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Type Ii Diabetic And Non-Diabetic Patients With Chronic Periodontitis Following Non-Surgical Periodontal Therapy- An Interventional Study

[1]Dr Shahnaaz, MDS, Department of Periodontics, Faculty of Dental Sciences, M.S. Ramaiah University of Applied Sciences, Bangalore

[2]Dr Hema Seshan, Senior Professor, Department of Periodontics, Faculty of Dental Sciences, M.S. Ramaiah University of Applied Sciences, Bangalore

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Corresponding Author: Dr Shahnaaz, MDS, Department of Periodontics, Faculty of Dental Sciences, M.S. Ramaiah University of Applied Sciences, Bangalore

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Abstract

The aim of this study was to evaluate if Type II Diabetes mellitus (DM) and Non- DM patients, both with chronic periodontal disease, would present changes between timing evaluation, at baseline and at follow up intervals of 3 and 6 months, in periodontal status, HbA1c and Platelet markers (MPV & PDW) after periodontal therapy.

Materials and Methods

The comparative, clinical study was performed between type II diabetics and non diabetics with chronic periodontitis. The study period was 6 months. Conventional periodontal scaling and root planing were performed, and the response to this treatment was compared between the groups at 3 and 6 months measuring plaque index (PI), gingival index (GI), probing pocket depth (PPD), clinical attachment gain (CAL) and blood parameters such as HbA1c, platelet markers such as mean platelet volume (MPV) and platelet distribution width (PDW) were evaluated and compared to baseline at every follow-up visit.

Results

An improvement in all clinical variables was observed, with no statistically significant differences between the groups, with the exception of probing depth and clinical attachment level ($P < 0.001$*). The improvement observed in blood HbA1c levels confirmed a positive metabolic response to periodontal treatment, with a

lower value for this variable at each measurement time. Furthermore, the results revealed a statistically significant reduction in the platelet volume and a decrease in platelet distribution width at every visit following phase I periodontal therapy. ($P < 0.001$*)

Conclusion

Both groups of patients showed a clinical improvement after basic non-surgical periodontal treatment. In addition to that, diabetic and non diabetic patients showed improved glycemic control and a reduced mean platelet volume and platelet distribution width at 3 and 6 months after periodontal treatment, although the levels in group B never reached the same levels as those of the subjects in group A.

Keywords

HbA1c, MPV, PDW, periodontal disease, SRP, periodontal pocket

Introduction

It is found that hyperglycemia causes larger platelets.5 Larger platelets also release more prothrombotic factors such as thromboxane A2, owing to active platelet release there is variation in platelet size resulting in increased platelet distribution width (PDW).5,6 It is also suggested that the increased platelet activity enhances vascular complications in these patients.4

An increase in MPV is one of the risk factors for macro-vascular complications, such as myocardial infarction, ischemic stroke and venous thromboembolism.5 It has been found that MPV is significantly higher in DM Type II patients having micro-vascular complications than in patients without them.4 Improved glycemic control decreases MPV and thereby, it can be suggested that reduced platelet activity by proper glycemic control may prevent or delay vascular complications in these patients.7

The relationship between diabetes mellitus and periodontitis has appeared in the literature for over 70 years; however, with conflicting data. Numerous studies in various populations have demonstrated that individuals with diabetes tend to have a higher prevalence of and more severe periodontitis than non diabetics.8 Today, chronic periodontitis has been identified as the sixth complication of diabetes alongside retinopathy, nephropathy, neuropathy, macro vascular disease and poor wound healing.9

Materials And Methods

Study Population

A total of 40 subjects were included in the study based on the inclusion and exclusion criteria. Subjects who met the necessary criteria for inclusion in the study were asked to sign an informed consent form. Subjects were between age group of 30-70 years, patients with a history of type II diabetes mellitus, subjects with atleast 10 teeth present per dental arch with a clinical diagnosis of chronic generalised periodontitis with pocket depth of $\geq$ 5 mm and clinical attachment levels of $\geq$ 4 mm, subjects not having received non surgical periodontal therapy within past 6 months or surgical periodontal treatment within the past 12 months and subjects with no modification in medication in the 2 months before or during the study. Exclusion criteria were presence of systemic diseases other than DM 2 could influence the course of periodontal disease, intake of antibiotics or anti-inflammatory drugs in the 4 weeks before the study, tobacco use, pregnancy or intention to become pregnant during the 6 months of the study, patients on anticoagulant therapy, subjects with systemic complications of DM to be excluded, inability of the persons to cooperate because of their physical or mental status or daily routine. Study subjects were divided in to 2 groups : • Group A consisted of 20 Non-Diabetic

patients with chronic periodontitis • Group B consisted of 20 Type II Diabetic patients with chronic periodontitis.

Study Design

The diabetic group were instructed to continue with their medical treatment of DM (oral hypoglycemic agents), diet and life style without medications during the study period. At the second visit, the conventional treatment indicated for chronic periodontitis was started which consisted of phase I therapy including non-surgical periodontal treatment, using Gracey curettes and ultrasonic instrumentation at baseline. After the periodontal treatment, follow-up examinations at 3 and 6 months included all elements of the initial examination, determination of HbA1c and Platelet indices such as (MPV, PDW) , periodontal examination, provision of information/ instructions on periodontal disease and oral hygiene.

Clinical Parameters for Comparison

The following clinical parameters were recorded at baseline, 3 and 6 months intervals using UNC-15 probe and customized acrylic occlusal stents grooved to provide reproducible insertion axis. The parameters assessed were plaque index (Sillness and Loe, 1964), gingival index (Loe and Sillness, 1963) probing pocket depth (PPD) clinical attachment level (CAL).

