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Original Research Article

Comparison of split skin thickness graft survival in diabetic and non-diabetic ulcer

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ABSTRACT

Background: Split skin grafting is widely used surgical procedure for the treatment of ulcers. Graft survival depends on number of factors like vascularity, wound infection etc, diabetes is associated with endothelial dysfunction, neuropathy, wound infection which collectively affect the graft survival. Objective of this study was to compare the amount of graft uptake, the post-operative complications and survival of split thickness skin graft in diabetic and non-diabetic ulcer.
Methods: In our prospective comparative study total 112 patients with ulcer were included of which 56 were diabetic and 56 were non-diabetic. All of them underwent split skin grafting as part of their wound management. Comparison was made between two groups in terms of amount of graft uptake, post-operative wound infection, revisional surgery, donor site infection.
Results: Compared with non-diabetics, diabetics have significantly less graft uptake ($p<0.001$). out of 56 patients in diabetic group 4 (66.7%) underwent revisional surgery, out of 56 patients in non-diabetic group 2 (33.3) patients underwent revisional surgery (p value is <0.68) which is statistically insignificant. 3 (60%) out of 56 in diabetic group developed post-operative graft infection, 2 (40%) out of 56 in non-diabetic group developed graft infection ($p=1$, not significant). One patient in the study developed donor site infection. Among 112 cases, only 1 case had donor site infection with diabetic.
Conclusions: Diabetes is associated with poor graft uptake and post-operative complication rates in patients undergoing split skin grafting.

Keywords: Donor site infection, Diabetes, Revisional surgery, Split skin graft, Recipient site infection

INTRODUCTION

Ulcers represent wide spectrum of etiology and pathology. Severity and morbidity associated with it leads to significant loss of work. Lower-extremity ulceration is a debilitating phenomenon not only affecting the patient directly but having a great impact on the economy, since a significant amount of resources are spent every year to treat, prevent, or decelerate the progression of the disease. Studies carried out earlier found that chronic leg ulceration affects about 1% of the population at some point in their lives. The split-thickness skin grafting (STSG) is the most common performed procedures to close defects unable to be closed with the simple approximation of the wound edges. STSG is the cornerstone in the treatment of deep partial thickness burns with a large risk of scar formation, full-thickness burns and large skin defects.[13] STSG is widely used in dermatological and plastical procedures to manage surgical wounds, postoperative defects (e.g. malignancy excision), chronic wounds, large traumatic wound, prevent fluid loss (e.g. burns) and for cosmetics purposes.

Necrotizing fasciitis (NF) affects the tissue through thrombosis of skin microcirculation, which results in necrosis, liquefaction of fat, and destruction of muscles. For such defects, wound coverage is usually achieved by using meshed STSG.[12] Patients with diabetes are at increased risk for foot ulcers. The prevalence of foot ulcers among patients with diabetes is 12 percent.[11] Diabetic wounds are a significant healthcare problem with its healing depends on many factors such as glycemic control, vascularity, bacterial load, location of the wound, nutritional status of the patient.[11]

The purpose of the study is to compare survival of split thickness skin graft in diabetics and non-diabetic ulcer, to compare the amount of graft uptake in diabetic and non-diabetic ulcers and to compare the post-operative complications of split skin graft in diabetics and non-diabetics.

METHODS

This is a prospective comparative study conducted in the Nijalingappa S Medical College and Honagal Sri Kumareshwar Hospital, Navanagar, Bagalkot from December 2017 to June 2019. Institutional ethics committee clearance was obtained. Total 112 patients were studied of which 56 were diabetics and were 56 non-diabetics. All the patients underwent STSG for the management of ulcer after following standard criteria. Results were compared between two groups in terms of amount of graft uptake, post-operative graft infection, need for revisional surgery, donor site infection. Amount of graft uptake was calculated by measuring surface area of the wound that was grafted and area of the graft that was taken at fifth post-operative day. Surface area was measured with standard manual method of transparent sheet and graph paper.[1] All the patients in the study were followed up for a period of 3 months.

