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TO COMPARE THE EFFICACY OF 0.2% OZONATED WATER & 0.02% CHLORHEXIDINE AS AN IRRIGANT ALONG WITH SCALING IN TREATMENT OF CHRONIC PERIODONTITIS PATIENTS

Periodontology

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ABSTRACT

Scaling is used as non surgical approach in treatment of chronic periodontitis, in which distilled water acts as an irrigant, having non-specific action of flushing the pocket contents without other beneficial effect. Recently the adjunct use of various subgingival irrigation agents were suggestive which may effectively help to reduce deep pockets and qualitative flushing of pocket content. Hence the aim of the present study is to compare the efficacy of 0.2% of ozonated water & 0.02% chlorhexidine water as an irrigant along with SRP in the treatment of chronic periodontitis patients.

Materials & Methods: In this study, the chronic periodontitis patients were studied for two groups for the mentioned irrigants. The pre-treatment & post-treatment parameters were recorded (OHIS index, periodontal pocket depth, Clinical attachment loss, Microbial count)

Results: Results were expressed as mean±SD and proportions as percentages. Intragroup comparisons were made by paired t-test and unpaired t-test for intergroup comparisons. For all the tests, a P-value of 0.05 or less was considered for statistical significance. The intragroup comparison showed improvement in all the parameters in both the groups however ozonated water group showed statistically significant difference in all clinical and microbiological parameters, except it showed similar results for gram negative bacilli in both groups.

Conclusion: The present clinical study suggestive of the adjunctive use of antimicrobial irrigants such as 0.02% of chlorhexidine & 0.2% of ozonated water to SRP can provide additional clinical benefits compared to SRP alone, it was found that ozonated water showed more beneficial results with respective to (PI), (GI), (PPD), (CAL) parameters and microbial count. Further studies can be possible to confirm these findings with varying concentrations of mentioned irrigants in SRP in the treatment of chronic periodontitis patients.

KEYWORDS

INTRODUCTION:

Periodontitis is a destructive inflammatory disease of the supporting tissues of the teeth and is caused either by specific microorganisms or by a group of specific microorganisms, resulting in progressive destruction of periodontal ligament and alveolar bone with periodontal pocket formation, gingival recession, or both.[1] the pathophysiology of which is related to tooth accumulated microbial plaque and the host response to those accumulations.[2,3] These diseases are induced by a variety of organisms that colonize and proliferate supragingivally and subgingivally in susceptible individuals.[4]

Ozone was first used in medicine in 1870 by Landler. However, it was not until 1932 that ozone was seriously studied by the scientific community, when ozonated water was used as a disinfectant by Dr. E. A. Fisch,[5] a Swiss dentist. It is an unstable gas and it quickly gives up nascent Oxygen molecule to form Oxygen gas. Due to the property of releasing nascent Oxygen, it has been used in human medicine since long back to kill bacteria, fungi, to inactivate viruses and to control hemorrhages.[6]

Ozone is currently being discussed in dentistry as a possible alternative antiseptic agent. The use of ozone has been proposed in dentistry due to its disinfectant, antibacterial and healing properties. In medicine and dentistry, ozone is used as a powerful sterilizing agent either in the gaseous or aqueous phase, as it successfully kills bacteria, fungi and viruses.[7]

Ozone finds dental application for caries and hypersensitivity treatment, sterilization of cavities and root canals, bleaching, treatment of mucosal lesions, periodontitis, periimplantitis etc. also it has a bactericidal effect, particularly in staphylococcal, streptococcal and other infections. Its high antimicrobial power without the development of drug resistance has been noted in water purification and food preservation.[2] Recent investigations have reported antimicrobial effects on oral pathogens of both gaseous and aqueous forms of ozone, and the effectiveness of ozone in the treatment of oral diseases is currently a subject of intense research.

