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Soft Tissue Reconstruction of Heel in Teritary Health Care Center

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ABSTRACT-Defects in the weight-bearing region of foot can represent a substantial restriction in quality of life and pose a challenge for reconstructive surgery(1).HenceSoft tissue reconstruction in the plantar foot should be aimed for improved function after surgery. Soft tissue cover is a challenge to the ankle and foot region due to unique requirements of withstanding body weight and providing sensory function. Additionally, the plantar aspect of foot has minimal mobility of skin thus making primary closure nearly impossible . This leads to the utilization of other options on the reconstruction process. Normal ambulation is dependent on many factors, including durable soft tissue coverage and intact sensation. The ideal option for reconstruction should be durable, sensate, and associated with low morbidity rate.

KEY WORDS-medial plantar flap, Heel, Reconstructive surgical procedures ; verrucous carcinoma , Foot trauma, reverse sural flap.

AIM- The aim of study is presenting a series of 6 cases in which either medial plantar flap or sural flap was used for the treatment of reconstruction of the heel.

OBJECTIVE-The objective of this study is to present a series of cases with tumours of heel, trophic ulcers and traumatic soft tissue loss of heel who underwent surgical reconstruction with the medial plantar flap or sural flap..

I. INTRODUCTION-

soft tissue defects of heel still present challenge for reconstructive surgeons. This challenge has been attributed to the poor availability of local and regional tissue to perform the heel reconstruction(1). The plantar foot, especially heel, have unique identity to accommodate high weight bearing load and shearing forces exerted during standing and mobilisation(1). In addition to a large pad of fat, the heel has thick skin compared to the non-weight bearing surfaces of the plantar foot, allowing it to more pressure and force.Hence It is more important and equally challenging to reconstruct the plantar aspect of foot while maintaining function after surgery(1).

Reconstruction of heel defects have many options including skin grafts, local island flaps, regional flaps, cross-leg flaps, and free tissue transfer. The use of skin grafts is simple but does not provide adequate pad of fat tissue for the weight-bearing surface of the heel. Plantar transposition flaps are based on perforating vessels from the medial and lateral plantar artery. The medial plantar flap was first described by Harrison and Morgan in 1981. (1, 2) It is based on the medial plantar artery and consists of a fasciocutaneous flap using the skin of the plantar arch of the foot, is an ideal tissue for covering defects in the region of heel and other regions of the foot due to their structural similarity. The use of same side medial plantar artery flaps (MPA flaps) has gained a lot of interest in the past and present situations. It can be raised as a fasciocutaneous plane or musculocutaneous flap.

II. MATERIALS AND METHODS

In our department, we performed 6 cases of heel reconstruction during the period from June 2019 to till date. The soft tissue defects were classified as anterior when they are located in weight-bearing area (WBA) of the heel and as posterior when they were located on the non-WBA of heel (2). The following variables were evaluated are age, sex, etiology of the trauma, presence and site of fractures, characteristics of the loss of substance. The causes of reconstruction were tumors in 3 patients , and ulcer in 1 patient, trauma in 2 patients. The inclusion criteria were patients with lower limb trauma and tumour, trophic ulcers

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who underwent reconstruction with the medial plantar flap. The exclusion criteria are hemodynamically unstable patients, and patients with lesions with injury in the plantar donor area.

After the preparation of the recipient site, the defect size was measured and transferred to the donor site. The flap had to be slightly greater than the recipient area(6).

