A randomised clinico-microbial trial evaluated the use of ozone as a supplement to scaling and root planing in the treatment of chronic periodontitis.

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Abstract

Background and objectives: Controlling mechanical plaque is a crucial component of periodontal treatment. In the current research, the effectiveness of using ozone water irrigation in addition to scale and root planing to treat generalised chronic periodontitis was assessed.

Materials and methods: After scaling and root planing, the twenty-four chronic periodontitis patients chosen for the research were randomly assigned to Group A or Group B, getting irrigation with ozone water or distilled water, respectively. To assess the "red complex" periodontal pathogens, subgingival plaque was taken from the chosen investigational teeth and examined using the BANA-ZymeTM Processor. At baseline, 14 days, 21 days, and 2 months, the clinical and microbiological data were noted.

Results: At the baseline, Group A and Group B's mean probing pocket depth scores were 6.833 1.193 and 7.833 1.276, respectively; on Day 14, they were 6.616 1.403 and 7.083 1.378; on Day 21, they were 5.166 0.937 and 6.083 1.443; and on Month 2, they were 4.500 0.797 and 5.166 1.029. In Group A, 9 samples at the second month showed BANA negativity, 3 samples showed BANA positivity, and in Group B, 12 samples at the second month showed BANA negativity, 0 samples showed BANA positivity. In both groups, the microbiological study revealed a decrease in periodontal infections.

Conclusion: An effective complement to scaling and root planing in the treatment of chronic periodontitis, subgingival ozonated water irrigation has shown significant improvement in both clinical and microbiological indices.

Keywords: BANA, chronic periodontitis, Ozonated water, scaling and root planing.

INTRODUCTION

A polymicrobial infectious condition called chronic periodontitis results from an expansion of the microflora. The most significant pathogens of chronic periodontitis are members of the "red complex," which include Porphyromonas gingivalis, Tannerella forsythia, and Treponema denticola. These various organisms are known to be associated with the clinical development of the illness. [1] Mechanical removal of dental plaque is a crucial component of managing and treating periodontal disease, and it may be done by a professional or a patient at home. To achieve total remission, it is necessary to alter the subgingival environment in order to prevent and impede the proliferation of the extremely anaerobic subgingival microflora. [2] This may be accomplished using a variety of techniques, such as the use of oxygenating and redox agents, molecular oxygen, hyperbaric oxygenation, hydrogen peroxide, and, more recently, the subgingival irrigation with ozonized water. [3] Recently, ozone has drawn interest in the realm of dentistry due to its potent antibacterial qualities that don't cause germ resistance. Therefore, the purpose of this research was to assess the effectiveness of ozone as a supplement to scale and root planing in the management of chronic periodontitis.

Materials and method:

A total of 30 individuals between the ages of 30-65 who visited the institution's outpatient periodontics department were a part of this randomised controlled clinical research. The institution's ethics committee gave its approval to the research protocol. Participants in the trial had to still have at least 20 teeth and have been diagnosed with chronic periodontitis with a probing pocket depth (PPD) of at least 5 mm. Exclusion criteria for the trial included participants who had recently used antibiotics, undergone scaling, had an allergy to one of the study's active components, were pregnant or nursing, smoked, or were currently taking any mouthrinses for dental issues.

30 people who were assessed for eligibility and chosen for the research. To achieve 80% statistical power, the sample size was estimated using the G*Power programme (Heinrich-Heine-University of Düsseldorf). Twelve people from each of the two groups were chosen at random from among the twenty-four people who met the inclusion requirements.

• Group A: Scaling and root planning with irrigation with ozonated water

• Group B: Scaling and root planning with watering with distilled water.

Each individual included in the research provided their written, informed permission. A case history pro forma was used to capture the participant information. Plaque index (PI), gingival index (GI), and PPD were clinical parameters evaluated and documented at baseline, as well as at days 14, 21, and 2 months. The participants in Group A had subgingival irrigation using ozonated water that was produced by an apparatus that discharged a single, pulse-like stream of ozone into sterile water. Participants in Group B got distilled water subgingival irrigation. For all groups, subgingival irrigation was carried out using a 20-gauge blunt needle syringe injected subgingivally for a duration of 30-45 s.

