

# Assessment of Attachment Level by Laser in Pocket Therapy

Suraksha Subedi,<sup>1</sup> Sudhir S Patil,<sup>2</sup> Bikash Kumar Baniya,<sup>2</sup> Soni Bista,<sup>1</sup> Barsa Kafle,<sup>3</sup> Niva Shrestha<sup>4</sup>

<sup>1</sup>Department of Periodontology and Oral Implantology, Gandaki Medical College, Pokhara, <sup>2</sup>Department of Periodontology and Oral Implantology, Universal College of Medical Sciences, Bhairahawa, <sup>3</sup>Mantrana Dental Home, Biratnagar, <sup>4</sup>Smile Zone- Multispeciality Dental and Orthodontic center, Kallimati.

## ABSTRACT

**Background:** Scaling and root planing is the gold standard non-surgical therapy in patients with periodontitis. However, mechanical debridement alone may not eradicate all periopathogens from subgingival niches. Adjunctive use of diode laser in pocket therapy may improve tissue healing by its bactericidal and detoxification effects in subgingival areas. The objective of this study was to evaluate and compare effectiveness of scaling and root planing alone and scaling and root planing along with diode laser in chronic periodontitis patients.

**Methods:** This is a prospective comparative study conducted in which 30 chronic periodontitis patients with at least one site with clinical attachment loss  $\geq 3$ mm in each contralateral quadrant were included and divided into Site A (control) scaling and root planing only and Site B (test) scaling and root planing with diode laser therapy. Clinical parameters (Plaque Index, Gingival Index, Probing Pocket Depth and Clinical Attachment Level) were recorded at baseline, one month and three months postoperatively and compared. Student's t-test was used to analyze intra and inter site mean variation.

**Results:** Site A and Site B showed significant improvements in clinical parameters at three months postoperatively ( $p \leq 0.05$ ) with better improvement observed in Site B ( $p \leq 0.05$ ).

**Conclusions:** The use of diode laser as an adjunct to scaling and root planing can be considered as an effective treatment modality for the management of chronic periodontitis than scaling and root planing alone.

**Keywords:** Chronic periodontitis; diode laser; root planning; scaling

## INTRODUCTION

The primary goal of periodontal treatment is to remove periopathogens from the oral cavity.<sup>1</sup> This can be considered as achieved when there is decrease in plaque index (PI), gingival index (GI), probing pocket depth (PPD) and gain in clinical attachment level (CAL). Among them, gain in CAL serves as the most reliable indicator.

Scaling and root planing (SRP) is the gold standard non-surgical therapy.<sup>2</sup> However, it does not remove all periopathogens from subgingival niches. Various adjunctive protocols have been developed among which the use of lasers have gained popularity.<sup>3,4</sup> Most of the studies<sup>4-9</sup> have shown superior results with added use of a diode laser over SRP alone in periodontitis while some did not show significant difference.<sup>10-12</sup>

However, to our knowledge no such literatures are

available in Nepal. Thus, the present study was designed to compare effect of SRP alone and SRP along with diode laser in chronic periodontitis.

## METHODS

This is a prospective comparative study with a split mouth design conducted over a period of one year (9<sup>th</sup> October 2018 to 10<sup>th</sup> September 2019) in Department of Periodontics, Universal College of Medical Sciences (UCMS), Bhairahawa, Nepal. This study was reviewed and approved by Institutional Review Committee of UCMS, Bhairahawa, Nepal (UCMS/ IRC/198/18). A written consent was taken from the patients prior to data collection.

Systemically healthy patients diagnosed as chronic periodontitis with clinical attachment loss  $\geq 3$ mm on at least one site in each contralateral quadrant (either

**Correspondence:** Dr Suraksha Subedi, Department of Periodontology and Oral Implantology, Gandaki Medical College Teaching Hospital, Pokhara, Nepal. Email: surakshya691@gmail.com, Phone: +9779846022297.

maxilla or mandible) at baseline and patients with good compliance were included in the study. Patients who were on systemic antibiotic treatment in the preceding three months, those who had taken periodontal treatment during last six months, pregnant or lactating females, smoker and alcoholic were excluded from the study. Based on the study by Salgam et al.,<sup>13</sup> considering CAL as variable outcome, standard deviation of 0.65 and mean difference of 0.5, the number of patient required to be enrolled in the study was calculated as 27. However, considering the possibility of having a certain amount of drop-out patients, total number of patients included was 30.

