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Successful Repair of Diabetic Foot Ulcer with Honey-Based Treatment: A Case Report

Elahe Delshad,[1] Mandana Tavakkoli-Kakhki,[1] and Malihe Motavasselian[1,*]

[1]Department of Persian Medicine, School of Persian and Complementary Medicine, Mashhad University of Medical Sciences, Mashhad, Iran

[*]*Corresponding author*: Malihe Motavasselian, Department of Persian Medicine, School of Persian and Complementary Medicine, Mashhad University of Medical Sciences, Mashhad, Iran. Tel: +98-5138552188, E-mail: m_motevasselian@yahoo.com

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Abstract

Introduction: As a common diabetic complication, foot ulcers may cause a huge burden both on the patient and healthcare system. The current study aims at investigating the effectiveness of honey dressing in the presence or absence of olive oil in diabetic foot ulcer.

Case Presentation: The study attempted to report a 70-year-old female with the history of diabetes undergoing high doses of oral antidiabetes drugs (OADs). Following a car accident, she developed a neuropathic ulcer categorized as Wagner grade-II. The case was admitted in Imam Reza General hospital, Mashhad, Iran in August 2014. A combined regimen of cephalexin, cefixime and anti-inflammatory drugs was started after hospitalization. Since granulation formation and tissue repair did not occur, honey dressing with and without olive oil was used to repair the ulcer. The whole treatment period lasted a month.

Conclusions: To sum up, honey dressing with and without olive oil could successfully prevent the risk of amputation in case of diabetic foot ulcers.

Keywords: Diabetic Foot, Ulcer, Honey, Olive Oil, Traditional Medicine

1. Introduction

Diabetes refers to a metabolic disorder with multiple etiologies, which accompanies chronic hyperglycemia as well as impaired metabolism of lipid, carbohydrate and protein. Of note, the function of insulin is widely decreased (1, 2). It was reported that diabetes affected 6.4% of adults across the globe in 2010. This statistics is predicted to reach 7.7% by 2030. Nowadays over 2 million cases with diabetes are identified in Iran (3).

Diabetes is associated with long-term complications and diabetic neuropathy, which, in turn, can lead to diabetic ulcers and amputations (4). Out of the 14% with diabetic foot ulcers, 15% - 20% may require amputation. This ongoing trend reportedly hits its maximum in Iran (5). The main causes of diabetes are patients' impaired immune system, venous insufficiency, and peripheral neuropathy (6).

Diabetic foot, characterized by a classical triad of neuropathy, ischemia, and infection, in addition to gangrene are common reasons threatening patients' health. Moreover, even a minor trauma or a minimal deformity can cause foot ulcers and infection. In this regard, several treatments are proposed including topical epidermal growth factor, negative pressure, and peripheral stem cell injection, which might show effective outcomes to some extent; thus, other alternatives are required to treat or at least prevent amputation (7). On the other hand, antibiotic–resistant pathogens may induce wound infection in patients with diabetes, which necessitate the application of other treatments instead of antibiotic agents, as well (6). Given the rapid rise in the burden of diabetic wounds, the use of a cost-effective treatment sounds very essential to overcome such difficulties.

It was found out that honey has high potential against bacteria without any tissue damages due to its high acidity. Honey is a viscous liquid extracted by bees from the nectar of flowers, with a wide application to treat wounds over centuries. Mohamed et al. reported a 65-year-old female with a plantar ulcer caused by a thermal burn, which successfully healed in 16 weeks (8). Surahio et al. demonstrated the beneficial role of honey dressing in wound healing and amputation reduction in a prospective observational study on 172 patients (9). Therefore, the current study tried to objectively investigate the effectiveness of honey dressing in combination with other herbal substances to treat foot ulcers in local population.

2. Case Presentation

The current study intended to describe a 70-year-old female with a body weight of 65 kg and body mass index (BMI) of 22 $\pm$ 2.40 kg/m^2. She underwent high doses of

oral antidiabetes drugs (OADs) (metformin 500 mg, tid and glibenclamide 5 g, bid) for about 15 years (Table 1).

