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STUDY THE EFFECT OF PHASE I PERIODONTAL THERAPIES ON SERUM LIPID PROFILE IN PATIENTS WITH GENERALIZED PERIODONTITIS

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ABSTRACT

Recent studies have shown that periodontal infections are associated with atherosclerosis and myocardial infarction. Hypercholesterolemia, particularly elevations in serum levels of LDL and triglycerides appear to be the major risk factors for atherosclerosis. Experiments carried out on animals have also demonstrated the relationship between periodontitis and hyperlipidemia. The aim of this study was to evaluate the effect of phase I periodontal therapies, including education of hygiene, scaling and root planing on decreased serum levels of triglycerides and cholesterol in patients with generalized periodontitis. In this case-control study, 40 patients with moderate generalized periodontitis, who had referred to a dental clinic during 6 months (from September 23, 2013 to March 20, 2014), were selected (20 subjects as the intervention group and 20 subjects as the control group). After a thorough explanation about the type of research, an informed and written consent was obtained from all patients. For all patients before periodontal treatment, the following were measured and recorded: Plaque index, probing depth, bleeding on probing, analysis of adhesion as well as total cholesterol levels, high density cholesterol (HDL) levels and low-density cholesterol (LDL) levels. Then, the intervention group received periodontal treatment and oral hygiene instruction. Approximately 1 week after periodontal treatment, blood lipids levels were again measured. Lipid testing was simultaneously performed for the control group as well. For statistical data analysis, the SPSS software Ver. 16 and the statistical paired-t test were used. The first phase of periodontal therapy in cases led to reduced levels of triglycerides and cholesterol compared to the situation before treatment (P < 0.05). In this group of patients, LDL levels decreased and HDL levels increased; however, these changes compared to pre-treatment values were not significant (P > 0.05). In the control group, the mean levels of triglycerides, cholesterol and its components showed no differences at the end of the study compared to the values before the treatment (P > 0.05). Based on the findings in this study, it can be concluded that the first phase of periodontal treatments associated with oral hygiene can reduce periodontal infection, and thus leads to reduced serum levels of cholesterol and triglycerides. Since hyperlipidemia can increase the risk of developing arteriosclerosis and cardiovascular diseases, control of localized infections such as periodontal infections is important.

Keywords: Phase I, Periodontal, Generalized Periodontitis

INTRODUCTION

Periodontitis is a common disease that its clinical symptoms are usually seen in midlife ages. Periodontitis is a chronic inflammation and tissue-destructive disease that causes dental attachment apparatus, and finally their loss. The severe form of the disease is seen in about 10-15% of the adult population, while 35% of patients show mild or moderate symptoms (Buhlin *et al.,* 2003).
Some studies show that people with periodontitis are more at risk of cardiovascular diseases, coronary artery disease (Buhlin *et al.,* 2003; Al Zahrani *et al.,* 2006), preterm labor and premature birth (Mustapha *et al.,* 2007; Dasanayake, 1998), diabetes (Offenbacher *et al.,* 1996; Shi *et al.,* 2006) and hyperlipidemia (Losche *et al.,* 2000; Cutler *et al.,* 1999; Banihashemrad *et al.,* 2008). Recent studies have also shown that periodontal infections are related to atherosclerosis and heart attacks. Hypercholesterolemia, and in

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particular, increased serum concentrations of LDL and triglycerides are the major risk factors of atherosclerosis (Valentaviciene *et al.,* 2006; Bahekar *et al.,* 2007). Experiments on animals have also shown the association between periodontitis and hyperlipidemia (Matthews *et al.,* 2008). It was also found that there is a relationship between periodontal damage rate and blood cholesterol concentrations (Ebersole *et al.,* 1999). In recent years, several studies have been conducted by the American Heart Association on the relationship between periodontal disease and atherosclerotic vascular diseases (Lockhart *et al.,* 2012).