Inclusion criteria

Patients more than 18 years of age undergoing split skin graft, non-diabetic patients with necrotising facitis, burns, traumatic wounds, a known case of diabetes millites patient with ulcer, patients with ulcers secondary to peripheral arterial disease, venous disease.

Exclusion criteria

Patients less than 18 years of age, patients with HIV, malignancies, tuberculosis which hinders wound healing, wounds with moderate or heavy growth of organism.

Statistical analysis

Data were entered in MS excel and analyzed in SPSS V22. Descriptive statistics were represented with percentages, Mean with SD. Chi-square test, Fisher Exact test, Independent t-test were calculated. P value <0.05 was considered as statistically significant.

RESULTS

Among 112 cases, more number of diabetic patients fall in the age group of 61-70 years i.e., 22 (68.8%). Non diabetic patients are aged between 21-30 years i.e., 14 (100%). The correlation between diabetic and non-diabetic with age shows statistically significant with p value <0.001, chi-square value= 30.37.

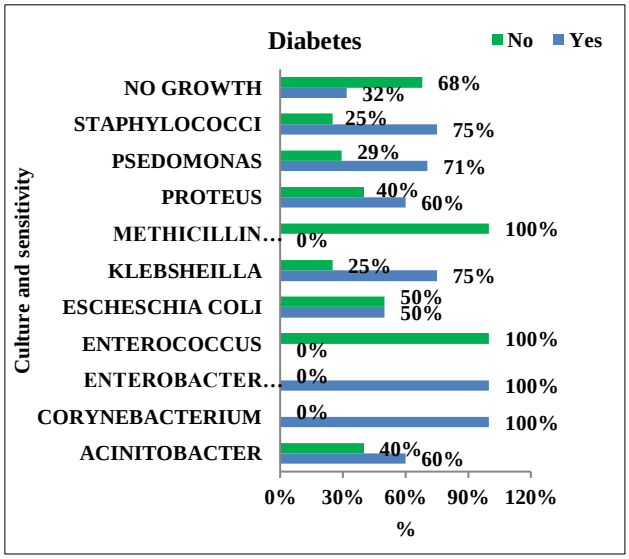

Figure 1: Association between organism and diabetic/non-diabetic among the study participants.

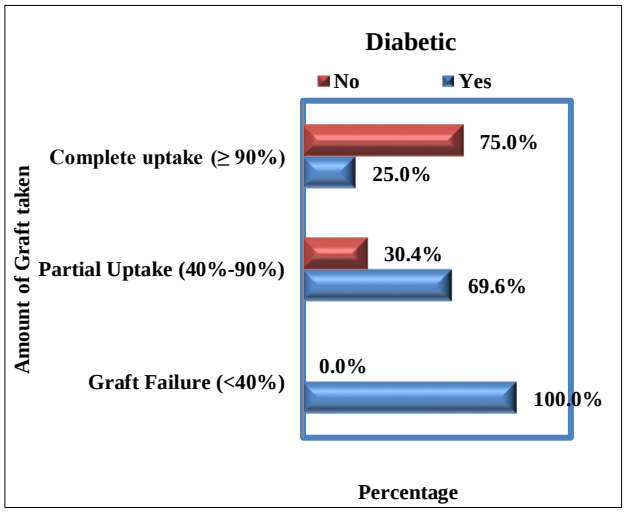

Figure 2: Association between diabetes and graft uptake among the study participants.

Among 112 cases, no growth from pre-operative wound is seen in 47 cases, out of which 15 cases (31.9%) who had diabetes and 32 cases without diabetes (68.1%). Among the total 12 (70.6%) cases with pre-operative pseudomonas infection in diabetic and 5 cases are non-diabetic cases, among the 9 cases (50%) with *E. Coli* infections and diabetes, 9 cases with *E. coli* and non-diabetes (50%). *Klebsheilla* is seen 9 cases with diabetes

(75.0%) and 3 cases without diabetes (25%). Rest Acinetobacter 3 cases with diabetes and 2 cases without diabetes. Corynebacterium in 1 case with diabetes, 3 cases of proteus with diabetes and 2 cases without diabetes, MRSA is seen 1 case without diabetes. *Staphylococci* is seen in 3 cases with diabetes and 1 case without diabetes. Association between organism and diabetic /non diabetic among the study.

