

# Twice Daily Saline Dressing versus Single Dressing before Split Skin Grafting Among Diabetic Foot Ulcer Patients and its Role in the Percentage of Graft Uptake: A Cross-Sectional Study

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## Abstract

**Objective:** The objective of the study is to assess the percentage of graft uptake among diabetic foot ulcer patients undergoing twice daily saline dressing versus single saline dressing for a week before split skin grafting.

**Methodology:** This is a cross-sectional study involving 50 diabetic foot ulcer patients, above 18 years of age who have undergone split skin grafting at Saveetha Medical College. Out of the 50 patients, 25 of them underwent twice daily normal saline dressing, and the other 25 underwent normal saline dressing once daily before split skin grafting. The percentage of graft uptake after split skin grafting was assessed at 1<sup>st</sup> week, 2<sup>nd</sup> week, and 3<sup>rd</sup> week and compared between the two groups during regular follow up.

**Results:** In the study group, out of the 50 patients 33 were male (66%) and 17 were female (34%). Among the study population, most of them had Type II diabetes mellitus for a period of 1–10 years, 44 patients (88%), and the average duration of ulcer was <1 month, 32 patients (64%). Average graft uptake among diabetic foot ulcer patients undergoing split skin grafting with single daily saline dressing for a week before the procedure is, at 1<sup>st</sup> look 78%, at 2<sup>nd</sup> look 72%, at 3<sup>rd</sup> look 69%. The average graft uptake among diabetic foot ulcer patients undergoing split skin grafting with twice daily saline dressing for a week before the procedure is, at 1<sup>st</sup> look 93%, at 2<sup>nd</sup> look 89%, at 3<sup>rd</sup> look 87%.

**Conclusion:** The percentage of graft uptake is higher and better among patients undergoing twice daily normal saline dressing than among patients undergoing single daily normal saline dressing for a week before split skin grafting. Hence twice daily normal saline dressing before split skin grafting helps in better graft uptake and wound healing, among diabetic foot ulcer patients which will greatly help in reducing the morbidity of the disease.

**Key words:** Diabetes mellitus, Diabetic foot ulcer, Graft uptake, Morbidity, Normal saline dressings, Split skin grafting

## INTRODUCTION

Diabetes mellitus is an important and highly prevalent disease in various parts of the world. Its incidence and prevalence in India are rapidly increasing and is a major cause of morbidity and mortality. According to the International Diabetes Foundation, although the country has now been surpassed in the top spot by China. Diabetes currently affects

more than 62 million Indians, which is more than 7.1% of the adult population. The average age on onset is 42.5 years. Nearly 1 million Indians die due to diabetes every year.<sup>[1]</sup>

Diabetic foot ulcer is a major complication and cause of morbidity among diabetic patients. Wound healing is an innate mechanism of action that works reliably most of the time. A key feature of wound healing is stepwise repair of lost extracellular matrix that forms the largest component of the dermal skin layer. But in some cases, certain disorders or physiological insult disturbs the wound healing process. Diabetes mellitus is one such metabolic disorder that impedes the normal steps of the wound healing process.<sup>[2]</sup> Diabetic foot ulcer occurs in 15% of people with diabetes and precedes 84% of all diabetes-related lower-leg amputations.<sup>[3]</sup>

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Risk factors implicated in the development of diabetic foot ulcers are infection, older age, diabetic neuropathy, peripheral vascular disease, cigarette smoking, poor glycaemic control, previous foot ulcerations or amputations, and ischemia of small and large blood vessels. Prior history of foot disease, foot deformities that produce abnormally high forces of pressure, renal failure, edema, impaired ability to look after personal care (e.g., visual impairment) are further risk factors for diabetic foot ulcer.<sup>[4]</sup>

