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Original Research Paper

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RECONSTRUCTION OF PLANTAR FOOT DEFECTS USING MEDIAL PLANTAR ARTERY FLAP: OUR EXPERIENCE

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ABSTRACT

Background: Reconstruction of full-thickness plantar foot defects present a challenge to surgeons. These defects ideally should be reconstructed with durable sensate tissue. Despite the numerous procedures that have been described for resurfacing these plantar, to achieve a sensate foot with normal function still remains an intricate task.
We present our clinical experience of plantar foot defects reconstructed using medial plantar artery flap.
Methods: 18 patients with defects of the plantar surface of the foot were reconstructed using medial plantar artery flap. All the flaps were raised as sensate fasciocutaneous pedicled flaps based on the medial plantar artery. The donor site was closed using a split thickness graft.
Results: In 13 patients the defect healed with good results and no complications within 4 weeks, 3 patients presented with superficial epidermolysis in the periphery and 1 patient had a flap loss. 2 patients had partial graft loss in the secondary defect.
Conclusion: In our experience medial plantar artery flap cover is a durable option for sole defects with acceptable aesthetic and functional outcomes. Donor site morbidity is minimal. This flap is a safe reliable and technically easy alternative flap coverage for plantar defects especially around the heel.

KEYWORDS : Plantar Foot, Medial Plantar Flap, Sensate Flap

Introduction:
Plantar foot defects pose a reconstructive challenge to the surgeons.[1,2,3]. The thick glabrous skin and a subcutaneous fat layer densely adherent to the plantar fascia and periosteum of the calcaneum further make reconstruction difficut[1,4]. Ideal reconstruction of a full thickness defect of the sole comprises a resilient sensate tissue. The goal of reconstruction should be optimised for a near normal foot function. Various reconstructive options exist, although only a few have yielded totally acceptable results [1,2,3,4.]

This paper illustrates our experience with the reconstruction of the plantar foot defects using the medial plantar flap. The flap was mainly used for the heel defects. The major advantage of this flap is that the skin on the instep region of the sole is non – weight bearing which leads to minimal donor site morbidity[1,5,6]. Donor site is closed using a split skin graft[1].

AIM:
This aim of this study was to evaluate the clinical and functional outcomes of the plantar foot defects reconstructed with the sensate medial plantar artery flap

METHODS:
18 patients with defects of the plantar surface of the foot were reconstructed using medial plantar artery flap between August 2015 and January 2018. All the cases were operated in a government general hospital, tertiary care centre in Chennai by the same surgeon. Aetiologies included raw areas post trauma, assault, diabetic ulcers, melanoma excision defects, and trophic ulcers post spinal surgery.

Pre-operative evaluation of all patients included a complete clinical examination, routine blood investigations and anesthethic work up. The dorsalis pedis and posterior tibial artery pulsations were evaluated essentially. In doubtful cases, Doppler examination and angiography was performed to assess the functional patency of these vessels. All the flaps were raised as sensate fasciocutaneous pedicled flaps based on the medial plantar artery. The donor sites were closed using split thickness graft. The patients were followed up over a period of 2 years.

Technique
All the surgeries were performed under tourniquet control and 4 x loupe magnifcation. Arterial angiosomes of the sole were marked. Planning in reverse was done. Depending on the size of the defect, the skin island was designed on the medial plantar artery angiosome.

A line between center of the heel posteriorly and medial sesamoid of the great toe representing the medial edge of plantar aponeurosis was marked. This line indicates the perforators emerging from the medial plantar artery. Dissection was started by incision along the distal edge of the flap. The plantar fascia was transversely divided. Further dissecting between the abductor hallucis and flexor digitorum brevis muscle, the medial plantar neurovascular bundle was identified.

The dissection was performed from distal to proximal and in dorsal to plantar direction taking care not to injure the cutaneous branches from the nerve to the flap The flap was raised at the level between the plantar fascia and the flexor digitorum brevis muscle, keeping the medial plantar vascular bundle and the cutaneous nerve branches intact with the flap by meticulous interfascicular dissection.