Figure 3: Partial uptake of graft in diabetic patient on post op day 5.

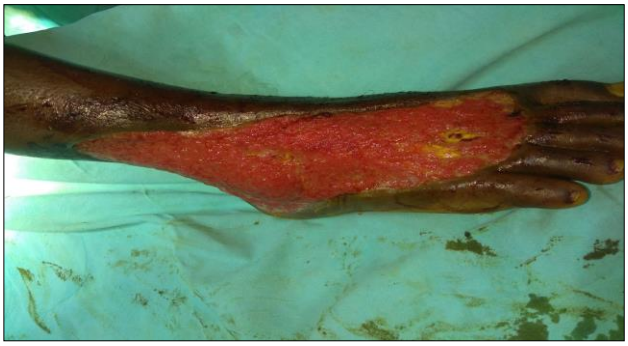

Figure 4: Pre op wound in non-diabetic patient.

Figure 5: Complete uptake of graft in non-diabetic patient on post op day 5.

Participants is statistically not significant with p value= 0.07.

Among 56 cases of non-diabetic's complete graft uptake is seen in 39 cases (75%) compared with diabetic complete graft uptake is seen in 13 cases (25%) compared with diabetics, graft failure seen in 4 cases of diabetic cases and nil in non-diabetic group. Most of the diabetic cases had partial uptake of graft 39 cases (69.9%). Association between diabetes and graft uptake among the study participant was statistically significant (p<0.001).

Table 1: Association between post-operative graft infection and diabetic.

Post operative graft infection	Diabetic			
	Yes		No	
	Count	%	Count	%
Yes	3	60.0	2	40.0
No	53	49.5	54	50.5
Total	56	50.0	56	50.0
P=1				

Among 112 cases 6 patients underwent revised graft surgery out of which 4 are diabetic (66.7%) and 2 are non-diabetic (33.3%). Association between revised graft surgery and diabetic is not statistically significant p value= 0.68.

Figure 6: Post-operative graft infection in diabetic patient.

Among 112 cases, only 1 case had donor site infection with diabetic and rest had no donor site infection. This association between donor site infection and diabetic is not statistically significant p value= 1.

Among 112 cases, 5 cases had postoperative graft infection, out of it 3 cases are diabetic and 2 are nondiabetic association between post-operative graft infection and diabetic not statistically significant p value= 1.

Association between duration of complete healing of wound and diabetic statistically significant with p value <0.001. Mean and SD of diabetic cases in association with duration of complete healing is 35.43 and 29.91 respectively and in non-diabetics mean 19.93, SD 13.54.

Table 2: Association between duration of complete healing of wound in diabetic and non-diabetic patients.

Variable	Diabetic	N	Minimum	Maximum	Mean	SD	P value
Duration of complete healing of wound	No	56	10.0	90.0	19.93	13.54	0.001
	Yes	56	10.0	180.0	35.43	29.91	
	Total	112	10.0	180.0	27.68	24.39	

DISCUSSION

The present study is a prospective study aimed at assessing the amount of graft uptake and the post-operative complications in diabetic and non-diabetic ulcer. This study analyzed 112 patients who underwent split skin grafting for the treatment of ulcers. The study included patients from 18 years to 84 years. The mean age of the participants in the study is 55.8 years.

Among 112 cases, more number of diabetic patients fall in the age group of 61-70 years i.e. 22 (68.8%). Non diabetic patients are aged between 21-30 years i.e. the correlation between diabetic and non-diabetic with age shows statistically significant with p value <0.001, chi-square value= 30.3.[14] In a study by Moghazy et al, there was a significant correlation between age and skin graft uptake, where with lower age the graft uptake is better.[4]

Table 3: Association between graft uptake and diabetes in similar studies.

