Original Research Article

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Analysis of outcome of diabetic foot ulcer following topical phenytoin and betadine use: a comparative study

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ABSTRACT

Background: Diabetic ulcer is the major cause of morbidity and excess hospital care cost for the patients with diabetes and most frequent reason for hospitalization in patients. Diabetic foot ulcers precede almost 85% of amputations in India. Though there are many modes for care of the wound, treating diabetic wounds are still an enormous problem. Aim of the study was to analyse the outcome of topical phenytoin dressing as compared to conventional wound dressing in diabetic ulcers and thus to know if phenytoin is a better and cheaper alternative option in the management of diabetic ulcers

Methods: A sample of 90 patients were selected using purposive sampling technique. Of which 45 underwent topical phenytoin dressings, remaining 45 underwent conventional wound care. Daily dressing was done for 14 days and then was subjected to split skin grafting. The variables were compared based on rate of granulation tissue formation, graft uptake & duration of hospital stay. The categorical variable was compared by chi square test and continuous variable by student t-test. A p value <0.05 was considered significant.

Results: In Phenytoin group, mean rate of granulation tissue formation was 92.51%. Mean graft up-take was 92.98% and mean hospital stay was 35.68 days. In Conventional group, mean rate of granulation formation was 83.31%. The Mean graft up-take was only 78.09%, mean hospital stay was 47.31 days.

Conclusions: Topical phenytoin helps in faster healing of the diabetic ulcer and better graft up-take and reduces hospital stay.

Keywords: Diabetic ulcers, Graft take up, Rate of granulation tissue formation, Topical phenytoin wound dressing

INTRODUCTION

Diabetic ulcer is the major cause of morbidity and excess hospital care cost for the patients with diabetes and most frequent reason for hospitalization in patients. It is estimated to affect 15% of all diabetic individuals during their lifetime. Prevalence of diabetic foot ulcer in clinical population is 3.61%. Diabetic foot ulcers precede almost 85% of amputations in India.¹

Though there are many modes for care of the wound, treating diabetic wounds are still an enormous problem. Lot of topical molecular factors for wound healing like epidermal growth factors, tissue stimulating factor, vacuum assisted dressing and dressing with hyperbaric oxygen are developed but are still expensive and their efficacy is still under study and the cost factor should be kept in mind. This lead to a search for better and cheaper wound-healing agents. One such agent is phenytoin which is cheap, easy to use and readily available for medical practice.

Phenytoin (diphenylhydantoin) was used as an effective drug for control of convulsive disorders. In 1939 Kimball first noticed the gingival hyperplasia in some patients treated with phenytoin; this inspired the study regarding the potentiality of phenytoin in wound healing.² Phenytoin aids in formation of healthy granulation tissue and thus improves quality of graft bed and results in better graft up take. This ensures better wound management for the patient.

The present study was conducted to assess the efficacy of topical phenytoin dressing as compared to wound dressing using conventional materials in the healing of diabetic ulcers and to check whether it is a better alternative in the management of diabetic ulcers.

METHODS

This Study included 90 patients with diabetic ulcers admitted in our institution from October 2014 to March 2016 satisfying all the inclusion criteria mentioned below after obtaining the clearance from the ethical committee.

Inclusion criteria

- Grade I and II foot ulcers per Meggit-Wagner clinical classification
- Patients on oral hypoglycaemic agents or insulin for Diabetes Mellitus

Exclusion criteria

- Grade III, IV, V foot ulcers according to Meggit-Wagner clinical classification
- Age less than 18 years.
- Ulcer of size more than 5x5 cm.
- Immunocompromised state like HIV.
- Patients with varicose vein and decreased vascularity (ischaemic) of lower limb.
- Chronic ulcer of other aetiology.
- Patients with multiple ulcers.
- Other co morbid conditions like renal failure, generalized debility, jaundice, severe anaemia which adversely affect wound healing
- Patients with allergy to phenytoin.

After satisfying inclusion and exclusion criteria, the selected patients were randomly assigned into treatment group and control group. A written informed consent was obtained at the time of enrolment. Routine haematological, biochemical, urine microscopic investigations were done for each patient. After slough removal, the surface area was measured, tracing the outline on transparent paper. This outline was transferred to graph paper and size was measured and recorded in both the groups.

In study group, a single 100mg phenytoin sodium capsule was opened and sprinkled over the wound at 20mg/cm² TBSA and dressing was done whereas in control group, dressing was done using 5% w/v povidone-iodine solution. Dressings were done daily. The patients were followed up daily for 14 days in both the groups. Size of

the ulcer was measured once in a week. Wound culture was obtained at the start of the treatment and on the 14th day of treatment. Observed or spontaneously reported side effects (local and systemic) were documented. The patients were then subjected to split thickness skin grafting and the wounds were assessed on fifth post-operative day for skin graft up take. The total no of days of hospitalization were noted. The follow up of the patients were done at one month after discharge in outpatient department for post skin grafting complications.

