

Honey and wound dehiscence: A study of surgical wounds in the mandibular bed

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Abstract

Background: There is a paucity of literature on the use of honey in wound healing after oral and maxillofacial surgical procedures.

Objective: To evaluate the efficacy of the healing properties of Obudu honey in patients who developed wound dehiscence after segmental mandibular resections.

Patients and Methods: This was a prospective study of 72 patients who had benign lesions of the mandible, and were treated by segmental mandibular resection, with the surgical wounds developing dehiscence. The subjects were randomized into two treatment groups of A (control, $n = 36$) and B (experimental, $n = 36$). Unlike the control, the wounds in the experimental group were dressed in honey after debridement.

Results: The ages of the patients ranged from 21 to 73 years with a mean age of 46.3 ± 2.1 years while the male: female ratio was 3:1. There was no significant demographic difference about age ($P = 0.44$) and gender ($P = 0.38$) between the two groups. The smaller the initial circumference of the surgical wound, the shorter the duration of healing and this was significant ($P = 0.001$) in either of the treatment groups. Numerically, more healing was completed in the first 5 weeks in subjects in the experimental group ($n = 19, 52.8\%$) than the control ($n = 13, 36.1\%$). However, the duration of healing between the subjects in the control and experimental groups at the end of 9 weeks showed no significant difference ($P = 0.23$).

Conclusion: Honey speeds up the healing of dehiscence wounds of resected mandible when used as dressing more than the control.

Key words: Dehiscence, honey, mandible, surgical, wound

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Introduction

Wound dehiscence is the process of splitting or bursting open of a partly healed wound usually after surgery, and it occurs 3-11 days postoperatively.^[1-3] When dehiscence occur, wound healing, and patients' recovery are delayed and this usually result in increased cost of treatment, prolonged hospital stay, and missing additional days or weeks of productive working period.^[2-4] It presents at any age, in both gender, and its occurrence is influenced by the presence of predisposing factors, which may be either presurgical, peri-surgical or postsurgical in origin.^[4,5]

Honey is a sweet syrupy substance produced by bees from the nectar gathered from flowers and used by humans as a sweetener and a spread. While the color and flavor are determined by the flower used by the bees, about 80% of honey is levulose and dextrose, the remainder being water.^[6,7] It is available in four forms: Comb, extracted, chunk, and creamed.^[6,8] In the olden days, honey was considered the food of the gods and the symbol of wealth and happiness.^[9] It was used to treat infected wounds in humans as long as 2000 years before bacteria was discovered

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to be the cause of infection.^[8,10] In contemporary clinical practice, it is also used as a last resort to treat cases of recalcitrant wounds that do not respond to modern medical and surgical therapy.^[6,11] The importance of honey that has been reported in clinical dental practice include its use in the treatment of oral infections, mouth ulcers, periodontal diseases, stomatitis following radiotherapy, as well as antihalitosis and anticariogenic agents.^[12-17] Furthermore, in modern medical practice, it has been established that honey has to be medically graded for the purposes of wound management which ensures that it has been sterilized by gamma irradiation and has standardized antibacterial activity.^[18]

While surgeons' in other surgical specialties worldwide are embracing the use of honey in the management of wounds, oral and maxillofacial surgeons particularly in Nigeria have not deemed it necessary to explore this area. Consequently, there is a paucity of literature on the use of honey in wound healing after oral and maxillofacial surgical procedures. The purpose of this study was to evaluate the efficacy of the healing properties of Obudu honey in patients who developed dehiscence of surgical wounds after segmental mandibular resection over a period of 7 years in a Nigerian Teaching Hospital.

Patients and Methods

The study was prospectively carried out at the Dental and Maxillofacial Surgery Department of this health institution between January 2006 and December 2012. Approval was obtained from the Research and Ethics Committee of the hospital before the commencement of the study and each patient was required to sign a consent form before being included in the study. The study followed the 1975 declaration of Helsinki on medical protocol and ethics. There were 72 patients who had benign lesions of the mandible that were segmentally resected with the resulting wounds developing dehiscence postoperatively after primary closure with 3/0 vicryl sutures. Following wound dehiscence, the wounds that could not be repaired primarily were included in the study. Patients, who were diabetic, obese, malnourished, hypertensive, use alcohol/tobacco, on steroid therapy/contraceptives, anemic including sickle cell anemia, and wounds resulting from surgeries of malignant lesions were excluded from the study. Furthermore, excluded was wound dehiscence resulting from noncompliance with postoperative treatment regimen. The 72 patients were randomized into two treatment groups of A (control) and B (experimental). In the control group, wounds were debrided with dilute hydrogen peroxide alternated with normal saline, and the subjects were instructed to continue with warm saline mouthwash for 2 weeks. The debridement was repeated twice, at weekly intervals. The same treatment regimen was carried out in the experimental group except that their wounds were dressed at weekly

intervals for three consecutive times with Obudu honey, and discontinued. The Obudu honey (Anape/Obudu, Cross River State, Nigeria) was smeared on the wound surfaces and then impregnated on ribbon gauze before tucking it into the wounds. The ribbon gauze dressing filled the wound cavity from its bed to the oral mucosal surface. The postoperative reviews and wound dressings were done by the same surgeon/assistant.

