Section: Plastic Surgery

Original Research Article

A CLINICAL STUDY ON THE REVERSE SURAL FLAP FOR THE RECONSTRUCTION OF DISTAL THIRD OF THE LEG AND FOOT – OUR EXPERIENCE IN A TERTIARY CARE CENTRE

Received : 05/11/2024
Received in revised form : 17/12/2024
Accepted : 02/01/2025

Keywords:
Distal third leg, Foot, Defects, Reverse sural flap.

Corresponding Author:
Dr. Ravikumar Gopalakrishnan,
Email: gravikumar1962@gmail.com

DOI: 10.47009/jamp.2025.7.1.219

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (1); 1130-1132

Ravikumar Gopalakrishnan[1], Balamuralee R[1]

[1]Department of Plastic and Reconstructive Surgery, Trichy SRM Medical College Hospital and Research Centre, The TN Dr. M.G.R Medical University, Chennai, India

Abstract

Background: Reconstruction of Soft tissue defects around the distal third of the leg and the foot are very challenging for the surgeon because of the paucity of soft tissues. **Materials and Methods:** A retrospective study was conducted on sixteen patients with soft tissue defects of the lower third of the leg and foot admitted in the Department of Plastic and Reconstructive Surgery in a tertiary care centre between August 2022 to July 2024. Eleven patients (68.75%) had post-traumatic defects, three patients (18.75%) had post debridement raw areas and two patients (12.5%) had post excisional raw areas. Reverse sural artery flap cover was given for all the defects after identifying perforators preoperatively with handheld Doppler. **Results:** Fifteen patients were males and one patient was a female. The age range was 24 to 48 years. 10 patients had defects in the tendo achilles area, 4 patients had defect in the heel pad area and 2 patients had defect in the lateral malleolar area. The size of flap ranged from 4cm to 12 cm in length and 4 to 8 cm in width. Healing of the flap was good in fifteen patients while one patient had flap edge necrosis. Donor site graft loss was present in one patient. **Conclusions**: Reverse Sural flap provides a good coverage of the defects around the distal third of the leg and the foot without any donor site morbidity. The functional and aesthetic results are satisfactory for the patients.

INTRODUCTION

Soft tissue defects around the distal third of the leg and the foot are very challenging for the reconstructive surgeons because of the paucity of soft tissues.[1] The reconstructive options include skin grafts, local flaps, distant flaps and free flaps but their usage is limited and problems exist in these regions. Skin grafts are not suitable to cover the exposed bone, tendon, malleoli, heel, and weight bearing areas. Absence of peripheral pulses, diabetes, and peripheral vascular thromboses are contraindications to local flaps. Free tissue transfers provide excellent tissue coverage but require a microvascular team and equipment. In addition, free tissue transfers are lengthy procedures.[2]

Perforator-based flaps can be used to cover defects around the distal third of the leg and the foot.[3] Here we discuss our experience with reverse sural flap for the reconstruction of distal third of the leg and foot.

MATERIALS AND METHODS

A retrospective clinical study was conducted on the coverage of distal third of the leg and foot defects with reverse sural flap in a tertiary care centre between August 2022 to July 2024. The study included sixteen patients with soft tissue defects in the distal third of the leg, ankle, heel and dorsum of the leg. The demographic data, the site and size of the defect, the etiology, flap dimension, method of closure of the secondary defect, the postoperative result and complications were obtained.

Operative Surgical Technique

Pre operatively the perforating arteries of the reverse sural flap were identified using a hand-held doppler probe. The vessels supplying the reverse sural flap were found connected to perforators of the peroneal artery, which provided the reverse flow in the distally based flap. Reliable peroneal perforators were usually located at 5 to 7 cm above the lateral malleolus. The pattern of the defect was used to mark the skin paddle slightly larger than the defect.

Under suitable anaesthesia with tourniquet control the flap was raised by sub-fascial dissection. The perforating artery was identified and the flap was dissected along 2 to 3 cm to allow up to 180 degree of flap rotation without any risk of pedicle torsion. The entire flap was lifted on the perforating artery then advanced or rotated to cover the defect. Tension-

ISSN (O): 2687-5365; ISSN (P): 2753-6556

free suturing of the flap was performed, taking care that none of the stitches resulted in tissue ischemia. The secondary raw area was covered with skin graft. [Figure 1,2]
A padded dressing was applied to the leg to prevent compression to the flap and pedicle. Post operative leg elevation was done to reduce the flap oedema.

