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Research Article

Effectiveness Of Diode Laser As An Adjunct To Non Surgical Periodontal Therapy- A Split Mouth Study

Dr. Neeta. V. Bhavsar[1], Dr. Ramya.P[2], Dr. Bandish Jhala[2]

[1]Head of the Department, Dept of Periodontia, Govt Dental College And Hospital, Ahmedabad.
[2]Post Graduate, Dept of Periodontia, Govt Dental College And Hospital, Ahmedabad.

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ABSTRACT

Background and objective: Since centuries various adjunctive therapies used along with non-surgical periodontal therapy. One such adjunctive therapy Laser, with bio stimulating and bactericidal effect which when used as an adjunct is shown to be promising and has shown improvements in both clinical and microbiological parameters. In this study we have evaluated the effect of 810 nm diode laser as an adjunct to non-surgical periodontal therapy.

Methods: A split-mouth, controlled, clinical study was conducted for which a total of 30 samples (60 quadrants) aged 25 –55 years with Chronic periodontitis was recruited from outpatient department of public dental hospital. Control group comprising two control quadrants treated with Ultrasonic and curettes. Test group comprising two contra lateral quadrants treated with Ultrasonic and curettes in combination with laser. Periodontal parameters were measured at baseline, 6 and 12 weeks after treatment. Plaque index (PI) Gingival index (GI) Probable Pocket depth (PPD) Relative attachment level (RAL)

Result: There is highly significant reduction in PI, GI, PPD, and RAL in both laser group and control group from baseline to 6 weeks and 12 weeks. An intergroup comparison shows improvement in all periodontal parameters with higher reduction in laser group and it is statistically significant. ($p < 0.05$ for GI, PPD, RAL) at 6 weeks and 12 weeks.

Conclusion: Thus, Diode Laser is effective as an adjunct to Scaling and root planning in improving clinical parameters.

Corresponding Author: *Dr. Ramya. P, Post graduate, Dept of Periodontia, Govt Dental College And Hospital, Ahmedabad*

INTRODUCTION:

Chronic Periodontitis (CP), one of the most common oral disease is a chronic inflammatory response of periodontium to the accumulation of microbial plaque on tooth surface. The most common approach for the removal of plaque biofilm is mechanical debridement (i.e. non-surgical periodontal therapy). The success of mechanical debridement depends on the effective removal of supragingival and subgingival plaque biofilms and the smear layer, which contains bacteria, bacterial endotoxins, and contaminated root cementum.[1,2]

The Non-surgical periodontal therapy has shown to be successful in arresting progression of disease and resolution of the inflammation. Yet the bacterial endotoxins in deeper areas of the pockets and furcation sites which are often difficult to access by mechanical debridement remains challenging. In order to overcome this, complementary methods such as various laser systems have been proposed.[3]

LASER therapy primarily in the near infrared spectrum (NIR, 800–1,000 nm) - have become established in dentistry in the past 15 years. Lasers are most commonly used for various periodontal surgical procedures yet its use in pocket debridement is inevitable. The Diode Laser has been persuaded largely due to its characteristics, biocompatibility and bactericidal effect. Yet results have been controversial, Caruso et al. [4] and De Micheli et al.[5] did not find any additional benefits by using the diode laser during nonsurgical periodontal treatment. Other studies have shown positive results both clinically as well as microbiologically using the same type of laser.[6] The divergence of results may be related to the difference in study methodology used by the investigators.In this study we have evaluated the effect of 810 nm diode laser as an adjunct to non-surgical periodontal therapy.

MATERIALS & METHODS:

