Section: General Surgery

Original Research Article

LIPOCOLLOID SILVER SHEET VS CONVENTIONAL DRESSING IN DIABETIC FOOT ULCER: A COMPARATIVE STUDY

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ABSTRACT

Background: Diabetes mellitus is a chronic non-communicable disease shows a rising potential burden worldwide. Diabetic people have a lifetime risk of developing foot ulcers of up to 25%. The mainstay of managing diabetic foot ulcers continues to be dressing, with occasional debridement and antibiotic treatment. The conventional treatment for diabetic ulcers consists of regular saline and betadine dressings. Innovative products for antibiotic or antimicrobial administration in the wound site and innovative therapies of biofilm-associated infections are being designed because traditional dressings cannot guarantee protection against bacteria. Recently silver dressings are utilized to treat diabetic ulcers. Hence this study was conducted to assess the efficacy of a lipocolloid-Ag sheet with conventional dressing for diabetic ulcer. **Materials and Methods:** This randomized control study was conducted at Department of Surgery, Dhanalakshmi Srinivasan Medical College, Perambalur for a period of six months. This study was conducted among patients with chronic diabetic foot ulcers. They were randomly allocated in to two groups with n=16 each, in which group A received lipocolloid silver sheet dressing and Group B received conventional dressing. The effectiveness of dressing was assessed by means of progression of granulation tissue as percentage of total ulcer surface area, number of sittings of debridement and the average duration of hospital stay. Data's were collected and entered in Microsoft Xcel. Data analysis was done using SPSS and continuous variables and categorical variables were interpreted using frequencies (mean±SD) and proportions (%). Independent 't'test and chi-square test are used to compare the variables. **Results:** Among the study participants the mean age among Group A (lipocolloid silver dressings) participants was 51.7±8.3 years and the mean age of Group B (conventional dressing group) participants was 52.3± 9.1years. Majority of the patients in both groups were males. The average duration of length of stay in hospital among Group A is 5.54± 1.75days compared to Group B is 12.09± 1.06 days which shows statistically significant ($p<0.01$). In the study it was found that Group A showed better reduction in the amount of slough covering the wound surface, and required lesser number of debridement than Group B with statistical significant ($p<0.01$). **Conclusion:** Our study results show that lipocolloid silver dressings improve wound healing by lowering the quantity of slough and the necessity for debridement. The sheets containing silver ions have the ability to reduce the size of wounds and lessen infection symptoms, making them a promising adjuvant therapy for chronic wounds.

INTRODUCTION

Diabetes is a serious chronic illness characterized by hyperglycemia due to absolute or relative deficiency of insulin. The American Diabetes Association (ADA) defines diabetes mellitus as a collection of metabolic disorders marked by elevated blood sugar levels caused by deficiencies in either insulin secretion, insulin action, or both.[1,2] A diabetic foot ulcer (DFUs) is characterized as an ulcerated foot that is associated with peripheral artery disease, neuropathy, or both in a diabetic patient. It is one of the most serious and debilitating consequences of diabetes.[3] The prevalence of diabetic foot ulceration in the diabetic population is 4–10%.This condition is more frequent in older patients. Diabetes patients have a 40-fold increased risk of leg amputation

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compared to non-diabetic people. Proper glycemic control, debridement to control local infection, proper dressing and systemic and local antibiotics are all part of treating diabetic ulcers.[4]

Review of Literature

The World Health Organization (WHO) reports that non-communicable diseases (NCDs) caused 74% of fatalities worldwide in 2019. According to research studies, the prevalence of diabetes would be 9.3% worldwide in 2019 and might increase to 10.2% and 10.9% by 2030 and 2045 respectively.[5] Uncontrolled diabetes is a serious condition that can lead to many problems, including diabetic ulcers. Research indicates that 2.5% of diabetic individuals experience diabetic foot ulcers (DFUs) annually, and a staggering 25% develop DFUs at some point in their lifetimes. The foot and leg may be saved by early detection and appropriate treatment of diabetic foot lesions. In addition, DFU is linked to the disturbance of the typical wound-healing process. It is most likely the result of bacterial contamination and subsequent infections that cause the ongoing inflammation in DFU.[6,7]

