ORIGINAL ARTICLE

Conservative Wound Treatment in DMT2 Patients Using Honey

Putu Pradnyasanti Laksmi[1], Made Ratna Saraswati[2], Ratna Rayeni Natasha Rooseno[3]

[1]General Practitioner, Prof. IGNG Ngoerah General Hospital, Faculty of Medicine Udayana University, Bali, Indonesia

[2]Endocrinologist, department of Internal Medicine, Prof. IGNG Ngoerah General Hospital, Faculty of Medicine Udayana University, Bali, Indonesia

[3]Department of Plastic Surgery, Regional Public Hospital Mangusada, Badung, Bali, Indonesia

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**Correspondent Author:*
putupradnyasanti@gmail.com

ABSTRACT

Introduction: The number of diabetic patients in Indonesia is on the rise. In contrast to typical wounds in non DMT2 patients, chronic wounds in DMT2 patients heal more slowly, which makes it difficult to achieve complete primary wound healing. Thus, surgery is frequently required to achieve optimal healing. Patients' physical condition, age, comorbidities, and financial circumstances such as high medical costs frequently limiting patients from receiving comprehensive care, resulting alternative treatments are required to treat chronic wounds in DMT2 patients whom prefer conventional medications, addressing all circumstances. Honey, in addition to having fructose compounds, which has the benefit of increasing glucose homeostasis and insulin response, resulting in lower insulin and plasma glucose levels, also has been shown to contain anti-inflammatory and antimicrobial substances that aid in wound healing. Thus, it may be an alternative therapy for chronic wound in DMT2 patients.

Methods : A Case-series studies of four DMT2 patients who were referred to Plastic and Reconstructive Outpatient ward with chronic wound were evaluated on a monthly basis following conservative treatment using Nusantara local honey-coated gauze.

Results : Secondary wound healing, which can be assessed from the epithelialization process started from the peri-wound area has been obtained through monthly observations.

Conclusion : Honey is used as an alternative therapy for patients with diabetic foot ulcers due to its anti-microbial and anti-inflammatory properties in the wound healing process. Furthermore, honey is considered less expensive and more affordable alternative for patients with co-morbidities that is impossible to operate, or with financial limitations.

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Introduction

Diabetes Mellitus (DM), is a clinical syndrome of metabolic disorders characterized by hyperglycemia caused by defects in insulin secretion, defect in insulin action, or both.[1] In Indonesia, diabetes' rising prevalence has resulted in various comorbidities. The most severe repercussions of hyperglycemia are microvascular complications (e.g nephropathy, neuropathy, and retinopathy); as well as macrovascular complications (e.g coronary artery disease, stroke, and peripheral arterial disease).[2]

Foot ulceration occurs in 15-20% of diabetics patients over their lifetime, and has been the leading cause of hospitalization. More than 15% of foot ulcers necessitate leg amputation. A range of 0.5-3% of diabetic foot ulcers occur annually, according to a number of other studies. The prevalence of foot ulcers has been reported to range from 2-10%. 45-60% of diabetic foot ulcers are solely neuropathic, while the remaining 45% are both neuropathic and ischemic.[2] In indonesia, diabetic ulcer patients make up about 15% of the population, with a 32% mortality rate and a 30% amputation rate.[3]

The fructose content of honey may play a role in one of the possible ways that may help people with diabetes. Reduced intestinal absorption[4], prolonged gastric emptying[5,6], and reduced food intake[7,8] are potential mechanism in this process. Chepulis and Starkey found that feeding honey to Sprague-Dawley rats for several weeks resulted in a significant decrease in HbA1C levels,[9] in contrast to rats that received glucose, in account that fructose improved glucose homeostasis and insulin response[10].

The use of topical honey also has been shown to increase the production of cytokines in tissue and influence the elimination of bacterial infection by increasing the mitogenic activity in B and T lymphocytes and neutrophils.[11,12] As a result, wound infections recover quickly, dead tissues are removed from wounds, and scar tissue is reduced. Additionally, they have a beneficial effect on epithelial growth, tissue granulation and angiogenesis.[12]

Case 1

A 53 years old female patient came to the Plastic and Reconstructive Outpatient Ward presented with an open wound on the sole of her left foot and primary complaint of swelling. History of DM (+) and currently not taking any prescribed medications. Patient stated that one week prior coming to the outpatient ward, during activites, she felt an excruciating pain on her foot along with warmness and swelling. These conditions was not alleviated with resting.

During physical examination on ventral pedis, an open wound with a tissue base, RSA (+) and slough was found without any necrotic tissue. The skin surface was not warm on palpation and no oedema was found. Patient was not feeling any pain during examination. ROM was limited.

