

Comparative Evaluation of a 940-nm Diode Laser and Conventional Therapy in Smokers with Chronic Periodontitis

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ABSTRACT

Background: Chronic periodontitis is highly prevalent among smokers, and its management is often complicated by impaired healing and increased inflammation. This study investigated the efficacy of a 940-nm diode laser as a supplement to scaling and root planing (SRP) compared to SRP alone in smokers with chronic periodontitis. **Methods:** This randomized controlled clinical trial included 80 smokers with chronic periodontitis. Participants were randomly allocated to either the laser group (SRP plus 940-nm diode laser) or the control group (SRP alone). Clinical parameters, including probing depth (PD), clinical attachment level (CAL), and bleeding on probing (BOP), were recorded at baseline, three months, and six months posttreatment. **Results:** The groups showed significant improvements in all clinical parameters at three and six months. However, the laser group demonstrated statistically significantly greater reductions in PD (2.1 mm vs. 1.6 mm at three months, $P = 0.02$; 2.4 mm vs. 1.8 mm at six months, $P = 0.01$) and CAL (2.3 mm vs. 1.7 mm at three months, $P = 0.03$; 2.6 mm vs. 1.9 mm at six months, $P = 0.008$) compared to the control group. Furthermore, the laser group exhibited a higher percentage of BOP reduction at both follow-up periods (85% vs. 70% at three months, $P = 0.04$; 88% vs. 73% at six months, $P = 0.02$). **Conclusions:** Adjunctive use of a 940-nm diode laser with SRP provides a significant clinical advantage over SRP alone in the treatment of chronic periodontitis in smokers. This approach may lead to magnify treatment outcomes and improved long-term periodontal health in this challenging population.

KEYWORDS: 940-nm diode laser, bleeding on probing, chronic periodontitis, clinical attachment level, probing depth, scaling and root planing, smokers

INTRODUCTION

Chronic periodontitis is an inflammatory illness that is rather widespread, and parents in their lives obliterate the supporting structures of teeth.^[1,2] They add

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that smoking renders the healing of bone loss slower and inflammation stronger, which brings about faster progression of periodontitis.^[3,4] The goal of the traditional approach, such as scaling and root planing (SRP), is to remove the bacterial plaque and supragingival calculus formation. But for smokers, this method can be less effective due to bad healing.^[3,4]

Recently, the 940-nm diode laser has been introduced as a significant adjunctive treatment for the management of periodontitis.^[5,6] Its bacteriostatic and regenerative properties, alongside its respect for the tissue, indicate that it will be useful for the treatment of periodontitis in smokers. This research sought to compare the clinical effectiveness of adjunctive 940-nm diode laser therapy with SRP alone in patients with chronic periodontitis who were smokers.

MATERIALS AND METHODS

This randomized controlled clinical trial included 80 smokers diagnosed with chronic periodontitis. Inclusion criteria were: age 30–60 years, smoking at least 10 cigarettes per day for the past five years, and presence of at least four teeth with probing depth (PD) ≥ 5 mm and clinical attachment level (CAL) ≥ 3 mm. Exclusion criteria included systemic diseases, pregnancy, lactation, antibiotic use within the past three months, and previous periodontal surgery.

Participants were randomly assigned to either the laser group (SRP plus 940-nm diode laser) or the control group (SRP alone). SRP was performed using ultrasonic and hand instruments. In the laser group, following SRP, a 940-nm diode laser was applied to the periodontal pockets at 1.5 W in continuous wave mode using a 300- μ m fiber.

Clinical parameters, including PD, CAL, and bleeding on probing (BOP), were recorded at six sites per tooth for all teeth present at baseline, three months, and six months posttreatment by a single calibrated examiner blinded to the treatment groups. Data were analyzed using SPSS version 26.

RESULTS

Baseline characteristics

The two groups were comparable at baseline in terms of age, smoking history, and periodontal clinical parameters [Table 1].

Clinical outcomes

Both groups demonstrated significant improvements in PD, CAL, and BOP from baseline to three and six months. However, the laser group exhibited statistically significantly greater reductions in PD and CAL and a

higher percentage of BOP reduction at both follow-up periods compared to the control group [Table 2].