Analysis of the Blood Parameters

All the subjects were referred to M.S. Ramaiah Medical Teaching Hospital for blood parameter assessment at baseline after initial examination, at 3 and 6 months following intervention at baseline. 5 ml of venous blood sample was obtained collected in hologram tubes with dipotassium EDTA and biochemistry tubes, tested within 1 hour of collection to minimize variations due to sample aging. Samples were maintained at room temperature. HbA1c was measured by automated ion-exchange high performance liquid chromatography (Bio-Rad Variant II). Mean platelet volume and platelet distribution width were estimated using Sysmex Automated Hematology Analyser (XT-2000i/XT-1800i).

Statistical Analysis

The study data was analyzed using SPSS Software Version 22, IBM., Corp. The frequency distribution for gender was expressed in terms of number & percentage. Mean & SD were derived for all the continuous variables. Student Unpaired t test was used to compare the mean values of age & other study parameters at baseline, 3 & 6 months follow-up period. Repeated Measures of ANOVA followed by Bonferroni's Post hoc Analysis was used to compare the mean scores within subjects at different time intervals in two groups. Pearson Correlation test was used to correlate between HbA1c, MPV & PDW at baseline level. The level of Significance [P-Value] was set at P <0.05.

Results

The demographic features of the patients are presented in Table 1. The mean age of the patients was 49.8 years in the control group and 50.4 years in the test group, which was not found to be a significant difference (P=0.39). The gender distribution also did not significantly differ between the groups at baseline (P=1.00).

There was no significant difference between the two group at baseline with respect to plaque index and gingival index (P value= 0.77, 0.79). Where as with respect to probing pocket depth and clinical attachment levels the values were superior for the test group (P <0.001*). The blood parameters such as glycated hemoglobin, mean platelet value and platelet distribution width varied between the two groups. The values being superior for the test group compared to the control group

and this difference was statistically significant (P value <0.001*).

Discussion

In the present study an association was demonstrated between glycated hemoglobin and platelet markers such as MPV and PDW in diabetic patients with chronic periodontitis on comparison to non diabetic subjects which is in accordance with a study by Kemal Turker et al.4 where in MPV was significantly higher in subjects with diabetes as compared to both non-diabetic subjects and MPV had a high positive correlation with HbA1c.

The study was also in association with studies by Boos et al.13 suggested that increased HbA1c level was associated with raised MPV. Kakouros N et al.14 suggested that hyperglycemia results in generation of larger platelets.

Shimodaira et al.15 confirmed a relationship between MPV and FSG in prediabetic subjects. However present study did not reveal any association between MPV and prediabetes as seen in Group A (non diabetic subjects with periodontal disease) where in mean platelet volume remained within normal range (9.37 ± 0.24 fl), P value 0.32.

The reduction in glycated hemoglobin in diabetic group was followed by an improvement in the MPV the value reduced to 10.48 ± 0.26 fl at 6 months from 11.03 ± 0.28 fl at baseline (P value <0.001) thereby reducing the risk of cardiovascular events in diabetic subjects with chronic periodontitis. This is in accordance with a study by Sarikaya et al.18 which suggested higher MPV in diabetic patients was independently related to myocardial perfusion defects and may be an indicator of myocardial ischaemia.

In the present study, results showed a positive metabolic response to periodontal treatment, with lowering of HbA1c values at every visit in diabetic subjects. The values decreased from 7.69% ± 0.37% at baseline to 7.13% ± 0.40% at 6 months and this difference was statistically significant (P value <0.001). The change in HbA1c level being 0.5%. This finding is in accordance with various studies.

A systematic review by Fabrizio et al.19 after the study selection process, five randomized clinical trials were included. Results of the meta-analysis indicated that SRP was effective in the reduction of HbA1c (MD = 0.65; 95% CI 0.43 to 0.88; P <0.05).

The present study also revealed elevated levels of glycated hemoglobin in non diabetic subjects with periodontitis. The mean HbA1c level of group A at baseline was 6.02 ± 0.18 which was in the prediabetes range according to American Diabetes Association. Six months after SRP, the mean HbA1c level of group A was 5.68% ± 0.16% indicated, that periodontal therapy improved their glycemic status. This is in agreement with studies by Zhang et al.20 reported that for HbA1c values of 5.5% to <6.0% and 6.0% to <6.5%, the risks for developing DM were 21% and 44%, respectively.

Jayachandran et al.21 who demonstrated the HbA1c levels of individuals without diabetes and with periodontitis were significantly reduced 3 months after non-surgical periodontal therapy, although they never **reached the** same levels as those of the individuals without diabetes or periodontitis.

Larger, multi-centred studies are needed to substantiate our findings and confirm that they are generalizable to other populations of Patients With Type 2 Diabetes.

Conclusion

Non-Surgical periodontal therapy leads to a reduction in HbA1c and platelet markers such as mean platelet volume and platelet distribution width especially in patients with an elevated degree of DM severity and

periodontal disease. However it is not yet possible to precisely establish the clinical relevance of these variations.

The findings of this study showed that effective periodontal treatment resulted in lower glycemic levels which in turn lowers the platelet volume and decreases the size of platelet distribution width. Furthermore, there was reduction in the clinical parameters of periodontal infection, confirming the existing interrelationship between diabetes mellitus and periodontal disease. Therefore periodontal therapy should be included in diabetes preventive measures.

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