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Original Research Paper

Periodontics

THE USE OF 980NM DIODE LASER AS AN ADJUNCT TO NON-SURGICAL PERIODONTAL TREATMENT IN CHRONIC PERIODONTITIS: A CLINICAL STUDY

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ABSTRACT

BACKGROUND: Chronic Periodontitis (CP) is a major cause of tooth loss. Management usually consists of Non-Surgical Periodontal Therapy (NSPT) and surgical treatment. Lately advances in periodontics include the use of lasers, known for their beneficial effects, as efficient adjuvants to NSPT. This study evaluated and compared clinically, the efficacy of 980 nm Diode Laser (DL) used as adjunct to conventional NSPT for treating CP. **MATERIALS AND METHODS:** The study included 50 subjects, aged 35-65 years with moderate CP (5-8mm pocket depth). According to inclusion and exclusion criteria, 25 patients were selected and randomly allocated to two groups; the first group, the control group (CG), treated by NSPT; and 25 in the second test group, (TG), received NSPT followed by DL irradiation. Assessment was conducted for gingival index (GI), bleeding on probing (BOP), clinical attachment level (CAL), and probing pocket depth (PPD) at baseline (B/L), 4th and 12th weeks. **RESULTS:** There was statistically significant improvement in all clinical parameters. GI reduced from 2.35 at B/L to 1.07 and 0.93 in CG; and from 2.39 to 0.96 and 0.85 in TG at 4 and 12 weeks ($P < 0.00001$). At B/L all 50 patients had BOP, which decreased to 7 in the CG and to 0 in the TG at both 4 and 12 weeks, ($P < 0.003$). PPD at B/L was 7.8mm for CG; 7.92 mm for TG and reduced to 4.8mm and 5.1mm in CG; 3.64 mm and 3.36mm in TG at 4 and 12 weeks ($P < 0.00001$). CAL at B/L was 7.24 mm for CG and 7.28mm for TG, and improved to 4.6mm and 4.72mm and in TG to 3.28mm at 4 and 12 weeks ($P < 0.00001$). **CONCLUSIONS:** The application of adjunctive980 nm DL improves clinical parameters including GI, CAL, PPD and most markedly, BOP.

KEYWORDS : Chronic periodontitis, Laser, Non-surgical periodontal therapy.

INTRODUCTION

Chronic Periodontitis is an inflammatory condition initiated by plaque biofilm and many factors, including microbial species, genetics, and environmental factors, influence the progression, severity and extent of the disease and the response to periodontal treatment.[1] Subgingival microflora is often deemed as initiating factor for periodontitis, therefore, disinfection, to reduce the microbial load, mainly in the form of mechanical debridement is the cornerstone or initial therapy in most forms of periodontal disease. [2]Based on the results of the initial therapy, many clinicians may recommend additional measures such as local or systemic antibiotics, Laser or open flap procedures. Recent advances in the field of periodontics for sulcular debridement include the use of lasers.[3,4]The advantages of laser are that they are economical, less invasive, painless, bloodless therapy, and more acceptable to the patient over surgical treatment. Lasers are known for their additional beneficial effects as efficient adjuvants to Non-Surgical Periodontal Therapy (NSPT). The beneficial effects of laser have been shown in many studies.[5-7]

MATERIALS AND METHODS

The study subjects were selected from the patients reporting to the outpatient of department of Periodontology, Albadar Rural Dental College and Hospital, Kalaburagi. The study was approved by the Institutional review board and ethical committee. This was a randomized-controlled clinical trial. Test and control subjects were chosen by coin-toss randomization. Fifty patients, both male and female, aged 35-65 years with generalised CP were included. Verbal and written informed consent forms, duly signed by the patients were obtained.

Inclusion criteria:

1. Patients with untreated moderate to advanced CP with minimum PPD 5mm involving at least 30% teeth.
2. At least 20 teeth present.
3. Systemically healthy patients.
4. Patients between 35-65 years of age.

