



CLINICAL PROFILE OF PATIENTS UNDERGOING SPLIT SKIN GRAFT FOR DIABETIC FOOT ULCER

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ABSTRACT

Introduction: Diabetic foot ulcer is a chronic complication of diabetes mellitus which manifest as lesions on the deep tissue of the foot. It has an estimated global prevalence of 6.3% with 15-25% of diabetes mellitus patients developing DFU during their lifetime. **Aim:** To assess the clinical profile of patients undergoing split skin graft for diabetic foot ulcer. **Methodology:** It is a hospital based cross sectional study conducted among 50 patients aged 20 years or above with diabetic foot ulcer and planned for split thickness skin graft in a tertiary care teaching hospital. Sociodemographic characteristics and history were taken using a preformed proforma, clinical examination including ulcer assessment and arterial assessment was done. Laboratory parameters like FBS, PBS, HbA1C were taken using standard diagnostic procedures on the next day of admission. **Results:** 58% of the participants were male and the mean age of participants was 54.7±13.4 years. 62% of the patients gave history of ulcer for more than one month. 72% of the case had single wound. Right foot was involved in 52% cases and left foot in the rest. The glycosylated hemoglobin of the participants ranged from 5.8-9.3% with mean value of 7.8±0.87%. In addition, fasting blood sugar ranged from 121-362mg/dl with mean value of 201.3±51.7mg/dl. Similarly, the post prandial blood sugar ranged from 143-30mg/dl with mean value of 222.2±51.7mg/dl. **Conclusion:** Majority of the cases of diabetic foot ulcer patients coming for split skin graft procedure have clean wound but uncontrolled diabetic profile.

KEYWORDS

Diabetic foot ulcer, split skin graft, graft uptake, fasting blood sugar

INTRODUCTION

Diabetic foot ulcer (DFU) is a chronic complication of diabetes mellitus which manifest as lesions on the deep tissue of the foot. It has an estimated global prevalence of 6.3%¹ with 15-25% of diabetes mellitus patients developing DFU during their lifetime². This is of public health importance as Diabetes mellitus affects 463 million population worldwide with a global prevalence of 9.3%, and is expected to rise to 25% by 2030 and 51% by 2045³. Various musculoskeletal, dermatological, vascular and neurological changes in diabetes mellitus leads to DFU⁴. Elderly population, duration of DM, history of hypertension and smoking contribute to the disease⁵. In addition, 50% of the patients with DFU develop infection with *Pseudomonas*, *E. coli*, and *S. aureus* infections causing most of the infection. Moreover, 20% of the patients require amputation, with 50% of them requiring secondary amputation within 2 years⁶. Hence early appropriate intervention and management of diabetic foot ulcer is of utmost importance.

Every patient with diabetes mellitus needs to be assessed for risk of DFU and other complications⁵. The DFU can be classified based on methods like diabetes ulcer severity score classification (DUSS)⁷, Meggitt Warner classification⁷ and PEDIS classification⁸ (Perfusion, extent/size, depth, infection and sensation). This helps in predicting mortality and risk of amputation in DFU cases⁹. While guidelines on management of DFU vary across countries, the standard of care for DFU include debridement, dressing, off-loading, vascular assessment and management of active infection¹⁰⁻¹¹. Parallely, metabolic control, health education and self-care play important role in patient care¹⁰⁻¹¹. Adjuvant therapies include skin graft and bioengineering techniques, platelet derived growth factors, energy-based therapies like electrical stimulation and shock wave therapies, negative pressure wound therapies, oxygen therapies and systemic therapies¹². Split thickness Skin graft is one such technique where a cutaneous tissue consisting of epidermis and superficial part of dermis is transferred from one part of the body to another to close the wound¹³. They can be classified based on origin as natural, semisynthetic or synthetic¹⁴; and based on pattern as sheet or island¹⁵. These grafts are mainly indicated when other simple method of wound closure has failed¹⁶. However, they are absolutely contraindicated in cases of active infection, active bleeding and known cancer, and are relatively contraindicated in wounds with exposed bone, tendon, nerve, or blood vessel without appropriate vascular layer¹⁶. As DFU constitute for 30% of all admissions in DM cases, and split thickness skin graft is indicated when other measures of wound management have failed, the current study is conducted with an aim of understanding the clinical profile of such patients.

MATERIAL AND METHODOLOGY

It is a hospital based cross sectional study conducted between among 50 patients with diabetic foot ulcer and planned for split thickness skin

graft in A.J. Institute of Medical Sciences, Mangaluru, Karnataka. The study was conducted for a period of 1 year from September 2020 to September 2021.

