ISSN Print: 2394-7489
ISSN Online: 2394-7497
IJADS 2022; 8(2): 483-487

www.oraljournal.com
Received: 13-01-2022
Accepted: 23-03-2022

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Comparative evaluation of healing in extraction sockets with & without manuka honey: A randomized clinical control trial

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DOI: https://doi.org/10.22271/oral.2022.v8.i2g.1548

Abstract
The aim of this study was to compare the healing of extraction sockets with Manuka honey vs. without manuka honey attending outpatient clinic Department of Oral & Maxillofacial Surgery, Jaipur Dental College. Thirty subjects were randomized into two groups i.e., group A in which Manuka Honey is placed in the extraction socket & a group B, which is a control group. Main outcome measure was to compare the amount of time required for haemostasis, pain according to VAS scale on 1st, 3rd & 7th day, presence of swelling on 1st, 3rd & 7th day, any other post-operative discomfort such as difficulty in speech, any kind of discharge, and presence of any signs of alveolar osteitis. Through the study we concluded that sockets in which the Manuka Honey was placed had better healing and less signs of inflammation was observed as compared to the contra-lateral site.

Keywords: Comparative, healing, sockets, honey, randomized, trial

Introduction
Honey has been used for a chilliad in widespread cultures as a medication and food. Honey is renowned for its antibacterial activity that was first rumored in 1892 (as cited by Dustmann in 1919). Since precedent days, honey has been used for treatment and hindrance of wound infections. With the appearance of antibiotics, the clinical application of honey was deserted in modern Western medicine. Honey has been one among the oldest used agents in alternative and folk medicine since earlier period, besides being a sweet food. It's recently shifted from a food or folk-medicine product to a medicinal substance with high medical properties that attracted the eye of researchers in several medical fields [1, 2].

The Properties of honey that build it effective against bacterial growth are (i) high sugar content, (ii) low moisture content, (iii) gluconic acid, creates an acidic environment and (iv) hydrogen peroxide. Another impact of honey on wounds that has been noted is that it reduces inflammation and hastens subsidence of passive hyperemia. It conjointly reduces oedema. Honey is rumored to be soothing once applied to wounds and to cut back pain from burns, in some cases giving fast diminution of native pain.

It has with success been utilized in the treatment of burns, graft donor sites, necrotizing fasciitis, infant surgical wound infections, and skin ulcers. Honey has been rumored to be significantly effective as a wound treatment for patients receiving chemotherapy, during which the physiological method of wound healing is impaired and prolonged. Clinical and experimental studies have documented that honey prevents infection around wounds, decreases inflammation, and expedites tissue healing and epithelization.

Sufficient proof exists recommending the utilization of honey in the management of wounds and burns [1, 3-5]. Studies disclosed that the healing impact of honey may well be classified by its antibacterial, antiviral, anti-inflammatory drug, and inhibitor properties of its components [6]. Honey is rumored to be soothing once applied to wounds and burns. Honey dressing is extremely effective as compared to povidone iodine dressing in reducing pain and increasing comfort in subjects with chronic wounds [7], and reducing acute surgical pain and

analgesic needs in patients after tonsillectomy [8, 9]. in addition Honey can be used as medicament for pain management of alveolar osteitis [10]. Manuka honey springs from flowers of Manuka tree (*Leptospermum scoparium*) in New Zealand. This honey is exclusive because it's superior to different kinds of honey [11-15].

It has been observed that Manuka honey, derived from the Manuka tree (*Leptospermum scoparium*) in New Zealand, has a very high level of "non-peroxide" antibacterial activity [9- 10]. The pronounced antibacterial activity of Manuka honey is an important commercial property, which is referred to in marketing purposes as the so-called "Unique Manuka Factor" (UMF), leading to a classification of premium products based on microbiological assays [In a recent report, Weigel *et al*. [13] showed that honey contains varying amounts of 1,2-dicarbonyl compounds such as glyoxal (GO), methylglyoxal (MGO), and 3-deoxyglucosulose (3-DG) besides 5-hydroxymethylfurfural, a well-known indicator for heat-treatment. 1,2-Dicarbonyl compounds are formed in the course of the Maillard reaction or caramelization reactions as degradation products from reducing carbohydrates [14].

Methodology

This randomized split-mouth controlled study included thirty patients undergoing extractions under local anaesthesia in the Department of Oral and Maxillofacial surgery, Jaipur dental college between the age of 18-22 years.

Extractions were performed by post graduate students of the same department under close supervision of surgery instructors in the University Clinics.

Inclusion Criteria

Patients requiring bilateral orthodontic multiple extractions with mandibular posterior teeth with the same diagnosis.

