



Management of Diabetic Leg Ulcers using Traditional Mixed DHSc dressing: A Case Study

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Abstract

The treatment of chronic wounds using honey has been widely studied, and sea cucumber has been used for the treatment of diabetic wounds. In addition, dates (*Phoenix dactylifera*) have been used for wound healing. This study applied a mixed dressing of these three ingredients, referred to as DHSc (dates, honey and sea cucumber). The aim of this study was to evaluate the speed and effectiveness of the use of DHSc dressings for healing diabetic wounds. A case of a male patient with an infected diabetic ulcer on the left lower tibia that extended to the dorsal area is presented. Results: Mixed DHSc dressings were found to be effective for the treatment of chronic wounds, and they achieved wound healing in less than 12 weeks. The wound bed showed good contraction and healthy granulation with no side effects, evidence of infection or maceration. Thus, researchers concluded that DHSc mixed dressings are suitable for the treatment of diabetic ulcer patients in a clinical setting.

Keywords: Diabetic Ulcers, Honey, *Phoenix dactylifera*, Sea Cucumber

1. Introduction

Diabetic ulcers are a complication that result from uncontrolled blood sugar level, which can result in infection, damage to the skin tissue, and even amputation¹⁻⁴. A holistic wound care approach to diabetic ulcers is required to prevent further damage⁵. The primary treatment for diabetic ulcers consists of properly preparing the wound bed. Basic wound management includes the removal of damaged tissue, control of inflammation and infection, control of moisture balance and expansion of wound edges⁶. Adequate understanding of the preparation of the wound bed is an important part of maintaining a moist wound environment. Many types of ointments and wound dressings are available, which can be used as traditional topical agents for wound care that are infused with active agents, such as honey, dates (*Phoenix dactylifera*) and sea cucumber. Honey has been used for thousands of years as a wound healing treatment and can be traced back to ancient Egyptian times⁷. There are various types of honey, one of them is *Trigona* spp. Study reported that *Trigona* spp. can increase proliferation

and do not alter normal cell cycle progression in dermal fibroblasts⁸. *P. dactylifera* has been recently added as a wound care treatment. Studies reported that *P. dactylifera* accelerates cell proliferation and contributes to wound healing, and it is therefore effective as an anti-inflammatory and antimicrobial agent⁹⁻¹². One study showed that a mixed dressing of *Trigona* spp and *P. Dactylifera* accelerated the rate of wound healing.¹¹ Sea cucumber (*Stichopus Variegatus extract*) was reported as an antimicrobial agent that accelerates wound healing¹³⁻¹⁶. In Indonesia, traditional dressings are used in community health settings for chronic wounds and include honey (*Trigona* spp), sea cucumber gel (*Stichopus Variegatus extract*), dates extract (*P. Dactylifera*), and/or a mixture of these three agents. To date, no studies evaluated dressings consisting of a mixture of *P. Dactylifera*, *Trigona* spp, and *Stichopus Variegatus extract*. In this study, a DHSc dressing was used for the treatment of diabetic leg ulcers. The aim of this case study was to evaluate the efficacy of a traditional mixed DHSc dressing for the treatment of infected diabetic foot ulcers.

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2. Case Presentation

The study was conducted in a clinic caring for wounds and under home care setting once the patient was discharged from the hospital. The written informed consent obtained from the patient included his permission to take photos. The standard protocol for the management of wounds at the Kitamura Wound Clinic includes regular sharp debridement of nonviable and sloughed tissues. Honey, dates and sea cucumber (DHSc) were used in an equal (1:1:1) ratio. The DHSc was formulated by pharmacist, Faculty of Pharmacy Tajungpura University. Impregnated gauzes containing mixtures of dates, honey, and sea cucumber were prepared in this study. The clinical outcomes of the ulcer-healing process are described both quantitatively and qualitatively.