Biological evaluation

Each patient's experimental teeth were chosen at places with PPD of at least 5 mm, and subgingival plaque was taken from those teeth. At the 21st day and the second month, plaque samples were taken from the same locations. After removing the supragingival plaque, the subgingival plaque was removed using a sterile Gracey curette. It was moved coronally by scraping along the root surface after being placed subgingivally into the maximal probing depth area of the periodontal pocket. Using the BANA-ZymeTM Processor, the samples were examined to determine the presence of "red complex" periodontal infections.

The difference in the mean decrease of GI scores between baseline and two months served as the major outcome variable. The differences in the mean decrease of the PI and PPD scores from baseline to two months were the secondary outcome variables.

The research employed the following statistical analysis techniques. Microsoft Excel was used to input the data, and SPSS version 20 was used to execute the statistical analysis (Mission Hills, California, United States). The intragroup analysis of Gram-positive and Gram-negative microorganisms and spirochetes was carried out using the Wilcoxon signed-rank test, and the Mann-Whitney U-test and unpaired t-test were used to examine the difference between the groups. The difference between pretreatment and posttreatment parameters was assessed using a paired t-test. For the aforementioned tests, statistical significance was determined by P 0.05.

Results:

The mean difference in PI scores between the groups was not statistically significant [Table 1].

Table 1 Plaque scores comparison between groups at different time intervals using the unpaired t-test

	Groups	***N***	**Mean±SD**	***P***
BLPI	Group A	15	2.23±0.23	0.76
	Group B	15	2.45±0.12	
DAY14PI	Group A	15	1.56±0.45	0.67
	Group B	15	1.58±0.56	

DAY21PI	Group A	15	1.78±0.60	0.56
	Group B	15	1.45±0.45	
MON2P1	Group A	15	1.77±0.56	0.56
	Group B	15	1.67±0.37	

The mean difference in scores between the groups was not statistically significant [Table 2].

Table 2 Gingival scores comparison between groups at different time intervals using the unpaired t-test

Unpaired *t*-test				
	Groups	***N***	**Mean±SD**	***P***
BLGI	Group A	15	2.22±0.39	0.11
	Group B	15	2.11±0.11	
DAY14 GI	Group A	15	1.89±0.33	0.55
	Group B	15	1.78±0.01	
DAY21 GI	Group A	15	1.56±0.61	0.54
	Group B	15	1.83±0.39	
MON2 GI	Group A	15	1.55±0.72	0.45
	Group B	15	1.08±0.28	

The mean difference in scores between the groups was not statistically significant [Table 3].

Table 3 Probing pocket depth scores comparison between groups at different time intervals using the unpaired t-test

Unpaired *t*-test				
	Groups	***N***	**Mean±SD**	***P***
BLPPD	Group A	15	6.45±0.93	0.066
	Group B	15	7.33±1.73	
DAY 14 PPD	Group A	15	6.67±1.34	0.11
	Group B	15	7.33±1.89	
DAY 21 PPD	Group A	15	5.67±0.74	0.06
	Group B	15	6.33±1.38	
MON 2 PPD	Group A	15	4.00±0.72	0.08
	Group B	15	5.17±1.86	

The mean PI scores of Group A at the baseline and after 2 showing a statistically significant difference ($P < 0.001$). The mean GI scores of Group A at the baseline and after 2 months showing a statistically significant difference ($P < 0.001$). The mean PPD scores of Group A at the baseline and after 2 months showing a statistically significant difference ($P < 0.001$) [Table 4].

Table 4 Intragroup comparison using paired t-test at baseline and at the end of 2 months of plaque index, gingival index, and probing pocket depth

Paired *t*-test				
Group A	**Mean**	***n***	**SD**	***P***
PI				
BLPI	2.08	15	0.822	<0.00
MON2PI	1.64	15	0.63	
GI				
BLGI	2.92	15	0.61	<0.001
MON2GI	1.55	15	0.06	
PPD				
BLPPD	6.33	15	1.13	<0.01
MON2PPD	4.00	15	0.72	

