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CLINICAL EFFICACY OF TETRACYCLINE FIBERS AND DIODE LASER AS AN ADJUNCT TO SCALING AND ROOT PLANING IN TREATMENT OF PERIODONTITIS

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Abstract : Aims: To compare efficacy of tetracycline fibers and diode laser in treatment of periodontitis as an adjunct to scaling and root planing (SRP). Settings and Design: 10 patients suffering from chronic periodontitis were selected for split mouth study and two non-adjacent sites in separate quadrants which had probing pocket depth of ≥5mm. Methods and Material: Randomization for site allocation of the test groups treatment modalities was done by using randomization software. All treatment procedures was performed by a single operator whereas, all measurements (SBI, PPD, RCAL) was done by a blinded assessor at baseline and at 1 month interval. Collected data was then put to statistical analysis. Statistical analysis used: Data was collected for all clinical parameters of all patients at both intervals (at baseline and after 1months). Statistical analysis was performed using Statistical Product and Service Solution (SPSS) version 16 for Windows (SPSS Inc, Chicago, IL). Intergroup comparison was done by using Independent T test and for intragroup comparison Paired T test was done. Results: Data collected from patients was compared and analysed by applying suitable statistical software. No significant difference was found in both groups.Conclusions: Tetracycline fibers and diode laser both are equally effective as an adjunct to SRP in treating periodontitis.

Key-words **- Tetracycline fibers, diode laser, scaling and root planing**

INTRODUCTION

Local drug delivery of antimicrobial agents into periodontal pockets has been used for almost 30 years.(1) The antimicrobial agents include tetracycline, metronidazole, ofloxacin, clindamycin, chlorhexidine which is used in periodontal pockets and can inhibit or eliminate the periodontopathogenic microorganisms as well as modulate the inflammatory response of the tissues.(2) A meta-analysis has found that adjunctive usage of locally delivered tetracycline improves the success of conventional periodontal therapy.(3)

Apart from the local drug therapy the application of diode laser in non-surgical therapy have also shown significant improvement in clinical and immunological parameters compared with scaling and root planing up to 6 months after treatment.(4) The Diode laser has shown a possible decrease in incidence of bacteraemia and can be routinely associated with mechanical non-surgical therapy in the treatment of periodontal pockets of patients with moderate-to-severe periodontitis.(5) Although one meta-analysis in 2015 concluded that LDD does not significantly improve the effectiveness of non-surgical treatment of periodontitis, 0but further long term randomized, controlled studies are recommended.(2)

Various studies evaluated clinical effects of tetracycline fibers and diode laser used adjunctively with scaling and root planing but to the best of our knowledge no study has compared tetracycline fibers and diode laser in combination with scaling and root planing in a split mouth design. Thus present study was conducted in a split mouth design to evaluate the efficacy of tetracycline fibers and diode laser in a periodontal pocket used adjunctively to scaling and root planing.

MATERIAL AND METHODS

A randomized single blind split mouth clinical trial with a sample of 10 patients suffering from chronic periodontitis having atleast 1 site in opposing quadrants with probing pocket depth ≥ 5mm were included.
Patients were selected according to following inclusion criteria:

1. Patient must have at least 2 sites in two separate quadrants having a probing pocket depth of ≥ 5 mm. (without any local irritant or risk factor like grooves/enamel pearls etc.)
2. No systemic disease that could influence the outcome or progression of periodontal therapy
3. No use of antibiotics within the previous 6 months
4. No use of anti-inflammatory drugs within the past 3 months
5. Not on any hormonal drug therapy/medications
6. Patient should be able to understand and give a written informed consent
7. Availability of the patient for the entire duration of the study

Patient was excluded if they have

1. History of allergies to tetracycline
2. Taking any medications or having treatment which may affect mucosal healing or influence the outcome or progression of periodontal therapy
3. Who were on periodontal therapy in past 6 months
4. Pregnant and/or lactating females

After obtaining thorough case history and written informed consent, the patients were enrolled in the study (considering all inclusion and exclusion criteria). Before SRP, each patient was subjected to recording of sulcus bleeding index (SBI) (Muhlemann and Sons 1971).