Cases of Heel Reconstruction-

s.no	Cause	Defect Size, cm	Localization	Flap	Donor site	Complications(3)
1	Tumour	5*4	**Anterior (WBA)**	MPF	STSG	No
2	Tumour	4*4	WBA	MPF	STSG	marginal wound dehiscence
3	Tumour	5*3	WBA	MPF	STSG	No
4	Neuropathic ulcer	3*2	WBA	MPF	STSG	No
5	PTW	5*4	WBA	RSF	STSG	No
6	PTW	6*4	WBA	RSF	STSG	No

MPF-medial plantar flap,
RSF-reverse sural flap
WBA-weight bearing area
PTW-post traumatic wound
STSG-split thickness skin graft

Surgical procedure-

After initial assessment, wide local excision done in tumours and wound debridment done in traumatic lesions. In cases where Medial plantar flap was planned, patients had hand Doppler probe for localisation of dorsalis pedis and medial plantar arteries (4)preoperatively.Sterile marking done along the course of artery (5)and defect. Defect size was marked. Under Regional anesthesia and tourniquet control(5), the patient in supine position, axis of medial plantar flap marked by a line joining the palpable posterior tibial artery behind medial malleolus and head of first metatarsal.Planning in reverse done, incision made on medial border of instep area, along the marking (which is parallel to abductor hallucis longus muscle) (5)and fasciocutaneous flap was raised, superficial to flexor hallucis brevis muscle and in a retrograde direction. The origin of the medial plantar artery (superficial branch) is identified at the septum between the abductor hallucis muscle and the flexor digitorum brevis muscle .This artery continues along the medial aspect of the (5)foot, anastomoses with the first plantar metatarsal artery. The medial plantar artery is generally smaller than the lateral plantar artery.The medial plantar artery is attached distally to the flap, and the proximal stump is sutured to the flap. Subfascial dissection of the flap is then performed; the flap is elevated in a distal-to-proximal direction The flap is islanded and rotated to cover defect area in heel. Tourniquet was deflated, and viability of the flap was assessed carefully with visual assessment of the flap marginal capillary circulation.Then donor area was covered with split skin graft(3, 5, 6).

In cases where the defect extended into posterior heel or with large area of traumatic loss of heel ,reverse sural flap was planned.The perforators in the lower third of lateral aspect of leg marked preoperatively .Sural flap marked by a line joining the centre between lateral malleolus and Achilles tendon, and centre of upper third-mid third junction of the posterior aspect of leg . Planning in reverse done ,flap elevated and transferred to the defect as a peninsular flap. Flap inset given .Donor area and any residual raw area in the anterior aspect of defect skin grafted .Flap division and inset was done after 3 weeks.

