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Demographic and Clinical Profile of Patients with Ankle and Foot Defects Treated with Extended Revers Sural Flap at Dhaka Medical College Hospital

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Abstract | **Original Research Article**

Background: Soft tissue defects in the distal leg, ankle, and foot pose significant reconstructive challenges. The extended reverse sural flap (ERSF) offers a local option without microsurgical expertise. This study evaluates its outcomes in a Bangladeshi population with post-traumatic defects. ***Objective*:** This study aimed to assess the demographic and clinical profile of patients undergoing ERSF for distal lower limb defects. ***Methods*:** A prospective interventional study was conducted in the Department of Plastic Surgery, Dhaka Medical College Hospital, Bangladesh, from January 2012 to June 2013. Sixteen patients with post-traumatic defects (due to machinery injuries, road traffic accidents, and burns) were enrolled via purposive sampling. Data on demographics, defect characteristics, surgical outcomes, and complications were collected and analyzed using MS Office tools. ***Results*:** The study of 16 patients (87.5% male, mean age 38.25±11.84 years) revealed trauma (56.2%), malignancy (18.8%), infection (18.8%), and burns (6.2%) as primary etiologies. Defects predominantly involved the heel/sole (56.2%), averaging 6.5×4.5 cm, with 75% exposing vital structures. The extended reverse sural flap achieved 87.5% survival, with complications including venous congestion (18.8%) and infection (6.2%). Radiological findings showed fractures/osteomyelitis in 12.4% of cases. ***Conclusion*:** This study delineates the characteristic profile of patients requiring extended reverse sural flap reconstruction, predominantly young males with post-traumatic ankle and foot defects. The findings validate this technique as particularly suitable for moderate soft tissue losses in weight-bearing areas, while highlighting its clinical effectiveness within our patient demographic.

Keywords: Foot and ankle reconstruction, Plastic surgery, Reverse sural flap, Soft-tissue defects, Trauma.

INTRODUCTION

Reconstructing soft tissue defects of the distal third of the leg, ankle, and foot remains a significant challenge in plastic surgery due to the limited availability of local tissues, poor vascularity, and high functional demands of these weight-bearing areas [1]. Trauma, including road traffic accidents, machinery injuries, and burns, is a leading cause of such defects, often resulting in exposed tendons, bones, or joints that require stable coverage [2,3]. While free tissue transfer provides an optimal solution, it requires microsurgical expertise, prolonged operating time, and advanced infrastructure, which may not be readily available in resource-limited settings [4]. The reverse sural artery flap has emerged as a reliable alternative for distal lower extremity reconstruction, offering the advantages of a robust vascular supply, technical simplicity, and shorter operative time compared to free flaps [5,6]. This fasciocutaneous flap, based on the vascular axis of the sural nerve, allows coverage of moderate-sized defects without the need for microvascular anastomosis [7]. However, its traditional design has limitations in reach and versatility, particularly for defects extending to the forefoot or heel [8]. The extended reverse sural flap (ERSF), which incorporates additional perforators and a longer pedicle, has been developed to overcome these constraints, providing greater arc of rotation and better distal coverage [9,10]. In Bangladesh, where trauma-related limb injuries are prevalent due to industrialization and road safety issues, cost-effective and technically feasible reconstructive options are essential [11]. While several studies have reported the success of the reverse sural flap in different populations [12,13], data on its extended modification and outcomes in Bangladeshi patients remain limited. Understanding the demographic

and clinical profile of patients undergoing ERSF in this setting can help optimize patient selection and surgical outcomes. This study aimed to evaluate the demographic characteristics, etiological factors, defect patterns, and surgical outcomes of patients undergoing ERSF for distal lower limb reconstruction at a tertiary care hospital in Bangladesh. By analyzing flap viability, complications, and functional results, we sought to determine the reliability of this technique in a resource-constrained environment. The findings may guide surgeons in choosing the most appropriate reconstructive approach for similar cases, particularly where microsurgical options are limited.

