

Case Report

First Results of Treating Pediatric Wounds with Medihoney: Analysis of 60 Cases

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Abstract

The use of complementary medical treatment in wound management has continued to grow throughout the world. There is a large body of evidence that supports the use of honey as a wound dressing for a wide range of types of wounds. Clear guidelines for the use of honey in pediatric wound care do not exist. We present an analysis of 60 pediatric cases using honey as a form of complementary medicine in wound management.

Keywords: Honey; Pediatric; Child; Wound; Infection

Background

A variety of different unhealed wounds, burns and ulcers exist, which have a great impact on public health and economy. Numerous interventions, such as new medications and technologies, are currently being used to stimulate wound healing and to eliminate infections. In conclusion, the finding of an intervention that would have both a therapeutic effect and would help eliminate microbes would be of immense value. Honey is a viscous, supersaturated sugar solution derived from nectar gathered and modified by the honeybee, *Apis mellifera*; a natural product that has been recently introduced in modern medical practice. It has a long history of use as a medical substance. Stone age paintings in several locations dating to 6000 BC or earlier depict honey hunting, documenting human use of honey for at least 8000 years. References to honey as a medicine, or rather as an ingredient carrier vehicle, are found in ancient scrolls, tablets and books [1,2]. The first mention of honey as the primary medicine for wound treatment was by the anonymous author of the Edwin Smith papyrus, an Egyptian surgical text that was written between 2600-2200 BC [3]. Furthermore the Ayurvedic, Chinese and Roman early medical traditions have used honey in wound care [4-6]. The effective mechanisms of honey on wounds are manifold. It is postulated that honey causes significantly greater wound contraction than controls, and it enhances the epithelialization of wounds [7,8]. Furthermore honey appears to draw fluid from the underlying circulation and therefore providing a moist environment as well as topical nutrition that may enhance tissue growth, the synthesis of collagen, and development of new blood vessels in the bed of wounds [9,10]. Another very important aspect of medical honey is its antimicrobial properties, suggesting that it might be a real alternative to the use of antibiotics and other chemotherapeutic agents for the treatment of wound infections. The antibacterial activity of honey was first reported in 1882 [11]; it was subsequently found that hydrogen peroxide might be an important factor, as the antimicrobial activity increased when honey was diluted with water. Over the past decade the interest in using honey for wound treatments in pediatrics has considerably grown. That is why it is important to analyze the current data in order to assess how in detail the honey works, whether there are side effects and, most importantly, whether honey reveals the proposed effects in wound healing.

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Methods and Results

We report about 60 pediatric cases treated successfully with medical honey. The patients were between 2 years and 15 years old. Honey was applied every 2 days till the wound completely disappeared. An early wound healing was found, especially in older pediatric cases. Regular controls were done by two pediatricians. Photo documentation showed independently good results of the wound healing process due to medical honey treatment. No side effects occurred. Eighty citations or references were found that matched our criteria. In several studies honey has been used to dress wounds. The results showed an increase in healing, a prompt successful graft, a minimized debridement and a removal of dry crust. Furthermore the wounds were deodorized and cleansed [12-15]. In addition it was found that honey is effective in treating infected wounds, as it has antibacterial activity [16-19]. Several clinical studies exist, that report that wounds which were treated with honey became sterilized in 3 to 10 days [20,21].

