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Original Research Paper

Dental Science

ADJUNCTIVE EFFECT OF DIODE LASER THERAPY AND H_2O_2 MOUTHRINSES ALONG WITH SCALING AND ROOT PLANING IN THE MANAGEMENT OF PERIODONTAL POCKET- A CLINICO-MICROBIOLOGICAL STUDY.

Dr. Maydina Achom*	PG student, Department of Periodontology and Oral Implantology-I.T.S Centre for Dental Studies and Research Muradnagar Ghaziabad, U.P-INDIA *Corresponding Author
Dr. Farheen Khan	PG student,Department of Periodontology and Oral Implantology-I.T.S Centre for Dental Studies and Research Muradnagar Ghaziabad, U.P-INDIA
Dr. Mallika Sethi	Professor, Department of Periodontology and Oral Implantology-I.T.S Centre for Dental Studies and Research Muradnagar Ghaziabad, U.P-INDIA
Dr. Nikhil Sharma	Professor and Head of Department of Periodontology and Oral Implantology- I.T. S Centre for Dental Studies and Research Muradnagar Ghaziabad, U.P-INDIA

ABSTRACT Periodontal therapy focuses on removal of the periodontal microbial biofilm and stop further progression of the destruction there by restoring the biological function of period on tally diseased root surfaces. Our study aims to compares and evaluate the effectiveness of diode laser with Scaling and root planing and Hydrogen (Peroxide H2O2) mouth rinses along with scaling and root planing in treatment of chronic periodontitis. A total of 30 patients having pocket probing depth ≥ 5mm were randomly assigned to the group I- (Laser with scaling and root planing) and group II- (H2O2 with scaling and root planing)- 15 each. In the result, it was observed that the clinical parameters from baseline to 3 months between group I and group II showed significant difference with better improvement in the group I. Thus, it was concluded that the adjunctive used of diode laser along with mechanical debridement have additional benefit in the clinical as well as microbial management of chronic periodontitis patients.

KEYWORDS : Chronic Periodontitis, Diode Laser Pocket Therapy, Hydrogen PeroxideH2O2 mouthrinse.

INTRODUCTION

Periodontitis is a multi factorial inflammatory disease which is cause by the progression of bacterial infection sub gingivally leading to destruction of the periodontium.[1,2] Periodontal destruction are result of combination of bacterial factors along with host immune interaction that are changing over time. Primary goal of periodontal therapy aims to eliminate the bacterial deposits and to stop further progression by removing the supragingival and subgingival plaque and to restore the biological function of periodontally diseased root surfaces for attachment of periodontal fibers. Conventional mechanical debridement i.e., scaling and root planning (SRP) is considered to be the gold standard for the non-surgical periodontal treatment that reduced the levels of periopathogens. Although SRP improves the clinical parameters but complete elimination of bacterial deposits is difficult to accomplish as mechanical therapy alone may fail to eliminate pathogenic bacteria in the subgingival areas and in areas that are inaccessible to periodontal instruments, such as deep periodontal pockets, furcation areas, and root depressions.[3-5]

To make the conventional mechanical therapy more effective, several adjunctive treatment modalities have been developed. Among these, the use of soft tissue lasers has been proved to act as an adjunct for the reduction of bacterial infection because of its bactericidal and detoxification ability and for its capacity to reach sites that conventional mechanical instrumentation cannot reach.[6] Diode laser application, with a wavelength in between 655 and 980 nm, can accelerate wound healing through accelerated collagen synthesis, promotion of angiogenesis, and augmentation of growth factor release. The soft tissue diode lasers are well absorbed by melanin and haemoglobin and other chromophores present in periodontally diseased tissues and this laser energy is delivered with a thin, flexible fiber optic system (300 to 400 μm in diameter) that allows the clinician to access the diseased tissue.[7,8]

H_2O_2 mouth rinses have been used as an anti-plaque and anti-gingivitis agents for many years. Various studies had described the antimicrobial activity of H_2O_2 as bactericidal for known periodontal pathogenic bacteria.[9,10] H_2O_2 mouth rinse prevent the colonization of filaments, fusiforms, motile and curved rods and spirochetes in developing plaque and delayed plaque formation.[11]Therefore, the aim and objective of this clinical and microbiological evaluation was to compare the effectiveness of diode laser along with SRP and SRP with H_2O_2mouth rinse in the management chronic periodontitis and to find the amount of bacterial reduction in both the groups.

