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Efficacy of Photodynamic Therapy compare to Chlorhexidine Irrigation as an adjunct to Scaling and root planing - An Original study

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ABSTRACT

The purpose of the present study was to evaluate the efficacy of the Photodynamic therapy in addition to the classical treatment with scaling root planing compare to subgingival chlorhexidine irrigation. A 20 patient of chronic generalized periodontitis with probing depth more than 5mm, were included in the study. According to split mouth design, for one quadrant scaling and root planning with Photodynamic therapy was performed and other side scaling and root planning with chlorhexidine irrigation was done as a control group. A statistically significant difference in median Gingival Index score over a period of 20 days from baseline was observed in the site of the test group as compared to control site. The present study supports the treatment approach of Photodynamic therapy an adjunct to routine scaling and root planning. Photodynamic therapy is as efficient and safe to be used in addition to root planing when compared to sub gingival irrigation with scaling and root planning.

Keywords: Photodynamic Therapy, Periodontitis, Scaling and root planing

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INTRODUCTION

The primary goal of a management of inflammatory periodontal disease is to reduce and eliminate the microbial biofilm and microorganism attached to the root surface. Biofilm reduction plays a key role as it provides a promotive environment for bacterial growth. In addition to the classical method of using hand instruments for the reduction of bacterial load and root planning various other adjunctive therapy has been considered including uses of laser, chemical debridement, local antibiotic delivery and Photodynamic therapy[1]. Photodynamic therapy (PDT) uses the phenomenon of excitation of photo sensitizer usually a nontoxic dye by a light wave generated by a laser light which results in releasing singlet oxygen and reactive form of oxygen which can cause oxidative damage to the target cell. Commonly used photo sensitizers are methylene blue, toulidine blue and acridine orange[1, 2]. Chlorhexidine has a broad activity against bacteria, yeast, fungi and enveloped viruses and used often in periodontal irrigations.

MATERIALS AND METHOD:

The present study was planned to evaluate the efficacy of Photodynamic therapy (PDT) after scaling and root planning (SRP) compared to chlorhexidine irrigation.

A 20 adult patient of chronic generalized periodontitis with probing depth more than 5mm, who reported to the department of periodontics, AB Shetty Dental College Mangalore were included in the study. Informed written consent was obtained prior to the study. Inclusion criteria for the study group are patient with generalized periodontitis with probing depth more than 5mm in minimum 2 teeth in each quadrant and the patient who consented to participate in the study. The exclusion criteria study were presence of systemic disease, treatment with antibiotics for the last six months, pregnancy, and smoking

At the beginning of study each patient two types of treatments were planned according to split mouth design. For one quadrant scaling and root planning (SRP)with Photodynamic therapy (PDT) was performed as a study group and other side scaling and root planning with chlorhexidine irrigation as a control group (figure 1 and 2)

For the Photodynamic therapy 0.005% methylene blue was used as a photo sensitizer and activated with a laser at a wavelength of 830-930 nm and a maximum power of 0.1 watts for 60 seconds at all six sites of the teeth. The laser tip was placed in contact mode by placing it into pocket depth. For the control site undiluted 0.2% chlorhexidine irrigation was used to irrigate sub gingivally at all sites of the teeth after scaling and root planning (figure 1 and 2)

All subsequent examination was done by the same examiner with a fixed periodontal probe. The measurement of the clinical parameter was performed at baseline ie; prior to the treatment and 20 days after the treatment. Clinical parameter used for the comparison was gingival index probing for gingival bleeding and oral hygiene index (figure 3 and 4). The results obtained were analysed statistically by utilizing Shapiro-Wilk test, also with non-parametric test (Wilcoxon paired test) for comparisons between visits within each group and Mann-Whitney test for comparisons of change magnitude between test groups.