According to German dentist Fritz Kramer, ozone, such as in the form of ozonated water, can be used as a powerful disinfectant, in its ability to control bleeding, in its ability to cleanse wounds in bones and soft tissues, by increasing the local supply of oxygen to the wound area, ozone can improve healing, ozonated water can increase temperature in the area of the wound, and this increase the metabolic processes related to wound healing.[6,7]

Gingivitis and periodontitis are characterized by a local hypoxia of tissues Antihypoxic effect of Ozone brings about the rise of pO2 (Partial pressure of oxygen) in tissues and improves transportation of oxygen in blood, which results in change of cellular metabolism – activation of aerobic processes. Additionally it has Immuno-stimulating effect- Ozone influences cellular and humoral immune system. It stimulates proliferation of immune competent cells and synthesis of immunoglobulins.[8]

Another potent antiseptic, Chlorhexidine is a gold standard against which other antiplaque and antigingivitis agents are measured.[9] It was developed by Imperial Chemical Industries in England during 1940's. It was marketed as a general antiseptic in the year 1950. In 1957 chlorhexidine was introduced for human use in Britain as an antiseptic for skin. Later it was widely used in medicine and surgery. Plaque inhibition first investigated by Schroeder in 1969.[10] A definitive study for caries inhibition by inhibition of dental plaque was done by Loe and Schiott 1972.[11]

Conventionally, mechanical subgingival instrumentation namely scaling and root planing has been the main treatment modality in periodontal therapy by which most of the periodontal conditions can be effectively managed. Variation in the efficacy of scaling and root planing to gain access into deep pockets, furcations, root morphological alterations can leave residual plaque deposits in the pocket which can result in the recolonization of the treated areas with pathogenic organisms. This has led to the use of antibacterial agent usually in the form of subgingival irrigants as an adjunct to scaling and root planing.

Sub gingival irrigation with distilled water has a non-specific action of flushing the pocket contents which are associated with chronic periodontitis.[12] Studies in the past two decades have reported improvements in terms of use of adjuvant irrigants which provide the specific and more effective action of flushing of pocket contents , and effectively alter the quality and quantity of unattached subgingival plaque and alteration in clinical and microbiological parameters with the adjunct use of subgingival irrigation agents like, chlorhexidine , ozonated water.[13] There was less literature on the efficacies of various different kind of irrigants, yet to find a better efficacious subgingival

irrigant. Thus the aim of present study was undertaken to evaluate and compare the efficacies of 0.2% ozonized water and 0.02% chlorhexidine as subgingival irrigation as an adjunct to scaling and root planing in patients with chronic generalized periodontitis.

MATERIALS AND METHODS:

A randomized controlled clinical trial was performed. A total of 20 systematically healthy chronic periodontitis patients were selected for this study from the Out-Patient Department of Periodontics, Al Badar Rural Dental College, Gulbarga, Karnataka. Patients of both sexes within the age limit of 20–60 years were included in the study and having atleast with 20 natural teeth. Patients who were pregnant or lactating; suffering from any known systemic diseases, who had received any surgical or non-surgical therapy 6 months prior to the start of the study, who had received any antibiotic therapy in the last 6 months, who had or are on steroids, who had received any chemotherapeutic mouth rinses and oral irrigation during the past 6 months and who were smokers were excluded from the study. All participants gave informed consent. A total 20 chronic periodontitis patients subjected to SRP were divided into two groups as :

Group A – (Ozonated water Group (0.2% ozonated water as an irrigant)
Group B – (Chlorhexidine Group (0.02% Chlorhexidine as an irrigant)

The study period of 7 days , was divided into two time intervals, i.e. baseline (T0) to 7th day (T1). The efficacy of the mentioned irrigants was compared using following parameters:

1) Oral Hygiene Index Simplified (Greene and Vermilion, 1964): (OHIS) measured with the help of mouth mirror and Sheferd's probe
2) Probing pocket Depth: (PPD) was measured with William's Graduated Periodontal Probe, on six surfaces for each tooth
3) Clinical Attachment loss: (CAL) it was calculated in gingival recession – summation of distance from CEJ to marginal gingiva and PPD
4) Microbiological count: The subgingival plaque sample was obtained with the help of subgingival curette or a hand scaler and which was transferred on to sterile glass slide, prepared a thin layer of subgingival plaque biofilm covering 1/3rd of glass slide, stained with gram staining was carried out, the slide then examined under the light microscope (100X), for the 1/8th of total field for gram positive cocci, gram positive bacilli, gram negative bacilli.

All the clinical and microbiological parameters (Oral Hygiene Index Simplified, Probing pocket Depth , Clinical Attachment loss and Microbiological count) were recorded at T0 before the scaling procedure, then the ultrasonic scaling procedure was performed using mentioned irrigants in divided subjects with respected groups, patients were given oral hygiene instructions and they called after 7 days for follow up, to record all the clinical parameters at T1.

