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Management of traumatic wounds by honey dressing at pravara rural hospital, Loni: A prospective study

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Abstract
Honey is an ancient treatment that is increasingly earning its place in modern wound care, antibacterial properties, ease of use and ability to promote a moist environment there have been advances in the selection of honey for use in wound care, based on its antibacterial properties, and in clinical protocols for its use. This paper examines wound-healing results achieved with honey in the past two years, the extent of its use and practical issues relating to its clinical use. In honey the activity is due to hydrogen peroxide, but much of this is inactivated by the enzyme catalase that is present in blood, serum, and wound tissues. Hydrogen peroxide in honey is 1000 times more potent than in regular hydrogen peroxide available commercially. The aim of this study is to establish if honey is a reliable substitute for dressings of traumatic wounds instead of use of regular dressing materials. This prospective longitudinal study has been done in department of orthopedics, Pravara rural hospital, rural medical college, Loni, tal- Rahata, dist- Ahmednagar.

Keywords: honey dressing, hydrogen peroxide in honey is 1000 times more potent than in regular hydrogen peroxide available commercially, prospective longitudinal study

Introduction
Honey is an ancient treatment that is increasingly earning its place in modern wound care, antibacterial properties, ease of use and ability to promote a moist environment there have been advances in the selection of honey for use in wound care, based on its antibacterial properties, and in clinical protocols for its use. This paper examines wound-healing results achieved with honey in the past two years, the extent of its use and practical issues relating to its clinical use. Honey has been used as a wound dressing for thousands of years, but only in more recent times has a scientific explanation become available for its effectiveness. It is now realized that honey is a biologic wound dressing with multiple bioactivities that work in concert to expedite the healing process. The physical properties of honey also expedite the healing process: its acidity increases the release of oxygen from hemoglobin thereby making the wound environment less favorable for the activity of destructive proteases, and the high osmolarity of honey draws fluid out of the wound bed to create an outflow of lymph as occurs with negative pressure wound therapy. Honey has a broad-spectrum antibacterial activity, but there is much variation in potency between different honeys. There are 2 types of antibacterial activity. In honey the activity is due to hydrogen peroxide, but much of this is inactivated by the enzyme catalase that is present in blood, serum, and wound tissues. Hydrogen peroxide in honey is 1000 times more potent than in regular hydrogen peroxide available commercially. There is good evidence for honey also having bioactivities that stimulate the immune response (thus promoting the growth of tissues for wound repair), suppress inflammation, and bring about rapid autolytic debridement. There is clinical evidence for these actions, and research is providing scientific explanations for them. The widespread development of antibiotic-resistant bacteria has generated an increasing interest in the use of alternate therapies for the treatment of infected wounds.

Aim
The aim of this study is to establish if honey is a reliable substitute for dressings of traumatic

wounds instead of use of regular dressing materials.

Objectives

1. 1 to get healthy granulation tissue at wound site with debridement and dressings with application of honey every 48 hours
2. To increase cost effectiveness in rural population and use in wounds which are antibiotic resistant

Material and Method

This prospective longitudinal study has been done in department of orthopedics, Pravara rural hospital, rural medical college, Loni, tal- Rahata, dist- Ahmednagar.

There were total 73 patients with mean age of 40 years. There were total 33 female & 40 male patients out of 73. The patients having injury upto Gustillo Anderson grade 3 were included. Pediatric patients were excluded.

When patient came to the casualty, general examination and primary treatment of stabilization of patient was done. Debridement of contaminated wound was done according to the clinical presentation of the wound. After debridement, honey was applied directly over the wound. Dressing was done every 48 hours until healthy granulation tissue appeared covering the wound.

Result

There were total 73 patients with mean age of 40 years. There were total 33 female & 40 male patients out of 73.All the patients have post traumatic wound. There were 25 smokers. The mode of injury was RTA in 50 patients, industrial trauma in 13 patients and fall in 10 patients. The duration of the healing was as shown in Fig 1.In this study 68.49% patient's wound healed between 15-20 days. The pre and post dressing image sare shown below.

