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Original Research

Comparative evaluation of the effect of scaling and root planing with and without photo dynamic therapy on Glycemic control in Type II diabetic patients with chronic periodontitis

Keerthi KL[1], Aravind Pavuluri[2], SVVS Musalaiah[3], Narendra Babu M[4], Ravi Raj K[5], Harish Prabhudev P[6]

[1]Post Graduate, Department of Periodontics, St joseph dental college, Andhra Pradesh
[2]Professor, Department of Periodontics, St joseph dental college, Andhra Pradesh
[3]Professor, Department of Periodontics, St joseph dental college, Andhra Pradesh
[4]Professor, Department of Periodontics, St joseph dental college, Andhra Pradesh
[5]Senior Lecturer, Department of Periodontics, St joseph dental college, Andhra Pradesh
[6]Senior Lecturer, Department of Periodontics, St joseph dental college, Andhra Pradesh

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ABSTRACT

Aim: The present study was to evaluate if use scaling and root planing with and without photo dynamic therapy on glycemic control in type II diabetic patients with chronic periodontitis.
Methodology: A total number of 20 patients aged 35-65 years, visiting the outpatient department of Periodontics, St.Joseph dental college, Eluru, were enrolled for this clinical study. Group A consisted of 10 patients who underwent scaling and root planning. Group B consisted of 10 patients who underwent scaling and root planing with adjunctive use of Photodynamic therapy.
Results: Results of the study showed that there was marked reduction in the HBA1c levels and it was more prominent in GroupB (Scaling and Root planing + Photodynamic therapy).
Conclusion: It can be concluded that both the groups showed clinically significant outcome and that photodynamic therapy showed significant improvement in HBA1C levels at the end of 6 months.

INTRODUCTION

Periodontitis is an inflammatory disease of the periodontium that elicits an immune

response in turn resulting in loss of supporting structures of the teeth.

Diabetes mellitus is a systemic disease with several complications affecting both the quality and length of life, one of which is periodontal disease.

Southerland et al suggested that periodontitis and diabetes have a common pathogenesis involving an increased inflammatory response at local and systemic level. Patients with inflammatory periodontal diseases commonly have elevated serum levels of pro inflammatory cytokines, while patients with diabetes have hyperinflammatory immune cell that can exacerbate the elevated production of pro inflammatory cytokines. This has the potential to increase insulin resistance and makes it more difficult for the patient to control diabetes.

Association of diabetes mellitus (DM) and periodontal disease (PD) is well- documented in literature, in which plausible biological mechanism associated with capillary dysfunction has been identified[1]. People with diabetes are at a higher risk of developing periodontal disease. The American Diabetes Association estimates that 70% of the population in the United States have type 2 diabetes. The function of immune cells, like neutrophils,

* Corresponding author***: Keerthi KL,*** *Post Graduate, Department of Periodontics, St joseph dental college, Andhra Pradesh*.

monocytes and macrophages is often altered in cases of diabetes. Neutrophilic adherence, chemotaxis and phagocytosis are changed, inhibiting an adequate defense against bacteria in the periodontal pouch and significantly increasing the destruction of the periodontium.

It is well known that mechanical therapy provides an excellent clinical response in most of the patients but scaling and root planing (SRP) alone may not be effective in elimination of complete pathogenic organisms. In some cases administration of local and systemic chemotherapeutic agents yields good prognosis and recovery.

Photodynamic therapy (PDT) is a medical treatment modality that utilizes light to activate a photosensitizing agent (photosensitizer) in the presence of oxygen. PDT, also known as photo-radiation therapy, phototherapy, or photo-chemotherapy, involves the use of a photoactive dye (photosensitizer). It is activated by exposure to light of a specific wavelength in the presence of oxygen[2].

Photo dynamic therapy is defined as eradication of target cells by reactive oxygen species produced by means of a photosensitizing compound and light of an appropriate wavelength. It could provide an alternative for targeting microbes directly at the site of infection, and overcomes the problems associated with antimicrobials[3].

