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Journal of Dental Specialities

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Original Research Article

# Comparative evaluation of laser curettage with or without local drug delivery agent as an adjunct to non-surgical periodontal therapy in chronic periodontitis: A clinico- microbiological study

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## Abstract

**Background:** Periodontal diseases are influenced by various factors, with bacteria being a primary contributor. As Scaling and Root Planing (SRP) alone may not be able to eliminate these bacteria, combining SRP with locally delivered drug agents (LDD) and laser pocket irradiation enhance the action of laser in pocket eradication. Laser can reduce bacterial load, promote bio-stimulation and reach areas difficult to access whereas LDD provide sustained antibacterial effects that enhances periodontal health.
**Materials and Methods:** 15 chronic periodontitis patients were randomly allotted to three treatment groups: Group A (SRP+ Conventional curettage), Group B (SRP+ laser curettage) and Group C (SRP + laser curettage with local drug delivery agent). Clinical parameters were evaluated at baseline and after three months. A quantitative analysis of sub-gingival plaque samples for aerobic and anaerobic bacterial growth was conducted at both baseline and one month using the colony count method.
**Results:** In all therapeutic approaches there were significant changes in all parameters on intragroup comparison but on intergroup comparison significant changes in OHI-S, significant reduction in aerobic as well as percentage reduction in anaerobic bacteria were seen in group B and C when compared with group A.
**Conclusion:** Laser curettage combined with a LDD agent demonstrates similar clinical outcomes in terms of percentage reduction in bacteria when compared with laser curettage alone in the management of chronic periodontitis. Using Laser combined with LDD contributing to more effective periodontal therapy that supresses inflammation and enhances periodontal health.

**Keywords:** Laser curettage, Local drug delivery, Chronic periodontitis, Probing depth, Colony forming units.

**Received:** 15-11-2024; **Accepted:** 18-02-2025; **Available Online**: 23-04-2025



## 1. Introduction

Periodontitis is an inflammatory condition that affects the supporting structures of the teeth, triggered by specific microorganisms or microbial communities. It causes the gradual breakdown of the periodontal ligament and alveolar bone, often resulting in the formation of pockets or gum recession. A key goal of Phase-1 periodontal therapy is to reduce the presence of tooth-associated biofilms and their harmful by products, such as endotoxins, antigens, enzymes, and other substances that irritate the surrounding tissues.[1,2]

An essential component of periodontal disease management is the removal of plaque biofilm through Scaling and Root Planing (SRP). Although mechanical treatment significantly reduces the subgingival microbiota, it does not fully eradicate all microorganisms embedded deep within the connective tissue, which are chiefly responsible for tissue destruction.[3] Antibiotics that are systemic are utilized to lower the subgingival bacteria population. However, side effects are frequently linked to these medications.[4]

To treat periodontal diseases, various local drug delivery agents are applied directly to the mouth. These include fibers, strips, films, microparticles, gels, and nanoparticles, all designed for targeted delivery of antimicrobial agents.[5]

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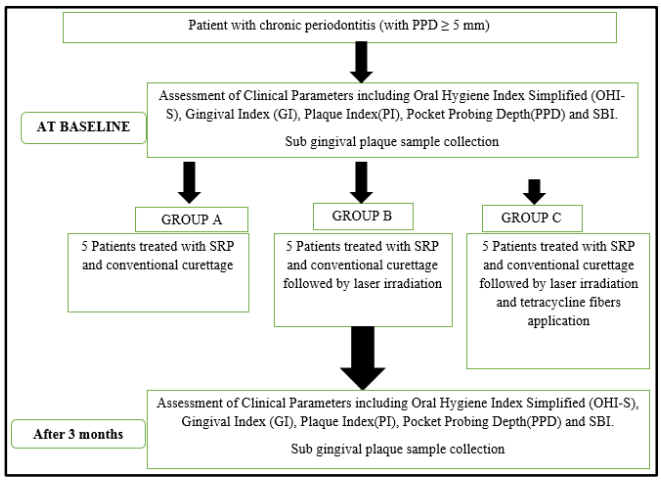
http://doi.org/10.18231/j.jds.2025.017

