

A Comparative Study Between Honey and Povidone Iodine as Dressing Solution for Wagner Type II Diabetic Foot Ulcers

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SUMMARY

Honey dressing has been used to promote wound healing for years but scanty scientific studies did not provide enough evidences to justify its benefits in the treatment of diabetic foot ulcers. We conducted a prospective study to compare the effect of honey dressing for Wagner's grade-II diabetic foot ulcers with controlled dressing group (povidone iodine followed by normal saline). Surgical debridement and appropriate antibiotics were prescribed in all patients. There were 30 patients age between 31 to 65 years old (mean of 52.1 years). The mean healing time in the standard dressing group was 15.4 days (range 9 - 36 days) compared to 14.4 days (range 7-26 days) in the honey group ($p < 0.005$). In conclusion, ulcer healing was not significantly different in both study groups. Honey dressing is a safe alternative dressing for Wagner grade-II diabetic foot ulcers.

KEY WORDS:

Honey, Wound dressing, Diabetes mellitus

INTRODUCTION

Honey has been used in clinical practice for many types of disease for centuries^{1,3}. It is still being used as a dressing material for burn wounds, decubitus ulcers, gunshot wounds and wound dehiscence. It enhances autodebridement by absorbing edematous fluid around the ulcer margins and promotes granulation tissue formation and epithelization².

There are no proper prospective studies on the effect of honey in treatment of diabetic foot ulcer (DFU). In comparison with other wounds, slow healing of DFU is attributable to polymicrobial infection, ischemia, neuropathy and immunosuppression. Existing dressing materials including alginate, foam, hydrocolloid, hydrogel or transparent film was consistently suitable throughout the entire healing phase. We conducted this prospective study to compare the effect of honey with povidone iodine as a dressing material in DFU.

MATERIALS AND METHODS

This control clinical trial study was conducted in Hospital Universiti Sains Malaysia (HUSM). During the study period, all non-Insulin dependent diabetes mellitus patients

(NIDDM) with Wagner grade-II ulcers who were admitted for surgery were enrolled if the following parameters were met : age between 35 to 65, transcutaneous oxygen tension of more than 30mmHg (measured using the TINA RADIOMETER COPENHAGEN TCM3) and serum albumin level of more than 35g/dl, were fulfilled. Exclusion criteria included multiple medical co-morbidity, steroid therapy, neutrophil count less than 2000/mm³.

The patients were randomized into two study arms; honey dressing group and standard dressing group. Clean non-sterile pure honey which is commercially prepared for food (packed by Barnes for Honey Cooperation of Australia Pty. Ltd.) was used for honey dressing. The properties of this honey include a pH of 6.5, glucose 321mmol/l and specific gravity of 1.003. Povidone iodine solution 10% (dilute with normal saline) was used in the other study arm. All patients received appropriate antibiotics and the ulcers were debrided surgically by a resident with at least two years of surgical experience or an orthopaedic specialist. Tissue specimens taken during the debridement were sent for culture and sensitivity testing. Blood glucose control was kept optimum under supervision by a physician. Wound dressing was started on the first post-operative day and it was carried by a few trained nurses.

In the honey dressing group, the wound was initially cleansed with normal saline. A thin layer of honey was poured on the wound and the wound was then covered with sterile gauze and bandaged. In the control group, the wound was first cleansed with normal saline, followed by covering it with povidone-soaked gauze. Conversion to normal saline dressing was made once the wound was cleared from frank pus. The dressings were carried out on daily basis. All the wounds were assessed every other day by a surgeon blinded to the material of dressing. The assessment ended when the wound was either ready for surgical closure or needed further debridement.

Duration from the initial debridement to the wound closure day was analyzed. If the wound required further surgical debridement, the treatment was categorized as failure and it will not be considered as the end result of the study. Wound swab for culture and sensitivity was taken when the assessing surgeon declared the wound was ready for closure.

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RESULTS

There were 30 patients age between 31 to 51 years with equally distributed sex ratio. Malays represents 93% of all patients. The transcutaneous oxygen tension ranged from 36 mmHg to 42mmHg (mean 39 mmHg).

The organisms isolated prior to the treatment were *Streptococcus sp.* (30%), *Staphylococcus sp.* (16%), *Pseudomonas* (10%), *Enterococcus* (7%), *Bacteroides* (3%), *Acinobacter* (3%), *Proteus* (3%) and *Escherichia coli* (3%). Polymicrobial infections were encountered in (20%) of patients. One patient has no growth from wound culture (3%).

