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Research Article

Use of Chlorhexidine Chip and Diode Laser as an Adjunct to Scaling and Root Planing in Chronic Periodontitis-A Randomised Controlled Clinical Trial

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Abstract

Adjunctive use of chlorhexidine and diode laser in localised periodontal pocket decontamination along with scaling and root planing provides favourable outcome. The purpose of this study was to assess the efficacy of diode laser and sub-gingival chlorhexidine chip when used as an adjunct to SRP for non-surgical management of patients having periodontal pockets. 15 patients, 7 males and 8 females belonging to the age group of 18-60 years fulfilling the inclusion and exclusion criteria were included in the study. Baseline measurements PI, GI, PPD, CAL were done. SRP was done and groups were randomly assigned into Group I, Group II, Group III, Group IV to Control group (SRP), SRP + (GaAlAs) diode laser group, SRP + CHX chip group, SRP + (GaAlAs) diode Laser + CHX chip group respectively. Clinical parameters were assessed at 1 month, 3 months, and 6 months. Inter-group comparison of test groups revealed that the CHX chip group and combination of laser decontamination and chlorhexidine chip group showed statistically significant difference in PPD reduction and gain in CAL when compared with diode laser group at 3 and 6 months. The results suggested that chlorhexidine local delivery alone or in combination with diode laser decontamination was effective in improving all parameters when used as adjuncts to SRP in non-surgical periodontal therapy of patients with chronic periodontitis.

Keywords: Chlorhexidine Chip; Diode Laser; Chronic Periodontitis

Introduction

The initiation and progression of periodontal disease is associated with pathogenic bacteria present in the sub-gingival biofilm [1]. Majority of the periodontal patients can be managed by non-surgical periodontal treatment.[2] It includes maintenance of oral hygiene, gingival irrigations, mechanical instrumentation, full mouth disinfection, host modulation and antimicrobial therapy, which are used as adjunctive treatments or as standalonetherapies [2]. Mechanical therapy does not completely reaches the deep and tortuous pockets making it difficult to eradicate [2].

Goodson, Haffajee and Socransky, in 1979, first proposed the concept of controlled local drugdelivery in the treatment of periodontitis [3]. The concept of local drug delivery is based on antimicrobial agent placed directly into the pocket shall provide prolonged higher concentrations of the drug locally without any systemic side effects [4]. Chlorhexidine [CHX] isthe most widely used topical antiseptic and antiplaque agent in periodontics [5]. It has plaque inhibitory effect that results primarily from the binding of the antiseptic to anions present on the tooth surface. Therefore, a locally delivered system containing chlorhexidine along with conventional therapy can be expected to control periodontal disease progression more effectively [6].

A vast variety of dental lasers are commercially available, each having their specificadvantages. The diode laser is a semiconductor laser that generally includes a combination ofgallium, arsenide, and other elements such as aluminium and indium to convert

electricalenergy into light energy [7]. The wavelength of diode laser ranges between 800 and 980 nm [8]. Thenon-surgical laser assisted periodontal therapy includes pre-procedural disinfection, sub-gingival curettage, sulcular debridement and decontamination [9]. Laser therapy is proven to beeffective when used for the non-surgical treatment of patients with chronic periodontitis.[10] There are very few studies that have compared local delivery of chlorhexidine and lasers as anadjunct to SRP for the management of periodontal diseases.

Aim

The purpose of this study was to assess the efficacy of diode laser and sub-gingival chlorhexidine chip when used as an adjunct with scaling and root planing for non-surgical management of periodontal pockets in patients with chronic periodontitis.

Materials and Method

The study was conducted in outpatient Department ofPeriodontology, Shree Bankey Bihari Dental College, Masuri, Ghaziabad. The study hasbeen approved by the institutional ethical committee. 15 patients, 7 males and 8 femalesbelonging to the age group of 18-60 years fulfilling the inclusion and exclusion criteriawere included in the study. All the patients was informed about the purpose of the study andwritten informed consent was taken from them. Randomization was done by chit method.

Inclusion criteria

Presence of a minimum of 15 teeth. One interproximal site with probing pocket depth measuring 4mm-6mm in each quadrant. Patients who are non-smokers. Patients who are co-operative and able to attend the hospital for regular follow-up.