In 1922, LASER was introduced for treatment of periodontal disease.[6,7] Laser treatment effectively eliminate the periodontal pocket, bacterial plaque and calculus from both the tooth surface and the pocket's lateral wall.[8] Earlier, conventional hand instruments and ultrasonic instruments were the treatment of choice. With the advancements, diode laser having a wavelength of 940nm were used as an additive treatment modality for bacterial reduction and debridement of the periodontal pocket and the sulcus which ultimately goals to reduce the pocket probing depth.[9,10] Diode laser in vivo had shown no damage to cementum tissue and no thermal side effects to the tooth when treated on the root surface and also helps in enhancing drug penetrability deep into the biofilm associated with tooth structure.[10]

To our knowledge, role of diode laser assisted curettage along with local drug delivery agents have been rarely investigated. The aim of this study was to assess the antimicrobial effectiveness of Laser Curettage, with and without the addition of a local drug delivery agent, in patients with chronic periodontitis.

## 2. Materials and Methods

### *2.1. Study design*




### *2.2. Ethical consideration*

The study was carried out on patients visiting the Outpatient clinic of Department of Periodontology and Oral Implantology, I.T.S Centre for Dental Studies and Research Muradnagar, Ghaziabad, U.P.

The study was conducted according to the Declaration of Helsinki and ethical clearance was obtained from Institutional Ethical Committee under the protocol number ITSCDSR/IIEC/RP/2024/053.

### *2.3. Sample size calculation and subject groups*

A total of 15 patients with demographic considerations as shown in **Table 1** were equally distributed by chit system in all the groups. Sample size was calculated using G*Power version 3.1.9.7.

GROUP A having 5 Patients treated with SRP and conventional curettage.
GROUP B having 5 Patients treated with SRP and conventional curettage followed by laser irradiation.
GROUP C having 5 Patients treated with SRP and conventional curettage followed by laser irradiation and tetracycline fibers application.

The study included patients with localized chronic periodontitis having age ranging from 35 to 60 years and probing depth >5 mm, provided they had no ongoing systemic diseases and were not taking any medication. Exclusion criteria comprised individuals who had taken antibiotics in the last 4 weeks, received periodontal therapy in the last 12 weeks, or were pregnant or breastfeeding.

### *2.4. Procedure*

After obtaining thorough case history and written informed consent, patient were enrolled in the following study. Before SRP, all clinical parameters (OHI-S, GI, PI, PPD and SBI) were recorded. Measurements of chosen sites (PPD ≥ 5mm) were recorded using UNC 15 periodontal probe.

For microbiological sample collection, the sites were first superficially cleaned with cotton pellets and the supragingival area was dried using a stream of air. Subgingival plaque samples were then obtained from the deepest pocket using a sterilized gingival curette. Each sample were aseptically transferred into a sterile eppendorf tubes containing Phosphate Buffer Solution (PBS) and stored at -20℃ for further analysis.

After thorough full mouth SRP in all the groups, conventional curettage was done in group A with Gracey curettes under local anesthesia (**Figure 1**). In group B, conventional curettage followed by laser irradiation was done (**Figure 2**) and in group C, conventional curettage followed by laser irradiation and tetracycline fibres (Periodontal AB Plus) application was taken place (**Figure 3**).

### *2.5. Diode laser irradiation*

Selected pocket site was irradiated with Diode laser of 980nm wavelength, at 0.8W, 0.2ms pulse interval, 0.1ms pulse length in continuous pulsed contact mode. The 300µm diameter tip was inserted into the selected pocket and operated with gentle sweeping motion in distal to mesial direction for 30 sec.

Patients were then scheduled for a follow-up visit after 3 month, during which clinical parameters (OHI-S, GI, PI, PPD and SBI) were recorded and subgingival plaque samples were collected. Measurements at selected sites were taken using the UNC 15 periodontal probe.

