



# International Journal of Surgery Science

E-ISSN: 2616-3470

P-ISSN: 2616-3462

© Surgery Science

[www.surgeryscience.com](http://www.surgeryscience.com)

2020; 4(1): 650-652

Received: 16-02-2020

Accepted: 21-03-2020

**Dr. Rikhav Shah**

Assistant Professor, Department of  
General Surgery, Gujarat Adani  
Institute of Medical Science, Bhuj,  
Kutch, Gujarat, India

## Comparative analysis of conventional dressing vs. topical heparin dressing in lower limb diabetic ulcers

**Dr. Rikhav Shah**

**DOI:** <https://doi.org/10.33545/surgery.2020.v4.i2g.987>

### Abstract

**Background and Aim:** Lower limb diabetic ulcers are very difficult to treat due to the poor vascularity and brittle granulation tissue formed during the healing phase. So a novel method is needed apart from conventional dressings to enhance the healing process. Objectives of current study were to estimate the length of hospital stay and antibiotic requirement among patients with lower limb diabetic foot ulcers, to estimate the length of hospital stay and antibiotic requirement among patients with diabetic foot ulcers managed with Heparin dressing and to compare the effect of topical heparin dressing over conventional dressing in diabetic foot ulcers.

**Material and Methods:** A cross-sectional comparative study was done among patients diagnosed with diabetic foot ulcers admitted in the surgical ward of a teaching institution of Tertiary care hospital India. Total of 200 patients were included in the study and were divided in to two study groups, for Group 1 only conventional dressing was done, for Group 2 topical heparin solution was applied, for both groups glycemic control and antibiotics were added accordingly and monitored.

**Results:** Majority (80%) of the study participants were male of which 46.25% of the received heparin treatment. The mean hospital stay was higher in conventional group compared to Heparin group. Of the total study participants, majority (75%) received empirical sensitive antibiotics while only 25% had the drug revised by culture and sensitivity, of which majority 36 (72%) belonged to the conventional group of treatment.

**Conclusion:** The group having the application of heparin dressing showed significantly better granulation tissue development, faster reduction of ulcer area and shorter duration of hospitals stay, as compared to conventional dressing using povidone iodine.

**Keywords:** Antibiotics, diabetic ulcers, heparin, povidone iodine

### Introduction

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. Due to poor vascularity and brittle granulation tissue formed during wound healing phase accounts for this. A novel method is needed to overcome these factors and which promotes healing and lessens the hospital stay and morbidity. 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 <sup>[1]</sup>.

Wound healing in itself is a complex process. The complications of diabetes, like poor vascularity and uncontrolled infection, further increase its complexity. Diabetic foot ulcers are a significant cause of hospital admission and frequent cause of amputation resulting in economic loss and decreased quality of health <sup>[2]</sup>. Treating diabetic ulcers are challenging to surgeons as they contribute to morbidity, expenditure due to prolonged use of antibiotics and prolonged hospital stay <sup>[3, 4]</sup>. The standard management of diabetic ulcers includes debridement, control of infection, glycemic control and local dressings. Newer modalities like off-loading technique, local phenytoin sodium application, use of growth factors, laser therapy have been tried with modest results. 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 <sup>[5, 6]</sup>.

**Corresponding Author:**

**Dr. Rikhav Shah**

Assistant Professor, Department of  
General Surgery, Gujarat Adani  
Institute of Medical Science, Bhuj,  
Kutch, Gujarat, India

Objectives of current study were to estimate the length of hospital stay and antibiotic requirement among patients with lower limb diabetic foot ulcers, to estimate the length of hospital stay and antibiotic requirement among patients with diabetic foot ulcers managed with Heparin dressing and to compare the effect of topical heparin dressing over conventional dressing in diabetic foot ulcers.

### Material and Methods

A cross-sectional comparative study was done among patients diagnosed with diabetic foot ulcers admitted in the surgical ward of a teaching institution of Tertiary care hospital India. The study was conducted over a period of 18 months and the samples were selected using an universal sampling method. A total of around 754 cases visited the surgical OPD with complaints of diabetic foot ulcer of which 262 patients required admission. 62 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 200 patients were included in the study and were divided in to two study groups, for Group 1 only conventional dressing was done, for Group 2 topical heparin solution was applied, for both 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.

### Statistical analysis

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2007) and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). For all tests, confidence level and level of significance were set at 95% and 5% respectively.

### Results

A total of 200 patients were with lower limb diabetic ulcers were included in the study and were split in to two groups and treated group 1 with conventional dressing and group 2 with topical heparin dressing and outcome regarding length of hospital stay. 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. Majority (80%) of the study participants were male of which 46.25% of the received heparin treatment. Of the 99 participants who received conventional treatment 86 and 15 were male and female respectively, while the gender distribution among the group receiving heparin was 74 and 25 of male and female respectively. (Table 1) The mean hospital stay was higher in conventional group (approximately 18 days) compared to Heparin group (approximately 14 days). Of the total study participants, majority (75%) received empirical sensitive antibiotics while only 25% had the drug revised by culture and sensitivity, of which majority 36 (72%) belonged to the conventional group of treatment. Among those participants receiving conventional method of treatment 64 were started on empirical sensitive antibiotics while 36 of the patient's antibiotics were revised by culture and sensitivity. While 86 received empirical sensitive antibiotics and 14 drugs were revised by culture and sensitivity among the group receiving heparin treatment. (Table 2) Of the total study participants only 3% people required amputation or disarticulation and all belonged to the conventional group which contributed to 3 of participants of conventional group.

