

Original Article

Utilisation of topical honey in Burns wounds contaminated with *Pseudomonas aeruginosa* compared with silversulfadiazine and acetatmafenid

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Abstract

Background Heat injury with consequent coagulation necrosis of skin layers provides an environment that is suitable for bacterial infection as a result of low tissue perfusion and high protein content. Gram negative bacteria and especially *Pseudomonas aeruginosa* have been recognized as the main causative organisms of burns wound infection. For long time, mankind has been interested in remedial role honey. The role of honey in deep burns wound remains especially after massive secondary bacteria infection has not been sufficiently if documented.

Materials and method: In this study,60 Indian piggies were categorised into three equal groups. A part of the skin of each piggy approximately 8.5cm²,was burned with steam(third degree burns). The wounds were each subsequently inoculated with 10⁸ *Pseudomonas aeruginosa*. For each group a specific dressing agent was used to cover the wounds (honey, 1% silver sulfadiazine or 8.5%Acetatmafenid).On specific days, according to a formulated schedule, the weight of the animals ,the condition and extent of wounds were recorded. Culture specimens were also taken for qualitative and quantitative analysis periodically.

Results : Out of the three groups the Honey group had the least contamination in prepared specimens on the tenth day (20% compared with 95% and 100% in the other groups), the smallest remaining wound (percentage dwindle in size) 62%,compared to 29% and 22% in the other groups) and the most formation of granulation tissue(90% compared with 35% and 44% in the other groups) at 10 days. Mortality was also least in the honey group (30% with 40% and 45% in the other two groups)

*Conclusion:*The topical use of honey in deep burn wounds contaminated with *pseudomonas aeruginosa* is superior to silver sulfadiazine and Acetatmefamid in terms of granulation tissue formation, wound healing and antimicrobial effect.

Key words: Indian piggy,Honey Acetatmafenid ,silver sulfadiazine

Introduction

Heat injury with creation of coagulation necrosis of skin layers ,prepares an environment that is suitable for bacterial invasion as a result of low tissue perfusion.Conversion of partial thickness to full thickness burns also facilitates the penetration

of microbes into vital tissues and spread of infection as a result of destruction of the skin barrier. Infection therefore is an important factor that delays the healing process and prolongs treatment period¹.

Since the late 1950s gram negative bacteria especially *Pseudomonas aeruginosa* have been recognized as the main causative organisms in mortality following wound infection. Although antimicrobial drugs have had significant effects in decreasing wound infection, massive burns wound infection is still one of the most important causes of mortality² after burns injury.

Currently three topical antimicrobial drugs are available.(silver sulfadiazine,silvernitrite and Acetatmafenid). Before bacterial massive

colonization of the wound, application of each of these topical agents will have equal effects² Mankind has for along time been interested in the remedial role of honey. The remedial properties of honey is mentioned in papyruses traced to 3500 years ago have among ancient Egyptians and the Hebrews 3000 years ago. Greeks ,ancient Chinese and Hindus are mentioned 2000 years ago³. In the books of some philosophers; Aristotle, Hippocrates, and Aricenna and other wisemen, the curative role of honey has been recognized . Aricenna believed that honey prepared poultice is very helpful in healing of infected wounds⁴ Honey is also mentioned in the Koran Holy Book of Moslems a medicine: 'And God voiced to Honey bee to lodge in mountains and elevated trees and roofs and then to nourish from sweet fruits and sweet- smelling

flowers nectars and to obey from Gods way . Afterwards a sweet variously- coloured sherbet comes out of them that cure of human is in it' ⁵.

Current literature has demonstrated the beneficial effects of honey in superficial and non infectious burns, better than placental membranes and pomad. Silver sulfadiazine cover and honey have been introduced as ideal cover of burns⁶. The role of honey in deep burns wound with massive bacterial contamination , has not been fully studied . This study is therefore aimed at determining the effectiveness of honey in deep and contaminated burns wound as compared to silversulfadiazine 1 % . and Acetatmefamid 8.5% in relation to wound healing and antimicrobial properties.

