Comparative Evaluation Of The Efficacy Of Pocket Debridement With Diode Laser And Periodontal Open Flap Debridement

Dr. Dhara Pandya*, Dr. Jigna Shah, Dr. Mayur Mishra***, Dr. Mandeepsinh Gohil******

*Assistant Professor, **Professor And Head, Department Of Dentistry, Government Medical College, Bhavnagar, ***Senior Lecturer, ****Reader, Department Of Public Health Dentistry, College Of Dental Science, Amargadh, Bhavnagar

Abstract: Background: In the last decade, the use of lasers (light amplification by stimulated emission of radiation) has occupied part of the dialogue within periodontology and oral surgery because of several proposed advantages. Laser uses produces less postoperative swelling, reduces inflammation and is also relatively painless. In the arena of periodontology, laser use as an adjunct to non-surgical therapy was demonstrated to enhance periodontal health. The present study was done to highlight these facts and to add over the previous researches. Material And Methods: A total of 50 patients with generalized chronic moderate to severe periodontitis with pocket probing depth (PD) ≥5 mm were selected for a split-mouth study. Flap surgery with adjunctive diode laser irradiation was performed in the test quadrant while routine OFD was done in the control quadrant. Clinical parameters including PD, plaque index, and gingival index were recorded at baseline, 3 months and 6 months following treatment. Result: All clinical parameters significantly improved after therapy without any statistically significant difference between the two groups for any of the parameters. The results of the present study indicate that diode laser used as an adjunct to in OFD did not significantly enhance the treatment outcome. Conclusion: Since there was a significant clinical improvement in case of gingival inflammation, it can be safely and effectively used to achieve the same and can aid in tissue healing. [Pandya D Natl J Integr Res Med, 2022; 13(1): 69-74, Published on 26/01/2022]

Key Words: Diodlaser, OFD, Periodontal Surgery, Pocket Debridement

Author for correspondence: Dr. Dhara Pandya, Assistant Professor, Department Of Dentistry, Government Medical College, Bhavnagar E-Mail: dentodhara08@yahoo.co.in

Introduction: Periodontitis is a chronic inflammatory disease that affects the supporting structures of teeth, resulting in tooth loss[1]. Periodontal therapy is directed at disease prevention, slowing or arresting disease progression, regeneration of lost periodontal tissues, and maintaining the achieved therapeutic objectives[2]. A major objective of periodontal therapy is to remove the soft and hard, supra- and sub-gingival deposits from the root surface to stop disease progression[1].

Complete mechanical debridement being the "gold standard" of periodontal treatment, still does not eliminate the micro-organisms in the soft tissue wall of the pocket, neither is complete resection of the diseased tissues possible.

Additional soft tissue curettage procedures using ultrasonics and other chemicals as well as several adjunctive locally delivered agents such as antimicrobials, antiseptic agents, antiinflammatory agents, and host - modulating agents have been evaluated for enhancing the treatment outcome of chronic periodontitis with varying degrees of success. However, the predictability of these treatments is not certain as well as antimicrobial drugs may lead to the development of resistant microbial strains[3]. Nowadays, periodontal therapy involves not only arresting the disease process, but also regenerating the tissues lost during the disease process. Intervention should be addressed with available treatment modalities.

In the last decade, the use of lasers (light amplification by stimulated emission of radiation) has occupied part of the dialogue within periodontology and oral surgery because of several proposed advantages[4]. Several lasers such as the carbon dioxide (CO2), Ho: YAG, Nd: YAG, diode, Er: YAG has been experimentally utilized for soft tissue periodontal procedures. Laser uses produces less postoperative swelling, reduces inflammation and is also relatively painless[3].

In the arena of periodontology, laser use as an adjunct to non-surgical therapy was demonstrated to enhance periodontal healing; however, it is still a matter of debate. Advantages over conventional periodontal flap surgeries include ablation, vaporization, hemostasis, pocket sterilization, and morbidity reduction. Lasers are also advantageous in many aspects for

periodontal treatment such as effective root surface debridement[4].

