



Case report

The use of Indonesian randu honey for chronic wounds in a patient with uncontrolled type 2 diabetes mellitus: A case report

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ABSTRACT

Introduction and importance: Honey has been recorded as having healing properties at a low cost. Many studies have been conducted related to Manuka honey, but studies about Indonesian randu honey are still limited. We report the use of Indonesian randu honey as a wound dressing on non-pressure chronic skin ulcers in uncontrolled T2DM patient.

Case presentation: A 54-year-old man with uncontrolled T2DM came with an unrecovered wound. A thorough inspection revealed several exposed bones, tendons, muscles, and meniscus in the left lower leg region. It was supposed to be amputated, but he declined. He received insulin, debridement, STSG, and a combination of Indonesian randu honey dressing and VAC on the exposed wound before and after the debridement and STSG. There was skin graft lysis, and we intended to do another surgery, but he preferred to be an outpatient. As an outpatient, he received honey wound dressing and insulin. After 1.5 years, the wound was fully closed, and he could walk with the help of a walking stick.

Clinical discussion: Treatment for multiple exposed bones, tendons, and muscles in uncontrolled T2DM patient are complex. Studies reported that Indonesian honey could provide an antibacterial effect, cost-efficiency, speed up wound healing with no side effects, and no physical-chemical properties differences compared to Manuka honey. **Conclusion:** Using Indonesian randu honey as wound dressing could stimulate wound healing with no side effects in chronic wounds with uncontrolled T2DM that were supposed to be amputated. However, it took several months for the wound to fully close.

1. Introduction

Wound healing is a complex process influenced by many factors [1]. There are four phases of wound healing: (1) hemostasis, (2) the inflammation phase, (3) the proliferative phase, and (4) the tissue remodeling phase [1,2]. Chronic wounds develop when the wound healing process is interrupted by multiple factors such as infection, poor tissue oxygenation, foreign body, stress, ischemia, diabetes, age, and immunocompromised condition [1]. Type 2 diabetes mellitus (T2DM) is a major global health epidemic that causes inappropriate function at all stages in the wound healing process [3].

Honey has been recorded as having healing properties since ancient times. Many studies reintroduce honey as a wound dressing in modern

medical practice because of its low cost and considerable potential for healing [4–10]. Prior studies reported that honey could stimulate granulation tissue formation, wound epithelialization, tissue growth, collagen synthesis, and new blood vessels development [4,5]. Honeybees that consume flower randu (*Ceiba pentandra*) nectar produce randu honey with yellow-brown color and very thick characteristics; this is the most common type of honey in East Java, Indonesia [6]. Local Indonesian honey has antibacterial activity against MRSA, *S. aureus*, and *P. aeruginosa*; however, its minimum inhibitory concentration (MIC) is higher than Manuka honey [6,7]. Studies of randu honey as wound dressing are still limited; therefore, we aim to report the use of Indonesian randu honey as a wound dressing in non-pressure chronic ulcers with uncontrolled T2DM. There was no conflict of interest in choosing

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Indonesian randu honey, “Madu Murni Nusantara,” produced by PT Madu Murni Nusantara (Jakarta, Indonesia).

This case report is written following the Surgical Case Report (SCARE) 2020 criteria [8].

2. Case presentation

A 54-year-old man with a history of uncontrolled T2DM came to Dr. Sardjito Hospital with a prime complaint of unrecovered wounds. The wound started in tiny size on his left leg, then it grew expansively in 1 year and involved the knee, leg, and ankle. He and his family were minimally educated; therefore, he didn't treat his wound while still on a smaller size and his T2DM. He also didn't know whether he had a family history of T2DM. He came to the cardiovascular and thoracic surgery division and was diagnosed with non-pressure chronic skin ulcers. He was suggested to amputate his leg, but he refused. Thus, he received wound debridement. A thorough inspection during wound debridement revealed the raw surface of one-third distal femur bone until pedis bone, tendon of extensor hallucis longus muscle, tibialis anterior muscle, gastrocnemius muscle, fibularis longus muscle, extensor hallucis longus muscle, soleus muscle, and exposed lateral meniscus (Fig. 1). He was referred to the plastic, reconstructive, and aesthetic surgery division for further treatment (Table 1).

