International Journal Dental and Medical Sciences Research
Volume 6, Issue 5, Sep - Oct 2024 pp 229-234 www.ijdmsrjournal.com ISSN: 2582-6018

Single Stage Adipofascial Turnover Flap for the Coverage of Lateral Malleolar Defects

Dr. Rajkumar Meena*, Dr. Rakesh Kumar Jain, Dr. Ketan Patel***
Department of Plastic & Reconstruction, SMS Medical College, Jaipur
** Senior Professor & Unit Head
* Senior Resident

Submitted: 01-10-2024 Accepted: 10-10-2024

I. INTRODUCTION

Lateral malleolar Defects are commonly encountered by plastic surgeons in clinical practice attributed to various causes like trauma, burns, pressure injuries, and Diabetes and are very challenging to treat. There are various treatment options available from local flaps to more complex microsurgical reconstruction.

These lesions are sometimes very challenging to treat due to poor vascular supply of distal lower limbs such as in Diabetes and PVD, and due to the exposure of vital structures like bone and tendons.The Donski and Fogdestam first describe the reverse sural(1). Their work was further carried forward by Masquelet et al.(2), which is a staged procedure commonly used for reconstructing such defects, especially in patients where the free flap is not possible. This flap has undergone various modifications, and many of these modifications have fallen into disrepute as they did not deliver the desired results. One such modification is the two-staged fasciocutaneous reverse sural flap, as described by Agelats and Albert.(3). Another modification of this flap In the early 1990s is adipofascial turnover and local transposition flaps gained some popularity with the work of Lin et al., still the past years had not seen much work on this potentially usable tissue(4)(5) In lateral malleolar defects that are challenging to manage, we have applied one of these modifications: the adipofascial turnover flap based on a peroneal artery perforator. This study aims to describe our experience with this technique and discuss the advantages and limitations of the strategy.

II. PATIENTS & METHODS :

In this study, A retrospective review was conducted of 12 patients with lateral malleolar defects & was operated with an Adipofascial Turnover flap in the Department of Plastic and Reconstructive Surgery, SMS Medical College and Hospital, Jaipur, India, between April 2022 to April 2024. Informed consent was taken from all the patients.

Data was acquired regarding age, sex, comorbidities, mechanism of injury and size of the defect, the operative technique used, operative time, complications and follow-up. Any patients with comorbidities such as smoking, peripheral vascular disease, Diabetes or Hypertension were excluded from the study as they can confound the results. Table 1 shows the baseline data.

III. SURGICAL TECHNIQUE :

For patients without palpable peroneal artery on physical examination or with possible vascular injury due to previous trauma, computed tomography (CT) angiography for the lower extremities was performed. The peroneal artery perforators were mapped using a hand-held Doppler before surgery. Surgery was performed mostly under spinal anesthesia if possible. However, if spinal anesthesia was difficult or in cases where a combined operation on other areas was required, general anesthesia was used. Debridement was done &the final tissue defect was measured and a template was cut out. The perforator was rechecked and marked using a hand-held Doppler, and the pivot point was determined. The width of the flap was designed to be identical to the width of the defect, and the length of the flap was determined by using a piece of gauze/ template to simulate flap turnover and in-setting for satisfactory coverage of the defect; the flap was designed to be a little longer considering the thickness of the folded part of the flap(fig.1).

International Journal Dental and Medical Sciences Research
Volume 6, Issue 5, Sep - Oct 2024 pp 229-234 www.ijdmsrjournal.com ISSN: 2582-6018