STATISTICAL ANALYSIS:

Statistical analysis was done using inferential statistics such as independent t-test for comparison of changes in clinical and microbiologic parameters between Group A (0.2% ozonized water as an irrigant) and Group B (0.02 % chlorhexidine group as an irrigant) at the baseline (T0) and after 7 days (T1). The results were expressed as mean±SD and proportions as percentages. Intragroup comparisons were made by paired t-test and unpaired t-test for intergroup comparisons. For all the tests, the P-value of 0.05 or less was considered to be statistically significant.

RESULTS:

All patients completed the whole study period. Baseline data showed all parameters recorded before the treatment and showed satisfactory changes after 7 days after the treatment. In the result, the OHIS (Oral Hygiene Index Simplified) was not considered for compare analysis, as it was suggestive of patients preoperative oral health status hence the all the remaining clinical and microbiological parameters were considered for statistical analysis for pre and post treatment data in patients with Group A and group B independently.

Table 1, showing the intra-group comparison of clinical and microbiological parameters in patients with Group A, and it showed statistically significant difference in all the clinical and microbological parameters when compared baseline values i.e. pre treatment values and post treatment values in same group, where the p-value ≤ 0.05, is considered to be statistically significant.

[Table 1] Group A - Ozonated water

MEAN AND STANDARD DEVIATION (SD) OF ALL THE PARAMETERS FOR OZONISED WATER

	MICROBIAL COUNT GRAM +VE BACILLI		GRAM +VE CACCI		GRAM -VE BACILLI		PPD		CAL	
	PRE	POST	PRE	POST	PRE	POST	PRE	POST	PRE	POST
MEAN	37.6	21.8	50.2	26.1	13.6	4.6	5.68	3.71	7.42	4.81
SD	8.28	5.06	8.48	4.95	5.38	2.58	1.11	0.85	1.40	0.90
t VALUE	4.88		7.36		4.52		4.24		4.62	
P VALUE	0.00006 S		0.00001 S		0.00013 S		0.0002 S		0.0001 S	

Table 2, showing statistical analysis of the intra-group comparison of clinical and microbiological parameters in patients with Group B, where it showed no statistically significant difference in all the clinical and microbological parameters except for the count of gram negative bacill when compared baseline values and post treatment values in same group, where the p-value ≤ 0.05, is considered to be statistically significant.

[Table 2] Group 2- Chlorhexidine group

MEAN AND STANDARD DEVIATION (SD) OF ALL THE PARAMETERS FOR CHLORHEXIDINE

	MICROBIAL COUNT GRAM +VE BACILLI		GRAM +VE CACCI		GRAM -VE BACILLI		PPD		CAL	
	PRE	POST	PRE	POST	PRE	POST	PRE	POST	PRE	POST
MEAN	40.4	30.8	41.5	32.3	12.3	7.3	5.02	3.91	6.41	5.19
SD	16.08	16.07	26.16	19.03	4.63	4.36	1.49	1.43	1.62	1.38
t VALUE	1.34		0.85		2.34		1.61		1.73	
P VALUE	0.0985 NS		0.2032 NS		0.0155 S		0.0624 NS		0.0504 NS	

Table 3, showing intergroup evaluation of all clinical and microbiological parameters it was found that in patients with Group A when compared to the patients with Group B, showed more significant improvement in OHIS, probing pocket depth (PPD), clinical attachment gain (CAL) and microbial count after 7 days.

[Table 3] Compared Evaluation of Two Groups

Group A vs Group B	Microbial count for gram +ve bacilli	Gram +ve cocci	Gram –ve bacilli	Probing pocket depth (PPD)	Clinical attachment loss (CAL)
t value	2.23	2.27	2.28	2.29	2.12
p value	0.0158 S	0.0179 S	0.0146 S	0.0172 S	0.0241 S

S: statistically significant, NS : not significant

DISCUSSION:

The clinical trial of present study was to compare the clinical effects of adjunctive use of 0.2% ozonized water in 20 patients and use of 0.2% of chlorhexidine in 20 patients as a subgingival irrigation along with mechanical therapy (SRP) in the treatment of chronic periodontitis patients, using different parameters such as OHIS, PPD, CAL and Microbiological count, after the completion of study period (7days), this study showed that the use of 0.02% of ozonated water showed better changes in all the clinical parameters when compared with 0.2% of chlorhexidine as a subgingival irrigant. The main goal of nonsurgical periodontal therapy is to eliminate bacterial plaque, supra and subgingival calculus and prevent their recolonization. As SRP is found to be frequently inadequate in curing severe periodontal infections so the adjuvant use of antimicrobial irrigants can play important role in flushing of the periodontal pocket contents. Mechanical measure (ultrasonic motion) along with chemotherapeutic measures is always showed a better results in non surgical treatment plan. Studies done by Waerhaug et al, and Rabbani et al., concluded that complete plaque removal by mechanical measures in pocket depth above was 5mm was difficult,[14,15] so adjunctive methods that enhance the effect of mechanical measures can be used.