Split Skin Grafting is a major surgical technique involved in the treatment of diabetic foot ulcers. A split-thickness skin graft (STSG) is a skin graft including the epidermis and part of the dermis. Its thickness depends on the donor site and the needs of the person receiving the graft. It can be processed through a skin mesher, which makes apertures onto the graft, allowing it to expand up to nine times its size. Split-thickness grafts are frequently used as they can cover large areas and the rate of autorejection is low.<sup>[5]</sup>

Split skin grafting in diabetics pose a great challenge because of various factors such as neuropathy, endothelial dysfunction, increased susceptibility to infection, hyperglycemia. These factors produce various effects such as delayed presentation of ulcers to the hospital (due to neuropathy), increased chance of infection leading to poor wound healing, reduced chemotactic factors to fight infections, microvascular damage to eyes, kidneys, and distal extremities.<sup>[6]</sup> All these factors have to be taken into account when planning the line of management.

Treatment of all wounds requires adequate wound bed preparation, beginning with irrigation and debridement.<sup>[7]</sup> Adequate irrigation is an important step involved in the healing process and various agents can be used in the process. The various agents which can be used are povidone-iodine, water, saline, hydrogen peroxide.<sup>[8]</sup> Proper dressing of the wound and the number of times the wound has been irrigated and dressing done, will greatly influence wound healing and graft uptake.<sup>[9]</sup>

This study involves assessing and comparing the percentage of graft uptake among patients undergoing single daily saline dressing and those undergoing twice daily saline dressing. Increased percentage of graft uptake indicates greater wound healing which will, in turn, result in a reduction in the morbidity caused by diabetic foot ulcers. Better irrigative procedure which improves graft uptake can be used and patient outcome can be improved worldwide.

## OBJECTIVES

- To assess the percentage of graft uptake among ulcer patients undergoing split skin grafting with a single

daily saline dressing for a week before the procedure

- To assess the percentage of graft uptake among ulcer patients undergoing split skin grafting with twice daily saline dressing for a week before the procedure
- To compare the percentage of graft uptake between the two groups.

## METHODOLOGY

### Study Design

Cross sectional study.

### Study Area

Saveetha Medical College, Thandalam.

### Study Population

Diabetic foot ulcer patients above 18 years of age in Saveetha Medical College, Thandalam.

### Inclusion Criteria

- Those who are willing to participate in the study
- Patients above 18 years with a diabetic foot ulcer
- Patients above 18 years with non-healing ulcer for >2 weeks
- Patients above 18 years with wound culture and sensitivity negative.

### Exclusion Criteria

- Those who are not willing to participate in the study
- Patients above 18 years with vascular compromise
- Patients with a previous history of surgery or split skin graft
- Patients above 18 years with traumatic ulcers
- Patients above 18 years with positive wound culture.

### Duration of the Study

6 months.

### Sample Size

50 individuals.

### Sampling Method

Simple random sampling method.

### Sample Unit

Patients in Saveetha Medical College, Thandalam.

### Data Collection Technique

Interview schedule.

### Data Analysis

Data entry will be done in MS Excel and analysis is done using SPSS (version 16) software. Descriptive statistics will be calculated for background variables related to twice daily saline dressing versus single dressing for a week before split

