The Effect Silver Colloidal Cream As Primary Dressing For Treating Infections In Diabetic Foot Ulcer: A Case Report

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ABSTRACT

Background: Infection in diabetic foot ulcer (DFU) is one of the main factors delaying wound healing. The use of silver in cream formulation can be an option as a primary dressing. **Objective:** In this case study, the authors report the wound healing progress of an infected diabetic foot ulcer treated with colloidal silver cream as the primary dressing. **Case Presentation:** A 60-year-old man presented to Wocare on March 17, 2025, with complaints of wounds on both feet that appeared on February 11, 2025. The wound began as blisters after sun exposure at 1:00 p.m. on February 10, 2025. He sought treatment at a hospital where daily wound cleansing was performed, but the wounds showed no improvement. Multiple wounds were noted on both feet. The wounds were unstageable because the wound bed was covered with slough. The wound base consisted of 40% yellow tissue and 60% red tissue. There was a large amount of serous exudate, erythema, edema, and warmth around the wound area. Wound management used the TIME framework, applied with the 3M approach (Mencuci, Membuang, Mengaplikasikan) . The primary dressing used was colloidal silver cream, and dressings were changed every three days. **Conclusion:** Silver cream is effective in managing infection in diabetic foot ulcers. Clinical signs of infection, such as erythema, edema, and warmth around the wound, were no longer present during evaluation.

Keywords : *diabetic foot ulcer, diabetic foot infection, wound care*

ABSTRAK

Background : Infeksi pada diabetic foot ulcer menjadi salah satu faktor penghambat penyembuhan luka, penggunaan silver dalam sediaan krim dapat menjadi pilihan dressing primer. **Objective** : Dalam case study ini penulis melaporkan perkembangan luka infeksi pada diabetic foot ulcer dengan krim koloidal silver sebagai dressing primer. **Case:** Pria usia 60 tahun datang ke wocare 17 maret 2025. keluhan utama luka dikedua kaki muncul tanggal 11 februari 2025, awalnya lepuhan setelah berjemur didepan rumah jam 13.00 WIB 10 februari 2025. Kemudian berobat ke rumah sakit luka setiap hari dibersihkan namun tidak membaik. Luka tampak multiple pada kedua kaki. Kategori luka unstageable karena dasar luka tertutup slough. warna dasar luka kuning 40%, merah 60%. Eksudat banyak, jenis cairan serosa. Ditemukan eritema, edema dan area sekitar luka teraba hangat. manajemen luka menggunakan pendekatan TIME, yang dilakukan dengan 3M. Dressing primer menggunakan krim kolloidal silver. Balutan diganti setiap 3 hari. **Conclusion** : Silver dalam sediaan krim efektif untuk mengatasi infeksi pada diabetic foot ulcer. Tanda-tanda klinis infeksi pada luka seperti eritema, udem, dan hangat disekitar luka sudah tidak ditemukan saat evaluasi dilakukan.

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INTRODUCTION

Background

Diabetes mellitus is a chronic disease with serious long-term complications, one of which is diabetic foot ulcer (DFU). DFU is a chronic wound on the lower extremities caused by a combination of

peripheral neuropathy, vascular impairment, and recurrent mechanical trauma. Yang et al. (2021) explained that prolonged hyperglycemia leads to nerve and vascular damage, thereby reducing the natural wound-healing ability. According to Cao et al. (2020), DFUs often develop unnoticed due to the loss of pain sensation caused by neuropathy. Abdelbary et al. (2024) noted that infections frequently occur in wounds with poor glycemic control and impaired peripheral blood flow.

The prevalence of diabetes mellitus in Indonesia in 2024 reached 20.4 million people and is projected to increase to 28.6 million by 2050 (IDF, 2025). Approximately 35% of individuals with diabetes develop diabetic foot ulcers, and 20% of these cases result in amputation (E.M. Yunir, 2024). Singh et al. (2022) reported that infections occur in 40–60% of DFU cases and represent the leading cause of lower extremity amputations. Tajdar et al. (2024) highlighted that wound infections in DFU significantly slow healing and increase the risk of severe complications. Ravishankar et al. (2020) further emphasized that infections in diabetic wounds require therapies that can rapidly and effectively reduce microbial load.

Silver-based dressings, such as 50 ppm colloidal silver, are effective in managing infections due to their broad-spectrum antibacterial properties. Yang et al. (2021) described that silver ions disrupt bacterial cell membranes and inhibit microbial enzymatic activity. Lafontaine et al. (2023) stated that silver dressings are widely used in clinical practice to accelerate wound healing in diabetes. Ilham et al. (2024) also reported significant improvement in infected wound conditions after three days of silver dressing application.

