

“Evaluation of the Outcome of Lateral Supramalleolar Flap for Soft Tissue Coverage in Patients with Exposed Dorsum of Foot and Heel Area”

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ABSTRACT

Objective: To evaluate the outcome of lateral supramalleolar flap for soft tissue coverage in patients with exposed heel and dorsum of foot.

Methodology: This prospective study was conducted in Department of Orthopaedic Surgery, Bahawal Victoria Hospital Bahawalpur from 1st April 2008 to 30th June 2009. Lateral Supramalleolar Flap was used in total of 20 cases for soft tissue coverage of heel and dorsum of foot. All patients discharged on 5th day after flap surgery. First follow up in outpatient department was scheduled ten days after discharge and skin sutures were removed, then patients were followed on every 5th day for two months.

Results: Eighteen cases of soft tissue defects of heel region and two cases of dorsum of foot were covered with supramalleolar flap. There were sixteen cases of soft tissue defects of heel after trauma, two cases of chronic heel ulcer and one of chronic osteomyelitis. All cases of soft tissue defects of dorsum of foot were because of trauma. Flap survived in all cases. Only in four cases marginal necrosis was seen which were used to cover heel. Flap was debrided and advanced in three cases while other needed split thickness skin grafts. Mild flap edema occurred only in six cases, which resolved only by elevation of limb.

Conclusion: Lateral supramalleolar flap is a very effective tool for reconstructing the soft tissue defects in dorsum of foot and heel region.

Key words: Soft tissue defects, Supramalleolar flap.

INTRODUCTION

The most important goal in management of severe open injury of lower limb is to obtain soft tissue coverage. It provides a close wound to promote revascularization of injured bone and soft tissues and to prevent late infections and non-union that may occur secondary to persistent bone ischemia. Soft tissue defect of lower one fourth of leg, heel and foot is difficult to cover¹.

Various options for soft tissue coverage are now available because of great developments of newer concepts in flap surgery ranging from simple skin grafts to technically demanding free microvascular flaps.

Different types of local flaps are available. Fasciocutaneous flaps like Sural flap, Dorsalis pedis artery flap, medial plantar artery flap and lateral calcaneal flaps are local flaps.²

Muscular flaps like abductor hallucis and flexor hallucis longus flaps are also available but of limited reach. Cross leg flaps have also been used for this difficult region to come but now these are not considered a good option because of difficult

posture and difficulty in rehabilitation of the patient³.

Reconstruction with free microvascular flap is a good option but it is a lengthy procedure, trained microvascular surgeon and expensive equipments are required^{4,5}.

Reverse flow fasciocutaneous flaps, including reverse flow peroneal, anterior tibial and posterior tibial artery flaps have been described.⁶ Each of these mentioned flap has its own merits and demerits.

The lateral supramalleolar flap was described in 1988, thereby expanding the armamentarium of locoregional flaps for coverage of the ankle and foot⁷. The peroneal artery, in its distal course behind the tibiofibular angle, provides a perforating branch that traverses the interosseous membrane. This branch provides multiple ascending branches to the overlying skin. At the premalleolar region, is an anastomotic junction between the anterolateral malleolar artery (branch of the anterior tibial artery) and the perforating branch of the peroneal artery. The flap, vascularized by a cutaneous branch

arising from the perforating ramus of the peroneal artery, is raised on a retrograde vascular flow.

Lateral supramalleolar flap is not a sensory flap, because peroneal nerve is sacrificed with flap elevation. It is better than the above-mentioned flaps because this particular new flap has wide arc of rotation. It is easy to perform and has good results so these are the reason we have chosen this flap for coverage of wounds of heel and dorsum of foot.

MATERIAL AND METHODS

This prospective study was conducted in Department of Orthopaedic Surgery, Bahawal Victoria Hospital Bahawalpur from 1st April 2008 to 30th June 2009. Lateral Supramalleolar Flap was used in total of 20 cases for soft tissue coverage of heel and dorsum of foot. Mean age of patients was 31 years with range from 12_50 years. Patients included were 15 males and 5 females. Table no.1 shows the of soft tissue defects in these patients. Maximum size of flap was 16x5cm, with average size of 10x6cm. All patients were discharged on 5th day after flap surgery. Patients as well as attendants were given detailed information about the care of newly reconstructed defect. First follow up in outpatient department was scheduled ten days after discharge and skin suture were removed, then patients were followed on every 5th day for two months.