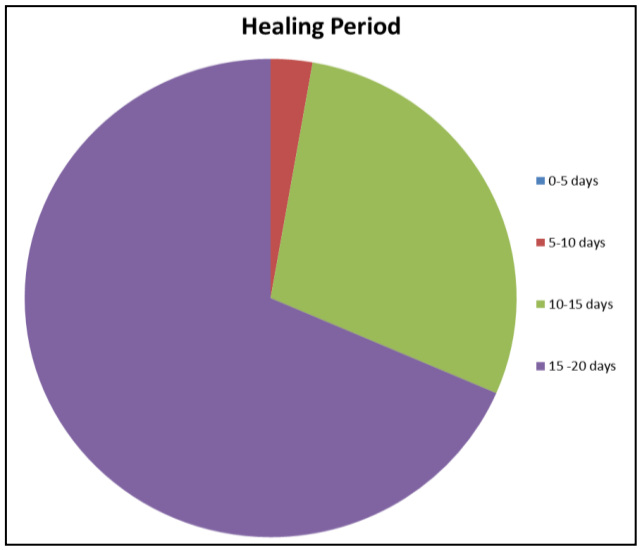

Fig 1

Day 0 **DAY 5** **DAY 10** **DAY 15** **DAY 20** **DAY 23**

Discussion

In 1989, an editorial in the Journal of the Royal Society of Medicine, referring to reports on the successful use of honey in wounds, stated: 'The therapeutic potential of uncontaminated, pure honey is grossly underutilized.' This paper examines how the chemical and physical properties of honey may facilitate wound healing and offers guidance on practical issues related to clinical use.

Antibacterial action

A number of laboratory studies have demonstrated the significant antibacterial activity of honey. Using concentrations of honey ranging from 1.8% to 11% (v/v), researchers have achieved complete inhibition of the major wound-infecting species of bacteria.[3] Other reports include: complete inhibition of a collection of strains of MRSA (1%-4% v/v honey) [5]; complete inhibition of 58 strains of coagulase-positive Staphylococcus aureus isolated from infected wounds (2%-4% v/v honey) 1998, 18-215; complete inhibition of 20 strains of Pseudomonas isolated from infected wounds (5.5%-8.7% v/v honey) 1998, 18-216;. The antibacterial activity of honey has also been shown in vivo, with reports of infected wounds dressed with honey becoming sterile in 7-10 days 1998, 18-21 [12];. Solutions of high osmolarity, such as honey, sugar and sugar pastes, inhibit microbial growth [13] because the sugar molecules 'tie up' water molecules so that bacteria have insufficient water to support their growth. When used as dressings, dilution of these solutions by wound exudate reduces osmolarity to a level that controls the infection, especially if wounds are infected with Staphylococcus aureus (a common osmo-tolerant wound pathogen) [14, 15]. Even when diluted by exudate to a point where its osmolarity no longer inhibits bacterial growth, honey's additional antibacterial components still ensure sterility. Honey's antibacterial activity is thought to be due primarily to the presence of hydrogen peroxide, generated by the action of an enzyme that the bees add to nectar [16]. Some floral sources provide additional antibacterial components by way of plant-derived chemicals in the nectar, such as flavonoids and aromatic acids [17]. This partly explains the very large variation that is seen in the antibacterial potency of honeys from different floral sources [18]. However, the variation results mainly from differences in the amount of hydrogen peroxide formed in the honeys, because nectar from some floral sources contains components that break down hydrogen peroxide or destabilise the enzyme that produces it. Exposure of honey to heat and light also deactivates the enzyme that produces hydrogen peroxide.[18] Differences in the

antibacterial potency are reflected in the varying sensitivity results reported for wound infecting species of bacteria [18]. The use of hydrogen peroxide as an antiseptic agent in the treatment of wounds is generally considered to give outcomes that are less than successful. However, when honey is used, the hydrogen peroxide is delivered in a very different way. Hydrogen peroxide is an effective antimicrobial agent if present at a sufficiently high concentration [19], but at 'higher concentrations, it causes cellular and protein damage in tissues by giving rise to oxygen radicals [20, 21] This limits the concentration of hydrogen peroxide that can be used as an antiseptic. Honey effectively provides a slow release delivery of hydrogen peroxide; the enzyme producing it becomes active only when honey is diluted [16] and continues to produce it at a steady rate for at least 24 hours (unpublished work). In honey diluted with an equal volume of pH7 buffer, the concentration of hydrogen peroxide accumulating in one hour is typically about 1000 times less than that in the solution of hydrogen peroxide (3%) that is commonly used as an antiseptic. Honey also has high levels of antioxidants [22], which would protect wound tissues from oxygen radicals that may be produced by the hydrogen peroxide.

Deodorising action

The deodorisation of offensive odour from wounds is an expected consequence of honey's antibacterial action. The mal odour is due to ammonia, amines and sulphur compounds, which are produced when infecting bacteria metabolise amino acids from proteins in the serum and necrotic tissue in a wound. The rapidity of honey's deodourising action is probably due to the provision of a rich source of glucose, which would be used by the infecting bacteria in preference to amino acids [23], resulting in the production of lactic acid instead of malodorous compounds.

