

## Comparative Assessment Of The Antibacterial Efficacy Of Chlorhexidine And Diode Laser 910NM Among Chronic Periodontitis Patients

Research Article

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### Abstract

**Aim:** The aim of the present study is to compare the antibacterial efficacy of diode laser with chlorhexidine among chronic periodontitis patients.

**Materials And Method:** Total of 20 subjects were included in the study. Group I- Patient is given chlorhexidine for pre-procedural decontamination and Group II- Patient underwent laser preprocedural decontamination. Subgingival plaque was collected after isolating the area with cotton, using sterilized curette. Group I - 0.12% CHX mouthwash was given to swirl around the mouth for 1 minute and spit. Group II - 910nm diode laser was used on all the surfaces in non contact mode for decontamination at 0.25 Watt. Subgingival plaque was collected using different sterilized curette. Collected subgingival plaque samples were incubated for 24 hours. Swab from the sample was swapped over the nutrient agar plate and incubated for 24 hours. Colonies were counted manually. Statistical analysis was done.

**Results:** In the present study, there was a significant difference in pre and post of both the groups, but there was no significant difference between chlorhexidine and diode laser.

**Conclusion:** Mouthrinse containing 0.12 percent CHX and diode laser of 910nm with 0.25 watt are equally effective in reducing the levels of spatter bacteria generated during ultrasonic scaling and their use could help decrease the level of microbial contamination in the subgingival plaque. Owing to its strong antibacterial effect and the fact that it has fewer side effects than CHX, a solution con diode laser may be a good alternative to that containing 0.12 CHX as a preprocedural mouthrinse.

### Introduction

The oral cavity is heavily colonized by a diverse, relatively specific microbial population, characterized by a sessile microbial community, with a clear interdependent link of microorganisms adhered to each other and/or on dental surfaces, arranged in so-called oral biofilm, or plaque.[1, 2] This biofilm was described as a three dimensional complex with microorganisms embedded in an extracellular polymeric matrix of substances. Dental plaque has a wide range of microorganisms, some are beneficial and some can be detrimental as well. These bacteria have the power to cause masses of dental infection. Aerosol created during dental treatment has proven to have a great amount of bacterial load. Pre-procedural contamination has become a new trend to overcome this ordeal.

For almost a decade, different procedures and antimicrobial agents have been proposed for minimizing microbial load. One of the most common formulas is mouth rinse. Mouthrinse was and is used even currently to help with the decontamination process. Chlorhexidine is considered gold standard material for reducing oral bacterial load for many years now.[3-6]. It has broad spectrum antibacterial activity with substantivity of 8-12 hours. [7, 8] Some antiseptics, such as essential oils and cetylpyridinium chloride, have been used as pre-procedural mouthwashes (CPC). [9] CPC has significant antimicrobial activity and is regarded as a healthy commodity to market. One of the latest techniques is using lasers for decontamination.

Because of its minimally invasive action, laser radiation in dentistry has a wide range of applications in a number of specialties.

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Hard and soft tissue removal, bacterial decontamination, edema reduction, pain relief, healing enhancement, and tissue regeneration are only a few of the advantages of using laser equipment. [10] Numerous studies have proven that the bactericidal effect of a diode laser (910 nm) is based on thermal properties; furthermore, bacteria cannot develop resistance to laser exposure. A diode laser has been used in several areas of dentistry with promising disinfection outcomes. It's a semiconductor system that's similar to a light-emitting diode in which a diode pumped directly with electrical current will produce lasing conditions at the junction.[11]

The aim of the present study is to compare the antibacterial efficacy of diode laser with chlorhexidine among chronic periodontitis patients.

### Materials and Methods

This study was conducted in Saveetha Dental College and Hospital, Chennai after ethical clearance. Patients were selected from the Out patient Department of Periodontics. The present study is a simple randomised controlled clinical trial.