Exclusion criteria:

1. H/O systemic conditions like diabetes mellitus, hypertension, cardiac patients, etc.
2. H/O any surgical therapy within past 6 months.
3. Patients with aggressive periodontitis, characterized by arc-shaped bone loss, involvement of first molars and central incisors, and a family history of periodontal disease.
4. Patients who had taken antibiotics and/or antivirals during the past six months were excluded.
5. History of tobacco-chewing, alcoholism, and current/former smokers.
6. Patients on steroid therapy and oral contraceptives or any medication affecting periodontal tissue like phenytoin sodium etc.
7. Pregnant/Lactating females.
8. Acute oral lesions.

Clinical periodontal parameters:

Gingival Index (GI) was recorded as per the criteria given by Loe and Silness (1963). Probing Pocket Depth (PPD) and Clinical Attachment Level (CAL) measurements were made using the UNC-15 probe (Hu-Friedy, Chicago, IL). Bleeding on probing (BOP) was recorded by evaluating the presence or absence of bleeding, up to 30 seconds after probing with the periodontal probe. Clinical measurements of BOP, PPD and CAL were recorded at six sites (mesiobuccal, mid-buccal, distobuccal, mesiolingual, mid-lingual, and distolingual) for each tooth, whereas GI was recorded at four sites per tooth. Data was recorded for all patients at baseline, and after the 4th, and 12th weeks of treatment. All periodontal variables were

recorded by a single examiner, to prevent inter-examiner variability.

Study Design

A total 50 patients were selected and randomly allotted, chosen by coin toss randomization, 25 each, to the following two groups:

O Group 1: Patients treated with NSPT only. (Controls)

Patients in Group 1 served as controls; after diagnosis and recording baseline data, received NSPT alone. NSPT was performed with ultrasonic instruments and curettes, under local anesthesia (2% Lignocaine, Spray or gel), using an ultrasonic instrument (Cavitron Select, Dentsply Cavitron, Long Island, NY, USA) and Gracey Curettes (Hu-Friedy Instruments, Chicago, IL, USA).

O Group 2: Patients treated with NSPT followed by irradiation with 980 nm DL (Test group)

In this group, NSPT was performed, followed immediately by lasing with 980 nm Diode Laser (Sirona®) at 1 W power setting using a continuous wave with a 320micron fiber for 10 sec. The fiber was introduced 1 mm less than the value obtained through the probing procedure. For this, an endodontic stop was placed on the fiber to control the irradiation depth. The fiber was cleaved before use and introduced into the pocket parallel to the cemental surface and irradiated with apico–cervical scanning movements. This was done mesially, distally, buccally and lingually. The treatment was repeated until the entire pocket was irradiated. Irrigation with saline solution followed each session of irradiation. For all patients, after initial therapy, oral hygiene instructions were given and the follow-up was done at 4th and 12th weeks.

Table1: Mean and standard deviation (SD) of GI for the two groups. P value to compared by student, unpaired t-test

	Baseline		4 weeks		12 weeks	
	Mean	SD	Mean	SD	Mean	SD
Group 1	2.38	0.28	1.08	0.21	0.94	0.21
Group 2	2.40	0.24	0.96	0.16	0.84	0.15
P value	0.4359(NS)		0.0273(S)		0.0484(S)	

Table 2: Distribution according to Gingival bleeding index and p value for comparison by Chi-square Test

Period	Test group	Control group
Baseline	25	25
4 weeks	0	7
8 Weeks	0	7
P value	0.003(S)	

Table 3: Mean and standard deviation (SD) of PPD for the two groups.

	baseline		4 Weeks		12 Weeks	
	Mean	SD	Mean	SD	Mean	SD
Group 1	7.56	1.04	4.80	1.35	5.20	1.44
Group 2	7.60	1.05	3.24	0.88	3.21	0.88
P value	0.4463(NS)		<0.00001(S)		<0.00001(S)	

Table 4: Mean and standard deviation (SD) of CAL for the two groups. P value to compare by student, unpaired t-test

	baseline		4 Weeks		12 Weeks	
	Mean	SD	Mean	SD	Mean	SD
Group 1	7.60	0.86	4.40	1.12	4.64	1.32
Group 2	7.52	1.01	2.64	0.57	2.64	0.57
P value	0.7643(NS)		<0.00001(S)		<0.00001(S)	

RESULTS

The efficacy of the treatment was assessed at the 4th, and 12th weeks using standardized tables. Mean and SD were calculated for the two groups. A paired T- test with pair wise comparisions were made within the groups. Unpaired T- test, to assess parameters between groups.

