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Benefits of Using Honey in The Management of Postoperative Wound Infections

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ABSTRACT

Introduction: The unrefined honey has anti-oxidant, anti-bacterial, and anti-inflammatory properties. The antibacterial effect is due to acidity, content of hydrogen peroxide, osmotic effect, antioxidant, nutritional contents, stimulation of immunity, and other unidentified compounds. Wounds treated with honey had less swelling, less redness, less infection and less pain.

Aim of this study: This study aimed to address the benefits of honey in the management of postoperative wound infections.

Methods: 40 cases with postoperative wound infections, the cases were divided into 2 groups, each containing 20 cases. Group A was treated with honey (H group) group B was treated with antiseptics without honey (Wo-H group). Patients aged between 20 and 50 years old presented with infected postoperative wounds. Patients with infected wounds not related to operations and patients who refused to participate in this study were excluded. The wound was cleaned with normal saline and then gauze was soaked with sterile honey. Wo-H group dressing was done with normal saline, betadine, glycerine magnesia. In the first 7 days, dressing was done twice daily, while after the first 7 days, dressing was done once daily.

Results: All wounds of the H group (20 cases) became clean by the end of 3 weeks (100%); in 12 cases (60%) the wound became clean by the end of first 10 days, 4 cases (20%) became clean at day 14, and 4 (20%) cases became clean at day 21. The wound healing occurred by the end of 4 weeks without need for secondary sutures in 12 cases (60%), and 8 cases (40%) needed secondary sutures. Regarding wounds of Wo-H group (20 cases), in 12 cases only the wounds became clean by the end of 3 weeks (60%), in 2 cases (10%) the wound became clean by the end of first 10 days, ln 3 cases (15%) the wound became clean at day 14, and 7 cases (35%) the wound became clean at day 21. In 8 cases (40%), the wound became clean after 4 weeks. The wound healing occurred by the end of 4 weeks without the need for secondary sutures in 6 cases (30%), and in 14 cases (70%), the wound healing occurred after 5 weeks and needed secondary sutures.

Conclusion: Honey was highly effective in promoting healing of post-operative infected wounds. It acts as a natural dressing for infected postoperative wounds.

Keywords: Honey, Wound, Infections, Surgical site, Healing.

INTRODUCTION

Surgical site infections are considered one of the common causes of nosocomial infections and account for nearly 20-25% worldwide [1]. Most common organisms causing surgical site infections are the following: Staphylococcus aureus, Pseudomonas, Coagulase-negative Staphylococcus, E.coli, Enterobacter, Klebsiella, Proteus, and Enterococcus, etc [2]. The occurrence of antimicrobial resistance in bacterial pathogens makes the treatment of wound infection post-surgery difficult [3].

The unrefined honey has anti-oxidant, anti-bacterial, and anti-inflammatory properties [4].

The antibacterial effect is due to acidity, content of hydrogen peroxide, osmotic effect, antioxidant, and nutritional contents, stimulation of immunity, and other unidentified compounds [5].

Honey increases the healing rate in pressure wounds and is used to reduce the foul odor of the wound [6]. The anti-inflammatory effect of honey decreases exudates and edema, and subsequently improves healing, decreases the pain caused by the pressure occurring on nerve endings, and decreases the prostaglandin produced in the process of inflammation [7].

The honey triggers a sequence of events that enhance fibroblast proliferation, angiogenesis, and epithelial cells due to the production of certain growth factors [8].

In the inflammation process, nitric oxide and prostaglandins are considered major players. Honey decreases the level of prostaglandins and increases nitric oxide end products [9]. Acidification of the wound due to the low pH of honey can improve healing. Low pH of honey can improve the offloading of oxygen from hemoglobin in capillaries. It can suppress the activity of protease in the wound due to the non-neutral pH, which is considered unfavourable for its activity [7]. There is sufficient evidence to recommend the use of honey in acute wounds [10]. Wounds treated with honey had less swelling, less redness, less infection, and less pain [11].

MATERIALS AND METHODS

This prospective observational study was conducted through the period from March 2020 to February 2021. It included 40 cases with postoperative wound infections. The cases were divided into 2 groups each group contained 20 cases. Group A was treated with honey (H group) and group B was treated with antiseptics without honey (Wo-H group).

Inclusion criteria: Patients aged between 20 and 50 years old who presented with infected postoperative wounds. They were selected randomly.

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Exclusion criteria: Patients with infected wounds not related to operations, and patients who refused to participate in this study.

Method of applying honey: Cleaning of the wound with normal saline and then putting gauze soaked with sterile honey.

Wo-H group dressing: It was done with normal saline, betadine, glycerine magnesia.
Dressing was done under aseptic conditions as follow: Washing of hands, wearing sterile gloves, debridement of the wound, remove of all pus from inside the wound, using normal saline to clean the wound, drying of the wound with sterile gauze and then putting a layer of sterile honey on a sterile piece of gauze in the wound and then the wound is covered with sterile dressing.

