# Evaluation of the Complementary Effect of Tualang Honey to Non-Surgical Periodontal Therapy: Clinical Application

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## Abstract

Honey has been shown to promote tissue healing and used to cure many diseases since ancient times. Nevertheless its effect on periodontal therapy has very limited evidence. The aim of this study was to evaluate the potential complementary effect of Tualang honey applied in adjunct to periodontal therapy.

Fourteen chronic periodontitis patients with total number of 94 sites with periodontal pocket of 5mm and above were randomly assigned into control and test groups. Parameters such as plaque score, gingivitis score, pocket depth and clinical attachment loss were recorded. Scaling and root planing were done in all patients followed with honey application into the periodontal pockets of test group. The parameters were reevaluated after six weeks.

The periodontal pocket depth and clinical attachment loss were significantly improved after 6 weeks in both groups (P<.05). However, the magnitude of changes in all parameters showed no significant different between control and honey group. Considering limitation of this study, the superior effect of Tualang honey as an adjunct to nonsurgical periodontal therapy was not evidence. Many factors may involve the sustainability of honey in the periodontal pocket. Thus we recommended further investigation to evaluate the effect of honey on periodontal wound healing.

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## Introduction

Chronic periodontitis is an inflammatory disease due to bacterial infections which affects supporting tissues of the teeth. Clinical findings in patients with chronic periodontitis include gingival inflammation, pocket formation, loss of periodontal attachment and alveolar bone which are frequently associated with supragingival and subgingival plaque accumulation as well as calculus formation[1,2]. Therapy for chronic periodontitis is started with initial therapy which includes scaling and root planing procedures or also known as non-surgical periodontal therapy (NSPT)[3]. The healing of periodontal tissues is observed when there is reduction of the periodontal pocket depth (PPD) and other parameters (plaque score and gingivitis score) after NSPT. Plaque score reflects the oral hygiene status whereas gingivitis score shows the presence of gingival inflammation and gum bleeding. However, some pockets will persist or no response to NSPT. Antibiotics either locally or systemically have been used as an adjunct to NSPT to improve periodontal health[4-6]. The use of antibiotic in periodontal therapy is an adjunct and may impose to some side effects or development of antibiotic resistance in various bacterial species. In the past 20 years, reports of the existence of antibiotic-resistance and even multi resistance oral bacteria have been increasing[7].

Honey is a natural substance produced, when the nectar and sweet deposits from plants are gathered, modified and stored in the honeycombs by honeybees[8,9]. In Malaysia, Tualang honey is a multifloral jungle honey,

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collected from the combs of Asian rock bees (*Apis dorsata*), which build their hives high up on the Tualang tree (*Koompassia excelsa*). Tualang honey is used commonly as a medicinal products as well as food supplement[10].

Many researchers have reported the antibacterial and anti-inflammatory effect as well as the healing property of honey[10, 11]. Zaghloul et al. in 2001 reported that honey showed strong antimicrobial effects against pathogenic and non-pathogenic micro-organisms include those who are antibiotic resistance[12-14]. Furthermore, natural unheated honey has been reported to have some broad spectrum antibacterial activity against pathogenic bacteria, oral bacteria and food spoilage bacteria[15, 16].

Many types of wound are being treated all over the world with natural unprocessed honeys from different sources[17,18]. The antibacterial properties of honey have been shown to accelerate the growth of new tissue thus promote wound healing[14, 19].

Regarding therapeutic effect of honey in oral cavity, Samani et al. in 2011 reported that honey significantly augmented and accelerated the wound healing process after periodontal surgical flap besides its anti-inflammatory effects with notable improvement in gingival index. No allergic or other side effects related to honey application was recorded. This showed that topical application of honey might promote periodontal surgical wound healing[20]. Besides, i*n-vitro* study had suggested that Tualang honey may promote growth of periodontal cells in an optimum concentrations[21].

In spite of many investigations on the healing property of honey, studies on the possible effect of locally applied honey on periodontal tissue healing are very limited. Therefore, this study was conducted to evaluate the potential clinical benefits of locally applied honey on periodontal tissues as an additional to nonsurgical periodontal therapy.

## Materials and Methods

Chronic periodontitis patients attending Dental Clinic, Hospital USM, Kelantan was chosen as our source population. Total of 14 subjects with the mean age of 46.57 (SD9.68) years were included in this study after fulfilled the inclusion and exclusion criteria. Subjects were randomly assigned into control group (scaling and root planing, SRP) and test groups (SRP + honey).