The glycated haemoglobin (HbA1c) test was suggested as an alternative screening test for Type 2 diabetes. HbA1c level represents a 2–3-month average of blood glucose concentrations. The accuracy of HbA1c analysis may be influenced by the presence of haemoglobinopathy or renal failure. HbA1c measurement is quicker and more convenient.

HbA1c can be measured at any time of the day regardless of the duration of fasting or the content of the previous meal[4].

Aim of the present study is to evaluate and compare the efficacy of administering photodynamic therapy as an adjunct to non surgical periodontal treatment and the beneficial role of it in treating chronic periodontitis.

MATERIALS AND METHODS

Total number of 20 type II diabetes mellitus patients with clinically diagnosed chronic periodontitis were obtained from Out Patient Department of Periodontology at St. Joseph dental college, Eluru.

METHOD OF COLLECTION OF DATA

The patients for the study were selected based on the following criteria –

INCLUSION CRITERIA

Subjects with age group of 35 to 65 years with chronic generalised periodontitis having pockets measuring 5-7mm and HbA1c baseline level with 6% - 7% in known diabetics.

EXCLUSION CRITERIA

Patients with systemic disorders other than diabetes that could influence the course of periodontal disease and had undergone periodontal therapy for past 6months.Patients who are pregnant and lactating mothers. Habit of tobacco chewing and smoking with trauma and infection

METHODOLOGY

A total number of 20 patients aged 35-65 years, visiting the outpatient department of Periodontics, St.Joseph dental college, Eluru, were enrolled for this clinical study based on the inclusion and exclusion criteria as listed above. At the first visit, after explaining about the study an informed consent was obtained, a detailed history was

recorded on the demographic data, medical history, gingival and periodontal findings.

The study was carried out in one experimental group and one control group. The patients were allotted to these groups sequentially.

Patients were divided into two groups :

1) Group 1(10 patients): received one stage full mouth scaling and root planning(FMSRP)

2) Group 2(10 patients): received FMSRP + local application of methylene blue dye and activation with 660nm photodynamic unit

PERIODONTAL EXAMINATION

Clinical examination consisted of recording case history and intraoral examination was done for all 20 patients by a single examiner. On screening day printed performa was used to collect the data of patients for intraoral examination. Baseline Hba1c level was recorded.

Periodontal health status was assessed using Plaque Index given by Silness and Loe (1964), Gingival Index by Loe and Silness (1963). Periodontal destruction was assessed by relative attachment loss and probing pocket depth. Occlusal stents were made for each patient. Periodotal pocket depth was measured from the crest of marginal gingiva to the base of the pocket. Relative loss of attachment was measured as the distance between the fixed point on the stent and the base of the pocket. Both the measurements were recorded using Michigans graduated probe.

After recording all parameters at the baseline, full mouth scaling and root planing using ultrasonic scalers followed by hand instruments was performed.

1% Methylene blue dye manufactured by Thermo Fisher Scientific India Pvt. Ltd. was taken, and diluted with distilled water to obtain a concentration of 0.1%, by adding 1 ml of 1% methylene blue dye to 100ml of distilled water. The obtained diluted dye was applied with a sub-gingival cannula to the instrumented sites, starting from base of the pocket and moving coronally to avoid entrapment of air bubbles. One minute later, pocket was thoroughly rinsed with sterile saline to remove the excess photosensitizer. Immediately after rinsing, the Hi-power LED red light source (APOZA Lit-600 PAD system, APOZA Enterprise Co., Ltd, Taiwan) with 660 nm wavelength and 0.5 W of power output equipped with a probe tip, was activated and placed at the depth of the pocket and moved circumferentially around the tooth for 60 seconds.

Standardized oral hygiene instructions will be given, modified bass method will be demonstrated.

Clinical Re-evaluation of treated sites was assessed at 1 month , 3month and 6th month.

