

Prevalence and risk factors of lower limb skin graft failure in Pakistani patients

Afroza Tajuddin¹ and Muhammad Asim Saad^{2,*}

¹ Master of Science in Nursing, Aga Khan University School of Nursing and Midwifery.

² BS public health, University of Karachi.

World Journal of Advanced Research and Reviews, 2025, 27(02), 1378-1383

Publication history: Received on 10 July 2025; revised on 16 August 2025; accepted on 18 August 2025

Article DOI: <https://doi.org/10.30574/wjarr.2025.27.2.2975>

Abstract

Background: Lower limb skin grafting is a common reconstructive procedure, but graft failure remains a significant challenge. Multiple patient- and procedure-related factors can influence outcomes.

Objective: To evaluate demographic, clinical, and surgical variables associated with lower limb skin graft success and failure.

Methods: This observational study included 79 patients undergoing lower limb skin grafting for indications including cancer, trauma, ulcers, and elective reconstruction. Demographic characteristics, comorbidities, procedural details, and postoperative outcomes were recorded. Variables were compared between graft success and failure groups, and statistical significance was assessed.

Results: The mean age was 28.5 ± 11.2 years, with 41 males and 38 females. Hypertension ($n=75$) and diabetes mellitus ($n=62$) were the most prevalent comorbidities. The most common indication for grafting was cancer ($n=23$), and split-thickness grafts were most frequently used ($n=70$). Graft failure occurred in 28 cases (35.4%). Significant predictors of graft failure included older age (median 73 vs. 62 years, $p=0.02$), female gender ($p=0.005$), and use of immunosuppressive medication ($p=0.02$). Other factors, such as BMI, comorbidities, and dressing type, were not statistically significant.

Conclusion: Age, gender, and immunosuppressive therapy significantly impact lower limb skin graft survival. Preoperative optimization of at-risk patients and tailored perioperative management may improve graft outcomes.

Keywords: Lower Limb; Skin Graft; Graft Failure; Wound Healing; Immunosuppressive Therapy; Reconstructive Surgery

1. Introduction

For treating a variety of lower limb lesions, such as burns, diabetic foot ulcers, traumatic injuries, and chronic non-healing ulcers, skin grafting is still a fundamental component of reconstructive surgery. Skin grafts are essential for regaining the function and look of the injured limb because they speed up wound closure and encourage tissue regeneration. Graft failure risk is still a major clinical concern even with improvements in surgical methods and postoperative care. Increased morbidity, delayed healing, multiple surgical procedures, extended hospital stays, and higher healthcare expenses can result from graft failure, which is characterized as the partial or total loss of the graft as a result of non-adherence, necrosis, or infection. Numerous patient-related and procedure-related factors, as well as the lower limb, influence the prevalence and determinants of transplant failure. Because of their dependent location, which makes them more susceptible to edema and venous congestion, the lower extremities are more susceptible to graft

* Corresponding author: Muhammad Asim Saad

failure. Graft problems are also caused by inadequate vascularity, increased contamination risk, limb mobility, and exposure to external stress during the healing process. A properly prepared wound bed, sufficient perfusion, infection control, immobilization, and proper postoperative care are all essential for graft success. However, by interfering with microcirculation, angiogenesis, and cellular regeneration, comorbidities such as diabetes mellitus, peripheral artery disease, smoking, anemia, malnutrition, and immunosuppression severely reduce graft take. Patients undergoing lower limb reconstruction frequently have these characteristics, especially in low- and middle-income nations like Pakistan.

Pakistan has a disproportionately high rate of chronic wounds and lower limb injuries because to industrial risks, inadequate diabetes management, rising traffic accidents, and delayed access to specialized care. According to national estimates, diabetes mellitus, a key risk factor for foot ulcers and the need for skin grafting, affects more than 16% of Pakistan's adult population.

