

Original Research Article

ANALYZING DIFFERENT METHODS OF FOOT DEFECT RECONSTRUCTION AND THEIR OUTCOMES: A PROSPECTIVE STUDY

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ABSTRACT

Background: Foot defects requiring reconstructive surgery pose significant challenges in plastic and reconstructive surgery. Understanding the demographic characteristics, clinical presentations, surgical interventions, and outcomes of foot reconstruction is essential for optimizing patient care. This prospective observational study aimed to analyze the demographics, clinical presentations, surgical interventions, and outcomes of elective foot reconstruction surgeries.

Materials and Methods: Over a 24-month period, 50 cases undergoing elective foot reconstructive surgery were studied. Demographic data, including age, sex, etiology, and comorbidities, were recorded. Clinical characteristics such as foot involvement, defect size, structures exposed, associated fractures, and vascular status were assessed. Surgical interventions and complications, including type of reconstruction and post-operative outcomes, were documented. Functional outcomes and patient satisfaction were evaluated during follow-up.

Results: The majority of patients (72%) were aged 18-40 years, with males comprising 84% of the study population. Trauma was the leading etiology (88%) of foot defects, and 22% presented with associated comorbidities. Most defects were right-sided (68%) and ranged from 5-10 cm in size (70%). Bones and tendons were commonly exposed (48%), and 60% of patients had associated fractures. Lateral supramalleolar flap and RSA flap were the most common reconstruction procedures (both 26%). Flap necrosis and donor site morbidity affected 8% and 24% of patients, respectively. Despite challenges, 94% of patients reported satisfaction with the outcome of their reconstruction.

Conclusion: Elective foot reconstruction surgeries present complex clinical scenarios. This study provides insights into the demographics, clinical characteristics, surgical interventions, and outcomes of foot reconstruction, aiding in optimizing patient management and improving surgical outcomes.

Keywords: Foot reconstruction, plastic surgery, reconstructive surgery, clinical characteristics, surgical interventions, outcomes.

INTRODUCTION

Foot defects, arising from various etiologies such as trauma, infection, and malignancy, present significant challenges in plastic and reconstructive surgery.^[1,2] The successful reconstruction of these defects is crucial for restoring function and aesthetics, thereby improving patients' quality of

life.^[3,4] However, the optimal management strategies for foot defects remain a subject of debate, necessitating a comprehensive understanding of the demographics, characteristics, and outcomes associated with reconstructive procedures.^[5]

In recent years, advancements in surgical techniques and materials have expanded the repertoire of reconstruction options available to surgeons.^[6] These

include local flaps, regional flaps, and microsurgical free tissue transfer, each with its indications and outcomes. Additionally, the prevalence of comorbidities such as diabetes mellitus and hypertension further complicates the management of foot defects, necessitating a multidisciplinary approach to care.^[7,8]

While several studies have investigated the outcomes of various reconstructive techniques for foot defects, there remains a need for further research to refine treatment algorithms and improve patient outcomes. Understanding the demographic characteristics, etiology, and associated complications of foot defects is essential for tailoring treatment plans to individual patient needs.

Aim and Objectives

Aim: This study aims to comprehensively analyze the demographics, characteristics, surgical interventions, complications, functional outcomes, and patient satisfaction associated with reconstructive surgery for foot defects.

Objectives

To evaluate the demographic distribution of patients undergoing reconstructive surgery for foot defects.

To assess the etiology and characteristics of foot defects, including size, location, and structures involved.

To analyze the types of surgical interventions employed for foot reconstruction, including flap techniques and their outcomes.

To investigate the incidence and management of complications following foot reconstructive surgery.

MATERIAL AND METHODS

Study Design: This prospective observational study was conducted at the Department of Plastic and Reconstructive Surgery, Osmania Medical College/Osmania General Hospital, Hyderabad, over a 24-month period from November 2019 to November 2021.

Inclusion Criteria

Patients undergoing elective reconstructive surgery of the foot for any etiology (trauma, malignancy, infection, chronic ulcers including diabetic foot ulcers) were included.

Defects involving any site of the foot (forefoot, mid-foot, hindfoot, including ankle and heel) and of any size (small, medium, large) were included.

All methods of reconstruction, including split skin grafting, and their outcomes were included.

Both males and females aged between 10 and 60 years were eligible.

Exclusion Criteria

Patients outside the age range of 10-60 years. Emergency surgeries.

Patients with paralysis of both lower limbs (paraplegia) and bedridden patients.

Patients with severe peripheral vascular disease.

