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RESEARCHARTICLE

DOES NON-SURGICAL PERIODONTAL THERAPY AFFECT SERUM LIPID PROFILE IN CHRONIC PERIODONTITIS PATIENTS? EXPLORING A RELATIONSHIP

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ABSTRACT

Aim

The purpose of this study is to evaluate the effect of non-surgical periodontal therapy on serum lipid levels in chronic periodontitis.

Methods

Study population included 60 subjects between the ages of 30-60 years with chronic periodontitis. Only non-obese subjects were selected as determined by calculation of body mass index (BMI). Clinical parameters, probing pocket depth (PPD) and clinical attachment loss (CAL) were recorded. In addition, blood sample of each subject was investigated under 12 hour fasting conditions at baseline and 3 months following the nonsurgical periodontal therapy (NSPT) for: total cholesterol (TC), triglyceride, low density lipoprotein (LDL), high density lipoprotein (HDL), very low density lipoprotein (VLDL), LDL/HDL cholesterol ratio and total cholesterol (TC) /HDL ratio.

Results

Patient with chronic periodontitis have higher level of TC, LDL, VLDL, TG, ratio of LDL/HDL and total Cholesterol/HDL but lower level of HDL at baseline. Statistically significant changes ($P < 0.005$) in lipid levels were observed after 3 months of nonsurgical periodontal therapy (NSPT). Improvement in clinical parameters of periodontal health were noted as well.

Conclusion

The present study indicates that non-surgical periodontal therapy in chronic periodontitis patients could cause significant changes in serum lipid levels which may help in preventing any systemic complications in future.

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INTRODUCTION

Periodontitis primarily represents an anaerobic gram- negative oral infection that leads to gingival inflammation, destruction of periodontal tissues, loss of alveolar bone, and eventual exfoliation of teeth in severe cases (Hansson, 2005; Danesh, 1997). The Gram negative, anaerobic microorganisms present within the dental plaque are the etiological agents for periodontitis. 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 (Hansson, 2005; Alvarez and Ramos, 1986). Periodontitis has been shown to be associated with an increased levels of proatherogenic plasma lipoproteins (Losche, 2005; Pussinen, 2004). Hyperlipidemia is a state of abnormal lipid profile, which is characterized by elevated blood concentrations of triglycerides (TG), elevated levels of total cholesterol (TC) and low-density lipoprotein (LDL), and decreased levels of high-density lipoprotein (HDL).

Hyperlipidaemia is a main risk factor for cardiovascular diseases such as atherosclerosis, ischemic disorders and cardiac strokes (Machado, 2005). Lately, however, the medical community has questioned whether periodontal diseases could be a risk factor for the development of Hyperlipidemia and recent studies have advocated such a relationship (Losche, 2000; Rutger Persson, 2003). Attempts have been made to investigate the effect of periodontal therapy on serum lipid levels (Tamaki, 2011; Pejicic, 2001). However, there are very few studies related to the effect of non-surgical periodontal therapy on serum lipid levels in patient with chronic periodontitis in Indian population. Thus this study was designed to evaluate the effects of non-surgical periodontal therapy on serum lipid levels in chronic periodontitis patients of Indian population.

MATERIALS AND METHODS

Subjects

60 subjects (32 females and 28 males) between the ages of 30-60 years with chronic periodontitis were selected from patients who reported to the Department of Periodontics, Pandit

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Deendayal Upadhyay Dental College, Solapur. The Ethical Committee and Review Board of Pandit Deendayal Upadhyay Dental College, Solapur approved the study protocol. The protocol was clearly explained to all the patients and informed written consent was obtained from all recruits.

Inclusion criteria

- Non-obese subjects (BMI 18.50 - 24.99 kg/m²) (Global data base on body mass index, 2006).
- Subject with chronic periodontitis, having a probing depth \geq 4 mm and clinical attachment loss \geq 5 mm (Carranza, 2006).

Exclusion criteria

Subjects with

- Any periodontal treatment in the past 6 months.
- Anti-hyperlipidemic drug therapy
- Any other systemic disease which can alter the course of periodontal disease or serum lipid levels.
- Smoking
- Alcoholics
- Pregnant, lactating and post-menopausal women
- Aggressive periodontitis
- Cardiac diseases
- Rheumatoid arthritis
- Obesity

Anthropometric evaluation

Case history was recorded to obtain information regarding gender, age, diet and Body Mass Index (BMI). Body Mass Index (BMI) is a simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in meters (kg/m²) (Global data base on body mass index, 2006).