Several clinical studies have supported the antibacterial effect of lasers in periodontal pockets. Some studies have even reported tissue regeneration on histologic evaluation following laser mediated periodontal therapy utilizing the "laser assisted new attachment[3].

There are numerous studies done to find exclusive advantage of diode laser over conventional therapy. But there are paucity of evidence to find the key advantages over the conventional therapy. The present study was done to highlight these facts and to add over the previous researches. Hence the study was aim to do comparative evaluation adjuvantive benefit of diode laser to open flap debridement in surgical treatment of periodontal disease.

Material & Methods: This study was carried out on 50 participants having moderate to severe chronic periodontitis, visiting department of periodontology, Pacific dental college, Udaipur.

Before starting of the study ethical clearance was obtained from ethical committee of the institution. The study was approved by the Institutional Ethics Committee and carried out in accordance with the Declaration of Helsinki of 1975 as revised in 2000.

The details of the study were explained to the patients, and oral as well as written informed consent was taken from all for the same. The study participants were prior explained about the study and their treatment modalities.

Inclusion Criteria: Participant with chronic periodontits willing to give consent. Age group 25-60 years. Patients who had at least two quadrants with three teeth each having a pocket probing depth (PD) of ≥5 mm post.

Exclusion Criteria: Patients having systemic diseases e.g. diabetes, heart disease, immuno-compromised patients and patients on medications, which could affect the periodontium were excluded.

In addition, smokers (current or smoking within the last 5 years), pregnant women, patients having recent history of antibiotic use (within the previous 3 months) and patients allergic to medications to be prescribed Study design and parameters.

A comparative, split-mouth controlled clinical trial was carried out to compare and evaluate the plaque index (PI)5, gingival index (GI)6, and probing depth (PD), before and after closed pocket debridement with diode laser and periodontal open flap debridement. Study design A split-mouth study design was used by selecting two quadrants in each of the 50 patients.

The two assessment groups were - the control was "open flap debridement (OFD)" and test group "OFD + diode laser." Prior to the surgery, the selected quadrants were randomly allocated (by the toss of a coin) into control and test group where the control sites were treated with OFD and the test sites with OFD + diode laser.

Method: All the patients were subjected to clinical periodontal examination by a single examiner. The examiner was trained and calibrated in the subject. The clinical probing measurements PD (probing depth) were measured using a "University of North Carolina - 15" periodontal probe. 3 teeth/quadrant were selected and the deepest site was recorded of each tooth. Plaque index (PI) and gingival index (GI) were calculated at baseline, followed by posttreatment at 3 months and 6 months recall visits. The average of the mesio-buccal, facial, disto-buccal, and lingual values was considered as the index value per tooth. No attrition noted during the study for participants.

Prior to the surgery, the selected quadrants were randomly allocated (by the toss of a coin) into control and test group where the control sites were treated with OFD and the test sites with diode laser. The surgical procedures were performed by a single operator. The control quadrant OFD procedure was first performed.

Two weeks later the test side surgery was performed similarly with diode laser irradiation of the inner lining of the flap.

In the control group, the area undergo surgery was anaesthetized with 2% lignocaine hydrochloride with adrenaline (1; 80,000).

Intracrevicular incisions were placed. The granulation tissues were removed from the defects and the roots were thoroughly scaled and

planed. No root surface conditioning was performed. The control sites were sutured with the simple interrupted sutures.

For the test group, diod laser assisted periodontal therapy no local anesthesia was given. If required, the pocket was to be irrigated with 2% lignocaine hydrochloride solution with adrenaline (1; 80,000). The laser assisted therapy was inducted with all the precaution to patients and health care worker; they all were given protective eye wear, masks, gloves and drapes.

