

Case Report

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Volume 1 : Issue 1

Article Ref. #: 1000DRMTOJ1105

Article History

Received: January 25th, 2016

Accepted: March 14th, 2016

Published: March 17th, 2016

Citation

Al-Lenjawi B, Mohamed H, Abu Salma M, Abo Gouda Z. Natural honey in the management of thermal burn of the foot in a type 2 diabetic patient: a case report. *Dermatol Open J.* 2016; 1(1): 14-18. doi: [10.17140/DRMTOJ-1-105](https://doi.org/10.17140/DRMTOJ-1-105)

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Natural Honey In The Management of Thermal Burn of The Foot In a Type 2 Diabetic Patient: A Case Report

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CASE REPORT

We report the case of a 58-year old male with type 2 diabetes who was admitted to Um-Gwailinah Health Center with a second degree burn involving his big hallux, 4th and 5th toe and the bases of 2nd, 3rd, 4th and 5th toe of the right foot. The patient had sustained the second degree burn after exposing his right foot to hot charcoal during winter time in the desert. The patient reported loss of sensation in his feet which he described as being numb. He was diagnosed with type 2 diabetes thirty years ago and was suffering from hypertension, hypercholesterolemia and obesity. The patient divulged that he is a chronic heavy smoker with 40 cigarettes per day (i.e., 40 packs/year).

He was managed by oral hypoglycemic agents including Metformin 500 mg three times daily, Gliclazide 120 mg once daily and 100 mg enteric coated aspirin. His biochemical profile revealed HbA1c of 8.8% denoting uncontrolled glycaemia, according to the International Diabetes Federation (2013). His lipid profile was normal except for a high LDL-C level, which showed a value of 3.5 mmol/L. His liver function tests were normal but had chronic kidney disease; however his Erythrocyte Sedimentation Rate (ESR) and C-reactive protein (CRP) were normal. Vital signs examination revealed a temperature of 36.8 °C, a heart rate of 76 beats per minute, which was regular in rate and rhythm, a respiratory rate of 14 per minute and a blood pressure (BP) reading of 130/83 mmHg with a Body Mass Index (BMI) of 31 kg/m². An initial assessment was made by the consultant family physician who has a special interest in diabetic foot conditions.

NEUROLOGICAL ASSESSMENT

The patient presented with a painless foot condition, sensory neuropathy was suspected. This was further proven by neurological assessment of light pressure utilizing a Semmes-Wienstein 10 g monofilament, which was applied to the head of the big hallux and the bases of the first, third and fifth metatarsals which revealed loss of sensation. This was further consolidated by the use of the 128 Hz tuning fork applied to the big hallux showing loss of sensation. Finally, vibration sense was measured using the Biothesiometer which was applied to the big hallux and showed a recording of 65 volts, denoting diabetic peripheral neuropathy. The Biothesiometer was used as it provides a quick and reliable assessment of vibration threshold, which gives an objective measure of the degree and progress of diabetic peripheral neuropathy. Upon palpation, pedal pulses were manually palpable but weakly felt (dorsalis pedis and tibialis posterior), and this was further consolidated by Doppler examination using a hand-held Doppler (Huntleigh Super Dopplex 2; Huntleigh Health Care, UK). This revealed weak triphasic foot pulses (abnormal sounding) suggesting presence of peripheral vascular disease. The Ankle Brachial Index (ABI; systolic ankle to brachial BP ratio) was also measured using the hand-held Doppler and a BP cuff (Reister Big Ben Round, Germany). The ABI was measured by dividing the systolic ankle pressure at the malleolar level divided by the higher of the two brachial

pressures, which gave us a reading of 0.8 (confirming the diagnosis of lower-extremity PAD). The wound was cleaned with normal saline and Natural Honey was applied directly on the burnt areas and covered with Adaptic (systagenix wound management) which is a Non-Adhering Silicone Dressing – flexible, open-mesh primary wound contact layer comprised of cellulose acetate coated with a soft tack silicone. The soft tack silicone assists dressing application, prevents adherence of the secondary dressing to the wound and is a traumatic to the wound and surrounding skin. The open mesh structure allows free passage of exudate in to an absorbent secondary dressing. The Adaptic layer was covered with secondary cotton gauze and the foot was offloaded using felt pad. Natural honey used in this case was a homogenous, thick, white honey mixed with royal jelly and produced by Russian bees (i.e., *Apis mellifera*) native to the PrimorskyKrai region of Russia. Prior to use with patients, the honey was sent to the microbiology laboratory of the Ministry of Health in Qatar. After rigorous testing it was found to be sterile and free from *Clostridium difficile* spores. Afterwards the honey was kept in sterile jars for subsequent use. Natural honey dressing was done on a daily basis. The initial ulcer (Figure 1) measured 7.5 cm × 3.1 cm, while those on the digits measured an average 0.3 cm × 1.1 cm. The periwound area of the ulcer was composed of dry callus which was debrided using a sharp surgical blade. One week later the main ulcer reduced in size by about 50% measuring 3.6 cm × 0.6 cm (see Figure 2). Three weeks later the ulcer reduced further to 2.5 cm × 0.3 cm (Figure 3) and at four weeks the ulcer had completely healed (Figure 4).