Methods and Materials:

Sixty Indian piggies were categorized into 3 groups of 20 each randomly. These groups were tagged as Honey, Acetatmafenid 8.5% and silversulfadiazine 1% groups by lottery. Each animal was weighed at the beginning of the study and the right groin was shaved in each animal. The animals were anaesthetized in turns with ketamine(IV or IM)2mg/kg Bwt).The shaved area was sterilized with Betadin solution and alcohol and some preformed lidded boxes were fixed in place to cover and protect the shaved area with nylon O suture. Each of the shaved areas was washed with physiological saline and exposed to boiling water steam for a period of 10 secs. Immediately after cooling of the area, 10^8 microbes of pseudomonas aeruginosa were inoculated into each wound . After about 4-6 hours following inoculation the wounds were dressed with either honey or silversulfadiazine or acetatmafenid, depending on the category. All wounds were dressed daily with a specific agent . The weight of the animal , the burns condition, and the extent of the of the burns were determined and recorded on specific days. Specimens were also taken from each wound for qualitative analysis of bacteria on specified days. Daily wound dressing was continued fro a period of 30 days at the end of the period which the residual wound extent was measured and recorded. The weight of the animals was also re-evaluated.

Results

Granulation tissue formation.

Wounds condition on the the 10th day after burns was assessed clinically in each group and classified into 2 groups (G1 and G2) G1granulation tissue was ready for grafting. G2 consisted of wounds with poor granulation tissue not suitable for grafting.

Microbial cultures.

Qualitative culture (wound swab) specimens were taken on two occasions to determine the level of wound contamination in all the piggies. Similarly, quantitative analysis of number of organisms in tissue

specimens was done also on two occasions. Wound infection was considerer to be present when there were more than 10^5 micro organisms /gram of tissue. In all the three groups ,wound cultures were positive by the day 4 .Thereafter, the honey group fared much better than the other groups. By the 10th day post burns 80% of wounds in the Honey group have been rendered sterile. By the 14th day 90% of tissue specimens of wounds in the silversulfadiazine group contained more than 10^5 microbes/gram of tissue as compared to only 5% in the honey group.

Wound extent (dwindling of size).

After wound dressing for 30 days, wound extent was measured and its ratio to the initial extent size on the 1st day of burns was determined. The average wound extent after 30 days was 6.5cm^2 in Mafenid group, 6cm^2 in silver group and 3cm^2 in the honey group. Thus the rate of dwindling in size of the wound was faster in the honey group (62%) at day 30.

Weight change

The average weight of the animals at the beginning of the study was 640g, 638g, and 628g in Honey,Mafenid and silverdiazine respectively. At thirty days 3 groups (491g in Honey 482 in Mafenid and 5005 in silversulfdiazin groups).There was no glaring weight loss differential among the groups.

Morbidity among the three groups

A total of 23 deaths were recorded. 2 piggies died in the silversulfadiazine group within the first 48 hours of burns injury. Mortality was encountered in all the groups after the 10th day of burns. The mortality rate was least in the honey group.

Discussion

The remedial role of honey is well known to man since time in memoriam. In most studies of burns, only superficial and non infective burns were considered in the evaluation of the curative properties of honey. The role of honey in deep infected burns has not been previously well documented. This study therefore has provided an experimental model for the evaluation of the use of honey in deep ,contaminated or outright infected burns wounds as well as comparing other dressing agents available in the care of burns wounds. (Acetatmafenid and silverfadiazine).Although the stud y was on animals (piggies) the results obtained may be extrapolated to the humans

. In this study it has been demonstrated that honey has better properties at formation of granulation tissue compared to two other agents. at the 10th day post burns and it was possible to graft 50% of the wounds in the honey group. The honey group also clearly reduced the contamination of the wound so that by day 14 only 5% of the Pseudomonas organism were present in the wound. The rate of wound contraction(dwindling in wound size) was more than twice in the honey group compared to the other groups. These findings suggest that the overall wound healing process was faster in the honey group.

Conclusion

From this model experiment ,it can be conclude that topical application of honey in the treatment of deep and contaminated (infected) burns wound not only accelerates the healing process of trhe wound but also ahs antimicrobial effect compared to acetatmafeni and silversulfadiazin.

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