Those who were diagnosed with chronic periodontitis with minimum periodontal pocket depth of 5 mm, aged 25 years old and above were included. Patients taking antibiotic 6 months prior to the treatment, having uncontrolled systemic disease, smokers and those that need antibiotic prophylaxis were excluded from this study. Inform consent was obtained from all subjects. This study protocol was approved by Human Research and Ethics Committee, Universiti Sains Malaysia.

### Clinical Procedures

The baseline plaque score (PS), gingivitis score (GS), periodontal pockets depth (PPD), and clinical attachment loss (CAL) were recorded by using Michigan 'O' Periodontal probe with William marking 1-10 by Examiner A (NK). After full mouth scaling with ultrasonic scaler, EMS Piezon Master (Electro-Medical System, Switzerland)), root planing procedure was carried out on sites with PPD of 5mm and beyond under local anaesthesia (Mepivacaine 2.2ml with adrenaline ratio 1:100,000) by using Gracey (Dentsply, UK) curettes. All treated pockets were then irrigated with normal saline. For the test group, non-diluted Tualang honey was then delivered into the pockets by means of syringe and 20G needle. Patients were given oral hygiene instruction and were advised to refrain from drinking/ rinsing/ eating within 1 hour after treatment. The procedures were done by Examiner B (HJM). They were reviewed after six week for reevaluation of all parameters by Examiner A. The Examiner A was blinded on which group of the patients belongs to, in order to avoid bias in measurement. The Tualang honey used was supplied by the Federal Agriculture Marketing Authority (FAMA), Malaysia.

### Statistical Analysis

The statistical analysis was performed using SPSS software (IBM SPSS statistic 20.0). As the sample size was small, analysis was done by using Wilcoxon Signed Rank and Mann-Whitney test to compare the parameters within and intergroup respectively. The data is expressed as median and interquartile range (IQR). The statistical significance was set at $P < 0.05$.

## Results

The participants enrolled consisted of 7 males and 7 females with 94 periodontal sites with PPD of 5mm and above were treated, ranging 2-15 sites per patient in the control and test group (Table 1). Among all the study subjects, only one patient in the test group had complained of mild pain at the area of treatment done after which had subsided within a few days. There is no other subjects reported allergic to honey or experienced any complication after NSPT. All patients had turned up during the evaluation stage. The flow chart of this trial is shown in Figure 1.

| Variables | SRP+Honey (n=7) | | SRP (n=7) | |
|---|---|---|---|---|
| | Median (IQR) | Frequency (%) | Median (IQR) | Frequency (%) |
| Age (years) | 50.0 (3) | | 52.0 (11) | |
| Gender | | | | |
| Male | | 2 (28.6) | | 5 (71.4) |
| Female | | 5 (71.4) | | 2 (28.6) |
| No of teeth treated | 3.0 (3) | | 3.0 (3) | |
| No. of sites with PPD ≥5mm | 6.0 (3) | | 6.0 (6) | |

**Table 1.** Characteristic of study subjects (n= 14).
SRP= Scaling and root planning; IQR- Interquartile Range; PPD= Probing Pocket Depth

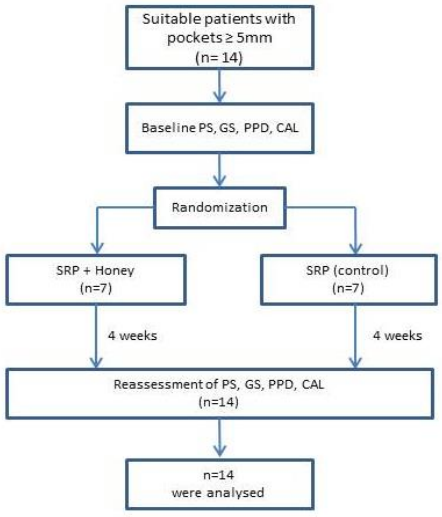


**Figure 1.** Flow chart of the trial. PS, Plaque Score; GS, Gingivitis Score; PPD, Probing Pocket Depth; CAL, Clinical Attachment Loss; n, number of patients.

### Periodontal Parameters Evaluation

In the SRP group, there were no significant difference of the median plaque score (*P*=0.50) and gingivitis score (*P*=0.40) from the baseline and at six weeks. However the median periodontal pocket depth and clinical attachment loss were significantly reduced after NSPT with *P*=0.018. As for the SRP+honey group, except for the plaque score, all other parameters had reduced significantly after six weeks with *P* <0.05 (Table 2).

