ORIGINAL RESEARCH PAPER
Volume - 11 | Issue - 10 | October - 2022 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

COMPARATIVE STUDY OF TOPICAL PHENYTOIN V/S CONVENTIONAL DRESSING FOR DIABETIC FOOT ULCERS

General Surgery

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ABSTRACT

Introduction: Diabetic Foot Ulcer (DFU) is a common cause of morbidity in India and is estimated to affect 15% of all diabetic individuals during their life time. Its prevalence in clinical population is 3.61% and precedes almost 85% of amputation. Though many modalities of dressing have been described for such patients but they are quite costly for patients coming to our setup. Diabetes is a cause of many complications, one of them being foot ulcer and gangrene. Control of diabetes and wound healing should be the aim of treatment. Wound healing requires formation of healthy granulation tissue after wound debridement. Topical phenytoin helps in the formation of granulation tissue, reduces the slough and bacterial load, and promotes wound healing in diabetic foot. It is cheap and easily available. We wanted to compare the efficacy of phenytoin with conventional dressing (povidone iodine in management of diabetic foot gangrene after surgical debridement.

Aims & Objectives

1. To evaluate the effectiveness of phenytoin as methods of dressing in treatment of Diabetic Foot Ulcer.
2. To compare the results of topical phenytoin dressing v/s conventional dressing using Betadine (povidone iodine).

Observation: In our study we found that there was a significant difference between the two groups in all three parameters we studies in favour of study group. of HGT on Day14: 86.95 % v/s 48% (p= 0.004).Mean Reduction in ulcer area on day 7 &14: 41.38 & 68.17 v/s 24.56 & 47.85 (p < 0.001) >50% reduction in ulcer area on Day 14: 62% v/s 38% (p= 0.004). **Conclusion:** It can be concluded that Phenytoin for healing of DFU is an acceptable alternative to conventional method. Iis safe, easily available, easy to apply and inexpensive.

KEYWORDS

INTRODUCTION:

Diabetic foot disease poses a growing global public health challenge and a major financial burden on healthcare systems worldwide. The prevalence of diabetes is exploding worldwide and is expected to involve more than 500 million people in next 10 to 15 years. Foot complications are a major cause of hospitalization in patients with diabetes mellitus (DM), which consumes a high number of hospital days because of multiple surgical procedures and prolonged length of stay[1]. Patients with DM have up to a 25% lifetime risk of developing a foot ulcer[2], which precedes amputation in up to 85% of cases[3]. A mainstay of diabetic foot ulcer (DFU) therapy is debridement of all necrotic, callus, and fibrous tissue[4,5], with a primary goal to obtain wound closure. The management of the DFU is largely determined by its severity (grade), vascularity of the limb, and the presence of infection[6–8].In India habits like walking barefooted, lack of knowledge regarding diabetic foot, hot climate leading to increased perspiration, poor hygiene, poor sanitation, diet poor in proteins, general poverty, lack of basic medical infrastructure, etc. have worsened the problem.

Phenytoin (diphenylhydantoin) was introduced into therapy in 1937 for effective control of convulsive disorders with a common side effect being gingival hyperplasia. This stimulatory effect of phenytoin on connective tissue suggested possibility for its use in wound healing.

Since wound healing is a complicated process involving multiple steps. The mechanism by which phenytoin promotes wound healing is not understood completely. Several theories have been proposed on the phenytoin mechanism of action which include[9,10]

- Stimulation of fibroblast proliferation.
- Enhancing the formation of granulation tissue.
- Decreasing collagenase activity.
- Inhibition of glucocorticoid activity.
- Direct or indirect antibacterial activity by affecting inflammatory cells.

Phenytoin increases gene expression of the platelet derived growth factor b chain in macrophage and monocytes and hence increases granulation tissue formation.

Diabetic ulcers are the indication for 50% of non traumatic amputations. There is a need for evaluation of new method for treating these ulcers which is economical and more effective in increasing healing rate and decreasing the amputation rate. Some studies on topical phenytoin have shown increased healing rate in chronic foot ulcers than other conventional dressings.[11,12,13]. Systemic absorption of phenytoin on topical use in diabetic ulcer was not significant. Other side effects noticed on use of topical phenytoin in diabetic ulcer were transient burning sensation initially and hypergranulation.[14,15,16]. Though many studies are conducted on using topical phenytoin in chronic leg ulcers only few studies are conducted on diabetic ulcers and such studies have not been conducted in our institute.