Evaluation of bacterial load was done using digital colony counter.

*2.6. Assessments*

*2.6.1. Clinical parameters*

Oral Hygiene Index Simplified (OHI-S), Gingival Index (GI), Plaque index (PI), Pocket probing depth (PPD) and Sullivan Bleeding Index (SBI) at Baseline and after 3 months in all 3 groups.

*2.6.2. Microbiological parameters*

Quantitative analysis of sub gingival plaque samples was conducted to assess aerobic and anaerobic bacterial growth using Colony Forming Units (CFU/ml) at Baseline and after3 months in all 3 groups.

*2.7. Statistical analysis*

The data were tabulated in an excel spreadsheet and subjected to statistical analysis using Statistical Package for the Social Sciences software package (SPSS 16 Inc, Chicago IL, USA). The statistical significance of mean differences between groups was assessed using the One-Way ANOVA among the groups at each time point. The Kruskal–Wallis test was applied to find the difference in each group at each time point. The level of significance and confidence interval was 5% and 95% respectively, i.e. $p < 0.05$.

## 3. Results

Significant changes were observed in all parameters during intragroup comparison. However, in intergroup comparisons, notable improvements were seen in Group B and C, including a significant reduction in the Oral Hygiene Index Score (OHI-S) as well as a decrease in both aerobic and anaerobic bacteria, compared to Group A.

In this study, the Gingival Index (GI) was assessed to monitor gingival status. The mean gingival index scores (GI) at baseline in Group A, B and C were 2.20 ± 0.83, 1.80 ± 0.4 and 2.00 ± 0.7 respectively. After 3 months, the mean GI was 1.00 ±0.7, 0.60 ± 0.5 and 0.60 ± 0.5 for Group A, B and C respectively. On intragroup comparison, the mean gingival index scores were significant in all the groups (**Table 2**). On intergroup comparison, all three groups were showing non-significant results (**Table 3**, **Table 4**).

The mean plaque index scores (PI) at baseline in Group A, B and C were 1.88 ± 0.66, 1.72 ± 0.11 and 1.9 ± 0.3 respectively. After 3 months, the mean PI was 1.06 ±0.13, 1.02 ± 0.04 and 1.0 ± 0.0 for Group A, B and C respectively. On intragroup comparison, the mean plaque index scores were significant in all the groups **(Table 2)**. On intergroup comparison, all three groups were showing non-significant results **(Table 3, Table 4)**.

The Oral Hygiene Indices Score (OHI-S) was recorded to evaluate the oral hygiene status of the patients with mean score of 4.13 ± 1.8, 3.9 ± 0.2, 4.04 ± 0.35 in Group A, B and C respectively at baseline. After 3 months, the mean scores were reduced to 1.68 ± 0.34, 2.22 ±0.34, 2.16 ± 0.26 respectively. On intragroup comparison, the mean OHI-S scores were significant in all the groups (**Table 2**). On intergroup comparison there were significant results among all the groups (**Table 3**, **Table 4**).

The Pocket Probing Depth (PPD) is an essential clinical feature of periodontitis, as it helps in assessment of progression or regression of the disease post-treatment. In this study, the mean scores were 5.80 ± 1.9, 4.80 ± 0.83, 4.60 ± 0.54 at baseline in Group A, B and C respectively. These scores were subsequently reduced to 3.20 ± 1.48, 2.20 ± 0.83, 2.00 ± 0.70 after 3 months. On intragroup comparison, there was statistically significant reduction in pocket depth in all groups (**Table 2**). On intergroup comparison, non- significant reduction was seen (**Table 3**, **Table 4**).

In this study, the Sullivan Bleeding index (SBI) is used to assess the severity of periodontal disease. So, the mean BI scores at baseline for Group A, B and C were 2.00 ± 1.00, 1.80 ± 0.44, 2.00 ± 0.00 respectively and after 3 months it was reduced to 0.60 ± 0.89, 0.60 ± 0.54, 0.60 ± 0.54. On intragroup comparison, the mean BI scores were significant in all the groups (Table-2). On intergroup comparison, all three groups were showing non-significant results (**Table 3**, **Table 4**).