For standardizing the measurement of probing pocket depth (PPD) and relative clinical attachment level (RCAL), customized acrylic occlusal stents were prepared. With the help of acrylic occlusal stent, PPD and RCAL measurements of the chosen 2 sites in opposite quadrant were (≥5mm) recorded using UNC 15 periodontal probe. [Figure 1a & 2a]

After thorough full mouth scaling and root planing with the help of ultrasonic scaler, randomization for site allocation of the 2 test group treatment modalities was done using randomization software. The sites were divided into group I, and II according to the treatment to be given. Group I: SRP + Tetracycline fibers (TG), Group II: SRP + diode laser (LG).

Tetracycline fibers adjunct to scaling and root planing [Figure 1c]: The sites receiving fiber therapy were carefully isolated using cotton rolls. 2 mg of Tetracycline (Periodontal Plus AB™) impregnated with 25 mg collagen fibres were taken in a dappen dish and moistened with sterile normal saline and gently packed in the periodontal pockets using goldman fox probe. The fibres were inserted in the deepest site and successive layers were placed till all sub gingival areas are filled to the gingival margin.

Diode laser adjunct to scaling and root planing [Figure 2c]: The treatment was applied under relative isolation and in accordance to standard guidelines for usage of laser therapy. Selected pocket site was irradiated with Diode laser (Ezlase 940, Biolase) 940 nm wavelength, 0.8 power average output, operated in continuous mode. The 300-µm-diameter tip (E3–4) was inserted into the selected pocket site and operated with a gentle sweeping movement, apically to coronally direction for 30s. The entire volumes of periodontal pockets was irradiated.

After completing all the procedures instructions on proper oral hygiene measures was given to each patient. Re-assessment of all the three parameters (SBI, PPD & RCAL) in the same standard manner for all patients was performed after 1 month interval [Figure 1b & 2b]. All the treatment procedures was performed by a single operator whereas SBI, PPD and RCAL measurement was done by a blinded assessor at baseline and at 1 month interval post-operatively. Collected data was then put to statistical analysis.

(a) (b) (c)

figure 1- probing pocket depth measured using stent: a) at baseline b) at 1 month c) tetracycline fiber application

(a) (b) (c)

figure 2- probing pocket depth measured using stent: a) at baseline b) at 1 month c) diode laser application

RESULTS

As shown in Table 1 SBI score found to be statistically significant from baseline to 1 month. The PPD and RCAL results (mean ± SD) for TG and LG at baseline and after 1 month are presented in Table 2 and 3.

When compared to the baseline statistically significant differences were found in PPD and RCAL at 1 month interval post-operatively for both TG and LG ($p \leq 0.05$) (Figure 3 & 4). No significant differences between TG and LG were found in terms of reduction in PPD and RCAL gain at 1 month (Table 4) (Figure 5).

Table 1: Sulcus Bleeding Index (SBI) at baseline and 1 month

Timeline	SBI	P- value
At baseline	**0.74 ± 0.35**	**0.01***
At 1 month	**0.54 ± 0.23**	

$p \leq 0.05$ *significant difference
Test applied paired T test

Table 2: Intra group comparison between the TG and diode LG (n=10) for PPD (in mm).

Timeline	TG (mean ± SD)	LG (mean ± SD)
At baseline	5 ± 0.01	5 ± 0.01
At 1 month	3.4 ± 0.84	3.4 ± 0.84
P-value	0.01*	0.01*

$p \leq 0.05$ *significant difference
Test applied paired T test

Table 3: Intra group comparison between the TG and LG (n=10) for RCAL (in mm).

Timeline	Tetracycline Fiber group (mean ± SD)	Diode laser group (mean ± SD)
At baseline	8.7 ± 1.05	9.4 ± 1.71
At 1 month	7.2 ± 1.31	7.8 ± 1.93
P-value	0.03*	0.01*

$p \leq 0.05$ *significant difference
Test applied paired T test

Table 4: Inter group comparison between the groups (TG and LG) at 1 month Interval for PPD and RCAL