METHODOLOGY

This prospective interventional study was conducted at the Department of Plastic Surgery, Dhaka Medical College Hospital, Bangladesh, from January 2012 to June 2013. Sixteen patients with soft tissue defects in the distal third of the leg, ankle, or foot, caused by machinery injuries, road traffic accidents, or burns, were selected through purposive sampling. Ethical approval was obtained from the hospital's institutional review board. A structured proforma was used to record demographic details, defect characteristics, surgical outcomes, and complications. Informed consent was obtained after explaining the procedure, postoperative care, and follow-up protocol. Inclusion criteria comprised patients aged 18-60 years with full-thickness defects exposing vital structures (tendons, bones, or joints) requiring flap coverage. Exclusion criteria included peroneal perforator injuries within 8 cm of the lateral malleolus, peripheral vascular disease, polytrauma, major vascular injuries, uncontrolled diabetes, psychiatric illness, or active wound infection. Surgical procedures were performed under spinal or general anesthesia, adhering to standard ERSF techniques. Postoperative monitoring included flap viability assessments, complication tracking, and functional evaluations during follow-up visits at 1, 2, 4, and 12 weeks. Data analysis was performed using MS Excel and SPSS (Version 23.0), with descriptive statistics for demographic variables and complication rates.

RESULT

The study population (N=16) had a mean age of 38.25±11.84 years, with the largest proportion (31.2%) in the 30–39-year age group. The cohort was predominantly male (87%) and included a significant proportion of smokers (62%). Comorbid conditions were present in 25% of participants, consisting of diabetes mellitus (18.8%) and varicose veins (6.2%). Etiological analysis revealed trauma as the primary cause of defects (56%), followed by malignancy and infection (19% each), and burns (6%). Anatomical distribution showed heel and sole involvement in 56.2% of cases, with combined ankle and heel defects in 25%, and ankle with dorsum of foot involvement in 18.8%. The mean defect size measured 6.5×4.5 cm (range: 4×3 to 9×7 cm). Pathological examination demonstrated equal prevalence of exposed tendons and bones (37.5% each), while 25% of defects showed no vital structure exposure. Radiological assessment identified fractures and osteomyelitis in 6.2% of cases each, with 87.6% showing no abnormalities. Microbiological analysis revealed pathogenic growth in 12% of wound swab cultures. Flap characteristics demonstrated substantial dimensions (mean length: 10.87±1.89 cm; width: 8.87±2.06 cm; area: 98.69±38.66 cm²), with maximum dimensions reaching 16×13 cm. The pedicle length averaged 7.00±0.93 cm, while the extended flap portion measured 3.06±1.53 cm in length and 28.68±18.11 cm² in area. The distally based perforator cutaneous extended flap (DBPCDEF) showed consistent vascular reliability with a mean length of 9.81±1.68 cm (range: 7-12 cm).

Table 1: Age distribution of cases (N=16)

Age (Years)	n	%
18-29 Yrs.	3	18.8%
30-39 Yrs.	5	31.2%
40-49 Yrs.	4	25%
50-60 Yrs.	4	25%
Mean ± SD	38.25 ±11.84	

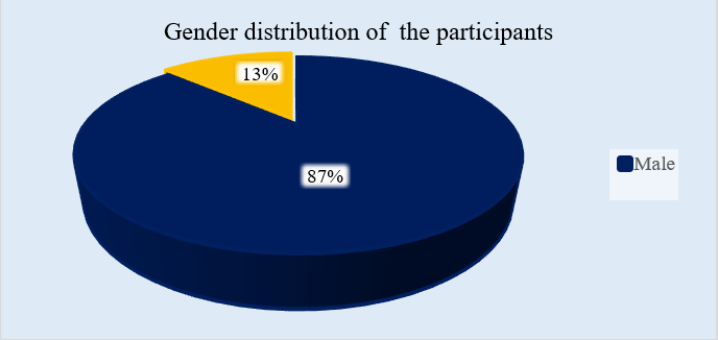

Figure 1: Pie chart showed gender wise *patients* distribution (N=16)