Objectives of the study:

To assess the efficacy of topical phenytoin compared to conventional wound care in improving the healing process and to prove it as a relatively low cost and easy to use option in the management of diabetic ulcers.

MATERIALS:

This prospective randomized comparative study included 50 patients with diabetic ulcers admitted In KR Hospital attached to Mysore Medical College and Research Institute, Mysuru for period of 11 months satisfying all the inclusion criteria mentioned below after obtaining consent and clearance from the ethical committee.

Inclusion Criteria-

Patients with chronic ulcers (ulcers of 4 weeks duration) with diabetes mellitus and wound size <5% TBSA

Exclusion Criteria-

Chronic non-healing wounds of other aetiology.Diabetes mellitus with gangrenous changes. Wounds with osteomyelitis.

Other co-morbid conditions like generalized debility and other factors, which adversely affect wound healing.

METHODS:

Data were collected from 50 patients who were having diabetic ulcers satisfying the inclusion criteria mentioned above. The whole sample population was equally divided into group A and group B randomly.

All patients underwent detailed clinical examination and relevant investigations and the wounds were thoroughly debrided and the ulcer dimensions as well as the surface area assessed using measuring tape, before both types of dressings were applied. The control group and study group were subjected to daily dressing. Discharge was sent for culture and sensitivity. Empirical antibiotics were started with ciprofloxacin and metronidazole changed to sensitive antibiotics after sensitivity report and also measures were taken for adequate glycaemic control with Inj. plain insulin, oral hypoglycaemic drugs and diabetic diet. The patients were followed up for 2 weeks in both study and control groups.

Application of Dressing:

Patients in group A were dressed with topical phenytoin (study group) and group B with povidone iodine (control group)

Topical Phenytoin:

Phenytoin sodium tablet was crushed and dissolved in 5ml of normal saline to form a suspension. Sterile gauze was soaked in the suspension and spread evenly over the ulcer and left for 24 hours till the next dressing.

Control group dressing was done with 5% povidone iodine (betadine) once a day. Before applying both dressing daily, wound was cleaned with normal saline and debridement was done if necessary. Ulcer size was measured initially and at the end of 14 days, size was recorded. Size was measured twice and mean of two was taken. Wound was also observed for granulation tissue, discharge at the end of 14 days was recorded, wound discharge was sent for culture and sensitivity on 14th day of treatment.

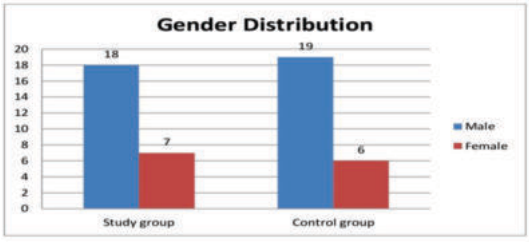
RESULTS:

The present study was conducted in KR Hospital attached to Mysore Medical College and Research Institute, Mysuru and the findings are tabulated as below.

During the study year from November 2019 to May 2021, 50 patients with Diabetic foot ulcers were randomized into study (topical phenytoin dressings) and control (Povidone iodine) group. These groups were studied for the effect of conventional normal povidone iodine dressings versus topical phenytoin dressings on wound healing.

Table1: sex distribution

Sex	Group		Chi square value	P value
	Study Group	Control Group		
Male	18	19	0.104	0.7471 NS
Female	7	6		

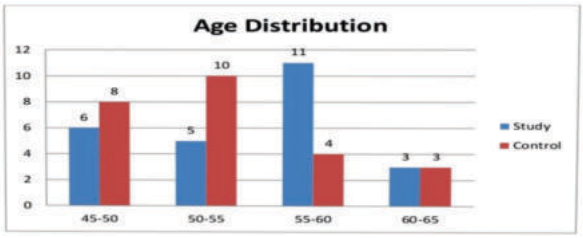


Graph 1: Gender distribution

In the study group total number of males and females were 18(72%) and 7(28%) respectively. In the control group total number of males and females were 19(76%) and 6(24%) respectively. Statistically in this study, there was no significant difference in sex distribution between interventional and control group. The table depicts that incidence of diabetic foot ulcer was predominantly more in male than in females.