The inability of conventional dressings to provide complete bacterial protection has prompted the development of innovative solutions for the delivery of antibiotics or other antimicrobials to the wound site Along with advanced remedies for biofilm-associated infections. It has been shown that silver-containing dressings can effectively destroy bacteria in both mono- and polymicrobial biofilms, indicating that they have an impact on biofilm in chronic wounds that are resistant to healing.[8]

Lipocolloid-silver sheet gels, creates a moist environment that is ideal for the healing of wounds. Both gram-positive and gram-negative bacteria are susceptible to the antibacterial activity of silver ions. It works especially well against the bacteria that cause locally infected wounds most often: Staphylococcus aureus, Streptococcus pyogenes, MRSA, and Pseudomonas aeruginosa. Silver lowers the population of biofilm after 24 hours, and this reduction lasts for seven days.[9,10]

Silver particles can kill the bacteria in a number of ways. These include the breaking down of bacterial membranes, the migration of the microbial body and the initiation of intracellular death, the disintegration of cells and the elimination of lipopolysaccharide, and the induction of oxidative stress, in addition to non-oxidative stress processes, and metal release ions.[11] Several research studies have also shown that silver gel dressing is more effective in healing diabetic ulcers.

In a study conducted by J Hakeem et al,[12] stated that lipocolloid silver dressings provide better wound healing by reducing the amount of slough and increasing the granulation formation. Essa et al done a prospective randomized study compared the effectiveness of silver nanoparticles' effectiveness in accelerating healing rate of non-ischemic diabetic foot ulcers and they found that the rate of complete healing of ulcers are effective in silver nanoparticles dressing than conventional one.[13]

Aim & Objectives Aim

- To compare the efficacy of a lipocolloid-Ag sheet with conventional dressing for diabetic ulcer.

Objectives

- To assess the progression of granulation tissue as percentage of total ulcer area
- To assess the number of debridement sittings
- To assess the duration of hospital stay among the study participants.

MATERIALS AND METHODS

Study design: A Prospective randomised controlled trial study

Study area

- Department of General Surgery, Dhanalakshmi Srinivasan Medical College, Perambalur
- **Study duration:** Six months (August 2025-January 2026)

Study population

- Patients with diabetic ulcers either admitted or visiting as out-patient in Department of General Surgery.

Sampling technique: Convenient sampling

Sample size: 32.

Inclusion Criteria: Patients aged 35-70 yrs o Patients with chronic diabetic foot ulcers o Patients willing to participate in the study.

Exclusion Criteria: All other causes of ulcer, which can attribute to other coexisting diseases like paraplegia, varicose veins etc

- Patients with severe systemic illness o Healed diabetic ulcers

Data collection

Data was collected in Department of General Surgery, Dhanalakshmi Srinivasan Medical College, Perambalur. After getting informed written consent from the patients a total of 32 patients with chronic diabetic foot ulcers are enrolled for this study. A semistructured questionnaire was used to collect the demographic details, past medical history, duration of diabetes. Complete clinical examination was done to all the study participants. They were randomly allocated in to two groups Group A and B with n=16 each.

Group A – received lipocolloid silver sheet dressing changed every 48-72 hrs.

Group B - received conventional dressing, changed every 12-24 hrs.

Ulcer examination was done in all these patients and wound assessed of its characteristics and photographed. Wound response was evaluated weekly. The same protocol was repeated in each follow up week until complete wound closure.

Visual scores for the percentage of wound covered with slough are:

1. 76-100% OF WOUND COVERED BY SLOUGH

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2. 51-75% WOUND COVERED BY SLOUGH
3. 26-50% OF WOUND COVERED BY SLOUGH
4. 11-25% OF WOUND COVERED BY SLOUGH
5. 0-10% OF WOUND COVERED BY SLOUGH
6. NO SLOUGH COVERING THE ULCER

The visual score for the percentage of wound filled by granulation tissues are

1. NO GRANULATION TISSUE COVERING THE ULCER
2. PINK / DULL <25% WOUND FILLED
3. BRIGHT BEEFY RED 25-74% WOUND FILLED
4. BRIGHT BEEFY RED 75-100%

Data Analysis

Data was entered in Microsoft excel 2019 and analysed using software SPSS (Statistical Package of Social Sciences) version 22. Continuous variables and categorical variables were interpreted using frequencies (mean±SD) and proportions (%). Independent 't'test and Chi-square test are used to compare the variables. A P value of <0.05 was considered significant.