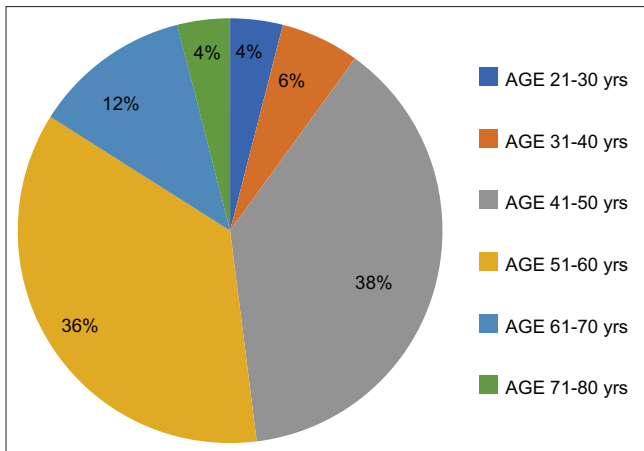


Figure 1: Age group of the patients

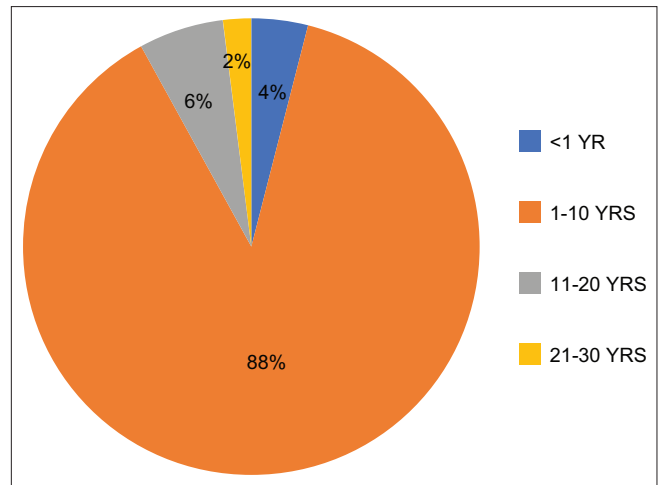


Figure 4: Duration of diabetes mellitus among the patients

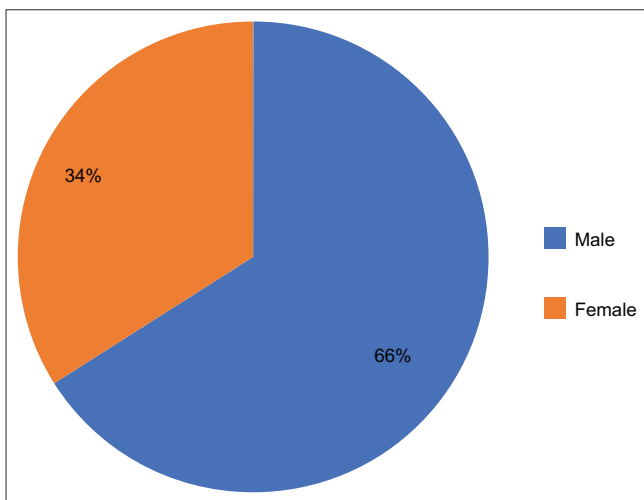


Figure 2: Sex distribution of the patients

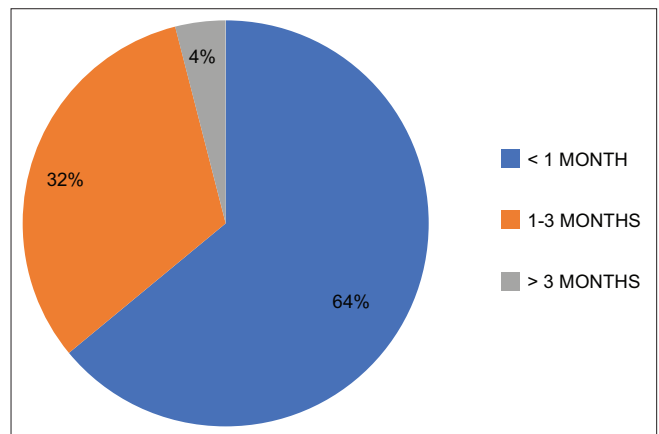


Figure 5: Duration of ulcer among the patients

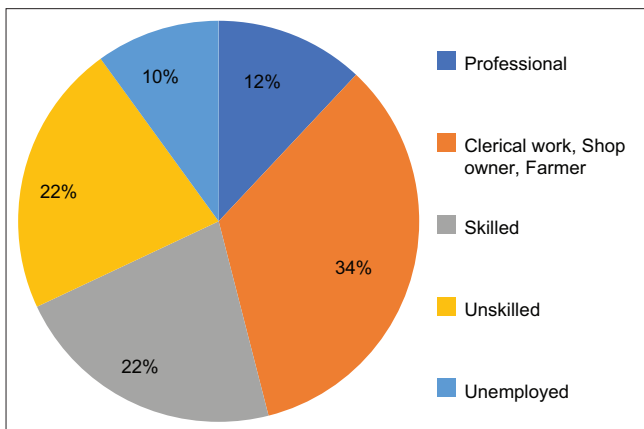


Figure 3: Occupation of the patients

skin grafting and the percentage of graft uptake. Association between the background variables and the factors affecting twice daily saline dressing versus single dressing for a week before split skin grafting and the percentage of graft uptake will be analyzed by test and proportion and the chi-square test will be used as test of significance.