A split-mouth, controlled, clinical study was conducted at the Public Dental Hospital. The study followed a split-mouth design with equally divided quadrants between the right and left sides.The study sample consisted of 30 patients (with 60 quadrants – 30 each in test and control group) of both the sexes and aged between 25 –55 years diagnosed with Chronic Periodontitis according to the criteria of the 1999 American Academy of Periodontology Workshop.The Institutional Review Board and Ethical Committee approved the study protocol and written and verbal consents were obtained from all the study participants. Inclusion criteria were Chronic periodontitis patients with pocket depth more than or equal to 5 mm; No periodontal treatment or use of antibiotics within the previous 6 months; ; Exclusion criteria were Patients with any prosthesis, Teeth with grade III mobility (Miller et al), [7] Patients with Systemic Disease, Pregnant women, smokers.A total of 30 subjects within the age range of 25-55 years with the above mentioned criteria was selected for the study. They were divided into the following groups: Control group comprising two control quadrants treated with Ultrasonic scaler and curettes. Test group comprising two contra lateral quadrants treated with Ultrasonic scaler and curettes in combination with Laser.One week before the treatment protocol, supragingival scaling was done with ultrasonic scaler and oral hygiene instructions were given to the patients.Following Periodontal parameters were recorded before the treatment and at 6 and 12 weeks after treatment.Plaque index (PI) (Turskey, Glickman and Gilmore modification of quingley and hein Plaque index, 1970), [8] Gingival index (GI) (Loe and Silness, 1963), [9] Probable Pocket depth (PPD), Relative attachment level (RAL). A trained examiner blinded for the quadrant allocation recorded the periodontal parameters at 6 and 12 weeks.

Treatment protocol:

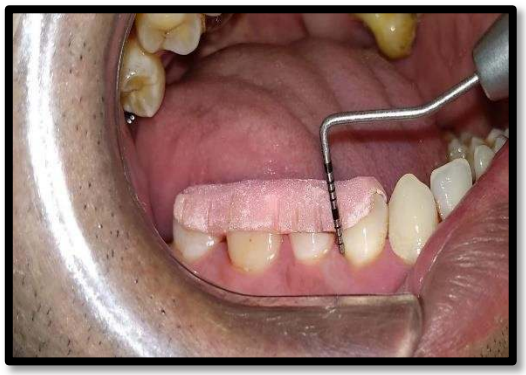
After initial Supra gingival scaling, full mouth Subgingival Scaling and Root Planing under Local Anesthesia was performed for each patient on all groups using Ultrasonic scaler and curettes in single appointment.

Laser treatment was performed using a 810 nm diode laser with a 300-µm fiber-optic delivery system in which the fibre with 1mm short of the pocket depth was introduced parallel to the root surface apically and scanning multi directional movements was performed for 10 seconds per tooth. Laser treatment was done twice on 1st and 3rd day after Scaling and Root Planing on test groups.(Fig 2) The following parameters of diode laser unit were used: peak power- 2.0

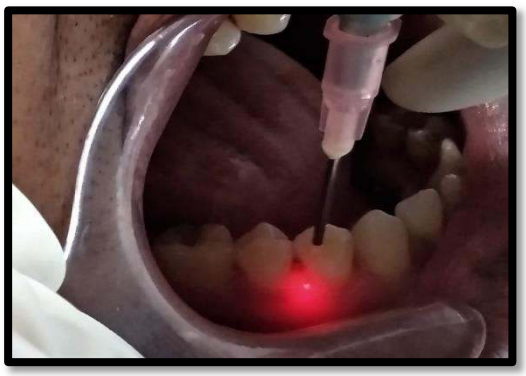
Watts; average power- 0.75 Watts; used in pulsed mode and timer adjusted with 25 milliseconds. The

placement of fiber 1 mm less than the pocket probing depth is because Laser energy can penetrate the tissue and reduce the bacterial load and at the same time epithelial attachment at the bottom of the pocket is left undisturbed.[10]

CASE



BASELINE



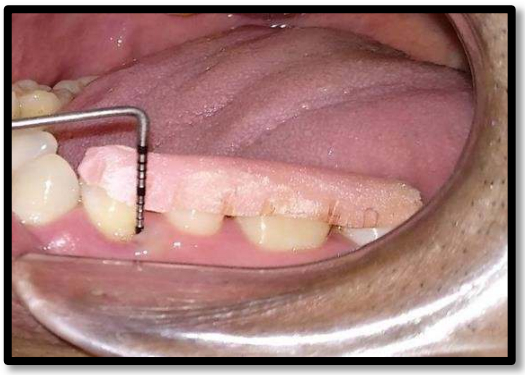
LASER TREATED

6 WEEK

CONTROL SIDE

12 WEEKS

BASELINE



6 WEEKS

12 WEEK

Statistical Analysis:

IBM SPSS VERSION 20.0 for Windows (SPSS) was used for the data analysis. Intragroup and intergroup differences were analyzed using paired *t* test and the Student's independent *t* test respectively.

