TOPICAL APPLICATION OF HONEY FOR BURN WOUND TREATMENT - AN OVERVIEW

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SUMMARY. The use of honey in the treatment of burn wounds is discussed and an attempt is made to assess honey's current status as a burn wound dressing. Various kinds of honey are considered, as also the history of its use for this purpose since ancient times. The scientific reasons for honey's appropriateness in burns treatment are reviewed and an account is provided of the main benefits of such treatment.

Introduction

The use of natural products to enhance wound healing is a common practice in many parts of the world. A survey conducted by Hermans[1] in 1998 to review worldwide use of different treatment options for burns found that honey was used in 5.5% of instances, while 1% silver sulphadiazine was the preferred treatment for partial-thickness and mixed burns. Since that time, a number of scientific research papers have testified to the beneficial effects of honey in controlling infection and promoting burn wound healing. This paper makes an attempt to assess the current status of honey as a dressing in burn wounds.

What is honey?

Honey is a mixture of sugars prepared by honey bees from the natural sugar solutions - called nectar - obtained from flowers or other plant secretions. By inverting the sucrose in the nectar, the bee increases the attainable density of the final product, and thus raises the efficiency of the process in terms of caloric density. By the addition of enzymes and the evaporation of water contained in it, honey bees transform it into a sweet liquid.[2]

Types of honey

Honey is either unifloral or multifloral, depending whether the honey collected is from the same plant source or from plant sources of various types. The colour and thickness of honey depend on the source - thus honey may be dark-brown, black, etc. The contents of all honey are more or less the same: sugars, e.g. sucrose, fructose, minerals, and vitamins in addition to various enzymes such as catalase, invertase, and diastase.

There are two main types of honey, apiary honey and forest honey. Honeys produced by the Indian hive bee, *Apis cerana indica*, and the European bee, *Apis millifera*, in apiaries and collected by the modern extraction method are called apiary honey. These are transparent and free from foreign materials. Honeys produced by the rock bee, *Apis dorsata*, or from wild nests of *Apis cerana indica* in forests and collected by the crude method of squeezing the comb are known as forest honeys. These honeys are turbid owing to the abundant presence of pollen, wax, brood (bee larvae), parts of bees, and plant materials. Extra filtration of the honey is necessary to separate the suspended particles. Granulation is a natural process of the crystallization of honey's glucose content, and granulated honey can be made liquid by slight warming.[3]

Purity of honey

Visual observation and layman tests are not reliable for the ascertainment of the purity of honey. A simple test to detect adulteration of honey is to heat 10 g of it with sodium bisulphite and barium. If barium sulphate is precipitated, sugar or jaggery is present in the honey.[3]

Honey as a medicine

The medicinal properties of honey have been known over the years. The Indian medicine system Ayurveda describes honey as the nectar of life and recommends its use in the treatment of various ailments such as diarrhoea, ulcers, etc.[4] Honey is used as a nutritious food, recommended to be taken along with lemon juice and hot water early in the morning.[3] It was used as a component of beauty creams and for embalming the dead in Egypt.

Honey has been used as an adjuvant for accelerating wound healing in ulcers, infected wounds, and burns. It

has also been used for storing skin grafts.[5] In 1933 Philips[6] mentioned the use of honey in burns and described it as the best natural dressing. In 1937 Voigtlander[7] used honey to treat scalds and stressed the relief of pain and honey's soothing action.

Studies in animal models have demonstrated that honey leads to faster healing and reduced inflammation than controls in infection-free superficial burns and full-thickness wounds and in wounds experimentally infected with *Staphylococcus aureus*.[8] There are case reports describing burn wounds not responding to conventional treatment which healed when honey dressings were used.[9] A retrospective study of 156 burn patients treated in a hospital over a 5-yr period (1988 to 1992) found that 13 patients treated with honey had a similar outcome to those treated with silver sulphadiazine.[10]

Prospective randomized controlled clinical trials have proved that honey treatment leads to significantly more rapid healing of superficial and partial-thickness burns than that achieved with silver sulphadiazine, polyurethane film, amniotic membrane, and potato peel.[2,11-20] However, in full-thickness burns, early tangential excision and skin grafting were found to be superior to honey dressing.[17]

