Evaluation of Alteration in Serum Lipid Levels in Patients with Chronic Periodontitis Postperiodontal Therapy

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ABSTRACT

Aim: There is growing evidence that periodontitis may affect general health. This study was assigned to explore changes in cholesterol levels following nonsurgical periodontal therapy in patients with chronic periodontitis.

Materials and methods: Periodontal parameters and lipid profile (total cholesterol, high-density lipoprotein, low-density lipoprotein, triglycerides and very low-density lipoprotein) were evaluated in 50 subjects suffering from moderate to severe generalized chronic periodontitis.

Results: At third month, there was significant reduction in total cholesterol, low density lipoprotein, very low density lipoprotein, triglyceride and increase in high density lipoprotein after nonsurgical periodontal therapy (NSPT). Also, the reduction in bleeding on probing, pocket depth and attachment level were statistically significant in the treatment group.

Conclusion: The results of our study showed that periodontal destruction and serum lipid levels are positively correlated and nonsurgical periodontal treatment in chronic periodontitis patients resulted in significant changes in the concentration of total cholesterol, triglycerides, HDL, LDL levels in blood serum.

Keywords: Chronic periodontitis, Cholesterol, NSPT.

INTRODUCTION

Over the last 50 years, the prevailing view among dentists and physicians was that, periodontal infections were localized only to the marginal periodontium and that, as such, they rarely had systemic implications in healthy individuals. More recent evidence, however, has indicated that patients with periodontitis present with increased systemic inflammation, as indicated by raised serum levels of various inflammatory markers, when compared with those in unaffected control populations. Further, these individuals have a perturbed lipid profile (increased serum cholesterol) not explained just by their lifestyle, but perhaps causally related to chronic episodes of bacteremia and endotoxin dissemination.

The etiological agents for periodontitis are the gram-negative, anaerobic microorganisms, present within the dental plaque. Recent studies have proven that periodontal disease can produce disorders in systemic health by changing the blood chemistry, with a rise in inflammatory mediators, proteins and lipids in the serum. Periodontitis is often associated with endotoxemia and mild systemic inflammatory reactions and periodontal pathogens have been identified in early atherosclerotic lesions. Several studies have indicated that subjects with periodontal disease may have a higher risk for cardiovascular diseases when compared to subjects with a healthy periodontium.

Recently, a causal relation has been demonstrated between high serum lipid levels and periodontal disease. Recent studies illustrate the existence of a relation between periodontal disorders and hyperlipidemia, which power the probable effect of periodontal disease as an underlying factor for hyperlipidemia. This theory is presented in Losche et al study, which demonstrated higher level of TGL and lower HDL among the patients suffering from periodontitis than control group significantly, which was approved by some other studies. The aim of the present study was to investigate the effect of nonsurgical periodontal therapy (NSPT) on the lipid levels in patients with chronic periodontitis.
MATERIALS AND METHODS

Fifty subjects (27 males and 23 females) participated in the study. The age group of the patients ranged between 36 and 50 years (mean age 39.45 ± 7.18). Body weight was assessed by using body mass index (BMI) and only nonobese individuals (BMI: 18-22.9 kg/m²) were enrolled in the study. The patients were recruited from the OPD in the Department of Periodontics in Sharad Pawar Dental College, Wardha. Institutional ethical committee gave approval for the study. The protocol was clearly explained to all the patients and informed consent was obtained from all recruits.

Definite diagnosis of chronic periodontitis was performed by two expert periodontists based on the existence of calculus and plaque, at least one pocket within 4 mm depth in every quadrant, bone destruction, appropriate to calculus and plaque in radiography, accordingly.19

The exclusion criteria for the study were dental treatment during the past 6 months, smoking, alcoholics, pregnant, lactating and postmenopausal women, aggressive periodontitis, cardiac diseases, rheumatoid arthritis, obesity, patients taking any drug against hypercholesterolemia and any other systemic disease, which can alter the course of periodontal disease or serum lipid levels.

MEASURED VARIABLES

Presence of plaque: Presence or absence of plaque was registered quantitatively.

Bleeding on probing: It was assessed using modified sulcus bleeding index.

Probing pocket depth and periodontal attachment levels were measured using William’s graduated periodontal probe. Periodontal pockets were categorized as healthy (within 3 mm), moderate disease (4 to 5 mm) and advanced disease (more than 6 mm).

Serum lipids were determined in the Midas laboratory using routine enzymatic methods. To identify subjects with pathologic values, the following cutoff points were used according to the laboratory’s recommendation: TC > 200 mg/dL, LDL > 130 mg/dL, HDL < 35 mg/dL, VLDL > 40 mg/dL, and TG > 200 mg/dL. The serum lipid levels were recorded at baseline (day 0) and 3 months following the scaling and root planing.

STATISTICAL ANALYSIS

Values are presented as mean and standard deviation. Differences between means were proved for significance using the student’s t-test. The data were analyzed using statistical software.

RESULTS

There was not much difference in the social status of periodontal disease patients and control subjects. Based on the extent of periodontal pockets, most of the patients suffered from moderate periodontitis: 37.4 ± 18.2% of sites had a probing depth of 4 to 5 mm and 12.3 ± 10.3% sites had a probing depth of more than 5 mm. Bleeding on probing was more frequently observed in association with significant plaque accumulation.

Table 1 demonstrates the demographic data and patient characteristics of the study population. The lipid levels were determined for the periodontitis patients at baseline and at the end of 3 months.

As shown in Table 2, there was significant reduction in the TC, LDL, VLDL and TG at the end of 3 months after NSPT. Also, there was a statistically significant increase in HDL after NSPT. The clinical periodontal parameters also showed significant improvement after treatment, thus, suggesting that periodontal destruction and higher TC, LDL, VLDL and TG are positively correlated, while HDL is positively correlated with periodontal health.