Mean CFU/ml of aerobic bacteria **(Figure 4)** at baseline for group A, B, C were 1737.60±171.80, 912.40±386.96 and 755.60±420.73 respectively and it was reduced to 1198.40±207.72, 578.20±389.79 and 236.60±177.98 after 3 months. On intragroup comparison, the mean scores were significant in all the groups (**Table 2**). On intergroup comparison between group B and C, non-significant results were found whereas on comparing group B and C with group A, significant results were observed (**Table 3**, **Table 4**).

Mean CFU/ml of anaerobic bacteria **(Figure 5)** at baseline for group A, B, C were 1067.20±909.18, 1569.60 ±627.66 and 1163.20±747.85 respectively and it was reduced to 810.40±709.93, 318.40±80.72 and 272.80± 231.92 after 3 months. On intragroup comparison, the mean scores were significant in all the groups (**Table 5**). On intergroup comparison between group B and C, non-significant results were found whereas on comparing group B and C with group A, there were significant percentage reduction of anaerobic bacteria (**Table 6**, **Table 7**).

**Table 1:** Demographic data

| Group * Sex Cross tabulation | | | | | |
|---|---|---|---|---|---|
| | | | Sex | | Total |
| | | | Male | Female | |
| **Group** | **Group A** | Count | 4 | 1 | 5 |
| | | % within Group | 80.0% | 20.0% | 100.0% |
| | **Group B** | Count | 1 | 4 | 5 |
| | | % within Group | 20.0% | 80.0% | 100.0% |
| | **Group C** | Count | 3 | 2 | 5 |
| | | % within Group | 60.0% | 40.0% | 100.0% |
| Total | | Count | 8 | 7 | 15 |
| | | % within Group | 53.3% | 46.7% | 100.0% |

**Table 2:** Intragroup comparison of PI, GI, OHI-S, PPD, BI and CFU/ML of aerobic bacteria

| Group | | | Mean | Std. Deviation | P value |
|---|---|---|---|---|---|
| **Group A** | Pair 1 | Pre PI – Post PI | .820 | .683 | .055* |
| | Pair 2 | Pre OHI-S - Post OHI-S | 2.4520 | 1.6305 | .028* |
| | Pair 3 | Pre GI – Post GI | 1.200 | .447 | .004* |
| | Pair 4 | Pre PPD - Post PPD | 2.600 | .894 | .003* |
| | Pair 5 | Pre BI - Post BI | 1.400 | .548 | .005* |
| | Pair 6 | Pre aerobic - Postaerobic | 539.200 | 167.007 | .002* |
| **Group B** | Pair 1 | Pre PI- Post PI | .700 | .141 | .000* |
| | Pair 2 | Pre OHI-S - Post OHI-S | 1.7200 | .2683 | .000* |
| | Pair 3 | Pre GI – Post GI | 1.200 | .447 | .004* |
| | Pair 4 | Pre PPD - Post PPD | 2.600 | .548 | .000* |
| | Pair 5 | Pre BI - Post BI | 1.200 | .447 | .004* |
| | Pair 6 | Pre aerobic - Postaerobic | 334.200 | 183.260 | .015* |
| **Group C** | Pair 1 | Pre PI - PI | .900 | .308 | .003* |
| | Pair 2 | Pre OHI-S - Post OHI-S | 1.8800 | .3899 | .000* |
| | Pair 3 | Pre GI – Post GI | 1.400 | .548 | .005* |
| | Pair 4 | Pre PPD - Post PPD | 2.600 | .894 | .003* |
| | Pair 5 | Pre BI - Post BI | 1.400 | .548 | .005* |
| | Pair 6 | Pre aerobic - Postaerobic | 519.000 | 274.632 | .013* |