A number of characteristics found in honey are essential for wound healing: nitric oxide, prostaglandins, osmolarity, hydrogen peroxide, and increased lymphocytic and phagocytic activity. Honey has the ability to increase NO production [22]. As NO is important for the reduction of bacteria, viral inhibition and healing [23,24] and is therefore an important factor for the increased wound healing in honey. Moreover, NO has been shown to play a role in the host defence against various infections [25], which would explain a factor that contributes to the antibacterial activity of honey. Honey also has the ability to decrease the prostaglandin synthesis [26]. As they are the mediators of inflammation and commonly regarded as immunosuppressive [27], their reduction caused by natural honey could explain many of the honey therapeutic effects. Furthermore it is known that bacteria, in order to grow, need sufficient water [28]. Honey, because of its high osmolarity, is able to draw water from wounds, and therefore it can prevent the growth of bacteria and induce healing [29]. When diluted with water, hydrogen peroxide is formed by the action of the enzyme glucose oxidase in concentrations which exhibit antibacterial effects but without cytotoxic side effects [30,31]. It is very important as an antiseptic and further stimulates the wound healing process. Further, the effect of honey on wound healing may be partially related to the stimulation of inflammatory cytokines from monocytic cells, which are known to be an important factor for healing and tissue repair [32]. A study in the United Kingdom was performed in order to analyze the effect of three honeys (manuka, pasture and jelly bush) on the release of inflammatory cytokines from MM6 cells. Together with a sugar syrup control, these honey were incubated with MM6 cells. The results proved, that natural honey is able to significantly increase the TNF- α , IL-1 β , and IL-6 release from MM6 cells, as well as human monocytes.

Numerous early studies have described the antimicrobial activity of honey [1]. Further studies demonstrated that leptospermum honey (manuka honey) successfully inhibited the growth of antibiotic-resistant strains of micro-organisms both in vivo [33] and in vitro [18]. Furthermore, the inhibition of bacterial growth has been shown by incorporating honey into agar plates [34]. George and Cutting [35] compared the sensitivity of 130 clinical isolates to leptospermum honey and they reported that the growth of MRSA was inhibited by 4% diluted honey, but the Gram negative enterobacter, including vancomycin-resistant organisms, required 6-8% honey in order to inhibit growth.

Further important mechanism of honey on wound healing is that honey is easy to apply and remove [36] and does not stick to the underlying wound tissues. The natural acidity of honey does not primarily seem important for its antibacterial activity. Honey is mildly acidic with a pH around 3,9, and it is well-known that many bacteria and fungi can tolerate extremely acidic conditions [37,38].

On the other hand numerous potential risks for the therapy with honey exist. Mad honey poisoning, allergy to honey, infant botulism and pain are the most known complications following honey intake.

Mad honey poisoning: In cases of mad honey poisoning bradycardia, cardiac rhythm disturbances like bradycardia or atrioventricular block, convulsions, vomiting, sweating, blurred vision, chills and cyanosis are known [39,40]. Especially honey from the Black Sea region contains grayanotoxin I, which is responsible for honey poisoning. Different forms of grayanotoxins have been isolated from the leaves and flowers of the rhododendron and some other plants [40]. Animal studies showed that grayanotoxin I increases the membrane permeability to sodium in sodium dependent excitable membranes and maintains those cells in a state of depolarisation [41,42].

Allergy to honey: Honey allergy is extremely rare, but can result in anaphylaxis. Allergy may be due to both plant and bee proteins and pollen found in the honey [43]. Only case reports and case series of honey allergy with limited number of patients have been reported in adults and Tuncel et al. described on case of anaphylaxis caused by honey, which is to our knowledge the first in literature [43].

Infant botulism: Infant botulism is a rare condition caused by contamination of honey with spores of Clostridia. Honey appears to be one commonly-implicated dietary source of Clostridium spores. It occurs mainly in infants less than 12 months of age, nearly 95% of cases found in the first 6 months of life. No case of topical medical honey application was found in literature to induce infant botulism. Germinating spores of clostridia are colonized in the gut of the infant after oral intake, leading to constipation as the first sign of botulism. Concerns about wound infection from Clostridium spores appear unfounded, as no such complication has been described in more than 500 reports in the literature [44].