MATERIALS AND METHOD

The study was carried out on patients visiting the outpatient Department of Periodontology & Oral Implantology. 30 systemically healthy individuals within 35-50 years of aged with Chronic Periodontitis having periodontal pocket probing depth ≥ 5mm were allotted for the study. The patients were randomly assigned to the test group and the control group 15 each respectively with the help of a flip of coin.(Figure 1: Study design flow chart) The following standardized clinical parameters: -Gingival Index (GI), Plaque Index (PI), Pocket probing depth (PPD) and Colony forming unit (CFU) were recorded at baseline,1month and 3 months. The exclusion criteria include individuals with any systemic disease or medication that would influence the treatment; periodontal treatment in the previous 6 months; pregnant or lactating women; smokers (> 5 cigarettes/day); failure to comply to oral hygiene instructions provided or/and to keep to regular study appointments. Patients were informed about the study and their inclusion was purely voluntary and written informed consent was taken from the patient.

CLINICAL MANAGEMENT

At baseline, the clinical examination was performed and the

subgingival microbiological plaque sample was collected after the patient received supragingival scaling. The pocket therapy using 980 nm diode laser (Zolar technology & Manufacturing co.inc, Canada) with flexible glass fiberoptic guide with 300 micrometer spot diameter for bacterial reduction was done at a setting of 0.5W, 0.05 sec pulse radiation mode, coagulation setting at 0.8W continues wave performed on 1st day ,7th day and 14th day. The end of the fiberoptic guide was calibrated to the PPD approximately 1 mm less than the measured pocket depth. This allowed absorption of laser energy around the tip, and irradiation of the pathogenic periodontal tissues without thermal damage to healthy tissues. The fiberoptic guide was introduced into the periodontal pocket parallel to the long axis of the root surface and focus at the diseased soft tissue lining the pocket wall and was moved around the tooth, from apical to coronal direction in a sweeping motion and towards the top of the pocket with overlapping horizontal and vertical strokes maintaining contact with the soft tissue at all times. This procedure was carried out in all four quadrants, i.e., buccally, lingually, palatally and approximally. The procedure was repeated until the full circumference of the root was irradiated and signs of a new wound site that is until fresh bleeding appeared. The total irradiation period for the entire procedure was approximately 30 second per pocket. In cases of bleeding during laser irradiation, thorough rinsing with saline solution was performed to prevent thermal damage to the root surface. The duration of lasing depends on the depth of the respective periodontal pocket.For the control group that is SRP with H_2O_2, mouth rinses containing $H_2O_2$1.5% w/v was prescribe on home basis for 15 days and subgingival irrigation was performed at 1st day, 7th day and 14th day. (Figure 2-a, b)

For the microbial examination, prior to subgingival scaling and pocket therapy plaque sample was collected in test tubes with 3ml phosphate buffer saline (PBS) and the samples were first shaken by vortexing for 1 min. The undiluted PBS containing plaque sample were then inoculated on blood agar, trypticase soya broth plates (TSB) and placed in incubator at 37℃ for 48 hours. Colony counting was done by placing the culture plate under the manual colony counter and dividing it into four equal parts. Further colonies of one part were counted and multiplied it by four. (Figure:3). This was done at baseline, 1 month and 3 months for both the groups.