At the baseline, in Group A, 4 (33.3%) samples showed BANA negative and 8 (66.7%) samples showed BANA positive, and in Group B, 8 (66.7%) samples showed BANA negative and 4 (33.3%) samples showed BANA positive; there was no statistically significant difference in proportion of samples in both the groups with respect to BANA test result (P = 0.102). At the 21st day, in Group A, 11 (91.7%) samples showed BANA negative and 1 (8.3%) sample showed BANA positive, and in Group B, 12 (100%) samples showed BANA negative and 0 (0%) sample showed BANA positive; there was no statistically significance difference in proportion of samples in both the groups with respect to BANA test result (P = 1.000). At the 2nd month, in Group A, 9 (75%) samples showed BANA negative and 3 (25%) samples showed BANA positive, and in Group B, 12 (100%) samples showed BANA negative and 0 (0%) sample showed BANA positive; there was no statistically significance difference in proportion of samples in both the groups with respect to BANA test result (P = 0.217) [Table 5].

Table 5 Intergroup comparison BANA-Zyme™ test results at different time intervals

Chi-square test			
BLBANA	**Group**		***P***
	Group A	**Group B**	
BLBANA			
Negative			0.12
Count	4	8	
Percentage within group	32.1	64.2	
Positive			
Count	8	4	
Percentage within group	64.2	32.1	
Total			
Count	15	15	
Percentage within group	100.0	100.0	
DA21GBANA	Group		*P*
	Group A	Group B	
DAY21GBANA			1.000
Negative			
Count	11	12	
Percentage within group	91.7	100.0	
Positive			
Count	1	0	
Percentage within group	8.3	0.0	
Total			
Count	12	12	
Percentage within group	100.0	100.0	
MON2BANA	Group		*P*
	Group A	Group B	
MON2BANA			
Negative			0.217
Count	9	12	
Percentage within group	75.0	100.0	
Positive			
Count	3	0	
Percentage within group	25.0	0.0	
Total			
Count	12	12	
Percentage within group	100.0	100.0	

Discussion:

The major aims of periodontal treatment are to maintain a healthy, functioning periodontium and to stop the disease's development. The mechanical removal of calculus deposits, supra- and subgingival plaque, and patient motivation are its key components. However, it has been shown that a full clearance of subgingival deposits and trustworthy, efficient regulation of the subgingival essential flora are exceedingly difficult goals to attain using nonsurgical methods. [6] Numerous supplementary strategies to enhance the results of mechanical debridement have been attempted to get over these restrictions.

Ozone therapy is becoming more and more used in many dental treatment approaches lately. Ozone is an unstable gas that rapidly releases a new oxygen molecule. This feature has been employed to eradicate bacteria in the medical area for a very long time. [7] In this randomised clinical experiment, the effects of supplementary ozone water irrigation on participants' clinical outcomes were examined. The findings showed that scaling and root planing in conjunction with ozone water irrigation led to the most clinical advantages (PI, GI, and PPD). According to investigations by Katti and Chava,[8] Ramazy et al.,[9] and Hayakumo et al.,[9] this is the case. [10] Nagayoshi et alin .'s vitro research, which demonstrated that dental plaque growth on decalcified human teeth was suppressed when exposed with ozonized water indicative of disinfecting properties,[11] further supports the findings of our investigation.

When 0.2% chlorhexidine gluconate and ozonated water were used as subgingival irrigants, Pandya et al.[12] found that chlorhexidine was more successful in improving the evaluated clinical and microbiological parameters. In contrast to the findings of our research, Seydanur Dengizek et al.[13] observed no significant increase in periodontal repair with the use of ozone in their randomised controlled trial comparing ozone as an adjuvant to scaling and root planing.

Clinical and microbiological data in the current investigation showed a statistically significant difference between the study group and the control group from the baseline to two months. The clinical and microbiological data, however, did not change statistically significantly across the groups, which is consistent with the 2014 research by Kaur et al. [14]

With no statistically significant difference between the groups in our investigation, both methods of therapy reduced pocket depth from baseline to two months, which is consistent with the findings of a study by Skurska et al. on patients with chronic and aggressive periodontitis.[15]

Conclusion:

The goal of the current randomised clinical research was to determine how ozone water irrigation affected several clinical indicators of periodontitis and the microflora in periodontal pockets in people.

The following conclusions from this research might be made based on the results: Ozone water irrigation is a viable mode of therapy for periodontal pockets, providing advantages above scaling and root planing alone.Ozone is an antibacterial agent that may be used to treat periodontal pockets in a safe manner.

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