RESULTS

The present study was to evaluate if use of photodynamic therapy along with scaling and root planing improved glycemic control and periodontal health compared to scaling and root planning alone in patients with type II diabetes.

So the study sample consisted of 20 patients both male and female with age ranging from 35 to 65 years. Selected patients were given informed consent prior to clinical examination and they were divided into 2 groups.

Group A and B

Group A (n=10)-Scaling and root planing alone,

Group B (n=10)-scaling and root planing along with the use of Photodynamic therapy

Table 1 and figure 1 shows intra group comparison of mean HBA1C levels at various interval. Both the Groups showed statistically significant difference in mean HBA1C in all 3 intervals. Within Group B marked

reduction was seen from baseline to 6 months compared to Group A.

		N	Mean	STD. Deviation	P Value
Group A	Baseline	10	6.980	.3967	0.01*
	3 months	8	6.588	.3271	
	6 months	7	6.729	.3729	
Group B	Baseline	10	6.830	.4968	0.004*
	3 months	8	6.660	.6071	
	6 months	7	6.486	.6149	

Table 2 and figure 2 shows intergroup comparison of mean HBA1C levels showed marked reduction of mean value in 3 months and 6 months but no statistically significant difference was noted. Group B showed consistent reduction after 6 months.

		N	Mean	Standard Deviation	P Value
Baseline	Group A	10	6.980	.3967	
	Group B	10	6.830	.4968	0.75
3 months	Group A	8	6.588	.3271	
	Group B	8	6.600	.6071	0.99
6 months	Group A	7	6.729	.3729	
	Group B	7	6.486	.6149	0.63

Table 3 shows both the groups showed significant reduction in all the periodontal parameters evaluated.

			Mean diff	P value
Plaque index	6 months	Group A v/s Group B	0.26	0.008
Gingival index	6 months	Group A v/s Group B	-0.59	0.004
PPD	6 months	Group A v/s Group B	0.286	0.254
Relative Attachment loss	6 months	Group A v/s Group B	-0.429	0.225