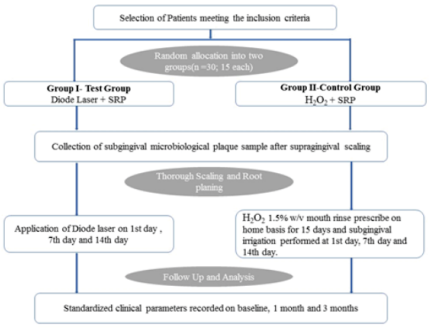


FIGURE 1: CONSORT FLOW DIAGRAM DEPICTING STUDY DESIGN

Figure 2: (a)H_2O_2 rinses with SRP; (b) Diode Laser pocket therapy after SRP

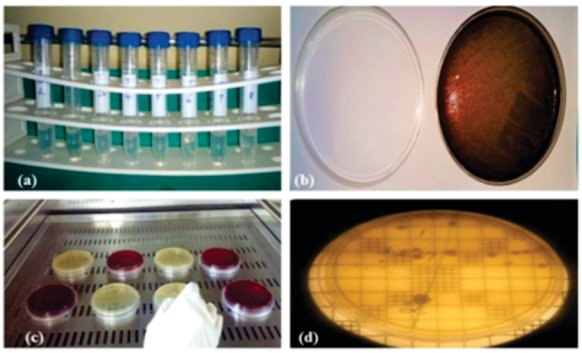


Figure 3: Microbiological analysis

STATISTICAL ANALYSIS

All the data were documented in Microsoft Excel sheet and then the statistical analysis was done using SPSS software. Test of normality was done using Kolmogorov Smirnov, Shapiro-Wilk, since most of the parameters were distributed normally. Parametric tests like independent and paired t tests were used to analyses the data obtained. Kruskal-Wallis test was opted for multiple comparisons of the non parametric data (PPD reduction, GI, PI and CFU) between groups. In addition, Mann-Whitney test was applied to compare the groups. Friedman and complementary Wilcoxon signed-ranks test were applied to determine the differences in the means of clinical parameters for the baseline, 1 month and 3 months. One-way analysis of variance (ANOVA) was used in order to compare the microbial variables between the groups after confirming the normality of data distribution. Paired t test was used to determine the significance of the difference between baseline ,1 month and 3 months within each group. P <0.05 was considered significant.

RESULTS

In the present study, the mean value of the PPD decreases significantly in the laser and SRP group from approximately 5-7 mm at baseline to approximately 1-2mm at 3 months and in the $H_2O_2$and SRP group from approximately 5-7 mm at baseline to 3-4 mm at 3 months.

The table 1 show the distribution of mean ± SD of PI, PPD, GI at different interval of the two group. The mean PI, PPD and GI from baseline to 3 months between group I and group II showed significant difference with better improvement in the group I that is laser group. For the colony forming unit (CFU), there was a significant reduction of microbial count in both the group I and

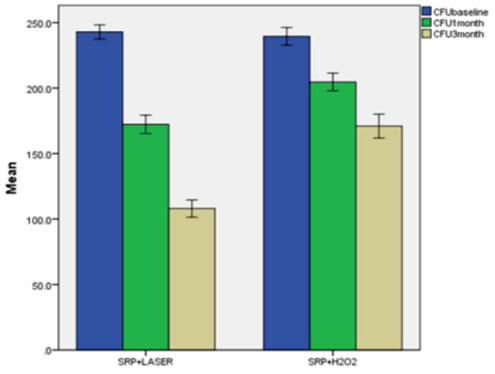
Table 1: Comparison of mean of Plaque Index(PI), Pocket Probing Depth(PPD), Gingival Index(GI) at different time interval between Group I and Group II.

Parameters	Group	Mean ±Std. Deviation	Mean diff. ± SEM	P value
PI baseline	I	1.67±.488		1.000
	II	1.67±.488	0.000±.178	
PI 1month	I	.87±.352		.326
	II	1.00±.378	.133±.133	
PI 3month	I	.40±.507		.025*
	II	.80±.414	.400±.169	
PPD baseline	I	5.47±.640		.333
	II	5.27±.458	.200±.203	
PPD 1month	I	4.20±.676		.417
	II	4.00±.655	.200±.243	
PPD 3month	I	2.20±.561		.007*
	II	2.80±.561	.600±.205	
GI baseline	I	2.60±.507		1.00
	II	2.60±.507	.000±.185	
GI 1month	I	1.633±.4806		.687
	II	1.700±.4140	.0667±.1638	
GI 3month	I	.533±.4806		.004*
	II	.967±.2289	.4333±.1374	

Value expressed as Mean ± SD (Standard Deviation);Mean diff. ± SEM(Standard Error of the Mean). Statistically no significant difference at P>0.05, Statistically significant difference at * P<0.05.

