Effectiveness of Honey Dressing and Silver Sulfadiazine Dressing on Wounds Healing in Burn Patients

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Abstract: Objectives: The incidence of the injuries was varying from region to region throughout world. The aim of the study was to evaluate the effect of honey dressing and silver sulfadiazine dressing on wound healing in burn patients. Material & Methods: Observational study was conducted in Burn Unit POF Hospital Wah Cantt, Pakistan, of tertiary level hospital. Patients (n=78) of both sexes, with age group between 10 and 60 years and with first and second degree of burn of less than 50% of Total body surface area (TBSA) were included in the study, over a period of 1 years (March 08 to Feb. 2009). After stabilization, patients were randomly attributed into two groups: ‘honey group’ and ‘silver sulfadiazine group’. Time elapsed since burn was recorded. After washing with normal saline, undiluted pure honey was applied over the wounds of patients in the honey group (n=42) and silver sulfadiazine cream over the wounds of patients in silver sulfadiazine group (n=42), every day. Wound was dressed with sterile gauze, cotton pads and bandaged. Status of the wound was assessed every third and seventh day and on the day of completion of study. Patients were followed up every fortnight till epithelialization. The bacteriological examination of the wound was done every seventh day. Results: The mean age was 25.95 ±16.7 years. Wound swab culture was positive in 29 out of 36 patients who came within 8 hours of burn and in all patients who came after 24 hours. The average duration of healing in patients treated with honey and silver sulfadiazine dressing at any time of admission was 18.16 and 32.68 days, respectively. Wound of all those patients (100%) who reported within 1 hour became sterile with honey dressing in less than 7 days. All of the wounds became sterile in less than 22 days with honey, whereas 32 days with silver sulfadiazine treated wounds. The honey group included 32 patients reported within 24 hour of injury, and 27 had completed outcome at 2 months of follow-up, while silver sulfadiazine group were 32 patients were within 24 hours and 12 had completed outcome and 20 had uncompleted outcomes at after 2 months. Conclusion: Honey dressing improves wound healing, makes the wound sterile in lesser time, has a better outcome in terms of prevention of hypertrophic scarring and post-burn contractures, and decreases the need of debridement irrespective of time of admission, when compared to silver sulfadiazine dressing.

KEYWORDS: Burn; Honey dressing; Silver sulfadiazine dressing; Treatment outcomes; Wounds healing

According to the World Health Organization (WHO) burn injuries are classified by site of injury as "burns and corrosions" and in terms of etiology, they are classified as those caused by exposure to smoke, fire and flames, contact with heat and hot substances, exposure to electric current, lightening and exposure to corrosive substances. Therefore burns include scalds as well as injuries caused by heat from electrical heating appli-
The present study is aimed to compare the effect of honey dressing and silver sulfadiazine dressing on wound healing.

Material and Method
Prospective, observational study was designed in Burn Unit POF Hospital Wah Cantt, Pakistan. is a tertiary level hospital, which cover not only North West parts of country but even Afghanistan near people were comes too. During the period (March 2008 to February 2009) of study, patients sample were collected randomly. Of 154, only 83 patients were fulfill the criteria and were selected for study in burn unit of hospital.

Inclusion criteria; Age group between 10 and 60 years and with first and second degree of burn having burn area less than 50% of total body surface areas (TBSA) were included in study.

Exclusion criteria; Patients on chemotherapy, renal and/or liver failure, immune-compromised state and those with bronchial asthma were excluded.

After taking consent from the patients/parents or guardians, patients were randomly attributed into two study groups; Honey group and silver sulfadiazine group, and following data were recorded:

• Registration data: age, sex, residence, level of education, occupation, marital status.
• Time of admission: time elapsed since burn and taken to reach the hospital.
• Investigations: CBC, RBS blood urea, serum creatinine, serum electrolyte.
• Clinical assessment of the wound: site, affected body surface area, degree, depth, presence or absence of slough, culture sensitivity every seventh day, any additional treatment, outcome.
• Chronological data: dates of admission and discharge.

