

An Analytical Comparative Assessment of Two Different Techniques of Heparin Dressing in Lower Limb Diabetic Ulcers

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Abstract

Aim: To study the effectiveness of topical heparin over conventional dressings for lower limb diabetic foot ulcers.

Methodology: A cross-sectional comparative study was done among patients diagnosed with diabetic foot ulcers admitted in the surgical ward of D M.C.H, Darbhanga, Bihar. The study was conducted over a period of March 2018 to February 2019. A total of around 356 cases visited the surgical OPD with complaints of diabetic foot ulcer of which 124 patients required admission. 34 patients were excluded from the study as they were presenting with sepsis or peripheral vascular disease or didn't consent for the study. Thus, A Total of 90 patients were included in the study and were divided in to two study groups. For Group 1, only conventional dressing was done and for Group 2, topical heparin solution was applied. For both the groups, glycemic control and antibiotics were added accordingly and monitored. All data were collected according to the guidelines of the Institutional ethical committee. The data was entered in MS Excel and the frequencies were analyzed.

Results: Majority (77.8%) of the study participants were male. Of the 45 participants who received conventional treatment, 38 (84.4%) and 7 (15.6%) were male and female respectively, while the gender distribution among the group receiving heparin was 35 (77.8%) and 10 (22.2%) of male and female respectively. The mean hospital stay was higher in conventional group (15.8 days) compared to Heparin group (12.3 days). Of the total study participants, majority (72.2%) received empirical sensitive antibiotics while only 27.8% had the drug revised by culture and sensitivity, of which majority 17 (68%) belonged to the conventional group of treatment. The mean of Bates-Jensen wound healing score was higher in heparin group (28.2) at 0 weeks compared to conventional group (26.6). The score gradually decreased over the period of three weeks.

Conclusion: From this study, examination of ulcers have shown significant reduction in the ulcer surface area with appearance of healthy granulation tissue, decreased length of hospital stay in patients treated with topical heparin solution as compared to conventional dressing.

Keywords: Heparin, granulation, diabetes, ulcer.

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Introduction

Diabetic foot ulcers have many pathogenic mechanisms, the most common etiology being peripheral sensory neuropathy, deformity, high plantar pressures, and peripheral arterial disease. Hyperglycaemia can decrease fibrinolytic activity, which increases blood viscosity and induces a high coagulation state in people with diabetes mellitus. The high coagulation state can damage vessel walls and lead to vascular dysfunction, coagulation- anticoagulation disorders. This high coagulation state contributes to the slow healing of diabetic foot ulcer [1].

Shortly after diabetic foot ulcers were described in the 19th century, the most prevalent treatment approach was prolonged bedrest. Dr. Frederick Treves (1853-1923) revolutionized the management of DFU's when he established three important principles in DFU treatment, which continue to be the basis of modern-day care: sharp debridement, off-loading, and diabetic foot education [2].

Dressing the lower limb diabetic ulcers using 200 IU/ml sodium aqueous heparin [3] solution USP (heparin) dripped on the ulcer surfaces is such a search towards our goal. Heparin promotes migration of capillary endothelial cell and produces angiogenesis [4] and thus formation of healthy granulation tissue. It also reduces bacterial translocation [5] and necessary for antibiotics minimized. Heparin also enhances type 1 collagen synthesis [6, 7] and hence the stable granulation tissue causes better healing.

Heparin and related substances are glycosaminoglycans that exist naturally inside the cell and in the extracellular matrix. They act by binding selectively to varieties of proteins and pathogens and are important to many disease processes [8, 9]. They have beneficial effects on local tissue microcirculation and oxygenation through the inhibition of thrombin generation and

increase in plasma fibrin gel porosity, which may promote vascular perfusion in the ischaemic foot significantly and lead to improvements in its blood supply [10]. They can promote healing of chronic ulcers by stimulating production of basic fibroblast growth factor and transforming growth factor- beta [11].

Diabetic ulcers of lower limb are very difficult to treat and they contribute to a great account of morbidity and expenditure of human resources and manpower. A novel method is needed to overcome these factors and which promotes healing and lessens the hospital stay and morbidity. Due to poor vascularity and brittle granulation tissue formed during the healing phase, conventional dressings might not be that effective in treating the wound so this study aims to study the effectiveness of topical heparin over conventional dressings for lower limb diabetic foot ulcers

Methodology

This comparative study was done among patients diagnosed with diabetic foot ulcers admitted in the surgical ward of D M.C.H, Darbhanga, Bihar. The study was conducted over a period of March 2018 to February 2019 . and the samples were selected using universal sampling method. A total of around 356 cases visited the surgical OPD with complaints of diabetic foot ulcer of which 124 patients required admission. 34 patients were excluded from the study as they were presenting with sepsis or peripheral vascular disease or didn't consent for the study. Thus, A Total of 90 patients were included in the study and were divided in to two study groups.

