

Original Article

Honey Compared with Silver sulphadiazine as Burn Wound Dressing

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Objective: To assess the efficacy of Honey in comparison with 1% Silver sulphadiazine (SSD) as burn wound dressing.

Study Design: Interventional Comparative study.

Duration of the study: The study was carried out from Jan 2007 to Jun 2009, in the departments of Surgery Railways hospital Rawalpindi, and IIMC Hospital Islamabad.

Materials and Methods: A total of 50 patients with superficial burns involving 5 to 40 percent body surface area were treated over the course of 30 months. Patients were divided into two equal groups randomly by consecutive sampling method, one group was dressed with honey as the topical antibacterial agent while the other was treated with 1% silversulphadiazine cream, and the results regarding duration of wound epithelialization, pain relief, swabs from wound to become culture negative, and cost of treatment were compared.

Results: 50 patients were divided in two equal groups randomly for topical application of Honey (Group-I), and 1% Silver sulphadiazine (Group-II), as wound dressings. From group-I, In 14 patients (56%) wound epithelialization occurred by 10th day, whereas in all 25 patients (100%) epithelialization occurred in 40 days. Those treated with SSD showed epithelialization in 15 patients (60%) between day 16 and 30, and 25 patients (100%) were found to be epithelialized by day 60. With honey dressings 17 patients (68%) were rendered culture negative by the end of first week, and 3 patients (12%) became culture negative by the end of second week, whereas with SSD dressings 11 patients (44%) could become swab culture negative after 1 week while the rest showed positive swab culture, it took 6 weeks for all patients to become culture negative. With honey dressings pain relief was achieved in 9 patients (36%) by 5th day, all patients were pain free by 18th day and mean time was 12 days. With SSD dressings 4 patients (16%) were pain free by 8th day while relief in all 25 patients (100%) was obtained by 26th day, mean time was 16.8 days. Cost of treatment with honey was approximately 48.5% of that with SSD.

Conclusion: Thermal burns patients dressed with honey showed advantage compared to those dressed with SSD regarding early wound epithelialization, time taken in wounds to get culture negative, earlier pain relief and cost-effectiveness.

Key words: Honey in treatment of burns. Burn wound dressing. Honey vs. Silver sulphadiazine as burns dressing.

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Introduction

Severity of burns injury depends on the degree of the burns and the area of the body affected. Burns may be superficial, involving just the epidermal layer of the skin, Partial thickness or full thickness, involving all layers of the skin and deeper structures. The extent of the injury is expressed in percentage of total body surface area (TBSA) involved. In burn injury, management of the wound is of paramount importance, which is very susceptible to infection. Prevention of

infection and promoting epithelialization is the mainstay of treatment and several agents such as Silver sulphadiazine, Eusol and Gentian Violet, Gentamicin and Honey have been used to achieve this goal. Burn wounds are most commonly dressed using a combination of paraffin-impregnated gauze (designed to prevent adherence of the dressing to the wound) and an absorbent cotton wool layer.^{1,2} Silver sulphadiazine (SSD) has been commonly used in burn wound management since 1968 to try to overcome the problem of wound infection. Topical wound agents have not been very extensively studied as seen in systemic reviews of

randomized trials.³ An exception is the subject of dressings and topical agents for chronic and burn wounds, which has been the subject of systematic evidence collection.⁴ High osmolality has been considered a valuable tool in the treatment of infections because it prevents the growth of bacteria and encourages healing.⁵ High osmolality can safely be achieved topically by the use of honey.

Honey was used to treat infected wounds as long ago as 2000 years even before bacteria were discovered to be the cause of infection. In c.50 AD, Dioscorides described honey as being "good for all rotten and hollow ulcers",⁶ more recently honey has been reported to have an inhibitory effect to around 60 species of bacteria including aerobes and anaerobes, gram-positive and gram-negative bacteria.⁷

Honey has been regarded as having specific antibacterial properties. For example, honey diluted seven to fourteen times beyond the point where osmolality ceased to be completely inhibitory still prevented growth of *Staphylococcus aureus*.⁷⁻⁹

Honey helps heal skin in a variety of ways. In a study, honey increased the amount of tissue regrowth in several different kinds of wounds (including incisional and burn wounds), and increased wound epithelialization.¹⁰ In addition; honey decreases inflammation as seen histologically, and redness at the wound site.¹¹ The purpose of the study was to compare Honey with Silver sulphadiazine as a topical agent in burns wound dressing regarding swabs from wounds to become culture negative, cost of treatment, effectiveness in relief of pain, and time taken for wound epithelialization.