Patients were stabilized by supportive treatment, and empirical intravenous antibiotic therapy including ampicillin, gentamicin and metronidazole were started in all patients.

Since ancient times, various dressing materials have been used for dressing the burn wounds amniotic membrane, boiled potato peel, banana leaf, etc. With new era, research developed so many medicines like framycin, silver sulfadiazine, skin grafting, epidermal growth factor, honey dressing. Though with silver sulfadiazine shows some better coverage against burn wounds. 10 Honey, being economical and easily available, makes it a reasonably ideal dressing material. 11

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swab cultures from three different sites from all patients were taken, at the time of admission and on 7th day. Antibiotics were initiated according to the results of bacteriological examination. Intravenous antibiotics were given for minimum 10 days to all the patients with second-degree burns and for 5 days to all the patients with first-degree burns. Wounds were examined carefully and washed with normal saline. Patients included in the honey group were dressed with pure undiluted honey and those in the silver sulfadiazine group (with cream), every day. After application of the dressing material, sterile gauze and cotton pads were applied and wounds bandaged. The status of the wounds was assessed every third and seventh day, and on the day of discharge. Patients were followed up every fortnight for 2 months, and final decision was made either complete or incomplete recovery. Complete recovery included complete healing without scar or contracture. Formation of soft scar, hypertrophic scar and/or contracture was taken as incomplete recovery. The data was analyzed by SPSS 16.0 version. Results are expressed in number and percentages. The association between various factors was studied by using chi square and p value was considered significant if it is < 0.05. Ethical approvals have been taken prior to the study.

Results

The age of the burn patients ranged from 10 to 60 years (mean 25.95 ±16.7 years); most of the cases (31.5%) were between 21 to 30 years of age. A majority of patients 36 (44.1%) reported within 1-8 hours of burn. Out of 84 patients, 68 (80.9%) patients came to the hospital within first 24 hours of burn, while 16 (19.1%) patients came after 24 hours of burn. There were no significant differences among these in both groups except that more number of patients in the honey group than in the SSD group. [Table 1]

Table 2 revealed that, 5 (83.3%) of patients in the honey group, who presented in less than 1 hour of burn, had their wound swab cultures negative at the time of admission; whereas 4 (66.7%) were for the silver sulfadiazine group. Patients who came within 1-8 hours following burn, 83.3% and 75% in two groups, respectively, had wound swab culture positive at the time of admission. All patients in both groups reporting after 24 hours had wound swab culture positive on admission.

The average duration of wound healing in patients in the honey group coming within 1 hour, 2-8 hours, 9-24 hours and more than 48 hours were collectively 21.5 average days. Among patients in the silver Sulfadiazine group, average duration (days) of healing was 32.0. Thus average duration of healing of patients in the honey group was significantly lower than that of patients in the silver sulfadiazine group, as shown in Table 3.

Among patients treated with honey dressing, wound swab culture became negative in less than 7 days, in 62.5%, 50%, 25% and 50% of total number of patients reporting in 1-8 hours, 9-24 hours, 25-48 hours and after 48 hours, respectively. Among patients treated with silver sulfadiazine dressing, none of the patients' wounds became sterile in less than 7 days. Wounds of half (50%) of the patients who presented within an hour of burn became sterile in less than 21 days, those of 33.3% in less than 14 days and of 16.7% in more than 28 days (p<0.05). Patients who presented between 1-8 hours 5 (41.6%) had their wound sterile in silver sulfadiazine group less than 28 days, 4 (33.3%) in less than 21 days, 2

