

Research Article

The Role of Advanced Bioactive Wound Dressings in Treating Diabetic Foot Ulcers

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Keywords

- Diabetic foot
- Wound healing
- Advanced bioactive dressing

Abstract

Aim: The aim of this study was to investigate effectiveness of bioactive wound dressings for treating Diabetic Foot Ulcer (DFU).

Method: 30 DFUs were selected to receive the bioactive wound dressings (n=30 wounds). Wound healing process was recorded at the beginning of each dressing change. None of 30 patients dropped out of the study. The rate of wound healing and effectiveness of the dressings were evaluated.

Result: The study demonstrated that the use of advanced bioactive wound dressings increased the rate of healing, reduced the length of hospital stay, eliminated the need for surgical debridement and as a result there were fewer amputations.

Conclusion: The study confirmed the value of advanced bioactive wound dressings. Physician's satisfaction and patient's comfort were significantly increased in using them. The use of moist bioactive wound dressings significantly increased the Healing rate. This will in turn improve the quality of life of these patients and bring significant cost savings for health care system.

INTRODUCTION

Wound healing is a complex process, organized in a cascade of cellular and molecular events. In any wound healing process particularly in diabetic foot ulcers cellular responses to inflammatory mediators, growth factors, cytokines and the mechanical forces play important roles. At present there are different types of wound dressing available that can be used for DFUs treatments which differ on their application mode, materials and shape.

Diabetic foot ulcers (DFUs) are chronic hard to heal wounds of diabetes that lead to high hospital costs and, in extreme cases, to amputation. Approximately 5% of diabetes develops foot ulcers each year and 1% leads to amputation [1-4].

Even with immediate and intensive treatment, foot ulcers may take weeks or months to heal or may not heal at all. Moreover, 70% of foot ulcer patients have recurrent lesions within 5 years after treatment [5]. This not only leads to physical disability and marked reduction of quality of life but also leads to the majority of lower-extremity amputations [6,7].

In this study advanced bioactive wound dressings based on natural biopolymers especially chitosan were used for diabetic

foot ulcers treatment and their effects on the duration of wound healing were recorded.

ChitoTech company manufacture advanced bioactive wound dressings containing the biomaterial chitosan (hydrophilic mucopolysaccharide) and polysaccharide alginate.

MATERIALS AND METHODS**Study design**

In this work, patients suffered from diabetic disorder in Iran between the year 2007 and 2015 for diabetic foot ulcers were considered for eligibility in a Clinical Trial. The inclusion criterion was the existence of diabetic foot ulcer. However, patients with other types of wounds or those who were receiving other treatments at the time of admission were excluded.

Study procedure

In this work, ChitoTech bioactive dressings were used. Patients meeting the eligibility criteria signed the informed consent before being included in the study. Diabetic wound ulcer of patients were irrigated with SilvoSept Wound spray and, depending on the wound type and grade of the wound, a suitable form of the dressing was applied. The wound was then covered

with a non-adherent pad and fixed with secondary dressings such as polyurethane adhesive.

Dressings used for high exuding wounds were changed every day, and those with medium or low exudate were changed every other day according to wound management protocols. A pre-instructed nurse was assigned to supervise the procedure based on the study protocol. A data collection form was filled out, recording the patient's wound grade, age, gender, and data regarding dressing changes.

Ethical considerations

Before being included in the study, eligible participants accepted to sign the informed consent. Each participant was allowed to withdraw from the study whenever he/she desired. All the treatment devices were provided for the participants free of charge. Finally, all of the patients' information were classified and the findings were reported anonymously.

Analysis

The picture manager software was used to compare the therapeutic effects of the bioactive dressings on DFUs before and after application.

- The followings were assessed at each dressing changes: Wound size
- Wound grade
- Wound healing status
- Duration of healing Figure (1) illustrates study design.

RESULTS

A total of 30 patients were analyzed in this study.

Table 1 (included as supplementary data) illustrates wound condition and shows the results of using ChitoTech wound dressings.

DISCUSSION

Major aspects of DFU that should be dealt with are the extended healing procedure, infection, affecting general health and weakening of the immune system. These aspects would lead to critical difficulties for patients and even may result in amputation.

In this study it was demonstrated that the use of advanced bioactive wound dressings would result in decreasing hospitalization, and in turn, reduced hospital costs. Furthermore, in many cases it avoided the need for use of various dressings and drugs.

All of the wounds treated with advanced bioactive wound dressings healed faster and none of them developed infection.

While advanced bioactive wound dressings are commonly used in many countries, some practitioners in a number of developing countries are still hesitant to stop using traditional methods of wound managements such as gauze.

The findings in the study indicate the effectiveness of ChitoTech advanced bioactive wound dressings to treat diabetic foot ulcers.