Table 1. The Patient's Characteristics

Feature	
BMI (kg/m^2)	22 ± 2.40
Blood glucose (mg/dL)	140 - 160
Glycated hemoglobin (HbA1C) (%)	6.5
Respiratory rate (bpm)	16
Systolic pressure (SBP; mm Hg)	12.04 ± 1.32
Diastolic pressure (DBP; mm Hg)	8.11 ± 4.63

Abbreviation: BMI: body mass index.

Baseline measures including anthropometric and biochemical assessments were performed prior to the intervention. BMI was measured by dividing weight in kilograms by height in square meters. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were determined by an analogical sphygmomanometer (Model ALPK2, Japan). A 15 mL blood sample was taken and analyzed for fasting blood sugar through auto analyzer (Model BT3000, Italy). Serum hemoglobin (Hb) A1C was evaluated by Biosystem kit (Pars Azmoon, Iran).

Her blood sugar ran between 140 and 160 mg/dL, while the mean blood concentration of HbA1C was 6.5%. The respiratory rate of the patient was 16, and SBP and DBP were 120 and 80 mmHg, respectively. She was advised insulin therapy as part of her treatment, but she refused. At the end of August 2014, she experienced little bruising on legs following a minor car accident where tires hit the lower extremities. She subsequently developed neuropathic ulcers despite adequate care throughout her attendance at Imam Reza hospital, a general university hospital in Mashhad, Iran, with 856 beds. This state hospital consists of 2 H-shaped sections linked together with a central part. Neuropathic ulcers were categorized as Wagner grade-II (Figure 1A) (10). The patient complained of deep wound pain, as well. Following admission, written informed consent was obtained from the patient. The current study was approved by the medical research ethics committee of Mashhad University of Medical Sciences. She was strongly advised for hospitalization to receive intravenous antibiotics and blood glucose monitoring. Initially, 250 mg cephalexin capsules and 200 mg bid cefixime tablets along with anti-inflammatory drugs (i e, ibuprofen and diclofenac) via oral administration were prescribed due to patient's dissatisfaction. Thereafter, she was recommended skin grafting, however, she refused. Meticulous cleansing and dressing were performed each day for infection control and wound care. The wound remained clean and showed no infection symptoms after 3 weeks of admission. Moreover, granulation formation and tissue repair did not occur. It is reported that a honey dressing for diabetic foot ulcer is assumed as an alternative in case of any failure in topical therapies and conventional medicine. She was then referred to the clinic of Iranian traditional medicine affiliated to Mashhad University of Medical Sciences to pursue therapy.

In this phase, her wound was washed with normal saline, filled with natural honey, and then covered with sterile gauze dressing twice a day. It was required that any cavities were filled with honey. Having launched a honey-based treatment, there were pink tinge and local irritation. Along with the nutrition tailored to diabetes, she was given an instruction to reduce stress and avoid any kind of strenuous activities. The foot blood circulation was examined by monitoring the touch temperature in foot, decrease in foot numbness, strength of dorsalis pedis pulse, and toe movement. It was observed that wound size (2 × 2 × 2 cm) decreased gradually and the patient felt less pain in the first week of treatment with honey dressing. Fifteen days after honey treatment (week 2), the wound cavity was filled while an obvious reduction of size and pain was found (Figure 1B-D). At week 3, a herbal product with astringent properties was also utilized due to the relatively slow recovery, which, in turn, made the wound contract following 3 days (Figure 1E) (11). Nevertheless, local slight swelling and stalled healing processes occurred. Accordingly, the use of this product was stopped after a week. At week 4, another 1:1 ratio of honey and olive oil was combined to be applied as a remedy. In the long run, granulation tissue formation was thoroughly achieved within a few days; the swelling disappeared and the wound was fully closed (Figure 1F). The whole treatment period lasted a month. No sign of infection, pain, and exudate were observed except a small scar on the leg. A 3-6-month follow-up showed that the patient had no recurrence.