**Table 3:** ANOVA Test for Inter group comparison of PI, GI, OHI-S, BI, PPD and CFU/ML of aerobic bacteria

| Parameters | Comparison | Mean Square | P value |
|---|---|---|---|
| **Pre PI** | Inter Groups | .049 | .769 |
| | Intra Groups | .181 | |
| | - | | |
| **Post PI** | Inter Groups | .005 | .516 |
| | Intra Groups | .007 | |
| | - | | |
| **Pre OHI-S** | Inter Groups | .046 | .963 |
| | Intra Groups | 1.234 | |
| | - | | |
| **Post OHI-S** | Inter Groups | .438 | .041* |
| | Intra Groups | .104 | |
| | - | | |
| **Pre GI** | Inter Groups | .200 | .661 |
| | Intra Groups | .467 | |
| | - | | |
| **Post GI** | Inter Groups | .267 | .503 |
| | Intra Groups | .367 | |
| | - | | |
| **Pre PPD** | Inter Groups | 2.067 | .303 |
| | Intra Groups | 1.567 | |

| | | | |
|---|---|---|---|
| | - | | |
| **Post PPD** | Inter Groups | 2.067 | .203 |
| | Intra Groups | 1.133 | |
| | - | | |
| **Pre BI** | Inter Groups | .067 | .848 |
| | Intra Groups | .400 | |
| | - | | |
| **Post BI** | Inter Groups | .000 | 1.000 |
| | Intra Groups | .467 | |
| | - | | |
| **Pre aerobic count** | Inter Groups | 1391554.400 | .002 |
| | Intra Groups | 118758.633 | |
| | - | | |
| **Post aerobic count** | Inter Groups | 1188664.867 | .000* |
| | Intra Groups | 75588.267 | |
| | - | | |

**Table 4:** Multiple Intergroup comparison of PI, GI, OHI-S, BI, PPD and CFU/ML of aerobic bacteria

| **Parameters** | **Group** | | **Mean Difference** | **Std. Error** | **P value** |
|---|---|---|---|---|---|
| **Pre PI** | Group A | Group B | .160 | .269 | 1.000 |
| | | Group C | -.020 | .269 | 1.000 |
| | Group B | Group A | -.160 | .269 | 1.000 |
| | | Group C | -.180 | .269 | 1.000 |
| | Group C | Group A | .020 | .269 | 1.000 |
| | | Group B | .180 | .269 | 1.000 |
| **Post PI** | Group A | Group B | .040 | .052 | 1.000 |
| | | Group C | .060 | .052 | .804 |
| | Group B | Group A | -.040 | .052 | 1.000 |
| | | Group C | .020 | .052 | 1.000 |
| | Group C | Group A | -.060 | .052 | .804 |
| | | Group B | -.020 | .052 | 1.000 |
| **Pre OHI-S** | Group A | Group B | .1920 | .7027 | 1.000 |
| | | Group C | .0920 | .7027 | 1.000 |
| | Group B | Group A | -.1920 | .7027 | 1.000 |
| | | Group C | -.1000 | .7027 | 1.000 |
| | Group C | Group A | -.0920 | .7027 | 1.000 |
| | | Group B | .1000 | .7027 | 1.000 |
| **Post OHI-S** | Group A | Group B | -.5400 | .2040 | .064 |
| | | Group C | -.4800 | .2040 | .109 |
| | Group B | Group A | .5400 | .2040 | .064 |
| | | Group C | .0600 | .2040 | 1.000 |
| | Group C | Group A | .4800 | .2040 | .109 |
| | | Group B | -.0600 | .2040 | 1.000 |
| **Pre GI** | Group A | Group B | .400 | .432 | 1.000 |
| | | Group C | .200 | .432 | 1.000 |
| | Group B | Group A | -.400 | .432 | 1.000 |
| | | Group C | -.200 | .432 | 1.000 |
| | Group C | Group A | -.200 | .432 | 1.000 |
| | | Group B | .200 | .432 | 1.000 |
| **Post GI** | Group A | Group B | .400 | .383 | .951 |
| | | Group C | .400 | .383 | .951 |
| | Group B | Group A | -.400 | .383 | .951 |
| | | Group C | .000 | .383 | 1.000 |
| | Group C | Group A | -.400 | .383 | .951 |
| | | Group B | .000 | .383 | 1.000 |
| **Pre PPD** | Group A | Group B | 1.000 | .792 | .691 |
| | | Group C | 1.200 | .792 | .466 |
| | Group B | Group A | -1.000 | .792 | .691 |