Patient who fulfilled all the inclusion and exclusion criteria, were divided into two treatment sites. Right side was considered as Site A (Control): Treated with SRP alone and the contralateral left side as Site B (Test): Treated with SRP along with diode laser therapy. The clinical parameters included evaluation of PI (Silness & Loe, 1964)<sup>14</sup>, GI (Loe and Silness, 1963)<sup>15</sup>, PPD and CAL. The PPD was measured by GDC University of North Carolina -15 probe to the nearest millimeter as the distance from the crest of the gingival margin to the base of the pocket. The CAL was measured using same periodontal probe as the distance between the base of the pocket and CEJ. Baseline measurement of the clinical parameters was done before SRP.

Full mouth SRP was performed using ultrasonic scalers on Site A (Figure 1).



Figure 1. Ultrasonic scaling at Site A

On the Site B, SRP was done followed by laser therapy. Local anesthesia was given and diode laser (iLase™) application was carried out using 940 nm, a flexible fiber optic tip with a diameter of 300 μm (Figure 2). The laser tip was activated after the fiber has reached calibrated depth. Then the tip was moved horizontally (back and forth) and coronally (up and down), maintaining contact with soft tissue for 15-20

seconds. Then the area was irrigated with normal saline. During laser application, protective eyeglasses were worn by the patient, operator, and the assistant. Then, patients were kept on follow up visits and all clinical parameters were recorded in one and three months.



Figure 2. Diode laser application at Site B

The collected data were entered in Microsoft excel sheet and the statistical analysis was done using Statistical Package for Social Sciences version 16.0. The data were subjected to test of normality (Q-Q plot) where it was found to be normally distributed. Student's t-test was used to analyze the variation in mean between two sites where,  $p \leq 0.05$  denotes statistically significant.

## RESULTS

In total 30 patients included in the study, 60% (n=18) were males and 40% (n=12) were females. The mean age of the patients was  $35 \pm 11.20$  years. The mean ( $\pm$ SD) clinical parameters in site A and site B is shown in table 1. The mean clinical parameters scores were found to be reduced postoperatively at one month and three months compared to baseline in both sites.

The mean reduction in clinical parameters in Site A and Site B from baseline to one month and baseline to three months is presented in table 2. On applying student's t-test statistically significant reduction in both sites at all time intervals were observed ( $p \leq 0.05$ ). Further, it was noted that Site B had greater improvement in all clinical parameters.

The mean difference in clinical parameters between Site A and Site B from baseline to one month and baseline to three months is illustrated in table 3. There was statistically significant improvement in GI, PPD and gain in CAL when Site A and Site B were compared at different time intervals ( $p \leq 0.05$ ). However, in case of PI score, it was statistical significant only when baseline was compared to three months ( $p \leq 0.05$ ).

Table 1. Clinical parameters in Site A and Site B (Mean±SD).

	Baseline		1 month		3 months	
	Site A	Site B	Site A	Site B	Site A	Site B
Plaque index score	1.85 ± 0.33	1.83 ± 0.34	0.93 ± 0.2	0.85 ± 0.38	0.85 ± 0.24	0.63 ± 0.31
Gingival index score	1.96 ± 0.18	2.00 ± 0.00	1.28 ± 0.27	1.11 ± 0.23	1.15 ± 0.35	0.86 ± 0.28
Probing pocket depth (mm)	6.53 ± 0.81	7.07 ± 1.17	5.50 ± 0.86	5.07 ± 1.11	5.27 ± 0.98	4.40 ± 1.13
Clinical attachment level (mm)	4.53 ± 0.81	5.20 ± 1.37	3.50 ± 0.86	3.17 ± 1.23	3.40 ± 1.19	2.53 ± 1.30

Table 2. Intra-site comparison of clinical parameters in Site A and Site B (Mean±SD).