It is well recognized that neuropathy, ischemia, and immunosuppression in diabetic patients hinder wound healing. Lower limb wound healing is made more difficult by the rising incidence of peripheral vascular disease in the elderly population. There is little local data on graft results and risk factors in spite of considerable clinical load. In Pakistani literature, the specific problem of skin transplant failure—particularly in the lower limbs—remains understudied, whereas the majority of publications concentrate on wound care or diabetic foot issues.

Furthermore, grafting methods, postoperative procedures, and outcome documentation are inconsistent because to the disparities in surgical practices between Pakistan's public and private healthcare facilities. High rates of problems are caused by a number of factors that are mainly unreported, including inadequate wound bed preparation, poor patient compliance, poor hygiene, and a lack of follow-up care. Surgical results and postoperative recovery are also influenced by sociocultural factors, such as health illiteracy, gender differences in access to care, and financial limitations. As a result, graft loss and related problems are more likely to occur in patients who are present late in the course of the disease or who stop treatment too soon.

Numerous factors, such as infection, wound bed ischemia, graft type and thickness, exposed tendons or bone, fixation method (sutured vs. stapled), and lack of use of adjuncts like negative pressure wound therapy (NPWT), have been found to be predictive of graft failure in the lower limbs worldwide. However, because of variations in infrastructure, patient characteristics, and resource availability, it is unclear whether these findings can be applied to the healthcare system in Pakistan. Establishing local epidemiological data that characterizes the extent of skin graft failure and pinpoints the most pertinent risk variables in our context is imperative. This data can be used to improve lower limb restoration results, create standardized procedures, and establish therapeutic standards.

To improve surgical decision-making and lessen the cost of repeated surgeries, it is essential to comprehend the prevalence and risk factors of skin graft failure in Pakistan. Preoperatively identifying high-risk patients enables the adoption of preventative measures, optimal medical condition optimization, suitable counseling, and the selection of the best grafting procedures. For example, when customized to the patient's risk profile, the use of NPWT, enhanced hemostatic control, infection prophylaxis, and limb immobilization can greatly increase graft success rates. Furthermore, local data can help with training and resource planning, particularly at tertiary care hospitals that handle a large number of trauma and reconstructive cases.

Therefore, the purpose of this study is to determine the main risk factors for lower limb skin graft failure in Pakistani patients as well as the prevalence of this condition. This study intends to measure the burden of graft failure and identify correlations between clinical, demographic, and surgical factors and transplant outcomes by analyzing multicenter patient data. The results will help surgeons with risk assessment and better perioperative care, in addition to adding to the scant amount of national literature already in existence. Ultimately, the goal is to reduce complication rates, improve graft viability, and enhance the quality of patient care in the field of reconstructive surgery in Pakistan.

2. Methodology

The study covered all patients who needed skin grafting for their lower limbs. Permission was obtained from the institute's ethical review committee. Details about the patient are recorded, such as age, gender, and BMI. Diabetes mellitus (DM), hypertension, hyperlipidemia, ischemic heart disease, cancer, ulcers, trauma, elective cases, and venous insufficiency were among the conditions for which data was gathered. Anatomical wound site, anticoagulation/antiplatelet therapies, and immunosuppression were recorded in the transplant history. We looked at the weight-bearing condition of the wound size at the time of STSG placement, 14 days after STSG, and 45 days after STSG. Proven techniques were used to perform skin grafts. All procedures were performed under either general or regional anesthesia, and as a precaution, antibiotics were given. Depending on the surgeon's judgment, the patients

were either released with early mobilization or admitted to the hospital under supervision for three to seven days. After surgery, the grafts were examined on the fifth day and then every other day until the graft was removed entirely. If more than 80% of the skin grafts were removed following a clinical assessment, the procedure was considered successful. Microsoft Excel was used for data entry. SPSS version 21 was used for statistical analysis. A parametric t-test was employed for statistical analysis to assume a normal distribution, and significance was determined using Fisher's exact univariate analysis.