ChitoTech bioactive wound dressings have been used in

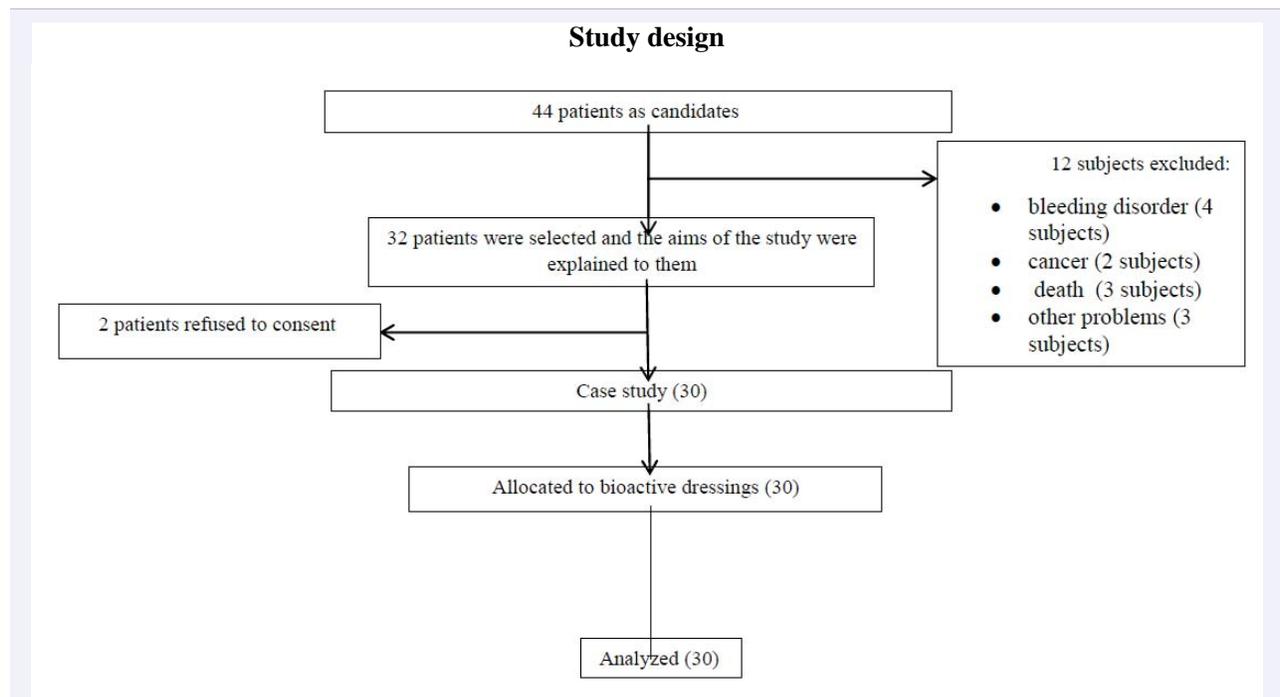


Figure 1 Flowchart of Study design.

Iran in the last 12 years and the results are reproducible. It may be readily applied in hospitals or in home care. Likewise, the methodology used in this study is easily replicable if used in national and international context, both in the private and public sectors, for hospitals, and home care.

CONCLUSION

Acceleration in the wound healing is the main outcomes of using advanced bioactive wound dressings.

The findings of the present study exhibited that using advance bioactive wound dressings can improve the quality of life of patients and reduce the cost of health care.

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Table 1: Wound condition.

Case number	Mean of wound size- initial (cm ²)	Picture	Duration of healing	Mean of wound size- final (cm ²)	Picture
1	3		27	0	
2	0.78		50	0.002	
3	6		45	0	
4	4		30	0	
5	12		58	0	
			6		

Case number	Mean of wound size- initial (cm ²)	Picture	Wound healing day	Mean of wound size- final (cm ²)	Picture
6	12		75	4	
7	70		120	10	
8	32.5		120	0	
9	3 (Necrotic Tissue)		10 (Granular Tissue)	2.7	
10	3.5		7	0.5	

Case number	Mean of wound size- initial (cm ²)	Picture	Wound healing day	Mean of wound size- final (cm ²)	Picture
11	200(Necrotic Tissue)		20	96(Granular Tissue)	
12	10		28	2	
13	1.5		60	0	
14	10.5		45	0	
15	6		60	4	
16	8		75	0	

Case number	Mean of wound size- initial (cm ²)	Picture	Wound healing day	Mean of wound size- final (cm ²)	Picture
17	40		80	6	
18	6		17	0	
19	3.9		33	0.5	
20	12		46	0	
21	70		50	0	

Case number	Mean of wound size- initial (cm ²)	Picture	Wound healing day	Mean of wound size- final (cm ²)	Picture
22	3		8	0	
23	18		10	0	
24	3.5		7	0	
25	10		27	2	
26	8		40	0	

Case number	Mean of wound size- initial (cm ²)	Picture	Wound healing day	Mean of wound size- final (cm ²)	Picture
27	7		20	0.7	
28	7.5		50	0	
29	3		30	0	
30	8		30	0	
Mean ± (SD):	19.42 ± 38.3	-	42.6 ± 29.5	0.3 ± 0.68	-