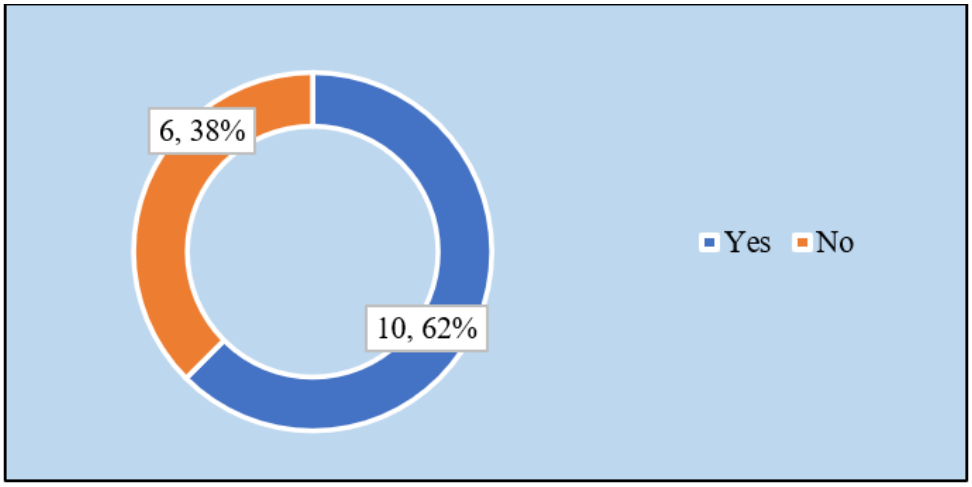

Figure II: Ring chart showed distribution of the cases by smoking habit (N=16)

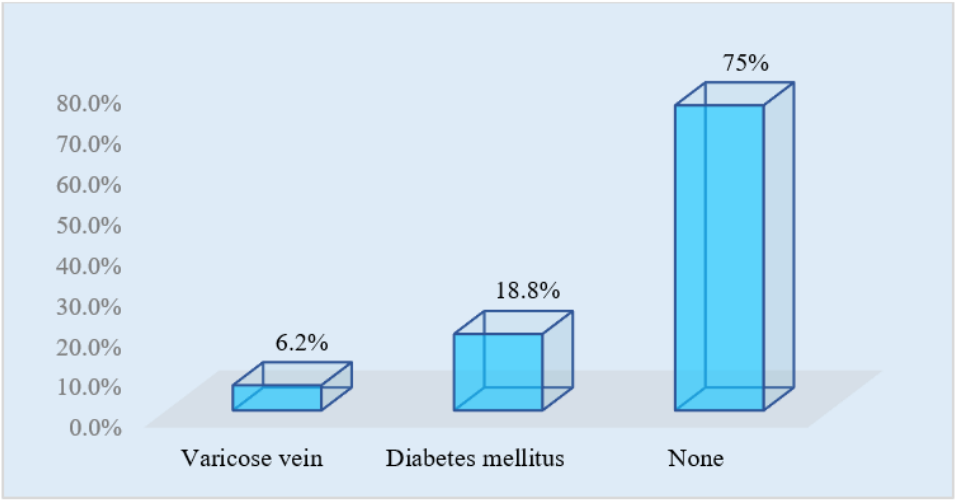

Figure III: Column chart showed distribution of the cases by co-morbidities (N=16)

