

# ADIPOFASCIAL SURAL ARTERY FLAP FOR FOOT AND ANKLE RECONSTRUCTION IN CHILDREN: FOR BETTER AESTHETIC OUTCOME

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## Abstract

**Background:** Wheel spoke injury of the ankle and foot is very common in children and its reconstruction is challenging. Reverse flow sural artery fasciocutaneous flap is versatile for this area but lead to significant donor site morbidity. Free tissue transfer is an option in children which needs a micro-vascular expertise, expensive equipment and long operating time.

**Method:** Fifteen adipofascial flaps were done for foot and ankle coverage from June 2011 to June 2014 at

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CH and ICH Lahore. The efficacy of adipofascial sural artery flap for the coverage of these defects was evaluated.

**Results:** Fifteen children presented with defects of foot and ankle, 11 (73%) were male and 4 (27%) were female. Their age ranged from 1 – 13 years. All patients had trauma to the foot due to wheel spoke injury. Flaps were used to cover tendoachilles and malleoli. In one patient there was flap tip necrosis with partial graft loss which healed with dressings. Donor site aesthetic outcome was satisfactory in all cases. Mean follow-up was 1 year.

**Conclusion:** Adipofascial Sural artery flap is quick and safe with wide arc of rotation, minimal donor site morbidity and better aesthetic outcome and it does not sacrifice major extremity vessel.

**Key Words:** Foot and ankle, Reconstruction, Adipofascial flap, Donor site morbidity.

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## Introduction

Lower extremity reconstruction in foot and ankle area is a challenge for the plastic surgeon because of distal location, tight skin, subcutaneous tendons and bones and limited local flaps options.<sup>1</sup> Local flaps have regained popularity because of better understanding of

vascular anatomy and many reports have been published describing distally based fasciocutaneous flaps for reconstruction of this area. Distally based sural artery flap is well established in adults for better aesthetic outcome.<sup>2</sup> Free skin graft is often not suitable and these children need flap coverage.<sup>3</sup> Local fasciocutaneous flap and microvascular free flap have been described.<sup>4</sup> This study is performed to see the use of reverse flow adipofascial flap as an option for medium and small defects in this area for the better perfusion and aesthetic outcome of donor site and short operating time.

### Material and Methods

This prospective study was carried out at The Children’s Hospital and Institute of Child Health (CH and ICH) Lahore from June 2011 to June 2014. Fifteen patients were included. Eleven patients were male and 4 were females. Age ranged from 1 – 13 years (Mean age: 8 years). Patients with trauma leading to exposure of bone and tendons were included in this study. Patients with injury to donor area were excluded from the study. Data was collected on a proforma and was analyzed by SPSS 17.

### Surgical Technique

This flap is based on reverse flow of posterior tibial artery perforators which are marked with hand held Doppler. Tourniquet is applied and skin flaps are elevated with a lazy – S incision avoiding injury to dermal plexus. Subcutaneous fat including deep fascia, sural nerve, short saphenous vein are elevated. Pivot point is 6 cm from tip of lateral malleolus and flap is perfused with perforator 5 cm from the tip of lateral malleolus. Flap is turned down like leaf of the book. Skin flaps are primarily closed and flap is covered with primary split thickness skin graft. Foot is kept in planter flexion with a volar slab to avoid tension on flap. Patient is nursed in prone position to avoid pressure on flap pedicle.

#### Case 1:



Picture 1: Motorbike Injury Left Heel.



Picture 2: After Debridement, Elevation of Skin Flaps.



Picture 3: After Flap Inset and STSG.



Picture 4: At 3 Months Post-operative.

#### Case 2:



Picture 5: Skin Marking after Debridement.



**Picture 6:** After Flap Inset.



**Picture 7:** After STSG.



**Picture 7:** At 7 Weeks Follow-up.

## Results

Size of flap ranged from 3 × 2 cm – 6 × 4 cm. Twelve patients were operated in 1<sup>st</sup> week after trauma and rest 3 were operated in 2<sup>nd</sup> week after trauma. One flap (7%) had tip necrosis and partial graft loss which healed with dressings. One patient underwent epidermolysis of donor site skin flap which healed without skin necrosis. Two patients (13%) developed marginal hypertrophy of skin graft which was managed with silicone gel sheet and pressure garments.