Exclusion criteria

Patients suffering from any known systemic disease. Patients who had received any known surgical or nonsurgical periodontal therapy within six months of the start of the study. Patients who had taken antibiotics, chemotherapeutic mouth rinses within the last six months of the start of the study. Patients with knownhypersensitivity to chlorhexidine.

In all the selected patients, clinical parameters; plaque index (PI), gingival index (GI), probingpocket depth (PPD), and clinical attachment level (CAL) was recorded at baseline. Full mouthscaling and root planing (SRP) was done. After 1 week one interproximal site in each quadrant with a probing pocket depth of 4mm to 6mm was randomly assigned by chit method into Group I, Group II, Group III, Group IV to Control group (SRP), SRP + (GaAlAs) diode laser group, SRP + CHX chip group, SRP + (GaAlAs) diode Laser + CHX chipgroup respectively. In Group II, (GaAlAs) diode laser (Zolar Laser) with a tip diameter of 400μm, optical fiber that emitted light at wavelength of 810nm was applied. The fiber was insertedinto the periodontal pocket upto 1 mm depth parallel to the long axis of the tooth and moved apico-coronally at 0.5 watts for 10 secs per site. In Group III, the area was dried, and the chlorhexidine chip was inserted into periodontal pocket with tweezers. Coe pak was placed onsites where chlorhexidine chip application was done. In Group IV, (GaAlAs) Diode laser followed by CHX chip placement was done. The patients were given instructions not to chewhard or sticky foods, not to floss on the treated site, not to probe the area with tongue, finger or tooth pick and to report immediately if the material or the pack is dislodged before the scheduled recall visit or if pain, swelling or any other problem occurs. All patient recalled after10 days for Coe pack removal and evaluation of any chip displacement. Patient recalled after 1 month, 3 month and 6 month and clinical parameters were recorded.

Statistical analysis

The data was analysed by SPSS (Statistical Package for Social Sciences) 21.0 version. Shapiro Wilk test was used to check which all variables were followingnormal distribution. Data were not normally distributed (p-value < 0.05). Therefore, bivariate analyses were performed using the nonparametric tests i.e., Friedmann test (for comparing repeated reading of two or more groups) and Wilcoxon paired test (for comparing two pairedreadings). A statistical significance will be assumed when $p < 0.05$. The values were represented in Number (%) and Mean + SD.

Results

All 15 subjects had completed the study. The mean age of subjects was 32.67 ± 11.91 years. On pair-wise comparison for all four parameters, significant differences were seen among all pairs of group. Higher scores were seen in group 1, which were significantly higherthan group 2, which were significantly higher than group 3 and this was significantly higher than that seen in group 4 at different time interval. Inter-group comparison of test groups revealed that the CHX chip group and combination of laser decontamination and chlorhexidinechip group showed statistically significant difference in PPD reduction and gain in CAL compared to diode laser group at three months and six months.

Discussion

Periodontal diseases consists of a group of chronic inflammatory lesions which takes place by the accumulation of sub-gingival biofilm. Mechanical sub-gingival debridement i.e., scaling and root planing is considered as the gold standard of non- surgical peri-

Figure 1: 1: PPD at baseline 2: Root planning 3: Chlorhexidine chip 4: CHX chip placed in periodontal pocket 5: Coe pack placed 6: Diode laser decontamination 7: PPD at 1 month 8: PPD at 3 month 9: PPD at 6 months.

		N	Mean	SD	Lowerbound (CI)	Upper bound (CI)	Chi squarevalue, p value
At baseline	GROUP 1	15	3.7953	.51520	3.5100	4.0806	0.073, ns
	GROUP 2	15	3.7807	.53850	3.4825	4.0789	
	GROUP 3	15	3.8853	.25559	3.7438	4.0269	
	GROUP 4	15	4.0187	.31697	3.8431	4.1942	
At onemonth	GROUP 1	15	4.0893	.40575	3.8646	4.3140	0.001*, sig Group 1> Group 2> Group 3> Group 4
	GROUP 2	15	3.6840	.51236	3.4003	3.9677	
	GROUP 3	15	3.4660	.24333	3.3312	3.6008	
	GROUP 4	15	3.3993	.27701	3.2459	3.5527	
At three months	GROUP 1	15	3.8300	.65130	3.4693	4.1907	0.001*, sig Group1> Group2> Group3> Group 4
	GROUP 2	15	3.4367	.24400	3.3015	3.5718	
	GROUP 3	15	3.1387	.40137	2.9164	3.3609	
	GROUP 4	15	3.1180	.45595	2.8655	3.3705	
At sixmonths	GROUP 1	15	3.4113	.30054	3.2449	3.5778	0.001*, sig Group1> Group2> Group3> Group 4
	GROUP 2	15	2.5967	.36716	2.3933	2.8000	
	GROUP 3	15	2.6227	.28411	2.4653	2.7800	
	GROUP 4	15	2.5567	.30856	2.3858	2.7275	

