



LATERAL CALCANEAL ARTERY FLAP FOR RECONSTRUCTION OF DEFECTS OF TENDO-ACHILLES REGION OF THE FOOT: AN INSTITUTIONAL EXPERIENCE

Plastic Surgery

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ABSTRACT

Background: Soft tissue defects of the Tendo Achilles (TA) region of the foot present difficult reconstructive problems. This paper reports the authors' experience of twenty eight patients treated with lateral calcaneal artery flap.

Methods: Between 2018 and 2019, twenty eight patients (22 males and 6 females) with soft-tissue defects over the TA region underwent a reconstruction using a lateral calcaneal artery flap. The flap sizes ranged from 3×2 cm to 6×4.0 cm.

Results: All flaps survived completely even after regularly wearing normal shoes. The flap donor sites were split skin grafted in all patients.

Conclusions: Lateral calcaneal artery flaps should be included in the surgical armamentarium to cover difficult wounds of the TA region of the foot. These flaps do not require the sacrifice of a major artery to the leg or foot, they are relatively thin with minimal morbidity at the donor site.

KEYWORDS

Foot, Posterior heel, Soft tissue defect, Lateral calcaneal artery flap.

INTRODUCTION

Soft tissue defects of the TA region of the foot can occur due to various causes like trauma, burns, chronic ulcers in moribund patients or vascularity insufficiency. These impose difficult reconstructive challenge due to underlying bony prominence and limited availability of adjacent expandable tissue. Moreover, there are many occasions where primary closure is impossible, even for small defects.¹ There are many alternatives present like grafting, loco regional flaps and free flaps. However, healing of skin grafts is next to impossible in cases with exposed bone or tendons and when the recipient sites are stimulated continuously by footwear. In addition, 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. The use of free flaps has improved the ability to cover soft tissue defects. However, technical expertise, steep learning curve, the flap bulk, the need for secondary procedures, and the risk of vascular failure are considerable obstacles.

A lateral calcaneal artery skin flap is an axial pattern flap that includes the lateral calcaneal artery, lesser saphenous vein and the sural nerve.² Since its development in 1981, 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.³ Modifications of this flap include island arterial flaps,³⁻⁶ distally based flaps and free flaps,⁷ all of which have a wide variety of clinical applications. This study reports our experience of twenty eight patients treated with this flap for a TA region defect reconstruction.



Fig. 1. (A) Post-traumatic soft tissue defect with exposure of the calcaneus and Achilles tendon in a 5 year-old male with design of flap. (B) The flap was dissected and the lateral calcaneal artery and the lesser

saphenous vein could then be visualized. The flap pivot point lies proximal to the superior edge of the calcaneus where the lateral calcaneal artery emerges. (F) The donor site was split skin grafted. (D) Reconstructed area showing a good contour and appearance at 10 months postoperatively. No functional impairment of ankle motion was evident. Note the excellent ankle joint motion.

METHODS and MATERIALS

Between January 2018 and October 2019, twenty eight patients (22 males and 6 females) with soft-tissue defects over the tendo-Achilles region underwent a reconstruction using a lateral calcaneal artery flap. The flaps ranged in size from 3×2 cm to 6×4.0 cm. The patients' ages ranged from 5 to 68 years (mean, 36.5 years), and the follow-up period ranged from 6 to 12 months (mean, 9 months).

Operative Procedure

Pre operatively, the peroneal and lateral calcaneal artery presence and patency were confirmed.² Intraoperatively, the flap sizes required to cover the heel defects were marked on the skin by reverse planning using a cloth pattern over the defect and transposing it to lie over previously demarcated artery. Initially, the posterior incision is given and dissection starts from the lateral aspect of calcaneal tendon and carried down distally to periosteum of the calcaneus.

The plane was developed above the periosteum. The anterior incision was made immediately behind the lateral malleolus and carried down through subcutaneous tissue. Finally, the distal horizontal incision was made and flap was raised from distal to proximal to the level of lateral malleolus.

The lateral calcaneal vessels and accompanying sural nerve were identified in the suprafascial layer. This neurovascular pedicle was protected and kept along the flap, and used as an anatomical landmark of the proper plane to undermine the fascia. The pivot point of the flap lies proximal to the superior edge of the calcaneus where the lateral calcaneal artery emerges. The proximal base of the flap was not narrowed and included the lateral calcaneal vessels, the superficial venous system and fascicular branches of the sural nerve.⁸ After rotating the flap to the recipient area, the donor site was split skin grafted. A moist, loose 1% sterile gauze dressing with a wet dressing was simply placed. Post op patients were immobilised for 5 to 7 days with leg elevation.