Table 2: age distribution

Age Group	Study	Control	Chi square value	P value
45-50	6	8	5.219	0.1564 NS
50-55	5	10		
55-60	11	4		
60-65	3	3		



Graph 2: Age-wise distribution

In this study, the age distribution between the groups had no statistically significant difference.

In our study after 2weeks there is significant decrease in wound size in control group that is In our study after 2weeks there is significant decrease in wound size in study group that is Phenytoin group.

Table3: comparing study and control group

Comparison between Povidone iodine group and Phenytoin group on reduced in size

Group	mean	Std.deviation	t-test value	df	pvalue	conclusion
Povidone iodine	1195.48	1398.21	-2.397	48	0.20	Significant
Phenytoin group	12320.24	23159.33				

In our study, we observed that mean reduction in ulcer size in phenytoin group (123230.24±23159.33mm2) was statistically significant compared to povidone iodine group (1195.48±1398.21 mm2) and there was 57.3 ± 2.3% reduction in ulcer size in phenytoin group compared to 11.3± 1.4% in control group which is statistically significant.

DISCUSSION:

An ideal dressing is every surgeon's desire, a dressing that promotes chronic ulcer healing without any complications. Successful wound dressing should keep the wound moist and be devoid of any adverse reactions such as infection, maceration and allergy.

Diabetic ulcers are chronic wounds, stuck in inflammation phase and shows cessation of epidermal growth. The present study was conducted at Mysore Medical College and Research Institute, Mysuru to study the effect of topical phenytoin on diabetic ulcer healing dynamics.

Our study compares the efficacy of topical phenytoin with conventional povidone iodine dressing on chronic non-healing diabetic ulcers. In both the groups the base line characteristics were similar. In our study non-healing ulcers of more than 4 weeks were chosen and in this study the treatment period was 2 weeks. In patients treated with topical phenytoin dressings the mean wound area in mm2 reduced from 18540.400 to 9896.72. The percentage of reduction in wound size was 56.8(2.3% compared to the 17.7(1.4% in control group. This study demonstrated that topical phenytoin dressings results in rapid wound area reduction and reduces wound infection in diabetic foot ulcers as culture conversion from positive to negative was statistically significant ($p<0.05$) in phenytoin group when compared to povidone iodine group. In study group, 21 patients out of 25 were culture positive on day one which reduced to 13 patients (84% to 52%) on day 14 and no conversion of bacterial growth was noted in control group.

The study is similar to the study conducted by Muthukumarswamy MG et al. The difference between the present study and the one done by Muthu was he 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 was 21 days in study

group and 45 days in control group. His study was done as a prospective randomized controlled comparative study to compare the efficacy of topical phenytoin moist dressing to conventional most wound dressing in management of diabetic ulcer.

In the present study it was seen that the incidence of diabetic ulcers were more in males (84%) compared to females (16%). The second national data source, NHDS documented higher hospital rates in males suffering from diabetic ulcers.

In our study, there was very significant faster reduction in wound size in phenytoin group compared to povidone iodine group. On day 14, the wound area in study group was 9896.72 mm2 when compared to control group 10970.56 mm2 which is statistically significant (p-value 0.207). Overall this study showed that phenytoin dressing is safe and effective in treating chronic foot ulcers. This study was conducted only for 2 weeks and complete epithelialisation and wound reduction was not awaited for.

CONCLUSION:

With the use of topical phenytoin dressing in comparison with the povidone iodine dressing for the treatment of diabetic foot ulcers, the following conclusions were derived; Compared to study group,

1. Topical phenytoin dressing showed faster and better healing rates.
2. Topical phenytoin group had better wound area and percentage reduction
3. There were no adverse reactions on topical application.
4. Compared to povidone iodine group the appearance of granulation tissue was earlier in topical phenytoin group.
5. Topical phenytoin may also have an anti infective effect.

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