Table 1: Causes of Soft Tissue Defects of Heel And Dorsum of Foot

Road side accident	17
Chronic ulcer	02
Chronic osteomyelitis	01

Table 2: Location of Soft Tissue Defect

Heel	18
Dorsum of foot	02

Surgical Technique:

Peninsular design with cutaneous pedicle was used in all cases. Operation was performed under general or spinal anesthesia. Patient was kept in lateral position or supine with pillow under the buttock. A tourniquet was applied and inflated before the elevation of flap. Flap was marked on lower half of the lateral aspect of leg, superiorly up to middle of leg, anteriorly up to tibialis anterior, posteriorly up to fibular crest, inferiorly including the tibiofibular space about 5 cm proximal to the tip of lateral malleolus, marked by depression in the

lower part of tibiofibular space. Once the flap was raised, it rested spontaneously in the defect after rotation with out any tension. It is important to avoid complications.

The donar area was reduced in size by approximating sutures and remainig defect covered with split thickness skin graft.

RESULTS

Flap survived in all cases. Marginal flap necrosis was occurred in four cases, which were used to cover heel defect. Flaps were debrided and advanced in three cases while other needed split thickness skin grafts. Mild flap edema occurred in six cases, which resolved only by elevation of limb. Many patients complained loss of sensation on dorsum of foot that was already explained to them. Three flaps covering the heel became bulky and patients complained of difficulty in wearing shoes.

DISCUSSION

Soft tissue coverage of defects in the region of distal leg, ankle and foot has always been a difficult reconstructive problem.⁸ Such soft tissue defects are caused by different etiological factors.

Relatively few procedures for cutaneous coverage of these regions are effective with low morbidity. Local flaps have limited reach.

Medial Plantar artery flap is considered appropriate for weight bearing heel.² Dorsalis pedis artery flaps can be based distally or proximally.⁹ Local muscles flaps are of restricted use.¹⁰ These are related with additional trauma to already insulted tissue and in cases of flap failure extent of local damage will greatly increase.

Proximally based fasciocutaneous flaps have little application for the coverage of soft tissue defects of distal leg, ankle and foot.¹¹

A number of perforator based fasciocutaneous flap from lower leg with distal base have been described for this region.¹² Posterior leg flap has also been reported but their scope is very limited.¹³ Distally based fasciocutaneous flap with a major vessel in their pedicle have been described for all three major leg vessels.¹⁴ Sacrifice of one major vessel is an obvious disadvantage.

In 1988, lateral supramalleolar neurocutaneous flap was described by Masquelet, with clinical experience of 14 cases that allowed the coverage of lateral, dorsal and plantar aspect of foot, the posterior heel and the lower medial portion of leg⁷.

In 1990, technical refinement of the lateral supramalleolar flap enabled it for covering most distal defects of the lower extremity¹⁵.

In 1998, Okazaki described lateral supramalleolar flap as a first choice for coverage of ulcers in the heel region¹⁶.

In 2001, Voche P described his experience of supra malleolar flap for soft tissue coverage in 35 cases¹⁷.

In 2001, Touam and Oberlin described the comparative study of lateral supramalleolar flap and sural flap for soft tissue coverage of distal tibia, ankle and foot¹⁸.

In 2004, Lee used distally based lateral supramalleolar adipofascial flap for reconstruction of dorsum of foot and ankle²⁰.

In 2005, Voche and Merle used lateral supramalleolar flap in his study of 41 cases for distal tibia, ankle, foot and heel skin defect reconstruction²¹.

In 2008, Sham and colleagues described lateral supramalleolar flap as a simple and durable in reconstruction of pressure ulcers in patients of spinal cord injury²².

In our study soft tissue defects were confined to posterior part of heel and dorsum of foot. Most common cause of soft tissue defect was trauma. Lateral supramalleolar flap is highly reliable, safe and easy to dissect. It does not need the sacrifice of major arteries. We used peninsular flap. A disadvantage related to this flap is wide area of anesthesia because of sacrifice of superficial peroneal nerve. It is a thin flap so cannot be used in weight bearing areas.

We used this flap in 20 cases, with mean age of 31 years that is equal to the study conducted at Aga Khan University for lateral supramalleolar flap²³ in which average age was 31.25 years. In their study of eight patients 75% were male and 25% were female that is comparable to our study where 75% are male and 25% are female.

In Voche P study of 35 cases¹⁷, partial necrosis observed in three cases that is comparable to our study in which marginal necrosis occurred in four cases. In their study venous congestion observed five times that is similar to our study in which flap edema occurred only in six cases.

Survival of flap was due to careful dissection, which remained deep-to-deep fascia having peroneal nerve with its accompanying vessels in it. Use of tourniquet in upper thigh was released after

the elevation of flap and vascularity confirmed and soft tissue coverage of defective area done.

CONCLUSION

Lateral supramalleolar flap is a safe, easy to perform and highly reliable flap. It can cover variety of soft tissue defects of foot and ankle.

It can be designed in different ways to match the soft tissue defects. No special sophisticated equipments are required to raise this flap. It is one of the best choices for soft tissue reconstruction of malleoli, ankle, heel, plantar surface except weight bearing areas and whole of the dorsum of foot.

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