For Group 1, only conventional dressing was done and for Group 2, topical heparin solution was applied. For both the groups, glycemic control and antibiotics were added accordingly and monitored. The purpose of the study was explained to the

study participants in detail and an informed consent was obtained, the right to withdraw from the study at any point of time without any loss of patient care was explained. All data were collected according to the guidelines of the Institutional ethical committee. The data was entered in MS Excel and the frequencies were analyzed.

Results:

A total of 90 patients with lower limb diabetic ulcers were included in the study and were split into two groups and treated

group 1 with conventional dressing and group 2 with topical heparin dressing. Majority (77.8%) of the study participants were male. Of the 45 participants who received conventional treatment, 38 (84.4%) and 7 (15.6%) were male and female respectively, while the gender distribution among the group receiving heparin was 35 (77.8%) and 10 (22.2%) of male and female respectively. The mean hospital stay was higher in the conventional group (15.8 days) compared to the Heparin group (12.3 days).

Table 1: Sex distribution among the study participants.

Gender	Conventional group N (%)	Heparin group N (%)
Males	38 (84.4%)	35 (77.8%)
Females	7 (15.6%)	10 (22.2%)

Table 2: Comparison of mean days of hospital stay.

	Conventional group	Heparin group
Mean hospital stay (days)	15.8	12.3

Of the total study participants, majority (72.2%) received empirical sensitive antibiotics while only 27.8% had the drug revised by culture and sensitivity, of which majority 17 (68%) belonged to the conventional group of treatment. Among those participants receiving the conventional method of treatment, 28 (62.2%) were started on empirical sensitive antibiotics while 17 (37.8%) of the patient's antibiotics were revised by culture and sensitivity. While 37 (82.2%) received empirical sensitive antibiotics and 8

(17.8%) drugs were revised by culture and sensitivity among the group receiving heparin treatment. Of the total study participants, only 3.3% of people required amputation or disarticulation and all belonged to the conventional group which contributed to 3 (6.67%) of participants of the conventional group. Antibiotic requirement was compared statistically and found that the group treated with heparin dressing had reduced length of hospital stay and wound healing was better.

Table 3: Antibiotics distribution among the study participants.

Antibiotics	Conventional group N (%)	Heparin group N (%)	Total N (%)
Empirical sensitive antibiotics	28 (62.2%)	37 (82.2%)	65 (72.2%)
Drugs revised by culture and sensitivity	17 (37.8%)	8 (17.8%)	25 (27.8%)

The mean of Bates-Jensen wound healing score was higher in the heparin group (28.2) at 0 weeks compared to the conventional group (26.6). The score gradually decreased over the period of three weeks.

Discussion

An ideal dressing is one that promotes chronic ulcer healing without any complications. Successful wound dressing should keep the wound devoid of any adverse reactions such as infection, maceration and allergy. The present study

was conducted to compare the efficacy of heparin dressings with conventional dressings on diabetic ulcer healing dynamics.

In the present study, majority (77.8%) of the study participants were male. Of the 45 participants who received conventional treatment, 38 (84.4%) and 7 (15.6%) were male and female respectively, while the gender distribution among the group receiving heparin was 35 (77.8%) and 10 (22.2%) of male and female respectively. A study by Srinivasan T et al [13] also reported a higher incidence of diabetic ulcers among males in the Cases as well as Controls (84.4% and 75.0%). In a similar study done by Abhishek et al [14], it was seen that the incidence of diabetic ulcers was more among the males in the heparin group as well as conventional group (85.0% and 75.0 % respectively). The difference in the distribution of sex among the groups was not statistically significant ($p=0.264$).

In the present study, the mean of Bates-Jensen wound healing score was higher in heparin group (28.2) at 0 weeks compared to conventional group (26.6). The score gradually decreased over the period of three weeks. In a similar Case-Control study, Srinivasan T et al [13] have also reported a lower Bates - Jensen wound healing score for Cases as compared to Controls at the end of week three and week 4.

In the present study, the mean hospital stay was higher in conventional group (15.8 days) as compared to Heparin group (12.3 days). This can be because of enhancement of Type 1 collagen synthesis by heparin, and hence the stable granulation tissue causes better healing. Heparin also promotes migration of capillary endothelial cell and produces angiogenesis and thus the formation of healthy granulation tissue [14-16]. In study done by Srinivasan T et al [13] also, a lower mean hospital stay was there for heparin group as compared to conventional group

(13.6 days vs 16.4 days). However, the statistical significance was not reported for their study. [17]

Conclusion

From this study, examination of ulcers have shown significant reduction in the ulcer surface area with appearance of healthy granulation tissue, decreased length of hospital stay in patients treated with topical heparin solution as compared to conventional dressing. But additional successful clinical evidence with large study groups is required to establish topical application of heparin solution as one of the most effective alternative topical agents in treatment of diabetic ulcers.

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