Exclusion criteria

Patients with uncontrolled systemic diseases, epinephrine contraindications, pregnant women, breast-feeding women, and women who were using oral contraceptives. Patients with hypersensitivity to honey were additionally excluded. Other exclusion criteria enclosed smoking, presence of acute infection, cystic lesions, traumatic extraction with fractured alveolar bone, extraction requiring bone reduction or root separation, and extractions that lasted for half hour.

The Institutional Ethical Committee approved the study after the complete fulfillment of the scientific and ethical requirements. The objectives of the study were explained to any or all patients who later signed the informed consents. The data concerning the the patients, together with their name, age, gender, mobile number, file number, and smoking, were collected using the questionnaire. Alongwith, their medical condition, tooth indicated for extraction, pre-operative pain, and halitosis were additionally documented.

Surgical Procedure

The study design was randomised split mouth controlled clinical trial, and the patients were asked to pick one of the two cards which was shown to them by one of the volunteers in the study allot them into to test and control groups.

White card was for Group A (Test Group)- patients in which manuka honey was placed in the extraction socket by loading it into a 5ml syringe and was then injected into the extraction socket.

Black card was for Group B (Control Group)- patients in which manuka honey was NOT placed in the extraction socket.

Further Randomization decided which side to begin with.

All extractions were done under local anesthesia comprising 2% Lidocaine with 1:80,000 epinephrine. Upper teeth to be extracted were anesthetized using buccal and palatal in-filtrations while local anesthesia for lower teeth to be extracted was performed with buccal and lingual infiltrations & inferior alveolar nerve block. Extractions were done simply by forceps. After the extraction was complete, the site was first thoroughly irrigated with saline and Manuka Honey capilano, manuka active honey MGO 30+ was applied on the extraction site in the test side only, in a way, that the socket was completely filled with honey and then the sutures were place to secure it in position.

Parameters

1. Post-operative pain (VAS scale) – 1st, 3rd, 7th day
2. Post-operative swelling – 1st, 3rd, 7th day
3. Presence of Alveolar Osteitis (AO)
4. Post-operative discomfort
   - any difficulty in speech
   - any kind of discharge
   - any kind of fatigue
5. Time required for haemostasis – Immediate
   - 1 min
   - 3 min
   - 5 min

Postsurgical pain was evaluated using Visual analogue scale (VAS) with markings 0-10,0 indicating no pain at all and 10 indicating excruciating pain in a period of 1st day, 3rd day and 7th day after extraction.

After placement of Manuka honey the time required for haemostasis was recorded and the patient was recalled for the next 1st, 3rd, and 7th day to know the status of the healing socket and post-operative pain according to VAS scale.

Alveolar Osteitis/Dry Socket was considered if the patient presented with pain greater than level 5 associated with food debris and empty socket on the third day.After every surgery, patients received fixed postoperative instructions regarding local homeostasis, cleaning, food and prescription.

Data were analyzed using Statistical Package for the Social Sciences for Windows V19 (SPSS Inc, Chicago, IL, USA). Analysis included descriptive statistics of all the variables. Student's t test and Mann–Whitney U test were used to compare groups.

Pictures

Fig 1: Manuka Honey

Group I

Fig 2: Placement of manuka honey in extraction socket

Fig 3: Hemostasis achieved

Fig 4 & 5: Healing of socket on 3rd & 7th day

Group II

Fig 6: Extraction socket without manuka honey

Fig 7: Healing after 7 days

Results

Table 1: Average value of time and pain score in cases with and without Manuka honey

	With Manuka Honey	Without Manuka honey	Test value	P value
Time in secs	54.8±7.58	93.33±28.24	7.21	<0.001
pain score according to VAS on 1st day	0.17±0.38	2.2±0.76	-6.49	<0.0001
pain score according to VAS on 3rd day	0±0	0.23±0.43	-1.545	0.12 NS
pain score according to VAS on 7th day	0±0	0±0	0.007	0.99 NS

Table 2: Distribution of number of cases according to time span required for haemostatis in both cases (with and without manuka honey)

	With Manuka Honey			Without manuka honey		
	Below or equal to 1 min	Between 1 to 3 min	Between 3 to 5 min	Below or equal to 1 min	Between 1 to 3 min	Between 3 to 5 min
Number of cases	26(86.67%)	4(13.33%)	0(0%)	7(23.33%)	23(76.67%)	0(0%)

Chi square value ($\chi 2$) =24.31, p< 0.001 HS

Table 3: With and Without Manuka honey

	With Manuka Honey			Without Manuka honey			
	Below or equal to 1	Between 1-3	Between 3 to 4	Below or equal to 1	Between 1-3	Between 3 to 4	$\chi 2$/P-value
Pain score acc to VAS on 1st day	30(100%)	0(0%)	0(0%)	4(13.33%)	24(80%)	2(6.67%)	45.88/<0.001 HS
Pain score acc to VAS on 3rd day	30(100%)	0(0%)	0(0%)	30(100%)	0(0%)	0(0%)	0/1.00 NS
Pain score acc to VAS on 7th day	0	0	0	0	0	0	

A total of thirty patients were included in the study out of which 17 (56.6%) were males and 13 (43.3%) were females. The average age group was 18-22 years. All the patients participated in the postoperative stage. No complications were associated with the procedure.