3. Clinical History and Assessment

A 50-year-old male patient was hospitalised for two days and returned home for outpatient treatment at a special care clinic in Indonesia as an outpatient with extensive injuries to the fibular area of the foot. During the course of one week of outpatient visits, the patient failed to adhere to the daily wound care protocols. Signs of infection were apparent during expansion of the dorsal foot and tissue exploration by the wound specialist nurses (Figure 1A). The patient's blood was examined on 6 June 2020. Results showed a white blood cell (WBC) of 16,000 cells/mm³, which was higher than the normal range (4000–10,000 cells/mm³); a haemoglobin level of 10.6 g/dL; a platelet level of 592,000/ μ L, also was higher than the normal (140,000 – 450,000/ μ L); an HbA1c level of 8% and an albumin level of 3 g/dL. His initial blood pressure was 145/80 mmHg, and his fasting blood glucose level was 343 mg/dL. The patient was receiving oral antidiabetic therapy in the form of metformin 500 mg every 8 hours and glimepiride 2 mg every 12 hours, antibiotic therapy in the form of cefixime 200 mg every 8 hours, cilostazol 100 mg every 12 hours, and analgesics as needed. The

patient was administered antibiotics for two weeks. On 4 July 2020, his blood sample showed a WBC count of 7,200 cells/mm³ and an albumin level of 3.5 g/dL. Examination of his neuropathy status was normal, his ankle brachial index was 1, and no foot deformity was noted. The patient received treatment at the wound clinic for one week and was then requested to continue wound care at home.

4. Wound Care Management

Wound care management included a wound healing assessment tool for diabetic patients that assessed wound depth, moisture, infection, size and tunnelling (DMIST) as well as pain on a numerical scale¹⁷. Both photography and thermography were performed and wound condition, laboratory data, patient characteristics and wound bed preparation were assessed. A DHSc-impregnated gauze dressing was applied as the primary dressing, and a menstrual pad was applied as the secondary dressing. A diabetic wound care nurse specialist changed the dressing every day. Wound assessment showed that the wound bed appeared to exhibit a healthy red granulating base with slight serous exudate and slough. Wound care management was performed via sharp debridement of devitalised tissue. Wound care was performed every day, and after the wound was nearly healed, wound care was conducted once every two days. During the inflammation phase and wound care, the patient complained of pain for a moment, which he rated as 3–4 on the numerical pain scale. When using the DMIST for wound assessment, the initial score was 19 (Figure 2), and after one month of home visits, the wound bed showed healthy granulation (Figure 1B), with a DMIST score of 12 (Figure 2). Thermography imaging (Figure 1B) showed that the wound layer exhibited a higher temperature than the surrounding skin. Epithelialisation of the wound edge was nearly complete at the two-month follow-up (Figure 1C), and the temperature of the bottom of the wound bed was low (Figure 1C). Overall, the prognosis of wound healing was good.

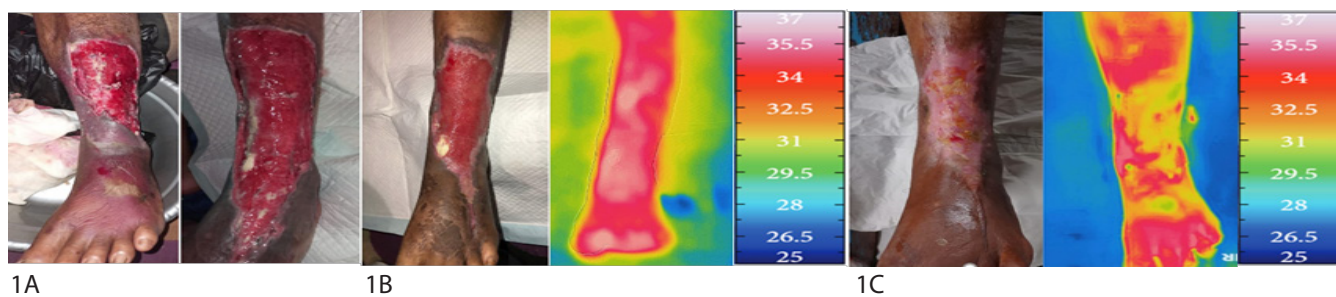


Figure 1. Wound appearance after surgical exploration (1A), 1B shows still higher wound temperature at the centre of wound bed. At discharged, centre of the wound bed exhibited lower temperature and indicating good progress of wound healing 1C.