Pain: Some patients experience pain on application of honey. In these cases a correlation between concentration of honey and the level of pain seems to be present; higher concentrations of honey seem to induce a higher level of pains [45,46] whereas the high osmotic potential (drawing pain) and/or low pH may be causal. Nevertheless, pain issues do not appear to exert a negative effect on healing rates but can influence patient life quality, depending on their tolerance. In a study comparing aciclovir vs. honey in treating labial herpes, significant lower pain duration was found in the honey group [47]. These findings were found in adult population, but to date never analysed in children.

Several studies exist that compared the effect of honey on wound healing against the standard therapy. In a randomized clinical trial Robson et al. [48] compared the effect of honey versus conventional wound dressing in a sample of 105 patients. As a result, the median time to healing in the honey group was 100 days compared with 140 days in the control group. In 2006 Molan [49] has identified 17 randomized

controlled trials with a total of 1965 participants, and five clinical trials of other forms including 97 participants. He has further identified 16 trials on a total of 533 wounds on experimental evidence and he has concluded the supporting of honey for wound treatment. Jull et al. [50] compared in 2008 the healing rates of venous leg ulcers dressed with calcium alginate dressings impregnated with manuka honey with standard treatment in 368 patients. These patients were randomized and after 12 weeks, there was a 5,9% increase in healing in favor of honey, although this did not reach statistical significance.

Other authors have reviewed the use of honey as a wound dressing and conclusion was that there is a lack of high quality comparative evidence for both conventional and unconventional treatments like honey [51,52]. A systematic review carried out by Gethin concluded that the evidence available from seven comparative studies on 264 patients was limited by lack of blinding, poor reporting and poor validity [51].

Discussion

Wound management in the pediatric field is a difficult topic, as it is often time-consuming, expensive, and may not lead to satisfying results. Many different dressing products exist, but the fewest of them have undergone the analysis of randomized controlled trials. In contrast, a large body of evidence exists, that supports medical honey in the treatment of wounds.

Other authors argue that there aren't enough high-level studies on the use of honey as a wound treatment and therefore a definite recommendation cannot be made. Campbell stated that the strongest evidence is derived from double-blind randomized controlled trials, followed by single-blind randomized controlled trials, open randomized controlled trials, nonrandomized studies, case-control studies, and finally case series [53]. On the other hand controlled studies and good case studies often have a message that may be useful for development.

To date, there has been little information treating pediatric patients with honey for wound management. Only few case reports and few controlled randomized trials do exist in children [54,55]. The scientific evidence for using conventional wound care products especially in paediatric patients is poor. No prospective randomized studies have been performed in this particular age class. The results of Simon, dealing with wound care with antibacterial honey (Medihoney) in pediatric hematology-oncology are promising [55]. Simon reported recently, that a pediatric patient with acute myeloid leukemia and wound infection with methicillin-resistant coagulase-negative staphylococci received topical medical honey application, leading to a successful healing without local or systemic complications. In a survey published in 2006, 15 pediatric oncology patients with different oncologic diseases were successfully treated with Medihoney™ [55].

To date, guidelines for the use of honey in pediatric wound care do not exist. Especially due to the little experience with pediatric patients, in the near future extensive randomized controlled trials should be performed to develop clear guidelines for pediatric wound management. The few studies deal with honey and pediatric wound management show promising results.

Conclusion

The above information shows that in microbiological and clinical tests, honey offers many advantages in controlling bacterial growth and in the treatment of certain health problems like gastric ulcers, burn wounds, leg ulcers and wounds in pediatric patients. The antibacterial, anti-inflammatory, antioxidant, as well as nutritional and physical properties of honey, make it a logical and accepted natural agent for wound dressing in pediatrics. In industrial countries and also in countries with low income, honey offers a cost-effective therapy to treat pediatric wound infections. Disadvantages of topical honey application

may appear in children with known, but extremely rare allergy to honey and the development of potential pain episodes.

Taking all these facts and mentioned studies into account, the topical application of honey for wound care in children has a high potential. In order to formulate clear guidelines for the pediatric wound treatment, further intensive research in this interesting field of wound management is necessary.

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