RESULTS:

Of the 30 patients initially recruited in the study, three patients were lost to follow up. So the data for 27 patients (54 quadrants) were analysed in the study. The reasons for the withdrawal from the study were that the patients had difficulty in keeping appointments due to domestic compulsions.

Table 1: Changes in all the parameters from baseline to 6 weeks and 12 weeks and between 6 and 12 weeks in control group.

parameters	Mean	Std. Deviation	Mean Difference	P Value
PI baseline PI 6 weeks	3.39 1.57	.47 .41	-3.36	0.004
PI baseline PI 12 weeks	3.39 1.35	.47 .23	-2.81	0.004
PI 6 weeks PI 12 weeks	1.57 1.35	.41 .23	-2.47	0.001
PPD baseline PPD 6 weeks	4.93 4.06	.40 .73	-1.81	0.002
PPD baseline PPD 12 weeks	4.93 3.51	.40 .71	-2.53	0.001
PPD 6 weeks PPD 12 weeks	4.06 3.51	.73 .71	-2.53	0.002
GI baseline GI 6 weeks	2.00 0.90	.00 .37	-1.63	<0.001
GI baseline GI 12 weeks	2.00 0.56	.00 .27	-1.33	<0.001
GI 6 weeks GI 12 weeks	0.90 0.56	.37 .27	-1.07	<0.001
RAL baseline RAL 6 weeks	9.10 7.88	.82 .92	-1.96	0.001
RAL baseline RAL 12 weeks	9.10 7.26	.82 .84	-2.37	0.002
RAL 6 weeks RAL 12 weeks	7.88 7.26	.92 .84	-2.37	<0.001

PI: Plaque Index, GI: Gingival Index, PPD: Probing Pocket Depth (in mm), RAL: Relative Attachment Level (in mm).

P value < 0.05 – Statistically significant

Table 2 Changes in all the parameters from baseline to 6 weeks and 12 weeks and between 6 and 12 weeks in test group.

Parameters	Mean	Std Deviation	Mean Difference	P Value
PI baseline PI 6 weeks	3.43 1.54	.49 .42	-3.36	0.004
PI baseline PI 12 weeks	3.43 1.34	.44 .21	-2.81	0.002
PI 6 weeks PI 12 weeks	1.54 1.34	.42 .21	-2.47	0.001
PPD baseline PPD 6 weeks	4.93 4.34	.41 .75	-1.81	0.001
PPD baseline PPD 12 weeks	4.93 3.94	.41 .71	-2.53	0.002
PPD 6 weeks PPD 12 weeks	4.34 3.94	.75 .71	-2.53	<0.001
GI baseline GI 6 weeks	2.00 0.96	.00 .36	-1.63	0.002
GI baseline GI 12 weeks	2.00 0.59	.00 .31	-1.33	0.004
GI 6 weeks GI 12 weeks	0.96 0.59	.36 .31	-1.07	<0.001
RAL baseline RAL 6 weeks	9.00 8.29	.79 .94	-1.96	0.001
RAL baseline RAL 12 weeks	9.00 7.84	.79 .84	-2.37	0.001
RAL 6 weeks RAL 12 weeks	8.29 7.84	.94 .84	-2.37	<0.001

PI: Plaque Index, GI: Gingival Index, PPD: Probing Pocket Depth (in mm), RAL: Relative Attachment Level (in mm).

P value < 0.05 – Statistically significant

Table 3: Parameters For Control And Test Group At 6 Weeks.

PARAMETER	CONTROL (mean±SD)	TEST (mean±SD)	p value
PI	1.54 ±0.42	1.57±0.41	0.784
GI	0.96±0.36	0.90±0.37	0.002*
PPD	4.34±0.75	4.06±0.73	0.001*
RAL	8.29±0.94	7.88±0.92	0.002*

**Statistically Significant, SD- Standard Deviation*

PI: Plaque Index, GI: Gingival Index, PPD: Probing Pocket Depth(in mm), RAL: Relative Attachment Level (in mm).

P value < 0.05 – Statistically significant

Table 4: Parameters For Control And Test Group At 12 Weeks.