The difference of the PS, GS, PPD and CAL between baseline and six weeks were then compared intergroup. The result shows that there is a trend of higher reduction of GS, PPD, and CAL in SRP+ honey group compared to group with SRP alone. However the median changes of all parameters did not exhibit any significant difference for the intergroup comparison (Table 3). It was also observed that the median changes of PS were slightly increased after NSPT in both groups.

| Variables | n | SRP+ Honey | | SRP | |
|---|---|---|---|---|---|
| | | Median (IQR) | *P* value[a] | Median (IQR) | *P* value[a] |
| Plaque Score (%) | 7 | | | | |
| Baseline | | 28.33 (14.55) | 0.600 | 19.44 (8.90) | 0.499 |
| 6 weeks | | 34.62 (19.40) | | 21.70 (6.33) | |
| Gingivitis Score (%) | 7 | | | | |
| Baseline | | 14.00 (17.50) | 0.046 | 15.20 (7.50) | 0.397 |
| 6 weeks | | 9.00 (12.14) | | 14.20 (6.44) | |
| PPD (mm) | 7 | | | | |
| Baseline | | 5.90 (1.00) | 0.018 | 5.50 (3.30) | 0.018 |
| 6 weeks | | 4.13 (0.40) | | 4.44 (3.20) | |
| CAL (mm) | 7 | | | | |
| Baseline | | 6.88 (2.40) | 0.017 | 6.00 (3.20) | 0.018 |
| 6 weeks | | 4.75 (1.30) | | 4.47 (2.80) | |

**Table 2.** Comparing the clinical parameters at baseline and six weeks within groups.
[a]Wilcoxon Signed Rank Test
SRP= Scaling and root planing
PPD= Probing Pocket Depth
CAL= Clinical Attachment Loss
IQR- Interquartile Range

The distribution of sites with PPD reduction and CAL gain were traced for both groups (Table 4). Each group has equally 47 sites with PPD 5mm and beyond. Pertaining to the PPD, 48.94% of sites showed >2-3mm reduction in SRP+honey whereas only 27.66% sites with similar changes noted in group with SRP alone. The CAL gain of 1-2mm had occurred in 51.06% sites for SRP+honey group. Many sites with SRP alone showed changes of only 0-1mm. No site showed the reduction of PPD or gain in CAL of more than 3mm in both groups.

| Parameters | SRP+ Honey | | | SRP | | | *P value |
|---|---|---|---|---|---|---|---|
| | Baseline n=7 | 6 weeks n=7 | Change | Baseline n=7 | 6 weeks n=7 | Change | |
| Plaque Score (%) | 28.33 (14.55) | 34.62 (19.40) | 0.00 (19.49)[a] | 19.44 (8.90) | 21.70 (6.33) | 2.77 (10.90)[a] | 0.749 |
| Gingivitis Score (%) | 14.00 (17.50) | 9.00 (12.14) | 5.00 (14.42)[a] | 15.20 (7.50) | 14.20 (6.44) | 0.80 (5.20)[a] | 0.110 |
| PPD (mm) | 5.80 (0.52) | 4.05 (0.28) | 1.75 (0.58)[b] | 6.29 (1.52) | 4.69 (1.51) | 1.64 (0.74)[b] | 0.767 |
| CAL (mm) | 6.81 (1.14) | 4.85 (0.84) | 1.95 (0.43)[b] | 6.54 (1.43) | 4.93 (1.49) | 1.57 (0.63)[b] | 0.205 |

**Table 3.** Clinical parameters at baseline and 6 weeks in group with honey and without honey.
*comparing the changes between SRP+Honey and SRP, significant level at *P*<0.05
[a]Median (Interquartile Range)
[b]Mean (Standard Deviation)
SRP= Scaling and root planing
PPD= Probing Pocket Depth
CAL= Clinical Attachment Loss

| Sites | 0-1mm | >1-2mm | >2-3mm | >3mm | Total |
|---|---|---|---|---|---|
| PPD change | | | | | |
| SRP+Honey | 2 (4.26) | 22 (46.81) | 23 (48.94) | 0 | 47 |
| SRP | 24 (51.06) | 10 (21.28) | 13 (27.66) | 0 | 47 |
| CAL change | | | | | |
| SRP+Honey | 0 | 24 (51.06) | 23 (48.94) | 0 | 47 |
| SRP | 24 (51.06) | 10 (21.28) | 13 (27.66) | 0 | 47 |

**Table 4.** Frequency distribution of sites with probing pocket depth and clinical attachment loss change (n, %). PPD= Probing pocket depth, CAL= Clinical attachment loss, SRP= Scaling and root planing.