Wound dehiscence occurred in these subjects between 3 and 10 days postoperatively. Wound healing in this study refers to the process of returning to health, and the restoration of structure and function of the surgically injured tissues of the subjects. The duration of healing which is a reflection of progression of healing was determined by continuous wound assessment method during the postoperative period using the ruler technique to measure the circumference of the wound.^[19] Reviews at the end of healing showed that the wounds have been filled and covered with an adequate amount of granulation tissues, no sign of either infection/inflammation, or evidence of pain during function.

The clinical variables recorded in a pro-forma questionnaire were patients' age, gender, types of lesion in the mandible, initial circumference of the wound and duration of clinical healing of the surgical wounds after dehiscence was diagnosed. Information obtained was analyzed using SPSS version 13 (SPSS Incorporated, Illinois, Chicago, USA) and results were presented as frequencies, percentages, mean and standard deviation. The level of significance was set at 0.05 where $P < 0.05$ is considered as significant.

Results

Within the study period, 238 subjects were seen; 76 (31.9%) developed wound dehiscence and 72 (30.3%) met the inclusion criteria. The ages of the 72 patients ranged from 21 to 73 years with a mean age of 46.3 ± 2.1 year. Majority of the cases in the two groups occurred in the fifth decades of life while in all the age categories the males outnumbered the females [Table 1]. The male: female ratio in both the control and experimental groups was 3:1. However, there was no significant demographic difference about age ($P = 0.44$) and gender ($P = 0.38$) between the two groups studied. Ameloblastoma ($n = 26$, 36.1%) was the most common indication for surgery [Table 2]. Majority ($n = 45$, 62.5%) of wound healing were completed between 4 and 7 weeks in both the control and the experimental groups [Table 3]. When the patients in both groups are compared, healing was completed in 19 (52.8%) patients in the experimental group compared to 13 (36.1%) in the control in the first 5 weeks of study. However, the duration of healing at the end of 9 weeks between the subjects in the control and experimental groups showed no significant difference ($P = 0.23$). On the contrary, the smaller the initial circumference of the surgical wound, the shorter the duration of healing, and this was significant ($P = 0.001$) in

Table 1: Age and gender distribution of subjects in the control and experimental groups

Age (years)	Gender		Total	Percentage
	Male	Female		
Group A				
21-30	3	1	4	11.1
31-40	4	2	6	16.7
41-50	7	3	10	27.8
51-60	5	3	8	22.2
61-70	3	2	5	13.9
71-80	2	1	3	8.3
Total	24	12	36	100.0
Group B				
21-30	3	2	5	13.9
31-40	5	2	7	19.4
41-50	8	4	12	33.3
51-60	4	1	5	13.9
61-70	3	2	5	13.9
71-80	1	1	2	5.6
Total	24	12	36	100.0

$\chi^2=6.87, df=7, P=0.44$ (age); $\chi^2=6.87, df=7, P=0.38$ (gender)

Table 2: Distribution of the types of the mandibular lesion

Lesion	Number	Percentage
Ameloblastoma	26	36.1
Ossifying fibroma	14	19.5
Odontogenic myxoma	9	12.5
Adenomatoid odontogenic tumor	8	11.1
Central giant cell granuloma	6	8.3
Chronic sclerosing osteomyelitis	5	6.9
Calcifying epithelial odontogenic tumor	4	5.6
Total	72	100.0

either of the treatment groups [Table 4]. There was no report of the adverse reaction in the form of allergy, side-effect or inflammatory response to the Obudu honey.

Discussion

Wound dehiscence is a common postoperative complication.^[20-22] The age and gender distribution, including the duration of occurrence of dehiscence in the present study is consistent with previous reports.^[4,5,23,24] The duration of healing of wounds in the oral cavity is influenced by the anatomical site and size of the wound, presence of local and systemic predisposing factors including patients' compliance with postoperative treatment regimen. The jaw diseases that were segmentally resected in this study were benign tumors that could not have interfered with the host defense mechanisms and subsequently the healing process.