II (Graph I) from baseline to 3 months. However, combination of laser and SRP group showed more decrease in the CFU at the 3 months(baseline-242.93±9.77; 1month-172.33±12.67;3months-108.0±11.92) than that of the $H_2O_2$and SRP group (baseline-239.53±12.23; 1 month-204.67±12.15; 3

months-171.0±16.49).This finding can be due to the bactericidal and detoxification effect of the diode laser.



Graph 1: Mean comparison of the Colony Forming Unit between Group I and Group II at Baseline, 1 month and 3 months.

DISCUSSION

This randomized controlled clinical study evaluates the effectiveness of diode laser therapy as an adjunct to SRP comparing with H_2O_2 along with SRP on the clinical and microbiological parameters of patients with chronic periodontitis. Long-term clinical success of periodontal therapy depends on the continuing periodontal maintenance phase. Since past decades, lasers have shown several applications in dentistry. Laser therapy increased the levels of vascular endothelial growth factor, transferring growth factor β and mRNA expression of insulin growth factor on hGF resulting in a predominant role on the connective tissue metabolism.[12]The beneficial effects of non surgical laser therapy to treat periodontal diseases have been discussed in many studies and reviews.[13-15]The present study shows the reduction of microbial load by the laser as the main deciding factor for their use as adjuncts to conventional periodontal treatment in comparison with H_2O_2mouth rinse.

Moritz et al[16]in their study used a diode laser of 2.5 W output power (pulse mode) in treatment of periodontal pockets following an ultrasound and after 6 months follow-up, bacterial reduction was significantly greater in the laser group with improvement of bleeding after probing, compared to the control group in which the ultrasound was followed by rinsing with H_2O_2. Our study shows similar finding specially in relation tobacterial reduction. Caruso et al[7] have used the same potency as in the study performed by Moritz et al[16] but their study showed that additional treatment with diode laser may lead to a slightly improvement of clinical parameters whereas no significant differences between test and control group in reduction of perio-pathogens were found. Dukic et al[17]also has similar results as our study in which diode laser led to significant improvement of clinical parameters (PI, PPD) after 30 days compared with that of SRP alone. Romanos et al[18]showed that instrumentation of soft periodontal tissues with diode laser led to a complete epithelial elimination when compared to conventional treatment method with hand instruments. Kreisler et al[19] found that application of the diode laser for pocket decontamination in periodontal therapy may cause damage to collateral soft tissues when applied incorrectly. The reported results on the use of diode lasers are still controversial.[19]These changes in the results may be due to small sample size, short follow up periods, difference in the definitions considered for classification of the disease-inclusion of moderate and deep pockets, use of different laser system and its parameters.

Several reports have described the antimicrobial activity of H_2O_2 as bactericidal for known periodontal pathogens. Daily use of a mouth rinse containing 1.5%H_2O_2, in combination with tooth brushing is more effective in maintaining periodontal health.[20-22] No complaints of side-effect was reported by the patients using the H_2O_2 rinse in our study. However, reports have documented several adverse effects of topically applied H_2O_2, such as pathologic changes of preneoplastic lesions in hamsters and inhibition of collagen synthesis and glucose metabolism in bone in vitro.[23,24]In our study, both the treatment modality show statistically significant improvements in all the clinical as well as microbiological parameters from baseline to 1 month and to 3-month. However, the lasers group showed better results.

CONCLUSION

Within the limitation of this study, the use of diode lasers as an adjunct to SRP during treatment as well as maintenance phase showed better results when compared to SRP and H_2O_2.Hence,laser pocket therapy in combination with conventional mechanical debridement- Periodontal therapy represent a new approach in the management of periodontal pocket with chronic periodontitis.

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