Ethical issues

- Participants were informed about the study and informed consent was obtained.
- This study was presented to Institutional Ethical Committee of Dhanalakshmi Srinivasan Medical College, Perambalur.

RESULTS

Table 1 shows the baseline characteristics of participants. The mean age among Group A (51.7 ± 8.3) and Group B (52.3 ± 9.1) was comparable among groups the difference among groups was statistically insignificant (p 0.808). The distribution of gender, duration of diabetes and duration of diabetic foot ulcer is equal as results were non -significant suggesting both groups comparable.

Table 1 also shows that average duration of stay in hospital in Group A is less ehen compared to Group B with statistical significant of (p<0.002).

Table 1: Baseline parameters of the Study participants (n = 32)

S.NO	Variables	Group A (n = 16)	Group B (n = 16)	p
1	Age	51.7 ± 8.3	52.3 ± 9.1	0.808
2	Gender (M:F)	(11:5)	(10:6)	0.562
3	Duration of Diabetes Mellitus (years)	10.4± 3.2	11.3 ± 2.9	0.411
4	Duration of Diabetic foot ulcer (years)	5.1 ± 1.6	5.5 ± 1.2	0.430
5	Average duration of hospital stay (days)	5.54 ± 1.75	12.09 ± 1.06	**0.002***

Table 2 shows that number of wound dressings required for Group A is shows majority (87.5%) had required less than 5 dressings than Group B in which majority (62.5%) required more than 10 dressings during the course of treatment which shows statistically significant.

Table 2: Number of wound dressing required (n = 32)

S No	Groups	<5	6-10	>10	p value
1	Group A	14(87.5%)	2 (12.5%)	0	**0.001***
2	Group B	2(12.5%)	4(25%)	10(62.5%)	

Table 3 shows that number of wound debridements required for Group A is shows majority (75%) had required less than one than Group B in which majority (75%) required 1-5 sittings for wound debridement which shows statistically significant.

Table 3: Number of wound debridement required (n = 32)

S No	Groups	<1	1-5 nos	>5 nos	p value
1	Group A	12(75%)	4(25%)	0	**0.001***
2	Group B	1(6.3%)	12(75%)	4(18.7%)	

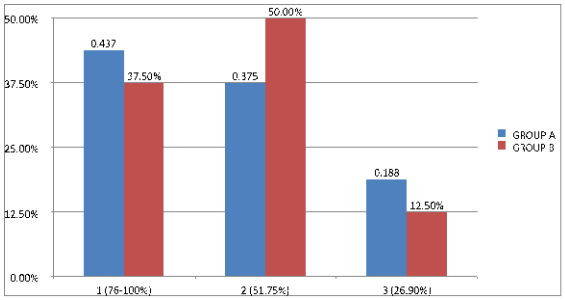

Figure 1: Visual score of slough during admission

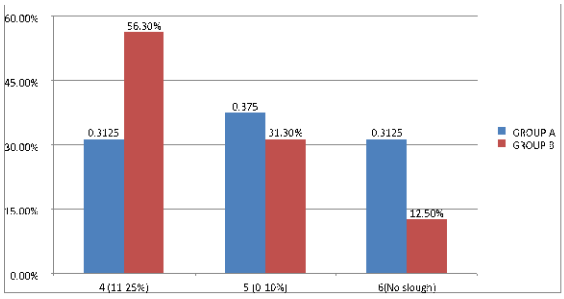

Figure 2: Visual score of slough during discharge

Figure 1 and Figure 2 represents the visual slough area present during admission and during discharge

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among the study participants. Group A patients recovered well than Group B.

Table 4 shows that presence of granulation tissue for Group A shows majority in visual score 3(43.75%) than Group B with majority visual score 2 (43.75%).

Table 4: Presence of granulation tissue (n = 32)

S No	Visual score	Group A	Group B	p value
1	Visual score 4	5(31.25%)	2(12.5%)	0.128
2	Visual score 3	7(43.75%)	5(31.25%)	
3	Visual score 2	4(25%)	7(43.75%)	
4	Visual score 1	0	2(12.5%)	