DFU infection management involves wound cleansing, debridement, antimicrobial dressings, and adequate glycemic control, all of which contribute to better clinical outcomes. Tajdar et al. (2024) reported that colloidal silver dressings reduced wound area by up to 67.77% and accelerated healing to 23 days compared to 48 days with normal saline dressings. Ravishankar et al. (2020) asserted that ionic silver hydrogel is clinically and economically more efficient than conventional dressings. Singh et al. (2022) demonstrated that colloidal silver nanoparticles (cAgNPs) effectively inhibited MRSA and VRE biofilm formation and significantly reduced bacterial load. Xu et al. (2021) also found that combining silver ions with PHNB gel accelerated epithelialization and reduced systemic inflammation. Yang et al. (2021) further reported that nano-silver dressings reduced dressing change frequency and significantly shortened wound healing time.

Despite these positive findings, Lafontaine et al. (2023) reported that in acute non-infected DFUs, silver dressings did not demonstrate significant advantages over standard dressings. This suggests that the benefits of colloidal silver are most evident in chronic wounds with active infections. This case report presents the management of DFU infection in a 60-year-old male patient treated with silver colloidal cream as the primary dressing.

METHODS

This study employed a case report design. Observations were conducted between March 17, 2025, and March 28, 2025, on a 60-year-old male patient who presented at Wocare Bogor on March 17, 2025.

Case Presentation

A 60-year-old male patient presented to Wocare Bogor on March 17, 2025. The wound history began on February 10, 2025, when both feet developed blisters after sun exposure at 1:00 PM. On the following day, February 11, 2025, the blisters worsened, and the patient was taken to the hospital. During hospitalization, the wounds were cleaned daily by a surgeon but showed no improvement. At home, wound care was performed using 0.9% NaCl, ointment, and dressings, which were changed weekly. Therapy included one week of antibiotics and routine medications such as insulin, blood thinners, and cardiac medications. The patient had a history of diabetes mellitus (DM) and coronary artery bypass grafting (CABG) performed 10 months earlier.

Clinical Funding

Physical Examination: The patient was fully conscious (compos mentis), with vital signs within normal limits and random blood glucose within normal range. Multiple wounds were observed on both feet. The wounds were categorized as unstageable due to the wound bed being covered by slough tissue. The wound bed appeared yellow (40%) and red (60%). There was a large amount of exudate, with serous fluid characteristics. Erythema, edema, and warmth were noted in the periwound area.

Laboratory and Imaging Finding

Kamis 13 maret 2025 leukoit 21.000/ uL, hasil lab pagi 17 maret 2025 leukosit 13.000/ uL. CT Angiografi pembuluh di kaki menunjukan tidak ada sumbatan. Kultur luka dilakukan tanggal 14 maret hasil sedang diminta.

RESULT

First Wound Care Session:

Wound management was performed using the **TIME** framework and the **3M approach** (Cleansing

Mencuci luka), Removing devitalized tissue (Membuang Jaringan Mati), and Applying appropriate dressing (Mengaplikasikan Balutan Tepat Guna)).

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Step 1: Cleansing (M1). The wound was irrigated using sterile water for wound irrigation and gentle antiseptic soap. The wound was then dried with sterile gauze, followed by the application of PHMB spray and ozone therapy for 15 minutes.

Step 2: Removing devitalized tissue (M2). Mechanical debridement, such as conservative sharp wound debridement (CSWD), was performed in combination with autolytic debridement. Due to the presence of thick and adherent slough, complete removal was challenging, as shown in *Figure 1*.

Step 3: Applying appropriate dressing (M3). Following debridement, colloidal silver cream was applied as the primary dressing. The cream was directly applied to the wound bed and periwound area, as shown in Figure 1.

Figure 1. First Wound Care Session (17/03/2025

Second to Fifth Wound Care Sessions:

Wound management continued with the TIME framework and the 3M approach, with colloidal silver cream consistently applied as the primary dressing.

By the fifth session, the wound bed condition showed significant improvement, consisting of 80% red tissue and 20% yellow tissue. Granulation and epithelialization were evident. No signs of infection such as erythema, edema, or warmth in the periwound area were observed. Exudate remained serous in nature and of moderate amount. The wound condition at the fifth session demonstrated notable improvement, as shown in Figure 2.

Figure 2. Fifth Wound Care Session(28/03/2025)

DISCUSSION

Infection is one of the most common complications in Diabetic Foot Ulcer (DFU). Careful monitoring of infection stages is crucial in wound management to ensure proper treatment and prevent deterioration. The infection stage determines the appropriate treatment methods and the choice of dressings. According to the *International Wound Infection Institute (IWII, 2022)*, there are five stages of wound infection:

1. **Contamination stage** – the wound is contaminated, but microorganisms have not yet multiplied and no host immune response is present.
2. **Colonization stage** – microorganisms begin to proliferate and form colonies, but there is still no immune response.
3. **Local infection stage** – divided into covert (hidden) and overt (visible). At this stage, immune responses such as local inflammatory reactions occur, and biofilm formation begins.
4. **Spreading infection stage** – characterized by persistent erythema, excessive exudate, tissue crepitation, and worsening wound condition.
5. **Systemic infection stage** – the infection spreads systemically, marked by fever, leukocytosis, tachycardia, and progression to sepsis.

