

Antiplaque and Antimicrobial Effects of oil Pulling Using Wet Processed Virgin Coconut Oil: An In-vivo Preliminary Study.

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ABSTRACT

Background: Oil pulling is a traditional ayurvedic practice which uses edible oils for dental plaque control. Coconut oil is found to have anti-plaque and antimicrobial effects in oral cavity. Majority of the studies have used refined coconut oil. Very few studies have evaluated the wet processed virgin coconut oil which has the beneficial phytochemicals in an un-altered form for their anti-plaque and antimicrobial effects.

Objective: To study the anti-plaque and anti- microbial effects of wet processed virgin coconut oil after 30 days of oil pulling.

Methodology: A prospective interventional study was done on with 15 subjects. Plaque index, Streptococcus mutants and Candida albicans colony counts were done before and after 30 days of oil pulling using wet processed virgin coconut oil.

Results: There was a statistically significant reduction in the plaque index ($p=0.001$), Streptococcus mutants colony counts ($p=0.003$) and Candida albicans colony counts ($p=0.05$) after 30 days of oil pulling using wet processed virgin coconut oil.

Conclusion: The study demonstrated antiplaque and antimicrobial actions of wet processed virgin coconut oil when used in oil pulling. This can be due to the unique medium chain fatty acids present in coconut oil. This study demonstrates that oil pulling using wet processed virgin coconut oil can be an effective organic plaque control measure.

Keywords: Oil pulling, coconut oil, dental plaque, streptococcus mutants, candida albicans

INTRODUCTION

Dental caries and periodontitis are the most prevalent oral disease worldwide. These diseases are found to be directly related to the microorganisms present on the dental plaque which is a highly structured resilient entity adhering on the teeth. Dental plaque is comprised of microorganisms and their products embedded in a highly organized matrix of salivary glycoprotein and extracellular polysaccharides.^{1,2}

Mechanical tooth cleaning is the most effective method for plaque control. Several chemotherapeutic agents like chlorhexidine is also used as an adjuvant in reducing the dental plaque. But these chemical agents have several disadvantages like altered taste and staining of tooth.² Hence dental community has been searching for an alternative to these chemical agents of plaque control.

Oil pulling is a traditional ayurvedic treatment procedure used to improve oral health by reducing gingival bleeding, bad breath, tooth decay and gingival inflammation. Oil pulling technique involves swirling of about 10 ml of edible organic oils like coconut oil or sunflower oil or sesame oil in the oral cavity. The oil is shuttled between the teeth for 10-15 minutes until it becomes milky white. After which it is spit out.^{3,4}

Coconut oil is an edible oil which is comprised predominantly of medium chain fatty acids (MCFA) and contains 92% saturated fats. Lauric acid forms 50 % of the medium chain fatty acids.^{4,5} Various studies have found that using coconut oil reduces the dental plaque formation and

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has antimicrobial and anti-inflammatory activities which are beneficial for oral health.^{1,6}

Traditionally coconut oil is extracted from dry steamed copra which is wedge pressed and the extract is subjected to refining, bleaching and deodorization. An alternate method is wet method wherein the oil is obtained from fresh coconut by

mechanical means without the use of heat or chemical process. The coconut oil produced by wet method is referred as virgin coconut oil and has greater retention of phytochemicals in its natural form.⁴

Even though many studies have evaluated the effectiveness of oil pulling procedure with refined coconut oil there are very few trials which has studied the effectiveness of virgin coconut oil produced by wet extraction method as an intraoral anti plaque and anti-microbial agent. The aim of our study was to evaluate the anti-plaque and anti- microbial effects of wet processed virgin coconut oil after 30 days of oil pulling.

MATERIALS AND METHODS

A prospective interventional study was done on with 15 subjects within the age group of 18 to 25. There were no control group in the study. Use of systemic or topical antibiotics in a period of 1 month, use of chlorhexidine mouth wash, history of dental treatment in the past one month, presence of any

systemic illness, presence of tobacco related habits were set as exclusion criteria. All subjects brushed twice or once daily and none had the habit of flossing.

The subjects were advised to perform oil pulling using 10 ml of wet processed virgin coconut oil (The Happy groove co, Virgin coconut oil TM) for a period of 5-10 minutes until it turns milky white and then its spit out. The procedure was performed for a period of 30 days. Institutional ethical committee approval was obtained for the study.

The study evaluated and compared the pretreatment and post treatment a) plaque index b) streptococcus mutants colony count c) candida albicans colony count.

Plaque was assessed on the labial, buccal and lingual surfaces of all the teeth after using disclosing agent. Plaque index was scored on numerical scale of 0 to 5.7 Plaque samples were collected using swabs and were taken from the buccal aspects of premolar teeth. Collected specimen was cultured using Mitis salivary agar medium in anaerobic conditions and

Table 1: Comparison of plaque index, Streptococcus mutants colony count and Candida albicans colony count before and after oil pulling treatment.

