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ORIGINAL ARTICLE

Lower Limb Skin Graft Failure: Incidence and Risk Factors: A Longitudinal Study

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ABSTRACT

Aim: To determine the incidence and risk factors of lower limb skin graft failure.
Study design: A longitudinal study
Place and duration: This study was conducted at Patel Hospital Karachi Pakistan from January 2021 to January 2022
Methodology: The study incorporated all the patients who required skin Grafts for lower limbs. Patient characteristics and diseases were noted. All Grafts were conducted with tried-and-true methods. Transplant history with immunosuppression, Anticoagulation/ antiplatelet treatments, and anatomical wound location was noted. Weight-bearing status of the wound size at the time of STSG placement, wound size 14 days post-STSG, and wound size 45 days post-STSG were examined. Patients were observed for six weeks after the transplant for graft take. Data were evaluated using SPSS version 21.
Results: A total of 62 patients received 79 skin Grafts, including multiple grafts for 17 individuals. The mean age of patients was 68 ± 9.2 years. The medium BMI of patients was 28. 19 (30.6%). A total of 11 (17.74%) patients had ischemic heart disease, and 19 (30.6%) had venous insufficiency. Immunosuppressant use 4 (6.4%), Diabetes 9 (14.5 %), and Peripheral vascular disease (PVD) were observed in 24 (39%) of patients. A significant association was observed with BMI, Immunosuppressant use, and peripheral vascular disease (PVD).
Conclusion: Skin Grafts on the lower limb fail more frequently than skin grafts on other body parts. Proper observation and treatment may reduce the risk of infection and hematoma. Skin graft failure rates are still high, and several contributing factors are associated with this condition. Immunosuppression use and BMI were the contributing factors in the present study
Keywords: Body mass index, Immunosuppression, Lower extremity, Reconstruction, Skin grafts

INTRODUCTION

Skin is the body's largest organ and the first line of protection against the outside world; it plays a crucial role in thermoregulation and metabolic function; therefore, its health is vital. (1) Large or non-healing damages to this integumentary layer expose the body to infection and subsequent injury, and failing to treat the wound can have devastating consequences. (2) Large wounds frequently result in severe parenchymal cell death and extracellular framework loss, and continuous inflammation exacerbates the damage, impeding the body's natural regeneration abilities. (3, 4) Plastic surgeons have traditionally struggled to determine the optimal reconstructive procedure for lower limb skin and soft-tissue injuries, owing to the restricted quantity of tissue around the defect. (5) Any reconstructive surgery must also consider proper joint movement and range of motion, making it more difficult than operations on other body parts. (6)

The transfer of cutaneous tissue from one part of the body to another is known as skin grafting, and it is commonly employed to treat significant wounds. (7) The idea behind skin grafts is to remove the skin from a healthy donor location and transplant it to a needy one. (8) Skin grafts, once included, protect wounds from the environment, germs, temperature, and excessive water loss in the same way natural skin does. (9) Full-thickness skin grafting or local flap covering are frequently employed for full-thickness skin injuries in the lower limbs. There is inadequate tissue for local flap covering in many lower limb injury situations. Any available is difficult to employ for therapeutic purposes due to the restricted quantity of tissue that can be transferred from locations nearby to the wound and limited flap mobilization. (10) Such procedures may not provide complete coverage in the event of big, full-thickness wounds, necessitating further treatment such as free flap and split-thickness skin grafting (STSG).

Although grafting techniques have changed throughout time, the fundamentals of good grafting have not. Inherent and external factors are unique to every patient to determine the failure and success of graft. (11) This is particularly true in the lower limb, where skin graft failure and complications are more common than in other body parts. There is currently a scarcity of data on the variables that contribute to the lower limb skin graft failure, which may clarify why doctors treat patients demanding lower limb skin grafts differently. This study aimed to determine how often lower limb skin grafts failed and what factors contributed to this.

