EFFECTS OF TOPICAL APPLICATION OF HONEY ON BURN WOUND HEALING

Subrahmanyam M.,1 Sahapure A.G.,1 Nagane N.S.,2 Bhagwat V.R.,2 Ganu J.V.2
São José Hospital, Lisbon, Portugal
1 Department of Surgery, Government Medical College, Miraj and General Hospital, Sangli, Maharashtra, India
2 Department of Biochemistry, Government Medical College

SUMMARY. In this prospective trial 100 burn patients were randomized in two equal groups to be treated either with honey dressing or with silver sulphadiazine gauze dressing. In the honey-treated group, wounds healed earlier (mean, 15.4 days versus 17.2 days). Serum lipid peroxide levels were raised in the immediate post-burn period in both groups. However, by days 7 and 14 there was a significant reduction in malon dialdehyde values that was more significant in the honey-treated group. Bacterial cultures revealed that 90% were rendered sterile in the honey-treated group, whereas in the silver-sulphadiazine-treated group there was persistent infection. Honey, by its anti-oxidant effect, presumably helped to limit lipid peroxidation and contributed to the rapid healing of the wounds, apart from its other known beneficial effects.

Introduction

Burn injury is accompanied by complex pathophysiological alterations that exert a deleterious effect on various organ systems. The biological and metabolic alterations include the degradation of adenosine triphosphate, a significant reduction in polyunsaturated fatty acids in the red cell membrane, and elevation of activity of serum enzymes.1-3 These changes have been associated with formation of the lipid peroxidation product malon dialdehyde (MDH) as a consequence of burn injury. There is experimental evidence showing increased levels of lipid peroxide in rat serum after thermal injury. This can result in the generation of the lipid peroxidation products that are detected in burned skin, lung tissue, and serum.2 Increased levels of lipid peroxide and enzymes have also been reported in burn patients.3

Honey has been found to be useful in the treatment of burns by helping the rapid healing of wounds.4-6 The high viscosity, acidic pH, inhibine factor, high osmolarity, and nutrient content of honey contribute to the inhibition of bacterial growth and promote wound healing.5,6 We designed this prospective randomized study in order to observe the effects of honey clinically and to correlate with biochemical and bacteriological studies.

Patients and methods

A total number of 100 patients with burns involving less than 40% body surface area, treated in our burns unit within 6 h post-burn over the period June 1998-December 1999, formed the material for this study. The prospective randomized protocol had been previously approved by the Hospital Ethics Committee. Informed consent was obtained from the patients or from the patients’ parents, if they were children.

The patients were allotted at random to two groups, the initial management being the same. In group 1 (no. 50), natural undiluted unprocessed honey obtained from hives was applied in quantities of 15-30 ml to the surface of the burn depending on its size, after the burn had been washed with normal saline. The source of the honey was unifloral, obtained from Syzygium Cumini, family Skeels, Myrtacae, commonly known as Jambhul. In group 2 (no. 50), the wounds were covered with silver-sulphadiazine-impregnated gauze pieces after being washed with normal saline. These were replaced and the wounds were inspected every two days until healing.

In group 1, after the honey had been spread on, the wounds were covered with dry sterile gauze and bandaged. The wounds were observed for evidence of infection, excessive exudate, or leakage until they healed. The times taken for the wounds to heal were recorded in each group. The serum levels of malon dialdehyde and serum uric acid were estimated on days 1, 7, 14, and 21 or until the wounds healed. Thiobutyric acid was purchased from the M/S Sigma Chemical Co. (USA) and all other agents were of analytical grade. Bacterial cultures and sensitivity
determinations were made from swabs taken from the surface of the wounds on admission, on
days 7, 14, and 21, or until the wounds healed in all cases. The cosmetic and functional results
were recorded three months post-discharge, and the results were analysed using the chi-square
test.

**Results**

Of the hundred patients, 52 were male and 48 female. The ages ranged from 3 to 65 yr. The burn
surface area ranged from 10 to 40% TBSA. Table I shows the details of the patients.

In patients treated with honey, wounds healed in 8 patients by day 7, in 37 patients by day 14,
and in the remaining 5 patients by three weeks. Thus, in all the patients in this group, the wounds
healed by day 21 (mean, 15.4 days). In the group treated with sulphur sulphadiazine, the wounds
healed in 4 patients by day 7, in 22 patients by 14 day, and in 24 patients by day 21 (mean, 17.2
days). The time taken for wound healing differed significantly between the two groups (p < 0.001).
The lipid peroxide levels increased considerably in the immediate post-burn period (6.2 ± 1.7
versus 5.9 ± 7.0) (p < 0.001, significant). By day 7, the MDH values were significantly reduced in
the honey-treated group (4.3 ± 1.2), compared with values of 5.3 ± 2.0 (p < 0.01, significant) in
the group treated with silver sulphadiazine, although both had higher compared with day 1. By
days 14 and 21 these values further declined to 3.8 ± 1.0, 3.2 ± 2.0, 4.4 ± 3.0, and 4.1 ± 1.0,
respectively in both the groups (significant, p < 0.005). The normal serum MDH values estimated
in 25 controls were 2.4 ± 2.0. The levels of serum uric acid were 3.2 ± 1.0 on day 1, 2.8 ± 2.0
on day 7, 2.8 on day 14, and 2.3 on day 21 (p > 0.01).