## Discussions

Honey has been used to treat wide variety of ailments for its antimicrobial, anti-inflammatory and anti-oxidant properties[22]. This accounts for its high osmolarity (low water activity), acidity (low pH), and hydrogen peroxide and non-peroxide components[23, 24]. Many researchers have reported the antibacterial and anti-inflammatory effect of honey[10, 11]. The use of honey in dentistry were also been reported, however those that are related to periodontal therapy are very limited[20, 25].

The goals of periodontal therapy are to cease the progression of periodontitis and to reverse or halt its complications. Both damaged and healthy tissue is removed during scaling and root planing. Then, there will be regeneration, repair and formation of new attachment. Periodontal pocket measurement reduces in responsive treatment[26]. In advance cases with persistent periodontal pockets, periodontal surgery may be necessary to reduce bacterial load through direct access debridement.

This present study aims to evaluate the effects of Tualang honey on periodontal healing by assessing the periodontal pocket depth and clinical attachment loss. Plaque score and gingivitis score were also determined particularly to assess the oral hygiene of the subject during the study period.

All subjects in honey and control groups in this study showed no significant difference in plaque score after NSPT. In general, all subjects maintained their oral hygiene throughout the study. However oral hygiene reinforcement and motivation are still necessary to reduce plaque accumulation significantly and therefore may help to eliminate disease progression.

English et al in 2004 reported that there were high significant reductions in the mean plaque scores in their Manuka honey test group compared to no changes in the control group. This inconsistence finding with this present study might be due to patients' oral hygiene maintenance factor and method of honey application. Besides different type of honey used, the subjects in their study chewed honey product three times daily for a period of 21 days[25]. This present study was designed to evaluate the

effect of honey on healing of periodontal pocket by application of Tualang honey directly into the periodontal sites immediately after root planing procedure. Therefore the effect might be only locally. On the other hand Samani et al. in 2001 demonstrated aggravated plaque formation in both groups; statistically significant in the control group ($P$<0.001)[20].

The plaque score should be established to maintain good oral hygiene by giving oral hygiene reinforcement during visit to the clinic. The trend of increased plaque score after review in this study subjects might be due to the length of review time and lack of motivation in patients.

In spite of slightly increase of plaque score in both groups, gingival inflammation showed significant reduction from the baseline with particularly more in honey group. However, the effects of Tualang honey in gingivitis improvement should be further confirmed in future study. This is consistent with Samani et al. whom reported gingival indices had improved by time, with the superiority in honey treated group. Earlier study also showed high significant reductions in the mean plaque scores and percentage of bleeding sites in honey group compared to control group[25]. On the other hand, later study comparing the effectiveness of honey (10%) with chlorhexidine gluconate (0.12%) on the dental plaque levels and gingival health showed no statistically significant different although there were slightly more reduction in honey group[27].

In regards to periodontal pocket depth and clinical attachment loss, this present study shows similar reduction of these parameters in both groups (Table 2). This indicates that periodontal healing was occurred in all subjects, thus showed periodontal therapy had improve periodontal health after scaling and root planing. On the other hand, there was no significant superior effect of Tualang honey over NSPT when comparing honey and control group. One of the possible reasons could be the washed out effect of honey by gingival crevicular fluid (GCF) that may affect its sustainability in the periodontal pockets. It was reported that deep pocket in periodontal disease exhibits high GCF flow rate (20-137µl/h)[28]. In order to overcome this in the future study, honey could be applied more frequently[25] into the pockets or it can be incorporated into vehicles such as fiber in which it can be inserted into the periodontal pockets so that the honey will be released and retained longer to exert its effect[30]. Besides that, the concentration and volume of honey may also influence the antibacterial activity or healing process in periodontal pockets. Zaid et al. had suggested 20g of Tualang honey to be consumed daily for the systemic therapeutic used[14]. In this study, 0.5ml of Tualang honey has been applied topically into each pocket which might not be sufficient to show its efficacy on the healing process. Therefore the effective dose of honey for topical or local application should be investigated further. Nevertheless about 49% periodontal pocket treated with honey showed reduction of 2-3mm compared to only 28% in group with SRP alone. This may warrant further exploration in future study.

## Conclusions

Within limitation of this study, the present data showed that the complementary effect of Tualang Honey in promoting periodontal healing was not evidenced. Thus the role of honey as adjunct to non-surgical periodontal therapy has yet to be elucidated. Further studies are recommended as Tualang honey may have potential clinical benefits in treating periodontal disease.

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