Measurement of serum lipids

Serum lipid levels were determined by enzymatic methods. To identify subjects with pathologic values, the following cutoff points were used according to the laboratory's recommendation: the serum lipid levels for total cholesterol (TC > 200 mg/dL), triglyceride (TG > 200 mg/dL), low density lipoprotein (LDL < 130 mg/dL), high density lipoprotein (HDL < 35 mg/dL) very low density lipoprotein (VLDL > 40 mg/dL), LDL/HDL cholesterol ratio (1.0-3.55) and total cholesterol/HDL ratio (3.72-4.9). All the above mentioned parameters were measured under 12hr fasting conditions (Expert panel on integrated guidelines for cardiovascular health and risk reduction in children and adolescents: Summary report. Pediatrics, 2011) at baseline and 3 months following the nonsurgical periodontal therapy (NSPT).

Periodontal parameters

All periodontal parameters such as periodontal probing depth (PPD), clinical attachment loss (CAL) were assessed at 6 different sites around each tooth (Mesio-buccal, Buccal, Disto-buccal, Mesio-lingual, Lingual and Disto-lingual) with the UNC 15 probe (Hu-Friedy, Chicago, IL, USA).

The periodontal parameters were recorded at baseline as well as 3 months after scaling and root planing. The patients received oral hygiene instructions and full mouth scaling and root planing (NSPT) were performed under local anesthesia after recording the baseline parameters.

STATISTICAL METHODS

Data is presented as mean and standard deviation. Difference between mean were proved for significance of lipid level using paired t-test at baseline and 3 months of NSPT. The data was analyzed using statistical software (SPSS statistical package version 17, SPSS Inc., Chicago, IL, USA).

RESULTS

Subject's demographic data and characteristics of the study population like age, body mass index (BMI) are listed in Table 1. The lipid levels determined at baseline and at end of 3 months after NSPT are represented in Table 2. There was significant reduction in the TC, LDL, VLDL, TG, LDL/HDL and total cholesterol/HDL ratio accompanied by increase in HDL levels after NSPT at the end of 3 months. Table 3. Shows significant improvement in clinical periodontal parameters after 3 months of NSPT. Thus results of our study suggest that periodontal health and TC, LDL, VLDL, TG, ratio of LDL/HDL, total Cholesterol/HDL are negatively correlated; while HDL is positively correlated with periodontal health.

Table 1. Demographic data and patient characteristics

| | Age | Body Mass Index |
|--------------------|-------|-----------------|
| Mean | 44.77 | 25.10 |
| Standard Deviation | 8.32 | 2.66 |
| Min | 31.00 | 21.00 |
| Median | 42.50 | 24.80 |
| Max | 60.00 | 29.20 |

Note: 60 patients (32 Females and 28 Males)

Table 2. Comparison of variables at base line and 3 months

| | Baseline | 3 Months | P Value |
|-----------------------|-----------------------|--------------------|---------|
| Total cholesterol | 155.63 16 \pm 29.66 | 144.93 \pm 26.07 | 0.001* |
| Triglycerides | 170.87 \pm 22.60 | 167.03 \pm 22.71 | 0.001* |
| HDL | 41.3016 \pm 8.24 | 51.10 \pm 7.32 | 0.001* |
| LDL | 117.87 \pm 19.62 | 106.37 \pm 18.79 | 0.001* |
| VLDL | 33.13 \pm 6.80 | 27.85 \pm 5.63 | 0.001* |
| LDL/HDL | 2.96 \pm 0.74 | 2.13 \pm 0.48 | 0.001* |
| Total Cholesterol/HDL | 4.27 \pm 1.03 | 3.44 \pm 0.73 | 0.001* |

*Statistically significant (p- value)

Table 3. Clinical periodontal parameters

| | Base line | after 3 months | P- value |
|--------------------------------|-----------------|-----------------|----------|
| Probing pocket depth | 5.25 \pm 0.63 | 3.97 \pm 0.75 | 0.001* |
| Periodontal attachment Level | 4.31 \pm 0.42 | 3.84 \pm 0.45 | 0.001* |
| Modified sulcus bleeding index | 2.74 \pm 0.47 | 1.94 \pm 0.31 | 0.001* |