In this case, the wound was at the local infection stage, overt category, as clinical signs of local inflammation were present, including erythema, edema, and increased periwound temperature.

Wound care was performed by cleansing with wound irrigation solution and gentle antiseptic soap, followed by 15-minute ozone therapy. Necrotic tissue removal was carried out using mechanical debridement and conservative sharp wound debridement (CSWD), combined with autolysis. Colloidal silver cream was applied as the primary dressing to control infection and maintain a moist wound environment. These interventions followed the TIME framework.

Evidence for the TIME Framework

The TIME approach has been shown to significantly accelerate DFU healing. In a retrospective study, Huang et al. (2021) reported that wound management focusing on infection and exudate control significantly reduced the need for further surgical intervention and shortened hospital stays. Bondi et al. (2021) emphasized that glycemic control, infection management, and modern dressings integral to the TIME framework are critical success factors for wound healing. Similarly, Coye et al. (2024), in a meta-analysis of 32 clinical trials, found that wound care based on TIME principles achieved a healing rate of approximately 33.15% within 12–24 weeks. Zhang et al. (2021) highlighted that the negative impact of peripheral vascular disease and wound size could be minimized through targeted strategies such as selective debridement and optimal moisture balance, both part of the TIME approach.

Colloidal Silver in DFU Management

In this case, beyond cleansing and debridement, colloidal silver cream was applied to control infection and maintain moisture. Silver colloid works through the release of silver ions (Ag^+), which interact with bacterial cell membranes, causing structural damage. These ions also inhibit DNA replication and enzymatic activity essential for bacterial metabolism, thereby suppressing colonization and biofilm formation. Singh et al. (2022) demonstrated that colloidal silver nanoparticles (cAgNPs) in topical formulations effectively disrupted MRSA and Enterococcus faecalis biofilms, significantly reducing infection in chronic wounds.

Tajdar et al. (2024) reported that silver-based creams and dressings reduced wound size by up to 67.77% within three weeks and accelerated healing compared with saline dressings. Krishna et al. (2024) showed a 99% healing rate with nano-silver compared with only 60–70% in a betadine-treated control group. Qin et al. (2021) found that silver dressings applied for 30 days reduced systemic inflammatory markers (FIB, PCT, hs-CRP) in DFU patients, controlled local inflammatory responses, and promoted more effective wound repair. These findings are consistent with this case, where by the fifth treatment session clinical signs of infection such as erythema, edema, and warmth had subsided. With the reduction in wound inflammation, healing progressed to the proliferative phase, as indicated by granulation and epithelialization.

Ozone Therapy as an Adjunctive Treatment

In addition to colloidal silver application, ozone therapy was administered at each session for 15 minutes prior to dressing application. Ozone therapy has proven to be an effective and safe adjunctive modality in DFU infection management. It supports wound size reduction, accelerates epithelialization, and suppresses inflammation. Sun et al. (2024) demonstrated that short-term ozone therapy increased VEGF levels, reduced inflammatory markers (CRP, PCT, IL-6, TNF-α), and improved oxidative stress, all contributing to faster wound healing and better long-term outcomes. Astasio-Picado et al. (2023) further confirmed that ozone enhances blood circulation, improves glucose and lipid metabolism, and supports overall wound repair in DFU patients. Faraji et al. (2021) reported that ozone therapy combined with silver dressings was effective in treating wounds unresponsive to conventional therapies.

Based on this evidence, the combination of ozone therapy and silver-based dressings represents an effective adjuvant strategy in DFU wound care.Ozone therapy accelerates wound healing through several mechanisms. It enhances blood flow by stimulating nitric oxide (NO) release, optimizes oxygen and nutrient delivery, and reduces oxidative stress via increased antioxidant enzyme activity. Its antimicrobial properties lower the infectious burden, while stimulation of growth factors such as PDGF and TGF-β promotes cell proliferation and new tissue formation.

CONCLUSION

This study evaluated the effectiveness of silver cream in managing infection in diabetic foot ulcers (DFU) while maintaining a moist wound environment. At the first visit, clinical signs of infection were observed, including erythema, edema, and increased periwound temperature; however, these signs were no longer present at the fifth evaluation. By the fifth treatment session, granulation and epithelialization were evident, indicating a reduction in the inflammatory phase and progression of the wound healing process into the proliferative stage.

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