One of the theories regarding the relationship between periodontitis and atherosclerotic disease is based on the inflammatory responses, which are started topically or systemically by the bacteria involved in periodontitis and leads to the formation or progression of atherosclerotic lesions. Formation of such lesions can be initiated by inflammatory stimuli such as systemic inflammatory cytokines produced topically or chemotactic factors causing changes in the endothelium, such as up-regulation of adhesion molecules.

These changes can cause interference between leukocytes, and thus leads to their migration to the intimal layer of the vessels. Fatty streaks containing LDL inside macrophages and dendertic cells within the intimal layer can cause the onset or progression of the inflammatory responses.

Endothelium up-regulation leads to the release of other chemotactic cytokines such as chemotactic monocyte 1 protein, which attracts monocytes or other cells as well as the bacteria into the lesions (Schenkein and Loos, 2013). It was shown in one study that Porphyromonas *gingivalis* - the main pathogen of periodontitis - directly attacks cardiovascular cells (Buhlin *et al.,* 2003).

Given the association between periodontal infections and systemic diseases such as cardiovascular diseases, a question also arises whether periodontal treatments and reduction of infection have any influence on the patient's systemic status improvement? In this regard, some studies show the positive effects of periodontal treatments such as phase 1 treatments on systemic status improvement. In a study, Mercongoglu *et al.,* (2004) evaluated the effect of phase 1 periodontal treatments on coronary endothelial dysfunction in patients with chronic periodontitis. In this study, 28 patients with chronic periodontitis and without atherosclerosis were considered as the case group, while 26 healthy patients were considered as controls. In both groups, the response to reactive hyperemia or endothelium - dependent dilation (EDD) and sublingual nitroglycerin or endothelium - independent dilation (EID) were measured before and after Phase I periodontal treatments. Their results showed that EDD and EID in patients with chronic periodontitis have significantly reduced; endothelial functioning has problems in these patients. These complications improved more following the phase I periodontal treatments (Mercanoglu *et al.,* 2004).

MATERIALS AND METHODS
In this case-control study, 40 patients with generalized moderate periodontitis, who had referred to a dental clinic during a six-month period (from September 23, 2013 to March 20, 2014), were selected (20 subjects as the intervention group and 20 subjects as the control group). After a thorough explanation about the type of research, an informed and written consent was obtained from all patients.

The study inclusion criteria were (1) having moderate periodontitis, (2) absence of systemic diseases, (3) not using cigarettes and other drugs, (4) mean age of 30-50 years old, and (5) having at least 20 teeth.

The study exclusion criteria were as:
1. Periodontal treatment during the last 6 months
2. History of hyperlipidemia, cardiovascular diseases, diabetes, hypertension
3. Use of antibiotics during the past three months

For all patients before periodontal treatment, the following were measured and recorded: Plaque index, probing depth, bleeding on probing, analysis of adhesion as well as total cholesterol levels, high density cholesterol (HDL) levels and low-density cholesterol (LDL) levels. Then, the intervention group received periodontal treatment and oral hygiene instruction. Approximately 1 week after periodontal treatment, blood lipids levels were again measured. Lipid testing was simultaneously performed for the control group as well.

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Lipid testing was simultaneously performed for the control group as well (This group was chosen among persons whose treatments were not followed for some reasons or they did not want to do the treatments). It should also be noted that the patients were evaluated in this study in an unknown single-blind approach. The study methodology was analytical and stochastic, and confounding factors were controlled. Periodontal therapies were done based on the disease type and the number of sessions needed. Blood tests for patients were determined in a certain and accredited laboratory.

RESULTS AND DISCUSSION
Results

In this study, 40 patients were examined (20 cases and 20 controls). The mean age and gender separation of participants were similar in the two groups. The paired -t test showed that periodontal treatment in the case group reduced the levels of triglycerides and cholesterol than the time before treatment ($P < 0.05$) (Table (1)). In this group of patients, LDL levels decreased and HDL levels increased, but these changes were not significant compared to the pre-treatment values ($P > 0.05$) (Table (1)).