DISCUSSION

Cardiovascular diseases (CVDs) are common all over the world, and atherosclerosis of coronary arteries is considered to be the leading cause of premature death among men.20 There is an increasing concern about the blood lipid levels as a risk factor for the development of coronary heart disease. Literature contains various findings about possible relationship between

| Table 2: Comparison of variables at baseline and 3 months |
|-----------------------------|------|------|-----------------|
| Variables                    | Baseline | 3 months | p-value   |
| Total cholesterol            | 163.39 ± 10.38 | 138.07 ± 7.12 | 0.001*   |
| LDL                          | 111.79 ± 10.41 | 93.83 ± 3.16 | 0.001*   |
| VLDL                         | 24.76 ± 3.62 | 23.61 ± 3.36 | 0.001*   |
| HDL                          | 37.79 ± 2.52 | 39.92 ± 2.67 | 0.001*   |
| Triglyceride                 | 141.86 ± 9.61 | 139.62 ± 10.09 | 0.002*   |
| Modified sulcus bleeding index | 2.92 ± 0.33 | 1.81 ± 0.23 | 0.001*   |
| Probing pocket depth         | 4.94 ± 0.36 | 3.75 ± 0.45 | 0.001*   |
| Periodontal attachment level | 4.52 ± 0.37 | 3.79 ± 0.41 | 0.001*   |

*p-value < 0.05 significant
blood serum lipids and periodontal conditions. Each of these studies has their own specifications such as definition of periodontal disease, assay for serum lipid levels, study design and number of cases. Others have shown lack of this relation. The statistical analysis of the findings and the evaluation of the obtained results suggest that periodontitis may trigger alterations in lipid levels by possibly eliciting an increased systemic inflammatory response. The data of the present study indicate, that periodontitis causes changes in serum TC, HDL, LDL, VLDL and TG levels. Periodontitis is a chronic, inflammatory, destructive disease that affects the supporting tissues of the teeth and is often associated with enhanced concentrations of proatherogenic plasma lipids, i.e. TC and LDL as well as TG. The outcomes of our study support this overall conclusion. But most of the above mentioned studies were unable to infer a positive correlation with all the parameters of lipid profile (i.e. TC, HDL, LDL, VLDL and TG) to arrive at a definitive conclusion on the association between periodontitis and increased lipid profile.

Loesche W et al determined a significant association between periodontal conditions and the concentration of triglycerides in blood. Krause S et al stated that hyperlipidemia causes hyperactivity of white blood corpuscles. It was determined that hyperactivity of white blood cells (e.g. increased production of oxygen radicals) may be associated with the development of periodontitis in adults. Cutler CW et al, in their article, stated that there exists a close relationship between damage to the periodontium, increased concentration of lipids in blood, and the presence of Porphyromonas gingivalis antibodies. Although the studied sample was small (26 people), this study showed that higher triglyceride levels might modulate the production of IL-1b polymorphonuclear leukocytes, stimulated by P. gingivalis. Morrison, HI et al, in their article, mentioned total blood cholesterol level, C-reactive protein, and fibrinogen as possible intermediate factors that associate periodontitis with increased risk for CVDs. However, these findings do not allow for the determination of causality, i.e. whether periodontal diseases may increase blood lipid concentration, or hyperlipidemia exists as the same risk factor for periodontal diseases and CVDs. One possible reason to explain the differences between the results of this study and previous studies, is the difference in how periodontitis is defined. We defined chronic periodontitis as subjects with more than three pockets, with a probing depth ≥ 4 mm and PAL ≥ 3 mm, whereas Katz et al, e.g. used CPITN scores for determining periodontitis.

A possible explanation for the association between hyperlipidemia and periodontal infection was postulated by Noack et al by assessing neutrophil respiratory burst by whole blood chemiluminescence and they found significant increases in both chemiluminescence and pocket depth on a group of patients with hyperlipidemia. They suggested that the association of hyperlipidemia with periodontitis could be due to the dysfunction of polymorphonuclear leukocytes. The results of the present study show that local periodontal treatment resulted in a significant decrease in TC, LDL, VLDL and TG levels. The reduction of TC, LDL, VLDL, TG and rise in HDL after treatment, suggests a potential effect of periodontitis-driven systemic inflammation on lipid metabolism. These findings are in accordance with a report by Pussinen et al who reported that periodontitis is associated with a reduction of the HDL levels and that periodontal therapy results in an increase in this antiatherogenic lipid fraction. However, in another study conducted by D’Aitio et al, lipid marker changes were insignificant between standard periodontal treatment and control groups, and some reductions of TC and LDL were present only in the intensive periodontal treatment group. There have been studies which reported that periodontal treatment is associated with the reduction of proatherogenic plasma lipid levels, i.e. TC and LDL as well as TG in patients with severe periodontitis. However, further investigations are needed for further exploration of the relationship among periodontitis, periodontal therapy and lipid metabolism. Larger studies and clinical intervention trials are necessary to better define the periodontitis subjects in whom local infection causes significant systemic inflammation, and whether these findings are true or are confounded by other important factors like nutrition, socioeconomic status, or age.

CONCLUSION The present study indicated that nonsurgical periodontal treatment in chronic periodontitis patients, could cause significant changes in the concentration of total cholesterol, triglycerides, HDL, LDL levels in blood serum. Further, longitudinal studies are needed to see the effects of pocket elimination therapy on changes in lipid profile in chronic periodontitis patients so that the systemic complications due to elevated lipid levels could be prevented.

REFERENCES


