

**COMPARATIVE ASSESSMENT OF OZONATED OLIVE OIL AND
CHLORHEXIDINE GEL AS AN ADJUNCT TO SCALING AND ROOT PLANING-
A CLINICAL STUDY**

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ABSTRACT

Background- Ozone is the allotropic form of oxygen. An ozone molecule consists of three oxygen atoms instead of two and this extra atom makes it highly potent for oxidation. High oxidation is necessary for killing microorganisms, especially anaerobic ones. Thus, ozone therapy can be highly effective when used as an antimicrobial agent for the treatment of periodontal diseases, since majority of the potent periodontopathogens are anaerobic in nature.

Aim- this study was carried out to evaluate the efficacy of ozonated olive oil and chlorhexidine gel as an adjunctive therapy to scaling and root planing in chronic periodontitis patients.

Material and Methods- Total 80 (20-50 years of age) study subjects were categorized into three groups based on inclusion and exclusion criteria.

Group I - consisting of 40 subjects (20 male and 20 female) with scaling and root planing followed by subgingival application of ozonated olive oil. (Dentozone India).

Group II - consisting of 40 subjects (20 male and 20 female) with scaling and root planing followed by subgingival application of chlorhexidine gluconate gel 1.0% W/W)(Hexigel-15gm, ICPA health care products ltd).

Results- Ozonated olive oil (Group I) was found to have equivalent results as compared to Chlorhexidine gel (Group II). The level of significance was set at (P<0.001).

Conclusion- The ozonated olive oil and chlorhexidine gel have shown significant improvement in periodontal health. Ozonated olive oil can be used as LDD, an adjunct to

scaling and root planing in chronic periodontitis which is safe and well accepted by patients without any noticeable side effects.

INTRODUCTION

Chronic periodontitis (CP) is defined as an inflammatory disease of tooth-supporting tissues. If left untreated, CP leads to progressive destruction of the tissues, which clinically features through gingival bleeding, progressively increasing pocket depth, clinical attachment loss and alveolar bone loss, ultimately results in loss of teeth. The primary etiology for periodontal diseases is the complex of dysbiotic microbiota present in dental plaque biofilm. Therefore, elimination of the pathogenic microorganisms is the ultimate goal of any periodontal therapy. This is done by disrupting and removing the dental plaque biofilms from the tooth surface. There are nonsurgical and surgical methods to accomplish the debridement which aims to effective removal of the dental plaque. Although mechanical debridement through scaling and root planing (SRP) is considered as the gold standard for nonsurgical periodontal therapy, certain factors such as anatomical variation of teeth, deep periodontal pocket, and tissue-invading ability of some bacteria decrease the effectiveness of it.¹

Even though chlorhexidine is considered gold standard antimicrobial agent for periodontal disease it is associated with some of the side effects such : a) Bitter taste in the mouth b) staining of the teeth c) burning of the oral mucosa etc. Ozonated olive oil has a combined advantage of ozone and olive oil which are olive oil acts a bactericidal agent and ozone acts as an immuno stimulant, antimicrobial agent. The complete elimination of the microorganisms is hardly achieved, and the bacterial reservoirs survive in those areas, which allows the microbial activity to continue. These factors have led us to the use of various antimicrobial agents, systemically prescribed or locally applied, as adjunctive to the mechanical debridement.² Local application of antimicrobial agents has several advantages over systemic use, such as achievement and maintenance of higher concentration of drug for a longer period of time at the diseased site, reduced systemic absorption of the drug, and most importantly, reduced production of the drug-resistant bacterial strains. Over the years, various antimicrobial agents have been tried for subgingival application for the treatment of periodontal diseases and have shown considerable results.

AIM:

To evaluate the efficacy of ozonated olive oil and chlorhexidine gel as an adjunctive therapy to scaling and root planing in chronic periodontitis patients.

MATERIAL METHODS

This clinical study was conducted in the Department of Periodontology, Rama Dental College Hospital & Research Centre Kanpur, Uttar Pradesh. The ethical approval was taken from Institutional Ethical Committee and informed written consent was obtained from all study participants.

Total 80 (20-50 years of age) study subjects were categorized into three groups based on inclusion and exclusion criteria.

Group I - consisting of 40 subjects (20 male and 20 female) with scaling and root planing followed by subgingival application of ozonated olive oil. (Dentozone India).

Group II - consisting of 40 subjects (20 male and 20 female) with scaling and root planing followed by subgingival application of chlorhexidine gluconate gel 1.0% W/W)(Hexigel-15gm, ICPA health care products ltd).

After randomly assigning the participants into the three groups, recording of clinical parameters and collection of subgingival plaque samples were done.

Subgingival plaque samples were collected from each test sites for determining subgingival microbial count before recording the clinical parameters and scaling and root planing by using endodontic paper points at baseline and after 1 month.