| | | | | | |
|---|---|---|---|---|---|
| | | Group C | .200 | .792 | 1.000 |
| | Group C | Group A | -1.200 | .792 | .466 |
| | | Group B | -.200 | .792 | 1.000 |
| **Post PPD** | Group A | Group B | 1.000 | .673 | .490 |
| | | Group C | 1.200 | .673 | .300 |
| | Group B | Group A | -1.000 | .673 | .490 |
| | | Group C | .200 | .673 | 1.000 |
| | Group C | Group A | -1.200 | .673 | .300 |
| | | Group B | -.200 | .673 | 1.000 |
| **Pre BI** | Group A | Group B | .200 | .400 | 1.000 |
| | | Group C | .000 | .400 | 1.000 |
| | Group B | Group A | -.200 | .400 | 1.000 |
| | | Group C | -.200 | .400 | 1.000 |
| | Group C | Group A | .000 | .400 | 1.000 |
| | | Group B | .200 | .400 | 1.000 |
| **Post BI** | Group A | Group B | .000 | .432 | 1.000 |
| | | Group C | .000 | .432 | 1.000 |
| | Group B | Group A | .000 | .432 | 1.000 |
| | | Group C | .000 | .432 | 1.000 |
| | Group C | Group A | .000 | .432 | 1.000 |
| | | Group B | .000 | .432 | 1.000 |
| **Pre aerobic** | Group A | Group B | 825.200* | 217.953 | .008 |
| | | Group C | 982.000* | 217.953 | .002 |
| | Group B | Group A | -825.200* | 217.953 | .008 |
| | | Group C | 156.800 | 217.953 | 1.000 |
| | Group C | Group A | -982.000* | 217.953 | .002 |
| | | Group B | -156.800 | 217.953 | 1.000 |
| **Post aerobic** | Group A | Group B | 620.200* | 173.883 | .012* |
| | | Group C | 961.800* | 173.883 | .000* |
| | Group B | Group A | -620.200* | 173.883 | .012* |
| | | Group C | 341.600 | 173.883 | .219 |
| | Group C | Group A | -961.800* | 173.883 | .000* |
| | | Group B | -341.600 | 173.883 | .219 |
| *. The mean difference is significant at the 0.05 level. | | | | | |

**Table 5:** Intragroup Comparison of CFU/ML of anaerobic bacteria

| **Groups** | | **Mean** | **Std. Deviation** | **P Value** |
|---|---|---|---|---|
| Group A | Pre anaerobic - Post anaerobic | 256.800 | 203.733 | .048* |
| Group B | Pre anaerobic - Post anaerobic | $1.251\times10^3$ | 601.261 | .010* |
| Group C | Pre anaerobic - Post anaerobic | 890.400 | 534.734 | .020* |

**Table 6:** ANOVA Test for Intergroup comparison of CFU/ML of anaerobic bacteria

| **Parameter** | **Comparison** | **Mean Square** | **P value** |
|---|---|---|---|
| **Pre anaerobic** | Inter Groups | 355652.267 | .565 |
| | Intra Groups | 593286.400 | |
| | - | | |
| **Post anaerobic** | Inter Groups | 444297.600 | .136 |
| | Intra Groups | 188105.600 | |
| | - | | |
| **% Reduction Anaerobic** | Inter Groups | 3354.496 | .000* |
| | Intra Groups | 130.062 | |
| | - | | |