Variable	Median $\pm$ IQR	P value
Pre-treatment Plaque index	1.72 $\pm$ 0.9	0.001
Post-treatment plaque index	1.2 $\pm$ 0.66	
Pre-treatment Streptococcus mutant CFU/ml count ($\times 10^3$)	12 $\pm$ 66.4	0.003
Post-treatment Streptococcus mutant CFU/ml count ($\times 10^3$)	0.3 $\pm$ 9.8	
Pre-treatment Candida CFU/ml count ($\times 10^3$)	2 $\pm$ 9.8	0.05
Post-treatment Candida CFU/ml count ($\times 10^3$)	0.1 $\pm$ 0.3	

Graph 1: Graphs depicting comparison of plaque index, Streptococcus mutants colony count and Candida albicans colony count before and after oil pulling treatment.

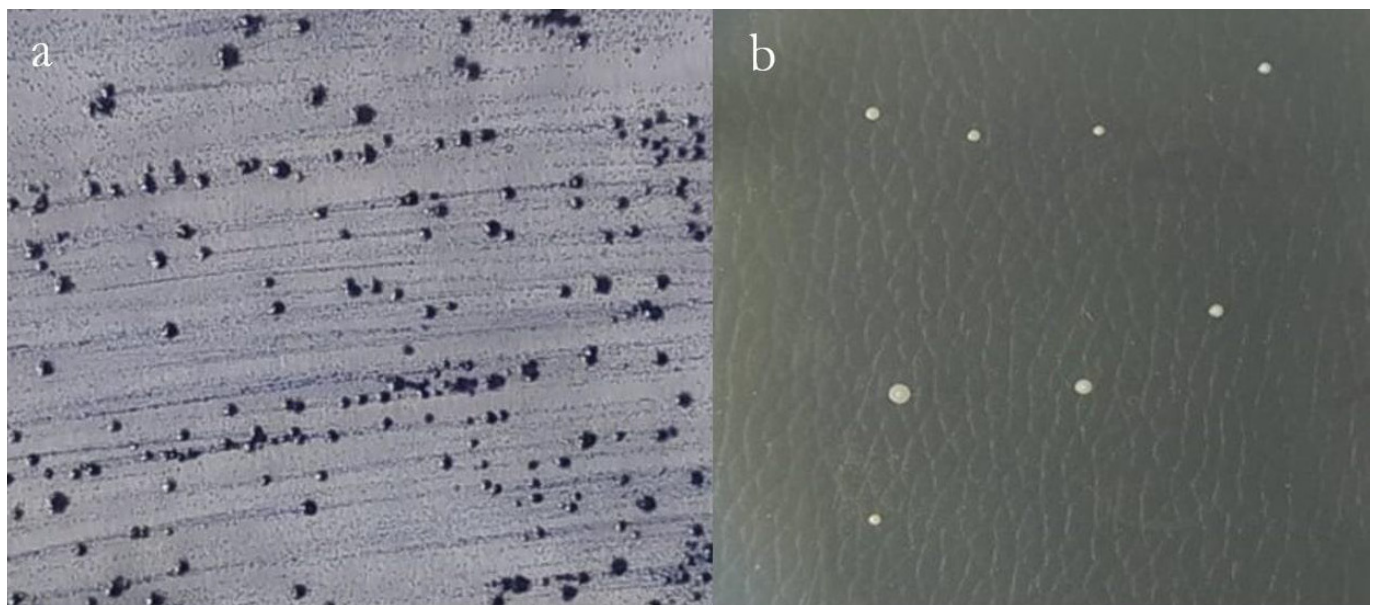
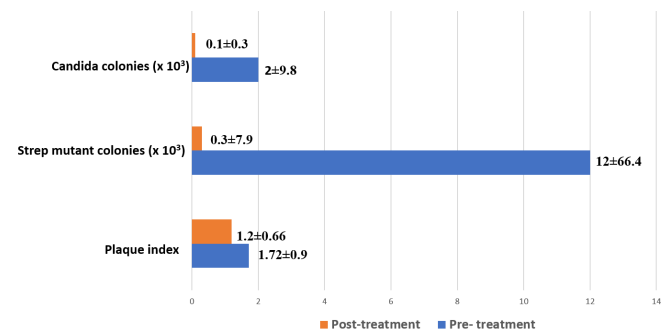


Fig.1: A. Streptococcus mutant colonies B. Candida albicans colonies

sabouraud dextrose agar in aerobic conditions. After 48 hours of incubation period streptococcus mutans appeared on the culture plate as small, rough, raised and adherent colonies.⁸ (Fig 1a) Candida albicans appeared as white or cream, smooth and glistening colonies.⁹ (Fig 1b)

The data was entered in SPSS v21. Median and IQR were calculated as summary statistics. The scores were analysed using paired t test and a p value less than or equal to 0.05 was considered to be statistically significant.

RESULTS

The median plaque index before oil pulling treatment with virgin coconut oil was a median of 1.72 ± 0.9 and after the oil pulling treatment for a period of 30 days it was reduced to a median of 1.2 ± 0.66 and this reduction in the plaque index was statistically significant ($p=0.001$).