We planned to perform STSG, but his blood sugar level was >300 mg/dl, so we postponed the STSG until his blood sugar level decreased to around 200 mg/dl. We consulted him with the endocrinology division, and then he received insulin. Wounds were managed by Plastic, reconstructive, and aesthetic surgeon with the combination of “Madu Murni Nusantara” wound dressing and wall suction vacuum-assisted closure (VAC). First, wounds were cleaned with chlorhexidine gluconate and cetrimide solution, washed off using NaCl 0.9%, and dried with sterile gauze. Poured honey into a sterilized container, placed sterile gauzes inside until it was submerged in the honey, then squeezed it before being used, applied honey gauzes to compress the wound, especially on the hollow spaces, hollow joints, and exposed tendons. Removed them after 15 min, then applied new honey gauzes on the hollow areas, exposed bones, and tendons. Close the wounds with sterile foam and adhesive dressing, then place the drainage tube connected to the wall suction VAC under the adhesive dressing. VAC therapy was

Table 1
Wound healing progression.

Time	Wound progression	Treatment
D-day	Raw surface of one-third distal femur bone until pedis bone, tendon of extensor hallucis longus muscle, tibialis anterior muscle, gastrocnemius muscle, fibularis longus muscle, extensor hallucis longus muscle, soleus muscle, and exposed lateral meniscus	<ul style="list-style-type: none"> • Debridement • Insulin Post debridement: <ul style="list-style-type: none"> • Ceftriaxone 1 × 2 g for 1 week • Combination of honey wound dressing and two-cycles VAC
Day 10	Tunneling on the lateral and posterior side of the femur towards the cranial part, with the size around 7 cm, exposed patella, and multiple exposed tendons that were excessively necrotic, especially on the ankle and patella region.	<ul style="list-style-type: none"> • Re-debridement and STSG • Insulin Post re-debridement and STSG: <ul style="list-style-type: none"> • Ceftriaxone 1 × 2 g for one week • Combination of honey wound dressing and VAC
Day 45 (1.5 months)	There were many necrotic tendons, especially on the ankle and patella regions.	<ul style="list-style-type: none"> • Re-debridement and STSG • Insulin Post re-debridement and STSG: <ul style="list-style-type: none"> • Ceftriaxone 1 × 2 g for one week • Combination of honey wound dressing and VAC
Day 60	Skin graft lysis was found on the patella-popliteal region, and the donor site wound was unhealed	<ul style="list-style-type: none"> • Honey wound dressing • Insulin
Year 1.5	The wound was fully closed. Patient could stand and walk with walking stick	<ul style="list-style-type: none"> • Insulin

done in 2 cycles (each cycle lasted five days) with 125 mm Hg continuous negative pressure. Honey wound dressing was changed every five days.

After two cycles of VAC therapy, there were around 7 cm of tunneling on the lateral and posterior side of the femur towards the



Fig. 1. Inspection during the first wound debridement.

cranial part and multiple exposed tendons (Fig. 2). Thus, the first author, a plastic, reconstructive, and aesthetic surgeon, performed re-debridement and STSG. Then, he received ceftriaxone for one week and continued the combination of honey wound dressing and wall suction VAC.

After 1.5 months, there were lots of necrotic tendons, especially on the ankle and patella regions. He underwent re-debridement and STSG to minimize the raw surface (Fig. 3). Debridement was done to the necrotic tendons, and biological dressing with STSG was done to the tendon on the patella and popliteal region that was not clearly necrotic. Donors for STSG were taken from the lateral aspect of the ipsilateral leg.

He received ceftriaxone for one week and a combination therapy of honey wound dressing and three cycles of wall suction VAC post-surgery. In the following two weeks, skin graft lysis was found on the patella-popliteal region, and the donor site wound was unhealed (Fig. 4). We planned to do another surgery, but he refused and insisted that he preferred continuously receive treatment at our outpatient ward. Outpatient wound treatment was scheduled by the plastic, reconstructive, and aesthetics surgeon every Monday, Wednesday, and Friday, and he had to stay under the endocrinologist's supervision for his T2DM.

At the outpatient ward, we used "Madu Murni Nusantara" as a wound dressing. We compressed the wound with honey gauzes for 15 min. Applied new honey gauzes on the hollow spaces, exposed bones, and tendons, then placed framycetin sulfate dressing above the honey gauze and closed them with thick sterile gauze. On granulation areas, directly put framycetin sulfate dressing, then seal it with thick sterile gauze. His blood sugar level was never below 200 mg/dl, so we consulted with a nutritionist, but he was reluctant to follow the dietary rules.

After 1.5 years, the wound was fully closed (Fig. 5), and he could walk with the help of a walking stick. There were no signs of infection or allergic reactions related to the honey wound dressing. During those years as an outpatient, he never skipped the wound treatment appointment that had been scheduled. He was delighted that his leg could heal without amputation.

3. Discussion

A chronic wound is a wound that fails to pass the typical phases of healing and is not closed in >1 month. Patients with diabetes and obesity are at a high risk of having chronic wounds. There are essential principles of chronic wound management: debridement, appropriate wound dressing, appropriate underlying diseases treatment, and

nutrition [9]. In our case, the patient's chronic wounds resulted from non-pressure ulcers and uncontrolled T2DM. He underwent several debridement and STSG because of the large wound size and excessive necrotic wound. He also received honey wound dressing, VAC, insulin, and dietary rules.