Table 1: Comparison of CAL among four groups at various intervals of time.

		N	Mean	SD	Lowerbound (CI)	Upper bound (CI)	Chi squarevalue, p value
At baseline	GROUP 1	15	3.39	0.19	3.28	3.49	0.300, ns
	GROUP 2	15	3.27	0.19	3.16	3.37	Group1>
	GROUP 3	15	3.23	0.27	3.08	3.38	Group2>
	GROUP 4	15	3.35	0.32	3.17	3.52	Group3>
							Group 4
At one month	GROUP 1	15	3.54	0.25	3.40	3.68	0.001*, sig
	GROUP 2	15	3.45	0.09	3.40	3.50	Group1>
	GROUP 3	15	3.32	0.13	3.24	3.39	Group2>
	GROUP 4	15	3.25	0.15	3.16	3.33	Group3>
							Group 4
At three months	GROUP 1	15	3.78	0.23	3.65	3.91	0.001*, sig
	GROUP 2	15	3.07	0.30	2.90	3.24	Group1>
	GROUP 3	15	3.10	0.14	3.02	3.18	Group2>
	GROUP 4	15	3.04	0.29	2.88	3.20	Group3>
							Group 4
At six months	GROUP 1	15	3.79	0.09	3.74	3.84	0.001*, sig
	GROUP 2	15	2.82	0.22	2.70	2.95	Group1>
	GROUP 3	15	2.77	0.33	2.58	2.95	Group2>
	GROUP 4	15	2.71	0.26	2.57	2.86	Group3>
							Group 4

Table 2: comparison of PPD among four groups at various intervals of time.

Friedmann test, level of significance set at $p < 0.05$; Ns: Non-Significant; sig: Significant

odontal procedure. However, mechanical therapy may fail to eliminate the pathogenic bacteria because of their location within gingival tissues or in other areas inaccessible to periodontal instruments. This has led to the development of alternative or adjunct treatment that might provide added benefits along with scaling and root planing.

Present study showed no significant improvement in probing pocket depth and clinicalattachment gain in laser group when compared to control group. On the contrary study conducted by Dukic., *et al.* (2013), showed a significant improvement in PPD and CAL [11].This conflicting result may be due to the higher power settings and multiple radiations used in thosestudies. The amount of pocket reduction is due to the soft tissue shrinkage following scaling and root planing as well as resolution of gingival inflammation due to the action of the antimicrobial agent. This is in accordance with the study conducted by Crispino A., *et al*. [12] (2015).

The effects of locally delivered controlled-release chlorhexidine have been shown to be evident upto 11weeks which corresponds to 3 month results [13]. In this study CHX chip groupcomparison with control group showed statistically significant reduction in PPD and mean gainin CAL. Reported results similar to our study [14]. On comparing chlorhexidine group with combination group there was no statistical significance, this can be interpreted in two ways. On one hand, the results of single laser decontamination can be

enhanced by the subsequent placement of chlorhexidine chip into a periodontal pocket.Conversely, there is no added benefit of laser decontamination of a pocket prior to local delivery of chlorhexidine. This method of decontamination is useful in case of shallow pocketsbut in the presence of deep pockets it does not provide complete remission and requires surgicaltherapy.

Conclusion

The results obtained in this study suggest that chlorhexidine local delivery alone or in combination with diode laser decontamination is effective in improving oral hygiene, reducing gingival inflammation, reducing probing pocket depth and improvingclinical attachment levels when used as adjuncts to scaling and root planning in non-surgical periodontal therapy of patients with chronic periodontitis.

Adjunctive use of a single application of diode laser decontamination has no significant effecton the clinical periodontal parameters over the results achieved by scaling and root planning.

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