<table>
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<tr>
<th>Table 1: Characteristics of the patients in the honey and silver sulfadiazine (SS) groups. NS = Non-Significant</th>
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<td>Patient characteristics</td>
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<td>------------------------</td>
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<tr>
<td>No. (%)</td>
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<tr>
<td>Gender</td>
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<td>Female 17 (40.7)</td>
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<td>Total 42 (100)</td>
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<td>Area</td>
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<tr>
<td>Urban 19 (45.3)</td>
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<tr>
<td>Degree of burn</td>
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<td>2nd degree 18 (42.8)</td>
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<td>Per centage of burn</td>
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<tr>
<td>11-20% 7 (16.6)</td>
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<td>21-30% 16 (38.1)</td>
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<td>31-40% 9 (21.4)</td>
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<tr>
<td>41-50% 9 (21.4)</td>
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<td>Time of admission</td>
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<tr>
<td>1-8 h 25 (59.2)</td>
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<td>9-24 h 4 (9.5)</td>
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<td>25-48 h 2 (4.7)</td>
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<td>&gt; 48 h 4 (9.5)</td>
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(16.6%) in more than 28 days and 1 (8.3%) in less than 14 days, detail are shows in table 4.

Table 5 represents the outcomes with honey and silver sulfadiazine groups. Dressing with honey group shows that, 34 (80.9%) patients treated with honey dressing who reported within 24 hours, 27 (64.3%) patients had complete recovery while 7 (16.6%) had incomplete. Out of a total 42 patient treated with honey dressing, 33 (78.6%) had complete recovery and out of a total of 42 patients, only 16 (38.1%) achieved complete recovery. These differences were statistically significant p< 0.01.

Discussion

From ancient times, honey has been used to treat a variety of ailments through topical application, but only recently, its antiseptic and antibacterial properties have been chemically explained. But recently some randomized controlled trials comparing honey with other antiseptic and antibacterial products. 

12 It was concluded that the confidence in honey as a useful treatment option for superficial wounds or burns is low and there is a definite biological plausibility for the same. While some recent research concluded that a particular type of honey might be useful in treating methicillin-resistant Staphylococcus aureus (MRSA) infections. 

13 Antibacterial properties of honey result from its low water activity which causes osmosis, its hydrogen peroxide content and its high acidity. 

14 – 15 Being primarily a saturated mixture of two monosaccharide’s, this mixture has a low water activity. Since most water molecules get associated with the sugars, only a few remain for micro-organisms, rendering a poor environment for their growth. Hydrogen peroxide in honey is activated by dilution; however, unlike medical hydrogen peroxide, commonly 3% by volume, it is present in a concentration of only 1 mmol/L in honey. Iron in honey oxidizes the oxygen free radical released by the hydrogen peroxide. When used topically (as for example, a wound dressing), hydrogen peroxide is produced by dilution with body fluids. As a result, hydrogen peroxide is released slowly and acts as an antiseptic. The pH of honey is commonly between 3.2 and 4.5. This relatively acidic pH level prevents the growth
of many bacteria.\textsuperscript{15} The antibacterial activity of honey is mainly due to inhibins in honey. These inhibins consist of hydrogen peroxide, flavinoids, and phenolic acids, plus many other unidentified substances.\textsuperscript{1,16} Some studies suggest that the topical use of honey may reduce odours, swelling and scarring when used to treat wounds; it may also prevent the dressing from sticking to the healing wound.\textsuperscript{15}

Burn patients have a higher morbidity than mortality because burn wound, due to the presence of necrotic tissue, has great chances of infection and thus requires long periods of dressings, leading to deformities and contracture.\textsuperscript{9} Delayed reporting has been found to be an important factor that causes an increase in wound infection and thus morbidity.\textsuperscript{17} This is a major problem in the third world countries like India, owing to poor transport condition, illiteracy and relative inaccessibility of tertiary health-care centers. Delay and inadequate fluid resuscitation and overwhelming infection were the major factors in the morbidity and mortality.\textsuperscript{18}

In patients with severe burns, wound infection and contamination frequencies have been found to be higher for all admission time points.\textsuperscript{5} Infection is one of the most frequent complications of wound healing despite the use of antibiotics and a modern sterile technique; it accounts for considerable patient morbidity, discomfort and prolonged hospitalization and it must be avoided to permit proper healing.\textsuperscript{19}