Proximally, the medial plantar neurovascular bundle was dissected upto its bifurcation with the lateral plantar neurovascular bundle. Retraction and in few cases division of the abductor hallucis muscle was done to free the neurovascular pedicle. Incision was completed circumferentially and the flap was harvested along with the plantar fascia. Donor defect was covered with a split-thickness skin graft.

Post operative care

Leg elevation was followed in the immediate post operative period. Dressings were changed every alternate day. Immobilization of the foot and ankle was done using a splint for 1 week. Non-weight bearing ambulation was done for a period of 4-6 weeks.

Results: Table 1

The mean age of patients was 40 years (20 – 60 years). Among 18 patients, 6 were females and 12 were males. Follow ups ranged from 4 months to 2 years. The functional outcomes were assessed at every follow up. Outcomes were evaluated based on the parameters – functional restoration, sensory improvement, weight bearing, gait, donor site morbidity, period for return to work, aesthesis and patient satisfaction. In 13 patients no complications were noted. In 3 patients, superficial epidermolysis of the peripheral margins was noted which healed spontaneously without any intervention. 2 patients had wound infection with discharge which was managed with regular dressings and iv antibiotics. Flap failure was noted in 1 patient, who underwent an alternative flap procedure secondarily.2 patients had partial graft loss in the secondary defect which healed secondarily.

TABLE 1

S.no	Age and sex of the patient	pathology	Defect location and size (cm)	Follow up period (months)	Results	Weight bearing (weeks)	Sensory Recovery (months) 2 point discrimination of 1cm	complications	Additional procedure (any)
1.	20/M	RTA	8x7	24	good	4	4	-	-
2.	34/F	RTA	5 x 4	5	good	4	5	-	-
3.	35/M	RTA	10 x 8	6	good	6	4	Superficial epidermolysis	-
4.	40/F	DM	3 x 4	18	good	4	5	-	-
5.	35/M	RTA	5 x 7	4	good	4	4	-	-
6.	44/M	Assault	7 x 8	4	good	5	4	-	-
7.	56/M	Trophic ulcer post spinal surgery	4 x 6	12	good	4 and 1/2	6	Wound infection	-
8.	49/M	melanoma	5 x 6.5	14	good	4	6	-	-
9.	22/M	RTA	6 x 8	4	good	4	4	-	-
10.	60/M	DM	5 x 6	12	good	5	8	Superficial epidermolysis	-
11.	50/F	DM	4 x 4	18	good	4	6	-	-
12.	45/M	melanoma	5 x 4	12	good	3 and 1/2	5	-	-
13.	55/F	DM	6 x 5	10	good	4	6	-	-
14.	47/F	Trophic ulcer post spinal surgery	8 x 8	9	-	-	-	Flap failure	RSSA flap
15.	35/M	RTA	5 x 7	6	good	4	6	-	-
16.	56/M	DM	6 x 8	15	good	5	8	Wound infection	-
17.	37/M	RTA	5 x 6	5	good	4	4	-	-
18.	57/F	DM	10 x 7	8	good	4	6	Superficial epidermolysis	-

Case 1 (Fig 1)

A 49 years old male presented with a pigmented lesion over the medial aspect of the foot near heel. Biopsy of the lesion revealed malignant melanoma. Wide local excision was performed and post excisional defect measured 5x 6.5 cm. The defect was reconstructed with the medial plantar flap. Patient was discharged after 1 week without any complication.

Fig 1. (A) Defect and flap planning **(B) Flap dissection**

(C) Flap elevation showing pedicle **(D) Follow up**

Case 2

A 56 years old male with known history of diabetis mellitus for 15 years presented with a chronic ulcer over the heel of left foot. Post debridement, a full-thickness defect measuring 6 x 8 cm was noted (Fig 2.). The defect was reconstructed with the medial plantar flap. Patient developed slight discharge from the undersurface of flap which subsided spontaneously in 5 days by regular dressings. Patient was discharged after 10 days. On subsequent follow ups, the flap healed well without any complication.