Sample Size: A total of 50 cases were studied.

Study Procedure: Patients were evaluated and analyzed for reconstructive options based on established protocols and operated on in an elective setting. Pre-operative assessment included a comprehensive history and physical examination, focusing on:

- Extent and dimension of tissue loss
- Localization (weight-bearing or non-weight-bearing areas)
- Neurovascular status
- Etiology of the defect
- Patient age and comorbidities
- Concomitant leg fractures and functional status
- Choice of recipient vessels for free flaps based on foot and leg vascular condition.

Basic blood investigations and viral screening (HIV, HBsAg) were conducted, and written informed consent was obtained. Prophylactic antibiotics were administered to all patients. X-ray of the foot and ankle and color Doppler of the limb were performed preoperatively to assess bony injuries and vascular status, respectively. Intraoperatively, handheld Doppler was used to confirm vascularity and mark perforators if needed.

Post-operatively, patients were followed up for a minimum of 6 months, with early initiation of physiotherapy for functional rehabilitation. Functional and aesthetic assessments of foot reconstruction were conducted, including ankle and toe movements, load-bearing, walking ability, color, texture match, contour deformity correction, and donor site morbidity.^[10]

Statistical Analysis: Descriptive analysis was performed on the collected data to summarize the demographic and clinical characteristics of the patients, as well as the outcomes of the reconstructive procedures.

Ethical Considerations: This study was conducted following the principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the Institutional Ethics Committee of Osmania Medical College/Osmania General Hospital. Informed consent was obtained from all patients before enrollment in the study. Patient confidentiality was maintained throughout the study period.

RESULTS

The study, comprising 50 patients, encompassed various age groups, with the majority falling between 18-40 years (72%). A smaller proportion comprised individuals under 18 years (10%) and over 40 years (18%) (see Table 1). Males constituted the majority of the study population (84%), while females accounted for 16%. Foot defects predominantly resulted from trauma (88%), followed by infection (10%) and post-excision malignancy (2%). Approximately 22% of patients presented with associated co-morbidities, such as hypertension, diabetes mellitus, and epilepsy (see Table 2).

Right-sided foot defects were more prevalent (68%) than left-sided ones (32%). The dorsum was the most frequently affected area (72%). Foot defects varied in size, with the majority falling between 5-10 cm (70%). Bones and tendons were commonly exposed (48%), and 60% of patients with foot defects also presented with associated bone fractures. Palpable pulses were observed in the majority of patients (92%) in the involved lower limb and foot (see Table 3 and Table 4).

Common reconstruction procedures included lateral supramalleolar flap and RSA flap (both 26%), followed by propeller flap (18%) (see Table 5). Flap complications were noted in a subset of patients, with complete flap necrosis occurring in 8% and marginal flap discoloration in 12%. Donor site morbidity affected 24% of patients, necessitating split-thickness skin grafting (10%), managing infections (8%), and addressing hypertrophic scarring (6%) (see Table 6).

A notable proportion of patients reported difficulty walking (42%) and wearing footwear (32%) (see Table 7). Despite challenges, the majority of patients (94%) expressed satisfaction with the outcome of their reconstruction, while 6% reported dissatisfaction (see Table 8).