Clinical Parameters	Site	Baseline to 1 month	p value	Baseline to 3 months	p value
Plaque index score	Site A	0.92 ± 0.37	<0.001*	1.00 ± 0.43	<0.001*
	Site B	0.98 ± 0.51	<0.001*	1.20 ± 0.49	<0.001*
Gingival index score	Site A	0.68 ± 0.30	<0.001*	0.81 ± 0.38	<0.001*
	Site B	0.88 ± 0.23	<0.001*	1.13 ± 0.28	<0.001*
Probing pocket depth (mm)	Site A	1.03 ± 0.41	<0.001*	1.26 ± 0.52	<0.001*
	Site B	2.00 ± 0.74	<0.001*	2.66 ± 0.84	<0.001*
Clinical attachment level (mm)	Site A	1.03 ± 0.41	<0.001*	1.13 ± 0.77	<0.001*
	Site B	2.03 ± 0.76	<0.001*	2.66 ± 0.84	<0.001*

\*statistically significant ( $p \leq 0.05$ )

Table 3. Inter-site comparison of clinical parameters at different time intervals (Mean±SD).

Clinical Parameters	Baseline to 1 month	p value	Baseline to 3 months	p value
Plaque index score	0.05 ± 0.25	0.21	0.19 ± 0.25	<0.001*
Gingival index score	0.20 ± 0.24	<0.001*	0.31 ± 0.31	<0.001*
Probing pocket depth (mm)	0.96 ± 0.80	<0.001*	1.40 ± 0.85	<0.001*
Gain in clinical attachment level (mm)	1.00 ± 0.83	<0.001*	1.53 ± 1.07	<0.001*

\*statistically significant ( $p \leq 0.05$ )

## DISCUSSION

SRP, also known as non-surgical periodontal therapy, is an integral part of periodontal therapy. Numerous clinical and histopathological studies have reported its beneficial effect on gingival and periodontal health.<sup>16-18</sup> But, it cannot effectively remove microorganisms from the tissues lining the periodontal pockets. This shortcoming can be overcome by adjunctive use of laser along with SRP as it exerts bactericidal and detoxifying effects.<sup>5</sup> The beneficial effects of laser in pocket therapy have been reviewed in several studies.<sup>2,19</sup> The use of diode laser is one of the innovative approaches in non-surgical periodontal treatment. It aids in reaching sites that cannot be accessed by routine mechanical instrumentation.<sup>20</sup> So, the present study was done to evaluate and compare the effectiveness of SRP alone with SRP along with diode laser in chronic periodontitis patients.

Our study showed mean reduction in PI scores of Site

A compared with Site B (1.20 ± 0.49) from baseline to three months, which was statistically significant. This is in agreement with study done by Makhoul et al.<sup>21</sup> and Qadri et al.<sup>22</sup> Based on these studies, these literatures indicate the bactericidal and detoxifying effect of lasers. Likewise, mean reduction in GI scores of Site A compared with Site B from baseline to three months was also statistically significant. This was supported by the findings of Yadwad et al.<sup>23</sup> Such reduction in GI scores could be due to reduction of clinical inflammation which causes microbial shifts to a less pathogenic subgingival flora, probing depth reduction, and gain of clinical attachment. On the contrary, the results by Assaf et al.<sup>11</sup> and Makhoul et al.<sup>21</sup> did not show clinical influences with additional use of diode laser on gingival healing.

The present study showed statistically significant mean reduction in PPD of Site A compared with Site B from baseline to three months. This is similar to study by Makhoul et al.<sup>21</sup>, Qadri et al.<sup>22</sup> and Dukic et al.<sup>24</sup> The greater reduction in PPD might be due to the de-

epithelization of the periodontal pockets which further led to an enhanced connective tissue attachment.<sup>8,25,26</sup> Our study also supports this concept and suggests that the activation of the laser into the pocket enhances clinical healing. However, it may not evoke a substantial inflammatory difference as compared to SRP alone.

In our study, mean gain in CAL of Site A was lesser compared to Site B from baseline to three months, which was statistically significant. This is in agreement with study done by Moritz et al.<sup>4</sup> Kamma et al.<sup>5</sup> and Dukic et al.<sup>24</sup> It could be because diode laser eliminated bacteria from periodontal pockets and thus promoted some healing of periodontal tissues. Contradictory results were shown by Borrajo et al.<sup>27</sup> where there was no significant difference between two groups regarding CAL.