Debriding action

The debriding action of honey has not yet been explained. It may be simply a result of the moist healing environment that is created by the honey dressing. Another possibility is that it is an enzymatic debridement process. There have been no reports of honey having any proteolytic activity, but the debridement action may be due to activation of proteases in wound tissues by hydrogen peroxide generated by the honey dressing as per regular protocols. It has been reported that metalloproteases can be activated by oxidation [24], and the inhibitors of serine proteases can be deactivated by oxidation.[25]

Anti-inflammatory action

Histological studies using experimental wounds in animals have shown that honey has an anti-inflammatory influence even when there is no infection present, this being seen as a reduction in the number of inflammatory cells infiltrating the wound tissue [26-29]. This confirms clinical observations of reduction in inflammation [26, 30], oedema [9, 10, 31-33], and exudation [9, 10, 26], and a soothing effect [26, 34, 35] when honey is applied to wounds. This anti-inflammatory influence may be associated with the antioxidant content of honey, which has been found to be of a significant level when assayed as the capacity of honey to scavenge free radicals?, Oxygen radicals are involved in various aspects of inflammation [25], and the application of antioxidants to burns has been shown to reduce inflammation [36].

Stimulation of tissue growth

Honey promotes the formation of clean healthy granulation tissue [7-10, 12, 30, 32, 37] and epithelialisation, [9, 10, 30, 33] as demonstrated histologically in animal studies [26-29]. This may be due to the generation of hydrogen peroxide, low levels of which stimulate angiogenesis and the growth of fibroblasts. Increased angiogenesis would provide more oxygen, which is a limiting factor for tissue regeneration. Acidification of the wound may also be responsible: honey typically has a pH from 3 to 4, and topical acidification has been shown to promote healing by causing more oxygen to be released from haemoglobin. Also it has been suggested that the decreased turgor resulting from the application of honey may increase tissue oxygenation [10]; the reduction in hydrostatic pressure in the interstitial fluid resulting from anti-inflammatory action would allow improved circulation in the tissues. Another theory is that the nutrient content of honey may stimulate growth — it has a wide range of amino acids, vitamins and trace elements, in addition to large quantities of readily assailable sugars. Studies in animals and humans have shown an association between topical application of nutrients to wounds and increased growth of granulation tissue. In addition, the high osmolarity of honey will draw fluid out from a wound bed. This outflow of lymph with its dissolved nutrients would also provide nutrition for regenerating tissue.

Clinical experience

Honey has been used to treat a number of different wound types, including surgical wounds [8, 11, 12], most notably vulvectomy wounds, [8, 11, 12] wounds related to trauma, honey is effective in management.

Guidelines for practice

Honey varies in consistency, from liquid to solid, with the glucose content crystallized. Solid honeys may be liquefied by warming and semi-solid honeys can often be liquefied by stirring. Heating above 37°C should be avoided, as this may burn the patient and will destroy the enzyme that produces hydrogen peroxide. The honey should be spread evenly on the dressing pad rather than directly to the wound. The amount of honey required on a wound depends on the amount of exudation; the beneficial effects of honey on wound tissues will be reduced or lost if small quantities of honey become diluted by large amounts of exudates. Wounds with deep infection require greater amounts of honey to obtain an effective level of antibacterial activity by diffusion into the wound tissues.

Although ancient physicians were aware that honeys from particular sources had the best therapeutic properties, little regard is given to this in current clinical practice. Any honey to be used for infected wounds should therefore have its antibacterial activity assayed. A 'UMF' rating (equivalent to the concentration of phenol which has the same activity against Staphylococcus aureus) is being used by producers of manuka honey to show the potency of its plant-derived component.

Potential risk

There is no report of any type of infection resulting from the application of honey to wounds although there is no reference in reports of the clinical application of honey on open wounds being sterilized before use. Honey sometimes contains spores of clostridia, which poses a small risk of infection, such as

wound botulism. Any risk can be overcome by the use of honey that has been treated by gamma-irradiation, which kills clostridial spores without loss of any of the honey's antibacterial activity.

Conclusion

This paper has described the chemical and physical properties of honey and has shown how these may have a positive influence on wound healing. Honey is a reliable substitute to use as a wound dressing material. Its fluidity even at room temperature allows it to spread and makes honey dressings easy to apply and remove.[37] The osmotic action resulting from honey's high sugar content draws out wound fluid and thus dilutes the honey that is in contact with the wound bed, minimizing adhesion or damage to the granulating surface of the wound [30] when the dressing is removed.[34] The high solubility of honey in water allows residual honey to be washed away by bathing. Although the clinical experiences detailed in this paper show positive results, more quality randomized controlled trials are needed to provide evidence to encourage the use of honey in wound care.

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