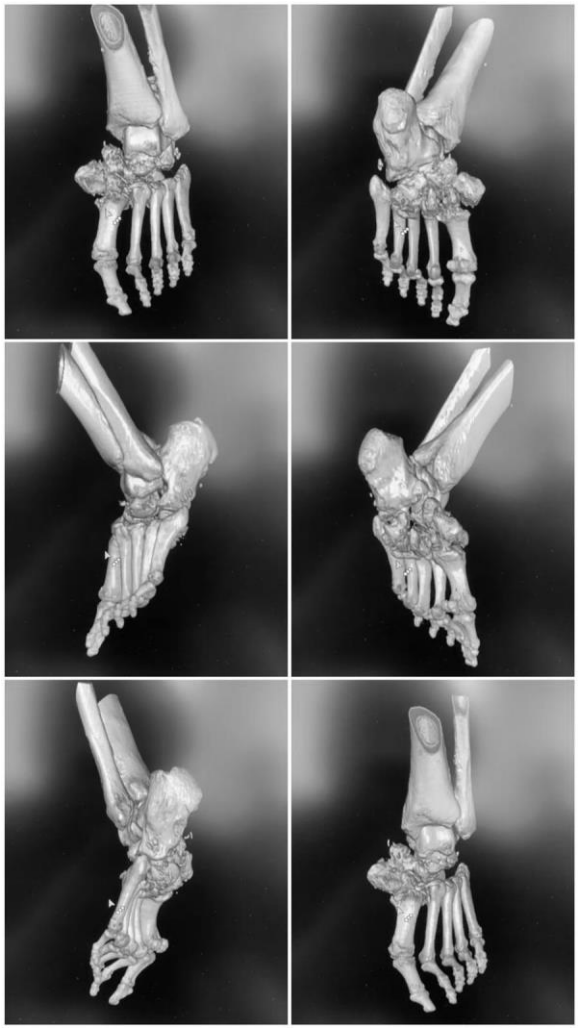

Figure 1 CT-Scan bone-view shown no abnormalities on bones and soft tissue.

CT-Scan of the leg did not reveal any tumor nor swelling on the gland. Bone and tissues were in normal condition.

Patient was advised to go on a surgery to perform debridement and secondary wound closure using skin graft or local flap, but she refused because she did not have enough money. Thus, the patient receives daily wound treatment using gauze coated in local Indonesian honey 'Nusantara' as an option. Follow-up is carried out once every 1 month.

Figure 2 A monthly follow-up showing progression of epithelization started from periwound after conservative wound treatment using gauze coated in local Indonesian honey 'Nusantara'.

Case 2

80 years old male referred from the neurology outpatient ward with pressure sores due to prolonged bed-rest after a non-hemorrhagic stroke which causes the patient to experience weakness in all four extremities. History of MD (+) with basal insulin treatment and oral medication. During examination, the local status showed a grade III-IV pressure abrasion with exposed coccyx base. Patients denied any complaints of pain. Both defecation and urination are assisted by the family members by using diapers.

After consulting with specalist in internal medicine, cardiology, anesthesia, and neurology, it was determined that this patient posed a high-risk due to age-related risk factors, lab results, and a long history of anticoagulant consumption, have made it impossible to perform debridement in surgical room. Thus, it was decided to use a conservative treatment using gauze covered with honey everyday, followed with a monthly check-up.

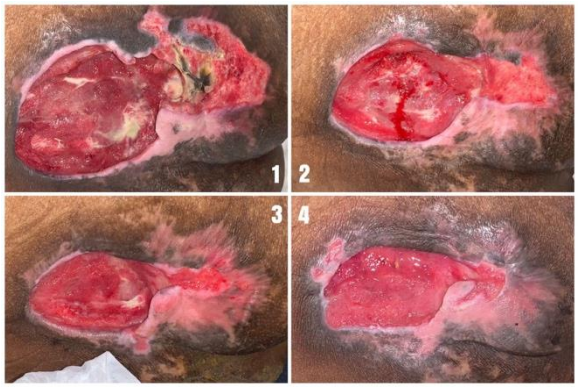

Figure 3 Routine follow-up results after 4 months of treatment. Notice how epithelialization process has occurred. A local necrotomy also has been carried out in the polyclinic to remove dead tissue for better wound-healing process.

Case 3

48 years old female came to the Plastic and Reconstructive Surgery Outpatient ward after receiving wound debridement in Emergency Unit two days prior due to history of trauma as a result of a traffic accident that caused multiple abrasions to the face and excessive skin loss on right leg. Patients had done an x-ray examination beforehand and no fractures in the calf has been found. Patient was then referred to the plastic and reconstructive surgery Outpatient ward for debridement and reconstruction with a local flap, but the patient refused to undergo surgery. History of DM (+) but patient refuses to take any medication and instead opt for traditional/herbal medicine.