The colony forming units of streptococcus mutans in the dental plaque before oil pulling treatment was 12 ± 66.4 ($\times 10^3$) units and there was a statistically significant reduction in the colony forming units to 0.3 ± 7.9 ($\times 10^3$) units after the oil pulling treatment ($p=0.003$).

There was a statistically significant reduction in the colony forming units of candida from pre-treatment counts of 2 ± 9.8 ($\times 10^3$) colonies to post-treatment 0.1 ± 0.3 ($\times 10^3$) colonies. ($p=0.05$) (Table 1, Graph 1)

DISCUSSION

Dental plaque is considered as a community of microorganisms found adherent on the tooth surface as a biofilm. It consists of colonies of various microorganisms embedded in a matrix of polymers of host and microbial origin. The microorganisms present in the dental plaque are highly resistant to antimicrobials and can cause various disease conditions like dental caries and periodontitis.¹⁰

Various plaque control measures are recommended in order to improve oral health. These measures include mechanical and chemical plaque control measures. The mechanical plaque control measures include brushing and flossing while chemical plaque control measures involve use of tooth paste and mouth rinses.¹¹ The chemical agents used as plaque control agents has shown adverse effects like altered taste and staining of teeth.²

Oil pulling is an ayurvedic practice involves vigorous swishing of organic edible oils like coconut oil, sesame oil or sunflower oil in the oral cavity. It has been reported to improve oral health and prevent oral diseases like tooth decay, halitosis and gingivitis. Various studies have shown that oil pulling procedure produces comparable results as with chlorhexidine mouth rinses.¹²

Coconut oil is widely advocated for oil pulling procedure. Coconut oil is primarily comprised of medium chain fatty acids (MCFA). It has been found that lauric acid is the primary component of coconut oil. The antimicrobial and anti-inflammatory activity of coconut oil is attributed to lauric acid.⁶ Traditional coconut oil is extracted from the dry copra by wedge pressing and the oil is subjected to chemical process like refining, bleaching and deodorization. The exposure of heat and chemical process will alter the benefactual phytochemicals in coconut oil. In contrast virgin coconut oil is extracted from fresh coconut kernel by mechanical process without any exposure to chemicals or heat there by retaining the natural phytochemical composition.⁴ There are very few studies till

date on the on the oral health benefits of oil pulling using virgin coconut oil.

In our study we found a statistically significant decrease in the plaque index after a 30 day period of oil pulling using wet processed virgin coconut oil. ($p=0.001$). Studies have shown similar reduction in the plaque index when subjects used oil pulling with coconut oil. Plaque inhibition when coconut oil was used for oil pulling was similar to sesame oil or using chlorhexidine mouth rinses.^{1,3,13} The possible mechanisms of plaque reduction in oil pulling can be due to saponification which involves alkaline hydrolysis of fat in the oil used for oil pulling with bicarbonate ions in the saliva and the product formed causes an increased cleansing action there by preventing plaque formation or the viscous nature of the oil causes inhibition of plaque adhesion on the tooth surface.^{1,5}

Streptococcus mutans are acidogenic bacteria present on dental plaque, which are considered to be responsible for dental caries. Various studies has demonstrated a decrease in streptococcus mutant colony count, post exposure to coconut oil pulling.^{14,15} In our study also we found a significant reduction in the streptococcus colony count post exposure to oil pulling treatment with virgin coconut oil ($p=0.003$) This antimicrobial effect of coconut oil is attributed to the presence of lauric acid which in the body is converted into a monoglyceride, monolaurin. Other medium chain fatty acids and monolaurin in coconut oil can alter and destroy the microbial cell walls, cell membranes and disrupt the enzymes involved in the nutrient transfer and energy production.¹⁴ Studies have shown that the antimicrobial effects of coconut oil pulling is comparable to that of chlorhexidine and sesame oil.¹⁶ Candida albicans a commensal seen in oral cavity can show exacerbated proliferation in immunocompromised states. Very few studies have been done on the antifungal action of coconut oil pulling procedure.⁶ In our study we found a statistically significant reduction in the colony counts of candida albicans after oil pulling treatment with virgin coconut oil for a period of 30 days ($p=0.05$) Tijin D L et al in 2016 demonstrated a significant reduction in the candidal colonies on exposure to virgin coconut oil and they found the minimum inhibitory concentration of the virgin coconut oil was 25% and the optimal exposure time required to eliminate the candida colonies were 2 days. This antifungal effect is attributed to the presence of lauric acid and other medium chain fatty acids which can disrupt the fungal cell wall and also inhibit the hyphae formation.⁹

Since this study was a preliminary report it had limitations like lack of a comparative evaluation using a placebo and other edible oils like refined coconut oil.

CONCLUSION

Our intervention study using wet processed virgin coconut oil for oil pulling has clearly demonstrated its antiplaque and antimicrobial actions. This is attributed to the unique medium chain fatty acids present in coconut oil. This study demonstrates that oil pulling using coconut oil is an organic alternative to chlorhexidine as a plaque control measure with fewer or no adverse effects. Further randomized control trials comparing wet processed virgin coconut oil and refined coconut oil are required to understand the real therapeutic potential of wet processed virgin coconut oil.



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