Fig 2 (a) Pre op **(b) post op**

Case 3 (Fig 3)

A 45 years old male presented with a pigmented lesion over the medial aspect of the heel. Biopsy of the lesion revealed malignant melanoma. Wide local excision was performed and post excisional defect measured 5x 6.5 cm (Fig 3.). The defect was reconstructed with the medial plantar flap. Patient was discharged after 1 week without any complication.


Fig 3 (A) Lesion **(B) lesion excised and flap raised**

(C) Follow up

Case 4

A 57 years old diabetic female presented with a chronic ulcer over the heel of right foot. Post debridement, a full-thickness defect measuring 10 x 7 cm was noted (Fig 4.). The defect was reconstructed with the medial plantar flap. Patient developed superficial epidermolysis at the periphery of the flap which healed without any intervention secondarily. Patient was discharged after 14 days.


Fig 4.(A) Chronic non healing ulcer (B) defect and flap planning


(C) Flap elevation **(D) Follow up**

DISCUSSION

Numerous techniques have been described in literature for the reconstruction of plantar foot defects[1]. In spite of adequate resurfacing, most of the patients develop an altered gait owing to the avoidance of weight bearing on the resurfaced plantar area (especially the heel) in a fear of dehiscence and shear. Using skin grafts in these areas often leads to skin breakdown and hyperkeratosis [1,2,7,8]

Shanahan and Gingrass first described the medial plantar sensory flap for resurfacing the defects of the heel [1,3] . Several modifications led to the evolution of an islanded pedicle flap [1,5] , muscle flap [5,9] , a reverse-flow island flap [1,10] and free flaps [1].

The medial plantar artery flap with its wide arc of rotation incorporates the instep glabrous skin, maintaining an intact tissue over the weight-bearing area of the sole[1]

CONCLUSION

Our experience with the medial plantar artery flap for the full thickness defects of the sole has demonstrated satisfactory long-term functional outcomes. This sensate flap provides an optimal restoration of foot function, with aesthetically acceptable results and minimal donor-site morbidity. Based on our clinical experience we recommend medial plantar artery flap as a safe, reliable and preferred option in the reconstructive armamentarium of the plantar foot defects.

References:

1. Raymond B, Sudjatmiko G. Medial Plantar Flap for Reconstruction of Heel Defect. JPR.Vol 1(1):38, 2012.
2. Sommerlad, B. C, McGrouther, D. A.Resurfacing the sole: Long-term follow-up and comparison of techniques. Br.J. Plast. Surg. 31: 107, 1978.
3. Seung J .B, Deok Y.K. , Jin S .K. Reconstruction of the heel defect by local arterialized !ap. J.Korean Soc. Plast. Reconstr.Surg. 12:587, 1985
4. Paul R, Ciaran M. J. Healy. Heel Reconstruction with a Medial Plantar V-Y Flap. Plast Reconstr. Surg. 119: 927, 2007.
5. Harrison, D. H., and Morgan, B. D. G. The instep island flap to resurface plantar defects. Br. J. Plast. Surg. 34: 315, 1981.
6. Shanahan, R. E., Gingrass, R. P. Medial plantar sensory flap for coverage of heel defects. Plast. Reconstr. Surg. 64: 295,1979.
7. .Avellan, L., and Johanson, B. Hyperkeratosis of scars in the weight-bearing areas of the foot. ActaChir. Scand. 131: 269, 1966.
8. Le Worthy, G. W. Sole skin as a donor site to replace palmarskin. Plast. Reconstr. Surg. 32: 30, 1963.
9. Hartrampf, C. R. J., Schelan, M., and Bostwick, J. I. The flexor digitorumbrevis muscle island pedicle flap: A new dimension in heel reconstruction. Plast. Reconstr. Surg. 66: 264, 1980.
10. Bhandari, P. S., and Sobti, C. Reverse flow instep island !ap.Plast. Reconstr. Surg. 103: 1986, 1999