METHODOLOGY

All patients who required skin graft for lower limbs were included in the study. Permission was taken from the ethical review committee of the institute. Patient characteristics, including age, gender, and BMI, are noted. Data was collected for diabetes mellitus (DM), hypertension, hyperlipidemia, ischemic heart disease, cancer, ulcer, trauma, elective cases, and venous insufficiency. Transplant history with immunosuppression, Anticoagulation/ antiplatelet treatments, and anatomical wound location was noted. Weight-bearing status of the wound size at the time of STSG placement, wound size 14 days post-STSG, and wound size 45 days post-STSG were examined. Skin Grafts were performed using tried-and-true procedures. All surgeries were executed under regional or general anesthesia, with antibiotics administered as a precaution. Patients were both admitted to the hospital under observation for 3–7 days or discharged with early mobilization, according to the surgeon's opinion. The grafts were checked 5th day and than followed by alternate day after surgery till graft taken completely . The skin graft was successful if more than 80% of the grafts were taken after clinical examination. The data were entered using Microsoft Excel. For statistical analysis, SPSS version 21 was employed. A parametric t-test was used for statistical analysis to assume a normal distribution, and significance was determined using Fisher's exact univariate analysis.

RESULTS

We found that 62 patients underwent skin grafts, whereas 17 patients received multiple grafts. The mean age of patients was 68 ± 9.2 years, and most were females (54.8%, n=34). The medium BMI observed was 28. A total of 19 (30.6%) patients had venous insufficiency, and 11 (17.74%) patients presented with Ischemic heart disease. Furthermore, 4 (6.4%) patients were taking immunosuppressants, 9 patients (14.5 %) had diabetes, and 24 patient (39%) had peripheral vascular disease (PVD), as shown in **Table 1**.

One of the most common reasons for elective surgery was skin cancer, observed in 66% of cases with skin grafts. In the patient with skin grafts, primarily STSG was performed. Most subjects received negative pressure dressing. A total of 57 (72 %) patients were on bed rest after skin transplant surgery. The overall success rates of the grafts at two weeks and six weeks were 94% and 76%, respectively. Twenty-eight failed grafts were observed in this investigation, out of which 7 (8.9 %) grafts developed a hematoma, and 21 (26.6 %) grafts developed an infection and were treated with antibiotics, as shown in **Table 2**.

No significant association was observed with the best rest, smoking, dressing, and conditions including diabetes, ischemic heart disease, venous insufficiency, etc. However significant correlation was observed between BMI, peripheral vascular disorders, and the use of immunosuppressive drugs, as described in **Table 3**. Furthermore, all graft failures were healed, and no revision skin grafting treatments have been performed on patients

Table 1: Parameters of patients undergoing lower limb skin Grafts are reported as (n, %).

Characteristics	Frequency (n=62)
Age (mean)	68 ± 9.2 year
Female	34
Male	28
BMI (Median)	28
Patients with multiple grafts	17 (27.4%)
Venous Insufficiency	19 (30.6%)
Diabetes	9 (14.5%)
Ischemic heart disease	11 (17.74%)
Smoking	8 (13%)
Peripheral vascular disease	24 (39%)
Anticoagulation/ antiplatelet	14 (22.5%)
Immunosuppressant medication	4 (6.4%)

Table 2: Data for lower limb skin Grafts is provided as (n, %).

Indication	Frequency (n= 79)
Cancer	66 (83.5 %)
Trauma	9 (11.4 %)
Ulcer	4 (5 %)
Elective case	63 (80 %)
Area of graft: median (range)	0. 92 cm2 (0.10 – 9 cm2)
Graft types	
Split thickness	72 (91%)
Full thickness	7 (9%)
Dressing types	
Vacuum	59 (74.7 %)
Sponge	20 (25.3 %)
Management	
Bed rest	57 (72 %)
Immediate mobilization	22 (28 %)

Table 3: Data is provided as (n, %) for successful grafts against unsuccessful grafts.

