

Original Article

Distally Based Sural Flap: Experience with 50 Flaps at Nishtar Hospital Multan

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Objective: To evaluate the efficacy of distally based Sural flap in coverage of the lower third of leg, ankle and foot defects

Study Design: Descriptive Case Series

Place and Duration of the Study: The Study was conducted in the Burn unit/Plastic Surgery Department, Nishtar Hospital Multan during a period from June 2008 to December 2011.

Materials and Methods: 50 patients with soft tissue defects over the distal leg and foot were included in this study. Distally based sural fasciocutaneous flap was used for coverage in all cases and its survival, successful coverage of the defect and donor site morbidity studied

Results: The flaps survived in all patients. Marginal loss over the distal edge of the flap was noted in one patient. No significant morbidity was found.

Conclusions: The distally based sural flap is a versatile and reliable flap for the coverage of soft tissue defects of the distal lower extremity. The procedure is done as a single stage; the dissection is easy with short operating time and minimal morbidity.

Key Words: Distally based Sural flap; Defects of distal leg and ankle; Flap coverage.

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Introduction

Treatment of high energy lower extremity trauma with soft tissue and bone injury remains a formidable problem. Treatment requires a team approach with the orthopedic, vascular and plastic surgeon. The goal in treatment of open tibial fractures and lower extremity salvage is to preserve a limb that will be more functional than an amputation. If the extremity cannot be salvaged, the goal is to maintain the maximum functional length.¹ There are many possible reconstructive options, which developed or modified for reconstruction of defects in the lower limb. These include; skin grafts, local flaps, distant flaps, and free flaps.

However, each of these techniques has its own limitations.³ The experience with the use of these reconstructive options is developing in various centers. However, still the indications, the selection of a particular technique for the different cases are not well established and are rather a matter of personal judgment.³

Soft tissue defects around the foot and ankle region often present an awkward problem to the Plastic surgeons. Tendons and bones are frequently exposed after trauma because of the thinness of the subcutaneous tissue. Traditionally, local flaps resurface

has short size and limited arc of rotation. Reverse flow flaps such as anterior tibial artery flap and posterior tibial artery flap require the sacrifice of major arteries. Free flap is currently the treatment of choice for large soft tissue defects of the distal extremity, It is however technically demanding .Furthermore in a few cases of trauma with damaged or occluded major vessels, where a free flap may be potentially hazardous, the reverse sural artery flap can prove to be one of the few safe options for soft tissue coverage.⁴ The accompanying arteries of the lesser saphenous vein and sural nerve have been utilized with success for harvest of reverse flow sural flap.⁵ The sural artery reverse flow flap is nourished by the lowermost perforating branch of the peroneal artery, introduced by Masquelet⁶ in 1992, it has become one of the favourite among reconstructive surgeons.

In this paper we present our experience of reverse flow sural neurocutaneous flaps with respect to its indications, range of coverage and therapeutic results.

Materials and Methods

This prospective study was conducted in the Department of Plastic Surgery and Burn Unit Nishtar

Hospital, Multan, from June 2008 to December 2011. This is a Descriptive Case Series. Fifty patients with soft tissue defects of the lower 1/3 of the leg and heel were included in this study. sampling technique was Non Probability Purposive Sampling. Our inclusion criteria was: Soft tissue defects of lower 1/3rd of the leg and ankle measuring not less than 3x3cm and not more than 10x10 cm, presenting within 1 month of sustaining the injury/wound. We excluded patients with irradiated area and injury of the donor area. Our study plan was approved by the ethical committee of our institution. All the necessary information regarding this was given to all the patients and attendants. A written consent was obtained from the patients, parents or guardians. During that study period all the details of patients regarding their medical report, operative notes, pre and post operative photographs, duration of hospital stay and outcome were filed individually.

The demographic data of our patients are described in table I. Regarding mechanism of injury Road Traffic Accident (RTA) was the prime. All the cases were admitted either thru OPD or shifted through orthopedic department. No procedure was done in emergency Department.