We found that both treatment modalities resulted in significant improvement in all clinical parameters in both control and test sites at three months. Similar results were shown in the study done by Kamma et al.<sup>5</sup>, Caruso et al.<sup>9</sup> and Gupta et al.<sup>20</sup> Furthermore, improvements in clinical parameters were greater in the site B compared to the site A. This could suggest that diode lasers might have some added benefits compared with SRP alone in the management of chronic periodontitis. Thus, diode laser treatment has hypothetically emerged as an effective non-surgical treatment modality in patients with advanced periodontitis with complex, inaccessible subgingival niches and in medically compromised patients, where comprehensive periodontal care may not be feasible. Further studies with larger sample size, additional use of microbiological, biochemical, radiographical parameters and reevaluation for a longer period of time would have added more value to the study.

## CONCLUSIONS

The adjunctive use of diode laser along with SRP can be considered as more effective treatment modalities in treatment of chronic periodontitis patients. Diode laser tends to remove the microorganisms from inaccessible areas and enhance periodontal wound healing. Further studies with longitudinal, randomized, and controlled clinical trials are necessary to adequately test the potential benefits of diode laser in non-surgical periodontal therapy for more effective management of different form of periodontitis.

## ACKNOWLEDGEMENTS

The authors would like to thank all the patients for

providing their consent for the study.

## CONFLICT OF INTEREST

None declared

## REFERENCES

- Teles RP, Haffajee AD, Socransky SS. Microbiological goals of periodontal therapy. *Periodontol* 2000; 2006;42(1):180–218. [[Pubmed](#) | [Full text \[Article\]](#)]
- Cobb CM. Non-surgical pocket therapy: mechanical. *Ann Periodontol*. 1996;1(1):443–90. [[Pubmed](#) | [Full text \[Article\]](#)]
- Miyazaki A, Yamaguchi T, Nishikata J, Okuda K, Suda S, Orima K, et al. Effects of Nd:YAG and CO2 laser treatment and ultrasonic scaling on periodontal pockets of chronic periodontitis patients. *J Periodontol*. 2003;74(2):175–80. [[Pubmed](#) | [Full text \[Article\]](#)]
- Moritz A, Gutknecht N, Doertbudak O, Goharkhay K, Schoop U, Schauer P, et al. Bacterial reduction in periodontal pockets through irradiation with a diode laser: a pilot study. *J Clin Laser Med Surg*. 1997;15(1):33–7. [[Pubmed](#) | [Article](#)]
- Kamma JJ, Vasdekis VGS, Romanos GE. The effect of diode laser (980 nm) treatment on aggressive periodontitis: evaluation of microbial and clinical parameters. *Photomed Laser Surg*. 2009;27(1):11–9. [[Pubmed](#) | [Full text \[Article\]](#)]
- Bach G, Neckel C, Mall C, Krekeler G. Conventional versus laser-assisted therapy of periimplantitis: a five-year comparative study. *Implant Dent*. 2000;9(3):247–51. [[Pubmed](#) | [Full text \[Article\]](#)]
- Dörtbudak O, Haas R, Bernhart T, Mailath-Pokorny G. Lethal photosensitization for decontamination of implant surfaces in the treatment of peri-implantitis. *Clin Oral Implants Res*. 2001;12(2):104–8. [[Pubmed](#) | [Full text \[Article\]](#)]
- Kreisler M, Al Haj H, D’Hoedt B. Clinical efficacy of semiconductor laser application as an adjunct to conventional scaling and root planing. *Lasers Surg Med*. 2005;37(5):350–5. [[Pubmed](#) | [Full text \[Article\]](#)]
- 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. [[Pubmed](#) | [Full text](#)]
- De Micheli G, de Andrade AKP, Alves VTE, Seto M, Pannuti CM, Cai S. Efficacy of high intensity diode laser as an adjunct to non-surgical periodontal treatment:

- a randomized controlled trial. *Lasers Med Sci.* 2011;26(1):43–8. [[PubMed](#) | [Full text](#) | [Article](#)]
11. Assaf M, Yilmaz S, Kuru B, Ipci SD, Noyun U, Kadir T. Effect of the diode laser on bacteremia associated with dental ultrasonic scaling: a clinical and microbiological study. *Photomed Laser Surg.* 2007;25(4):250–6. [[PubMed](#) | [Full text](#) | [Article](#)]
  12. Karlsson MR, Diogo Löfgren CI, Jansson HM. The effect of laser therapy as an adjunct to non-surgical periodontal treatment in subjects with chronic periodontitis: a systematic review. *J Periodontol.* 2008;79(11):2021–8. [[PubMed](#) | [Full text](#) | [Article](#)]
  13. Sağlam 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. [[PubMed](#) | [Full text](#) | [Article](#)]
  14. Silness J, Loe H. Periodontal disease in pregnancy II. Correlation between oral hygiene and periodontal condition. *Acta Odontol Scand.* 1964;22:121–35. [[PubMed](#) | [Full text](#) | [Article](#)]
  15. Loe H, Silness J. Periodontal disease in pregnancy I. Prevalence and severity. *Acta Odontol Scand.* 1963;21:533–51. [[PubMed](#) | [Full text](#) | [Article](#)]
  16. Lamont T, Worthington HV, Clarkson JE, Beirne PV. Routine scale and polish for periodontal health in adults. *Cochrane Database Syst Rev.* 2018;2018(12):CD004625. [[PubMed](#) | [Full text](#) | [Article](#)]
  17. Waerhaug J. Microscopic Demonstration of Tissue Reaction Incident to Removal of Subgingival Calculus. *J Periodontol.* 1955;26(1):26–9. [[Full text](#) | [Article](#)]
  18. Cobb CM, Sottosanti JS. A re-evaluation of scaling and root planing. *J Periodontol.* 2021;92(10):1370–8. [[PubMed](#) | [Full text](#) | [Article](#)]
  19. Slot DE, Kranendonk AA, Paraskevas S, Van der Weijden F. The effect of a pulsed Nd:YAG laser in non-surgical periodontal therapy. *J Periodontol.* 2009;80(7):1041–56. [[PubMed](#) | [Full text](#) | [Article](#)]
  20. Gupta S, Sawhney A, Jain G, Dhar S, Gupta B, Singh R, et al. An evaluation of diode laser as an adjunct to scaling and root planing in the nonsurgical treatment of chronic periodontitis: A clinico-microbiological study. *Dent Med Res.* 2016;4(2):44–9. [[Full text](#) | [Article](#)]
  21. Makhoulouf M, Dahaba MM, Tunér J, Eissa SA, Harhash TA-H. Effect of adjunctive low level laser therapy (LLLT) on nonsurgical treatment of chronic periodontitis. *Photomed Laser Surg.* 2012;30(3):160–6. [[PubMed](#) | [Full text](#) | [Article](#)]
  22. Qadri T, Javed F, Johannsen G, Gustafsson A. Role of diode lasers (800-980 nm) as adjuncts to scaling and root planing in the treatment of chronic periodontitis: a systematic review. *Photomed Laser Surg.* 2015;33(11):568–75. [[PubMed](#) | [Full text](#) | [Article](#)]
  23. Yadwad KJ, Veena HR, Patil SR, Shivaprasad BM. Diode laser therapy in the management of chronic periodontitis - A clinico-microbiological study. *Interv Med Appl Sci.* 2017;9(4):191–8. [[PubMed](#) | [Full text](#) | [Article](#)]
  24. Dukić W, Bago I, Aurer A, Roguljić 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. [[PubMed](#) | [Full text](#) | [Article](#)]
  25. Centy IG, Blank LW, Levy BA, Romberg E, Barnes DM. Carbon dioxide laser for de-epithelialization of periodontal flaps. *J Periodontol.* 1997;68(8):763–9. [[PubMed](#) | [Full text](#) | [Article](#)]
  26. Israel M, Rossmann JA, Froum SJ. Use of the carbon dioxide laser in retarding epithelial migration: a pilot histological human study utilizing case reports. *J Periodontol.* 1995;66(3):197–205. [[PubMed](#) | [Full text](#) | [Article](#)]
  27. Borrajo JLL, Varela LG, Castro GL, Rodríguez-Nuñez I, Torreira MG. Diode laser (980 nm) as adjunct to scaling and root planing. *Photomed Laser Surg.* 2004;22(6):509–12. [[PubMed](#) | [Full text](#) | [Article](#)]