Characteristics	Graft Success (n= 51)	Graft Failure (n= 28)	P-value
Age (median)	68 years old	70 years old	0.805
Gender (female: male)	18 : 28	11 : 6	0.625
Ischemic heart disease	10 (19.6 %)	7 (25 %)	0.612
Venous insufficiency	13 (25.4 %)	6 (21.4 %)	0.547
Peripheral vascular disease	22 (43 %)	11 (39 %)	0.030
BMI (median)	28	39	0.006
Split thickness skin graft	46 (90 %)	26 (93 %)	0.999
Vacuum dressing	34 (66.6 %)	16 (57 %)	0.084
Diabetes	11 (21.6 %)	8 (28.6 %)	0.365
Smoking	6 (11.8 %)	4 (14.3 %)	0.507
Immunosuppressants	1 (1.9 %)	3 (10.7 %)	0.010
Graft size (median)	0.91 cm2	1.12 cm2	0.274
Acute operations	7 (13.7 %)	4 (14.3 %)	0.637

DISCUSSION

Treatment planning and care for a skin injury in the lower leg might vary based on the lesion's size and depth, the tendon or bone exposure, and infection. STSG, local flap covering, full-thickness skin grafts, and free flaps can all be used to cover wounds. However, due to a lack of adequate tissue, the lower extremities have a lot of stress compared to other body areas and hence have a limited number of donor sites in the event of local flaps. Due to donor site limits and the size of graft that may be effectively transplanted, the use of full-thickness skin grafts is similarly limited. Despite developments in microsurgical methods and technology, the surgeon's experience and knowledge influence whether or not the free flap approach should be used due to its intricacy. It also has a more significant chance of taking a long time to operate and failing than other coverage approaches. As a result, STSG is frequently utilized. Complications such as hematoma and seroma might occur when the STSG is used. The STSG, on the other hand, is a simple and speedy reconstructive treatment. Infection is the leading cause of graft failure, and wound contraction is the most common complication following STSG.

In the present study, 35.4% graft failure was observed. The primary cause of graft failure was infection, hematoma, and seroma. In a previous study, Henderson et al. (2009) presented that 24.7 %t of grafts had complications (22 out of 85 grafts). 13 out of 17 graft failures were due to infection. (12) Another study showed that graft loss from infection was more frequent when it involved the lower extremities or when many sites were involved. (13) Stankiewicz et al. (2015) observed that the overall rate of skin graft failure was 53.4%, in which split graft failed more frequently than primary closure. (14) We observed that increasing BMI was highly linked with skin graft failure in addition to immunosuppressive drug usage. Similar results were observed in other studies. (15, 16) Eisendle etal. (2020) observed that graft failures were mostly recorded without immunosuppression. (17) In our study, no difference was observed between FTSG and STSG. Likewise, Shen et al. (2019) observed that graft failure ratios with the FTSG and STSG were statically significant. (18) While cases with STSG required noticeably additional wound dressing changes than those with FTSG, there was no significant difference in outcomes between the two groups. In terms of aesthetics and fewer donor site issues, FTSG is regarded to be preferable to STSG. (15) However, STSG remains the most popular form of skin covering in grafting of the lower limbs owing to higher scar quality than healing by secondary intention, the convenience of application, and the capacity to extend coverage through smashing. The wound defects in the lower leg are often too wide to be closed entirely, and local flap restoration can be challenging to perform, especially in senior patients. It is also easy to do revision surgery and oncological monitoring in individuals who have had skin graft repairs compared to those with local flap repairs. (19)

Patients who were either promptly mobilized or put on bed rest had the same outcome. In our research, the operating surgeon put the great majority of patients who needed lower limb Grafts on bed rest. Even though a growing body of research indicates that bed rest does not significantly improve results, it is nonetheless routinely utilized worldwide. Particularly in this group with extraordinary venous insufficiency rates, its appeal may be partially explained by the clinical opinion of reduced tissue edema and perceived less graft disruption with limb elevation and bed rest. (20) However, a recent Meta-analysis report suggests that for patients receiving STSG, early mobilization may be the best course of action since it promotes healthy graft healing and reduces morbidity. (21) Ellis et al. (2020) also observed no significant association between bed rest towards graft failure. (22) Similarly, our study observed no significant success with a negative pressure dressing. Turissini et al. (2019) showed that Split-thickness skin grafts have a higher success rate when negative pressure wound care is applied following skin graft insertion than when traditional bolster dressing is used. (23)

CONCLUSION

Skin graft failure rates are still high, and several contributing factors are associated with this condition. Immunosuppression use

and BMI were the contributing factors in the present study. Knowledge of these characteristics is crucial during the preoperative examination to identify patients who are more likely to experience postoperative difficulties. It is necessary to conduct many prospective trials to compare the efficacy of various treatments for reducing lower limb problems.

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