Treatment for multiple exposed bones, excessively necrotic exposed tendon, and joint tendon discharge in patients with uncontrolled T2DM is complex. Wound management needs to be done perseveringly to stabilize the wound and the patient's general condition so the necrotic wound would not expand and get infected. Wound healing requires a healthy environment to proceed with a natural healing process; therefore, a suitable dressing material must be used. As a wound dressing, honey can provide a moist healing environment, improve pressure ulcer healing rates, provide antibacterial properties, deodorizes, promote angiogenesis, granulation, and epithelialization, and reduce inflammation, edema, and exudate production [10–15]. Therefore, in our case, we chose honey as a wound dressing to stimulate the wound healing process.

Many research has been conducted related to Manuka honey. However, the study of Indonesian randu honey is still limited. K ADP et al. and Fadhillah et al. reported that local Indonesian honey has antibacterial activity against MRSA, *S. aureus*, and *P. aeruginosa*; however, its MIC is higher than Manuka, which means to acquire its antibacterial effect in a highly exudative wound, Indonesian honey wound dressing needs to be frequently changed to prevent honey dilution [6,7]. In Indonesia, the cost of randu honey starts from Rp 30.000 while Manuka honey starts from Rp 500.000. Therefore, we chose randu honey because of its low price. We changed the honey wound dressing every five days as inpatient treatment because we combined honey wound dressing with wall suction VAC that could remove fluid from an open wound [17]. Plastic, reconstructive, and aesthetic surgeons in Dr. Sardjito hospital have frequently done wall suction VAC in various wounds, with successful results following the VAC treatment [18,19]. In contrast, as outpatient therapy, we changed the honey wound dressing every two days because of the absence of a portable suction VAC in our hospital.

Previous case reports reported that Indonesian honey could stimulate granulations and epithelialization in chronic wounds, speed up wound healing with no allergic reactions or secondary bacterial infections, and provide cost-efficiency [9,16]. It also doesn't have many physical-chemical properties differences from foreign honey; therefore, Indonesian honey can be used as an infected wound treatment [9,16]. We also reported that Indonesian honey could stimulate wound healing with no allergic reactions or secondary bacterial infections to strengthen the



Fig. 2. Wound condition following the combination of Indonesian randu honey wound dressing and two-cycles wall suction vacuum-assisted closure (VAC).



Fig. 3. Results following re-debridement and STSG.

previous studies. Therefore, Indonesian randu honey could be an alternative therapeutic choice for wound healing, especially in developing countries, because of its low cost. However, there wasn't an acceleration in our patient's wound healing process; we presumed his uncontrolled T2DM and disobedience to the feeding rules caused it.

4. Conclusions

Align with previous case reports, in our case, the use of Indonesian randu honey as wound dressing could stimulate wound healing with no allergic reaction or secondary bacterial infection in chronic wounds with uncontrolled T2DM. The patient was delighted that his leg could heal without amputation. However, it took several months for the wound to fully close (Table 1). Indonesian randu honey could be an alternative therapeutic choice for wound healing, especially in developing countries, because of its low cost.

Abbreviations

T2DM	Type 2 diabetes mellitus
VAC	Vacuum-assisted closure
STSG	Split-thickness skin grafts
H ₂ O ₂	Hydrogen peroxide
NO	Nitric oxide
MIC	Minimum inhibitory concentration

Consent of publication

The patient gave written informed consent to publish this case report and the accompanying images. A copy of written informed consent is available for review by the Editor-in-chief of this journal on request.

Availability of data and materials

The datasets used during the study are available from the corresponding author on reasonable request.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Ethical approval

The authors affirm that informed consent was obtained from the patient who had undergone medical treatment in our hospital. Our institutional review board also does not provide ethical approval in the form of the case report.

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Fig. 4. Two-week evaluation following the second split-thickness skin graft (STSG).



Fig. 5. Fully closed wound at the end of the follow-up period.

Guarantor

Siti Isya Wahdini, MD.

Research registration number

This case report was registered in the Research Repository Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, with registration ID 202203116 (<http://research.repository.ugm.ac.id/beranda/detail/?regId=202203116>).

CRedit authorship contribution statement

SIW conceived the study. SIW and GCG drafted the manuscript. ID, MRS, NV, and RNR critically revised the manuscript for valuable intellectual content. Authors have read, approved the manuscript, and agreed to be accountable for all aspects of the work.

Declaration of competing interest

The authors declare that they have no conflict of interest.

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