## BENEFITS

A cross-sectional study which involves assessing the percentage of graft uptake among patients undergoing, twice daily saline dressing versus single dressing for a week before split skin grafting. This study will help in the undertaking of better wound care procedures which will help in enhanced wound healing and higher percentage of graft uptake among patients undergoing split skin grafting.

## Potential Risks

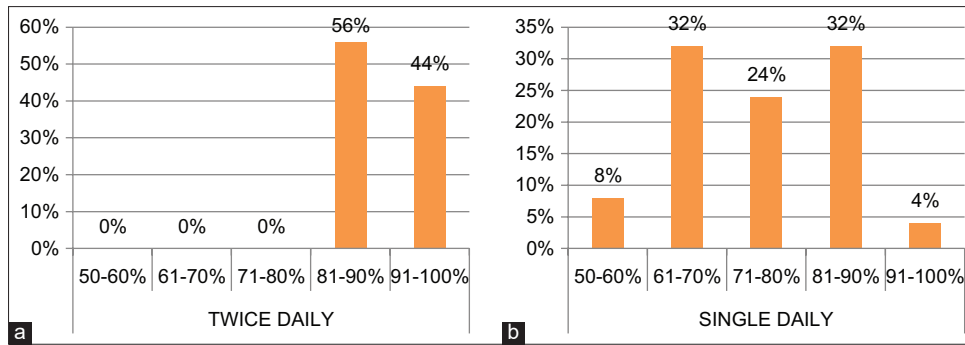
No potential risk involved.

## RESULTS

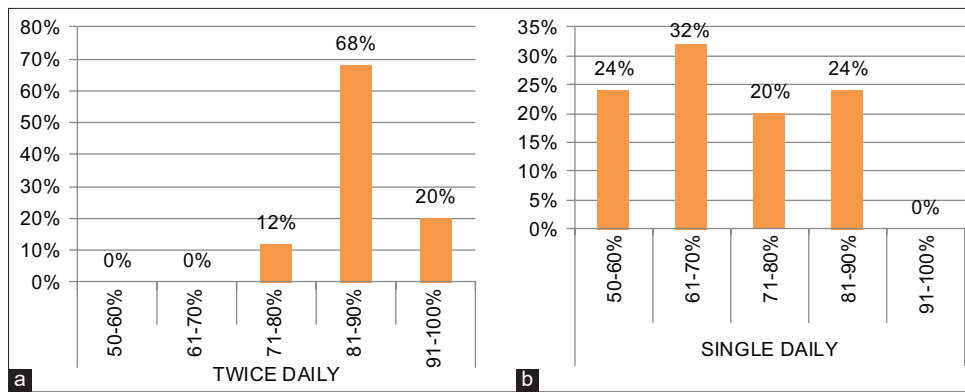
### Background Variables

A study was done to assess the percentage of graft uptake among diabetic foot ulcer patients undergoing split skin grafting with single daily saline dressing versus twice daily saline dressing for a week before the procedure.