The distribution of variables in the groups is shown in Table 1.

The VAS scores observed in the control group at the first and second post-surgical days of extraction were significantly higher compared to the test group (P-value <0.0001).The pain scores recorded on the VAS scale on the consecutive 3rd and 7th post-surgical days of extraction were statistically insignificant.

The time required for haemostasis after extraction was recorded immediately, 1, 3 and 5 minutes after the procedure on 1st, 3rd and 7th day post-operatively. It was then ascertained that on the first day the time required for haemostasis was significantly less in test group when

compared to the control group (*P*-value <0.001) whereas on the third and the seventh day, it was statistically insignificant.(Table 2)

There were no cases which reported of Post-operative swelling – 1st, 3rd, 7th day, presence of Alveolar Osteitis or any kind of post-operative discomfort i.e. any difficulty in speech, any kind of discharge, any kind of fatigue.

Discussion

The analgesic result brought up within the present study after intrasocket application of Manuka honey might be on account of its direct and indirect anti-inflammatory potential. The very fact that Manuka honey is an efficient antimicrobial agent may facilitate to elucidate its ability to scale back the inflammatory state indirectly. The compounds accountable for antimicrobial activity in honey are mainly: high sugar content, H2O2, methylglyoxal, bee defensin-1, low pH, and alternative antibacterial agents [13-15].

Considering the elevated sugar content of honey, it is adequate to forestall bacterial growth and this is often believed to be the results of osmotic effect [16]. But just the elevated sugar levels cannot be solely denounced for this activity. Honey, once diluted to scale back its sugar content and diffusion concentration, remains able to stop bacterial growth [6]. The antibacterial activity of honey is explained more clearly as a results of enzyme-produced peroxide activity that continues to be created even when diluted [11]. The peroxide activity of honey is simply counteracted by the applying of heat or treatment with catalase,& when this is done *in vitro* to Manuka honey, the effectiveness of this antimicrobial honey remains remarkably high [12].

Manuka honey could be a major medical-grade honey that is approved for clinical application [11, 15] as experiments showed that it's free of any variety of microorganisms [13]

The physical properties of the Manuka honey used particularly its high viscousness and semi-solidity, make it more applicable and retainable. Besides the very fact that honey is ready to inhibit the expansion of bacteria that cause inflammation, honey has direct role in inflammatory response. Manuka Honey conjointly was found to lower prostaglandin levels and elevate nitric oxide end products that play a significant role in inflammation. It additionally modulates adrenergic and muscarinic receptors to provide its anti-inflammatory and analgesic effects.

The study of Elbagoury *et al*. [17] was one in all the earliest studies on the result of honey dressing on socket healing following surgical extraction of impacted third molars. The results showed less pain and fewer occurrences of postoperative complications and swelling in the honey treated group than within the control group. Singh *et al*. [10] studied the result of honey as a treatment dressing agent in fifty four cases of AO. They found significant reduction in pain, inflammation, hyperemia, edema, and exudation after honey dressing. In the same manner, Soni *et al*. [18] found significant decrease in pain, erythema, and swelling after applying honey dressing in fifty cases of AO.

A study conducted by Alvarez-Suarez JM *et al* analysed the Composition and Biological Activity of Manuka Honey thought of Manuka honey as the gold standard for analysis of biological and chemical properties of honey [19]. In 2019, Al-Khanati NM and Al-Moudallal Y published a split-mouth controlled study on patients who had bilateral impacted lower third molars [20]. They performed the surgical extractions of the third molars in 2 visits. On one facet, they applied Manuka honey on the post-extraction socket. Two weeks after, they did the surgical extraction on the opposite facet without putting any medication. The results showed better soft tissue healing and considerably lower pain scores on the honey facet than the opposite facet on the first and second surgical days.

Conclusion

The time of haemostasis required in extraction sockets with manuka honey was less as compared to extraction sockets without manuka honey. On clinical examination once the healing was assessed the extraction socket with manuka honey recovered better than the opposite socket. Pain when extraction was observed higher in cases wherever manuka honey wasn't placed within the socket. thus we will conclude that manuka honey placed in extraction sockets contains a higher result in healing & post extraction pain attributable to its antibacterial, antiviral, anti-inflammatory and antioxidant properties of its components.

There are not any side-effects of honey. Excess use of euginol, will result in necrosis of bone. The honey is used as a medicament for the management of dry socket.

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