Following setting were used for diod power, 6 w, water-10 %, air -12% and frequency -20hz. A600µ sappire laser tip of 9mm length was used and inserted in to the sulcus to the base of the pocket. The tip was then withdrawn 1mmfrom the base and activated. The tip was moved in apico-coronally and mesio-distally in sweeping direction. The tip kept moving constantly with the objective of removing epithelial lining.

Each pocket was lased for 60 seconds. The area was irrigated with sterile saline. The visible deposits were removed with ultrasonic and hand instruments. The gingival tissue was compressed against the root surface to close the pocket and aidin the formation of fibrin clot. No sutures or periodontal dressing given.

Postoperatively no antibiotics or analgesics were prescribed. A 60 second rinse with 10 ml of 0.2% chlorhexidine gluconate solution twice a day for 7 days prescribed. Participants were motivated and educated to maintain oral hygiene throughout the period of study.

Plaque index and gingival index with probing depth were monitored post-treatment at 3moths and 6months.the average of mesio-buccul, facial, disto-buccul and lingual value were considered.

Statistical Analysis: The entire data were entered into the Microsoft Excel sheet before it was statistically analyzed in Statistical Package for the Social Sciences (SPSS). The statistical significance of difference of several periodontal indices studied between the two study groups was tested using independent t-test. Within the study groups, statistical significance of difference of preoperative (0th day) and postoperative (3 months and 6 moths) indices was tested using anova test. $P < 0.05$ was considered statistically significant.

Results: Results are as under.

Table 1: Intergroup Comparison Of Periodontal Parameters Studied

	Periodontal Parameter	Preoperative	Post Operative		P Value
		Baseline	3 Months	6 Months	
Test Group	Periodontal Index	2.20±0.40	0.87±0.24	0.89±0.26	0.001
	Gingival Index	2.04±0.37	1.102±0.25	1.102±0.24	0.001
	Probing Depth	6.09±0.94	4.15±0.60	4.12±0.54	0.001
Control Group	Periodontal Index	2.22±0.44	0.87±0.34	0.89±0.36	0.001
	Gingival Index	2.06±0.34	1.126±0.28	1.125±0.21	0.001
	Probing Depth	6.02±0.96	4.20±0.53	4.18±0.50	0.001

Table 2: Intergroup Comparison Of Periodontal Parameters Studied After 3 Months

Periodontal Parameters	Study Groups	Mean Score	Standard Deviation	Paired Test Value	P Value
Periodontal Index	Test Group	0.0265	0.06456	0.890	0.389
	Control Group	0.115	0.02998		
Gingival Index	Test Group	1.1500	0.22125	1.153	0.270
	Control Group	1.0750	0.22556		
Probing Depth	Test Group	2.25	0.48562	1.409	0.390
	Control Group	2.20	0.49950		

Total 50 patients sample comprised of 30 females and 20 males in the age range of 25-60 years were examined. 50 as test group (by diod laser) and 50 as control (OFD) in a split mouth design were equally divided. The average value of 3 teeth in each quadrant (i.e. test or control group) for each patient was considered while assessing the clinical parameters. The mean values and standard deviation at baseline, 3 months and 6 months are presented in Table 1.

The PI values were found to be 2.20±0.40 for test group and 2.22±0.44 for control group at the baseline while 0.87 ± 0.24 for test group and 0.87 ± 0.34 for control group after 3 months of the procedures. Very small amount of differences noted after 6 months in both the groups. The difference was found to be statistically significant. The GI decreased from 2.04±0.37 to 1.102±0.25 – 1.102±0.24 in test group and from 2.06 ± 0.34 to 1.126 ± 0.28 – 1.125±0.21 in control group after 3 months-6months of the procedures, and the difference was found to be statistically significant (*P* = 0.001) (Table 1).

There was reduction in PD at baseline from 6.09 ± 0.94 mm to 4.15 ± 0.60 mm in test group and from 6.02 ± 0.96 mm to 4.20 ± 0.53 mm in contol group after 3 months. There was very less amount of change in PD 6 months. These differences was also found to be statistically significant for both the groups (*P* = 0.001) (Table 1).