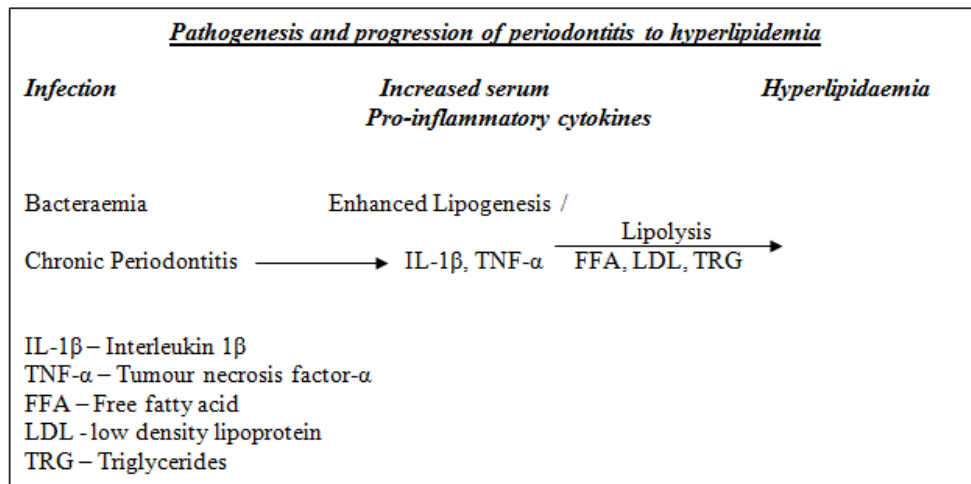
*Statistically significant (p- value)

DISCUSSION

In developed and developing countries, coronary heart disease has become a major health issue and a leading cause of death (Murray and Lopez, 1997; Ross, 1999). There is increasing concern about the blood lipid levels, as a risk factor for the development of coronary heart disease.

Periodontitis is a chronic inflammatory destructive disease associated with enhanced concentrations of proatherogenic plasma lipids, i.e., TC and LDL as well as TG (Machado, 2005; Lösche, 2000; Uchiumi, 2004). Many studies have also shown a positive correlation between periodontitis and increased serum lipid profile (Lösche, 2005; Machado, 2005; Uchiumi, 2004; Ebersole, 1999). Changes in concentrations of these markers have also been associated with acute and chronic infections, and in this respect, bacterial infections have been implicated as a possible risk factor in the etiology of cardiovascular disease, ischemic stroke, (Wright, 2008) and coronary heart diseases (Lösche and 2005; Leinonen and Saikku, 2002).

The results of our study show that local periodontal treatment resulted in a significant decrease in TC, LDL, VLDL, TG, LDL/HDL and total cholesterol/HDL ratio levels and rise in HDL after treatment. This suggests a potential effect of periodontitis-driven systemic inflammation on lipid metabolism which is a cause and effect relationship between periodontitis and lipid metabolism. These findings are in concordance with a report by Pussinen, 2004 who reported that periodontitis is associated with a reduction of the HDL levels and that periodontal therapy results in an increase in this anti-atherogenic lipid fraction.



The study of Feingold *et al.* (1992) showed that the administration of low doses of endotoxin in rats resulted in hypertriglyceremia suggesting the similar response in local infection such as chronic periodontitis (Feingold, 1992). But most of the above mentioned studies failed to determine 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. As Lösche, 2005 found only LDL to be significantly associated with the clinical parameters of inflammation and periodontal tissue destruction in periodontitis subjects. Evidences suggest that the microorganism, particularly *Porphyromonas gingivalis* (*P. gingivalis*) produce end toxin in the form of lipopolysaccharides (LPS) that are instrumental in generating a host-mediated tissue destructive immune response and can manifest a state of altered lipid metabolism; the main features of which are hypertriglyceridemia and lipid oxidation (Hansson, 2005; Alvarez and Ramos, 1986). HDL have several anti-atherogenic properties such as an ability to promote the efflux of cholesterol from cells, to function as an important antioxidant by inhibiting low density lipoprotein (LDL) oxidation, to prevent or interrupt foam cell formation and to retard inflammatory activity. These properties may prevent the harmful effects of infections, and conversely, infections may have a more detrimental effect in the absence of functioning HDL. Conversely, in another study conducted by D'Aiuto, 2005 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.

In a similar study Nishanth and Rao, 2011 and co-workers showed that periodontal destruction and serum lipid levels are positively correlated and non-surgical periodontal treatment resulted in improved control on lipid profile (triglycerides (TG), elevated levels of total cholesterol (TC) and low-density lipoprotein-cholesterol (LDL) and decreased levels of high-density lipoprotein-cholesterol (HDL) in chronic periodontitis patients. Further large scale intervention trials are necessary to define these findings are true or confounded by other important factors like nutrition, socioeconomic status or age.

Conclusion

The results of our study indicates that non-surgical periodontal treatment in chronic periodontitis patients causes significant changes in lipid levels which may help in preventing any systemic complications due to the elevated lipid levels.

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