All the data was analyzed using SPSS 10 software. Descriptive statistics were used to calculate percentages.

Table I: Demographic data of patients

Sex	No of cases	Percaentages
Male	36	72 %
Female	14	18 %
Age of Patients		
6-10 years	1	2 %
11-20 years	5	10 %
21-30 years	20	40 %
31-40 years	10	20 %
41-50 years	9	18 %
51-60 years	4	8 %
> 60 years	1	2%
Etiology of soft tissue defect of hand	Number of flaps in 50 patients (n=53)	
RTA	39	78 %
Blast injury	3	6 %
Machine injury	6	12%
Gun shot	1	2 %
Site of Defect	Number of Cases	
Lower 1/3 rd Leg	30	60
Heel and foot	20	40

Surgical Anatomy: The reverse flow sural fasciocutaneous flap is based on the median superficial sural artery.⁷ This artery is a branch of the superficial sural artery, originating from the popliteal or sural arteries and then following the course of the sural nerve 2 to 3 cm distal to its origin and emitting numerous branches along its suprafascial path towards the skin at the lower leg. The artery descends to the lateral malleolus in about 65% of individuals, or ramifies to a vascular network in the distal third of the leg in the remaining 35%. In both situations, constant anastomoses with 3 to 5 septocutaneous perforators from the peroneal artery ensure good circulation. The success rate of the flap increases when the accompanying arteries of the lesser saphenous vein are included, as these give off cutaneous perforators along its suprafascial course. The pedicle of this flap is composed of superficial and deep fascias, sural nerve, lesser saphenous vein and accompanying vessels, and the median superficial sural artery. The flap proper includes the skin island, subcutaneous tissue, and the fascias.^{8,9}

Operative Technique: Preoperatively, we performed hand held Doppler ultrasound in all cases as a part of essential clinical examination of flap to locate the cutaneous perforators.

With the patient in a lateral position or prone position, the flap was outlined at the posterior aspect of junction of upper and middle 1/3 leg. The pivotal point of the pedicle just be at least 5cm i.e., 3 fingers' breadth above the lateral malleolus to allow. Skin incision was started along the line in which the fascial pedicle will be taken. The subdermal layer was dissected to expose the sural nerve, accompanying superficial sural vessels and short saphenous vein. The subcutaneous fascial pedicle is elevated, with a width of 2cm to include the nerve and these vessels. At the proximal margin of the flap, the nerve and the vessels were ligated and severed. The skin island was elevated with the deep fascia. The donor site defect can be closed directly or grafted.

We immobilized ankle post operatively for 14 days and removed all stitches / staples all 8 to 10 days post operatively. Post operatively we monitored the flap survival clinically based on skin color, temperature, skin turgor, capillary refill and color of blood and pin prick. These assessments were done 6 hourly for first 24 hour and later on 8 hourly for 4 days next.

All the patients were followed up weekly in the first month, then monthly afterwards. During the follow up period we recorded the flap progression and its outcome. Cosmetic outcome was assessed based on three parameters: flap thickness, color match and appearance of the donor site defect. During that period details with photographs were recorded. Among 50 patients 42 patients were available for follow up for 6 months or more. Among remaining 8 cases, 3 patients were

followed up for 2 month or less and 5 patients never came for follow up.

Results

Among 50 patients there were 36 males and 14 females. The ages ranged from 6 to 65 years. (32.82 ± 13.13 years). Size of the smallest wound was 3x3 cm and maximum was 10x10cm. The mean size of the wound being 54.8 Cm.² As far as exposure of the underlying bone goes 49 patients had underlying bone exposure as compared to only 1 patient in whom underlying bone was not exposed. Most of the patients in our series were operated between 3rd and 4th week of injury. Earliest operation was done after 2nd week and maximum delay was 4.5 weeks. Mean Hospital stay after flap coverage in our patients was 11 days (range 7-21 days).