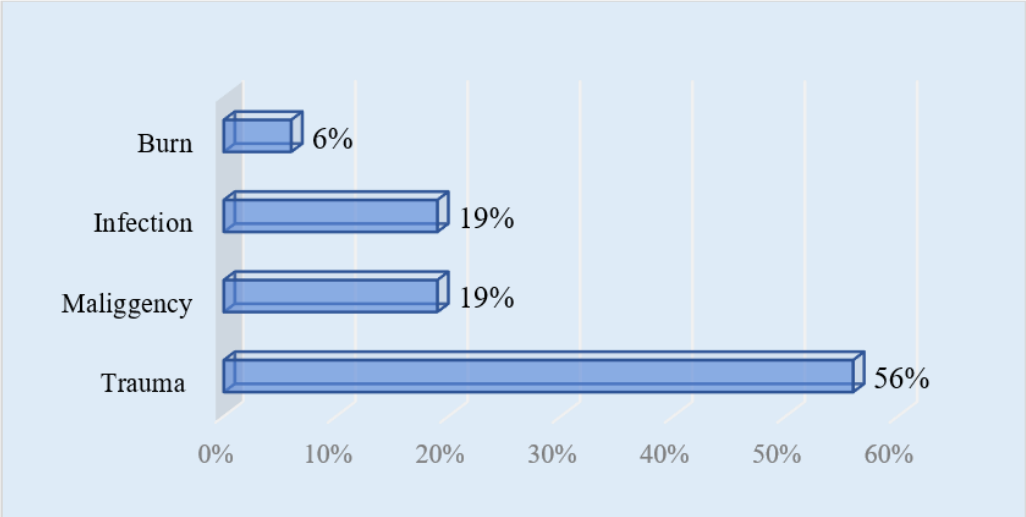

Figure IV: Bar chart showed distribution of cases by cause of defect (N=16)

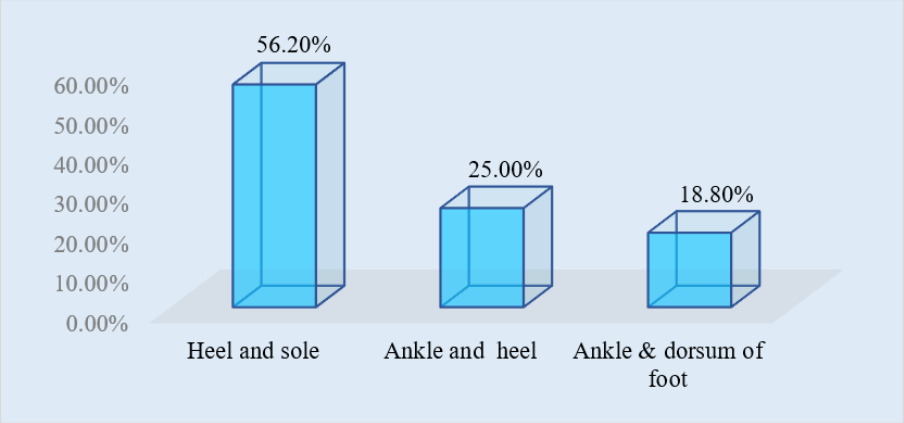

Figure V: Column chart showed distribution of cases by site of defect (N=16)

Table 2: Size of defect (N=16)

Measurement	Mean (SD)	Range
Length (cm)	11.94 (±3.39)	9-20
Width (cm)	11.06 (±5.16)	4-24
Dimension (cm^2)	141.69 (±107.99)	40-480

Table 3: Distribution of cases by exposed structures of defect (N=16)

Exposed structures	n	%
Tendon	6	37.5%
Bone	6	37.5%
None	4	25.0%

Table 4: Distribution of cases by radiological findings of defect (N=16)

Radiological findings	Frequency	Percent
Fracture	1	6.2%
Osteomyelitis	1	6.2%
No findings	14	87.6%