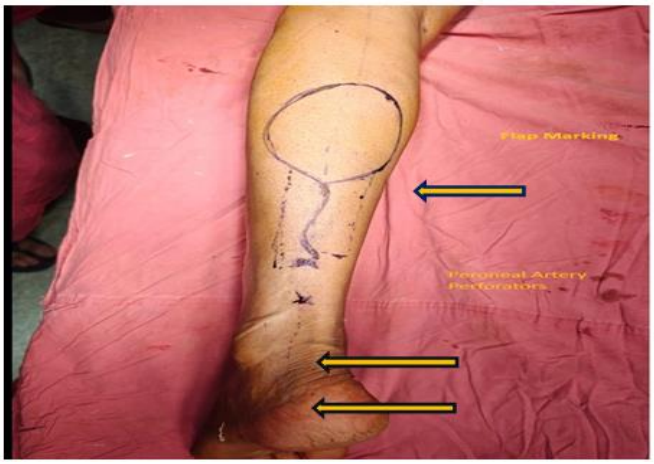

Fig.1 Showing Peroneal artery Perforators And Flap marking

flap can be harvested either by marking flap dimension thick skin was harvested with the help of skin graft handle OR A longitudinal skin incision was made in the middle of the designed flap, and skin flap elevation was performed on both sides of the incision. about 2–3 mm of fat tissue was included in the skin flaps to prevent necrosis. The adipofascial flap was elevated to the previously designed pivot point by dissecting below the deep fascia. The flap was then turned over to cover the defect without tension. The flap was subsequently inset into the defect and fixed with absorbable sutures. The flap was then covered with a split-thickness skin graft either by previously harvested overline skin OR harvested from thigh. grafted area was covered with vaseline gauze & wet cotton and followed by a firm dressing, A POP splint was applied for immobilization.

Case 1:
A 25-year-old male with post-traumatic left lateral malleolar defect with No bony injuries.
No H/o any medical co-morbidities, on examination wound over left lateral malleolar region with exposed tendons. Peripheral vessels were palpable
Peroneal perforators wasDopplered& marked &Adipo-fascial Flap turnover flap was done.
Post-op uneventful. (fig.2).

Fig. 2 : Showing Surgical Technique Of Adipofascial Flap ,A; Pre-op Defect showing exposed Tendons And Bone ,B; Flap Marking with perforator ,C; Elevation of Flap , D; Post op Flap with graft

International Journal Dental and Medical Sciences Research
Volume 6, Issue 5, Sep - Oct 2024 pp 229-234 www.ijdmsrjournal.com ISSN: 2582-6018

Case 2 :
32-Year-old male with post-traumatic left lateral malleolar Defect with Distal tibia Fracture, managed by calcaneal pin skeletal Traction, Known case of HTN on Regular medications.

No H/O Other medical Co-morbidity.& was a Smoker for 15 years.
After Doppler marking of perforators , the Adipofascial turnover flap was done.
No Post-op Complications.(fig.3).

Fig.3:A; Pre-op Defect ,B; Flap Marking with perforator ,C; Elevation of Flap , D; Post op Follow-up

Case 3:
47 Year old male with post-traumatic spinal injury with paraplegia since 1 year
Previously operated for lumbar spine fracture 1 year back.

V-Y advancement flap was done for sacral sore 6 months back now presents with malleolar sore, After doppler Marking of perforators , wound was debrided , planning in reverse was done &Adipofascial turnover flap was done.
No Post-op Complications.

Fig. 4 : Showing A; Pressure injury right lateral malleolar region, B; Flap Marking , C; Adipo-fascial Flap was raised , D; Immediate Post-op

International Journal Dental and Medical Sciences Research
Volume 6, Issue 5, Sep - Oct 2024 pp 229-234 www.ijdmsrjournal.com ISSN: 2582-6018

IV. RESULTS :

There were 12 patients with lateral malleolar defects, out of which 9 were male (75%) and 3 were female (25%)(Fig.5). the youngest patient was 18 years old and the oldest was 47 yr old. The .majority of the patients had trauma (58.3%) as a eiology and two patients had associated lateral malleolar fracture which was managed with k-wiring , post burn defects comprise (25%) & pressure injury comprise of (16.6%) .The average size of Defects was 4x3 cm with a minimum 2x2 and a maximum of 5x6 cm . The minimum duration of surgery is 45 mins, and the maximum duration was 60 mins. The complications included Hematoma formation associated with skin graft loss over flaps in four patients (33.33%) , partial flap necrosis in two patients (16.6%) ,infection of flap in one patient (8.3%) . out of this 3 patient required re-grafting , one required flap advancement and others was managed conservatively .there was no donor site infections or other complications ,the patient was discharged within a week of surgery and allowed with partial weight bearing after 3 weeks and full weight bearing after 2 months.