UNC-15 probe and Explorer No. (17/23) were used to record clinical parameters in all the participants of the study groups.

At baseline, after recording the clinical parameters, Scaling and root planing was carried out by using ultrasonic scaler and Gracey curettes followed by subgingival application of ozonated olive oil in group I and chlorhexidine gluconate gel in group II was done immediately after SRP by injecting through syringe until the overflow of the material from the pocket orifice.

Participants were recalled at the intervals 7, 14 and 21 days from baseline for performing supragingival scaling, after that the reapplication ozonated olive oil in group I and chlorhexidine gluconate gel in group II was done. Participation of the patients were voluntary, and all the participants were assured about the confidentiality of the data recorded.

Group I- consisting of 40 subjects (20 males and 20 females) who were treated by full mouth scaling and root planing along with subgingival application of ozonated olive oil. and also the collection of subgingival plaque samples were carried out for subgingival microbial count to determine number of colony forming units at baseline and after 1 month.

Group II - consisting of 40 subjects (20 male and 20 female) who were treated by full mouth scaling and root planing along with subgingival application of chlorhexidine gluconate gel 1.0% W/W) and collection of subgingival plaque samples were carried out for subgingival microbial count to determine number of colony forming units at baseline and after 1 month.

The inclusion criteria included chronic periodontitis patients, aged between 20-50 years with a probing pocket depth of ≥ 5 mm with atleast 20 teeth remaining in the oral cavity. Patients who are on systemic antimicrobial therapy, medically compromised patients, having history of periodontal surgeries in the past, also who underwent periodontal treatment ≤ 6 months back, having allergy to chlorhexidine and olive oil and smokers were excluded.

STATISTICAL ANALYSIS

Data collected were statistically analysed using statistical package SPSS 23.0 (SPSS Inc., Chicago, IL) and level of significance was set $p < 0.05$.

RESULTS

Table 1: Comparison Of the PI among Ozonated Olive Oil (Group I), And Chlorhexidine Gel (Group II).

PI	Group I		Group II		Kruskal Wallis test		
	Mean	SD	Mean	SD	SD	chi sq	p-value
baseline	2.83	0.38	2.78	0.42	0.42	0.40	0.818
1month	0.27	0.12	0.21	0.38	0.07	88.27	<0.001

* $p < 0.001$ was considered as statistically significant; SD: Standard deviation

Table 2: Comparison Of the GI among Ozonated Olive Oil (Group I) And Chlorhexidine Gel (Group II).

GI	Group I		Group II		Kruskal Wallis test	
	Mean	SD	Mean	SD	chi sq	p-value
Baseline	2.66	0.38	2.64	0.39	0.70	0.704
1month	0.07	0.05	0.05	0.05	51.78	<0.001

Table 3: Comparison Of PPD among Ozonated Olive Oil (Group I) And Chlorhexidine Gel (Group II)

PPD	Group I		Group II		Kruskal Wallis test	
	Mean	SD	Mean	SD	chi sq	p-value
Baseline	6.40	0.50	6.30	0.46	1.14	0.566
1month	5.40	0.50	5.28	0.45	19.29	<0.001

Table 4: Comparison Of CAL among Ozonated Olive Oil (Group I) And Chlorhexidine Gel (Group II).

CAL	Group I		Group II		Kruskal Wallis test	
	Mean	SD	Mean	SD	chi sq	p-value
baseline	6.00	0.00	6.40	0.50	21.64	<0.001
1month	5.00	0.00	5.28	0.45	50.77	<0.001

Table 5: Comparison Of CFU count among Ozonated Olive Oil (Group I) And Chlorhexidine Gel (Group II).

CFU	Group I		Group III		ANOVA	
	Mean	SD	Mean	SD	F-value	p-value
baseline	94.70	1.94	95.70	2.75	2.94	0.057
1month	27.53	0.72	23.03	0.97	12817.00	<0.001

DISCUSSION

Chlorhexidine (CHX) is a highly effective widely used broad-spectrum antimicrobial agent considered as the gold standard for chemical plaque control. Because of its broad-spectrum antimicrobial activity, substantivity, and lack of toxicity. However, prolonged use of CHX

may cause tooth staining, altered taste sensation, impaired wound healing, mucosal erosion, and reduced attachment of fibroblast to tooth surface.

Ozone is the allotropic form of oxygen. An ozone molecule consists of three oxygen atoms instead of two and this extra atom makes it highly potent for oxidation. High oxidation is necessary for killing microorganisms, especially anaerobic ones.³ Thus, ozone therapy can be highly effective when used as an antimicrobial agent for the treatment of periodontal diseases, since majority of the potent periodontopathogens are anaerobic in nature.