3. Results

Participants were 28.5 ± 11.2 years old on average. There were 38 females and 41 males among them. In terms of BMI distribution, 29 patients were underweight, 18 were overweight, 11 were obese, and 21 had a normal BMI. Sixty-two patients had multiple grafts, whereas seventeen patients received single grafts. Thirty-two patients had venous insufficiency.

Diabetes mellitus (62 cases) and hypertension (75 cases) were the most prevalent comorbidities, followed by peripheral vascular disease (9 cases) and ischemic heart disease (19 cases).

Thirteen patients reported using immunosuppressive medications, while thirty-two patients reported using anticoagulants.

Interpretation: Although the study sample was young, there were several chronic comorbidities, especially diabetes and hypertension, which are known to hinder wound healing and may have an impact on Cancer was the most common reason for grafting (23 instances), followed by ulcers (16), trauma (21), and elective cases (19). Graft area ranged from 0.16 to 8.1 cm², with a median of 0.92 cm². Nine grafts were full-thickness, while the majority 70 instances) were split-thickness. In 20 cases, sponge dressings were used, and in 59 cases, vacuum dressings. In terms of postoperative care, 20 patients were immediately mobilized, while 59 patients were put on bed rest.

Table 1 Demographic details of the study participants

Age		28.5 ± 11.2
Gender	Male	41
	Female	38
BMI	Normal	21
	Underweight	29
	overweight	18
	Obese	11
Grafts	Single	17
	Multiple	62
Venous insufficiency		32
Comorbidities	Diabetes mellitus	62
	Hypertension	75
	Ischemic heart disease	19
	Peripheral vascular disease	9
Anticoagulant usage		32
Immunosuppressant medication		18

Interpretation: The most common methods were split-thickness grafting and vacuum-assisted closure. In line with the reconstructive requirements for oncologic and traumatic lower limb abnormalities, cancer and trauma were the most common causes of skin grafts.

Table 2 Reported etiology for lower limb skin graft

Indication for lower limb skin graft		
Indication for lower limb skin graft	Cancer	23
	Trauma	21
	Ulcer	16
	Elective case	19
Area of graft		0.92 cm ² (0.16–8.1 cm ²)
Graft type	Split thickness	70
	Full thickness	9
Dressing type	Vacuum	59
	Songe	20
Management	Bed rest	59
	Immediate mobilization	20

Out of the total, 28 grafts failed and 51 were successful. The median age of patients with successful grafts was 62 years, which was lower than the median age of patients with failures (73 years, $p = 0.02$).

The distribution of genders revealed a significant correlation ($p = 0.005$), with a larger percentage of successful grafts in males. The failure group used immunosuppressive medications at significantly greater rates (6 vs. 1, $p = 0.02$). There were no statistically significant correlations found between other factors, including ischemic heart disease ($p = 0.07$), diabetes mellitus ($p = 0.07$), venous insufficiency ($p = 0.19$), BMI ($p = 0.52$), graft type ($p = 0.79$), and dressing type ($p = 0.11$). Interpretation: Graft failure was significantly predicted by immunosuppressive treatment, older age, and female gender. Despite their lack, comorbidities such as diabetes and IHD exhibited trends toward significance, indicating potential therapeutic relevance.

Table 3 Comparison of graft outcomes in study participants

Variables	Graft success 51	Graft Failure 28	P-value
Age (median)	62	73	0.02
Gender male: female	32:23	9:15	0.005
IHD	8	11	0.07
Venous insufficiency	10	22	0.19
Peripheral vascular disease	3	6	0.92
BMI (median)	30	42	0.52

Split thickness skin graft	42	13	0.79
Vacuum dressing	30	18	0.11
Diabetes	13	8	0.07
Immunosuppressants	1	6	0.02
Graft size	0.98	1.22	0.06
Acute operations	7	4	0.07

4. Discussion

The results of lower limb skin grafts were examined in this study in relation to demographic, clinical, and procedural parameters. The results show that the usage of immunosuppressive medications, age, and gender all have a substantial impact on transplant survival. The correlation between graft failure and advanced age is in line with research showing that poor healing in elderly individuals is caused by decreased fibroblast activity, delayed epithelialization, and impaired angiogenesis (Miller et al., 2021). Comparably, several studies have identified female gender as a possible risk factor, perhaps as a result of hormonal variations that impact vascular responses and collagen formation (Chen et al., 2020).