Inclusion Criteria:

1. Patients diagnosed with diabetic foot ulcer and undergoing split skin graft
2. Aged 20 years or above
3. A clean wound or ulcer with adequate granulation tissue
4. Consent given

Exclusion Criteria

1. Recurrent ulcer after skin grafting
2. Culture report suggestive of colonization of *S. Aureus* or *S.pyogenes*
3. X ray suggestive of Osteomyelitis of underlying bones

After taking permission from institutional ethical committee and concerned authorities, patients satisfying the inclusion and exclusion criteria were approached for the study. Socio-demographic characteristics and diabetic history of the patient were taken using preformed semi-structured questionnaire. Clinical examination of the ulcer was done with focus on site, size and number of lesions. Patients were further evaluated for palpable pulsations evaluation of palpable pulsations including femoral, popliteal, anterior tibial, posterior tibial, and dorsalis pedis artery. Laboratory parameters like FBS, PBS, HbA1C were taken using standard diagnostic procedures on the next day of admission.

RESULTS AND DISCUSSION

A. Socio-demographic Characteristics

The study included 50 patients planned for split thickness skin graft for diabetic foot ulcer. The patients belonged to the age group of 20 – 80 years with the mean age of 54.7±13.4 years. 58% of the cases were male with M:F ratio of 1.4:1. Majority of the cases were from urban residency (72%), BPL family (62%) and nuclear family (48%) (Table No.1).

B. Clinical Characteristics Of Participants

98% of the cases were suffering from type 2 Diabetes Mellitus and 40% of the participants were diagnosed cases of hypertension on medications. While half of the participants were diagnosed of DM for more than 5 years, 44% were diagnosed for a period of 1-5 years and the rest for less than one year. 54% of the patients were on oral antidiabetic medications on admission and 38% of the cases were on insulin injection. Remaining 8% were taking other medications like ayurvedic medications for diabetic control. 42% of the cases gave history suggestive of poor compliance towards medication. 62% of the patients gave history of ulcer for more than one month. 72% of the case had single wound. Right foot was involved in 52% cases and left

foot in the rest. The ulcer was equally distributed on dorsum and plantar surface of the foot. While 56% of the cases had wound size of less than 50 cm², wound size was between 50-100 cm² and > 100 cm² in 26% cases and 18% cases respectively. 8% case had previous history of wound infection.

C. Laboratory Parameters

The glycosylated hemoglobin of the participants ranged from 5.8-9.3% with mean value of 7.8±0.87%. In addition, 90% of the cases had HbA1c > 6.5% and on further assessment, 86% had HbA1c > 7%, and 48% had HbA1c > 8%. Fasting blood sugar (FBS) ranged from 121-362mg/dl with mean FBS of 201.3±51.7mg/dl. Similarly, the post prandial blood sugar (PPBS) ranged from 143-30mg/dl with mean value of 222.2±51.7mg/dl.

DISCUSSION

Split thickness skin graft is a type of management technique used in patients with diabetic foot ulcer where other measures like debridement, dressing and off loading have failed in providing adequate closure of the wound¹⁶. To provide the best outcome through STSG techniques, certain requisitions like clean and vascularized donor and recipient sites of grafts should be established. In contrast, ulcers with active infections, active bleeding and known cancer are absolute contra-indications for the procedure¹⁶. The current study was done to assess the clinical profile of patients planned for STSG procedure in DFU to understand the patient profile and ulcer evaluation in such patients, and also to assess their diabetic control at the time of admission. In addition to early complications poor wound bed or any build up fluid or shear/traction injury, with overall poor uptake of the graft, these parameters may also lead to long term complications like contracture and aesthetic issues¹⁶.

In the current study, there was good distribution of participants across both genders (M: F = 1.4:1) with mean age of participants of 54.7±13.4 years. These results were comparable to similar study by Saseedharan S et.al.¹⁷, where the mean age of participants was 58 years + 15 years with 59.7% male patients and to a study done by Jyothylekshmi V, Menon AS and Abraham S¹⁸, in a podiatric clinic in a tertiary care hospital in South India, where the mean age of participants was 61 years with higher cases among men. Hence the current study showed similar representation of population with DFU planned for STSG, compared to studies done in other geographical areas. Moreover, our study noted that majority of the cases belonged to urban residence and to poor socio-economic status. This could be because of the geographical location of the hospital and the major population it caters. However, it should be noted that previous studies have shown significant association between low socio-economic status with DFU and Diabetic foot syndrome¹⁹⁻²¹. Oladele CR and Barnett E²² noted that poor preventive practices among low SES population attributed to it. It may also be due to their inability to obtain adequate health care services²¹.