#### Inclusion criteria

- Patients between the ages of 20 and 45 are considered safe.
- There should be a minimum of 20 teeth in the dentition, with no clear signs of untreated caries.
- Patients diagnosed with Grade II and Grade III periodontitis according to AAP classification.
- Clinically, a patient with bleeding on a probing and periodontal pocket is present.
- For the previous six months, the patient had not undergone any periodontal treatment.
- Patients who were able to give informed consent and participate in the study were chosen.

#### Exclusion criteria:

- Subjects that have taken antibiotics or some other medications in the previous three months.
- Lactating mothers and pregnant women
- Patients that are medically ill.
- Those who smoke.
- There will be no partial dentures, restorations, or bridges that are clinically unacceptable.
- Orthodontic equipment on a patient
- Any patient who has previously been allergic to chemical or herbal products.

#### Group distribution

Group I- Patient is given chlorhexidine for preprocedural decontamination.  
 Group II- Patient underwent laser preprocedural decontamina-

tion.

Each group has 10 subjects. Total of 20 subjects were included in the study.

#### Sample collection

STEP1- Subgingival plaque was collected after isolating the area with cotton, using sterilized curette.

STEP 2- Group I - 0.12% CHX mouthwash was given to swirl around the mouth for 1 minute and spit. Group II - 910nm diode laser was used on all the surfaces in non contact mode for decontamination at 0.25 Watt.

STEP 3- Subgingival plaque was collected using different sterilized curette.

#### Microbial assessment

Collected subgingival plaque samples were incubated for 24 hours. Swab from the sample was swapped over the nutrient agar plate and incubated for 24 hours.

Colonies were counted manually.

#### Statistical analysis

SPSS version 23 was used for statistical analysis. Student T test was performed.

### Results

In the present study, there was a significant difference in pre and post of both the groups, but there was no significant difference between chlorhexidine and diode laser.

### Discussion

In the present study, there was a significant difference in pre and post of both the groups, but there was no significant difference between chlorhexidine and diode laser.

Microorganisms cause chronic periodontitis, which is an infectious disease that affects the periodontal tissues. The infection causes inflammatory responses in the host, resulting in the degradation of the tooth's supporting tissues. Periodontal therapy leads to release of disease causing microorganisms as aerosols. Reduce or minimize patient and dental professionals exposure to aerosolized microorganisms is one of the goals of infection prevention in dentistry. Preprocedural contamination, some studies have looked into this subject, and it appears to be one of the most successful methods of controlling the spread of bacteria in the dental office.[12-14] In our study, we assessed the efficiency of different method of preprocedural decontamination i.e. 0.12%

**Table 1. Depicts significance of tested groups.**

GROUP	Z	Sig.
Pre and post G-A	3.089	0.034
Pre and post G-B	3.002	0.023
Post G-A and G-B	-0.039	0.899

Figure 1. Pre and Post Chlorhexidine Group.

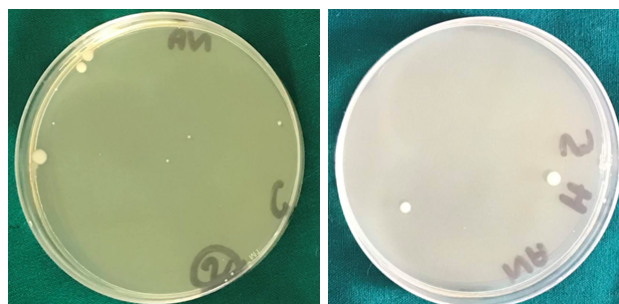
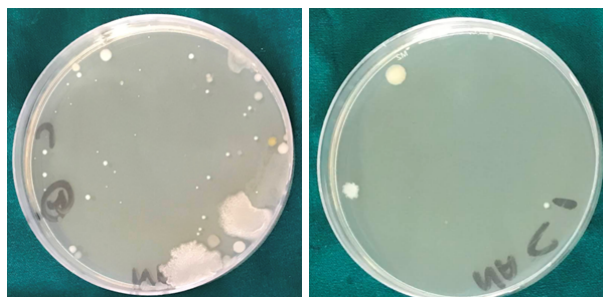
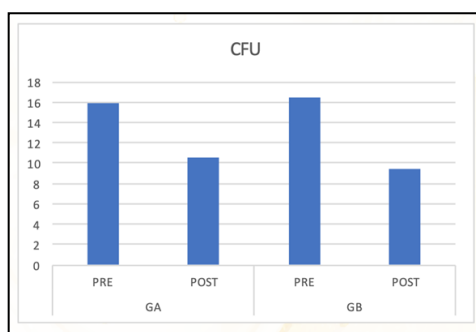


Figure 2. Pre and post laser decontamination.