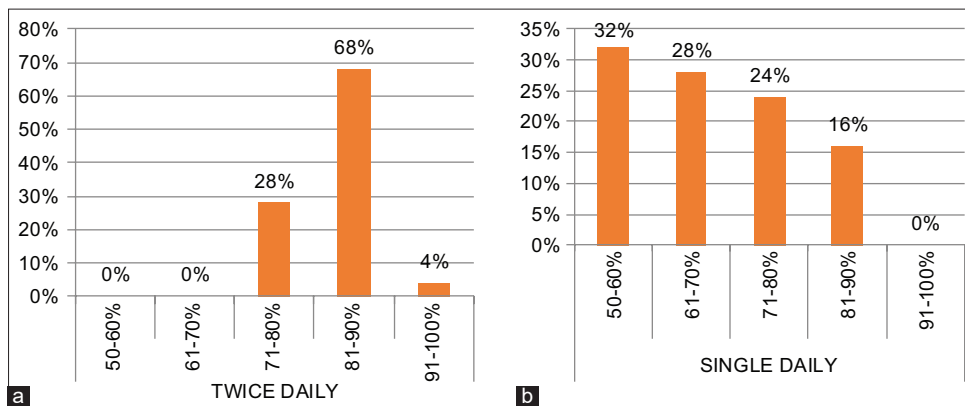
The study included a total of 50 patients with diabetic foot ulcer divided into two groups, 25 patients had single



**Figure 6:** (a and b) Percentage of graft uptake among patients with twice daily saline dressing versus single daily saline dressing for a week before split skin grafting at 1<sup>st</sup> look



**Figure 7:** (a and b) Percentage of graft uptake among patients with twice daily saline dressing versus single daily saline dressing for a week before split skin grafting at 2<sup>nd</sup> look



**Figure 8:** (a and b) Percentage of graft uptake among patients with twice daily saline dressing versus single daily saline dressing for a week before split skin grafting at 3<sup>rd</sup> look

daily saline dressing for a week before the procedure and the other 25 patients had twice daily saline dressing for a week before the procedure.

In the study, out of the 50 patients, 33 were male (66%) and 17 were female (34%) [Figure 2]. Among the 50 patients involved in the study, maximum number of patients belonged to the age group 41–50 years (38%) [Figure 1].

With regard to occupation most of them 17 (34%) belonged to clerical, shop owner, farmer group [Figure 3][Table 1].

### Duration of Diabetes Mellitus

Among the study group which included 50 patients, most of them 44 (88%) had diabetes mellitus for a period of 1–10 years [Figure 4][Table 2].

**Table 1: background variables of the study subject**

Questions	Responses	Frequency	Percentage
Age	21-30 yrs	2	4
	31-40 yrs	3	6
	41-50 yrs	19	38
	51-60 yrs	18	36
	61-70 yrs	6	12
	71-80 yrs	2	4
Sex	Male	33	66
	Female	17	34
Occupation	Professional	6	12
	Clerical work, shop owner, farmer	17	34
	Skilled	11	22
	Unskilled	11	22
	Unemployed	5	10

**Table 2: Duration of diabetes mellitus among the patients involved in the study**

Questions	Responses	Frequency	Percentage
Duration of diabetes	<1 year	2	4
	1-10 years	44	88
	11-20 years	3	6
	21-30 years	1	2%

**Table 3: Duration of ulcer among patients involved in the study**

Questions	Responses	Frequency	Percentage
Duration of ulcer	<1 month	32	64
	1-3 months	16	32
	>3 months	2	4

**Duration of Ulcer**

In the study out of the 50 patients, maximum number of them 32 (64%) had an ulcer duration of <1 month [Figure 5][Table 3].

**Percentage of Graft Uptake**

Among the 25 patients receiving single daily saline dressing for a week before the procedure of split skin grafting, maximum number of them 8 (32%) had graft uptake between 61% and 70% and 81% and 90% at 1<sup>st</sup> look, 8 (32%) had graft uptake between 61% and 70% at 2<sup>nd</sup> look and 8 (32%) had graft uptake between 50% and 60% at 3<sup>rd</sup> look [Figure 6-8].