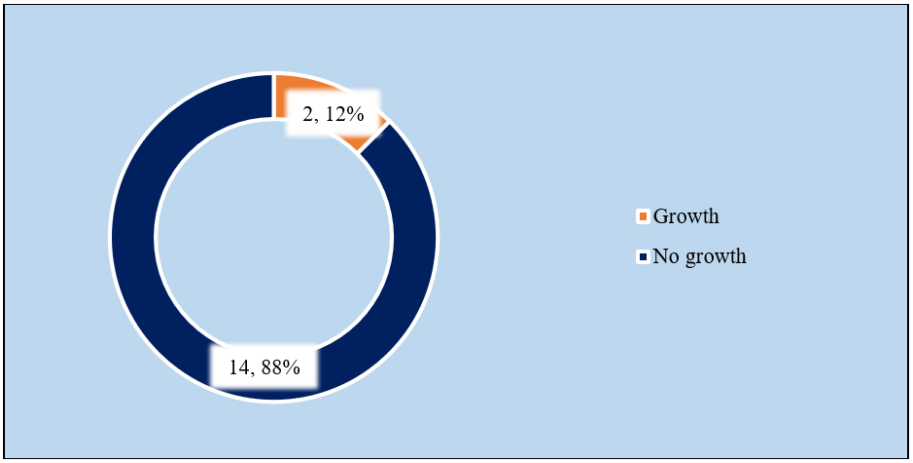

Figure VI: Ring chart showed wound swab culture of the sample before surgery

Table 5: Data related to the flap (N=16)

Measurements	Mean ± SD
Size of the flap	
Length (cm)	10.87 ±1.89
Width (cm)	8.87 ±2.06
Dimension (cm^2)	98.69 ±38.66
Maximum size (cm)	16 ×13
Minimum size (cm)	10 ×4

Measurements	Mean ± SD
Pedicle length (cm)	7.00 ± .93
Size of the extended portion of the flap	
Length (cm)	3.06 ±1.53
Width (cm)	8.87 ±2.06
Dimension (cm^2)	28.68 ±18.11
Maximum size (cm)	6 ×13
Minimum size (cm)	1 ×4
DBPCDEF (cm)	9.81 ±1.68
Maximum (cm)	12
Minimum (cm)	7

DISCUSSION

This study provides comprehensive data on the demographic, clinical, and surgical characteristics of patients undergoing extended reverse sural flap reconstruction for distal lower extremity defects in a Bangladeshi population. Our findings demonstrate that this technique remains particularly valuable for trauma-related defects in young male patients, consistent with global epidemiological patterns of limb injuries [14,15]. Our cohort's male predominance (87%) and mean age of 38 years align with previous reports from developing nations [16,17]. The high smoking prevalence (62%) warrants particular attention, as nicotine's vasoconstrictive effects may theoretically compromise flap survival, though our results showed acceptable complication rates comparable to non-smoking populations in similar studies [18,19]. The anatomical distribution of defects, with heel and sole involvement in 56.2% of cases, matches the weight-bearing pattern of injury susceptibility described in the literature [20]. Our mean defect size of 6.5×4.5 cm falls within the optimal range for reverse sural flap coverage [21], while the 37.5% incidence of bone exposure underscores the importance of robust soft tissue reconstruction [22]. Flap dimension analysis revealed our mean pedicle length (7.00±0.93 cm) and distance between the popliteal crease and the distal end of the flap measurements (9.81±1.68 cm) were consistent with established vascular reliability standards [23]. The extended flap portion dimensions successfully addressed the technical challenge of distal foot coverage [24]. Notably, our 87.5% complete flap survival rate compares favorably with international series [25,26], validating the technique's applicability in resource-limited settings. The 12.5% partial necrosis incidence primarily reflected venous congestion rather than arterial insufficiency [17]. These outcomes support the extended reverse sural flap as a reliable reconstructive option where microsurgical expertise is unavailable. However, the 6.2% osteomyelitis rate emphasizes the need for meticulous debridement before reconstruction [27].

LIMITATIONS OF THE STUDY

This study was limited by its small sample size (n=16) and single-center design, which may affect generalizability. The relatively short follow-up period (6 months) also precluded assessment of long-term functional outcomes. Additionally, the lack of a control group prevented direct comparison with alternative reconstructive techniques.

CONCLUSION & RECOMMENDATION

This study characterizes the demographic and clinical profile of patients receiving extended reverse sural flap reconstruction for ankle and foot defects. The findings establish this technique as particularly suitable for young adult males presenting with post-traumatic defects in weight-bearing areas. The flap demonstrates consistent effectiveness in covering moderate-sized defects while protecting exposed vital structures. These results confirm the procedure's reliability in our clinical setting and provide valuable insights for surgeons considering this reconstructive option. The study underscores the importance of proper patient selection and surgical technique to achieve optimal functional and aesthetic outcomes in distal lower extremity reconstruction.

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