PARAMETER	CONTROL (mean±SD)	TEST (mean±SD)	p value
PI	1.34 ±0.21	1.35±0.23	0.844
GI	0.59±0.31	0.56±0.27	0.004*
PPD	3.94±0.71	3.51±0.71	0.003*
RAL	7.84±0.84	7.26±0.84	0.002*

** Statistically Significant, SD- Standard Deviation*
PI: Plaque Index, GI: Gingival Index, PPD: Probing Pocket Depth(in mm), RAL: Relative Attachment Level(in mm). P value < 0.05– Statistically significant

Table 5 Intergroup Comparison Of Clinical Parameters Between Test And Control Groups

PARAMETER	*CONTROL (mean±SD)*	*TEST (mean±SD)*	*p value*
PI reduction	*2.06±0.53*	*2.10±0.52*	*0.90*
GI reduction	*1.40±0.32*	*1.52±0.38*	*0.018**
PPD reduction	*0.95±0.37*	*1.24±0.40*	*0.014**
RAL reduction	*1.15±0.48*	*2.31±0.48*	*0.016**

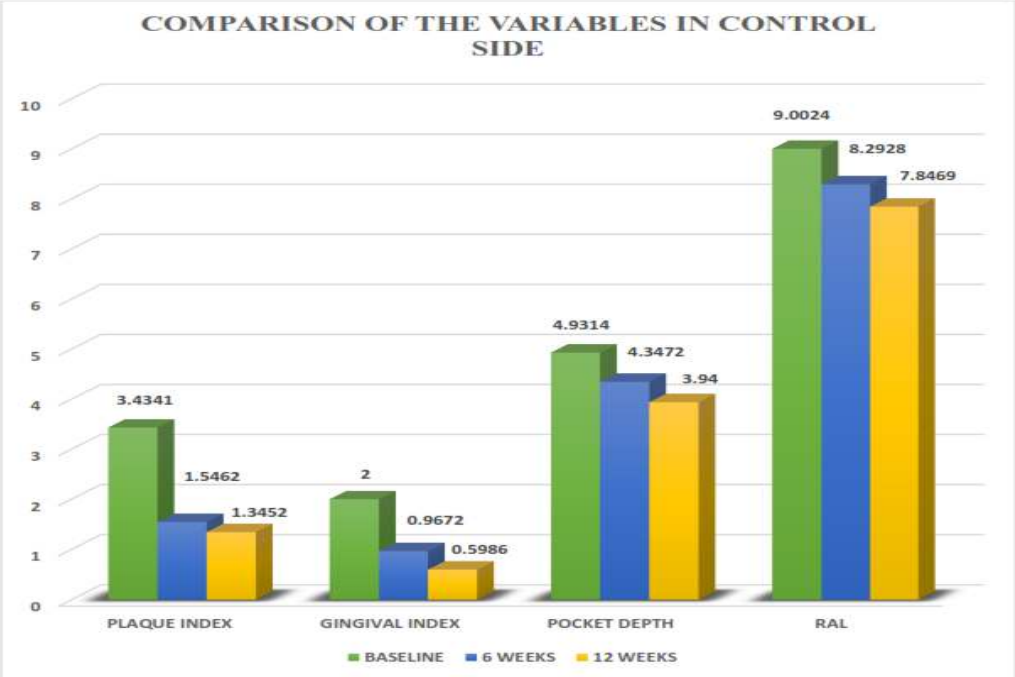
** Statistically Significant, SD- Standard Deviation*
PI: Plaque Index, GI: Gingival Index, PPD: Probing Pocket Depth (in mm), RAL: Relative Attachment Level (in mm).
P value < 0.05 – Statistically significant

