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## Lateral Calcaneal Artery Flap: A Reliable Option for Hindfoot Soft Tissue Defect Coverage

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### Abstract

**Introduction-** Lateral calcaneal artery flap is a reliable option for lateral calcaneal and posterior heel defects reconstruction.

**Materials and Method-** We conducted a prospective study using lateral calcaneal artery flap to cover posterior heel defects from January 2017 to October 2020 in the Department of Burn and Plastic Surgery, SMT S.C.L. Hospital, Ahmedabad to observe the clinical outcome of lateral calcaneal artery flap. A total number of 20 soft tissue defects in posterior heel with and without exposed Achilles' tendon or calcaneum due to different causes were reconstructed with lateral calcaneal artery flap.

**Results-** All twenty flaps survived completely without any breakdown of the skin, even after regular wearing of shoes. The flap donor sites were grafted with split-thickness skin grafts in all cases. Partial graft loss was noted in single patient, which eventually healed with dressing. Our results were satisfactory in terms of adequate coverage which is functionally and aesthetically good.

**Conclusion-** The lateral calcaneal artery flap can be used safely to provide sensory skin coverage in posterior heel defects of small size.

**Keywords:** Lateral calcaneal flap, posterior heel defect, hind foot reconstruction

### Introduction

#### 1. Introduction

Soft tissue defects over the posterior heel of the foot poses a difficult reconstructive problem due to the osseous or tendinous bed, poor area of vascularization, paucity of expandable local tissue & the limitations imposed by donor site morbidity. Moreover, there are many occasions where primary closure is impossible, even for small defects or often ends up in wound dehiscence.<sup>[1]</sup> Skin grafting usually gives unacceptable results. Several types of reverse flow fasciocutaneous flaps or cutaneous flaps have been described but they require sacrifice of an important leg artery and create obvious contour deformity in the donor site<sup>[2, 3]</sup>.

A lateral calcaneal artery skin flap is an axial pattern flap that includes the lateral calcaneal artery, lesser saphenous vein and the sural nerve.<sup>[4]</sup> Since its development in 1981, this flap has been demonstrated to be both an effective and reliable local flap for reconstructing soft tissue defects over the posterior heel and both malleoli.<sup>[5,6]</sup> Modifications of this flap include island arterial flaps,<sup>[6,7]</sup> distally based flaps,<sup>[11]</sup> adipofacial flap<sup>[10]</sup> and free flaps,<sup>[9]</sup> all of which have a wide variety of clinical applications. This one is essentially useful for reconstruction of small sized defects over posterior heel even in diabetic and elderly patients as peroneal artery is usually spared in atherosclerosis. This study reports our experience of 20 patients treated with lateral calcaneal artery flap for a posterior heel defect reconstruction.

#### 2. Materials and Method

This prospective observational study we conducted in the Department of Burns and Plastic surgery, Smt S.C.L Hospital from January 2017 to October 2020. A total number of 20

patients with posterior heel defects were reconstructed with lateral calcaneal artery flap for coverage of soft tissue defects with or without exposed tendoachilles or calcaneum. The size of wound ranged from 2-3 cm width to 5- 6cm in length. The follow-up period ranged from 3 to 6 months. No co morbid illnesses were considered as exclusion criteria. Patients were included in the study after obtaining an informed consent. All the study variables were collected on re-designed proforma such as age, sex, procedure performed and complications note.

The position and course of calcaneal artery was marked on the skin with hand held doppler and confirmed with duplex ultrasonography. With the leg dependent, the course of lesser saphenous vein was also marked out. The length and width of desired flaps were planned by using a lint pattern. The flap was designed as a short vertical or long flap that curves forward to the base of fifth metatarsal according to the defect size to be covered. The posterior incision follows the lateral edge of Achilles tendon down to the periosteum of the calcaneus and then curves forward towards the fifth metatarsal and undermining at this level. The plane was kept above the periosteum of calcaneum. The neurovascular structures lie on the deep surface of the subcutaneous tissues. The anterior incision requires division of large veins; it curves round the lateral malleolus and runs parallel to the posterior. Rotation to the defect was then performed, and the flap was given inset. Donor defect was covered with split thickness skin graft. Postoperatively lower limb elevation was given for 5 to 7 days. Patient's first dressing was done on fifth postoperative day.

### 3. Result

Commonest age group involved were 15-30years (40%). [Table.1] with commonest cause being road traffic accident (55%) followed by chronic raw area (30%) [Figure.1]. All twenty flaps survived well. The flap donor sites were grafted with split-thickness skin grafts in all cases. [Figure 2] Partial graft loss was seen in single patient, which eventually healed with dressing [Figure 3]. After healing of wound, patients became ambulatory and could wear shoes without breakdown of flap or skin graft. Follow up of patients ranges from 3 months to 6 months. Our results were satisfactory in terms of adequate coverage with functionally and aesthetically good outcomes.

### 4. Discussion

Reconstructing soft-tissue defects of posterior heel poses a continued challenge to plastic surgeons because of their osseous or tendinous bed, poor vascularization, paucity of tissue and constant shearing forces. Furthermore, they are often of traumatic origin and endorse young persons, causing significant morbidity if treated sub optimally. Multiple options available for coverage of posterior heel defects include local random pattern flap, lateral calcaneal

flap, reverse sural islanded flap, cross leg flap and free flap. The distally based reverse sural flap has been the workhorse flap for reconstruction of the posterior heel. Its broader spectrum of indications, larger vascular territory and great arc of rotation combine to make it a substitute for free tissue transfer for treatment of larger and composite defects. But it is not a good match for the defects of posterior heel as it is more bulky, insensate, usually leaves long linear scars cutting across the ankle and skin grafting is needed at donor site & also mandates secondary surgery often. <sup>(12)</sup>.