In the control group, the wounds initially harboring *Streptococcus*, *Staphylococcus*, *Acinobacter*, *Proteus* and *Escherichia coli* became negative culture at the end of treatment. Wounds infected with *Pseudomonas*, *Enterococcus* and mixed organisms remained infected until the end of the study. In honey dressing group, wounds with *Staphylococcus* or *Streptococcus* eventually became culture negative at the end of the treatment while those harboring *Bacteroides*, *Enterococcus* and mixed infections were persistently infected.

Wounds in the control group took a mean duration of 15.4 days (range 9 - 36 days) to be ready for surgical closure. In honey dressing group, the wounds required a mean duration 14.4 days (range 7 to 26 days) to achieve similar status. The difference in the duration was not statistically significant.

In terms of the cost for the dressing for each patient, RM 12.00 was needed to buy a bottle of 250 ml commercial honey. A bottle of honey was enough for dressing during the entire period of study (between 7 to 26 days). All patients in honey group experienced less pain during dressing. The oedema and foul smelling discharges improved faster when compared to the control group.

DISCUSSION

The aim of wound dressing is to provide a relatively clean wound with low bacteria count that provides optimal environment for healing⁴. The role of honey as a dressing material has been studied by many authors⁵. Most of the studies involving honey dressing were conducted on different types of diabetic wounds. DFUs have different characteristic in term of polymicrobial nature of infection, compromised tissue vascularity, loss of sensation and potentially deep-seated infection. In our study, strict inclusion criteria were adhered to standardized factors that may independently influence wound healing. Bias in selection and outcome evaluation were minimized with randomization of cases and single blinded assessment of the wounds.

Although the honey dressing group showed a slightly shorter duration for wound healing (mean of 14.4 days) when compared to controlled group (mean of 15.4 days), the difference was not statistically significant. Wound healing involves formation of granulation tissue, epithelization and wound contraction. We did not quantitatively measure these parameters as wounds in this study were of variable sizes. By focusing on whether the wound was clean and ready for closure, we hope to minimize the bias in assessment of the

wound of different size. It has been noted that burn wound dressed with honey allows early grafting on a clean clear base as compared with sulfur sulfadiazine dressing⁷. Honey dressing has been reported to promotes formation of clean healthy granulation tissue^{2,8}, accelerates wound healing⁹ and enhances graft taking⁷. However, our study was not able to demonstrate these advantages over the more conventional dressing with povidone iodine solution.

Polymicrobial infection was recognized to occur in 42% of Wagner grade-II DFUs and 5% were anaerobes⁹. The commonest organism were *Staphylococcus aureus*, coagulase negative *Staphylococcus* followed by *Enterococcus sp.*, *Streptococcus sp.* and *Enterobacteriaceae*. Our study also noted similar findings. However, Maria Fe *et al.* (2002) reported a predominant gram negative infection in Wagner grade-II DFUs, and the type of organism correlate well with the severity of infection as determined by grading of the DFUs. The antimicrobial properties of honey have been well documented. Inhibition of growth of organisms such as *Staphylococcus aureus*, *Enteropathogenes* and *Candida albicans* in undiluted honey has been attributed to inhibin^{5,6}. We found that honey dressing and systemic antibiotics additively work to eradicate streptococcus and staphylococcus from the wound. However, those wounds infected with mixed organism or enterococcus had persistent culture positive wound. Despite the presence of few organisms, the wounds granulated well and they were clinically safe for surgical closure. No new organisms were found from the wound in both groups indicating both techniques were able to prevent cross-infection. Studies on honey dressing in burn wound management tend to indicate healing is not inhibited by secondary infection^{2,8,9}. However, the accuracy of wound swab as a method of collecting specimen has been regarded as inaccurate¹¹.

Honey was shown to be able to absorb water from interstitial tissue through its higher osmolarity and this may in turn improve local lymphatic drainage and blood circulation^{2,5,8}. Early reduction of oedema and reduction of foul smell from the ulcers after honey dressing was observed in our study. Dressing procedure was generally less painful⁸. This is due to the ability of the honey to maintain the moisture of the wounds without adhesion to the granulating surface. Honey has also been shown to have direct effect on reducing pains in burn wound⁷.

DFUs usually take a longer time to heal and for this reason, the cost for the dressing may be an issue. Moisture retaining dressing materials which are available in the market are generally expensive. Therefore, the overall cost for wound dressing with honey is relatively cheaper and hence it does provide an economical and practical option for the management of wound ulcers in diabetic patients.

CONCLUSION

Wound dressing with honey is an option for managing Wagner grade-II DFUs with the rate of the wound healing comparable with the use of povidone iodine solution. It decreased wound edema and odour more effectively. Removal of gauze for repeated dressing is easier to perform and is less painful for the patient.

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