Figure 1: Armamentarium used for the Clinical Examination and for therapy

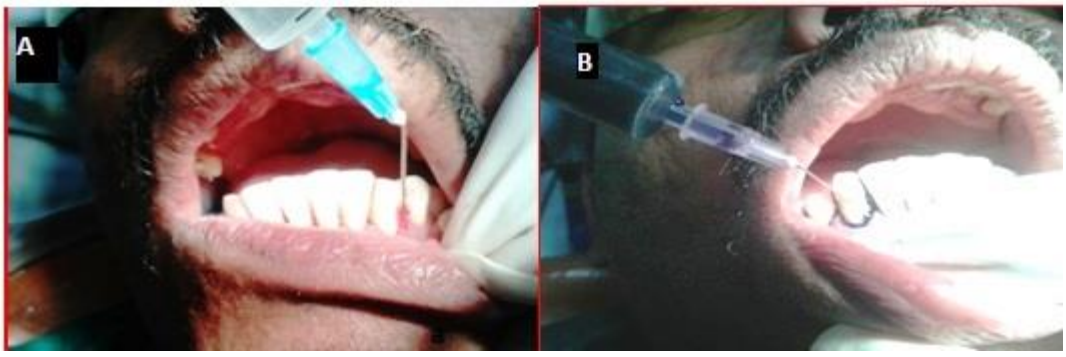

Figure 2: photograph showing chlorhexidine irrigation (A) and Methylene blue application after scaling and root planning in same patient

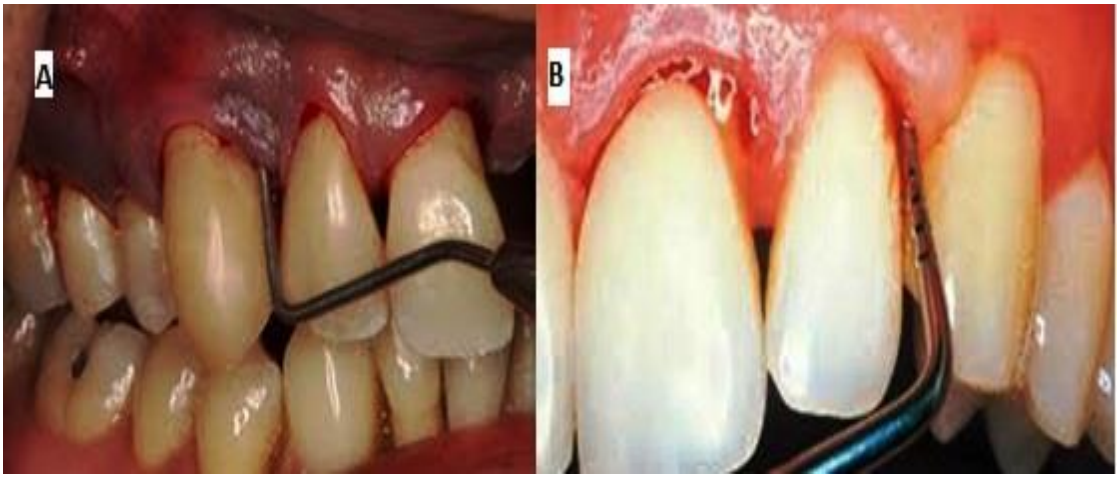

Figure 3 :Photograph showing gingival index and probing depth evaluation 20 days after the treatment

Figure 4: Photograph showing oral hygiene index in prior to the treatment and after 20 days

RESULTS AND DISCUSSION:

Efficacy of Photodynamic therapy with Scaling and root planing in the present study was assessed by comparing the baseline to the final assessment after 20 days. In the present study a statistically significant difference in median Gingival Index score over a period of time from baseline to after 20 days observed in the site of the test group as compared to control site. No significant difference is seen in median Oral Hygiene Index-Simplified score over a period of time between visit one and two. Improvement was seen concerning reduction in probing depth in sites treated with SRP and PDT as compared to SRP with irrigation. However statistically there is no difference in median probing depth score over a period of time from baseline to 20 days after scaling in both the groups (figure 5 and 6).