In our series we were able to cover the ankle, dorsum of foot up to the level just distal to metatarsal joints and heel and little of sole. All flaps survived. In one patient, we noted marginal loss over the distal edge of the flap. This patient unfortunately developed severe infection in the postoperative period that caused marginal flap loss.



Figure 1. A young man of 23 years had wound on heel

When we had culture and sensitivity report it turned out to be MRSA which responded well after antibiotics and was then managed with flap advancement and suturing. Mild edema developed in all patients and subsided over a time of two weeks except in one where edema was moderate and subsided in about three months. Only one

flap developed mild venous congestion in the early post operative period, which resolved with foot elevation. None of our patients had resurfacing to the weight bearing part of the heel. There was no interference with walking. The donor site had no complications except for the relatively unsightly scar. It was acceptable to all patients. All patients were satisfied with the cosmesis of the recipient site. Transient numbness along the sural nerve distribution was experienced by the patients. It resolved in all patients by three months. No painful neuroma developed as we routinely buried the nerve stump in the deep muscular plane. Long-term follow-up demonstrates excellent colour and texture match with reliable soft-tissue coverage. On interviewing; the patients have shown high level of satisfaction regarding flap / donor site esthetics. No patients required debulking for cosmetic reasons or shoe wear problems.



Figure 2: Flap coverage and STSG of donor area (7th post op day)



Figure 3: Flap at 2 week Post Operative

Discussion

Several procedures have been described for coverage of soft tissue defects of the distal 2/3 of the leg and foot

¹⁰⁻¹⁶ with their own disadvantages. The advent of neurocutaneous flaps by Masquelet has led to a new way of approaching the problem once considered a waterloo for reconstructive surgeons who are not familiar with the microvascular free flaps.

Septocutaneous perforators of the peroneal artery in the distal 1/3 of the calf are constant, reliable and well documented. Distally based sural provides reasonably big, simple, safe and reliable flap to cover moderate sized defects in any part of the distal 2/3 of the leg, ankle and proximal foot. Ease of elevation, pedicle width and length, arc of rotation of the flap are some of the other advantages of the flap.

Some documented disadvantages of the flap are:^{9, 10, 13}

- Prone position during surgery (avoided by positioning the patient in lateral decubitus).
- Sural hypoesthesia.
- Unsightly post scar on the calf.

The present study was conducted to establish to the fact that reverse flow sural artery fasciocutaneous flap is indeed a reliable source for coverage of soft tissue defects in our setup due to its good functional out come and minimum donor area morbidity. As well as to generate a local data base in our setup to ascertain the effectiveness and reliability of the reverse flow sural artery flaps is shown by various studies done in developed countries of the world.^{17,18}

In the literature sural flap was used to cover defects secondary to road traffic accidents, non healing skin wounds, chronic venous ulcers, chronic osteomyelitis in diabetics, contractures, gangrene, unstable scars, cancer resections, and electrical burns.^{19,20} In our patients road traffic accidents was major cause of defects, similar to some other studies.^{21,22} All of our flaps survived. Regarding complications we have had no complete loss of flap in any of our cases. There was partial flap necrosis in one case, had severe infection(which turned out to be MRSA positive) in the postoperative period leading to only marginal superficial flap necrosis and did not need any secondary procedure.

Venous congestion, not lack of arterial supply, is the most significant reason for flap necrosis.²⁴ The methods reported to improve venous outflow are exteriorising the pedicle, intermittent drainage of short saphenous vein, leaches, and the supercharging of the flap by anastomosing the proximal end of the lesser saphenous vein to a vein in the recipient defect.²⁵ In one of our patients, venous congestion was noted postoperatively. We exteriorized the pedicle and maintaining the sleeve of deep fascia around pedicle that maintains the integrity of arterial and venous channels and reduces these complications.

Conclusion

In our hands, we found the distally based sural flap a safe option for the coverage of soft tissue defects of the distal lower extremity.

Distally based sural flap is a versatile and reliable flap. The procedure is done as a single stage; dissection is easy with short operating time and minimal morbidity.

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