In superficial and partial-thickness burns, honey treatment of burns has resulted in an effective control of infection that is much better than that achieved with current standard treatment, silver sulphadiazine, and other substances.[21-23] Thermal injury is an oxidative injury. There is increased free radical activity at the site, resulting in increased lipid peroxidation, which is responsible for scarring and contractures. In burns the early application of honey mops up the free radicals and reduces such scarring and contractures.[24] This may also explain the reduced depigmentation after honey treatment compared to silver sulphadiazine and other methods of treatment. Decreased pain during dressing changes, decreased inflammation, and the promotion of healthy granulation have been shown to be further benefits of honey. Wound swabs taken before and after honey treatment and conventional treatment have shown significantly reduced rates of infection, indicating that honey sterilizes wounds and promotes early granulation.

The components and features of honey that are relevant to wound healing are as follows: viscosity, water content, sugars (primarily glucose and fructose), antioxidants, a wide range of amino acids, vitamins and minerals, glucose oxidase, which produces hydrogen peroxide, and gluconic acid, which gives honey an acidic pH of 3.2 to 4.5. Hydrogen peroxide is produced only when honey is diluted, as glucose oxidase is inhibited in undiluted honey - this provides most of the antibacterial activity of diluted honey (in undiluted honey the high osmolarity prevents bacterial growth) and improves local nutrition, because of levulose and fructose.[14-16]

This results in early wound healing and decreased hospital stay, thus contributing to honey treatment's cost-effectiveness. Honey is cheap, non-toxic, and non-allergenic, it does not stick to the wound, and it provides a moist environment conducive to rapid burn healing.

How to use honey?

In minor burns, it is recommended to pour tap water immediately on burns, as this reduces the temperature. Afterwards, honey can be applied. Depending on the area, 15-30 ml of honey can be applied directly onto the burn wound or soaked in gauze before application. Occlusive or absorbent secondary dressings are applied to prevent honey from oozing out, and the frequency of dressing changes depends on how rapidly the honey is diluted by the exudate, which declines as treatment progresses.[10]

Which honey?

Honey obtained from both unifloral and multifloral sources is useful. Unprocessed, undiluted honey has been used in clinical studies and the response has been good. The floral origin of honey and its antibacterial potency appear to make no difference to the effectiveness of honey in the treatment of burns and wounds.

The free radical control by honey, due to its anti-oxidant effect, limits damage and subsequent multi-organ dysfunction. Honey's anti-bacterial action, low pH, high viscosity, hygroscopic effect, and its hydrogen peroxide content all play a combined role in honey's effectiveness in burns treatment. Honey provides a moist environment for optimum healing conditions.[11-13]

Is it necessary to sterilize honey?

Honey can be sterilized by gamma irradiation without any loss of its anti-bacterial effect. Standard tests have proved honey to be sterile and so far no clinical study has shown any complication, such as allergy, after its use in wounds and burns - thus honey can be used unprocessed and undiluted.[16]

In a systematic review of clinical trials of honey in burns and wounds, Moore et al.[25] and Molan[26] concluded that honey was superior to other treatments and suggested there was biological plausibility for this.

Conclusion

With the increased number of reports on the use of honey in burns and wounds, honey as an alternative treatment for such injuries is gaining increased acceptance from

clinicians. However, discussion about the type of honey to be used is still ongoing, as also about the need to sterilize the honey before use. Further prospective randomized studies using various types of honey with varied properties may help to standardize the particular type of honey to be used. Present evidence supports the finding that honey, thanks to its various modes of action, is useful in superficial and partial-thickness burns.

RÉSUMÉ. L'Auteur examine la question de l'emploi du miel dans le traitement des brûlures et procède à une évaluation du rôle actuel du miel utilisé comme pansement dans de ce type de lésion. Il considère les diverses qualités du miel, comme aussi l'histoire de l'emploi du miel à cette fin depuis l'antiquité. Il présente en outre les justifications scientifiques de l'emploi du miel et il décrit les avantages principaux de cette modalité thérapeutique.

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