Name of study	Result
Mowlavi et al[9]	Decreased graft take in individuals with hyperglycemia
Ramanujam et al[10]	Diabetic patients shown decreased graft uptake
Present study	Statistically significant (p<0.001), decreased graft uptake in diabetes

Among 112 cases, female with diabetes are 14 (42.4%) without diabetes are 19 (57.6%). Males with diabetes are 42 (53.2%), without diabetes are 37 (46.8%). Gender distribution of the study participants in diabetic and non-diabetic is statistically not significant with p value= 0.41.

Hogsberg et al shown that male to female ratio 1:1.2 with mean age 69 years, no statistical relationship with gender and graft uptake.[2] Among 56 cases of non-diabetics complete graft uptake is seen in 39 cases (75%) compared with diabetic complete graft uptake is seen in 13 cases (25%) compared with diabetics, graft failure seen in 4 cases of diabetic cases and nil in non-diabetic group. Most of the diabetic cases had partial uptake of graft 39 cases (69.9%). Association between diabetes and graft uptake among the study participant was statistically significant (p<0.001). Mowlavi et al reported decreased graft take in individuals with hyperglycemia; however, the authors used only preoperative serum glucose level, rather than a diagnosis of diabetes, in their analyses and did not distinguish between patients with and without the co-morbidities associated with diabetes.[9]

Table 4: Association between duration of complete healing of wound in diabetic.

Name of study	Result
Ramanujam et al[10]	Significant differences in healing time
Present study	Duration of healing of wound is significant

Among 112 cases 6 patients underwent revised graft surgery out of which 4 are diabetic (66.7%) and 2 are non-diabetic (33.3%). Association between revised graft surgery and diabetic is not statistically significant p value= 0.68. Ramanujam et al retrospectively reviewed 203 patients who underwent STSG to determine significant differences in healing time, postoperative infection, and need for revision surgery and to create a predictive model to identify diabetic patients who are likely to have a successful outcome.[10] Overall, diabetic patients with preexisting co morbidities experienced a significantly increased risk of delayed healing time and postoperative infection and a higher need for revision surgery compared with non-diabetic patients or diabetic patients without co-morbidities. Among 112 cases, only 1 case had donor site infection with diabetic and rest had no donor site infection. This association between donor site infection and diabetic is not statistically significant p value= 1. Among 112 cases, 5 cases had post-operative graft infection, out of it 3 cases are diabetic and 2 are non-diabetic association between post-operative graft infection and diabetic not statistically significant p value= 1. Though post-operative wound infection rate was high in diabetics, it is not statistically significant. This study shown that correlation between duration of ulcer and diabetic is not statistically significant with p value= 0.14.

This study shown that association between size of ulcer and diabetic is not statistically significant with p value= 0.67. Among 56 cases of diabetic, mean 0.72 and SD 0.19. Among 56 cases of non-diabetic mean 0.91 and SD 0.10. Association between amount of graft taken and diabetic statistically significant with p value <0.001.

Ramanujam et al shown that diabetic patients without other comorbidities affect graft uptake.[10] This study shown that association between duration of complete healing of wound and diabetic statistically significant with p value <0.001. Mean and SD of diabetic cases in

association with duration of complete healing is 35.43 and 29.91 respectively and in non-diabetics mean 19.93, SD 13.54. This study shown association between hemoglobin and graft uptake is not statistically significant with p value= 0.06. Agarwal et al shown that no significant relationship between hemoglobin level and graft uptake.[6]

CONCLUSION

This study demonstrates that split skin graft uptake is significantly less in diabetics compared to non-diabetics. Rate of revisional surgery after skin grafting is significantly high in diabetic patients. There is no significant difference in donor site infection between diabetics and non-diabetics. Post-operative graft infection rates are high in diabetics though it is statistically insignificant. In patients with long standing diabetes, graft infection rates are significantly high. Rate of complete graft failure is significantly high in diabetics.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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