RESULTS

Fifteen patients were males and one patient was a female. The age range was 24 to 48 years. Eleven patients (68.75%) had post-traumatic defects, three patients (18.75%) had post debridement raw areas and two patients (12.5%) had post excisional raw areas. 10 patients had defects in the tendo achilles area, 4 patients had defects in the heel pad area and 2 patients had defect in the lateral malleolar area. [Figure 3]
The size of flap ranged from 4cm to 14 cm in length and 5cm to 10 cm in width. Healing of the flap was good in fifteen patients while one patient had flap edge necrosis. [Figure 4] Donor site graft loss was present in one patient.
Regular follow up of these patients showed perfect healing of the flaps. All the patients resumed their normal activities.

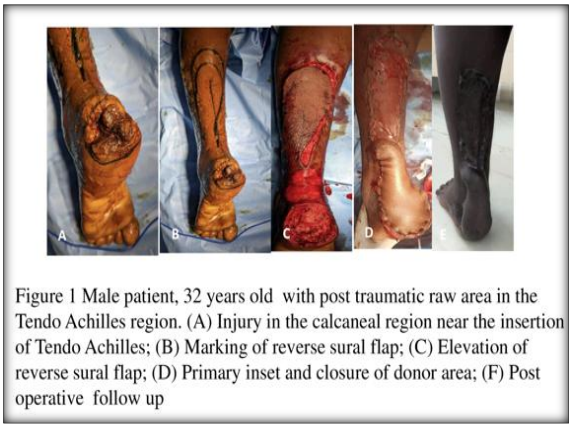

Figure 1 Male patient, 32 years old with post traumatic raw area in the Tendo Achilles region. (A) Injury in the calcaneal region near the insertion of Tendo Achilles; (B) Marking of reverse sural flap; (C) Elevation of reverse sural flap; (D) Primary inset and closure of donor area; (F) Post operative follow up

Figure 2 Male patient, 38 years old with post debridement raw area. (A) Post debridement raw area calcaneal region with flap marking; (B) Reverse sural flap raised and inset into the defect; (C) Immediate post operative period

Figure 3 Female patient, 40 years old with post osteomyelitic debridement raw area. (A) Post debridement raw area lateral malleolar region; (B) Reverse sural flap cover of the defect

Figure 4 Male patient, 40 years old with edge necrosis of reverse sural flap as a result of not maintaining the prone position in the initial 48 hours and early walking

DISCUSSION

Reconstruction of distal third of the leg and foot is a challenge as injuries are more severe.[4] The lack of donor tissue and potentially deficient vascularization in the region (especially in high-energy traumas) explain this difficulty.[5] Therefore, free flaps gained great popularity and became the main indication for reconstruction of extensive injuries in the lower third of the leg and foot. However, due to the long surgery time, morbidity in the donor area, and need for a specialized team and centre, not all patients would be candidates for this type of reconstruction. [6,7]
Pedicled flaps reappear as a reconstruction option, with the benefits of faster dissection and transfer, besides providing local tissue similar to the original.[8] The posterior and postero - lateral aspect of the calf is usually spared in cases of distal lower limb soft tissue defects. In addition, the distally based flap can be easily elevated and rotated to cover the defects over a large area.[9] The primary goal of lower extremity reconstruction is to cover the wound and maintain its function.[10]
The description of the neurocutaneous Masquelet flaps has revolutionised the osteoplastic armamentarium of surgeons not conversant with microvascular free flaps.[11] The reverse sural flap is an axial flap commonly used in the treatment of distal wounds in lower limbs.[12] The reliability of septo cutaneous perforators has been well documented. Raising a reverse sural flap based on the reliable anastomosis of peroneal artery and median sural artery, along with the sural nerve and short saphenous vein has been described to be successful.[13,14] Most of the authors emphasize on the importance of

ISSN (O): 2687-5365; ISSN (P): 2753-6556

including lesser saphenous vein to ensure good venous drainage.[15,16]

Patients with peripheral vascular disease present high incidence of necrosis and venous congestion. Venous congestion of flap because of inadequate venous drainage is one of the reasons for partial or complete failure of flap.[17] In our study one patient had flap edge necrosis due to improper position of the patient. The patient did not maintain the prone position in the initial 48 hours and walked early against our instruction. Excision of the edge and re-attachment of the flap was done.

Learning messages

1. Reverse sural flap can be easily elevated and rotated to cover the defects of distal third of the leg and foot.
2. The lesser saphenous vein should be included to prevent venous congestion and necrosis.
3. Faster dissection and transfer are advantages of reverse sural flap when compare to free flap.
4. Donor site morbidity is less.
5. Preoperative delay is essential in cases of wider defects.
6. Post-operative immobilisation is very important to prevent flap necrosis.

