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Case Report

Infected Diabetic Foot Ulcer

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Therapeutic application of Honey in the management of Infected Diabetic Foot Ulcer - A Case Study

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Honey is gaining popularity as a dressing for chronic wounds. Existing literature attributes honey with a number of useful properties, such as a broad-spectrum antimicrobial activity, deodorization, debriding and anti-inflammatory actions and stimulation of new tissue growth. Honey has been recognized for its medicinal properties since antiquity. Modern clinical research supports its efficacy in promoting wound healing and controlling infections due to its antimicrobial, anti-inflammatory, and wound-debridement properties. Case studies are being published increasingly which record positive outcomes with its use. Recent national media attention has featured the beneficial effects of honey in wound care and patients are beginning to request treatment. While honey may become a useful and widely accepted product for wound management in the future, the following case studies demonstrate that not all the expected beneficial effects are always realized in practice.

Keywords: Infected wound, Dushta Vrana, honey, wound healing, antibacterial property of honey, honey as wound dressing

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Introduction

Sushruta - The father of Indian surgery in his book *Sushruta Samhita*, has explained its complication and management in great details.

Shalyatantra is one of the important branches of *Ayurveda* in which surgical & Para surgical techniques have described for the management of Various disease.

Vrana - व्रण गात्रविचुर्णने व्रणयेति व्रण | (सु.चि.1/6)

Wound (*Vrana*) is an injury to the. body (as from violence, accident, or surgery) that typically involves laceration or breaking. of a membrane (as the skin) and usually. damage to underlying tissues. *Vrana* is seen as debilitating and Scoring disorder usually seen affecting the human being at any age. *Vrana* is most important and widely described chapter of *Shalya Tantra*.

In *Ayurveda Vrana* is defined as

वृणोति यस्माद् रूढेऽपि व्रणवस्तु न नश्यति आदेह धारणात्तस्माद् व्रण इत्युच्यते बुधैः | (सु.सु.21/40)

A wound which refutes to heal or heal very slowly inspite of best efforts is known as *Dushta Vrana*.

According to *Acharya Sushruta, Dushta Vrana* is described as.

तत्रातिसंवृतोऽतिविवृतोऽतिकठिनोऽ.....दुष्टव्रणलिङ्गानि । (सु.-सु.22/6)

The *Vrana* which is too long, to wide, too hard, too soft having elevated edges, too hot, too cold, other than black, yellow and white, colour, deadly looking foul smell, severe pain, vitiated blood discharge and it is chronic in nature. These are the feature of *Dushta Vrana*.

Case Report

Patient age/sex: 48 years old male patient from Astha approached to Shalya Tantra OPD, with complaining of redness, swelling, pain and potentially foul-smelling discharge.

Chief complaints: Pain and swelling at left foot of wound site, redness from 1-month, foul smelling discharge from 15 days.

History of present illness: According to the patient, he was reportedly healthy before 1 months, Then he suffers from Pain and swelling at left foot of wound site, redness from 1 month and foul-smelling discharge from 15 days. So, he came to Dhanvantari Hospital Ashta, Shalya Tantra OPD for further management.

Medical History: Type 2 diabetes mellitus (10 years), Hypertension, peripheral neuropathy

Presenting Condition: Infected diabetic foot ulcer (Wagner Grade 2) on the plantar surface, present for 1 month.

Initial Assessment:

Wound dimensions: 3.5 cm × 2.8 cm × 0.5 cm depth

Surrounding erythema, purulent discharge

Bacterial culture: Staphylococcus aureus (MRSA), Pseudomonas aeruginosa

Previous treatment: Systemic antibiotics (amoxicillin-clavulanate and metronidazole), daily saline dressings, unsuccessful over 2 weeks.

Intervention

Treatment Initiated

Medical-grade Manuka honey (UMF 15+) dressing applied once daily

Wound cleaned with sterile saline prior to application

No additional systemic antibiotics used post-initiation

Dressing covered with sterile gauze and non-adhesive pad

Mechanisms of action of Honey in Wound Healing

Antimicrobial Properties: Honey, especially Manuka honey, has natural antibacterial activity. The components responsible for this activity include hydrogen peroxide, methylglyoxal (MGO), and low pH.

Hydrogen Peroxide: When honey comes into contact with the wound, it releases small amounts of hydrogen peroxide, which has a strong antibacterial effect, helping to sterilize the wound.

Methylglyoxal (MGO): MGO, found specifically in Manuka honey,

Has potent antimicrobial effects against a wide range of bacteria, including drug-resistant strains such as Methicillin-resistant Staphylococcus aureus (MRSA) and Pseudomonas aeruginosa, which are often involved in chronic wound infections.

Low pH: The acidic environment created by honey helps prevent the growth of many pathogens while promoting the healing process.

Debridement: Honey has osmotic properties, meaning it can draw out excess fluid, bacteria, and necrotic tissue from the wound, effectively performing autolytic debridement. This process helps to clean the wound bed, reducing the risk of infection and promoting healthier tissue regeneration.

