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BACKGROUND: Soft tissues injuries at foot especially at heel expose thetendons, bones and especially joints, which leads to risk of infections andnecrosis.

These often result from trauma (spoke wheel), tumors, and chronicdiseases such as peripheral vascular disease and diabetes. Surgical planning ofthese defects remains a challenge due to shortage of local scar free tissue andreliable blood supply. The present study aims to prospectively evaluate theoutcome of distally based sural flap for coverage of defects of dorsumof foot, ankle & heel. MATERIAL&METHODS: This study was conducted at Department ofPlastic & Reconstructive Surgery, Dr. Ruth KM Pfau Civil Hospital Karachifrom January 2015 to January 2018. All patients who presented with wounds atheel, dorsum of foot, and exposed calcaneus or Achilles tendon were included. Aperoneal based perforator identified by hand held Doppler, a superficial vein, and the vascular axis of the sural nerve wereincluded in the pedicle.

Patients were followed during the first 6postoperative months. Complications like venous congestion, tip necrosis andpartial and complete flap failure were documented. A peroneal based perforator identified by hand heldDoppler, a superficial vein, and the vascular axis of the sural nerve were included in the pedicle. RESULTS: Total of 36 reverse low sural flaps weredone for the soft tissue coverage of the 24 heel defects, 8 ankle defects and 4dorsum of the foot defects. Twenty eight patients were male and eightwere females and age ranged from 6 to 36 (mean 21) years. Partial flap failure was seen in 4 cases and completeflap failure in 3 cases. There were no serious donor site

complications and allpatients were satisfied with the functional and aesthetic outcomepostoperatively.

CONCLUSION: Distally based sural artery flap is very useful in covering the defectsof heel and dorsum of foot. It is reliable, easy to harvest with minimalmorbidity to the patient. This flap is Safe because it does not sacrifice anyof the major vessels of the limb.

KEYWORDS: Calcaneus fractures, peroneal artery based perforator, Achillestendon, sural artery flap. INTRODUCTION: Due torecent urbanization, an increase in high velocity trauma, compound fractures, extensive degloving injuries and poly-trauma have become more frequent1, 2. Complete soft tissue coverage is extremely challenging3; due tounreliable blood supply after traumatic injury and thin subcutaneous tissueover the lower leg, heel and malleolus. As trauma and other degloving injuriesoften involve skin & subcutaneous tissue, underlying bone, ligamentousstructures& exposes the tendon and bones directly4, which leadsto risk of infections and necrosis. Soft tissue injuries and defects in thelower extremity often result from trauma, tumors, and chronic diseases such asperipheral vascular disease and diabetes. Lower extremity trauma most oftenoccurs after motorcycle or car accidents and frequently involves tibia.

Spokewheel injuries lies among the most common injuries in motorcycle riders. Thiskind of injury commonly occurs when foot gets struck in between the spokes ofthe wheel. The malignant tumors arising from the skeleton

frequently involvesthe tibia. Resection of the tumors with safe margins often results in largedefects with exposed bone, tendon or neurovascular structures; moreoverirradiation of the surrounding tissue makes doubtful primary closure. Chronicwounds of the lower extremity often involve the foot and ankle and are theresult of minor trauma in patients with co-morbidities like diabetes, peripheral vascular disease, and venous hypertension.

Reconstruction of these defects with softtissue coverage also demands for fat padding of calcaneus as it is the primaryweight bearing bone transferred from the tibia. Grading system that determinesthe extent of tissue damage: Type I: Skinloss with no exposure of bone or tendon. Type II: Skin loss with Achilles tendon either exposed or ruptured. Type III: Skin loss with Achilles tendondefect, calcaneus exposed or fractured. Type IV: Mangled foot with damage to neurovascular bundles10.

Thereare many possible reconstructive options, including skin grafts, local flaps, distant flaps and free flaps5, 6. Skin grafts are not suitable tocover the exposed bone, tendon, malleoli, heel, and weight bearing areas7, 8. Absence of peripheral pulses, presence of adjacent scarred skin andperipheral vascular thrombosis are contraindications to local flaps; being atthe top of reconstructive ladder free tissue transfers provide excellent tissuecoverage9 but require a microvascular team and equipment. Raising aflap with an intact neurovascular anatomy with a fair amount of mobility tocover a defect at a considerable distance is the key to a successfulrehabilitation. It is equally important to consider a meticulous dissection forachieving minimum donor site morbidity & related complications. Thisstudy was conducted to

evaluate the outcome ofreverse sural flap for the coverage of ankle, heel and dorsum offoot defects.

MATERIALAND METHODS: This descriptive, experimental study was conducted at Department of Plastic and Reconstructive Surgery, Dr. Ruth KM Pfau Civil Hospital Karachi, from January 2015 to January2018. It included 36 patients; 28 were males and 8 were females, with softtissue defects of the heel, ankle and dorsum of foot.

The age, gender, cause, duration, site and size of the defect, dimension of flap, transposition ofpedicle (through a tunnel or lay open), postoperative results and complicationswere recorded. X-rays of the recipient site were done in all cases to evaluatethe condition of the underlying bone and to rule out osteomyelitis. Patientswith calcaneus fractures, external fixator application, and osteomyelitis, andperipheral vascular disease, traumatic or irradiated tissue adjacent to woundwere excluded. Patients with trauma inzone of peroneal artery perforators were also excluded from study. Repeateddebridement and dressings of the wounds were performed until the wound wasready for further management. Allpatients were followed in outpatient clinic for flap outcome and complications for6 months.