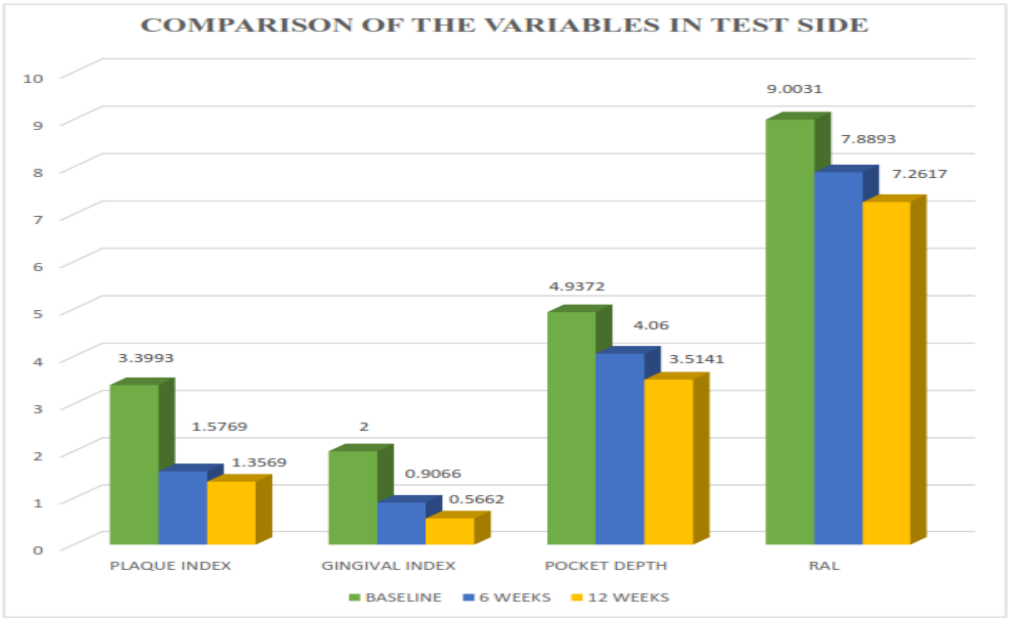
In this study the PI values showed a statistically significant reduction from baseline to 6 weeks, baseline to 12 weeks and from 6 weeks to 12 weeks in both test and control groups ($p < 0.05$) as shown in table 1, 2.In the intergroup comparison the difference in PI score for test and control groups at both 6 weeks (table 3) and 12 weeks (table 4) was negligible, and it was statistically not significant. Table 5 shows that the plaque index reduction was 2.10±0.53 and 2.06±0.52 in test and control groups respectively. This difference was statistically non-significant ($p > 0.05$) .The mean GI scores were 2.00 for both test and control groups, at baseline. The GI score reduction observed was statistically significant from baseline to 6 weeks, baseline to 12 weeks as well as from 6 weeks to 12 weeks for both test as well as control sides ($p < 0.05$) as shown in table 1,2. Intergroup comparison of, the GI scores, showed statistically significant improvement in test group when compared to the control group at 6 weeks ($p< 0.05$) (table 3), 12 weeks ($p < 0.05$) (table 4). Table 5 shows that the GI reduction was 1.40±0.32 and 1.44±0.38 in control and test groups respectively. This difference with greater improvement in test group was found to be statistically significant. ($p < 0.05$).

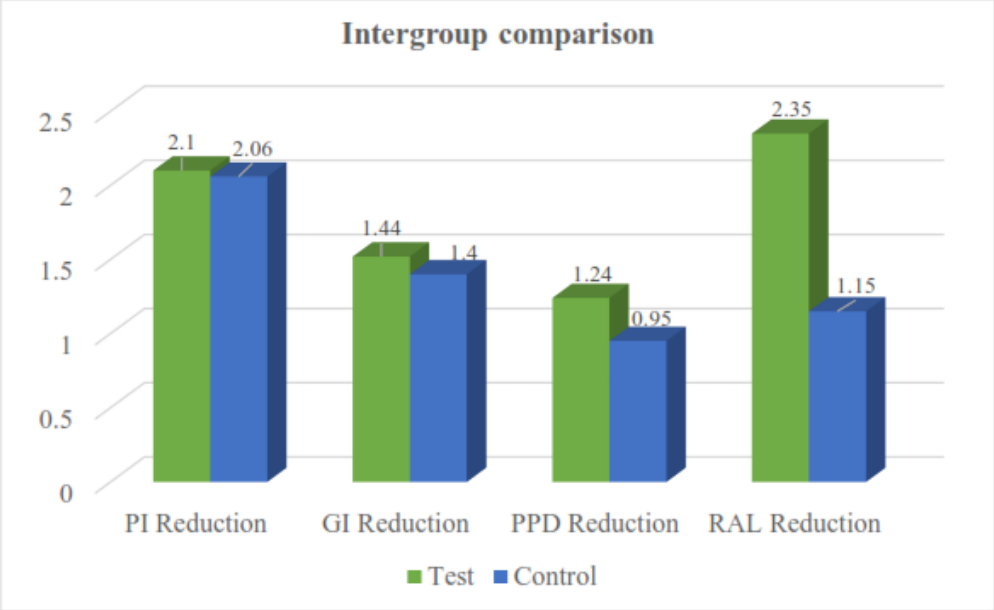
In this study, after the treatment there is reduction in mean PPD in both test group and control group in 6 weeks, 12 weeks as well as from 6 to 12 weeks which was statistically significant in both test and control groups ($p < 0.05$) as shown in table 1,2 (Fig 1,3,4 and Fig 5,6,7). In this study, the intergroup