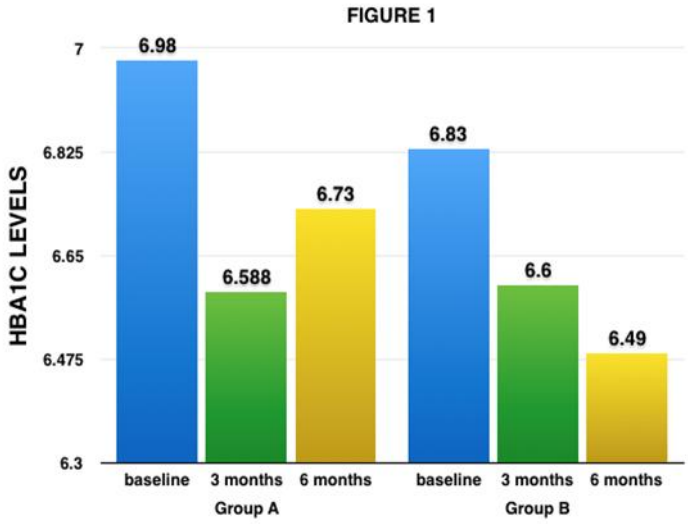

Fig. 1: Comparison of HBA1C within the group

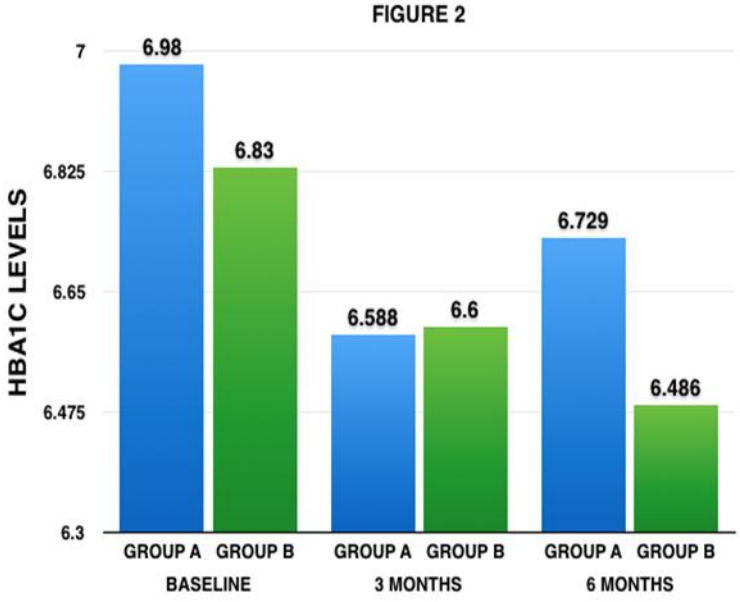

Fig. 2: Intergroup comparison of mean HBA1C levels

DISCUSSION

Diabetes mellitus (DM) is a systemic disease with several major complications affecting both the quality and length of life. One of these complications is periodontal disease (periodontitis)[5].

Nishimura et al. stated that periodontal disease represents subclinical inflammation. The recent data have indicated

that periodontitis is associated with a moderate systemic inflammatory response[6]. In another study it was suggested that both diabetes and periodontitis have a relatively high incidence in the general population and current studies tend to support the higher incidence and severity of periodontitis in patients with DM[7]. Southerland et al.suggested that periodontitis and diabetes share a common pathogenesis involving an increased inflammatory response at the local and systemic level[8]. Patients with inflammatory periodontal diseases have elevated serum levels of proinflammatory cytokines. The patients with diabetes have hyperinflammatory immune cells that promote the elevated production of proinflammatory cytokines that has the potential to increase insulin resistance and makes it more difficult for the patient to control diabetes[9].

Studies have provided evidence to support the assertion that periodontal infection has an adverse, yet modifiable, effect on glycaemic control. An RCT by al-Mubarak et al. on 52 patients with either type 1 or type 2 diabetes, compared the use of ultrasonic scaling and root planning along with the use of subgingival water irrigation. There was no significant decrease in HbA1c levels in either group, although there was an improvement in the periodontal status of both groups[10]. Christgau et al. reported that mechanical therapy did not affect the levels of HbA1c in poorly controlled diabetic patients[11]. Wesfelt et al. also found that HbA1c levels did not change[12]. On the other hand, Stewart et al.suggested that there was a significant improvement in glycaemic control in type 2 diabetes patients following periodontal therapy[13]. Rodrigues et al. also suggested that periodontal therapy improved glycaemic control in patients with type 2 DM[14].

The present study concluded that there was marked reduction in the HBA1c levels and it was more prominent in Group B (SRP+PDT) at the end of 3 months.

According to Dag et al all periodontal parameters and serum TNF-a levels were significantly decreased three months after the nonsurgical periodontal therapy when compared to the baseline values. The HbA1c values were markedly decreased only in well-controlled diabetic patients. They found no significant differences in the periodontal parameters or TNF-a levels at baseline and after three months between the two groups. Although non-surgical periodontal therapy eliminates local or systemic infection and inflammation via decrease in TNF-α, it is insufficient to significantly reduce HbA1c levels without strict glycaemic control in poorly controlled diabetic patients in a short period of time[15].

The present study showed that Group B showed significant reduction when compared to Group A for plaque index, gingival index, PPD and relative attachment level at 6 months.

CONCLUSION

From the observation of this study, it can be concluded that both the groups showed clinically significant outcome and Group B showed significant improvement in HBA1C levels at the end of 6 months. Long term evaluation is required to assess the validity of the procedure with a larger sample size and longer follow ups for clinical implementation of suitable modality that can be used as an adjunct along with scaling and root planing for better glycemic control (HBA1C) as well as for the improvement of periodontal parameters like plaque index, gingival index, pocket probing depth and relative attachment loss.

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