Although the chlorhexidine is potent antiseptic agent it has disadvantages like propensity to stain teeth and restorations and toxicity for gingival fibroblasts, which can impair periodontal healing and cause mucosal desquamation.[16]

Ozone has been recently advocated as an irrigating agent predominantly due to its antimicrobial action which results from oxidation of microbial cellular components and altering the sub gingival homeostasis. Due to its free radical mediated reaction it has been used in human medicine since long back to kill bacteria, fungi, to inactivate viruses and to control hemorrhages. Study done by Issac A et al 2015, in which author found that the Ozonized water subgingival irrigation can improve the clinical and microbiological parameters in patients with chronic periodontitis[2], Kshitish D et al 2010, in his crossover split-mouth clinical trial found that O3 and chlorhexidine

showed no antibacterial effect on Porphyromonas gingivalis (Pg) and Tannerella forsythensis, but the antifungal effect of ozone was found pronounced during the study period, unlike CHX, which did not demonstrated any antifungal effect[17], while our study showed better antimicrobial effect of ozonated water than that of chlorhexidine.

Schlangenhauf et al. showed the disclosed the antimicrobial action of ozonized water against the periodontal pathogens like Aggrigatibacter actinomycetemcomitants and Porpyromonas gingivalis.[18] There were results of invitro studies in dental literature reporting the effect of ozonized water against bacteria invading the dentinal tubule. A study conducted by Nagayoshi et al (2004) showed that ozonated water (0.5-4mg/l) was highly effective in killing both gram positive and gram negative oral microorganisms such as Porphyromonas endodontalis and Porphyromonas gingivalis[19], this found similar result to our study which showed the significant antibacterial effect of ozonated water against gram positive bacteria (bacilli and cocci) than chlorhexidine water except for gram negative bacilli. Huth et al (2011) found significant reduction in periodontal pathogens namely P.gingivalis, Parvimonas micra, Tannerella forsythia on irrigation with gaseous / aqueoue ozone as compared to 0.2% CHX.[20]

After 4 weeks of ozonized water irrigation, Hayakumo et al., evaluated a statistically significant mean reduction of 2.24mm , and clinical attachment gain of 2.42,[21] and Dodwad V et al., evaluated a statistically significant mean reduction 2.5mm (39.68%) in probing pocket depth when compared with the baseline, shows similar results to our study.[22]

There are a few limitations to the current study, such as the study examined the effects on specific periodontal pathogens i.e. gram bacterias, also it is carried out with small sample size, as the stability of ozonated water is low and it can dissipated very quickly at room temperature over 5 minutes.[23] so careful handling should be needed. The 7 days may be an insufficient time period to evaluate the efficacies of both the groups. Our study unlike previous ones, evaluated efficacy of the chlorhexidine gluconate with lesser percentage i.e. 0.02% and 0.2% of ozonized water in chronic periodontitis patients, as some studies showed that the chlorhexidine gluconate can produce adequate efficacy at lower concentrations.

CONCLUSION :

The present study suggestive of 0.2% ozonized water is more efficiant than 0.02% chlorhexidine water when used as an irrigant along with SRP in the treatment of chronic periodontitis patients. Unlike chlorhexidine, ozonated water found cost effective for patients, ozone in any form it has the ability to control bleeding, to cleanse wounds in bones and soft tissues, ozone can improve wound healing too, and it can prepared by portable ozone generator device easily and can be available from purification plant also. The local ozone application can serve as potent atraumatic, antimicrobial agent to treat periodontal disease non surgically both for home care as well as professional practice.

The present clinical study found that the adjunctive use of antimicrobial irrigants such as chlorhexidine & ozonized water to SRP may provide additional clinical benefits compared to SRP alone. However, there are less number of studies are conducted, further studies utilizing larger sample sizes and longer follow-up periods are recommended for supporting the finding of this study and a well-designed form of non surgical therapy (SRP) along with ozonized water as an irrigant is needed as it can be proved better when used as adjunct subgingival irrigant in Scaling and root planning.

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