The comparison of mean values of PI, GI, and PD after 3 months of the procedures in test group and control group is demonstrated in Table 2. The mean differences show there was greater amount of reduction in PI,GI values in test group compare to control group. But the difference in PI, GI as well as PD between test group and control group after 3 months of the procedures was not found to be statistically significant (P = 0.389, 0.270, 0.390 respectively) (Table 2).

Discussion: Among the various techniques used for periodontal therapy, laser assisted periodontal therapy has emerged as a novel technique in periodontal use. Nonsurgical laser pocket therapy offers several advantages over conventional surgical procedures including no need of analgesia, lesser mechanical trauma, lesser postoperative complications in the form of pain and swelling, being a minimally invasive procedure with greater patient compliance, lesser procedural time, minimal bleeding, and additional antimicrobial effect. Laser assisted periodontal therapy allows for selective removal of sulcular or pocket epithelium preserving the connective tissues.

It can be associated with cementum-mediated new connective tissue attachment and apparent periodontal regeneration on previously diseased root surfaces. Studies have also shown that diode lasers remove epithelium effectively without damaging the underlying connective tissues[2].

The effective applicability of lasers in the treatment of periodontal disease according to their theoretic advantages (i.e., ablation or vaporization, hemostasis, and sterilization effect) compared to conventional therapy is currently a very controversial topic in clinical periodontics[4].

The results of the present study indicate that the diode laser can be safely used as an adjunct to conventional therapy. However, no significant additional benefits except for its ability to cause a significant decrease in the gingival inflammation were observed.

In the present study, the periodontal parameter were periodontal index, gingival index and probing depth were examined before treatment, and 3 months and 6 months after the treatment.

The study result showed that there was greater amount reduction in gingival and periodontal inflammation and probing depth in both the groups after 3 months. Apparently, there was very less amount of change noted between 3rd month- 6th months interval in periodontal parameters.

The PI was recorded to evaluate oral hygiene status of the participants, which showed greater reduction in score in post treatment interval than pretreatment score.

The PI score were dependent on participant hygiene and habits. In the present study, regular check up and oral hygiene education shows almost same results for both the groups. Furthure more, these findings were accordance with the previous study done by Lobo T N et al[3].

The other periodontal parameter “gingival index” was included to examine gingival condition of both the groups. Both the group showed

improvement in gingival condition after treatment. The statistical comparison of both the groups showed that test group has achieved better gingival health than control group. Although it was not statistically significant, the gingival index mean score were less in test group compared to control group. The possible reason behind it is still remain un-established.

However a meta-analysis done by Behdin S suggest that the different types of laser, including CO2, Nd:YAG, Er: YAG, and diode, have been used for periodontal disease treatment and hard and soft tissue management. Laser irradiation, at low level, stimulates surrounding tissue cells and results in reduction of inflammation, higher tissue regeneration, better tissue attachment, and even increased lymph flow, as well as less postoperative pain, once the scattered beams penetrate into pockets.

Smooth and flat root surfaces with sealed dentinal tubules as well as bacterial elimination can be obtained using CO2 lasers (in defocused pulsed mode with power of 2W), which in turn enhance fibroblast attachment. A diode laser with wavelength of 810 or 910 to 980 nm is a useful setup for soft tissue management (coagulating and cutting gingiva or oral mucosa, sulcular debridement) and has antibacterial effects.

In a comparative evaluation37 of the efficiency of the diode laser as an adjunct to mechanical debridement versus conventional mechanical debridement in periodontal open flap surgery, no difference was found between laser-treated and non– laser-treated groups with regard to clinical parameters.

However, it was reported that the use of laser treatment adjunctive to open flap debridement provides a beneficial effect by reduction of anaerobic bacterial colonies within the sulci. The antiseptic potential of lasers was explained based on laser energy disrupting the protective mechanism of the organisms[4].