**Table 7:** Multiple Intergroup comparison of CFU/ML of anaerobic bacteria

| | Group | | Mean Difference | Std. Error | P value |
|---|---|---|---|---|---|
| **Pre anaerobic** | Group A | Group B | -502.400 | 487.149 | .968 |
| | | Group C | -96.000 | 487.149 | 1.000 |
| | Group B | Group A | 502.400 | 487.149 | .968 |
| | | Group C | 406.400 | 487.149 | 1.000 |
| | Group C | Group A | 96.000 | 487.149 | 1.000 |
| | | Group B | -406.400 | 487.149 | 1.000 |
| **Post anaerobic** | Group A | Group B | 492.000 | 274.303 | .294 |
| | | Group C | 537.600 | 274.303 | .221 |
| | Group B | Group A | -492.000 | 274.303 | .294 |
| | | Group C | 45.600 | 274.303 | 1.000 |
| | Group C | Group A | -537.600 | 274.303 | .221 |
| | | Group B | -45.600 | 274.303 | 1.000 |
| **% Reduction Anaerobic** | Group A | Group B | -45.21835* | 7.21282 | .000* |
| | | Group C | -44.49920* | 7.21282 | .000* |
| | Group B | Group A | 45.21835* | 7.21282 | .000* |
| | | Group C | .71915 | 7.21282 | 1.000 |
| | Group C | Group A | 44.49920* | 7.21282 | .000* |
| | | Group B | -.71915 | 7.21282 | 1.000 |
| *. The mean difference is significant at the 0.05 level. | | | | | |

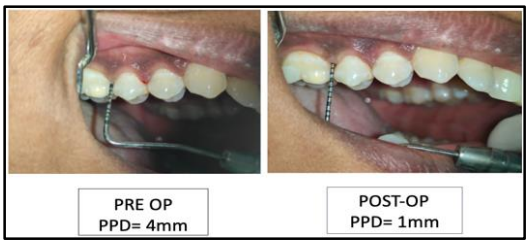



**Figure 1:** Group A: SRP + Conventional curettage (Pre and Post-operative PPD)

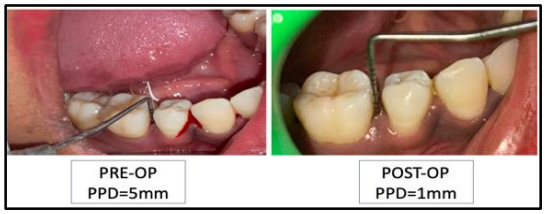



**Figure 2:** Group B: SRP + Conventional curettage + Laser (Pre and Post-operative PPD)

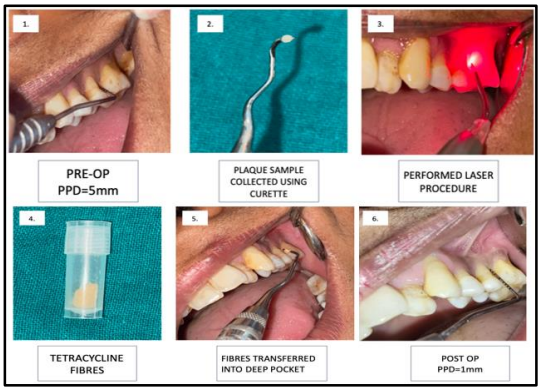



**Figure 3:** Group C: SRP + Conventional curettage + Laser + LDD (Pre and Post-operative PPD)

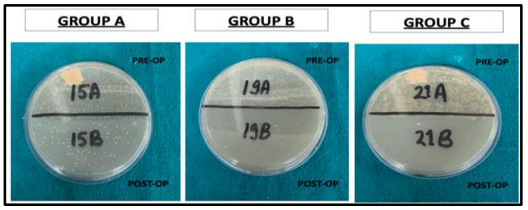



**Figure 4:** Pre and post- operative colony forming units (CFU/ML) of aerobic bacteria

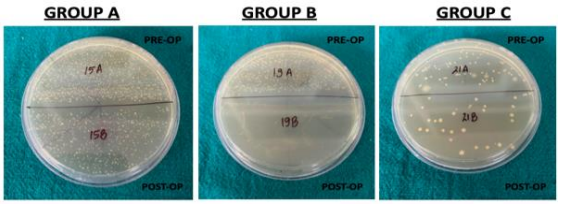



**Figure 5:** Pre and Post-operative colony forming units (CFU/ML) of anaerobic bacteria

## 4. Discussion

The rationale behind choosing microbiological culture for this study lies in its recognized position as the gold standard for both identifying and counting colonies. When utilized in conjunction with clinical trials, microbiological sampling not only enhances diagnostic procedures but also substantiates and reinforces the research results.

