

A Short Term Comparative Clinical Evaluation of Diode Laser and Hand Instruments for Gingival Curettage

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ABSTRACT

Objectives: This randomized split-mouth clinical trial was designed to evaluate the effect of gingival curettage with diode laser to gingival curettage with hand instruments.

Materials and methods: A total of 34 chronic periodontitis subjects, of both genders, were selected. 5 mm or deep periodontal pockets (up to 7mm), indicated for curettage procedures were chosen from each subject. In all patients contralateral sides were randomly divided into experimental and control site. The patients had undergone scaling and root planing before curettage procedure. On the experimental site curettage was done with diode laser (980 nm) and on control site curettage was done with hand instruments (gracey curettes). Clinical data were collected at baseline, 1 week, 6 weeks and 3 months after therapy.

Results: There was a significant improvement of all the clinical parameters - relative attachment level (RAL), probing pocket depth (PPD), plaque index (PI), modified gingival index (MGI) for both groups ($P < 0.001$), when compared with the baseline value. However, there was no significant difference in PI and MGI between test and control groups. Significant improvement was noticed in PPD and RAL in experimental group when compared with control group.

Conclusion: After 3 months of evaluation, the diode laser has shown little additional benefits in curettage procedure when compared to curettage procedure with hand instruments.

Key words: Subgingival curettage, lasers, chronic periodontitis

INTRODUCTION

Chronic periodontitis is the most common form of destructive periodontal disease in adults, which can occur over a wide range of ages. It is widely accepted that the initiation and progression



of periodontitis is dependent upon the presence of microorganisms capable of causing disease. The primary goal of periodontal treatment is to remove bacterial deposits

present on roots affected by periodontitis.¹ The outcome of periodontal disease has undergone an immense change over the last few years as modalities of treatment have changed. Initial therapy involves scaling and root planing to mechanically debride the depth of periodontal pockets. Other treatment includes full mouth disinfection, open flap debridement that is surgical therapy and adjunctive use of antibiotic treatment, locally delivered antimicrobial agents and modulating the host response.² Over the last ten years research and clinical case studies indicate that

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lasers, when adjunctively used with scaling, can improve the effectiveness of this phase I therapy.³ Diode lasers have become an important part of the dental armamentarium of current practice. They are easy to use and affordable and offer several advantages with regard to periodontal treatment.

The aim of the present randomized clinical study was to evaluate the clinical effectiveness of a diode laser compared to conventional gingival curettage with hand instruments in patients with chronic periodontitis and also to evaluate the effect of diode laser curettage along with conventional treatment on various clinical parameters such as plaque index, modified gingival index, periodontal pocket depth, relative attachment level and visual analogue score.

MATERIAL AND METHODS

This comparative clinical study was carried out at the Dept. of Periodontics, Karnavati School of Dentistry, Uvarsad, Gujarat. The study protocol was explained to each potential subject, and written informed consent was obtained prior to the commencement of any treatment.

Inclusion criteria:-

- Age group of 30 years to 65 years.
- 5 mm or deep periodontal pockets (up to 7mm), indicated for curettage procedures. (A pocket depth of at least ≥ 5 mm in three teeth in each quadrant was required).
- Medical history revealing good general health.
- Excluding third molars, each subject had to have at least 20 natural teeth present in the mouth.

Exclusion criteria:-

- The presence of systemic disease which could influence the outcome of the therapy.
- Current pregnancy or any physical condition that would limit instrument manipulation.
- Present medications that would be likely to affect gingival health.
- Tobacco smoking and chewing habit.

Study design

The study was designed as a split-mouth, case-control, randomized clinical trial. Each selected pair of sites was randomly allocated to the control group (Gingival curettage with gracey curettes) or in the test group (gingival curettage with diode laser - 980 nm) randomly. 34 patients were finally recruited for the experimental design.

Periodontal treatment

The patients had undergone scaling and root planing before curettage procedure.

Curettage procedure with diode laser on experimental site

Curettage was done using a diode laser (980 nm) on the experimental side on same day after scaling and root planing. A 980 nm diode laser operated at a power output of 2.5 W in a pulse mode (pulse duration 10 ms) was used. Laser light was delivered by means of a 400 μ m fiber optic delivery system. The fiber was inserted into the periodontal pocket, the laser was activated and the fiber slowly moved from apical to coronal in a sweeping motion during laser light emission. This was done mesially, distally, buccally, and lingually. The fibers were cleaved before each irradiation session for the maintenance of its initial physical characteristics. The fiber was introduced by 1mm less than the value obtained through the probing procedure. The treatment was repeated until the entire pocket was irradiated. Each pocket of the test group was irradiated for 30 seconds twice, with a 60 second interval.⁴ The use of local anesthesia is optional. Both patients and the operator wore protective glasses. All clinical parameters were recorded.