**Table 1:** Gender wise Distribution of study participants

Gender	Conventional group N (%)	Heparin group N (%)	Total N (%)
Male	86 (53.75)	74 (46.25)	160 (80)
Female	15 (37.5)	25 (62.5)	40 (20)

**Table 2:** Antibiotics distribution among the study participants

Antibiotics	Conventional group N (%)	Heparin group N (%)	Total N (%)
Empirical sensitive	64 (42.66)	86 (57.33)	150 (75)
Drug revised by C&S	36 (72)	14 (28)	50 (25)

### Discussion

Diabetic ulcers are chronic wounds, stuck in inflammation phase and show a cessation of epidermal growth. 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.

Majority (80%) of the study participants were male of which 46.25% of the received heparin treatment. A study by Srinivas and Muralidharan in Tamil Nadu, India, also reported a higher incidence of diabetic ulcers among males in the Cases as well as Controls (84.4% and 75.0%)<sup>[4]</sup>.

Heparin and related substances are glycosaminoglycans that exist naturally inside the cell and in the extracellular matrix<sup>[5, 7]</sup>. They act by binding selectively to varieties of proteins and pathogens are crucially relevant to many disease processes. These related substances include: low molecular weight heparin (LMWH), chondroitin, heparitin sulphate, hyaluronic acid and keratan sulphate. They have beneficial effects on local tissue microcirculation and oxygenation through the inhibition of thrombin generation and increases in plasma fibrin gel porosity, which may promote vascular perfusion significantly in the peripheral ischemia and healing of chronic ulcers by stimulating production of basic fibroblast growth factor and transforming growth factor-beta 1<sup>[8-10]</sup>.

The proliferative phase of wound healing is typified initially by the formation of granulation tissue, followed by re-epithelialization, and neovascularisation. Healthy granulation tissue is an indicator of recovery. Once granulation tissue fills the wound to the level of the original epithelium; the epithelia can proliferate and regenerate. Heparin enhances Type 1 collagen synthesis, 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<sup>[9, 10]</sup>.

Of the total study participants, majority (75%) received empirical sensitive antibiotics while only 25% had the drug revised by culture and sensitivity, of which majority 36 (72%) belonged to the conventional group of treatment. Srinivasan and Muralidharan have reported lower requirement of antibiotic and fewer changes in antibiotics in the Cases as compared to Controls as the sterile culture was obtained earlier in Cases as compared to Controls, similar to our study<sup>[4]</sup>.

Limitations of current study were; it was a single institutional study and sample size was small to represent all people with diabetic foot ulcers.

### Conclusion

The group having the application of heparin dressing showed significantly better granulation tissue development, faster reduction of ulcer area and shorter duration of hospitals stay, as compared to conventional dressing using povidone iodine.

However, additional successful clinical evidence is required with validated laboratory findings to establish topical application of heparin solution as one of the most effective alternative topical agents in treatment of diabetic ulcers.

## References

1. Su N, Xu T, Li X, Zheng H, Wu B, Zhang S, *et al.* Heparin and Related Substances for Treating Diabetic Foot Ulcers: A Systematic Review and Meta-Analysis. *Front Endocrinol (Lausanne)*. 2022;13:749368. DOI: 10.3389/fendo.2022.749368.
2. Boulton AJ, Vileikyte L, Ragnarson-Tennvall G, Apelqvist J. The global burden of diabetic foot disease. *Lancet*. 2005;366(9498):1719-24. DOI: 10.1016/S0140-6736(05)67698-2.
3. Ribu L, Hanestad BR, Moum T, Birkeland K, Rustoen T. A comparison of the health-related quality of life in patients with diabetic foot ulcers, with a diabetes group and a nondiabetes group from the general population. *Qual Life Res*. 2007;16(2):179-89. DOI: 10.1007/s11136-006-0031-y.
4. Srinivasan T, Murlidharan M. Comparitive Study of Conventional and Topical Heparin Dressing in Lower Limb Diabetic Ulcers. *IOSR J Den Med Sci*. 2017;16(2):29-33.
5. Gandhi NS, Mancera RL. Heparin/heparan sulphate-based drugs. *Drug Discov Today*. 2010;15(23-24):1058-69. DOI: 10.1016/j.drudis.2010.10.009.
6. Shafritz TA, Rosenberg LC, Yannas IV. Specific effects of glycosaminoglycans in an analog of extracellular matrix that delays wound contraction and induces regeneration. *Wound Repair Regen*. 1994;2(4):270-6. DOI: 10.1046/j.1524-475X.1994.20407.
7. Thachil J. Clinical Differentiation of Anticoagulant and non-Anticoagulant properties of heparin. *J Thromb Haemost*. 2020;18:2424-5.
8. Fan SQ, Qin LY, Cai JL, Zhu GY, Bin X, Yan HS. Effect of heparin on production of basic fibroblast growth factor and transforming growth factor-beta1 by human normal skin and hyperplastic scar fibroblasts. *J Burn Care Res*. 2007;28:734-41.
9. Azizkhan RG, Azizkhan JC, Zetter BR, Folkman J. Mast cell heparin stimulates migration of capillary endothelial cells *in vitro*. *J Exp Med*. 1980;152(4):931-44.
10. Folkman J, Shing Y. Control of angiogenesis by heparin and other sulphated polysaccharides. *Adv Exp Med Biol*. 1992;313:355-64.