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Original Research Article

Observational study of the effects of silver-based dressing materials in 50 cases of diabetic foot ulcers

Daxesh Patel, Rushabh Maisuria, Jawansing Manza*, Devendra Chaudhari, Divyang Dave

Department of General Surgery, Government Medical College, Surat, Gujarat, India

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***Correspondence:**
Dr. Jawansing Manza,
E-mail: jawanmanza@gmail.com

ABSTRACT

Background: Diabetic foot remains the most common chronic medical problem being the most common cause of the hospital visit and/or admission, amongst the diabetic patients. Topical antimicrobial dressings, including those that contain silver are used to prevent or manage infection in a wide range of wounds.
Methods: This is the prospective, observational study which included 50 cases of diabetic foot ulcer patients and effects of silver-based dressing materials will be evaluated.
Results: After application of silver based dressing materials for two weeks, wound was evaluated on the basis of discharge from the wound, healing rate, appearance of the granulation tissue and culture and sensitivity report which showed that out of 50 cases studied, 3 cases (6%) had purulent discharge from the wound, absent granulation tissue, culture report showed presence of micro-organism and thus poor healing rate while other 47 cases (94%) had minimal/serous discharge, presence of healthy granulation tissue, no organism on culture report and thus good healing rate.
Conclusions: Silver based dressing materials are effective in terms of promoting wound healing and more patient compliance.

Keywords: Diabetic foot ulcer, Wound healing, Silver based dressing materials

INTRODUCTION

Diabetic foot remains the most common chronic medical problem being the most common cause of the hospital visit and/or admission, amongst the diabetic patients. It is estimated that approximately 15% of the more than 150 million people with diabetes worldwide will at some stage develop diabetic foot ulceration.[1-2]

Topical antimicrobial dressings, including those that contain silver, are used to prevent or manage infection in a wide range of wounds. Although silver dressings have been used extensively, there is insufficient evidence to show that silver dressings improve healing rates. The overall effect has been to cast doubt into the minds of healthcare purchasers and to cause restrictions in the availability of silver dressings worldwide. In this study, the silver-based dressing materials were applied over diabetic foot ulcer and its effects were observed.

METHODS

This was the prospective, observational study which included 50 cases of diabetic foot ulcer patients and effectiveness of silver-based dressing materials. Patients were selected as per consecutive admission of the patient diagnosed as diabetic foot ulcer from august 2015 to October 2016. The patient within age 18-65years, had

diabetic foot ulcer and chronic ulcer (>3weeks) were included and the patients having TB and other immuno-compromised conditions, hypersensitive to silver sulfadiazine or sulfonamides, females who are at pregnancy or lactating, premature infants, newborn infants during the first month of life, as sulfonamides are known to cause kernicterus and patients undergoing radiotherapy, during MRI were excluded.

Procedure

Silver based dressing material was chosen according to the availability, need of the patient, the wound and the environment and the overall characteristics of the silver dressing which meet the additional needs of the patient, e.g. in terms of exudate handling, adherence and frequency of dressing change. Biatin Ag, Aquacel Ag, Acticoat, SSD are some examples of silver-based dressing materials. The concentration of silver in every preparation was greater than 30-40mg/L which was suggested to be effective. Author sent the swab samples of the wound for culture and sensitivity on the regular basis and dressing was changed on every 48-72hours. These dressings were used for two weeks initially and then the wound, the patient and the management approach were re-evaluated. Evaluation of the wound was done on the basis of the following factors:

- Discharge from the wound,
- Healing rate,
- Appearance of the granulation tissue,
- Swab C/S report.

If after two weeks:

- There was improvement in the wound, but continuing signs of infection-continue silver dressing with further regular reviews.
- The wound had improved and the signs and symptoms of wound infection were no longer present-the silver dressing should be discontinued.
- There was no improvement-the silver dressing was discontinued and consideration was given to changing the dressing to one that contains a different antimicrobial agent and if the patient was unwell, using a systemic antibiotic and re-evaluating possibly untreated comorbidities.

RESULTS

Majority of the patients in my study belonged to the age group of 45-65years of age contributing almost 60% of the cases studied. Mean age of the patient was 47.04years (Table 1).

The study shows male predominance in diabetic foot lesions. The male to female ratio M:F=11.5:1 (Table 2).

In this study, after two weeks of dressing, Purulent discharge was present in 3 cases while other 47 cases had serous or no discharge from the wound (P value <0.05) (Table 3).

Table 1: Age wise distribution of diabetic foot cases.

Age	No. of cases	Percentage
18-25 years	03	06%
26-35 years	09	18%
36-45 years	08	16%
46-55 years	15	30%
56-65 years	15	30%
Total	50	100%

Table 2: Sex wise distribution of diabetic foot cases.

Sex	No. of cases	Percentage
Male	46	92%
Female	04	08%
Total	50	100%

Table 3: Discharge from the wound.

Discharge	No. of cases	Percentage
Nil	31	62%
Serous	16	32%
Purulent	03	06%
Total	50	100%

The granulation tissue was present in 47 cases (94%) and was absent in 3 cases (6%) which suggest poor healing rate (Table 4).

Table 4: Appearance of the healthy granulation tissue.

Granulation tissue	No. of cases	Percentage
Present	47	94%
Absent	03	06%
Total	50	100%

Healing rate was evaluated on the basis of various factors such as size of the wound, presence of pus/slough/ discharge on the floor of the wound, appearance of the granulation tissue, scanty or serous discharge, punctate haemorrhage, sloping edge, wound contracture, culture report, bacterial load etc. (Table 5).