Follow-up: -In the first 7 days, dressing was done twice daily. - After the first 7 days, dressing was done once daily. - At each visit, assessment of the wound and evaluation of the degree of inflammation, redness, oedema, and discharge [colour and amount], and assessment of the degree of healing.

Data analysis:

The data in this study were coded and analysed by SPSS [Statistical Package for Social Science] version 25. P-values were considered significant when they were equal to or less than 0.05. Quantitative data were checked for normality (Shapiro–Wilk) and expressed as mean ± SD or median (IQR), while qualitative data were presented as numbers and percentages. Comparisons between the two groups were made using the Chi-square or Fisher's exact test for categorical variables and the independent t-test or Mann–Whitney U test for continuous variables.

The primary outcome was the proportion of wounds clean by three weeks; secondary outcomes included time-to-clean categories and the need for secondary sutures. Risk ratios with 95% confidence intervals were calculated, and Kaplan–Meier curves with the log-rank test were used for exploratory time-to-event analysis.

Ethical approval: We confirm that the present study was run in concordance with international ethical standards and applicable local regulatory guidelines of Helsinki Declaration. The study was approved by The Ethical Committee of Department of General Surgery, Ahmed Maher Teaching Hospital, Cairo, Egypt. Signed informed consents were obtained from all patients.

RESULTS

All the wounds of **H group** (20 cases) became clean by the end of 3 weeks (100%) as follow: 12 cases (60%) showed clean wounds by the end of first 10 days, 4 cases (20%) became clean at day 14, and 4 (20%) cases became clean at day 21. The wounds' healing occurred by the end of 4 weeks without the need for secondary sutures in 12 cases (60%), and 8 cases (40%) needed secondary sutures.

Wo-H group (20 cases), there were 12 cases only where the wounds became clean by the end of 3 weeks (60%) where 2 cases (10%) became clean by the end of first 10 days, 3 cases (15%) became clean at day 14 and 7 cases (35%) the wounds became clean at day 21.

In 8 cases (40%), the wounds became clean after 4 weeks. The wounds' healing occurred by the end of 4 weeks without need for secondary sutures in 6 cases (30%) and in 14 cases (70%), the wound healing occurred after 5 weeks and needed secondary sutures. In this study, wound infection incidence was higher in emergency operations (80%) than its occurrence in elective operations (20%) (Tables 1 & 2 and figures 1, 2, 3, 4, 5 & 6).

Table (1): Percentage of wounds that became clean by the end of 3 weeks

Result	**Clean**	**Not clean**	**Clean**	**Not clean**
Groups	H group	H group	Wo-H group	Wo-H group
Cases	20	0	12	8
Percentage	100%	0%	60%	40%

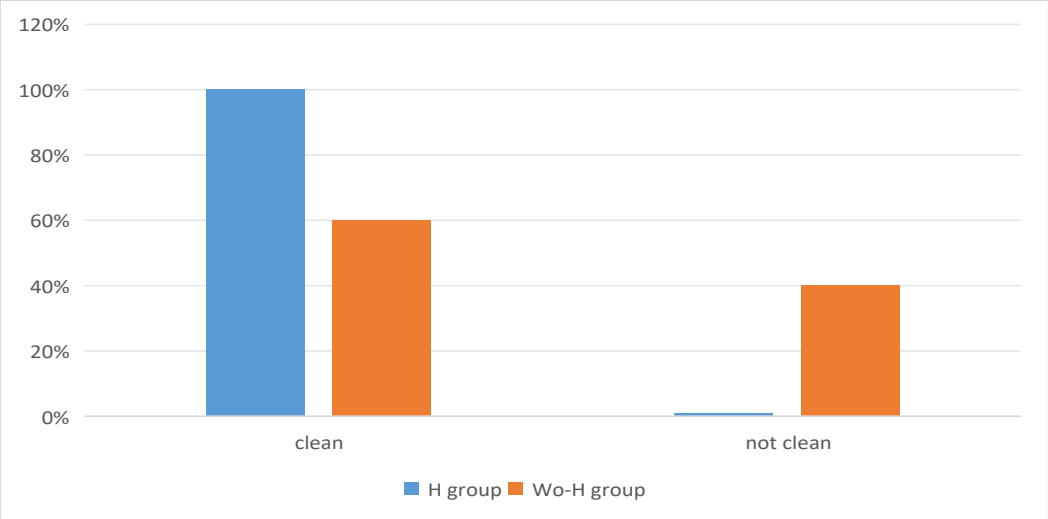

Figure (1): Percentages of clean wounds by the end of 3 weeks in each group.

Figure (2): Percentages of clean wounds by the end of 3 weeks in the Wo-H group.