3. Discussion

A wide array of efforts is made on the impact of honey dressing to treat diabetic ulcers. However, standard treatments were also continued besides honey dressing if required. In a study by Shukrimi et al., there was abundant evidence to support the usefulness of honey dressing to reduce the swelling as well as redness associated with less pain (12). Makhdoom et al. put stress on the effective influence of honey dressing as applied for diabetic wounds; thus, this treatment paved the way for the decrease in the frequency of lower extremity amputations (13). Moreover, it was revealed that honey dressing was

Figure 1. Diabetic Foot Ulcer

A, debridement of necrotic tissue; B, five days after the initiation of honey treatment; C, eight days after the initiation of honey treatment; D, twelve days after the initiation of honey treatment; E, three days after the addition of astringent herbal products to honey; F, complete healing by day 40

more likely to completely treat a diabetic foot wound of 10 × 5 cm post-thermal burn within 16 weeks (8). Considering the smaller initial wound size, the healing duration was significantly shorter in the current case. Interestingly, it should be noted that the ulcer was located on the lateral aspect of the leg, which was a difficult-to-dress area. Akin to the current study, Siavash et al. applied honey bee for diabetic wound healing in 8 patients. The outcome was indicative of successful management of ulceration throughout 41 days (14). However, other conventional treatments such as debridement and infection control were also involved in this report. The antibacterial potency of honey is ascribed to its acidity, osmolality, content of hydrogen peroxide and stimulation of immunity (15). According to the literature, the mechanism of action of honey might arise from its hyperosmolar property, which causes an osmotic gradient, and then a dual action in the wound through 2 well-known ways; firstly, it deprives the bacteria of water content, resulting in their death; secondly, it pulls fluid out of the edematous wound and improves wound circulation (16). On the other hand, there is an important enzyme, glucose oxidase, which increases the amounts of hydrogen peroxide necessary to kill bacteria, not including actions where the ulcer bed is undermined. In addition, bacteria may not resist since it is demonstrated that honey, even at low concentrations, can hinder the growth of various microorganisms such as bacteria (17). Moreover, honey contains essential trace elements, which can enhance the wound healing process (18).

The present case report highlighted the fact that comparable benefits of honey dressing can be yielded in single application and in combination with other natural sub-

stances (i.e. olive oil) to treat ulceration. In other words, it is concluded that honey dressing can be considered as another viable option, if not the replacement, for the current practices in healthcare system. Strength of the study was the daily inspection, meticulous control over the medical procedure, and digital photography prior to and during the treatment of foot ulcers. Moreover, wound healing was performed without antibiotics. The main limitation of the present study was failure to apply a color Doppler ultrasound for her foot blood circulation.

Footnotes

Authors' Contribution: Study concept and design: Mandana Tavakkoli-Kakhki; acquisition of data: Elahe Delshad; analysis and interpretation of data: Malihe Motavasselian; drafting of the manuscript: Elahe Delshad; critical revision of the manuscript for important intellectual content: Mandana Tavakkoli-Kakhki; administrative, technical, and material support: Elahe Delshad; study supervision: Malihe Motavasselian; role of the sponsor: Mashhad University of Medical Sciences approved the study and had no role in its design and conduction.