This study also found that there was significant reduction in probing depth after treatment in both the groups. Again the comparison between group showed there is slightly less probing depth in test group. Although it was not statistically significant, but it can rise interest for further research. A study done by Aena P J et al[1] also found the same results about reduction of probing depth in laser group compare to modified widman flap group in their study. A study done by lindhe et al.[7], Sculen et al[8] and Moritz et al[9] mentioned about reduction in probing depth after both the conventional and laser therapy. These studies were in accordance with the present study.

For the laser-assisted pocket therapy, the reduction in PD were found to be consistent with those obtained in the studies Moritz et al[9], borrajo et al[10] , and kammaet al[11] Findings from this study show that for regeneration and PD reduction surgical procedures, adjunctive use of lasers offers no significant clinical advantages in and PD reduction compared with conventional approaches. Although the advantage and little improvement of the periodontal health over conventional approaches cannot be neglected.

Conclusion: Despite a large number of publications concerning the application of lasers in periodontics, there still are relatively few longitudinal clinical trials. This, in turn, has led to a persistent disagreement among the clinicians regarding the appropriate application of lasers to the treatment of chronic periodontitis. The results of the present study indicate that diode laser used as an adjunct to in OFD did not significantly enhance the treatment outcome.

However, since there was a significant clinical improvement in case of gingival inflammation, it can be safely and effectively used to achieve the same and can aid in tissue healing. Further research is required to provide evidence for the benefit of diode laser use in flap surgery.

References:

1. Aena PJ, Parul A, Siddharth P, Pravesh G, Vikas D, Vandita A. The clinical efficacy of laser assisted modified Widman flap: A randomized split mouth clinical trial. Indian J Dent Res 2015;26:384-9
2. Deshmukh K, Shetty D, Shetty A, Bodduru R, Nayyar AS. Comparative evaluation of the efficacy of closed pocket debridement with diode laser and periodontal open flap debridement: A clinical and microbiologic study. J Clin Sci 2018;15:113-22
3. Lobo TM, Pol DG. Evaluation of the use of a 940 nm diode laser as an adjunct in flap surgery for treatment of chronic periodontitis. J Indian Soc Periodontol 2015;19:43-8.

4. Behdin S, Monje A, Lin GH, Edward B, Othman A, Wang HL. Effectiveness of Laser Application for Periodontal Surgical Therapy: Systematic Review and Meta-AnalysisJ Periodontol 2015;86:1352-1363
5. Silness J, Loe H. Periodontal disease in pregnancy. II. correlation between oral hygiene and periodontal condtion. Acta Odontol Scand 1964;22:121-35.
6. Loe H, Silness J. Periodontal disease in pregnancy. I. Prevalence and severity. Acta Odontol Scand 1963;21:533-51.
7. Lindhe J, Lang NP, Karring T. Clinical Periodontology and Implant Dentistry. 5th edition. UK: Wiley-Blackwell; 2008.p478-89
8. Sculean A, Schwarz F, Berakdar M, Windisch P, Arweiler NB, Romanos GE.Healing of intrabony defects following surgical treatment with or without an Er:YAG laser. J Clin Periodontol 2004;31:604-08.
9. Moritz A, Schoop U, Goharkhay K, Schauer P, Doertbudak O, Wernisch J, et al. Treatment of periodontal pockets with a diode laser. Lasers Surg Med 1998;22:302-11.
10. 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;22:509-12.
11. Kamma JJ, Vasdekis VG, Romanos GE. The effect of diode laser (980 nm) treatment on aggressive periodontitis: Evaluation of microbial and clinical parameters. Photomed Laser Surg 2009;27:11-19.

Conflict of interest: None
Funding: None
Cite this Article as: Pandya D, Shah J, Mishra M, Gohil M. Comparative Evaluation Of The Efficacy Of Pocket Debridement With Diode Laser And Periodontal Open Flap Debridement. Natl J Integr Res Med 2022; Vol.13(1): 69-74