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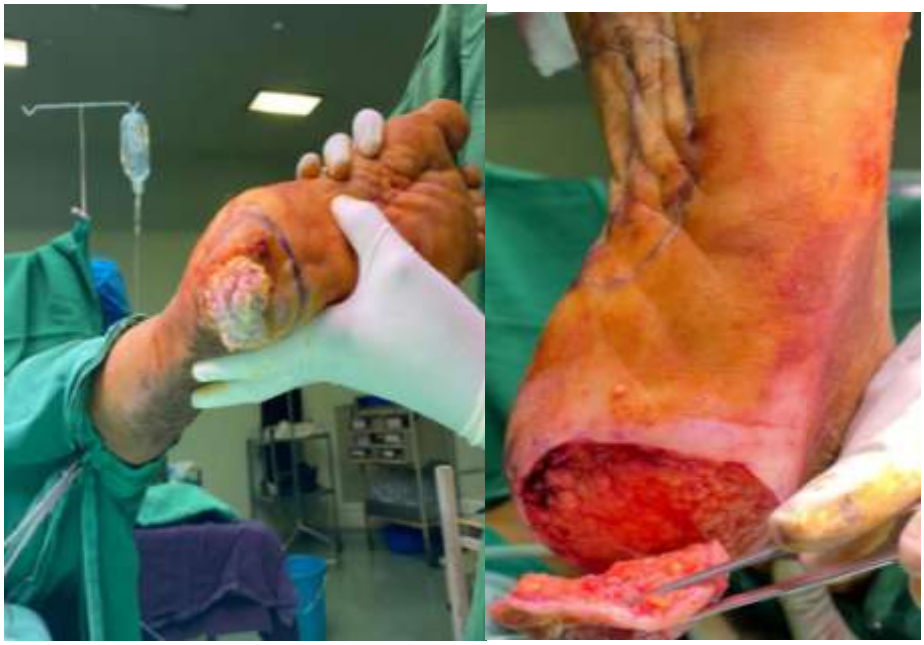
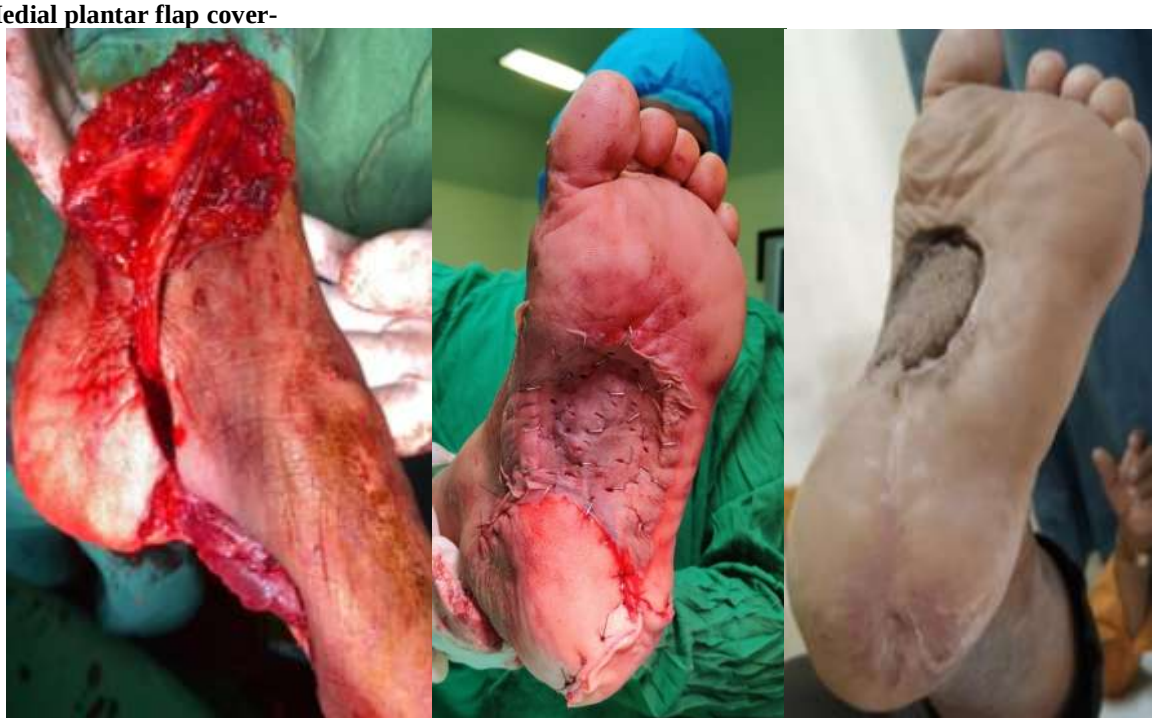
Wide local excision-



Medial plantar flap cover-



(fig-1a)