Moisture Promotion: Honey creates a moist environment around the wound, which has been shown to enhance wound healing by:

Maintaining optimal hydration at the wound site. Preventing scab formation, which can impede cell migration and tissue regeneration. Reducing pain and irritation during dressing changes.

Anti-inflammatory Effects: Honey has been shown to reduce the production of pro-inflammatory cytokines, which are responsible for the pain, swelling, and redness around wounds. By modulating inflammation, honey accelerates the healing process and improves patient comfort.

Tissue Regeneration:

Enhances angiogenesis and collagen deposition

Promotes autolytic debridement of necrotic tissue

Immune Modulation:

Stimulates cytokine production by monocytes and keratinocytes

Enhances phagocytic activity of immune cells

Treatment Protocol:

After reviewing the patient's condition and discussing treatment options, it was decided to use medical-grade *Manuka* honey as a part of the wound management regimen. The detailed treatment protocol was as follows:

Wound Cleaning and Preparation: The wound was first cleaned with normal saline to remove any debris or old dressings.

Debridement was performed to remove necrotic tissue. This was necessary to ensure that the honey could act directly on healthy tissue.

Honey Application:

A thick layer of *Manuka* honey (UMF 16+) was applied directly to the wound bed. *Manuka* honey with a high Unique *Manuka* Factor (UMF) was chosen due to its high antimicrobial potency and efficacy in treating resistant bacteria. The honey was spread evenly across the entire wound surface, ensuring full coverage, particularly in areas with signs of infection.

Dressing:

A sterile, non-stick dressing (such as a polyurethane foam dressing) was placed over the honey-coated wound. This dressing was designed to retain moisture and prevent contamination while allowing for the slow, controlled release of honey over time.

Frequency of Dressing Changes:

The dressing was changed once a day, although the frequency could be adjusted based on the wound's drainage and the patient's comfort level. Honey's antimicrobial properties would remain effective for extended periods, making daily changes sufficient in most cases.

Monitoring:

The wound was monitored for signs of infection, improvement in the size of the ulcer, and any adverse reactions to the honey (e.g., allergic reactions). Regular wound measurements and photographic documentation were used to track healing progress.

Outcomes and Observations

Week 1:

Reduced malodor and discharge

Pain levels significantly decreased

Early signs of slough breakdown and granulation tissue formation

Week 2:

Culture results negative for MRSA and Pseudomonas

Wound contraction observed; surrounding erythema resolved

Continued epithelialization from wound margins

Week 3-4:

Wound reduced to 1.2 cm × 0.6 cm

No signs of reinfection

Patient ambulatory with offloading footwear

Week 5:

Complete wound closure

No scar contracture, preserved skin integrity

No recurrence at 3-month follow-up After 4 weeks of honey treatment, the following results were observed:

Before Treatment

After Treatment

Reduction in Infection:

The wound exhibited a significant reduction in the purulent discharge, and the surrounding erythema began to subside.

The patient's systemic signs of infection (e.g., fever, increased white blood cell count) also improved. Bacterial cultures taken after four weeks showed a substantial reduction in bacterial load, with no growth of MRSA or other resistant pathogens that had previously been present.

Improvement in Wound Size:

The size of the ulcer decreased by 50%, with noticeable granulation tissue forming in the wound bed. The wound depth also reduced, indicating the beginning of epithelialization and tissue regeneration. The wound edges showed signs of re-epithelialization, with new skin cells migrating toward the center.

Pain and Discomfort:

The patient reported a significant reduction in pain, especially during dressing changes. This was likely due to the anti-inflammatory effects of honey, which reduced swelling and irritation around the wound.

Overall Healing:

By the end of the 4-week period, the wound had entered the proliferation phase of healing, and there was a clear progression toward full wound closure.

Discussion

The application of medical-grade *Manuka* honey in this case resulted in notable improvements in the treatment of a chronic, infected diabetic foot ulcer. The antimicrobial, anti-inflammatory, and regenerative properties of honey contributed significantly to wound healing, helping to control infection, reduce pain, and promote the formation of healthy tissue. This case demonstrates that honey, particularly *Manuka* honey, is not only a potent antimicrobial agent but also a valuable tool for maintaining a moist wound environment, which is crucial for tissue regeneration. Furthermore, its ability to reduce inflammation and accelerate healing makes it a promising alternative to traditional antibiotics, especially in the context of rising antibiotic resistance.

Limitations and Considerations:

Always use medical-grade honey to avoid contamination Not suitable for patients with severe honey allergies. Should be used under professional supervision in complex or deep wounds

Conclusion

Honey is a potent natural agent with multifaceted benefits in wound management. In this case, its application led to complete resolution of a chronic infected ulcer without reliance on systemic antibiotics. It should be considered a frontline topical therapy in appropriate wound care scenarios. Honey, specifically medical-grade *Manuka* honey, has proven to be an effective adjunctive therapy in the management of infected wounds, including diabetic foot ulcers. The case study illustrates how honey can help reduce infection, promote tissue regeneration, alleviate pain, and accelerate wound healing. While honey offers a promising treatment option, further large-scale studies are needed to establish its efficacy across different wound types and patient populations. Nonetheless, it represents a natural, cost-effective, and potentially life-saving approach to wound care in the modern clinical setting.

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