Honey dressing decreases the average duration of healing as compared to the silver sulfadiazine dressing. The healing process requires clearance of pathogenic organisms. Since antibiotics are ineffective in this situation and antiseptics cause tissue damage, the healing process is slow.\textsuperscript{20} Honey is reported to cause no tissue damage and appears to actually promote the healing process. There are also numerous reports of sugar being used as a wound dressing.\textsuperscript{21-26}

The results show that the average duration of healing was increased, as there was delay in admission in hospital, but the increase in duration of healing was more with the silver sulfadiazine dressing than with honey dressing. Honey therapy was seen to decrease the levels of serum lipid peroxide; while there was a mild increment in serum seruloplasmin levels, there was no significant effect on serum uric acid levels as compared to silver sulfadiazine dressing. Honey therapy seems to accelerate the process of healing. It has a more positive effect on reducing the oxidative stressful state in burn trauma when compared to silver sulfadiazine treatment, resulting in results in rapid wound healing.\textsuperscript{27} Patients who reached the hospital before 24 hours of burn had an average duration of healing of 19.28 and 30.83 days for honey and silver sulfadiazine groups. Those who reported after 48 hours had average duration of healing 21.5 and 32.0 days with honey and silver sulfadiazine dressing, respectively [Table 3]. Similar results were found in the previous study, where 84% and 72% showed satisfactory epithelialization by the seventh day with honey and silver sulfadiazine dressing, respectively.\textsuperscript{28} Epithelialization occurred in 100% and 84% of the patients by the 21st day in wounds treated with honey and SSD dressing, respectively. Histological evidence of reparative activity reached 100% by 21 days with the honey dressing and 84% with silver sulfadiazine.\textsuperscript{28}

In current study, 100% of wounds of patients who reported within 1 hour for admission and were treated with honey dressing became sterile in less than 7 days. 62.5%, 50%, 50% of the patients treated with honey dressing who reported within 2-8 hours, 9-24 hours and more than 48 hours, respectively, attained wound sterility in less than 7 days [Table 4]. This observation is comparable with published article, in which 52 patients treated with honey, 91% of wounds were rendered sterile within 7 days.\textsuperscript{29} 37.5% of patients’ wound became sterile in less than 14 days who reported within 2-8 hours [Table 4]. Antibacterial activity is attributed by several authors to the high osmolality of the sugar or honey.\textsuperscript{22, 30-32} Of the wounds treated with honey, 87% healed within 15 days as against 10% in the control group.\textsuperscript{29} Silver sulfadiazine dressing did not have any added benefit over honey dressing in terms of healing and making wound sterile. It is concluded that although there is evidence of antibacterial effect, there is no direct evidence of improved healing or reduced infection by silver sulfadiazine dressing.\textsuperscript{10} When both type of dressings were compared, early subsidence of acute inflammatory changes, better control of infection and quicker wound healing were observed with honey dressing, while in the silver sulfadiazine treated wounds sustained inflammatory reaction was noted even on epithelialization.\textsuperscript{28} Also, it was clear that increase in time of admission had adverse effect on wound healing and complication at follow-up. This is more so for silver sulfadiazine dressing. Subramanyam,\textsuperscript{28} also concluded that relief of pain, lower incidence of hypertrophic scar and post-burn contracture, low cost and easy availability make honey an ideal dressing in the treatment of burns.

**Conclusion**

Delay in hospital admission increases wound contamination and infection thereby delaying wound healing which has a detrimental effect on final outcomes. Since honey dressing improves wound healing by rendering it sterile in lesser duration of time, wounds thus treated have a better outcome in terms of hypertrophic scarring and post-burn contractures; this is due to the fact that early healing mitigates the need for debridement at when compared to silver sulfadiazine dressing.
Hence, Honey dressing is a better option for dressing in burns, in terms of decreased morbidity, economy, patient well-being and speedy rehabilitation.

References

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