Ozonated olive oil could be a good option for LDD. The reaction between ozone and the monounsaturated fatty acids present in the olive oil occurs, which produces various compounds such as ozonides, aldehydes, peroxides, hydroxyperoxides, etc., these compounds add to the effects of ozone, which is responsible for the wide antimicrobial activity of ozonated olive oil.⁴ Hence, this study was carried out to evaluate the efficacy of ozonated olive oil and chlorhexidine gel as an adjunctive therapy to scaling and root planing in chronic periodontitis patients.

Comparison of clinical efficacy of the two groups i.e. ozonated olive oil (Group I), chlorhexidine gel (Group II) for GI, PPD, CAL. GI in Group I at baseline (2.86 ± 0.38) was reduced after 1 month (0.07 ± 0.05), in case of Group II GI score at baseline (2.64 ± 0.39) was seen to reduce significantly to (0.05 ± 0.05). In case of PPD in Group I baseline results (6.40 ± 0.50) was found to reduce at the 1-month mark (5.40 ± 0.50). Group II the PPD at baseline (6.30 ± 0.46) was seen to reduce significantly to (5.28 ± 0.45). In case of CAL in Group I at baseline (6.00 ± 0.00) was reduced after 1 months (5.00 ± 0.00) with a mean attachment gain 1.00. In Group II there was found to be a significant reduction from the mean baseline value (6.40 ± 0.50) and after 1 month (5.28 ± 0.45) with the mean attachment gain being 1.02.

These findings are in agreement with the study conducted by Katti SS *et al.*⁵ in 2013, it explains the oxidizing mechanism of ozone which may involve direct reactions of molecular ozone and free radical mediated destruction. Dhingra K *et al.*⁶ in 2011 also found similar reductions in the clinical parameters GI (0.71 ± 0.14), and PPD (0.19 ± 0.04), Hayakumo *et al.*⁷ in 2013 who founded that there was subsequent reduction in the clinical parameters GI, PPD when ozone water irrigation was done along with non-surgical periodontal therapy, the results are also in accordance with the study by Nambier *et al.*⁸ 2022 in which he found subsequent decrease in the clinical parameters of all the groups after a follow up period of three

months. On the contrary to our result Muller *et al.*⁹ in 2007 found no significant reduction in clinical parameters with the use of ozone and SRP. Dengizek *et al.*¹⁰ in 2018 also found no reductions in the clinical and biologic parameters in using ozone as compared to SRP alone. Also, Tasdemir *et al.*¹¹ in 2019 had found similar results with no reduction in the clinical parameters with ozone being used as an adjunct to SRP.

In case of subgingival microbial count for Group I at baseline (94.70 ± 1.94) was significant reduced after 1 month (27.53 ± 0.72). In Group II which showed the most significant amount of reduction from baseline (95.70 ± 2.75) to after 1 month (23.03 ± 0.97). These results are in accordance with the study conducted by Patel *et al.*¹² in 2012 who conducted a study on ozonated olive oil and demonstrated a significant decrease in the count of potent periodontal pathogens without any adverse effects. The results are also in accordance with the study made by Nagayoshi *et al.*¹³ who found ozonized water should be useful in reductions of microorganisms in dental plaque which in turn reduces gingival inflammation. Huth *et al.* found a significant reduction in porphyromonas gingivalis, parvimonas micra and Tannerella forcythia on irrigation with aqueous solution of ozone as compared to 0.2% CHX.

Ozone gas is considered to be an oral antiseptic agent because of its stronger antimicrobial property, it kills bacteria, fungi and virus and does not induce microbial resistance. Ozonated oil has been proven to be effective against various putative periodontal pathogens are obtained from a chemical reaction between ozone gas and unsaturated fatty acids of vegetable oils, they have gained importance due to their excellent curative results, simple application, long term effects and nontoxic nature and another reason could be the saponification or “soap making” process as a result of alkali hydrolysis of fat. This can be attributed in the reduction of bleeding on probing, plaque accumulation which can ultimately lead to decreased probing pocket depth and clinical attachment gain.

Subgingival application of ozonated olive oil, and chlorhexidine gel have shown clinical efficacy and improvement in periodontal health. Chlorhexidine is a proven antimicrobial to control periodontal microflora, hence it is a gold standard antimicrobial for periodontal diseases. the ozonated olive oil was also found to be equally effective as that of chlorhexidine gel, because of the combined therapeutic effects of ozone and olive oil.

CONCLUSION

It is concluded that subgingival application of ozonated olive oil and chlorhexidine gel, along with scaling and root planing, significantly improved periodontal health. Results showed

reduced plaque accumulation, gingival bleeding, inflammation, probing pocket depth reduction, and clinical attachment level gain. Ozonated olive oil was seen to be equally effective as that of chlorhexidine gel, the gold standard antimicrobial agent for periodontal disease. Hence, Ozonated olive oil can be used as a local drug delivery in chronic periodontitis, which is safer and well-accepted by patients without any noticeable side effects.

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