Materials and Methods

A total of 50 cases of partial thickness thermal burns involving from 5 percent to 40 percent of body surface area were treated over a period of approximately 30 months from Jan 2007 to Jun 2009 at IIMC hospital Islamabad, and Railways hospital Rawalpindi. The cases were divided into two groups randomly by consecutive sampling method, in equal numbers. General management of the patients was the same in both groups, as well as the initial management of the wound regarding debridement and wound excision. The wounds were cleansed with normal saline and thorough debridement done. Swabs were taken on admission and weekly thereafter. Patients in group-I (25 patients) were treated with pure, unprocessed, undiluted honey which was applied once daily after the wound was debrided and washed. A thin layer of honey was poured and spread manually on the involved area and was covered with cotton sterilized gauze.

Patients in group-II (25 patients) were similarly dressed with a layer of 1% Silver sulphadiazine cream once daily.

At the time of change of dressing, details regarding the condition of the wound such as signs of infection, condition of the surrounding tissue, discharge, smell, presence of necrotic tissue, and degree of epithelialization were noted. Swabs for bacterial culture were obtained before first dressing and subsequently on weekly basis. Subjective factors such as pain and local irritation were recorded. Pain relief was noted by visual analogue scoring system (1-10). Pain was considered as severe for score 6-10, moderate 3-5, and mild less than 3. Pain was considered relieved if patient scored 0-1. Quantity of honey and Silver sulphadiazine cream applied at each dressing was noted for cost assessment.

Results

Of the 50 patients 21 were male and 29 were female. The ages ranged between 18 months and 50 years. 16 patients (32 percent) were in the age group of 21-30 years. **Table I** shows age, and extent of burns in 50 patients divided randomly in two groups.

Table I: Age and Extent of burns in 50 patients.

	Number of Patients in Age Groups in Years				
	1-10	11-20	21-30	31-40	41-50
Extent of Burns %					
GROUP-I (Honey)(n=25)					
5-10	0	0	2	0	0
11-20	0	2	2	0	0
21-30	4	4	3	2	1
31-40	1	1	2	0	1
Total	5	7	9	2	2
GROUP 2(Silver sulphadiazine)(n=25)					
5-10	0	2	0	0	0
11-20	0	2	2	0	0
21-30	4	3	4	1	2
31-40	1	2	1	1	0
Total	5	9	7	2	2

In group-I (**Table II**), epithelialization had begun at 5th day, in 14 patients (56%) epithelialisation occurred by 10th day. 24 patients (96%) were epithelialized by day 30, and healing all patients was complete by 40th day. While only in 5 patients (20%) in group-II healing occurred by 15th day. In this group epithelialization mainly occurred between 16-30 days in 15 patients (60%), and it took 60 days for epithelialization to occur in all patients. In group-I, wounds of 56% patients epithelialized between 5-10 days while in group II only 12% patient's wound epithelialized between 5-10 days,

in this way honey was found associated with early wound epithelialization. There was a significant difference in time taken for wound healing (p -value = 0.002) between the two groups.

Table II: Time required for healing (epithelialization) in patients in both study groups (n=50)

Time taken for wound epithelialization (days)	Group-1 (Honey) No. (%)	Group-2 (Silver sulphadiazine) No. (%)	p-value
5 – 10	14 (56.0%)	3 (12.0%)	0.002
11 – 15	6 (24.0%)	2 (8.0%)	0.24
16 – 20	3 (12.0%)	7 (28.0%)	0.28
21 – 30	1 (4.0%)	8 (32.0%)	0.02
31 – 40	1 (4.0%)	3 (12.0%)	0.60
41 – 50	0 (0.0%)	1 (4.0%)	1.0
51 - 60	0 (0.0%)	1 (4.0%)	1.0

At the time of admission in group-I, 20 patients (80%) were found to be culture positive, and 5 patients (20%) were culture negative. Whereas In group-II, 22 patients (88%) were found culture positive, and 3 patients (12%) were culture negative. In group-I, 17 patients (68%) were rendered culture negative at the end of first week, swab cultures of another 3 patients (12%) were found to be negative at the end of 2nd week. In group-II only 11 patients (44%) were rendered culture negative after 1 week, another 5 patients (20%) became culture negative at the end of 2nd week, while the rest showed positive swab culture, 3 patients (12%) became culture negative after 3 weeks, another 2 patients (8%) took 4 weeks, while 1 patient (4%) became swab culture negative at the end of 6th week. The organisms isolated were *Staphylococcus aureus*, *Streptococci*, *E.coli*, *Pseudomonas*, *Klebsiella*, and *Proteus*

In group-I, 9 patients (36%) had complete relief of pain by 5th day; another 9 patients (36%) were relieved by 12th day. Out of remaining 7 patients, 5 patients (20%) were relieved by 15th day and the last 2 patients (8%) were relieved by 18th day. Mean 12 days (Table III).