Figure 1: PRE-OP -7x5cm Defect Posterior Heel with Tendo- Achillis Rupture



Figure 2: PRE-OP Xray- Chip Avulsion Fracture Calcaneum



Figure 3: Peroneus Brevis Transfer



Figure 5: Follow up after 6 Months

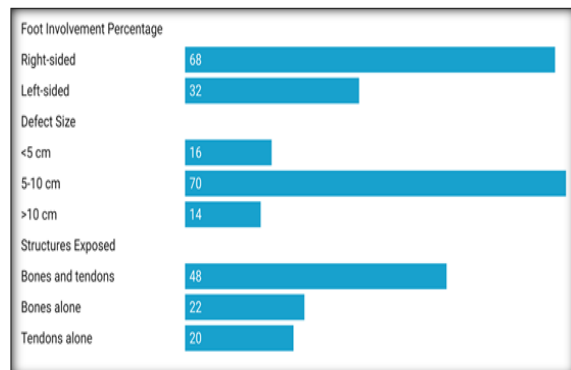


Figure 6: Clinical Presentation and Defect Characteristics

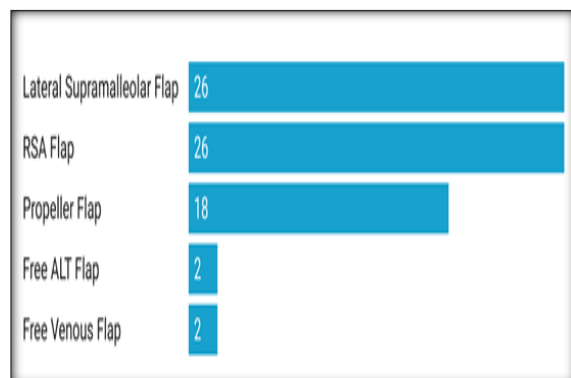


Figure 7: Surgical Interventions

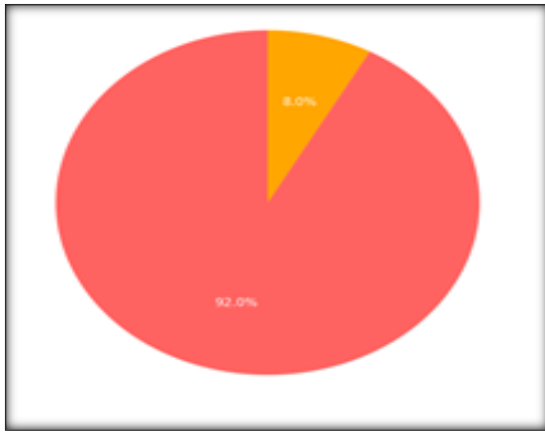


Figure 8: Vascular Status

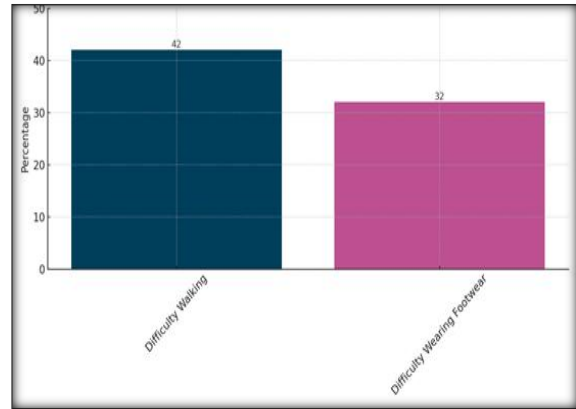


Figure 11: Functional Outcome

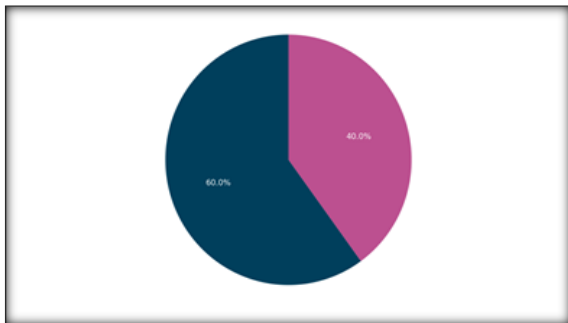


Figure 9: Associated Fractures

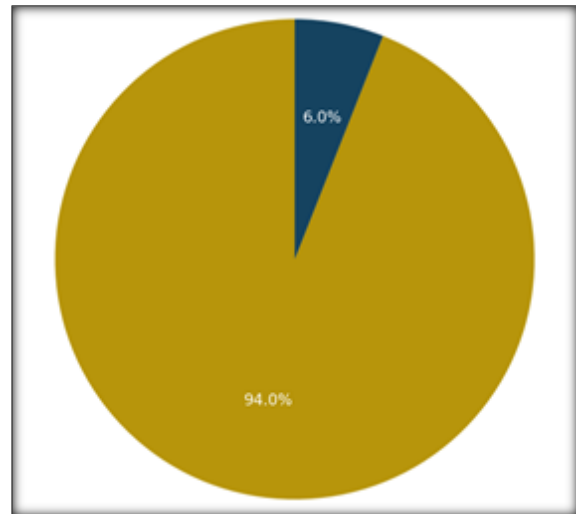


Figure 12: Patient Satisfaction

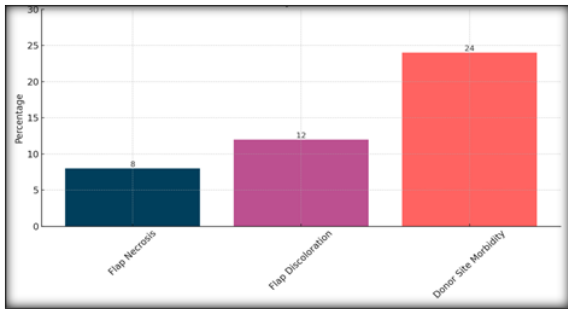


Figure 10: Complications

Table 1: Demographics and Characteristics - Age Group

Age Group	Percentage
<18 years	10%
18-40 years	72%
>40 years	18%

Table 2: Demographics and Characteristics - Sex, Etiology, and Co-morbidities

Demographics and Characteristics	Percentage
Sex	
Male	84%
Female	16%
Etiology	
Trauma	88%
Infection	10%
Post-excision Malignancy	2%
Co-morbidities	
Hypertension, Diabetes Mellitus, Epilepsy	22%