Children were allowed full activity after 4-6 weeks postoperatively.

## Discussion

Injury to ankle, heel and foot are common due to entrapment in motorcycle wheel spokes. Local flaps are difficult because of tight skin and distant location.<sup>5</sup> Manchot<sup>6</sup> first described vascular mapping of body area in 1899. Solmon<sup>7</sup> in 1936 described vascular

**Table 1:**

Patient	Age (Years)	Sex	Cause of Defect	Site	Flap size (cm)	Associated problem	Complication
1	7	M	Trauma	Left heel, Posterior surface	6 × 4	Exposed Bone	None
2	9	F	Trauma	Left heel, Posterior surface	4 × 3	Exposed Bone	None
3	1	M	Trauma		4 × 3	Exposed Bone	None
4	13	F	Trauma	Left Calcaneum	6 × 4	Exposed bone Tendon	None
5	9	M	Trauma	Right calcaneum	5 × 3	Exposed bone tendon	None
6	3	M	Trauma	Right Lateral Malleolus	4 × 4	Exposed Bone	None
7	4	M	Trauma	Right heel, Posterior surface	5 × 4	Exposed Bone	None

8	7	F	Trauma	Right Calcaneum	3 × 2	Exposed Bone	None
9	8	M	Trauma	Left Heel, Posterior surface	5 × 3	Exposed Bone	None
10	12	M	Trauma	Left Malleolus	6 × 3	Exposed Bone	None
11	11	M	Trauma	Left Heel, Posterior surface	4 × 3	Exposed Bone, Tendon	None
12	10	M	Trauma	Right Heel, Posterior surface	5 × 4	Exposed Bone	None
13	10	F	Trauma	Left Heel, Posterior surface	6 × 3	Exposed Bone	None
14	9	M	Trauma	Right Calcaneum	4 × 3	Exposed bone	None
15	8	M	Trauma	Right Calcaneum	5 × 4	Exposed Bone	Partial Flap Necrosis and Graft Loss

network around cutaneous nerves. Ponten<sup>8</sup> in 1981 presented concept of fasciocutaneous flaps. Donski and Fogdestam<sup>9</sup> described distally based peroneal artery adipofascial flaps in 1984. Gumener<sup>10</sup> in 1990 proposed use of this fasciocutaneous flap with a split thickness skin graft for coverage of this area. Distally based muscle flaps like soleus, extensor hallucis longus may be considered. Posterior tibial artery, anterior tibial artery and peroneal artery flap lead to sacrifice of major limb vessel. Cross leg flaps have been used but sometime lead to DVT and joint stiffness.<sup>11</sup> Adipofascial Posterior tibial artery flap has been described by Hong et al.<sup>12</sup> Youshimura et al,<sup>13</sup> used peroneal artery and vein flap. Masquelet et al,<sup>14</sup> in 1992 described peroneal artery flap. Neurocutaneous flaps have been described but lead to sensory loss and are less reliable. In our series of 15 children, we covered the heel defects with good results. All cases were resurfaced with split thickness skin graft, harvested from the posterior surface of same thigh. Advantages of distally based adipofascial sural artery flap are easy, quick and safe surgery in one stage: preservation of major arteries and minimal morbidity for the patients. This flap has a long pedicle and a wide arc of rotation, because its vascular axis has the largest direct artery of posterior calf and strongest peroneal perforators at its pivot point. The Doppler is a useful for marking the pivot point but it is not mandatory. Because the anatomy remains relatively constant, it was not used routinely in our paediatric patients. Microvascular free flaps are single stage but need long operative time, equipment and instrumentation.<sup>15</sup> Microvascular expertise is not available at all centers. The distally based adipofascial sural flap gains acceptance because of its simplicity, versatility, low cost, minimal donor site morbidity and better aesthetic outcome. However, the neurological deficit caused by sacrifice of sural nerve is negligible. The distally based adipofascial sural flap is an excellent choice in paediatric age group for covering defect of lower leg, foot and ankle.

## Conclusion

Reverse flow sural artery adipofascial flap is quick, versatile and reliable option for coverage of foot and ankle defects in children and does not sacrifice major extremity vessel. This flap has minimal donor site morbidity and better aesthetic outcome. We strongly recommend this flap for coverage of this difficult area in children.

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