Conventional dressing done

Figure 3a; Diabetic Ulcer Right foot at day 1

Figure 3b: Diabetic Ulcer Right foot at day 15

Lipocolloid dressing done

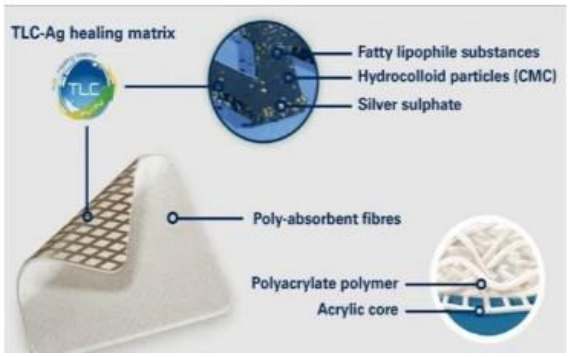

Figure 4a: Diabetic Ulcer Right foot at day 1

Figure 4b: Diabetic Ulcer Right foot at day 7

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DISCUSSION

Diabetic foot ulcers are a significant health and economical issue that can have a psychological impact on patients. Unfortunately, it was estimated that about 85% of major non-traumatic lower limb amputations are mainly due to diabetic foot ulcers. Wound dressings have evolved from providing physical protection to the raw surface, absorbing exudates and controlling local infections by local medications to the level of providing adequate environment promoting wound healing. Various agents have been tried upon to initiate early response in wound healing.

In the present study, the lipocolloid silver sheet dressing group's healing proportion was larger than the patients' in the conventional group dressing group. In this study on 32-patients, 16 patients had standard saline and antimicrobial dressings, and 16 patients got lipocolloid silver dressings. Group A's mean age was 51.7± 8.3, while Group B's mean age was 52.3 ±

9.1, and majority of them were older adult age group, indicating that diabetic foot ulcers are more common in this age range. In the present study it was found that in Group A patients, the number of dressing required and the number of debridement done was less when compared to Group B which shows statistically significant. In the present study it was also found that the visual slough area present during admission and during discharge among the study participants in Group A patients recovered well than Group B.

Our study report is similar to a study conducted by Hakeem et al stated that patients received lipocolloid silver dressings showed better reduction in the amount of slough covering the wound surface, granulation appeared better in ulcers treated with lipocolloid silver dressings than conventional dressings and patients managed with lipocolloid silver dressing required lesser number of debridement than conventional dressing group. In conventional group, majority (81.50%) did more than 30 dressings, whereas in lipocolloid silver group majority (82.60%) did only less than 15. The mean duration of hospital stay was less among those patients in lipocolloid group than conventional group and the number of dressings required for wound healing is less for lipocolloid silver dressings than conventional dressing. They concluded that lipocolloid silver dressings provide better wound healing by reducing the amount of slough and increasing the granulation formation.

Another study conducted by Tsang et al,[14] also stated that silver (Ag) group had better ulcer healing in terms of higher reduction rate of ulcer size than the conventional dressing group. They also found that the proportion of complete wound healing at the end of week 12, the nAg group demonstrated the highest proportion (81.8%) than conventional group (40%) which is similar to our study report.

Our study is in consistent with a study conducted by Essa et al stated that the healing rate of the Silver dressing group (Silver STAT Gel) was significantly higher than that of the conventional group. The healing rate per week of the silver dressing group was considerably higher than that of the conventional group ($P < .0001$). The rate of complete healing for ulcers in group A with silver dressing was achieved in 22 patients (55%) by the 6th week, while 29 (72.5%), 34 (85%), and 36 (90%) patients were healed entirely by the 8th, 10th, and 12th weeks, respectively. They also concluded that SilverSTAT Gel is effective in the treatment of DFU.

In a meta-analysis and systemic review done by Zhao et al,[15] also stated that silver-containing dressings can accelerate the healing rate of chronic venous leg ulcers and improve their healing in a short duration of time which is comparable to our study report. Another study by Lazareth et al,[16] also stated that 4-week treatment with silver-releasing lipidocolloid contact layer promotes a sustained increase of closure rate of venous leg ulcers presenting inflammatory signs, suggesting a high bacterial load which is also comparable to our report.

CONCLUSION

With use of lipocolloid silver dressings in comparison with the conventional saline dressing for the treatment of diabetic ulcer, the following conclusions were derived. Lipocolloid silver dressing showed faster wound healing, faster and better reduction in amount of necrotic tissue compared to conventional dressing. Granulation and epithelialization appeared early in lipocolloid silver dressing. Number of sitting for debridement and duration of hospital stay was less among those patients managed with lipocolloid. Lipocolloid silver sheet found more effective in treatment of chronic diabetic ulcers.

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