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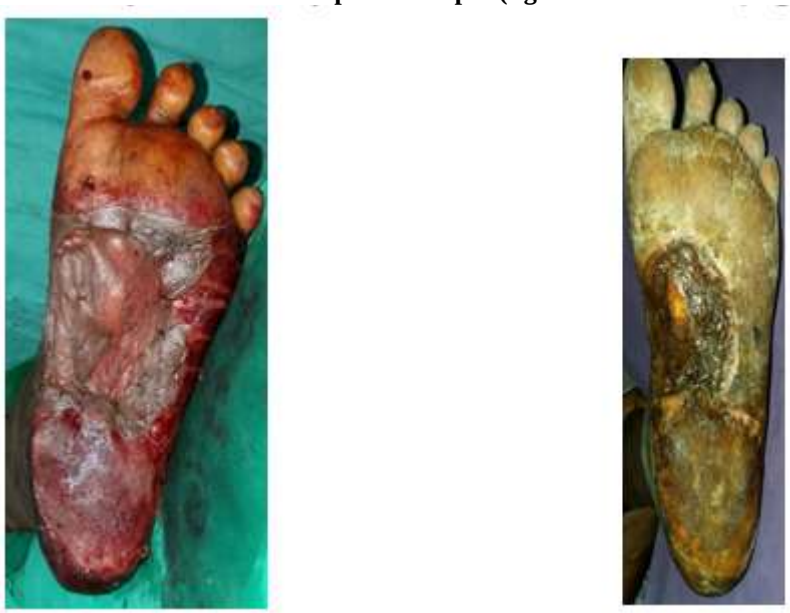
Medial plantar flap- (fig-2



(Fig-2a)

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(fig-3)

Reverse sural flap- (fig-4)

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(fig-4a)

III. RESULTS-

Regarding the etiology of the traumas, the main cause was two wheeler accidents (50%), followed by run-over injuries (33.3%) Regarding the location of the lesions, weight bearing area is most commonly involved (especially on heel) (1) .We performed 4 instep flaps to cover the defects of the anterior heel and 2 reverse sural flaps to cover the defects of the posterior heel and a complete defect. The reverse sural flap was harvested as an peninsular flap in all cases. In all cases, the donor site was closed with a split thickness skin graft . There was no significant complications except marginal wound dehiscence in one case which healed secondarily(fig 2a). The patients with reconstruction of WBA preserved the sensitivity in the skin paddle in cases of medial plantar flap , which is a clear advantage in the WBA. The reconstruction has been stable in all cases during the follow-up period (1year), and patients walk normally(7). Cutaneous sensation was preserved in every flap. No dysesthesia was detected.

IV. DISCUSSION-

The reconstruction of the soft tissue defects of the heel region represents a challenge for every plastic surgeon due to the limited local soft tissue availability that reduces the therapeutic options and also due to the special structural and functional characteristics of the anatomic region to be reconstructed. Different options have been described in the history like the medial plantar flap, reverse sural flap,and the instep flap. The skin of both the heel and the sole of the foot has specific histologic characters, presenting a thick epidermis and dermis, with a complex dermo-epidermal relationship(2). Although the posterior heel is not a weight-bearing zone, the anterior heel supports 80% of the total body weight in standing position. The posterior heel is not a weight-bearing zone but has thin skin.

Hence , Surgeons agree that the main reconstruction goal of the heel is to provide a durable coverage with a normal appearance and

allow the patient to walk properly and maintain normal life(2).

Skin grafts do not meet the requirements of this special area, and the use of skin grafts is limited nowadays to cover an adipofascial flap or free-muscle flaps.

Locoregional flaps are very useful to reconstruct soft-tissue defects in the heel area. Special surgical skills are not needed. Fasciocutaneous flaps are very useful because of their reliability, based on a constant vascular anatomy pattern.

The reverse sural flap is indicated for posterior defects and for those cases where the instep flap cannot be used due to vascular problems or because the extension of the defect is very large, exceeding the instep area.The sural artery flap is a fasciocutaneous flap located at the proximal dorsal area of the lower leg(8). A large flap can be raised from the posterior aspect of the leg and transposed to the heel area. Complete loss of skin can be reconstructed with this flap as well. The skin and fat of the leg provide a good cushion to the WBA.

V. CONCLUSION-

The medial plantar flap has been shown to be a good treatment option for tumour and posttraumatic injuries of the heel, with a high success rate and easy reproducibility. The main advantages of the flap are the sensation is preserved and provide normal life with low morbidity in the donor area. leading to a low percentage rate of complications.The sural flap is the main tool of reconstruction when posterior heel is involved.Large areas can be covered with this flap with good long term results.

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