Fig.5 : Showing sex distribution of patients -

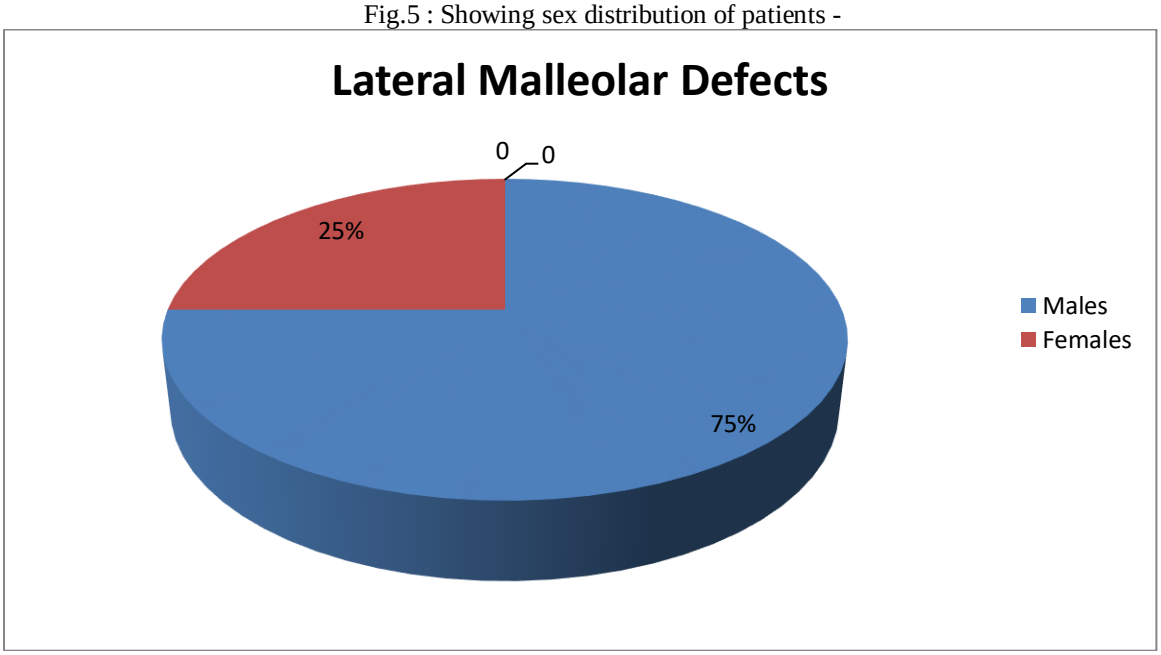

Table 1: Showing Patients Details and Clinical information

S.No	Patient Details	Etiology	Anesthesia	Defect Size in (cm)	Duration of surgery in (mins.)	complications
1	M/22	Trauma	Spinal	2x3	45	-
2	M/32	Trauma	Spinal	2x3.5	50	Graft loss
3	M/18	Trauma	Spinal	4x4	45	Partial flap necrosis
4	F/38	Pressure Injury	Local	2x2	60	-
5	M/42	Burn	General	3x4	50	Graft loss
6	M/28	Trauma	Spinal	4x4	45	-
7	F/26	Trauma	Spinal	3x5	60	Infected flap
8	F/30	Burn	Spinal	2x4	50	-
9	M/22	Trauma	Spinal	3x4.5	45	Partial flap necrosis
10	M/47	Pressure injury	General	5x6	60	Graft loss
11	M/24	Trauma	Spinal	3x5	50	-
12	M/25	Burn	Spinal	4x4	55	Graft loss

V. DISCUSSION :

Several Techniques have been mentioned in literature for the reconstruction of lateral malleolar and distal leg defects like distally based sural artery flaps (6), supramalleolar flaps , lateral calcaneal flaps(7)(8) and free tissue transfer .Although free tissue transfer is the preferred modality of treatment of such cases (9)(10) it may not be possible in all cases due to various reasons. Free tissue transfer requires high -end facilities and an experienced microsurgeon for a successful outcome. Moreover, donor site morbidity, bulky flap, patient comorbidities as well as vessel compromise due to trauma zone are potential dangers of free tissue transfer. All these reasons make reverse sural flap a very lucrative local option for such reconstructions(11).

- Li et al.(12) performed a three-stage protocol of debridement, followed by adipofascial flap coverage, and a final skin graft 1 week later. We performed those steps simultaneously because skin grafts take suitably on well-vascularized flaps, as demonstrated by Mojallal et al. (13)and Kim et al. (14).
- Schimdt et al (15) suggested adipofascial flap required less operating duration as compared to the fasciocuteous flap , but in our study it was an average 45 minute duration of surgery.
- HyeonjungYeoet al (16)**,** suggestedthe peroneal artery perforator-based adipofascial flap can provide stable and reliable coverage on the lateral malleolus, involving a relatively short operation time and simple operative technique. It could be a promising option for reconstructing not only lateral malleolus but also other foot and ankle defects, especially for patients with comorbidities who are typically not indicated for more complex procedures.