Figure 5: Descriptive statistics within each study group at each visit and for change of studied parameters between visits

Parameter	Group	V1- V2						
		Mean	Std Dev	Median	Q1	Q3	Wilcokson Signed Rank Test	Man-Whitney U test
Gingival Index	Control	0.833	0.2225	0.800	0.700	0.900	0.001*	0.003*
	Test	1.0867	0.282	1.000	0.900	1.200	0.001*	
OHI-S Index	Control	1.333	0.489	1.400	0.800	1.800	0.001*	0.325
	Test	1.206	0.384	1.300	0.900	1.600	0.001*	
Probing Depth	Control	0.8000	0.414	1.000	1.000	1.000	0.001*	0.461
	Test	0.933	1.032	1.000	1.000	1.000	0.008*	

Figure 6 : Wilcokson paired test for comparisons between visits within each group and Mann-Whitney test for comparisons of change magnitude between test groups.

Parameter	Group		
		Wilcokson Sign test	Man Whitney U test
Gingival Index	Test	0.001	0.003
	Control	0.001	
OHI-S	Test	0.001	0.325
	Control	0.001	
Probing Depth	Test	0.008	
	Control	0.001	0.461

The Goal of effective periodontal therapy and maintaining a healthy periodontium requires removal of biofilm microorganism which is universally accepted fact however there is a lack of consensus on the approach to this [3].

A Patient with severe periodontitis will receive a broader and more powerful antibiotic treatment than patients with milder periodontitis, but the optimal type of antimicrobial therapy is still a topic of debate. The morphological and infection complexity of the periodontitis suggests a pure mechanical approach to periodontal therapy may not resolve all cases [3].

Chlorhexidine is well known antiseptic and antimicrobial agent and commonly used as irrigants in oral surgical procedure. Subgingival irrigation with chlorhexidine is effective in reducing periodontal inflammation and in controlling subgingival plaque however Chlorohexidine is thought to interfere with periodontal healing and prolonged use of chlorohexidine causes staining of teeth[3].

Photodynamic therapy has been used in the treatment of cancer with a good success rate [4]. Photodynamic therapy has been suggested by many investigators as an alternative to chemical antimicrobial agents to remove subgingival micro organisms and treat periodontitis and many studies proved periodontal bacteria are susceptible to Photodynamic therapy [4,5].

Photodynamic therapy was introduced in the beginning of 20th century photodynamic therapy basically involves three nontoxic components namely visible light, a nontoxic photosensitizer and oxygen. The principle of the Photodynamic therapy is that photosensitizer binds to the target cells and can be activated by light of suitable wave length as a result singlet and reactive oxygen is produced. This reactive oxygen is highly toxic to the target cells or organisms. Photodynamic therapy is noninvasive, and considered as safe [5].

Photodynamic therapy appears to suppress the periodontal pathogens to reduce the sign of inflammation effectively and safely. However authors suggested the lack of evidence of effectiveness in a single dose. It is also suggested that Photodynamic therapy is advantageous in the patient who are sensitive or who display high resistance to antibiotic therapy [5] .

However a certain studies are disappointing showing no benefit of Photodynamic therapy in diabetic periodontitis [6].

Studies by de Oleveira RR et al showed no difference of TNF alpha and RANKL level of Scaling and root planning patient from Photodynamic therapy [7]. In another study Scaling and root planning and Photodynamic therapy showed similar clinical outcome [8]. In a similar study showed no improvement in terms of probing depth reduction and clinical attachment level gain in additional application of a single episode of Photodynamic therapy after scaling and root planning [9]. A six month study on comparison between scaling root planing and Scaling root planing with Photodynamic therapy showed an effective treatment outcome [1].

As Lang et al emphasized the importance of the bleeding on probing index as a predictor for the progression of periodontal disease [10]. In the present study it was observed a statistically significant a difference in median Gingival Index score over a period of time from baseline to after 20 days in the site of the test group as compared to control. The present study was encouraging as all the patients evaluated showed an improvement in the oral hygiene status and reduction in probing depth in sites treated with SRP and PDT as compared to SRP with irrigation although it was not significant.

The present study supports the treatment approach of Photodynamic therapy an adjunct to routine scaling and root planning. Photodynamic therapy is as efficient and safe to be used in addition to root planing when compared to sub gingival irrigation with scaling and root planning.

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