arterial flap[12], distally based flaps[13] and free flaps[14], all of which have a wide variety of clinical applications. Lin et al[15] modified this flap as an adipofascial flap and used it to reconstruct soft tissue defects of the posterior heel as well as the lateral malleolar and lateral supramalleolar areas.

The purpose of this study is to describe our early experience of five patients treated with this flap for reconstruction of posterior heel defects with or without exposure of tendo-Achilles.

Patients & Methods

This case series was conducted at department of Plastic Surgery, Patna Medical College and Hospital, between October 2018 to march 2021. Five patients with soft-tissue defects over the tendoachhillis underwent reconstruction using a lateral calcaneal artery skin flap. Soft-tissue defects were caused by post burn chronic ulcer in two and surgical wound dehiscence in three patients for repair of tendoachilles. The flaps ranged in size from 3.5 × 2.0 cm to 6.5 × 3.5 cm. The patient's ages ranged from 10 to 65 years and the follow-up period ranged from 3 to 12 months.

The length and width of the desired flap are planned in reverse, using a cloth pattern over the defect and transposing it to lie over the previously demarcated flap area. The flap can be designed as a short vertical flap or a long flap that curves forward to the base of the fifth metatarsal according to the defect size to be covered. Posterior incision should be given first and begun at the lateral aspect of the tendoacchilis and dissection is carried down distally to the level of periosteum of the calcaneus. The plane is then developed leaving the periosteum intact. The anterior incision is made immediately behind the lateral malleolus and carried down through the subcutaneous tissues. Finally the distal horizontal incision is made and the flap is raised in a retrograde fashion. The neurovascular structures lie in the deep surface of the subcutaneous tissues and can be visualized if the dissection is too superficial Dissection is carried out in a retrograde fashion to the level of the lateral malleolus. The pedicle of the flap lies immediately above the level of the lateral malleolus. Immediately above the malleolus, the calcaneal artery begins to sink to a deeper level. A minimal amount of dissection can facilitate rotation, but deeper dissection may be dangerous. The base of the flap is usually left intact and optimally should be at least 4 cm wide. Rotation to the defect is then performed, and the flap is inset. A split-thickness skin graft is placed over the donor defect. Postoperatively, the patient is kept in bed with the leg elevated for 5 to 7 days. This prolonged elevation minimizes skin graft loss as well as dehiscence of the flap secondary to edema.

Results

Table 1 shows the patient's clinical data. All five flaps had good perfusion and survived completely. Flap edema noted which lasted for 3-5 days. The skin grafts on the flap donor site had taken well in all patients. All patients became ambulatory after wound healing, and ankle motion was not restricted. There was no subsequent breakdown of the flap and the grafted skin with the regular wearing of shoes.

Table 1: Clinical data of ptients

Case	Age (yr), Sex	Cause of defect	Site of defect	Size of flap (cm)	Duration of follow-up (mon)
1	10, M	Acute trauma	Posterior heel	3.5 x 2.0	3
2	65, M	Chronic ulcer	Posterior heel & tendoachilles	5.4 x 3.5	12
3	23, M	Postsurgical wound dehiscence	Posterior heel &tendoachilles	4.0 x 2.5	6
4	20,M	Chronic ulcer	Posterior heel	3.5 x 2.4	8
5	35,F	Acute trauma	Posterior heel & tendoachilles	6.5 x 3.5	6

Discussion

Use of the lateral calcaneal artery skin flap for heel reconstruction has been reported since1981[15]. The flap is an axial pattern fasciocutaneous flap that is simple, stable and sensate. It is nourished by the lateral calcaneal artery, which is a terminal branch of the peroneal artery, is drained by the lesser saphenous vein and is innervated by the sural nerve[9]. It is preferred in small sized isolated posterior heel defects with exposed Tendoachilles or Calcaneum and normal skin in flap vicinity[16]. Peroneal vessels are last to be affected by age, diabetes mellitus or smoking, making it a safe flap in these patients[13]. Because this fasciocutaneous flap is moved as a transposition flap from the area below the lateral malleolus so a 'dog-ear' or kinking of the pedicle may occur. Bulkiness and occurrence of the dog-ear have been noted as late complications of fasciocutaneous flaps[17,18]. Disadvantages of the flap are that donor site requires grafting, which is put on the periosteum giving a depression, and causes a poor cosmetic appearance. Patients also have sensory disturbance at the lateral part of the dorsum of foot[18].

Island modification of this flap has been described to prevent the problems associated with classic lateral calcaneal artery skin flaps such as kink in the pedicle, dog-ear deformity, and the need for sacrificing the normal skin bridge for flap inset[12]. It also has a greater arc of rotation, but it could not solve the problems associated with the donor-site area[20]. Another disadvantage is the possible

compression over the pedicle by the skin bridge between the donor site and the recipient site. In our study this technique was not used.

In 1996, use of the lateral calcaneal artery adipofascial flap was reported for small defects on the ankle by Lin et al[15]. The advantages of this type of adipofascial flap are that it preserves the sural nerve and does not require skin grafting of the donor site[16]. The main shortcoming of this procedure is that additional skin grafts are applied to raw adipofascial flap surfaces. Most surgeons use a split-thickness skin graft. However, a full-thickness skin graft rather than a split-thickness graft minimizes the breakdown of grafted skin and cosmetically more acceptable.

Overall, lateral calcaneal artery skin flaps should be included in the surgical armamentarium to cover difficult wounds of the posterior heel of the foot. They do not require sacrifice of a major artery to the leg or foot, are relatively thin with acceptable morbidity at the donor sites. In addition, the flap dissecting technique is Straightforward; vascular pedicle is constant and surgical transfer easy. Lateral calcaneal artery flaps are limited in size but can fill defects of the posterior heel satisfactorily. In the present case series, we can confirm the usefulness of the lateral calcaneal artery flap in the cure of intractable posterior heel defects with bone or tendon exposure with minimal donor site morbidity that it offers.

Conclusion

The goal of reconstruction is to provide sensate and stable coverage for posterior heel soft tissue defect with minimal donor site morbidity. The lateral calcaneal artery skin flap fulfills all these requirements and therefore should be included in the surgical armamentarium to cover difficult wounds of the posterior heel of the foot in a single stage.

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