

Effect of Ozonised water on Chronic Periodontitis - A Clinical Study

Sandeep S Katti¹, Vijay Kumar Chava²

¹Reader, Department of Periodontology, Maratha Mandal Dental College & Hospital, Belgaum, Karnataka, India; ²Professor & Head, Department of Periodontology, Narayana Dental College & Hospital, Nellore, Andhra Pradesh, India.

ABSTRACT

Background: The aim of the study was to study the clinical effects of ozonated water on periodontal tissues.

Materials & Methods: In the present study 30 subjects were selected with age ranging from 20 to 60 years and pocket depth of ≥ 5 mm. Two sites were selected in each patient which were divided into two groups. Group 1 (control group-irrigation with saline) and Group 2 (study group-irrigation with ozonized water) and clinical parameters were recorded at baseline, 15 days and 30 days.

Results: When the comparison of mean values of Plaque Index and Gingival Index between the groups and at different time intervals were made, statistically significant difference were observed at 30 days at 5% level.

When the mean values of clinical attachment level on mesial and distal site was compared between the groups, statistical significance was observed at 5% level and 1% level respectively. Similarly statistical significance at 5% level was observed at 15 and 30 days on buccal site.

Conclusion: Subgingival irrigation with ozonized water is beneficial adjunct treatment modality to enhance periodontal health with significant role in periodontal therapy.

Key Words: chronic periodontitis, ozonated water, subgingival irrigation.

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Address for Correspondence: Dr. Sandeep S Katti. #2467, Sector-12, ITC, Mahantesh Nagar, Belgaum-590016, Karnataka, India. Email: zorb@rediffmail.com

Introduction

Periodontal diseases are "infections" in which microorganisms initiate and maintain the destructive inflammatory response.¹ The primary etiologic agent are gram negative bacteria found in subgingival plaque.² Suppression of these pathogenic microorganisms is not possible for the patient to achieve, because of its highly organized nature thus giving emphasis on professional treatment approaches.³

Many oral antiseptics like chlorhexidine digluconate⁴, sodium hypochlorite and hydrogen peroxide have been tried for subgingival irrigation but these agents

may cause undesirable effects making way for an alternative approach.⁵

Ozone is one such agent which at different concentration ozonized water helps in reducing the number of infections caused by gram-negative microorganisms⁶

Hence, this study is an attempt to evaluate the clinical effect of ozonated water on periodontal tissues.

Materials and Methods

The study was designed and conducted in Department of Periodontics, Narayana Dental College, Chintareddy

Table 1: Comparison of plaque index and gingival index between groups with changes at different time points.

VARIABLES	SALINE MEAN± S. D		OZONIZED WATER MEAN ± S.D		P- VALUE)	
	(P.I)	(G.I)	(P.I)	(G.I)	(P.I)	(G.I)
BASE LINE	1.76±0.39	2.13±0.52	1.70±0.39	2.04±0.49	0.43 (N.S)	0.19 (N.S)
DAY- 15	1.28±0.33	1.55±0.42	1.23±0.30	1.44±0.36	0.29 (N.S)	0.16 (N.S)
DAY- 30	1.35±0.34	1.48±0.35	1.20±0.279	1.30±0.30	0.02 (SIG)	0.02 (SIG)
CHANGES						
BASE LINE TO DAY 15	0.48 ±0.32	0.58±0.37	0.47±0.36	0.60±0.33	1.0(N.S)	0.86 (N.S)
BASE LINE TO DAY 30	0.41 ±0.31	0.65±0.46	0.35±0.41	0.56±0.52	0.43 (N.S)	0.19 (N.S)
DAY 15 TO DAY 30	-0.07±0.29	0.07±0.28	0.03±0.24	0.14±0.23	0.04 (N.S)	0.09 (N.S)

N.S- Not significant SIG- Significant

Palem, Nellore, Andhra Pradesh. The study was approved by the ethical committee and conducted.

In-vivo

30 subjects were selected from Out Patient Department of Periodontics, Narayana Dental College, Nellore. Patients of both the sexes were selected and the age group ranged from 20 to 60 years. Patients selected were diagnosed as suffering from chronic periodontitis (AAP International Workshop for Classification of Periodontal Diseases, 1999) and had periodontal pockets ≥ 5 mm.

the start of the study or patients who were pregnant, lactating or patients who were smokers were excluded from the study.

Two sites were selected in each patient. The selected sites were divided into two groups

Group 1 (control group) – Irrigation of selected pocket site with saline.

Group 2 (study group) - Irrigation of selected pocket site with ozonized water.

After the baseline recordings of Gingival index, Plaque index, Probing pocket depth, and Clinical Attachment

Table 2: Comparison of probing pocket depth (mesial and distal) between groups with changes at different time points.