RESULTS

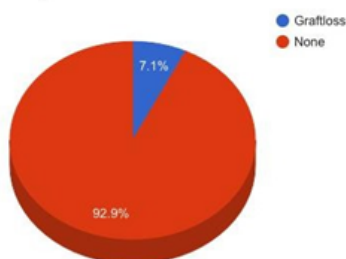
Table 1 shows the patient data. All twenty eight flaps had good perfusion and survived completely. No venous congestion was noted but flap edema lasted for 3 days. The skin grafts on the donor site had taken well in almost all except two patients. In all patients, the donor

sites of flap healed without any functional impairment. Two cases had partial graft loss which later healed by secondary intention. All patients became ambulatory after wound healing, and ankle motion was not restricted. There was no subsequent breakdown of the grafted skin with the regular wearing of shoes. Complications have been well depicted in Figure 2 with complications shown 7%. But the limitation of our study is small number of cases which need to be further evaluated with more number of cases.

Table 1. Clinical Data of the Patients

Case	Age (yrs)/Sex	Cause of defect	Size of flap	Site of flap	Follow up	Complication
1	22/M	Trauma	4x3	TA region	6mo	None
2	5/M	Trauma	5x3	TA	8mo	None
3	39/M	Trauma	6x4	TA	10mo	None
4	68/F	Chronic ulcer	4x2	TA	7 mo	Partial graft
5	34/M	Trauma	5x3	TA	6mo	None
6	24/M	Trauma	3x2	TA	8mo	None
7	25/M	Chronic wound	4x3	TA	9mo	None
8	20/M	Trauma	3x3	TA	1year	None
9	28/F	Trauma	3x4	TA	11mo	None
10	26/M	Trauma	3x2	TA	10mo	None
11	20/F	Burn	2x2	TA	6mo	None
12	22/M	Trauma	3x2	TA	11mo	None
13	23/M	Trauma	3x3	TA	10mo	None
14	21/M	Trauma	3x2	TA	9mo	None
15	32/M	Trauma	3x1	TA	8mo	None
16	35/F	Trauma	3x3	TA	11mo	None
17	30/M	Trauma	3x2	TA	10mo	None
18	28/M	Trauma	2x2	TA	8mo	None
19	36/M	Trauma	3x2	TA	9mo	None
20	8/M	Trauma	2x2	TA	10mo	None
21	28/F	Trauma	3x3	TA	11mo	None
22	26/F	Trauma	2x3	TA	6mo	Partial graft loss
23	38/M	Burn	2x2	TA	8mo	None
24	32/M	Trauma	3x2	TA	7mo	None
25	40/M	Trauma	2x2	TA	12mo	None
26	25/M	Trauma	2x3	TA	10mo	None
27	27/M	Trauma	3x2	TA	8mo	None
28	31/M	Trauma	2x2	TA	10mo	None

Complications



DISCUSSION

Lateral Calcaneal artery flap was first described by Grabb and Argenla in 1981 [2]. This neurovascular local skin flap includes-lesser saphenous vein, the sural nerve and the lateral calcaneal artery [5]. This flap is simple, stable and sensate. It is preferred in small sized isolated posterior heel defects with exposed tendoachilles or calcaneum [8]. There is a short (vertical axis and up to 8cm long) and a long(curved forward and up to 14 cm long) version of this flap.[2]

There are other options also present for TA region coverage like local fasciocutaneous flaps, skin grafting and free flaps but these have their limitations for coverage. Split skin graft do not fill the defect along with its difficult take on osseo -tendinous bed with shearing present in the TA region.Loco regional fasciocutaneous flaps present with donor site morbidities with sacrifice of a major vessel and contour deformities. Free flaps need expertise which is not available in every centre plus are bulky which does not suit the region as bulk imposes difficulty in wearing shoes.

Overall, lateral calcaneal artery flap should be considered to cover difficult wounds of the TA regions of the ankle. Lateral calcaneal flap presents good functional and aesthetical results for coverage of ankle defects.They are thin , pliable and do not require sacrifice of a major artery to the leg or footing with minimal morbidity at the donor sites. Importantly, they are very less time consuming as take only 15 to 20

min in their elevation which is a major advantage in high volume centres in developing countries. Thus, they can be utilised as a powerful tool in the TA region defects.

Lateral calcaneal artery flaps are limited in size but can fill defects of the TA region. In this present series , lateral calcaneal artery flaps were used to effectively cure nonhealing defects with minimal donor site morbidity.

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