

Evaluation of Efficacy of Virgin Coconut Oil in Maintaining Hygiene in Orthodontics Patients

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ABSTRACT

Background: Fixed orthodontic appliances are considered to jeopardize dental health due to the accumulation of oral microorganisms that may cause enamel demineralization. Oil pulling involves the use of edible vegetable oils as oral antibacterial agents. It is a practice of swishing oil in the mouth for oral and systemic health benefits. **Aims and Objectives:** To assess the effect of oil pulling therapy with virgin coconut oil on Streptococcus mutans count in patients undergoing orthodontic treatment. **Methods:** A total of thirty subjects were included in the study. They were divided in to 2 groups. Group A subjects were asked to swish coconut oil and Group B normal saline for a week. Streptococcus mutans colony forming units were estimated and compared. **Results:** A statistically significant reduction in S. mutans CFU was seen with Group A after oil pulling with coconut oil when compared to saline group (P = 0.0003). **Conclusion:** Edible oil-pulling therapy is natural, safe and has no side effects. Hence, it can be considered as a preventive therapy at home to maintain oral hygiene.

Keywords: Colony forming unit, Orthodontics, Plaque, Streptococcus mutans, Virgin coconut oil.

INTRODUCTION

World Health Organization (WHO) defined oral health as a state of being free from chronic mouth and facial pain, oral and throat cancer, oral sores, birth defects such as cleft lip and palate, periodontal (gum) disease, tooth decay and tooth loss, and other diseases and disorders that affect the oral cavity.^[1]

After initiation of orthodontic treatment maintenance of oral hygiene may be more difficult leading to plaque accumulation subsequently resulting in inflammation. For example orthodontic bands placed subgingival can affect the alveolar bone level. Soft- or hard tissue defects may be present. Efficient removal of dental plaque and following the instructions for adequate oral hygiene are very important parameters for both orthodontists and periodontists. Positive effects of

orthodontic treatment may be threatened if adequate and regular oral hygiene is not maintained.^[1,2]

Virgin coconut oil (VCO) differs from commercial coconut oil in the way it is processed. The latter is produced from copra or dried coconut meat and undergoes refining process to make the oil edible. The refined oil produced is called RBD (Refined, Bleached and Deodorized) coconut oil which is largely used as cooking oil. Virgin coconut oil production does not subject the oil to refining process since the oil produced is already edible. In effect, the term Virgin refers only to the process and not on the chemical properties which are essentially the same in both RBD oil and VCO. Their effect on health would likewise be the same, given the same medium chain fatty acid (MCFA) compositions.^[2,3]

Previous studies reported the benefits of VCO consumption, including antiulcerogenic, antinociceptive, anti-inflammatory, antihypercholesterolemic, antimicrobial and hepatoprotective effects.^[4-6]

Oil pulling as described in ancient Ayurveda involves the use of edible vegetable oils as oral antibacterial agents. It is a practice of swishing oil

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in the mouth for oral and systemic health benefits.^[5,6]

The aim of the current study was to assess the effect of oil pulling therapy with virgin coconut oil on oral microbial flora among patients treated with orthodontic appliances.

MATERIALS AND METHODS

The study was carried out on the patient who visited the Department of Orthodontics, P.K.Das medical College, Ottapalam, Palakkad, Kerala from June 2018 to December 2018. Our study is in accordance with the ethical standards on human experiments and with the Helsinki Declaration of 1975, as revised in 2000. Ethical clearance was obtained from the Institutional Review Board. Detailed explanation of the nature, purpose, and material risks of the proposed procedures was given to the study participants in a language that they understand. Informed consent was obtained from the subjects who were willing to participate before starting the study. The anonymity of the participants was maintained throughout the study. The trade name of the oil product used in the study aadrics agro product.

A total of thirty subjects were included in the study based on Pavithran et al study. The sample was divided in to 2 groups.

1. Group A: 15 subjects who used virgin coconut oil
2. Group B: 15 subjects who used normal saline.

The mean age of study subjects in Group A was 21.3 years and in Group B was 22.5 years. In Group A, there were 5 (33.33%) males and 10 (66.67%) females. In Group B, there were 6 (40%) males and 9 (60%) females

Inclusion Criteria:

1. Patients aged 18-24 years
2. Patients undergoing orthodontic treatment
3. Patients willing to participate in the study

Exclusion Criteria:

1. Patients with a history of antibiotic usage for the past 1 week
2. Patients who are smokers
3. Patients who are allergic to the oil.