VARIABLES	SALINE MEAN± S. D		OZONIZED WATER MEAN ± S.D		P- VALUE)	
	(Mesial)	(Distal)	(Mesial)	(Distal)	(Mesial)	(Distal)
BASE LINE	5.4±1.2	5.7±1.5	5.4±0.92	6.0±1.4	0.72 (N.S)	0.14 (N.S)
DAY- 15	4.7±1.0	5.1±1.3	4.0±0.9	4.9±1.5	0.03 (SIG)	0.46 (N.S)
DAY- 30	4.7±1.1	5.0±1.3	4.0±0.9	4.7±1.6	0.02 (SIG)	0.18 (N.S)
CHANGES						
BASE LINE TO DAY 15	0.7 ±0.7	0.6±0.8	1.4±0.6	1.2±0.4	<0.0001(SIG)	<0.0001 (SIG)
BASE LINE TO DAY 30	0.7 ±0.7	0.6±0.9	0.8±1.3	1.0±1.5	0.72 (N.S)	0.14 (N.S)
DAY 15 TO DAY 30	0.0±0.0	0.03±0.02	0.1±0.3	0.2±0.5	0.16 (N.S)	0.10 (N.S)

N.S- Not significant SIG- Significant

Patients having any known systemic diseases, received any antibiotic therapy in the last 6 months, undergone any surgical or non-surgical therapy 6 months prior to

Level, a thorough supragingival scaling was performed. The grouping was done randomly allocating the site for control or test irrigating saline and ozonized water by using "Water Pik" oral

irrigation device® respectively for 40 seconds after which irrigation was stopped.

After irrigation the patients were instructed to perform regular oral hygiene habits, i.e. twice daily brushing by 'bass technique'. The irrigation was done thrice in a week for two weeks and the clinical parameters were recorded subsequently on 15 and 30 days. All the clinical and microbiological parameters were recorded in the proforma.

Ozone in gaseous form was obtained from portable table top "Ozone generating device"® which was bubbled in sterile water. The concentration of the gas displaced from the ozone generator was analyzed at a biochemical laboratory and the concentration was gas

in water was found to be 2.40gms/liter.

® "Water Pik", Fort Collins, U.S.A

® V-Can Industries, Chennai

Results

The results were subjected to **Wilcoxon Signed Rank Sum Test and Mann-Whitney test**. When the comparison of mean values of Plaque Index and Gingival index between the groups at different time intervals was made, statistically significant difference was observed at 30 days and between day 15 to day 30 at 5% level for plaque index and at day 30 at 5% level for gingival index respectively (Table 1).

Table 3: Comparison of clinical attachment levels (mesial and distal) between groups with changes at different time points

VARIABLES	SALINE MEAN± S. D		OZONIZED WATER MEAN ± S.D		P- VALUE)	
	(Mesial)	(Distal)	(Mesial)	(Distal)	(Mesial)	(Distal)
BASE LINE	4.8±1.7	4.9±2.0	4.8±1.9	5.4±1.5	0.75 (N.S)	0.05 (SIG)
DAY- 15	4.2±1.4	4.6±2.0	3.5±1.6	4.2±1.5	0.009 (SIG)	0.35 (N.S)
DAY- 30	4.2±1.4	4.6±2.0	3.5±1.5	4.0±1.4	0.004 (SIG)	0.14 (N.S)
CHANGES						
BASE LINE TO DAY 15	0.6±0.8	0.3±0.6	1.2±0.8	1.2±0.5	0.003 (SIG)	<0.0001 (SIG)
BASE LINE TO DAY 30	0.6±0.9	0.3±0.6	0.6±1.5	0.8±1.5	0.75 (N.S)	0.05 (SIG)
DAY 15 TO DAY 30	0.03±0.2	0.0±0.0	0.1±0.3	0.2±0.4	0.32 (N.S)	0.01 (SIG)

N.S- Not significant SIG- Significant

Table 4: Comparison of clinical attachment levels (buccal) between groups with changes at different time points.

VARIABLES	SALINE MEAN± S. D	OZONIZED WATER MEAN ± S.D	P- VALUE)
BASE LINE	4.8±2.2	4.1±1.6	0.14 (N.S)
DAY - 15	4.2±1.9	3.3±1.5	0.04 (SIG)
DAY - 30	4.2±1.9	3.3±1.5	0.04 (SIG)
CHANGES			
BASE LINE TO DAY 15	0.6±0.6	0.9±0.6	0.21(N.S)
BASE LINE TO DAY 30	0.6±0.6	-0.2±1.8	0.14 (N.S)
DAY 15 TO DAY 30	0.0±0.0	0.0±0.0	1.00(N.S)

N.S- Not significant SIG- Significant

When the mean values of probing pocket depth on mesial and distal sites were compared between the groups, statistically significant difference was observed at day 15 and day 30 at 5% level on mesial side and baseline to 15 days at 1% level on distal side.

No significance was observed when the mean values of probing pocket depth on buccal and lingual sites were compared between the groups, and at different time intervals (Table 2).

When the mean values of clinical attachment level on mesial and distal site were compared between the groups, statistical significance was observed at day 15 and day 30 for mesial side at 5% level and baseline to 15 days at 1% level for distal side (Table 3 & 4).