The results obtained were statistically evaluated and compared in each group. The main parameters, which were analysed were

- No of days required for healing
- Rate of granulation tissue formation
- Quality of graft bed and skin graft up take
- Effect on bacterial load
- Side effects of topical phenytoin dressing

The variables were compared using the Unpaired Student's t-test. A P value <0.05 was considered significant.

RESULTS

The age of the patients varied from 31 to 80 years. Maximum number of cases belong to the age group of 41 to 60 years. The average diabetic foot lesion in our country is 50 years. The mean age in study group was 49.4±8.58 years and in control group was 49.8±10.6 years. In both study and control group male patients were more compared to females. In both groups, 66.67% of the patients were male and 33.33% were female.

The rate of granulation tissue formation was assessed at the end of 14 Days. The mean granulation growth rate was 92% seen in study group while it was 83% in control group. The results were analysed by unpaired student t-test which showed highly significant difference in rate of granulation tissue formation (p<0.0001) (Table 1).

Table 1: Granulation tissue formation.

Granulation tissue	Control	Study	p value
71-80	18	2	
81-90	23	12	
91-100	4	31	< 0.0001
Total	45	45	

The patients in both groups were subjected to split thickness skin grafting as the final treatment modality. The graft up-take was then assessed at the end of the 5th post-operative day as the percentage of ulcer surface area is given above. In study group 92.8% graft take up was seen while it was 78% in the control group. The results were analysed by unpaired student t-test which showed

highly significant difference in graft take up (p of <0.0001) (Table 2).

Table 2: Graft uptake.

Graft uptake	Control	Study	p value
< 70	11	1	
71-80	6	2	
81-90	27	10	_
91-100	1	22	< 0.0001
Total	45	45	

The quality of life of the patients in both the groups was assessed by the assessment of total hospital stay as number of days of admission in the hospital is as above.

The mean duration of hospital stay in Study group was 35.68 ± 3.42 and 47.31 ± 7.3 in the control group. The results were analysed by unpaired student t-test which showed significant difference in the number of days of hospital stay (p <0.001) (Table 3).

Table 3: Duration of hospital stay.

Duration of hospital stay	Control	Study	p value
Mean	47.31	35.68	< 0.001
SD	7.3	3.42	

Patient in both the groups were assessed for effect of topical agents on the bacterial load as percentage of people who are culture sensitivity negative at 14 days. 68% negative cultures were seen in study group while in control group, it was 51%. The results were analysed by unpaired student t-test which showed no significant difference (p 0.08) (Table 4).

Table 4: Bacterial culture report.

	Control	Study	p value
Positive	22	14	0.08
Negative	23	31	
Total	45	45	

No side effects were noted in both groups.

In both the groups, no complications occurred during the application of dressing, skin grafting or in the post-operative period. The patients were followed up after one month of discharge. The main post-operative parameters were wound size, contractures, pain and infection. All the parameters were less in study as compared to control.

DISCUSSION

Treatment of ulcers has undergone a dramatic change in the last few decades with development of various products which promote wound healing in different ways. The concept of 'outcome based medicine' demanded the need for a product which can improve outcome accurately and research still on for such a product. The burden of diabetic ulcer is not only measured by the hospital cost but also by the loss of pay he suffers due to hospitalisation. So, ideal dressing agent therefore should not only be cheap but also accelerate healing. Phenytoin is such an agent.

This study is similar to the study conducted by Muthukumarswamy MG et al.³ Both the present study and the one done by Muthukumarswamy used a thin layer of phenytoin powder over the wound. The study's sample size was 100, fifty in each group, mean age in study group was 56.4 years. and 58.7 years. in control. Graft take-up was 72.4% and 58.43% respectively. Hospital stay 21 days in study group and 45 days in control group.

In study made by me, the mean age group in study group is 49years and 50years in control group. Graft take-up was 93 % and 78% respectively. Hospital stays 35.6 days in study group and 47.31 days in control group. Results of this study were comparable with other studies like study conducted by Pendse et al, Lodha et al, Bansal et al also.⁴⁻⁶

Limitations of the study

The most important limitation of the present study is its sample size. A randomized controlled comparative study with a much larger population may help to further substantiate the findings or reveal variations which were not observed in the present study. The cost burden on the patient is also not analysed in this study as it can be influenced by various factors other than the cost of dressings. Another limitation was that other factors that affect wound healing like age, smoking, duration of diabetes, glycaemic control etc. were not compared and analysed. The quantitative assessment of the postoperative parameters like wound contracture, pain and residual raw ulcer area was also not included in the present study, which if included, might have given a much better analysis of the efficacy of topical phenytoin moist dressing as compared to conventional moist dressing.

CONCLUSION

Phenytoin is a cheap and better alternative dressing agent for ulcer care. It promotes healing by increased rate of granulation tissue formation, reduction in bacterial load and better graft take-up. Shorter duration of hospital stay seen in topical phenytoin dressing reduce the financial burden of the patient. Other advantages are that there are no noted side effects, it is easy to use and is readily available.

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Ethical approval: The study was approved by the

institutional ethics committee

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