Parameters	TG (mean ± SD)	LG (mean ± SD)	P-value
PPD	3.4 ± 0.84	3.4 ± 0.84	0.9
RCAL	7.2 ± 1.31	7.8 ± 1.93	0.42

p≤0.05* significant difference
Test applied Independent T test

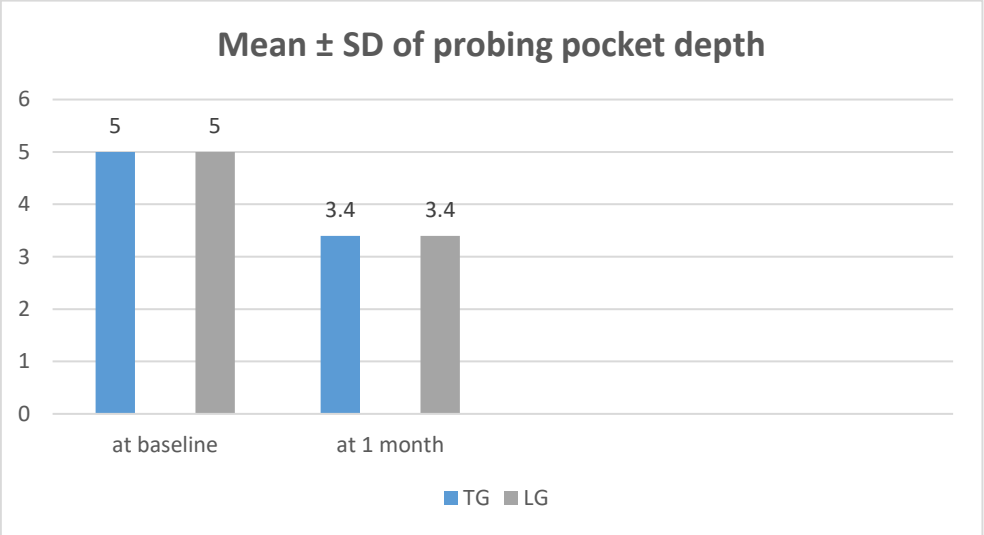

figure 3: Intragroup comparison for PPD in both the groups

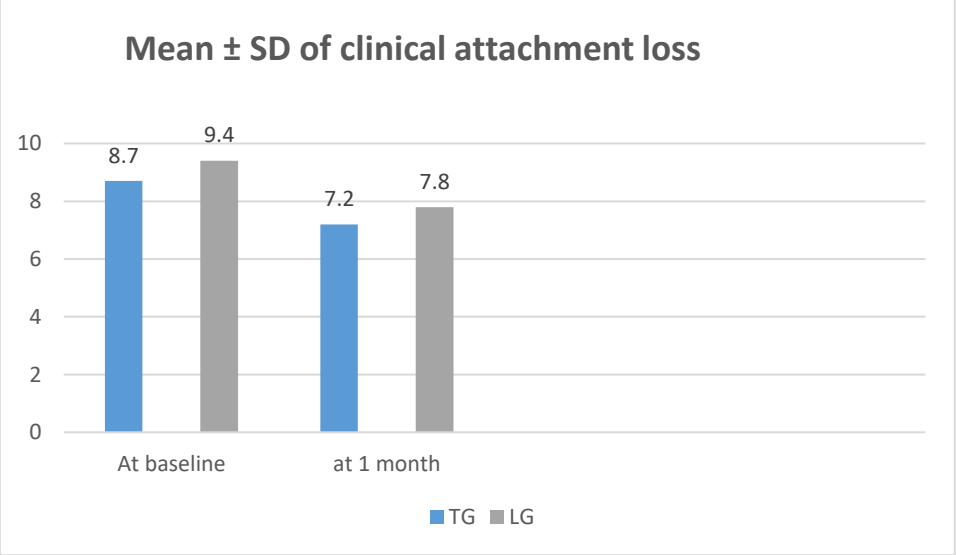

figure 4: intragroup comparison for RCAL in both the groups

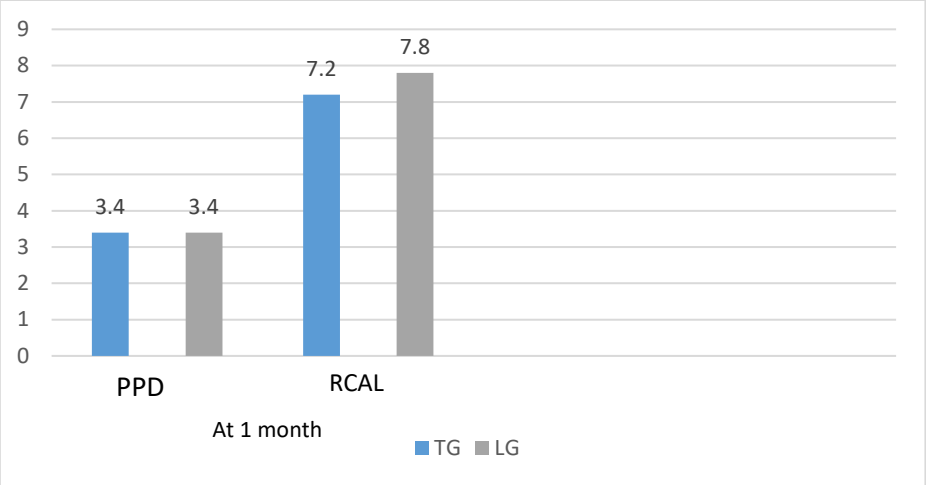

figure 5: intergroup comparison for RCAL and PPD

DISCUSSION

The use of local drug delivery and diode laser as an adjunctive therapy for periodontal disease is now well known to improve tissue healing by bactericidal and detoxification effects. [6],[7],[8],[9],[10],[11],[4]

According to the results, tetracycline fiber and diode laser therapy showed significant (P<0.001) reduction in probing pocket depth (PPD) and gain in clinical attachment level (CAL) as an adjunct to scaling and root planing (SRP) from baseline to one month. Similar results were found in the studies conducted by Goodson et al.,[9] Minabe et al.,[12] Newman et al.,[13] Drisko et al.,[14] Moritz A et al.,[15] Dukic et al.,[16] Tonetti et al.,[8] Crispino A et al.[17] Although significant Reduction of PPD and CAL gain was observed in the study but this finding could be attributed to SRP alone.

When compared tetracycline and diode laser therapy as an adjunct to scaling and root planing, no statistically significant difference was obtained in the mean change of PPD and clinical attachment level over a period of one month postoperatively. Dodwal et al.,[18] Sinha et al.,[19] Khan et al.,[20] and Borrajo et al.,[21] reported that significant improvements in clinical parameters (PPD, CAL) in tetracycline therapy when used as adjuncts to SRP versus SRP alone and laser therapy when used as adjuncts to SRP versus SRP alone in 1 month interval whereas, highly significant difference were found at 3 month interval in non-surgical periodontal therapy of patients with periodontitis. In contrast, the studies conducted by Ambrosini et al.