The P values are <0.05 thus, we reject the null hypothesis. This means that the difference among the GI, PPD, CAL and BOP in the TG is statistically significant with respect to CG.

DISCUSSION

Lasers are being used commonly by periodontists. The diode laser does not interact with dental hard tissues, making it convenient for soft tissue operations; such as cutting and coagulation of the gingival and oral mucosae, soft tissue curettage, and sulcular debridement. [8] Therefore, the present study, evaluated the efficacy of DL 980nm used as adjunct to NSPT.

Kreisler M et al. [9] examined the clinical efficacy of semi-conductor laser periodontal pocket irradiation, as an adjunct to conventional SRP in twenty-two CP patients. The clinical outcome was evaluated by using plaque index, GI, BOP, sulcus fluid flow rate, Periotest, PPD, and CAL at baseline and at 3 months after treatment. The teeth treated with Laser revealed a significantly higher reduction in tooth mobility, PPD, and clinical attachment loss. In the group treated with laser, 12% of the teeth showed attachment gain of 3 mm or more, compared with 7% in the control group. Attachment gain of 2–3 mm was found in 24% of the teeth in the laser group and 18% in the control group. They recommended the application of DL as an adjunct to conventional SRP. The findings of our study were similar.

Kamma JJ et al. [10] evaluated the effect of DL (980nm) treatment on aggressive periodontitis with respect to microbial and clinical parameters. They found that BOP, PPD and CAL showed improvement in patients treated with DL and did not reach baseline levels at 6 months post-treatment. The findings of our study correlate with the above findings, although they studied subjects with aggressive periodontitis and followed up for six months.

Borrajo JL, et al. [11] evaluated the clinical efficacy of InGaAsP DL as adjunct to traditional SRP in thirty patients with moderate periodontitis. The papilla bleeding index (PBI), BOP, and CAL were assessed; and registered moderate clinical improvement over traditional treatment. Our study also reported findings consistent with it.

There are differing opinions regarding the use of lasers in periodontics. Some studies have shown minimal or no benefits of the use of lasers, [10, 12-14] whereas some have reported definite significant advantages. [15]

This study presented an improvement in clinical parameters in both CG and TG after treatment. This indicates that mechanical instrumentation is effective in reducing the clinical severity of periodontal disease, promoting clinical improvement, as confirmed by previous studies. [12,14]

However, this study also demonstrated statistically significant improvements in the clinical parameters, especially with regard to BOP. This agrees with the study by Borrajo JL, et al. [11] Fenol A, et al. [6] compared and detected periodontal pathogens in twenty CP patients after NSPT with and without DL disinfection, using BANA test. From each patient, one test and one control site were selected and assessed for GI, OHI, PPD and CAL, and the presence of BANA pathogens. The test site underwent SRP along with DL therapy as an adjuvant while the control site received SRP alone. At 2 weeks and 2 months of recall, periodontal parameters were assessed and plaque samples were collected and analysed for BANA pathogens. Results showed a significant reduction in PPD, CAL, OHI, GI, and periodontal pathogens at the test site where DL was used as an adjuvant. [5] These findings are similar to our study.

Limitations of the Study

This clinical study was of three months duration. Some studies

have shown consistent improvements lasting almost six months. The follow-up intervals may be increased. In some studies, microbiological and immunological parameters have also been assessed. Further studies using microbiological parameters may be conducted in collaboration with the clinical observations.

CONCLUSIONS

The application of adjunctive 980nm DL, after traditional NSPT, helps in improving the clinical parameters, including PPD, CAL, GI and most markedly BOP. The results of our study presented an improvement in clinical parameters in both Control and Test groups after treatment. This indicates that mechanical instrumentation is effective in reducing the severity of periodontal disease and promoting clinical improvement, as confirmed by many researchers. [12, 14] However, the study also demonstrated the statistically significant improvements in the clinical parameters, especially with regard to BOP.

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