All the subjects of two groups were instructed to perform oil pulling once in the morning for one week and were asked to report after one week to the department of orthodontics. One tablespoon (10 ml) of respective group oil (coded in similar bottles) was measured and distributed randomly to each subject, and then, the primary investigator instructed the participants to pour the oil into the mouth on an empty stomach in the morning. With the mouth closed and chin up, without speed or effort, the subjects were instructed to sip, suck, swish, and pull the oil in the mouth between the

teeth in a relaxed way, and also exercise the jaw as if chewing action for a period of 10–15 min. They were instructed not to gargle the oil in the throat. The subjects were instructed to spit it out and wash the mouth and teeth thoroughly with water for 30 seconds. The subjects were instructed to relax for 2 minutes and then collect 2 ml of unstimulated saliva sample in the plastic sterile container. The participants, principle investigator and the analyser were blinded throughout the study. The saliva samples were immediately taken to the Department to Microbiology of the college. Each saliva sample was vortexed in the vortex mixer (REMI CM 101) for one minute. Then, 100 µl of this specimen was transferred to 9.99 ml sterile brain heart agar broth and vortexed again for 1 minute. Later, 100 µl of the diluted specimen was transferred to a sterile Mitis Salivarius Bacitracin Agar (HIMEDIA, Mumbai, Maharashtra, India) and spread uniformly using a sterile L spreader (TARSONS, Kolkata, West Bengal, India).

The inoculated culture media were incubated at 37°C in a candle extinction jar for 48 hours. The colonies on the agar plate were observed. Small convex deep blue colonies were further studied by gram stain and identification tests.

S. mutans were identified by gram stain morphology of Gram-positive cocci occurring in chains. They were confirmed by a positive mannitol and sorbitol fermentation tests. The colonies were counted using a Digital Colony Counter (Labtronics, D. Haridas and Company, Pune, Maharashtra, India) and the colony forming units (CFU) per ml of saliva was calculated.

The data were entered into the computer (MS-office, Excel) and were subjected to statistical analysis using the statistical package - SPSS version 20 (IBM). Proportions, means, standard deviation, and confidence interval for each group before and after oil pulling were calculated. Paired t-test was applied to assess the mean CFU/ml before and after oil pulling procedure in each group separately. Statistical significance value was set at $P < 0.05$ for this study.

RESULTS

The mean age of study subjects in Group A was 21.3 years and in Group B was 22.5 years. In Group A, there were 5 (33.33%) males and 10 (66.67%) females. In Group B, there were 6 (40%) males and 9 (60%) females [Table 1].

Table 1: Demographics

S. No	Group	Mean Age	Gender	
			Males	Females
1	A (Virgin Ccoconut Oil)	21.3 YEARS	5 (33.33%)	10 (66.67%)
2	B (Normal Saline)	22.5 YEARS	6 (40%)	9 (60%)

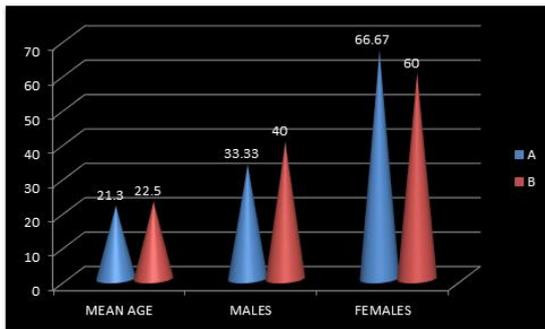


Figure 1: Demographics

The difference in the total number of *S. mutans* colonies formed after swishing of each of the oils was estimated using the CFU count. The mean baseline CFU in the Group A and B was found to be reduced after swishing with coconut oil and normal saline. A statistically significant reduction in *S. mutans* CFU was seen with Group A after oil pulling with coconut oil when compared to saline group ($P = 0.0003$; [Table 2]).