In our sample, immunosuppressive treatment was found to be a powerful predictor of transplant failure. This is consistent with data showing immunosuppressants, especially calcineurin inhibitors and corticosteroids, reduce collagen deposition and cellular proliferation, which compromises graft take (Anderson et al., 2019).

Comorbidities include diabetes mellitus and ischemic heart disease trended toward an elevated risk of failure even if they did not achieve statistical significance. Diabetes is known to produce neuropathy and microvascular impairment, which hinders the healing of wounds (Li et al., 2022). Split-thickness skin grafts are more common in procedural aspects, which is indicative of their high take rates and adaptability for lower limb reconstruction (Pereira et al., 2021). The study emphasizes the value of preoperative optimization, particularly for older and immunocompromised patients, and the necessity of carefully choosing which patients should be immediately mobilized rather than being placed on bed rest. To investigate modifiable perioperative factors and to further validate these findings, larger multicenter trials are necessary.

5. Conclusion

This study emphasizes that immunosuppressive drug use, advanced age, and female gender are important predictors of lower limb skin graft failure. Comorbidities such as diabetes mellitus and ischemic heart disease shown tendencies toward worse outcomes and are nonetheless clinically relevant even though they did not approach statistical significance. Graft survival in this cohort was not correlated with procedural parameters such as dressing technique or graft type. Graft success rates may be increased by optimizing patient health before surgery, especially in older and immunocompromised patients. To confirm these results and improve perioperative treatment techniques, larger, prospective trials are necessary.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

- [1] Surowitz JB, et al. (2020). *Skin grafting: Principles and current practices*. Clinics in Plastic Surgery.

- [2] Atiyeh BS, et al. (2021). *Optimizing wound bed preparation for skin grafting*. Burns.
- [3] Jameel A, et al. (2022). *Diabetes-related lower limb complications in Pakistan*. J Pak Med Assoc.
- [4] Chua AWC, et al. (2020). *Lower limb wound healing and complications: An overview*. Int Wound J.
- [5] Maruccia M, et al. (2019). *Skin grafts and risk factors of failure in lower limb reconstruction*. J Wound Care.
- [6] Basit A, et al. (2022). *Prevalence of diabetes and foot ulcers in Pakistan: An epidemiological review*. Diabetes Res Clin Pract.
- [7] Kim PJ, et al. (2020). *Adjunctive therapies in skin graft survival*. Plast Reconstr Surg.
- [8] Shimizu R, et al. (2021). *Infection and graft loss: Strategies for prevention*. Wounds.
- [9] Rehman TU, et al. (2023). *Clinical outcomes of skin grafting in Pakistani hospitals: A retrospective audit*. Pak J Surg.
- [10] Miller K, et al. "Impact of aging on wound healing: A systematic review." *J Surg Res*. 2021;265:265–273.
- [11] Chen Y, et al. "Gender differences in wound healing and graft survival." *Plast Reconstr Surg*. 2020;145(3):621–629.
- [12] Anderson P, et al. "Effect of immunosuppressive drugs on wound healing." *Clin Transplant*. 2019;33(1):e13444.
- [13] Li X, et al. "Diabetes and impaired wound healing: Mechanisms and clinical management." *Adv Wound Care*. 2022;11(9):456–472.
- [14] Pereira M, et al. "Outcomes of split-thickness skin grafts in lower limb reconstruction." *Ann Plast Surg*. 2021;86(2):193–199.
- [15] Krishnan P, et al. "Vacuum-assisted closure in skin grafts: Evidence and applications." *Int Wound J*. 2020;17(1):30–39.