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References

1. American Diabetes A. Diagnosis and classification of diabetes mellitus. *Diabetes Care.* 2009;**32 Suppl 1**:S62–7. doi: 10.2337/dc09-S062. [PubMed: 19118289].
2. Guthrie D, Guthrie R. Nursing management of diabetes mellitus: A guide to the pattern approach. New York: Springer; 2008.
3. Shaw JE, Sicree RA, Zimmet PZ. Global estimates of the prevalence of diabetes for 2010 and 2030. *Diabetes Res Clin Pract.* 2010;**87**(1):4–14. doi: 10.1016/j.diabres.2009.10.007. [PubMed: 19896746].
4. Hunt DL. Diabetes: foot ulcers and amputations. *BMJ Clin Evid.* 2011;**2011** [PubMed: 21871137].
5. Larijani B, Afshari M, Darvishzadeh F, Bastanhagh MH, Pajouhi M, Moadi M. Lower limb amputation in patients with diabetic foot ulcer: A 22 year review. *Iran Red Crescent Med J.* 2006;**3**:21–4.
6. Prevention and treatment of leg and foot ulcers in diabetes mellitus [Internet].Cleveland clinic: Center for continuing education 2010. Available from: cleveland clinicmeded.com/medicalpubs.
7. Larijani L, Ranjbar H. Overview of diabetic foot; novel treatments in diabetic foot ulcer. *Daru.* 2008;**16**:1–6.
8. Mohamed H, El Lenjawi B, Abu Salma M, Abdi S. Honey based therapy for the management of a recalcitrant diabetic foot ulcer. *J Tissue Viability.* 2014;**23**(1):29–33. doi: 10.1016/j.jtv.2013.06.001. [PubMed: 23891338].
9. Surahio AR, Khan AA, Farooq M, Fatima I. Role of honey in wound dressing in diabetic foot ulcer. *J Ayub Med Coll Abbottabad.* 2014;**26**(3):304–6. [PubMed: 25671933].
10. Galland B. Rutherford's Vascular Surgery, 7th ednCronenwettJack JohnstonK Wayne Rutherford's Vascular Surgery, 7th edn 2010 Saunders Elsevier London 2448 2 £237.00 9781416052234. *The Annals of The Royal College of Surgeons of England.* 2011;**93**(2):176. doi: 10.1308/rcsann.2011.93.2.176a.
11. Mehrabani Natanzi M, Pasalar P, Kamalinejad M, Dehpour AR, Tavangar SM, Sharifi R, et al. Effect of aqueous extract of Elaeagnus angustifolia fruit on experimental cutaneous wound healing in rats. *Acta Med Iran.* 2012;**50**(9):589–96. [PubMed: 23165807].
12. Shukrimi A, Sulaiman AR, Halim AY, Azril A. A comparative study between honey and povidone iodine as dressing solution for Wagner type II diabetic foot ulcers. *Med J Malaysia.* 2008;**63**(1):44–6. [PubMed: 18935732].
13. Makhdoom A, Khan MS, Lagahari MA, Rahopoto MQ, Tahir SM, Siddiqui KA. Management of diabetic foot by natural honey. *J Ayub Med Coll Abbottabad.* 2009;**21**(1):103–5. [PubMed: 20364754].
14. Siavash M, Shokri S, Haghighi S, Mohammadi M, Shahtalebi MA, Farajzadehgan Z. The efficacy of topical Royal Jelly on diabetic foot ulcers healing: A case series. *J Res Med Sci.* 2011;**16**(7):904–9. [PubMed: 22279458].
15. Al-Waili NS, Salom K, Butler G, Al Ghamdi AA. Honey and microbial infections: a review supporting the use of honey for microbial control. *J Med Food.* 2011;**14**(10):1079–96. doi: 10.1089/jmf.2010.0161. [PubMed: 21859350].
16. Eddy JJ, Gideonsen MD, Mack GP. Practical considerations of using topical honey for neuropathic diabetic foot ulcers: a review. *WMJ.* 2008;**107**(4):187–90. [PubMed: 18702435].
17. Molan PC. The evidence supporting the use of honey as a wound dressing. *Int J Low Extrem Wounds.* 2006;**5**(1):40–54. doi: 10.1177/1534734605286014. [PubMed: 16543212].
18. Molan PC. Potential of honey in the treatment of wounds and burns. *Am J Clin Dermatol.* 2001;**2**(1):13–9. [PubMed: 11702616].