When the mean values of clinical attachment level on buccal site was compared between the groups, statistical significance was observed at day 15 and day 30 at 5% level. No significance was observed when the mean values of clinical attachment level on lingual sites

Discussion

In the first part of the study anaerobic bacterial colonies were grown on culture plates and irrigated with saline and ozonized water in vitro and tested for reduction in the number of colonies. According our results it was observed that the ozonized water (2.40gm/liter) was highly effective in reducing gram negative organisms like *Porphyromonas gingivalis*, *Prevotella intermedia*, *Fusobacterium nucleatum*. This is in accordance with the studies conducted by Azarpazhooh et al⁷ & Baysan et al⁸. This could be because, rapid inactivation of micro-organisms by rupture of cell wall membrane of the organism associated with the lesion. It was also observed that *Porphyromonas gingivalis*, *Prevotella intermedia* were more sensitive to ozonized water compared to *Fusobacterium nucleatum* in pure cultures. This is in agreement with the study conducted by Nagayoshi M et al.⁶

In the present study no growth of *P. gingivalis* and *P. intermedia* was observed from day 4 to day 7. This may be because of the direct oxidative effect of ozonized water on anaerobic micro flora, which is in agreement with Eugenia Bezirtzoglou et al⁹. However *F. nucleatum* is reduced but not completely eliminated.

This may be because *F. nucleatum* may have been in planktonic state. This is in agreement with the results of Hems et al¹⁰ who found that ozone was less effective in killing planktonic bacteria. This is also in agreement with Muller et al¹¹ who found that matrix embedded micro-organisms are protected against antimicrobials.

In the second part of the study irrigation of both saline and ozonized water was done with the help of Water Pik device to observe the clinical changes on periodontal tissues.

Our study showed significant reduction in plaque index at specific site in ozonized water group at day 30. This is in agreement with Ramzy et al¹² who found significant reduction in plaque index scores at the end of their 4 week study. The result of our study is also in agreement with Nagayoshi M et al⁶ who found that treatment of ozonized water inhibited strongly the formation of dental plaque biofilm on decalcified human tooth, which may be due to the reduction of live bacteria in their in vitro study. These findings suggest that ozonized water with antiplaque activity might be effective as disinfectant solution.

The gingival index is improved in both groups with more significance at day 30. This is in agreement with Ramzy et al¹². This could be attributed to accelerate healing of oral mucosa associating haemostatic action and bactericidal effect of ozonized water. This also could be explained by the fact that removal of the microbial plaque by use of Waterpik, effectively leads to resolution of gingival inflammation however these results are in contrast with Anders Hugoson¹⁴ who found no reduction in gingival index when Waterpik was used as oral irrigator.

The probing pocket depth when measured on the mesial side, significant reduction was found on day 15 and day 30 and the changes were highly significant from baseline to 15 days. These findings are in agreement with the study conducted by Ramzy et al¹². This could be explained by the oxidizing mechanisms of ozone which may involve direct reactions of molecular ozone and free radical mediated destruction. These findings are also in agreement with Ciancio et al¹³ who concluded that irrigation with or without antimicrobial agent have beneficial effect on oral health. This can be explained by the fact that oral irrigation disrupt and detoxify subgingival plaque.

The probing pocket depth on the distal side was not significant. However highly significant difference was observed at baseline to 15 days interval. This is in contrast to Ramzy et al¹² who found significant reduction in probing pocket depth on distal side. This could possibly be explained that there was variation in penetration of the irrigating agents used in our study.

The probing pocket depth on the buccal side and lingual side had no significant differences when compared between the groups and at different time intervals. This is in accordance with Ramzy et al¹². This can be explained by the fact that in the present study most of the patients had shallow pockets, hence less of edematous tissue on either side showing irrigation ineffective¹⁵

The clinical attachment levels on the mesial side had significant difference at day 15 and day 30 and also significant changes were seen at interval of baseline to 15 days. This could be because plaque accumulation is greater in interproximal areas¹⁴ and that irrigation had disrupted plaque and thus reduced the clinical attachment. Since more of plaque is seen at interproximal site the tissue was more edematous on the mesial side and therefore penetration of the irrigating solution was easier¹⁵. Also there was significant reduction in the mean values of ozonized water at 15 days as compared to saline, signifying ozonized water as better irrigating agent.

The clinical attachment levels on the distal side at baseline in ozonized water group were higher compared to saline group and the progressive decrease was observed.

The clinical attachment levels on buccal side had significant values on day 15 and day 30. This could be due to the fact that most of the patients in the present study had shallow pockets on the buccal side, and therefore changes were evident.

The clinical attachment levels on the lingual side had no significant difference in the present study. This is because during the course of the study difficult accessibility on the lingual side to irrigate subgingivally was evident. However the mean values of ozonized water group on lingual side when seen at different time intervals were higher than saline group.

Conclusion

From the results obtained the following conclusions were arrived:

1. Subgingival irrigation with ozonized water is beneficial adjunct treatment modality to enhance periodontal health and has a significant role in periodontal therapy.
2. Subgingival irrigation is a simple, inexpensive and non invasive technique and ozonized water reduces gingival inflammation and inhibits attachment loss.
3. From the evidence of this study, it can be concluded that ozonized water is more effective as compared to saline in reducing the subgingival microbiota and is effective antimicrobial agent.

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