Among the 25 patients receiving twice daily saline dressing for a week before the procedure of split skin grafting, maximum number of them 14 (56%) had graft uptake between 81% and 90% at 1<sup>st</sup> look, 17 (68%) had graft uptake between 81% and 90% at 2<sup>nd</sup> look and 17 (68%) had graft uptake between 81% and 90% at 3<sup>rd</sup> look [Figure 6-8].

**Table 4: Percentage of graft uptake among patients at various looks**

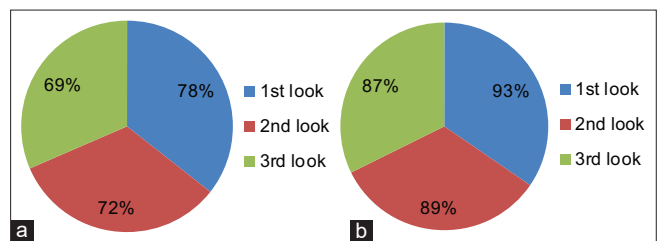
Percentage of graft uptake at first look			
Questions	Responses	Frequency	Percentage
Twice daily	50-60	0	0
	61-70	0	0
	71-80	0	0
	81-90	14	56
	91-100	11	44
Single daily	50-60	2	8
	61-70	8	32
	71-80	6	24
	81-90	8	32
	91-100	1	4

Percentage of graft uptake at second look			
Questions	Responses	Frequency	Percentage
Twice daily	50-60	0	0
	61-70	0	0
	71-80	3	12
	81-90	17	68
	91-100	5	20
Single daily	50-60	6	24
	61-70	8	32
	71-80	5	20
	81-90	6	24
	91-100	0	0

Percentage of graft uptake at third look			
Questions	Responses	Frequency	Percentage
Twice daily	50-60	0	0
	61-70	0	0
	71-80	7	28
	81-90	17	68
	91-100	1	4
Single daily	50-60	8	32
	61-70	7	28
	71-80	6	24
	81-90	4	16
	91-100	0	0



**Figure 9:** (a and b) Average graft uptake among diabetic foot ulcer patients undergoing split skin grafting with single daily saline dressing and twice daily saline dressing respectively

Average graft uptake among diabetic foot ulcer patients undergoing split skin grafting with single daily saline dressing for a week before the procedure is, at 1<sup>st</sup> look 78%, at 2<sup>nd</sup> look 72%, at 3<sup>rd</sup> look 69%. The average graft

uptake among diabetic foot ulcer patients undergoing split skin grafting with twice daily saline dressing for a week before the procedure is, at 1<sup>st</sup> look 93%, at 2<sup>nd</sup> look 89%, at 3<sup>rd</sup> look 87% [Figure 6-8].

## DISCUSSION

In a study conducted by Saaq *et al.* on vacuum-assisted closure (VAC) therapy as a pre-treatment for STSGs, among 100 adults, the results were found to be in favor of the VAC therapy group with respect to the various wound management outcome measures studied, i.e., graft take (>95% graft take in 90% of VAC therapy group vs. 18% of controls), wound healing time (2 weeks post grafting in 90% of VAC therapy group vs. 18% of controls), need for re-grafting (none among VAC therapy group vs. 8% of controls) and duration of hospital stay (<3 weeks in 90% of VAC therapy group vs. 18% of controls).<sup>[10]</sup>

In this study involving 50 patients with diabetic foot ulcer, the results were found to be, average graft uptake among patients undergoing split skin grafting with single daily saline dressing for a week before the procedure is, at 1<sup>st</sup> look 78%, at 2<sup>nd</sup> look 72%, at 3<sup>rd</sup> look 69%. The average graft uptake among patients undergoing split skin grafting with twice daily saline dressing for a week before the procedure is, at 1<sup>st</sup> look 93%, at 2<sup>nd</sup> look 89%, at 3<sup>rd</sup> look 87%.