Table 5: Healing rate.

Healing rate	No. of cases	Percentage
Good	38	76%
Fair	09	18%
Poor	03	06%
Total	50	100%

In this study, after two weeks, 3 cases (6%) were having culture sensitive report (2 cases were having *Pseudomonas spp*. and 1 case had *Staph. aureus*), while 47 cases (94%) had no organism on culture report with

statistical significance (P value <0.05) using Pearson Chi Square test (Table 6).

Table 6: Bacteriological swab culture report.

Culture report	No. of cases	Percentage
No organism	47	94%
Pseudomonas spp.	02	04%
Staph. aureus	01	02%
Total	50	100%

DISCUSSION

The number of patients studied were 50 cases of diabetic foot ulcer, on which silver-based dressing materials applied and effects were observed after two weeks of period.[9] In age distribution, 30 patients (60%) were between 46-65years of age (Table 1). Diabetic foot lesions are commonly found in the middle-aged person usually into the 4th and 5th decade of their life.[3-4] In sex distribution, males (n=46) were affected more than females (n=4) (Table 2). Higher incidence of male diabetic foot lesions may be due to the unhygienic habits, trauma, smoking and alcoholism etc.[5,6]

In recent years, a wide range of wound dressings that contain elemental silver or a silver-releasing compound have been developed. They are easier to apply, provide sustained availability of silver, need less frequent dressing changes, and provide additional benefits such as management of excessive exudate, maintenance of a moist wound environment, and facilitation of autolytic debridement.[7,8] Silver ions are highly reactive and affect multiple sites within bacterial cells, ultimately causing bacterial cell death. Silver ions are active against a broad range of bacteria, fungi and viruses, including many antibiotic-resistant bacteria, such as methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant *Enterococci* (VRE).[8]

Research into the clinical effectiveness of silver dressings is ongoing with improved understanding of the best way to use antimicrobial dressings, including silver dressings, in the prevention of infection or re-infection in wounds at high risk and further studies of silver dressings using endpoints related to bioburden and clinical indicators of infection are required.[9,10]

After application of silver based dressing materials for two weeks, out of 50 cases studied, 3 cases (6%) had purulent discharge from the wound, absent granulation tissue, culture report showed presence of micro-organism and thus poor healing rate, while other 47 cases (94%) had minimal/serous discharge, presence of granulation tissue, no organism on culture report and thus good healing rate.[10] Silver based dressing materials offer less number of dressing changes as compared to the routine conventional dressing.[11] They are indicated in preventing the infection, promoting healing and granulation tissue, reducing bacterial burden and thus overall improving wound healing.[12]

CONCLUSION

Silver based dressing materials are effective in terms of promoting wound healing and more patient compliance.

Diabetic foot ulcer emerged as one of the major causes of the longest period of hospital stay and work loss. Silver based dressing materials can be effectively used in the management of the diabetic foot ulcer.

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REFERENCES

1. Bal A. Diabetic foot: magnitude of the problem. J Ind Med Assoc. 2002;100(3):155-7.
2. Boutan AJM. The diabetic foot. Med Clin North Am. 1998;72(6):1513-33.
3. Kshitij S, Aparajit D. Observation on diabetic foot. Diab Mellitus Developing Countries.1981;43:241-5.
4. Reiber GE, Smith DG, Carter J, Fotieo G, Deery HG, Sangeorzan JA, et al. A comparison of diabetic foot ulcer patients managed in VHA and non-VHA settings. J Rehab Res Dev. 2001;38(3):309-18.
5. Armstrong DG, Lavery LA. Diabetic foot ulcers: prevention, diagnosis and classification. Am Fam Physician. 1998;57(6):1325-32.
6. Boyko EJ, Ahroni JH, Stensel V, Forsberg RC, Davignon DR, Smith DG. A prospective study of risk factors for diabetic foot ulcer. Seattle Diabetic Foot Study. Diab care. 1999;22(7):1036-42.
7. Leaper D. An overview of the evidence on the efficacy of silver dressings. J Wound Care. 2011;20(2):8-14.
8. Michaels JA, Campbell WB, King BM, Macintyre J, Palfreyman SJ, Shackley P, et al. A prospective randomised controlled trial and economic modelling of antimicrobial silver dressings versus non-adherent control dressings for venous leg ulcers: the vulcan trial. Health Tech Assess. 2009;13(56):1-14.
9. Silver-releasing dressings in treating chronic wounds. SBU alert report no. 2010-02, Available at: https://www.sbu.se/contentassets/7c23311902cf476ab7bfeea9b5d6d34c/silverreleasing_dressings_chro

nic_wounds_201002.pdf. Accessed on March 03 2010.
10. Carter MJ, Tingley-Kelley K, Warriner III RA. Silver treatments and silver-impregnated dressings for the healing of leg wounds and ulcers: a systematic review and meta-analysis. J Am Acad Dermatol. 2010;63(4):668-79.
11. Storm-Versloot MN, Vos CG, Ubbink DT, Vermeulen H. Topical silver for preventing wound infection. Cochrane Database Sys Rev; 2010.
12. Lo SF, Chang CJ, Hu WY, Hayter M, Chang YT. The effectiveness of silver-releasing dressings in the management of non-healing chronic wounds: a meta-analysis. J Clin Nursing. 2009;18(5):716-28.

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