Group-I was found associated with early pain relief in our study (p -value = 0.01). While over all Pain relief was slow in group-II patients. Only 4 patients (16%) had pain relief by 8th day. it took 26 days for all patients to be pain free in group-II compared to 18 days in group-I. Mean was 16.8 days (Table III)

The price of 1000 gm of honey ('Salman Honey' of Salman beehives Islamabad) was Rs. 480, whereas the price of 250 gm of Silver sulphadiazine (Flamazine) was Rs. 617. Amount of these topical applicants used in an adult in each dressing was approximately 2gm of SSD per percent of burn area or 4gm of honey per percent of burn area. Comparative cost per dressing per

percent burn is shown in Table IV. Cost of treatment with honey came out to be 48.5% of that with SSD.

Table III: Time required for pain relief in both study groups (n=50)

Time taken for pain relief (days)	Group-1 (Honey) No. (%)	Group-2 (Silver sulphadiazine) No. (%)	p-value
Up to 5	9 (36.0%)	1 (4.0%)	0.01
6 - 12	9 (36.0%)	11 (44.0%)	0.77
13 – 21	7 (28.0%)	11 (44.0%)	0.37
22 - 26	0 (0.0%)	2 (8.0%)	0.48

Table IV: Cost per dressing per percent burn.

	Amount used/ Dressing/% burn	Cost in Rs.
Silversulphadiazine	2 gm	4.92
Honey	5 gm	2.40

Discussion

According to Kramer¹², an ideal wound antiseptic should meet the following criteria.

Fast onset of bactericidal action and a remnant broad spectrum effect against bacteria and fungi even under the unfavorable conditions of exudation, colonized or infected wounds. Enhancement and acceleration of the physiologic process of wound healing (granulation, epithelialization). Even if applied for prolonged periods, no adverse local or systemic effects (allergy, toxicity related to absorption), and moderate cost even if applied two times daily. The aim of using Honey was to see if it fulfilled the above criteria, and how it compared with SSD.

The antibacterial property of honey was first recognized in 1892 by van Ketel.¹³ It has often been assumed that this is due entirely to the osmotic effect of its high sugar content.¹⁴⁻²⁰ Honey has an osmolarity sufficient to inhibit microbial growth.²¹ It contains an enzyme that produces hydrogen peroxide when diluted.²² This agent was referred to as 'Inhibine' prior to its identification as hydrogen peroxide.²³ Hydrogen peroxide is a well-known antimicrobial agent. Studies have demonstrated that honey reduces inflammation as seen histologically, compared with various controls, in deep²⁴ and superficial²⁵ burns.

In our study we found significant advantage of using honey compared to Silver sulphadiazine as burns dressing. Compared to 24 patients (96%) in which healing occurred in 30 days with honey, it took approximately 45 days for similar number of patients to heal with Silver sulphadiazine. Antibacterial potential of honey was found to be better than SSD. In one week 17 patients (68%) treated with honey were rendered culture negative, compared to only 11 patients (44%) who were rendered culture negative with Silver sulphadiazine in

the same time period. Lotfi²⁶ in his study has reported rapid epithelialization of wounds treated with honey in which after 3 days the tissue had 58% more skin growth ($P<0.001$), after 6 days it had 114% more ($P<0.001$) and after 9 days 12% more than the control. Two other randomized controlled clinical trials have compared honey with Silver sulphadiazine ointment on partial-thickness burns^{27, 28}. Both of these showed that honey gave better control of infection, and early wound epithelialization. It was also noted that change of honey dressing was much less painful because honey was readily soluble in water, a simple rinse with normal saline washed away the old application and debris, whereas scrubbing with swab was needed to remove the silver sulphadiazine application which was painful. In group-I patients were rendered pain free early, mean pain relief was by 12th day, while with the SSD dressing mean pain relief was in 16.8 days. Cost of treatment with honey came out to be less than half (48.5%) that with Silver sulphadiazine. No allergic reaction or side effect was noted in any of our patients dressed with honey or SSD. Honey is safer due to absence of any known side effects unlike Silver sulphadiazine which is known to cause plasmid mediated resistance of microorganisms to antibiotics, raised liver enzymes and an Argyria-like syndrome in burn patients²⁹. Hypertrophic scar tissue developed in 4 patients (16%) in group-II noted on follow up, this complication did not occur in patients treated with honey dressings.

Conclusion

From our study we concluded that better results were obtained in burn wounds dressed with honey as compared to Silver sulphadiazine, regarding wound sterilization, mean epithelialization time, and pain relief. Cost of treatment was an important consideration in most of the patients considering our socio-economic conditions, which went in favour of those treated with honey. Moreover those dressed with honey experienced less discomfort throughout the duration of therapy due to less painful change of dressings.

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