[22] and Thomas et al.[23] found no significant difference in clinical outcomes (PPD, CAL) when compared tetracycline and laser therapy as an adjunct to SRP than SRP alone at 3 month interval. Similar results was observed in the present study where no significant differences were found in clinical parameters (PPD, CAL). Sulcus bleeding index also showed statistically significant reduction from baseline to 1 month. Sharma NK et al.,[6] Sinha S et al.,[19] Khan FY et al.,[20] Kaur S et al[24] found significant improvements in SBI score from baseline to 1 month interval whereas, highly significant difference were found at 3 month interval.

Scaling and root planing being an extremely effective treatment modality for controlling early to moderate periodontitis,[16],[25],[10],[11] the use of currently available local delivery systems with antimicrobials and the diode laser as an adjunct to SRP does not seem to provide any added therapeutic advantage.[26],[27],[23]

There were some limitation like no microbiological studies and histopathologic evaluation was done. However, additional randomized, controlled long-term studies considering all clinical, microbial, tissue response aspects are warranted in order to assess the long-term effectiveness of the adjunctive application of diode laser therapy and tetracycline fiber application in the non-surgical treatment of periodontitis.

CONCLUSION

Current evidence suggests that the use of tetracycline fiber as an adjunct to SRP may be equivalent to the adjunctive usage of diode laser with respect to reduction in probing pocket depth and clinical attachment gain in the treatment of periodontitis. Additional prospective longitudinal studies are needed to evaluate the long-term effects of tetracycline fiber and laser therapy as an adjunct to SRP.

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