In a study conducted by Younes *et al.* on wound bed preparation with 10% phenytoin ointment increases the take of STSG in large diabetic ulcers, among 16 patients with diabetic foot ulcer whose wound bed was prepared using 10% phenytoin 2–8 weeks prior to grafting, the results were found to be that the graft survival was 100% in twelve patients, 80–90% in three patients take and 60% in one patient. Neither local nor systemic side effects were observed.<sup>[11]</sup>

In this study involving 50 patients with diabetic foot ulcer, the results were found to be, average graft uptake among patients undergoing split skin grafting with single daily saline dressing for a week before the procedure is, at 1<sup>st</sup> look 78%, at 2<sup>nd</sup> look 72%, at 3<sup>rd</sup> look 69%. The average graft uptake among patients undergoing split skin grafting with twice daily saline dressing for a week before the procedure is, at 1<sup>st</sup> look 93%, at 2<sup>nd</sup> look 89%, at 3<sup>rd</sup> look 87% [Figure 9][Table 4].

## CONCLUSION

From this study, we can conclude that the percentage of graft uptake is higher and better among patients undergoing twice daily normal saline dressing than

among patients undergoing single daily normal saline dressing for a week before split skin grafting.

Hence, twice daily normal saline dressing before split skin grafting helps in better graft uptake and wound healing, among diabetic foot ulcer patients which will greatly help in reducing the morbidity of the disease.

We have henceforth advised twice daily normal saline dressings for all patients undergoing Split Skin Grafting at our Institution for better surgical outcome and lower morbidity.

## REFERENCES

1. Gale J. India's Diabetes Epidemic Cuts Down Millions Who Escape Poverty. United States: Bloomberg; 2010. Available from: <https://www.bloomberg.com/news/articles/2010-11-07/india-s-deadly-diabetes-scurge-cuts-down-millions-rising-to-middle-class>. [Last accessed on 2012 Jun 08].
2. Iakovos NN, Malizos C, Vamvakopoulos NC. Protective and damaging aspects of healing: A review. *Wounds* 2006;18:177-85.
3. Brem H, Tomic-Canic M. Cellular and molecular basis of wound healing in diabetes. *J Clin Invest* 2007;117:1219-22.
4. Scott G. The diabetic foot examination: A positive step in the prevention of diabetic foot ulcers and amputation. *Osteop Fam Physician* 2013;5:73-8.
5. Barret-Nerin J, Herndon DN. Principles and Practice of Burn Surgery. New York: Marcel Dekker; 2004.
6. McCartan B, Dinh T. The use of split-thickness skin grafts on diabetic foot ulcerations: A literature review. *Plastic Surg Int* 2012;2012:715273.
7. Janis J, Harrison B. Wound healing: Part II. Clinical applications. *Plast Reconstr Surg* 2014;133:383e-92.
8. Provenzano DA, Deer TR. Essentials of Pain Medicine. 4<sup>th</sup> ed. Netherlands: Elsevier; 2018.
9. Pak CS, Park DH, Oh TS, Lee WJ, Jun YJ, Lee KA, *et al.* Comparison of the efficacy and safety of povidone-iodine foam dressing (Betafoam), hydrocellular foam dressing (Allevyn), and petrolatum gauze for split-thickness skin graft donor site dressing. *Int Wound J* 2019;16:379-86.
10. Saaq M, Hameed-Ud-Din KM, Chaudhery SM. Vacuum-assisted closure therapy as a pretreatment for split thickness skin grafts. *J Coll Physicians Surg Pak* 2010;20:675-9.
11. Younes N, Albsoul A, Badran D, Obedi S. Wound bed preparation with 10 percent phenytoin ointment increases the take of split-thickness skin graft in large diabetic ulcers. *Dermatol Online J* 2006;12:5.

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