In the honey-treated group 44 wounds had positive swab cultures on admission and six swab
cultures were sterile. Of the 44 positive swab culture patients, 40 (90%) were rendered sterile
after treatment with honey for 7 days, while the remaining four had persistent infection. In group 2,
of the 50 patients, 42 had positive swab cultures on admission, all of them showing persistent
infection after one week (p < 0.001). The organisms isolated in 86 positive swab cultures in the
two groups were Staphylococcus coagulase positive (20), Streptococci (8), Escherichia coli (17),
Pseudomonas (10), Klebsiella (16), Citrobacter (12), and Proteus (3).

Irritation, allergy and other side effects were not observed in any patient in either group. The
subjective relief of pain was better in the honey-treated group. Hospital stay in the honey-treated
group was 22.0 ± 1.2 days versus 32.3 ± 2.0 in the other group (p < 0.005). Four patients in
group 1 needed split-thickness skin grafting, compared with eleven who needed skin grafting in
group 2 (p < 0.05). At the three-month follow-up, there was one contracture in group 1 (neck)
and there were five in group 2, which responded to physiotherapy.

<table>
<thead>
<tr>
<th>Patients treated with honey (No. 50)</th>
<th>Patients treated with silver sulphadiazine (No. 50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>26.5 ± 1</td>
</tr>
<tr>
<td>Total size burn (% TBSA)</td>
<td>22.5 ± 3</td>
</tr>
<tr>
<td>Full-thickness burn size (%TBSA)</td>
<td>3.2 ± 2</td>
</tr>
</tbody>
</table>

Table I- Details of patients

**Discussion**
The use of honey as a medicine has been known since 2000 bc, and a number of articles concerning its use have appeared in the literature in recent years.4 Rapid desloughing, early appearance of healthy granulation tissue, early epithelialization, and accelerated wound healing have been reported with honey. Honey functions thanks to its high osmolarity, which inhibits the growth of bacteria and also accelerates the cleansing and desloughing of dirty wounds. Honey also contains a thermolabile factor, inhibine, related to the plant source of honey. When honey has been used in the treatment of burns, it has proved to be more effective in the sterilization of wounds than silver sulphadiazine.5

Thermal injury of the skin is an oxidation injury. There is always an increase in xanthine oxidase activity, which is accompanied by an increase in lipid peroxidation. This causes deleterious effects on various organ systems. An increase has been reported in lipid peroxide immediately after burns in experimental studies in rats and also in burn patients.3 The effect of burn treatment of on lipid peroxidation has not however previously been reported.

Conclusions

In this prospective study, honey caused wounds to heal earlier by making the wounds sterile through its antibacterial effect. The levels of lipid peroxide product in the serum showed an increase in the immediate post-burn period in both groups investigated, but the reduction in MDH levels was more significant by days 7 and 14 in the honey-treated group than in the silver sulphadiazine group. This we feel was due to the immediate application of honey on the burn wound, which may have caused the antioxidant effect of honey in the limitation of lipid peroxidation. This contributes to the early healing of wounds, with less scarring. We recommend immediate treatment of burn wounds with unifloral honey after confirmation that they are sterile. There are no side effects like allergy, irritation, or toxicity.

RESUME. Dans cette épreuve prospective les Auteurs ont divisé 100 patients brûlés en deux groupes égaux et les ont traités ou avec un pansement à base de miel ou avec un pansement de gaze traitée avec la sulphadiazine argentine. Dans le groupe traité avec le miel, les lésions guérissaient plus rapidement (temps moyen, 15,4 jours contre 17,2 jours). Les niveaux des lipides peroxydes sériques étaient augmentés dans la période immédiatement après la brûlure dans tous les deux groupes. Pourtant, avant le jour 7 et le jour 14 après la brûlure, les Auteurs ont noté une réduction significative des valeurs malondialdéhydes, qui étaient plus significative dans le groupe traité avec le miel. Les cultures bactériennes ont révélé que dans 90% des cas les cultures étaient rendues stériles dans le groupe traité avec le miel tandis que dans le groupe traité avec la sulphadiazine argente l’infection persistait. Le miel, à cause de son effet anti-oxidant, a contribué vraisemblablement à limiter la peroxydation lipide et a contribué aussi à la guérison rapide des lésions, sans parler des autres effets favorables.

BIBLIOGRAPHY


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Address correspondence to: Dr M. Subrahmanyam, Old Civil Hospital Compound, Opposite Post and Telegraph Office, Rajwada Chowk, Sangli 416416, Maharashtra, India. E-mail: -avanism@bom6vsnlnetin