This pedicled neurovascular flap described by Grabb and Argenta <sup>(4)</sup> in 1981 as a mean of reconstructing soft tissue defect over the lower 3-5cms of the Achilles tendon or over the calcaneum on its posterior and plantar surface is simple, stable and sensate flap. It's supplied by the lateral calcaneal artery, a terminal branch of the peroneal artery, drained by the lesser saphenous vein and innervated by the sural nerve. <sup>(5)</sup> There are two versions of the pedicled flap, a long and a short, depending on whether the plantar surface of heel requires reconstruction. Peroneal vessels are least affected by age, diabetes mellitus or smoking, making it a reliable flap in these patients. <sup>(13)</sup> As this fasciocutaneous flap is moved as a transposition flap from the area below the lateral malleolus, a 'dog-ear' of the pedicle may occur. Disadvantage of the flap include donor site skin grafting, giving a depression & poor cosmesis. <sup>(2)</sup> Patients also have sensory disturbances at the lateral part of the dorsum of foot.

While comparing to the other flaps for posterior heel reconstruction, lateral calcaneal artery skin flap has certain distinct advantages. It does not require sacrifice of any major artery to the leg or foot, relatively thin & pliable flap with acceptable morbidity at the donor sites, constant vascular anatomy & ease of flap elevation. It also eliminates disadvantages such as insensate coverage, a two-stage procedure associated with the cross-leg flap, a paucity of expandable local tissue associated with local skin flaps, sacrifice of main arteries and nerves, venous congestion and need for an extended dissection associated with the sural flap and the need for skilled personal and sophisticated equipment associated with microsurgical flaps. <sup>(14,15)</sup> The only limitations associated with it include size limitation and sensory disturbances in a limited area over dorsum of foot which is often subjected to trauma while kicking a two wheeler or playing sports ending up in graft breakdown & ulceration.

Despite such ease and advantages, this is one underutilized entity and hence we evaluated its use with all modifications to different soft tissue defects over posterior heel region and to also understand the size limitations of this flap.

### 5. Tables

**Table 1:** Distribution on Basis of Age.

Age (years)	Number	%
15-30	8	40
31-45	2	10
46-60	6	30
>60	4	20

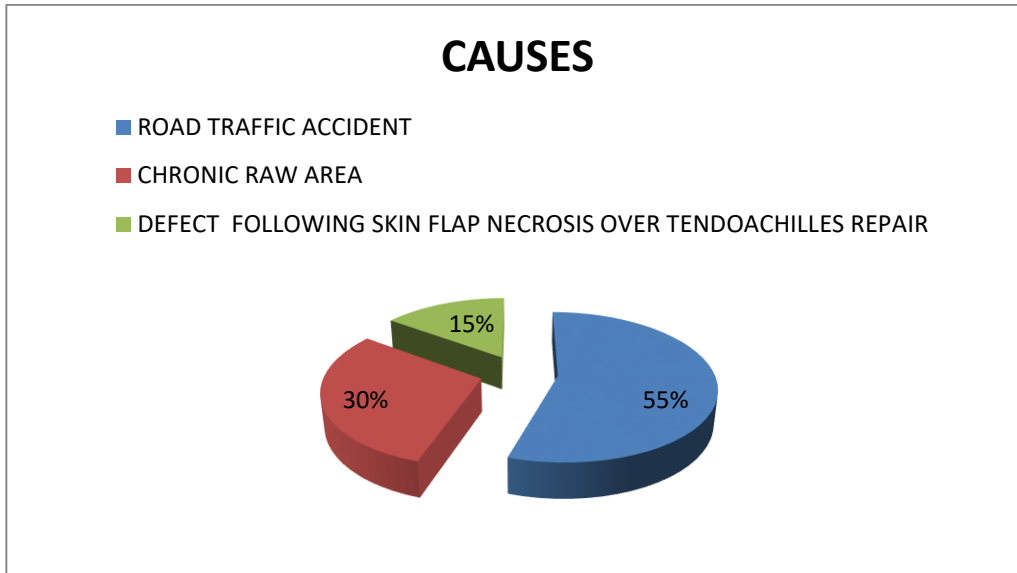


Fig. 1: Distribution on Basis of Causes



Fig. 2: Chronic Raw Area Over Tendoachilles Managed with Lateral Calcaneal Artery Flap.



Fig 4: Posterior Heel Defect with Exposed Repaired Achilles tendon (On Left) Coverage Given by Lateral Calcaneal Artery Adipofascial Flap. (On Right)

## 6. Conclusion

Lateral calcaneal flap presents good functional results for coverage of posterior heel and lateral calcaneum defects. Its advantages are its good functional results, its small perioperative morbidity and its relative ease for its design and creation. It is also a flap relatively immune to atherosclerosis, a common problem in patients with posterior heel defects.

Since, it provides sensate and stable coverage for posterior heel soft tissue defect with minimal donor site morbidity therefore this flap is an excellent option to cover posterior heel defect of small to moderate size.

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