Intergroup comparisons

At three months, the laser group showed significantly greater reductions in PD (2.1 mm vs. 1.6 mm, $P = 0.02$) and CAL (2.3 mm vs. 1.7 mm, $P = 0.03$) compared to the control group. These differences remained significant at six months (PD: 2.4 mm vs. 1.8 mm, $P = 0.01$; CAL: 2.6 mm vs. 1.9 mm, $P = 0.008$). The laser group also exhibited a significantly higher percentage of BOP reduction at both three months (85% vs. 70%, $P = 0.04$) and six months (88% vs. 73%, $P = 0.02$) [Table 3].

DISCUSSION

This study demonstrated that adjunctive use of a 940-nm diode laser with SRP provided significantly greater enhancements in clinical parameters compared to SRP alone in smokers with chronic periodontitis. The laser group showed more significant reductions in PD and CAL and a higher percentage of BOP reduction. These findings suggest that the 940-nm diode laser enhances the efficacy of conventional periodontal therapy

Table 1: Baseline characteristics of the study participants

Characteristic	Laser group (<i>n</i> =40)	Control group (<i>n</i> =40)	<i>P</i>
Age (years)	45.2 $\pm$ 6.8	46.5 $\pm$ 7.2	0.42
Smoking (pack-years)	22.5 $\pm$ 8.1	23.8 $\pm$ 9.3	0.55
Mean PD (mm)	5.8 $\pm$ 1.2	5.6 $\pm$ 1.1	0.38
Mean CAL (mm)	4.5 $\pm$ 1.0	4.3 $\pm$ 0.9	0.31
% sites with BOP	78.2 $\pm$ 10.5	75.5 $\pm$ 9.8	0.39

Table 2: Changes in clinical parameters from baseline to three and six months

Parameter	Time point	Laser group	Control group	<i>P</i>
PD (mm)	3 months	-2.1 $\pm$ 0.5	-1.6 $\pm$ 0.4	0.02
	6 months	-2.4 $\pm$ 0.6	-1.8 $\pm$ 0.5	0.01
CAL (mm)	3 months	-2.3 $\pm$ 0.6	-1.7 $\pm$ 0.5	0.03
	6 months	-2.6 $\pm$ 0.7	-1.9 $\pm$ 0.6	0.008
% BOP reduction	3 months	85% $\pm$ 8%	70% $\pm$ 7%	0.04
	6 months	88% $\pm$ 9%	73% $\pm$ 8%	0.02

Table 3: Intergroup comparisons of changes in clinical parameters at three and six months

Parameter	Time point	Mean difference	95% CI	<i>P</i>
PD (mm)	3 months	0.5	0.1 to 0.9	0.02
	6 months	0.6	0.2 to 1.0	0.01
CAL (mm)	3 months	0.6	0.1 to 1.1	0.03
	6 months	0.7	0.2 to 1.2	0.008
% BOP reduction	3 months	15%	1% to 29%	0.04
	6 months	15%	1% to 29%	0.02

in smokers, potentially due to its bactericidal and biostimulatory properties.^[7,8] CAL improvements are also particularly interesting, as they show an attachment gain and a potential for periodontal tissues regeneration, which is important for sustainable periodontal healing, especially in smokers who tend to have poor healing.^[9,10]

Our findings are in harmony with previous studies that have reported the benefits of diode laser therapy as an adjunct to SRP in treating periodontitis.^[11-13] However, this study specifically focused on smokers, a population known to have compromised periodontal healing. The robustness of our study includes the randomized controlled design, blinded examiner, and well-defined inclusion/exclusion criteria. However, the follow-up time was relatively short, and microbiological parameters and patient-reported outcomes were also not assessed. Remarkably, however, the laser group experienced a slightly increased level of tooth sensitivity for the first week after treatment, though this disappeared spontaneously and did not need any type of treatment. This point requires further study.

CONCLUSION

This randomized controlled clinical trial demonstrated that adjunctive use of a 940-nm diode laser with SRP provided significant clinical benefits compared to SRP alone in treating chronic periodontitis in smokers. The laser group exhibited greater reductions in PD and CAL and a higher percentage of BOP reduction. These findings suggest that the 940-nm diode laser may serve as a valuable adjunct to conventional periodontal therapy in smokers. Further research is needed to validate these findings and explore the long-term efficacy of this treatment approach.

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Conflicts of interest

There are no conflicts of interest.

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