Figure (3): Percentages of clean wounds by the end of 3 weeks in the H group.

Table (2): Number of cases according to the time at which the wound became clean.

Groups	First 10 days	14 days	21 days	After 4 weeks	Wounds do not need secondary sutures	The gaping wound needed secondary sutures
H group	12 cases	4 cases	4 cases	-	12 cases	8 cases
Wo-H group	2 cases	3 cases	7 cases	8 cases	6 cases	14 cases

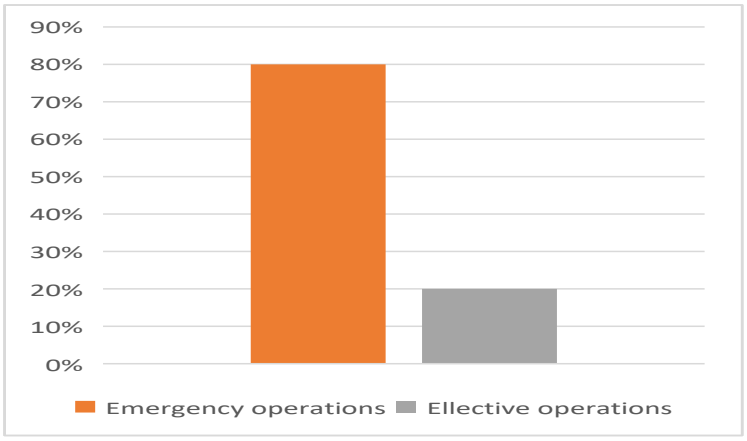

Figure (4): Percentages of wounds post-emergency and post-elective operations.

Figure (5): Pictures of wounds in the H group of honey in dressing

Figure (6): Pictures of wounds in the Wo-H group- no honey used in dressing.

DISCUSSION

Postoperative wound infections are considered a real risk associated with any surgical operation. It represents one of the important factors responsible for morbidity, prolonged hospitalization with additional costs of treatment, and mortality [12]. In addition to the antibacterial and anti-inflammatory properties of honey, it enhances the healing process of the wound [13]. It is effective in the treatment of wounds, for example, scratches, burst abdomen wounds, amputation wounds, cracked nipples, surgical wounds, septic wounds, trauma wounds, diabetic ulcers, burns, and leg ulcers [14].

In this study, the use of honey was more effective than routine dressing, as all **H group** patients' wounds (20 cases) became clean by the end of 3 weeks (100%) as follow: In 12 cases (60%) the wounds became clean by the end of first 10 days, 4 cases (20%) became clean at day 14 and 4 (20%) cases became clean at day 21. 100 % of wounds became clean by the end of 21 days, rapid debridement of tissues, less oedema and quicker healing. While, in **Wo- H group** (20 cases): In 12 cases only the wounds became clean by the end of 3 weeks (60%), in 2 cases (10%) the wounds became clean by the end of first 10 days, ln 3 cases (15%) the wound became clean at day 14 and 7 cases (35%) showed clean wounds at day 21. In 8 cases (40%), the wounds became clean after 4 weeks. Also, **Efem** [15] reported that the use of honey on wounds led to rapid debridement of tissues, quick epithelialization, decreased edema development, and quicker healing.

In this study honey improve closure of wound, as the wound healing in **H group** occurred by the end of 4 weeks without need for secondary sutures in 12 cases (60%), and 8 cases (40%) needed secondary sutures. While in Wo-H group, the wound healing occurred by the end of 4 weeks without need for secondary sutures in 6 cases (30%), and in 14 cases (70%) the wound healing occurred after 5 weeks and needed secondary sutures. **Bucekova *et al.*** [16] stated that the Def-1 peptide, which is found in the honey, had a positive effect on the closure of cutaneous wounds. Also, **Gethin *et al.*** [17] in their study evaluated the effect of honey in the management of lower leg wounds and diabetic ulcers. The results were a decrease in the healing time, and the percentage of completely healed wounds became much higher. The increase in wound healing and therapeutic effects of honey was also reported by **Martinotti *et al.*** [18] and **Nweze *et al.*** [19] in their studies.

In this study, wound infection incidence was higher in emergency operations (80%) than its occurrence in elective operations (20%). **Swathi *et al.*** [20] reported an increased incidence of surgical site infection in emergency operations (84%). Increased rate of surgical site infection in emergency surgery is likely due to lack of emergency operations of routine pre-operative preparation, which decreases the rate of surgical site infection, and most emergency operations are done on contaminated areas as the bowel [21].

CONCLUSIONS

Honey was highly effective in promoting the healing of

post-operative infected wounds. It acts as a natural dressing for infected postoperative wounds, as it is effective in removing tissue debris, killing bacteria, reducing inflammation, and accelerating of regeneration of tissues.

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Availability of data and materials: All data presented during this study were included in this article.

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