Total flap loss was considered as major complications. SURGICAL TECHNIQUEPatientwas laid in standard lateral or prone position under general or spinal anesthesiaand tourniquet control. Recipient site was debrided before harvesting the flap. Planning in-reverse was done. Pivot point of the flap was kept at a distance of5–6 centimeters from the lower end

of lateral malleolus. Hand held Doppler ultrasoundwas used for the assessment of perforators. The junction of proximal and middlethird of the leg was considered upper limit for the flap whereas patients' whorequired longer pedicle the flap was required to be placed in proximal third ofleg using delay phenomenon first in minor OT room under local anesthesia andthen the elevation and inset of flap was done after 10 days. The skin islandwas incised down to the level of the fascia.

The sural nerve was divided proximally, ligated and buried between muscles and the short saphenous vein and suralartery was ligated. Dissection was done from proximal to distal fashion. Inmajority of patients skin island was passed through a wide subcutaneous tunnelinto the defect (Fig 1) while in some patients an open passage wascreated for the flap by incising the skin bridge between the donor andrecipient area hence no tunneling was done (Fig2) and pedicle was then divided after 3 weeks. Tourniquet was released to check thevascularity of flap and control of bleeding. Donorarea was covered with split thickness skin graft in all the cases and the flapwas inset on the recipient area with help of Prolene 3/0 (Ethicon Inc., Cornelia, Georgia, USA) or skinstaples. Dorsal slab was given to all patients. Postoperativelypatients were laid in lateral position with elevation of operated limb toalleviate pressure from the perforator.

Weight bearing was allowed after 4–6weeks. RESULTS: Total 36 patients were included in thestudy with defect in the heel in 24 patients, at ankle in 8 patients and atdorsum of foot in 4 patients. The dimensions of the defect ranged from 5–12 cmin length and 4- 10 cm in width. Duration of the

defect was from 2 weeks to 2months. In 26patients the junction of proximal and middle third of the leg was consideredupper limit for the flap where as in 10 patients proximal third of leg wastaken as upper limit using delay phenomenon.

In 30 patients; skin Island was tunneled, while in 6 patients flap was interpolated betweendonor and recipient areas. (Table-1) Twenty nine flaps survived without anycomplications. Complete failure of flap in 3 cases and compression at the sitewas found to be the main cause, while 4 flaps showed partial failure which wasskin grafted later (Fig 3). On an average totalhospital stay was around one week. Dorsal splint was provided for 3 weeksand average healing time was 4 weeks.

There was no incidence of any neuromaformation or any flap donor site complications. Graft donor site; mostly thigh, also showed no major complication. No patient had difficulty in walking andweight bearing on the operated limb after 3 months. DISCUSSION: As Skin graft is easiest option to covera wound but cannot be used on exposed tendons, bones. Local flaps may not be feasiblebecause of limited flap mobilization and arc of rotation11. Freeflaps provide reliable and excellent soft tissue coverage but as it demands12prolongedoperative time and need for microsurgical expertise limits its use.

More overin developing countries costly infrastructure cannot be provided at everyhospital. Hence sural fasciocutaneous andadipofascial flaps provide

easy reconstruction option in our setup. In fact therehas been a renewed interest in local flaps because of pedicle perforator flaps13.

The reverse sural artery flap was first describedby Donski and Fogdestam and later popularized by Masquelet et al. 13, 14 The anterograde blood supply to sural angiosomearises from median, medial and lateral superficial sural arteries. However thisflap has retrograde blood supply from fasciocutaneous perforators of peroneal artery15. This flap also gets blood supply from perforators of posterior tibial artery. Additionally neurocutaneous perforators from small arteries accompanying suralnerve and venocutaneous perforators from small arteries accompanying short saphenousvein supply sural flap16. Among the 7 cases that developed necrosis, most had soft tissue defects over the ankle, dorsum of the foot; only othercase with necrosis had a diabetic ulcer over the dorsum of the foot. Thus, wesuggest that the chances of edge necrosis of the flap are higher when there isa distal soft tissue defect, more so among patients with diabetic ulcers16, 17. Partial flap necrotic cases were treated with debridement and splitthickness skin grafting.

Few patients complaint sural hypoesthesia over thedorsolateral foot, though being reverse sural an insensate flap; none of ourpatients developed a trophic ulcer. The reason for this observation demandsfurther research18, 19. After this flap, the surgeon is prohibitedfrom taking any posterolateral bone graft using Harman’s approach in casedelayed union or non-union of tibia 20. Thus, the reverse sural fasciocutaneous flapbased on peroneal perforators with a cutaneous pedicle or noncutaneous pedicleis a quick, easy

and versatile technique requiring no microvascular repair. However, there is no substitute for a meticulous dissection for achievingminimum donor site morbidity & related complications. CONCLUSION: Almost all the patients continued theirdaily activities three months after the surgery; it shows distally based suralartery flap is a versatile & reliable option for the coverage of softtissue defects of the distal lower extremity and the results are uniformlyacceptable with minor complication rates.