CONCLUSION

Reverse Sural flap provides a good coverage of the defects around the distal third of the leg and the foot without any donor site morbidity. The functional and aesthetic results are satisfactory for the patients due to thin flap and preservation of the leg vessels.

Acknowledgements

We acknowledge the Department of Plastic Surgery and our patients for permitting us to conduct the study.

Declarations

Funding: Nil

Conflict of interest: Nil

Ethical approval: Obtained.

REFERENCES

1. Buluç L, Tosun B, Sen C, Sarlak AY. A modified technique for transposition of the reverse sural artery flap. Plast Reconstr Surg. 2006;117(7):2488–2492.
2. KE, Baccarani A, Baumeister SP, Levin LS, Erdmann D. The distally based sural flap. Plast Reconstr Surg. 2007;119(6):138e–148e.
3. Daar DA, Abdou SA, David JA, Kirby DJ, Wilson SC, Saadeh PB. Revisiting the reverse sural artery flap in distal lower extremity reconstruction: a systematic review and risk analysis. Ann Plast Surg. 2020;84(4):463–470.
4. Clivatti GM, Nascimento BBD, Ribeiro RDA, Milcheski DA, Ayres AM, Gemperli R. Reverse sural flap for lower limb reconstruction. Acta Ortop Bras. 2022 Aug 26;30(4)
5. Khainga SO, Githae B, Mutiso VM, Wasike R. Reverse sural island flap in coverage of defects lower third of leg: a series of nine cases. East Afr Med J. 2007;84(1):38–43.
6. Hollenbeck ST, Woo S, Komatsu I, Erdmann D, Zenn MR, Levin LS. Longitudinal outcomes and application of the subunit principle to 165 foot and ankle free tissue transfers. Plast Reconstr Surg. 2010;125(3):924–934.
7. Dhamangaonkar AC, Patankar HS. Reverse sural fasciocutaneous flap with a cutaneous pedicle to cover distal lower limb soft tissue defects: experience of 109 clinical cases. J Orthop Traumatol. 2014 Sep;15(3):225-9.
8. Bekara F, Herlin C, Somda S, de Runz A, Grolleau JL, Chaput B. Free versus perforator-pedicled propeller flaps in lower extremity reconstruction: what is the safest coverage? A meta-analysis. Microsurgery. 2018;38(1):109–119.
9. Kumar S, Kumar S, Tiwari V, Nathani N, Pal L. Various Modalities of the Resurfacing of the Lower Limb and Its Outcome. Cureus. 2023 Oct 3;15(10):e46421.
10. Xu G, Jin LL. The coverage of skin defects over the foot and ankle using the distally based sural neurocutaneous flaps: Experience of 21 cases. J Plast Reconstr & Aesthetic Surg 2008; 61 (5): 575-7.
11. Masquelet AC, Romana MC, Wolf G (1992) Skin island flaps supplied by the vascular axis of the sensitive superficial nerves: anatomic study and clinical experience in the leg. Plast Reconstr Surg 89:21–1115
12. Grandjean A, Romana C, Fitoussi F. Distally based sural flap for ankle and foot coverage in children. Orthop Traumatol Surg Res. 2016 Feb;102(1):111-6.
13. Afifi AM, Mahboub TA, Losee JE, Smith DM, Khalil HH. The reverse sural flap: modifications to improve efficacy in foot and ankle reconstruction. Ann Plast Surg. 2008 Oct;61(4):430-6.
14. Parajuli NP, Shrestha D, Panse N. Distally based sural faciocutaneous and fascial (adipofascial) flap for reconstruction of distal leg, ankle and foot defects. Kathmandu Univ Med J (KUMJ). 2014 Apr-Jun;12(46):126-31.
15. de Blacam C, Colakoglu S, Ogunleye AA, Nguyen JT, Ibrahim AM, Lin SJ, Kim PS, Lee BT. Risk factors associated with complications in lower-extremity reconstruction with the distally based sural flap: a systematic review and pooled analysis. J Plast Reconstr Aesthet Surg. 2014 May;67(5):607-16.
16. Adendjingue DM, Andjeffa V, Okim AM, Siniki F, Touré A. Notre expérience du lambeau sural à pédicule distal dans la réparation des lésions du talon et de la plante du pied [Our experience of the sural flap with distal pedicle in the repair of foot plantar and heel of foot lesions]. Ann Chir Plast Esthet. 2023 Aug;68(4):346-353.
17. Akhtar S, Hameed A. Versatility of the sural fasciocutaneous flap in the coverage of lower third leg and hind foot defects. J Plast Reconstr Aesthet Surg. 2006;59(8):839-45.

ISSN (O): 2687-5365; ISSN (P): 2753-6556