5. Clinical Outcome

Upon discharge, no signs of trauma were present in the skin surrounding the wound, such as maceration or skin breakdown. The wound appeared to exhibit healthy granulated tissue with epithelialisation and a clear exudate. At discharge, the DMIST score was 0 (Figure 2). No signs of acute infection were noted during dressing changes. The mixed DHSc dressing provided adequate moisture balance without causing maceration of the wound margins. The dressing also provided an environment conducive to laying down new granulation tissue.

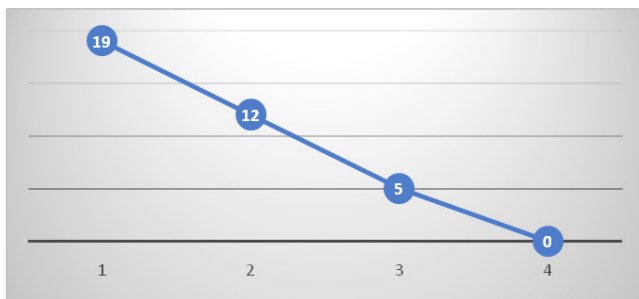


Figure 2. Graph shows total score of wound evaluation at the first assessment till discharge using DMIST scale.

6. Discussion and Conclusion

Many studies reported the effectiveness of honey in wound management. This case study demonstrates that the use of a mixed DHSc dressing controlled infection and resulted in no allergic reaction, no significant side effects and no maceration. Granulation, epithelialisation and contraction improved rapidly; wound odour was eliminated; exudate was reduced. Overall, the wound completely healed. The patient was comfortable with the DHSc dressing. The patient reported minimal pain upon removal, and he did not wish to be changed to another dressing.

In the literature, a variety of reports exist providing data supporting the use of a mixture of *Trigona* spp, *Stichopus Variegatus* extract and *P. Dactylifera* for wound treatment. Honey dressings became an option in wound care management and are currently quite widely used. Systematic reviews and meta-analyses showed that honey might demonstrate a beneficial effect on wounds as an antimicrobial, antioxidant and anti-inflammatory agent that controls odour, accelerates wound healing, reduces bacteria and decreases wound debridement and wound healing time as well as decreases hospital stay^{18,19}. Preclinical studies reported that *P. dactyliferai*

effective in healing wounds^{9,10,20–24}. Mixed dressings of *Trigona* spp and *P. Dactylifera* have also been shown to be effective¹¹. *P. dactylifera* has been reported to be good for wound healing, because it results in the rapid formation of granulation tissue, decreases the epithelialisation period, increases the wound contraction rate and increases collagen synthesis; it is also an antithrombotic²¹. One clinical study reported that skin care creams that included *P. Dactylifera* were effective anti-inflammatories and good for wound healing^{20,24}. The use of *Stichopus Variegatus* extract dressings in the clinical setting was reported to be very effective for the healing of chronic wounds in diabetic patients^{13,25}. The composition sea cucumber extract is nutrient rich, including high levels of antioxidants and essential amino acids, and it is also high in polyunsaturated and monounsaturated fatty acids, all of which can play a role in tissue repair without associated side effects^{14,16,26}. This present study, perhaps the wound healing also was due to of the role of antibiotics in reducing infection during treatment. However, this case showed a wound healing time of less than 12 weeks, which the healing time of diabetic ulcers is generally 12 weeks^{27,28}. In this study, wound healing might have been accelerated by the DHSc dressing because of the combination of these ingredients, all of which demonstrate various benefits in the wound healing process, for which they provide collagen and antioxidants as well as exhibit antibacterial, anti-inflammatory and anticoagulant properties.

The limitation of this case study was that it did not evaluate histological conditions. This should be explored in future research that includes a larger sample size. DHSc dressings are a traditional treatment that is effective in accelerating wound healing and can be used for chronic wounds in patients with diabetes mellitus.

7. References

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