DISCUSSION

Health professionals in the medical field are embracing

ionic silver impregnated products to treat a variety of acute and chronic wounds mainly due to a very extensive global marketing campaign especially in wound conferences worldwide. A recent study,^{1,2} Cochrane reviews^{2,3} have concluded that there is insufficient evidence to show that silver dressings improve healing rates. Furthermore, silver ions released by silver-containing dressings were found to be cytotoxic to keratinocytes and fibroblasts, and to impair epithelialization in animal wound models.^{4,5} While silver-based products are used extensively in the market, randomized controlled trials supporting its efficacy are lacking. Natural honey is re-emerging as a viable and cost effective alternative to expensive wound dressings and technologies in the market mainly due to the collective properties it contains including an osmotic gradient which inhibits microbial growth, and an ability to release Tumor necrosis factor- α (TNF- α)^{6,7}; an ability to release hydrogen peroxide at 1:1000 dilution thereby inhibiting microbial growth and stimulating angiogenesis without causing damage to health granulation tissue, increased lymphocytic and phagocytic activity⁸; IL-1 beta, and IL-6. Natural honey deodorizes wounds,⁹⁻¹¹ provides moisture and initiates tissue repair.

Natural honey antimicrobial efficacy has been long documented through research conducted on *Leptospermum scoparium* (manuka) honey,¹² which has shown antibacterial activity against *Escherichia coli* (*E. coli*), *Salmonella Typhi*, *Enterobacter aerogenes*, and *Staphylococcus aureus* (*S. aureus*).^{12,13} Furthermore, honey is effective against Vancomycin resistant Enterococci (VRE), methicillin-resistant *S. aureus* (MRSA), haemolytic streptococci.^{14,15} However, *Pseudomonas aeruginosa* (*P. aeruginosa*) and Enterococcus species are less susceptible to the antibacterial activity of honey.¹⁶



Figure 1: Initial ulcer size 7.5 cm × 3.1 cm.



Figure 2: Reduction of ulcer size by 50% by 1 week.



Figure 3: Reduction of size by 80%.

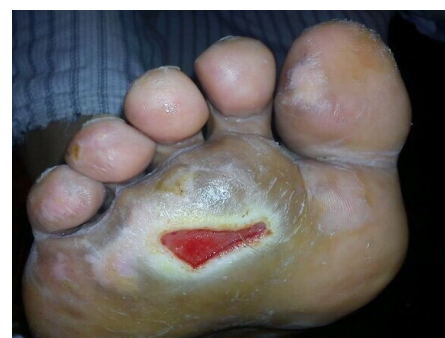


Figure 4: Complete healing four weeks later.

Al-Waili et al¹⁷ found that honey concentration ranging from 30% to 50% inhibits the growth of several yeasts including *Candida albicans*. This is further supported by Irish et al¹⁸ who reported anti-fungal efficacy of various honeys against clinical isolates of *Candida glabrata*, *Candida albicans*, and *Candida dubliniensis*. Khosraviet al¹⁹ on the other hand has demonstrated anti-fungal activity against *Candida parapsilosis*, *Candida tropicalis*, *Candida kefyr*, and *Candida dubliniensis*.

Natural honey has antiviral activities including those against Rubella virus,²⁰ had been used topically to treat recurrent herpes simplex lesions²¹ and shown antiviral activities against varicella zoster in *in vitro* studies.²²

A recent systematic review²³ assessing published Clinical Controlled Trials (CCTs) and Randomized Controlled Trials (RCTs) using two electronic databases; ISI Web of Science and Pub Med studied the efficacy of honey compared to other dressing materials among patients with diabetes. Four RCTs and two CCTs met the inclusion criteria for the effect of honey on chronic ulcers. The authors concluded that natural honey was far superior to advanced wound products in terms of wound healing stimulating capacity, for which two out of four RCTs report a statistically significant reduction in wound size, and two CCTs support the positive effect of honey on wound healing. A statistically significantly improvement was noted in favor of natural honey for the wound size.

This case clearly demonstrates lack of education on behalf of the patient which signifies failure of the health system to prevent such cases. Hence footwear and foot care education must be specific, targeting activities both inside and outside the house. The high-risk nature of this case (peripheral neuropathy) prompted us to schedule the patient for a regular monthly follow up. Although important health education per se is not enough to prevent or reduce recurrence of re-ulceration. A combination of optimal glycaemic control, psychological support, anti-platelet therapy, lipid lowering therapy, optimal blood pressure control, family support, protective therapeutic footwear, regular screening, nutritional support, smoking cessation and an integrated health system will help to minimize the risk of ulceration and re-ulceration, especially among high-risk patients.

The management of this case at primary care level demonstrated feasibility and cost-effectiveness of managing diabetic foot complications at primary care level provided that the attending physician is competent and trained to handle such cases. The cost of the entire course of treatment using honey is US \$40. In comparison, using other products or dressings that contain silver or alginate cost between US \$40 and US \$588 per product unit. It has been estimated that in the United States the cost of treating a single DFU costs US \$8000, US \$17000 if it was infected and US \$45000 if it required amputation.²⁴⁻²⁵

The success of honey application to many wounds especially burns is partly due to the fact that Natural Honey has a significant amount of antioxidants which mops up free radicals

thereby reducing inflammation and as a result prevent partial-thickness burns from turning into full-thickness burns requiring plastic surgery.^{26,27} Other properties which makes Natural Honey an optimal dressing is its cost effectiveness especially in developing countries where diabetes has reached epidemic proportions, its ability to provide moisture to the wound bed to help cells proliferate and migrate without causing maceration to the wound edges, and the ability to be removed without causing damage to the newly formed granulation tissues. Natural Honey also contains antioxidants, flavonoids, propolis, beeswax, nectar, all of these properties lead to minimization of scarring and stimulation of angiogenesis.²⁷ Furthermore, a recently published meta-analysis demonstrated that available evidence indicates markedly greater efficacy of Honey compared with alternative dressing treatment for superficial or partial thickness burns.²⁸⁻³³

CONCLUSION

This case report provides further evidence for the efficacy of Natural Honey in the treatment of second degree burns at primary care level.

CONSENT

The patient has provided written permission for the publication of the case details.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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