comparison of mean PPD showed statistically significant reduction in test group when compared to control group, at 6 weeks ($p < 0.05$) (table 3) ,12 weeks (table 4) post operatively ($p < 0.05$). Table 5 shows that the PPD reduction was 0.95±0.37 and 1.24±0.40 in control and test group respectively. This difference showing higher reduction of PPD in test group was found to be statistically significant ($p < 0.05$) (Fig 1,4 and Fig 5,7).

Also, there was a statistically significant decrease in RAL from baseline to 6 weeks, from baseline to 12 weeks as well as from 6 to 12 weeks in both the test and control groups ($p < 0.05$) as shown in table 1,2 (Fig 1,3,4 and Fig 5,6,7). In intergroup comparison the RAL also showed higher reduction in test group when compared to control groups which was statistically significant at both 6 weeks ($p < 0.05$) (table 3), 12 weeks ($p < 0.05$) (table 4) post operatively. Table 5 shows that the RAL reduction was 1.15±0.48 and 2.31±0.48 in control and test groups respectively. The difference between the group with greater improvement in test group was statistically significant ($p < 0.05$) (Fig 1,4 and Fig 5,7).







DISCUSSION:

Scaling and Root Planing (SRP) leads to inadvertent curettage, thereby indirectly results in removal of the infected sulcular epithelium. But SRP does not completely eliminate the microbial colonies, located deep within the periodontal tissue. Mechanical therapy doesn't have any direct effect on perio-pathogens. [11,12]. Thus the use of adjunctive treatment to add on to the beneficial effects of Non Surgical Periodontal Therapy comes to play a pivotal role. Various adjunctive treatment modalities including systemic antibiotics, locally delivered anti microbials, Host Modulation Therapy and topical antimicrobial agents are used since a long time. Various inadvertent effects were reported with above mentioned treatment modalities.[13,14,15]

Thus to improve the effect of non surgical periodontal therapy and to surpass the inadvertent effects of others adjuncts mentioned above Laser therapy was endeavoured. Lasers provides excellent photo ablation with strong bactericidal and detoxification effects. Both the 810 to 830 nm and the 980 nm wavelengths are used for nonsurgical periodontal therapy and are supported by the literature. Diodes in this range of wavelength are absorbed in hemoglobin and pigment (e.g., melanin). These chromophores, are present in high concentrations within the diseased periodontal pocket, making these wavelengths applicable for sulcular debridement.[16]. The test sites were treated with diode laser (810 nm) as an adjunct to SRP. The diode laser (810 nm) application was done at day 1 and 3. Since single application of diode laser is not effective as observed by Alves et al (2013),[17] Zare et al (2014),[18] Borrajo et al in (2004).[6] Similarly Dukic et al (2013)[19] & De Micheli et al (2011)[5] also observed multiple application of diode laser resulted in formation of long term stable connective tissue attachment. Multiple application of diode laser was done.

In the present study the PI values showed a statistically significant reduction from baseline to 6 weeks,12 weeks and from 6 weeks to 12 weeks in both test and control groups ($p < 0.05$). In the intergroup comparison the difference in PI score for test and control groups at both 6 weeks (table 3) and 12 weeks (table 4) was negligible, and it was statistically not significant as shown in Table 5. The results obtained are in accordance with studies done by Yilmaz et al.2002,[20] and Michelli GD in 2011[5] .

As reported by Brienger and co workers [21] SRP facilitates effective removal of bio film and deposits thereby reducing PI index. But the maintenance of PI also depends on patient compliance with oral hygiene practices. The plaque index at 6 and 12 weeks was much less in both the groups, because of the effect of SRP but their difference was not significant. This might be because this is a split mouth study design where patient's oral hygiene practise was equally attributed to the entire oral cavity rather than attenuating or accentuating the plaque accumulation on test or control sides of the mouth.