Curettage procedure with gracey curettes on control site

The curette was selected so that the cutting edge will be against the tissue. In subgingival curettage, the tissues attached between the bottom of the pocket and the alveolar crests are removed with a scooping motion of the curette to the tooth surface. The area was flushed to remove debris, and the tissue was partly adapted to the tooth by gentle finger pressure. Each selected tooth was subjected to mechanical debridement using Gracey curettes

Table 1: Comparison of Probing Pocket Depth (PPD) in experimental and control site.

Treatment	Baseline	6 weeks	3 months	Mean difference	
				Baseline to 6 weeks	Baseline to 3 months
Control side	3.372±0.196	2.730±0.175*	2.808±0.102*	0.642	0.564
Experimental side	3.360±0.175	2.592±0.150*	2.593±0.108*	0.768	0.767
p value	0.785	<0.0001	<0.0001	-	-
Mean difference	0.012	0.139	0.215	-	-

Significant difference from base1ine, * p<0.0001

Table 2: Comparison of Relative Attachment Level (RAL) in experimental and control site.

Treatment	Baseline	3 months	p value	Mean difference
Control side	9.324±0.535	7.471±0.507*	<0.0001	1.853
Experimental side	9.382±0.493	7.029±0.577*	<0.0001	2.353
p value	0.639	< 0.001	-	-
Mean difference	-0.059	0.441	-	-

Significant difference from base1ine, * p<0.0001

until a hard, smooth and calculus-free root surface was achieved. Clinical parameters were recorded.

Clinical measurements:

T0 = At baseline (T0) following parameters were recorded:

- 1) PI (Turesky-Gilmore-Glickman Modification of Quigley Hein Plaque Index).
- 2) MGI (Modified gingival index; Lobene - 1986).
- 3) PPD (Probing Pocket Depth) using a UNC-15 probe.
- 4) RAL (Relative Attachment Level) was also recorded using a customized resin stent and a UNC-15 probe.
- 5) Visual analogue score. (VAS)

T1 = At one week after completing periodontal therapy (T1), partial clinical records were performed: MGI, PI and VAS were recorded.

T2 = At six weeks (T2) clinical measurements were performed: PI, MGI and PPD.

T3 = At three months (T3) the clinical measurements PI, MGI, PPD and RAL were performed.

RESULT

All patients returned for all scheduled visits. No complications such as abscesses or infections were noticed throughout the study. The mean clinical changes from baseline to 3 months are shown in Tables 1, 2 and 3. At baseline, no statistically significant differences in any of the investigated parameters were observed. Plaque index (PI), (MGI) showed a significant improvement compared to baseline in both groups (p<0.0001).

Probing pocket depth (PPD) showed a significant decrease ($p < 0.0001$) and Relative attachment level (RAL) showed a significant gain in the two groups at 3 months ($p < 0.0001$). There was a significant difference in visual analogue score (VAS) during treatment ($p < 0.0001$) and after 1 week ($p < 0.0001$) between the two groups. The mean PPD values for baseline and T2, T3 for both groups are presented in table 1. The RAL values for baseline and after 3 months were described in table 2.

DISCUSSION

The main goals of periodontal therapy are to eliminate bacterial deposits and niches by removing the supragingival and subgingival biofilms. Subgingival scaling and root planing are the most important procedures and clinical efficacy has been demonstrated in numerous clinical studies.^{5,6} Complete removal of bacterial deposits and their toxins from the root surface and within the periodontal pockets is not necessarily achieved with conventional, mechanical therapy.⁷⁻⁹ Lasers can achieve excellent tissue ablation with strong bactericidal and detoxification effects. The adjunctive or alternative use of lasers with conventional tools may facilitate treatment, and has the potential to improve healing.^{10,11}

Diode laser is used for the treatment of soft tissue lesions and has a bactericidal effect, but does not ablate calculus from the root surface, therefore diode laser can be used as an adjunctive treatment with scaling and root planing due to its bactericidal and detoxification effects.^{10,11} A study has also demonstrated that root surfaces treated with a diode laser in vivo show no damage to the cementum tissue and no signs of thermal side effects in any of the teeth treated.³

Several studies have demonstrated that laser therapy is superior to scaling and root planing treatment alone.^{12,13} In a related study the diode laser at low power was able to remove the thin pocket epithelium in the same way regardless of the level of surgical experience of the practitioner.¹⁴ The Gingival curettage with either diode laser or hand instruments led to significant improvements in all investigated clinical parameters at the end of treatment.