The duration of healing was not significantly shorter in the experimental than the control group. However, honey

Table 3: Distribution of the duration of wound healing at 9 weeks

Group (subjects)	Duration (weeks)				Total
	2-3	4-5	6-7	8-9	
A	6 (16.7)	7 (19.4)	16 (44.5)	7 (19.4)	36 (100.0)
B	9 (25.0)	10 (27.8)	12 (33.3)	5 (13.9)	36 (100.0)
Total	15 (41.7)	17 (47.2)	28 (77.8)	12 (33.3)	

$\chi^2=9.3, df=7, P=0.23$; NB: Figures in parenthesis are in %

Table 4: Distribution of initial wound circumference and duration of healing

Initial wound circumference (cm)	N	Duration of healing (weeks)			
		2-3	4-5	6-7	8-9
Group A					
<4	4	3	1	0	0
4.1-6	8	3	4	1	0
6.1-8	13	0	2	10	1
8.1-10	8	0	0	4	4
10.1-12	3	0	0	1	2
Total	36	6	7	16	7
Group B					
<4	5	5	0	0	0
4.1-6	9	4	5	0	0
6.1-8	12	0	4	8	0
8.1-10	6	0	1	3	2
10.1-12	4	0	0	1	3
Total	36	9	10	12	5

Group A= $(\chi^2=52.641, df=25, P=0.001)$; Group B= $(\chi^2=52.651, df=25, P=0.001)$

used in the experimental group was beneficial to the subjects as considerable healing was achieved within the first 5 weeks (52.8%) than in the control (36.1%). This is similar to the report of Elbagoury and Fayed,^[12] although authors' report was based on the application of natural honey on surgical wounds after extraction of impacted mandibular third molars. Several other reports support the use of honey in the management of wounds both in surgical and nonsurgical therapy.^[6,9,14,17] The debridement of the wounds further encouraged healing, together with a warm saline mouthwash which ensured wound cleansing, increased blood flow to the wound area, and the effect of its antiedema properties.

Honey has a potent broad spectrum antibacterial activity, coupled with antiinflammatory action and soothing effect on pain. It is also an antioxidant. The stimulating action of honey on the growth of granulation tissues and epithelial cells is of benefit in hastening the repair of damaged tissues.^[7] Consequently, because of this beneficial effects, it was reported that honey clears infection, removes malodor, reduces inflammation and pain, causes edema and exudation to subside, and increases the rate of healing by stimulation of angiogenesis, granulation and epithelialization.^[7,11] The rapid clearance of infection is the most notable feature of honey because it is effective against aerobic, anaerobic,

Gram positive, Gram negative bacteria, and a variety of fungi^[11] This would be of additional advantage after oral surgical procedures as the micro-organisms that are normal commensals in the oral cavity become pathogenic under this circumstance and impair wound healing.^[4,5,25] Furthermore, as observed in this study, honey is not cytotoxic, it does not slow healing and neither does it have any adverse side-effects.^[7] The antibacterial activity of honey is partly due to its hygroscopic properties, acidic pH, hydrogen peroxide content and phytochemical factors.^[26-28] Recent researches have also revealed that honey may in addition to its antibacterial activity, clear infection by stimulating the activity of leucocytes. Cell culture studies have shown that low concentrations of honey stimulate proliferation of lymphocytes, activate phagocytes, and stimulate monocytes to release cytokines which are activators of the immune response.^[29,30] Honey supplies glucose that is essential for the “respiratory burst” in macrophages which is an important part of their mechanism of destroying bacteria.^[29] It provides substrates for glycolysis, which is the major mechanism of energy production in macrophages.^[31] In this study, the smearing of the honey on the wound surface and impregnating it on ribbon gauze during dressing was to ensure its efficacy by increasing its duration of contact with the wound.

Wound assessment remains a challenge in clinical practice as terminology describing it is not standardized, and consensus has not been reached on the most appropriate wound healing parameters to monitor.^[32] Following segmental mandibular resection, cavity wounds are created. The continuous measurement of cavity wounds is difficult because of undermining, which makes visualization of the area problematic.^[33] The accuracy depends on the patient being in the same position at each measurement.^[34] Furthermore, certain studies suggest that circumference measurement alone is sufficient to monitor changes in size of cavity wounds even if the depths are not measured.^[34,35] However, instruments used to describe healing of surgical wound including the ruler method lack comprehensive and quality evaluation with respect to the validity, reliability and sensitivity.^[36]

A drawback to the use of honey is that patients may have to return severally for change of dressings before healing is completed, and it is possible that some patients may not like the use of honey to dress their intraoral wounds. We did not encounter these problems during this study.

Conclusion

Honey speeds up the healing of dehiscence wounds of resected mandible when used as a dressing material more than the control. The number of subjects whose wounds healed at the end of the 5th week was higher in the experimental group, whereas at the end of the 9th week there was no significant difference between the two groups. However, we

observed that the smaller the initial circumference of the surgical wound, the shorter the duration of healing and this was significant in either of the treatment groups.

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