Adipofascial turnover Flaps represent an extremely useful modification of the classical Reverse sural flap and it is quick to perform with minimal donor site morbidity and require short duration single stage surgery with no secondary procedure required allow early mobilization of patients .

VI. CONCLUSION :

The peroneal artery perforator-based single -stage adipofascial turnover flap with skin grafting is a safe , reliable , good option for reconstruction of lateral malleolar defect , over to Reverse sural flap staged procedure. The pliability of adipofascial tissue makes it easily molding over defects resulting in an aesthetically better appearance . the operative technique is simple and convenient to perform with minimal complications , lesser operative duration and minimal donor site morbidity . hence it is useful optionfor the reconstruction of lateral foot defects.

REFERENCES:

[1]. Donski PK, Fogdestam I. Distally based fasciocutaneous flap from the sural region. A preliminary report. Scand J Plast Reconstr Surg. 1983;17(3):191–6.
[2]. Masquelet AC, Romana MC, Wolf G. Skin island flaps supplied by the vascular axis of the sensitive superficial nerves: anatomic study and clinical experience in the leg. Plast Reconstr Surg. 1992 Jun;89(6):1115–21.
[3]. Angelats J, Albert LT. Sural nerve neurocutaneous cross-foot flap. Ann Plast Surg. 1984 Sep;13(3):239–42.
[4]. Lin SD, Lai CS, Chou CK, Tsai CW, Tsai CC. Reconstruction of soft tissue defects of the lower leg with the distally based medial adipofascial flap. Br J Plast Surg. 1994 Mar;47(2):132–7.
[5]. Lin SD, Lai CS, Tsai CC, Chou CK, Tsai CW. Clinical application of the distally based medial adipofascial flap for soft tissue defects on the lower half of the leg. J Trauma. 1995 Apr;38(4):623–9.
[6]. Lee JH, Chung DW. Reverse lateral supramalleolar adipofascial flap and skin grafting for one-stage soft tissue reconstruction of foot and ankle joint. Microsurgery. 2010 Sep;30(6):423–9.
[7]. Chang SM, Zhang F, Yu GR, Hou CL, Gu YD. Modified distally based peroneal artery perforator flap for reconstruction of foot and ankle. Microsurgery. 2004;24(6):430–6.
[8]. Luo Z, Dong Z, Ni J, Wei J, Peng P, Lv G. Distally Based Peroneal Artery Perforator-Plus Fasciocutaneous Flap to Reconstruct Soft Tissue Defect Combined With Chronic Osteomyelitis in the Lateral Malleolus. Int J Low Extrem Wounds. 2022 Dec;21(4):464–70.
[9]. Batchelor JS, McGuinness A. A reappraisal of axial and nonaxial lower leg fascial flaps: an anatomic study in human cadavers. Plast Reconstr Surg. 1996 Apr;97(5):993–1000.
[10]. Zenn MR, Levin LS. Microvascular reconstruction of the lower extremity. Semin Surg Oncol. 2000;19(3):272–81.
[11]. Jeng SF, Wei FC. Distally based sural island flap for foot and ankle

reconstruction. Plast Reconstr Surg. 1997 Mar;99(3):744–50.

[12]. Li B, Chang SM, Du SC, Zhuang L, Hu SJ. Distally Based Sural Adipofascial Turnover Flap for Coverage of Complicated Wound in the Foot and Ankle Region. Ann Plast Surg. 2020 May;84(5):580–7.

[13]. Mojallal A, Shipkov CD, Braye F, Breton P. Distally based adipofascial sural flap for foot and ankle reconstruction. J Am Podiatr Med Assoc. 2011;101(1):41–8.

[14]. Kim KJ, Ahn JT, Yoon KT, Lee JH. A comparison of fasciocutaneous and adipofascial methods in the reverse sural artery flap for treatment of diabetic infected lateral malleolar bursitis. J Orthop Surg Hong Kong. 2019;27(1):2309499019828546.

[15]. Schmidt K, Jakubietz M, Djalek S, Harenberg PS, Zeplin PH, Jakubietz R. The distally based adipofascial sural artery flap: faster, safer, and easier? A long-term comparison of the fasciocutaneous and adipofascial method in a multimorbid patient population. Plast Reconstr Surg. 2012 Aug;130(2):360–8.

[16]. Hyeonjung Yeo1 ,Sanghun Lee1 , Hyochun Park1 , Hannara Park1 , Hyodong Kim2 , Daegu SonReconstruction of Lateral Malleolar Defects: Adipofascial Turnover Flap Based on the Peroneal ArteryPerforator