Table 3: Clinical Presentation and Defect Characteristics - Foot Involvement, Defect Size, and Structures Exposed

Clinical Presentation and Defect Characteristics	Percentage
Foot Involvement	
Right-sided	68%
Left-sided	32%

Defect Size	
<5 cm	16%
5-10 cm	70%
>10 cm	14%
Structures Exposed	
Bones and tendons	48%
Bones alone	22%
Tendons alone	20%

Table 4: Clinical Presentation and Defect Characteristics - Associated Fractures and Vascular Status

Clinical Presentation and Defect Characteristics	Percentage
Associated Fractures	
Present	60%
Absent	40%
Vascular Status	
Palpable pulses	92%
Other	8%

Table 5: Surgical Interventions

Type of Reconstruction	Percentage
Lateral Supramalleolar Flap	26%
RSA Flap	26%
Propeller Flap	18%
Free ALT Flap	2%
Free Venous Flap	2%

Table 6: Complications

Complications	Percentage
Flap Necrosis	8%
Flap Discoloration	12%
Donor Site Morbidity	24%

Table 7: Functional Outcome

Functional Challenges	Percentage
Difficulty walking	42%
Difficulty wearing footwear	32%

Table 8: Patient Satisfaction

Patient Satisfaction	Percentage
Good	94%
Poor	6%

DISCUSSION

In our investigation, we delved into various aspects of reconstructive surgery for foot defects in a cohort of 50 patients. Our study provided insights into demographic patterns, etiological factors, defect characteristics, surgical strategies, complications, functional outcomes, and patient satisfaction related to foot reconstruction.

The demographic distribution revealed that a significant portion of our patient population fell within the age range of 18-40 years (72%). This age group is typically associated with higher activity levels and a greater likelihood of sustaining traumatic injuries, which aligns with our observation that trauma was the leading cause of foot defects in our study (88%). In contrast, infections and malignancies contributed to a smaller proportion of cases (10% and 2%, respectively). Additionally, the presence of comorbidities, particularly hypertension and diabetes mellitus, underscored the complexity of managing foot defects in some patients.^[11]

Regarding defect characteristics, our findings highlighted the predominance of right-sided foot

defects (68%) and the frequent involvement of the dorsum of the foot (72%). These observations may have implications for surgical planning and approach selection. Surgical interventions varied, with lateral supramalleolar flap and reverse sural artery flap being the most frequently employed techniques (both 26%). However, despite the careful execution of these procedures, complications such as flap necrosis and donor site morbidity were encountered in some cases, necessitating additional interventions and highlighting the challenges inherent in foot reconstruction.^[12]

Comparing our study with previous research by Rajact et al,^[13] Almeida et al,^[14] and Stevenson et al,^[15] we identified both similarities and differences. While our study reported a larger sample size and corroborated trends in surgical interventions and complications, disparities in patient demographics and defect characteristics were evident across different cohorts. For example, our study exhibited a higher proportion of male patients and a greater prevalence of trauma-related foot defects compared to prior investigations. These disparities underscore the importance of context-specific considerations in

foot reconstructive surgery and emphasize the need for further research with expanded sample sizes and extended follow-up periods to validate our findings and optimize clinical outcomes effectively.

CONCLUSION

In our study, we observed a predominance of male patients with traumatic foot defects, frequently involving the right side and dorsum of the foot. Lateral supramalleolar flap and reverse sural artery flap emerged as dependable choices for dorsal defects, while the propeller flap provided simplicity and high patient satisfaction. However, free flaps necessitated expertise and posed risks of complications. Overall, non-microsurgical options like the lateral supramalleolar flap and reverse sural artery flap proved effective and safe alternatives for foot reconstruction, particularly in settings lacking advanced microsurgical facilities. These findings highlight the importance of customized reconstructive approaches based on patient demographics, defect characteristics, and available resources to optimize outcomes and patient satisfaction.

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