Since laser treatment has shown least or no discomfort the patients maintained adequate oral hygiene on test side equal to the control side thereby showing insignificant difference between both the groups on follow up. The improvement in GI in the present study is highly significant in both groups following therapy; this is The reduction observed was statistically significant from baseline to 6 weeks,12 weeks as well as from 6 weeks to 12 weeks for both test as well as control sides ($p < 0.05$).

The GI reduction was greater in test group and was found to be statistically significant. ($p < 0.05$). The results obtained are in accordance with the studies done by Saglam et al, in 2014[22] and Yilmaz et al. 2002.[20] The variation in the studies by Alves et al [14] where the difference between both the groups were not significant maybe because of patient's incompliance which indirectly affects the gingival index and also may be due to the variations in the laser protocol used and variations in interval of observation. The significant higher reduction in test group is attributed to the diode laser which cause a reduction in gingival inflammation and the augmented healing of the inflamed tissues by improving cellular repair by increased adenosine triphosphate synthesis, fibroblast proliferation; collagen synthesis , phagocytosis of macrophages.[23] In this study after the treatment there is reduction in mean PPD and RAL in both test group and control group in 6 weeks, 12 weeks as well as from 6 to 12 weeks which was statistically significant in both test and control groups ($p < 0.05$) The higher reduction of PPD in test group was found to be statistically significant ($p < 0.05$). Similar results were obtained by Birang et al in 2015.[24] In contrast Yilmaz et al. 2015,[20] observed that, the difference in PD reduction in the test and control groups to be statistically insignificant ($p > 0.05$). Similarly in case of RAL Sreedhar annanji et al in 2016 [25] showed that teeth treated with the Laser revealed a significantly higher reduction in CAL. ($p < 0.05$). In contrast to our study Suprith SS et al in 2016 [26] showed that the patients with laser treatment showed a higher reduction in RAL sites when compared to controls at 7th day which was statistically significant with p values of < 0.05 but the difference on 30th day was not significant with a p value of > 0.05. The insignificant reduction in various studies may be attributed to difference in laser protocol used in terms of application time (Once on the day of SRP) and power settings and reduced Laser energy emitted due to improper handling of fibers, In the present study the significant higher reduction in probable probing depth and relative attachment level in test group may be attributed to the photothermal effect of Diode Laser which removes the bacteria present within the diseased soft tissue and necrotic cemental surface. Through this photothermal and photodisruptive effects bacterial pathogens within periodontal tissues are completely eliminated, thereby aiding in the healing of diseased periodontal tissue and also providing new attachment on the laser treated sites.

LIMITATIONS:

- Limited sample size.

- Only clinical parameters were assessed, whereas microbiological parameters using subgingival plaque samples evaluating the direct effect of LASER on periodontal pathogens and its bactericidal effect were not evaluated.
- Histological study indicating new attachment after LASER treatment was not assessed.

CONCLUSION:

Thus it is concluded that Diode Laser is effective as an adjunct to SRP in the management of periodontitis and in improving clinical parameters.

REFERENCES:

1) O'Leary TJ. The impact of research on scaling and root planing. J Periodontol 1986;57(2):69-75.
2) Cugini MA, Haffajee AD, Smith C, Kent RL Jr, Socransky SS. The effect of scaling and root planing on the clinical and microbiological parameters of periodontal diseases: 12- month results. J Clin Periodontol 2000;27(1):30-6.
3) Chondros P, Nikolidakis D, Christodoulides N, Rossler R, Gutknecht N, Sculean A. Photodynamic therapy as adjunct to non-surgical periodontal treatment in patients on periodontal maintenance: a randomized controlled clinical trial. Lasers Med Sci 2009;24(5):681-8.
4) Caruso U, Nastri L, Piccolomini R, d'Ercole S, Mazza C, Guida L. Use of diode laser 980 nm as adjunctive therapy in the treatment of chronic periodontitis. A randomized controlled clinical trial. New Microbiol 2008;31(4):513–8.
5) De Micheli G, de Andrade AK, Alves VT, Seto M, Pannuti CM, Cai S. Efficacy of a high intensity diode laser as an adjunct to non-surgical periodontal treatment: a randomized controlled trial. Lasers Med Sci 2011;26(1):43–8.
6) Borrajo JL, Varela LG, Castro GL, Rodriguez-Nunez I, Torreira MG. Diode laser (980 nm) as adjunct to scaling and root planing. Photomed Laser Surg 2004;22(6):509–12.
7) Miller, S.C. Textbook of Periodontia. 1st ed., Philadelphia; Blakiston:1938.
8) Turesky S, Gilmore ND, Glickman I. Reduced plaque formation by the chloromethyl analogue of victamine C. J Periodontol. 1970;41(1):41-43.
9) Loe H. The gingival index, the plaque index and the retention index systems. J Periodontol 1967;38(6):610-6.
10) Raffetto N. Lasers for initial periodontal therapy. Dent Clin North Am 2004;48(4):923– 36.
11) Derdilopoulou FV, Nonhoff J, Neumann K, Kielbassa AM. Microbiological findings after periodontal therapy using curettes, Er:YAG laser, sonic, and ultrasonic scalers. J Clin Periodontol 2007;34(7):588–98.
12) Gaspirc B, Skaleric U. Clinical evaluation of periodontal surgical treatment with an Er:YAG laser: 5-year results. J Periodontol 2007;78(10):1864–71.
13) Drisko CH. Nonsurgical periodontal therapy. Periodontol 2000 2001;25(1):77–88
14) Quirynen M, Teughels W, De Soete M, van Steenberghe D. Topical antiseptics and antibiotics in the initial therapy of chronic adult periodontitis: microbiological aspects. Periodontol 2000 2002;28(1):72–90.
15) Preshaw PM. Host response modulation in periodontics. Periodontol 2000 2008;48(1):92-110.
16) Mary Lynn Smith, RDH. Laser Assisted Non Surgical Periodontal Therapy. In: Robert. A. Convissar. Text book of Principles and Practices of Laser Dentistry, 1st ed. Newyork: Mosby Elsevier Publishers; 2010. p. 29.
17) Euzebio Alves VT, de Andrade AK, Toaliar JM, Conde MC, Zezell DM, Cai S, et al. Clinical and microbiological evaluation of high intensity diode laser adjutant to non-surgical periodontal

treatment: a 6-month clinical trial. Clin Oral Investig 2013;17(1):87-95.

18) Zare D, Haerian A, Molla R, Vaziri F. Evaluation of the effects of diode (980 nm) laser on gingival inflammation after nonsurgical periodontal therapy. J Lasers Med Sci 2014;5(1):27-31.
19) Dukic W, Bago I, Aurer A, Roguljic M. Clinical effectiveness of diode laser therapy as an adjunct to non-surgical periodontal treatment: a randomized clinical study. J Periodontol 2013;84(8):1111-7.
20) Yilmaz S, Kuru B, Kuru L, Noyan U, Argun D, Kadir T. Effect of gallium arsenide diode laser on human periodontal disease: a microbiological and clinical Study. Lasers Surg Med 2002;30(1):60–6.
21) Breininger DR, O'Leary TJ, Blumenshine RV. Comparative effectiveness of ultrasonic and hand scaling for the removal of subgingival plaque and calculus. J Periodontol 1987;58(1):9-18.
22) Saglam M, Kantarci A, Dundar N, Hakki SS. Clinical and biochemical effects of diode laser as an adjunct to nonsurgical treatment of chronic periodontitis: a randomized, controlled clinical trial. Lasers Med Sci 2014;29(1):37–46.
23) Karu T. Photobiology of low-power laser effect. Health Phys 1989;56(5):691-704.
24) Birang R, Shahaboui M, Kiani S, Shadmehr E, Naghsh N. Effect of Non Surgical Periodontal Treatment combined with Diode Laser or Photodynamic Therapy on Chronic Periodontitis: A Randomized Controlled Split-Mouth Clinical Trail. J Lasers Med Sci 2015;6(3):112-9.
25) Annaji S, Sarkar I, Rajan P, Pai J, Malagi S, Bharmappa R, et al. Efficacy of Photodynamic Therapy and Lasers as an Adjunct to Scaling and Root Planing in the Treatment of Aggressive Periodontitis – A Clinical and Microbiologic Short Term Study. J Clin Diagn Res 2016;10(2):ZC08-12.
26) Suprit SS, Setty S, Thakur S. Diode Laser as an Adjunctive to Nonsurgical Periodontal Therapy during Maintenance Phase: A Randomized Controlled Clinical Trial. Int J Laser Dent 2016;6(1):12-17.

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