Graph 1. Depicts in the reduction of the microbial count.



CHX and 910 nm, 0.25 Watt non contact diode laser.

Laser and CHX rinsing both were equally effective as preprocedural decontamination. We observed less bacterial growth in agar plates after using laser and CHX. But there was no significant difference between the two groups. As compared to essential oils and water, Logothetis and Martinez-Welles found that the CHX preprocedural rinse significantly reduced CFUs at eight standardized locations in the dental office.[15] Similarly, when comparing the number of bacterial CFUs formed during ultrasonic scaling with no rinsing, Klyn and colleagues found that using CHX rinse reduced the number of bacterial CFUs formed significantly.[13] Feres and colleagues, a commercial mouthrinse containing 0.05 percent CPC when used as a preprocedural mouthrinse was equally effective as CHX in reducing the levels of spatter bacteria generated during ultrasonic scaling.[3] The findings of these studies, as well as our own, contradict those of Bay and colleagues, who found no substantial differences in total CFUs between participants who rinsed with CHX, essential oil, or water before undergoing a procedure. They believe the 30-second rinsing cycle used in their study was insufficient to produce an antimicrobial effect.[16] Our study, used 1 minute of preprocedural rinsing to overcome this limitation.

In a study comparing the efficacy of aerosol reduction devices (ARD) with 0.12% chlorhexidine solution as a pre-procedural

rinse, the aerosol reduction suction system outperformed 0.12% chlorhexidine and distilled water in reducing the bacterial aerosol generated. The findings were not improved further by combining an aerosol reduction system with 0.12 percent chlorhexidine.[13] A study result showed that there was statistically significant difference in the CFU counts between CHX group and Povidine iodine group and between Aloe vera group and Povidine iodine group. There was no difference between CHX group and Aloe vera group at both the locations. 94.5% aloe vera as a preprocedural rinse is better than 1% Povidine iodine and comparable to 0.2% CHX in reducing CFU count.[17]

The Erbium laser group had the best bactericide effect, followed by the GaAlAs diode group, when compared to the negative control group, according to the colony forming unit process. Following statistical evaluation, it was discovered that the implementation of various experimental treatments resulted in a large difference between groups in terms of values.[10] The antibacterial effect of various forms of laser radiation has been and continues to be thoroughly researched. Studies have shown that Er:YAG and diode lasers are particularly effective against *E. coli* and *Enterococcus faecalis*, making them a viable method for root canal decontamination. In other in vitro experiments, the bactericidal effect of Er:YAG laser radiation on *Porphyromonas gingivalis* and *Actinobacillus actinomycescomitans* was clearly demonstrated.[18, 19]

There are many incidents which may be the reason for decontamination: the water content of the acted-upon tissue, the length, thickness, and strength of the cell wall, the absorption property, and bacteria migration to tissues, as well as the degree of penetration in the enamel prisms, respectively dentinal tubules.<sup>[20]</sup>

Limitations of the study included, less sample size, various concentrations of mouthrinse and different types of laser, frequency and power was not compared.

## Conclusion

Mouthrinse containing 0.12 percent CHX and diode laser of 910nm with 0.25 watt are equally effective in reducing the levels of spatter bacteria generated during ultrasonic scaling and their use could help decrease the level of microbial contamination in the subgingival plaque. Owing to its strong antibacterial effect and the fact that it has fewer side effects than CHX, a solution containing diode laser may be a good alternative to that containing 0.12 CHX as a preprocedural mouthrinse.

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