In our study, half of the cases had been diagnosed with DM for more than 5 years and 62% of the cases had ulcer duration of more than 1 month. Similarly, Prakash V²³, in Bihar, noted that 68% of cases of DFU ulcer had diabetes mellitus for more than 5 years. And a study in Tanzania²⁴ noted that 62% cases planned for amputation for diabetic infections had DM for similar durations. However, there is a scarcity of such data on patients planned for split thickness skin graft. There is a need for further studies assessing the same. Furthermore, our study noted that there was equal distribution of DFU in both leg and both sides of foot. The current study also noted that 56% of the cases had ulcer size of 5-10 cm². This result was similar to a study in Sudan where 60% of cases planned for STSG had wound size of 5-10 cm². On contrast, a meta-analysis by Yammime K and Assi C²⁶ noted a larger ulcer size of 40 ± 28.4 cm². Hence, there is a need for guideline for selection of such cases for STSG based on ulcer size and duration. Our study also assessed the compliance on medication and diabetic profile of patients planned for STSG for DFU. 42% of cases poor drug compliance and poor diabetic profile was noted in majority of cases. Studies have noted that poor glycaemic control can lead to increased risk of lower extremity amputation among DFU cases²⁷⁻²⁸. Moreover, previous study in Mangaluru²⁹ has also noted poor diabetic profile

among cases admitted for STSG for DFU. Hence, there is a need for liaison with medicine and endocrine departments for better outcome in STSG for DFU. However, our study didn't document the peripheral artery status of these patients and this is one of the limitations of the study. Despite this, to best of our knowledge, our study is one of the first studies to assess the clinical profile of patients with diabetic foot ulcer planned for split thickness skin graft. There is a need for similar studies to understand the selection of cases for these procedures, along with assessing the outcome in such cases. Such studies will provide evidence based knowledge for future guidelines on standard of procedures for such cases.

Table No.1: Socio-demographic Characteristics Of Patients Undergoing Split Skin Graft For Diabetic Foot Ulcer

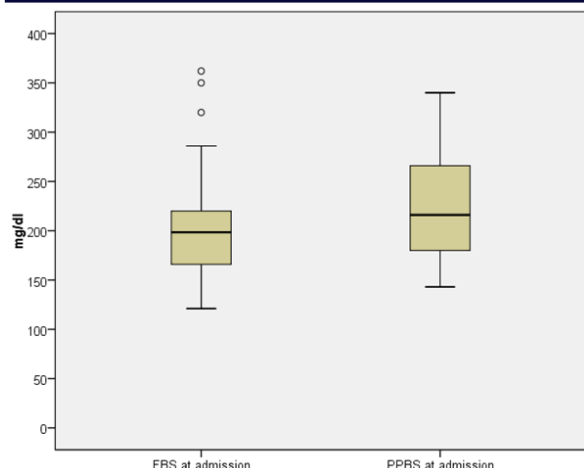
Socio-demographic characteristics	Frequency	Percentage
Age		
20-40 years	7	14
40 – 60 years	24	28
60 – 80 years	19	38
Gender		
Male	29	58
Female	21	42
Residence		
Urban	36	72
Rural	14	28
Socio-economic status		
BPL	31	62
APL	19	38
Type of family		
Nuclear	24	48
Joint	10	20
3 generation family	16	32
Total	50	100

Table No.2: Clinical Characteristics Of Patients Undergoing Split Skin Graft

Clinical characteristics	Frequency	Percentage
Type of DM		
Type 2	49	98
Type 1	1	2
Duration of DM		
< 1 year	3	6
1-5 years	22	44
> 5 years	25	50
Duration of ulcer		
< 1 month	19	38
>1 month	31	62
Side of wound		
Right foot	26	52
Left foot	24	48
Site of wound		
Dorsum	25	50
Plantar	25	50
Size of wound		
Less than 50 cm2	13	26
50-100 cm2	28	56
>100 cm2	9	18
Antidiabetic medications		
Oral drugs	27	54
Insulin injection	19	38
Others	4	8
Compliance to medication		
Good/regular	29	58
Poor/irregular	21	42
Hypertension		
Yes	20	40
No	30	60
Total	50	100

Table No.3: Laboratory Characteristics Of Patients At The Time Of Admission

Parameter	Range	Mean±SD
HbA1c (Glycosylated hemoglobin)	5.8 - 9.3	7.8 ± 0.87
Fasting blood sugar (FBS)	121 - 362	201.3 ± 51.7
Post prandial blood sugar (PPBS)	143 - 340	222.2 ± 51.7



Graph No.1: Box Plot Showing Distribution Of Fbs And Ppbs Among Study Participants

CONCLUSION

Modifiable risk factors like poor diabetic profile are high in diabetic foot ulcer patients planned for split thickness skin graft and these need to be assessed in liaison with physicians in pre-operative evaluation. Moreover, further studies are needed to assess the clinical profile of patients planned for such procedure for future guidelines on STSG for DFU.

Abbreviations

DFU: Diabetic foot ulcer
DM: Diabetes Mellitus
FBS: Fasting blood sugar
PPHS: Post prandial blood sugar
HbA1c: Glycosylated hemoglobin
STSG: Split thickness skin graft

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