Table 2: Streptococcus Mutans Colony Forming Units in both groups

S No	Group	Mean CFU	SD	P Value
1	Group 1	422.50	81.50	0.0003
2	Group 2	540.50	75.50	

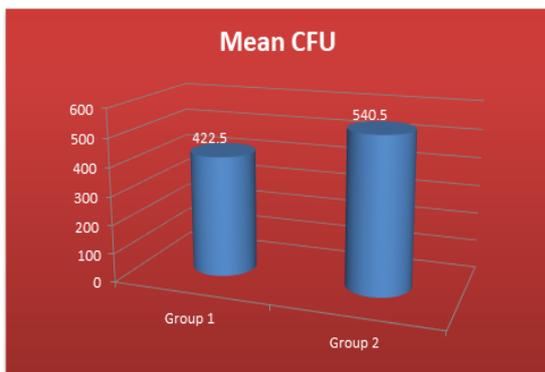


Figure 2: Streptococcus Mutans Colony Forming Units in both groups

DISCUSSION

According to Chang et al., the increase in oral Streptococcus following placement of orthodontic appliances can be explained by the irregular nature of their surfaces, which promotes the growth of acidogenic bacteria that prefer to grow on hard surfaces.^[9]

Batoni et al. showed that orthodontic treatment caused a modification in the oral flora and was associated with elevated counts of cariogenic bacteria in both the dental plaque and saliva.^[10]

In vivo studies generally revealed an increase in dental plaque with a specific rise in oral Streptococcus and Lactobacillus counts in plaque and saliva during the orthodontic treatment period.

According to these authors, orthodontic appliances are retention sites that promote colonization by certain cariogenic bacteria: oral streptococci and lactobacilli. The characteristics of dental plaque retention on appliances are the cause of a severe development of caries in unusual parts of the teeth, like the vestibular surfaces.^[11-14]

In the present study, there was a definite reduction in *S. mutans* count after oil pulling with coconut oil ($P = 0.003$) when compared to normal saline. This finding was in accordance with the in vitro study by Pavithran et al, which showed that coconut oil ($P = 0.008$) and sesame oil ($P = 0.039$) showed significant reduction in antibacterial activity against *S. mutans* on prepared biofilm models.^[8]

Hughes et al found that with sesame oil there was a reduction in mean *S. mutans* count in saliva in 24 hours ($P = 0.07$). There was a decline in mean number of colonies of microorganisms after 45 days of sesame oil pulling therapy ($P < 0.01$). The viability of *S. mutans* was not affected by any of the vegetable oils. At the highest concentration (416 mg/ml), olive oil inhibited the growth of *S. mutans* by 30%, followed by palm oil which inhibited up to 27% of growth. Coconut oil and sunflower seed oil inhibited bacterial growth by 26% and 23%, respectively.^[14] Anand et al showed the antibacterial effect of sesame oil on total bacteria. The reduction of total count of bacteria ranged from 10% to 33.4%. The average reduction of total count of bacteria was 20% after 40 days of oil-pulling. Therefore, the sesame oil is found to be effective in reducing bacterial growth and adhesion.^[15]

Jauhari et al found that the effect of coconut oil in plaque-related gingivitis was assessed. There was a steady decline in both the plaque index and the gingival index values from day 7. The average gingival index score on day 30 was down to 0.401 and the plaque index score was 0.385 from 0.91 and 1.19 at baseline, respectively.^[16] Sood et al reported no significant reduction in *S. mutans* after 2 weeks of oil pulling twice daily with sesame oil on 6–12-year-old.^[17] whereas Amith et al observed that oil pulling with sesame oil was as efficient as chlorhexidine mouthwash in reducing oral malodor and microorganisms, but the procedure took a long duration of time to be performed.^[18]

Asokan et al showed that there was a net decline in mean plaque scores from baseline to 45 days amounting to 0.81 ± 0.41 ($P < 0.01$). There was also a net decline in gingivitis which was 0.39 ± 0.17 ($P < 0.01$).¹⁹ Peedikayil et al study results of the comparisons of the pre- and post-therapy values of plaque index score and modified gingival index score showed a statistically significant difference in the study group that used sesame oil ($P < 0.001$).^[20] In the future, studies with longer durations are needed to assess the in vivo effect of oil pulling therapy with coconut oil over time.

CONCLUSION

Oil pulling with virgin coconut oil was found to be more effective when compared to swishing with saline. Oil pulling therapy assures to be an improved preventive home remedy adjunct to routine oral hygiene practices in developing countries like India.

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