The results of the present study showed curettage with diode laser in the treatment of chronic periodontitis may lead to a slight improvement of clinical parameters (MGI, PI) after 1 week, 6 weeks, 3 months compared with that of curettage procedure with gracey curettes. Also result showed that a significant improvement ($p < 0.0001$) was noticed in PPD at 6 weeks and at 3 months when intergroup comparison was made with grater reduction in experimental group. Significant improvement ($p < 0.0001$) was noticed in RAL score in both groups after 3 months. Secondly when comparison was made between experimental and control group there was a significant improvement in RAL ($p < 0.001$) in experimental group.

Table 1 shows mean probing pocket depth (PPD) at baseline in control group was 3.372 ± 0.196 mm and in experimental group 3.360 ± 0.175 mm. Probing pocket depth (PPD) showed significant reduction after 3 months ($p < 0.0001$) post treatment in both control group (2.808 ± 0.102 mm) and experimental group (2.593 ± 0.108 mm) when compared with baseline probing pocket depth (PPD). However there was greater reduction in probing pocket depth (PPD) in experimental side compare to control side after 3 months and it was statistically significant ($p < 0.0001$).

The present study is in accordance with a similar study conducted by Kreisler et al. who compared efficacy of laser application as an adjunct to conventional scaling and root planing. The study showed baseline probing depth (PD) was 4.2 ± 1.15 in experimental site and 4.3 ± 1.26 in control site. After 3 months in the probing depth was 2.4 ± 0.67 in experimental site and 2.7 ± 0.73 in control site. These values were statistically significant ($p < 0.001$) when compare to baseline values. The difference between the groups was also significant ($p < 0.001$) with greater reduction in experimental site.¹⁵

Result of this study was similar to other study for example, a study by Jiang Lin et al. demonstrated a statistically significant reduction ($p < 0.001$) of the PD in both groups after 4 weeks.

Table 2 shows relative attachment level (RAL) at baseline in control group was 9.324 ± 0.535 and in experimental group was 9.382 ± 0.493 . Gain in Relative attachment level (RAL) was around 1.853

mm in control group and 2.353 mm in experimental group after 3 months. Gain in relative attachment level was significant ($p < 0.0001$) in both control and experimental group after 3 months when compare to baseline. The difference in RAL between control group (7.471 ± 0.507 mm) and experimental group (7.029 ± 0.577 mm) was statistically significant ($p = 0.001$) after 3 months.

This study is in agreement with the study done by Kreisler et al. in which teeth treated with the laser revealed a significantly higher gain in clinical attachment level.¹⁵ Similar study done by Borrajo et al. showed significant improvement in CAL in both experimental and control group when compared with the baseline.¹⁶

Clinical study by Jiang Lin was to examine nonsurgical treatments of periodontal disease comparing a diode laser curettage to subgingival curettage with conventional hand instruments. The results demonstrated a statistically significant reduction of the GI, SBI and PD and a significant gain in CAL in both groups after 4 weeks. Work done by Gokhale et al.,¹⁷ Aykol G et al.,¹⁸ Ribeiro et al.¹⁹ and Kamma et al.²⁰ have shown more improvement in all clinical parameters in experimental group as compared to control group.

The results of this clinical study have shown that the high-intensity diode for gingival curettage procedure showed superior result when

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compare with conventional curettage procedure with gracey curettes.

CONCLUSION

The present study has been conducted to compare the effect of gingival curettage using diode laser (980 nm) with gingival curettage using conventional hand curettage with Gracey curettes. Statistical evaluations of the results obtained after an observation period of 3 months showed that the curettage treatment with diode laser may lead to a significant improvement of clinical parameters (MGI, PI) after 1, 6 weeks and 3 months, whereas the PPD and RAL showed significant improvement in both experimental and control group after 3 months. PPD and RAL improvement were more in the experimental group than in the control group. Study also showed less discomfort in experimental site compared to control site during treatment and after 1 week.

The use of diode laser provided little additional clinical and microbiological benefit over conventional mechanical treatment during short terms of observation.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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