On intragroup comparison, all groups showed improvement in all parameters that were statistically significant. On intergroup comparison Group B and C demonstrated superior efficacy over Group A in terms of Oral hygiene scores and CFU of aerobic and anaerobic bacteria after a period of 3 months. However, there was non-significant difference between group B and C. The enhanced response to diode laser treatment in Group B and laser with

LDD treatment in Group C may be attributed to bio-stimulation of soft tissue.

Regarding the impact of diode laser on the microbial flora of affected teeth, the study revealed a notable reduction in colony count. The wavelength of the diode laser is absorbed by protohemin and protoporphyrin IX pigments present in pigmented anaerobic Perio-pathogens. This absorption leads to the vaporization of water and subsequent lysis of the bacterial cell wall, ultimately causing bacterial cell death. At the cellular level, the diode laser induces bio-stimulation, leading to an elevation in metabolism. This, in turn, enhances the production of adenosine triphosphate (ATP), the cellular fuel responsible for powering various cellular functions. The augmented energy levels contribute to the normalization of cell function and facilitate tissue healing. Additionally, the diode laser plays a role in promoting hemostasis and coagulation, further contributing to improved periodontal health over time.

*Moritz et al* conducted comparable studies, revealing a statistically significant enhancement in bleeding on probing (BOP) after treatment in comparison to the baseline.[12] Lang et al have noted that a decrease in BOP scores correlates with a reduction in periodontal inflammation. As previously mentioned, both SRP and laser curettage contribute to eliminating gingivitis, consequently leading to a reduction in BOP, following the therapeutic intervention.[13]

*Capon et al* suggest that the improved wound healing seen with laser treatment results from the induction of heat shock proteins, which aid in the expression of transforming growth factors and enhance fibroblast proliferation and adhesion to the root surface.[14]

The findings of *Safavi et al* demonstrated that laser pocket therapy inhibits the production of interleukin-1 β and interferon γ, thereby highlighting the anti-inflammatory effects of laser treatment.[15] In the study of *Kamma et al*, he concluded that although the laser group demonstrated a greater reduction in the levels of two bacteria compared to the antibiotic group at the end of treatment, the difference between the two groups was not statistically significant.[16]

*Yang et al* in 2022 concluded that the combined use of SRP, 809 nm diode laser and minocycline hydrochloride can provide an effective and reliable nonsurgical approach for periodontal treatment.[17]

Limitations of this study comprises of small sample size and the exclusion of clinical attachment loss as a parameter in the patient assessments. Further biochemical, histomorphometric, and radiological analysis are needed to validate the effects of adjunctive laser curettage, along with long-term follow-up of patients undergoing nonsurgical periodontal therapy.

## 5. Conclusion

Within the limitations of this study, Laser curettage combined with a LDD agent demonstrates similar clinical outcomes in term of percentage reduction in bacteria as compared to laser curettage alone in treating chronic periodontitis. **A**dditional benefit of LDD was not statistically significant. This suggest that laser therapy alone also is highly effective and inclusion of LDD may provide only marginal additional benefit in certain cases.

## 6. Source of Funding

None.

## 7. Conflict of Interest

Authors have no relevant affiliations and financial support from any organization and also declared no conflict of interest with the matter and material discussed in the manuscript.

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**Cite this article:** Singhania A, Malik A, Varshney M, Sharma P, Malhotra S. Comparative evaluation of laser curettage with or without local drug delivery agent as an adjunct to non-surgical periodontal therapy in chronic periodontitis: A clinico- microbiological study. *J Dent Spec* 2025;13(1):111-119.