Figure 4 Chronic wound on lateral pedis (D) after 3 months follow-up.

Case 4

60 years old male referred from Orthopaedic Surgery Outpatient ward with chief complaint of chronic wound post-surgical reconstruction with tibial plate/screw due to traffic accident. History of DM run in the family was unknown, but during admission to the ER, it was found that patient' Random Blood Glucose result was above 200 and consulted to the internist. Patient currently treated with oral medication.

From physical examination, an open wound was found with plate and bone exposed, slough (+) and pus, necrotic tissue (-). Culture sample was taken, and it was found that patient was suffering from MRSA infection. Patient was then admitted to receive antibiotic IV using vancomysin for 5-7 days, prior planning a plate-removal surgery due to the secondary infection. However, the Orthopaedic surgeon recommends the plate to be

removed after one year of recovery. In the meanwhile, in order to achieve optimal epithelialization, patient was treated conservatively.

Figure 5 Monthly observation after 6 months treatment using Nusantara local honey. Epithelialization (+), slough (-), pus (-).

Discussion

Diabetes makes up the majority of non-traumatic lower limb amputations, which are widely preceded by ulcers which fails to heal. Hyperglycemia, which leads to abnormalities in the blood vessels and changes in the structure of peripheral blood vessels as a result of reduced blood flow to the skin, is the beginning in macroangiopathy complication. As a result, less blood is delivered to the distal areas; particularly the lower extremities, which further leads to sensory and motor neuropathy disorders. In addition, autonomic disorders alter the way of pressure distribution on the soles of feet. When this factor is combined with the lack of blood flow, it will make it easier for ulcers to form over time, thus making wound management more challenging.

The process of wound healing is diverse and influenced by numerous factors. Due to the excessive usage and tentative use of antibiotics in modern medicine, topical honey was used less as a wound treatment. Recent studies, however, have found antibiotic-resistant bacteria, such as *Methicillin Resistant Staphilococcus Aureus* (MRSA), in infected wounds, particularly within the past few years. This is due to the fact that antibiotic misuse leads to antibiotic resistance.

Apitherapy is the medical use of honey bee products, whether it's beeswax, pollen, royal jelly, propolis, or honey. Conversely, however, honey is extremely beneficial for wound healing due to its antibacterial and antiviral properties as it has an acidic pH of 3.2-4.5. It has been shown that a low pH may inhibit protease activity, reducing the amount of matrix destroyed that is needed for wound healing and tissue repair. In addition, an acidic environment may facilitate the ability for hemoglobin to release oxygen, which may assist in tissue regeneration. Although previous research has shown that microbes thrive in an acidic environment, the acidity of honey may hinder microbe reproduction. In comparison, honey is a hypertonic solution with an osmotic pressure of about 105 atmospheres. As a result, honey's high viscosity and osmolarity may aid in the formation of a barrier that prevents infections and prevents bacterial growth. Furthermore, the osmotic properties keep the wound surface moist, while simultaneously capable of absorbing pus and eliminate odor, in addition to restoring circulation and reducing both oedema and pain.

Because the majority of honey dressings are very effective at accelerating or reducing the size of the wound, honey should not be considered as a minor intervention. According to Muhammad Imran's research, the average wound healing time for diabetic ulcer patients was 18 days, compared to 29 days for other treatments (using a saline dressing, or conventional dressing).

A recent study at Cipto Mangunkusumo Hospital in Jakarta, has compared the antibacterial activity of local Indonesian Honey Nusantara to Manuka Honey using the dilution method with steril Mueler Hinton Broth of each honey to obtain various concentrations of honey. The Minimum Inhibitory Concentration (MIC) is the lowest honey concentration that can prevent bacteria growth in the media. This can be determined by comparing the clarity levels of various concentrations of control media against the strains of bacteria P. Aeruginosa, S. Aureus and MRSA culture.

From this study, it has shown that Manuka Honey has a lower MIC than Nusantara local honey; implying that the methylglioxil substance in manuka honey is responsible for the honey's potent antibacterial properties. Meanwhile, the presence of methylglioxil in Indonesian honey has never been investigated. It is also known that local honey cannot be diluted below its MIC to exert its antibacterial properties, due to its high MIC. This is relevant, especially in wounds with a fair amount of exudate, since exudate may reduce the effectiveness of honey against bacteria. Hence, to prevent honey from becoming diluted, it is necessary to change the honey dressing on a wound that is highly exudative on a regular basis.

Conclusion

Honey is used as an alternative therapy for patients with diabetic foot ulcers due to its anti-microbial and anti-inflammatory properties in the wound healing process. Furthermore, honey is considered less expensive and more affordable alternative for patients with co-morbidities that is impossible to operate, or with financial limitations.

Conflicts of Interest

The authors report no conflicts of interest

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