In the control group, the mean levels of triglycerides, cholesterol and its components at the end of the study showed no difference compared to the pre-treatment values ($P > 0.05$) (Table (2)).

Table 1: Comparison of blood lipids levels in the case group patients before and after periodontal treatment

P- Vaule	Mean ± SD	Variable
0/006	194/02 ± 21/40	Cholesterol before treatment
	160/81 ± 19/16	Cholesterol after treatment
0/001	155/2 ± 37/16	TG before treatment
	119/04 ± 29/14	TG after treatment
0/216	117/48 ± 23/56	LDL before treatment
	112/06 ± 30/18	LDL after treatment
0/466	47/19 ± 10/18	HDL before treatment
	50/01 ± 10/23	HDL after treatment

Table 2: Comparison of blood lipids levels in the control group before and after the study

P- Vaule	Mean ± SD	Variable
0/513	201/16± 39/02	Cholesterol before treatment
	203/14 ± 40/16	Cholesterol after treatment
0/312	149/01 ± 37/14	TG before treatment
		TG after treatment
0/914	113/17 ± 22/14	LDL before treatment
	114/09 ± 30/12	LDL after treatment
0/716	49/06 ± 11/14	HDL before treatment
	47/78 ± 10/13	HDL after treatment

Discussion

According to the statistics presented in the tables, the mean levels of triglycerides, cholesterol, LDL in the case group dropped after periodontal treatments. The reduction rates were significant regarding cholesterol and triglycerides, but not significant in the case of LDL. In this group, the mean values of HDL increased after treatment, which was not statistically significant. In the control group, the lipid profile test results had no differences before and after the study.

Due to the reduced levels of blood lipids in the case group with completed periodontal treatments compared with the control group with no significant change in the above values, one can suggests that the

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mean serum lipids levels, especially in the case of triglycerides and cholesterol showed a noticeable difference between the two groups. The difference well demonstrates the claimed subject matter. The results of this study are consistent with other studies (Mercanoglu *et al.,* 2004; Pussinen *et al.,* 2004; Pussinen *et al.,* 2004; Losche *et al.,* 2005).

It has been emphasized in several papers the adult periodontitis can be considered as a risk factor for various systemic illnesses, including coronary heart disease, premature birth and low birth weight infants (Losche *et al.,* 2005; D'Aiuto *et al.,* 2005).

As suggested, this is due to chronic and periodic bacteremia and subclinical endotoxemia occurring in patients with adult periodontitis (Periodontium serves as a reservoir to endotoxin, and cytokines and lipid mediators of other areas in the body) (D'Aiuto *et al.,* 2005). The study of Feingold *et al.,* (1992) showed that administration of low-dose endotoxin can cause hypertriglyceridemia. They suggested that this reaction occurs in local infections such as periodontal diseases, which are exposed chronically to microorganisms and lipopolysaccharides (Feingold *et al.,* 1992). In another study, Memon *et al.,* (2000) showed that periodontitis caused by bacterial lipopolysaccharide in mice increases high levels of triglycerides (Memon *et al.,* 2000). In another study by Doxey *et al.,* (1998) similar results have been reported (Doxey *et al.,* 1998).

Another hypothesis suggest that dietary changes following reduced chewing ability causes increased take of high-calorie foods with high levels of carbohydrates and fats, which may have an influence on this relationship (DeStefano *et al.,* 1993; Janket *et al.,* 2001; Mattila *et al.,* 2000).

It should be noted that the only difference between the current study and previous studies is an increase in serum HDL levels in the case group after performing periodontal treatments; however, this increase is not statistically significant.

Conclusion

Based on the findings in this study, it can be concluded that the phase 1 periodontal treatments associated with oral hygiene can reduce periodontal infection, and thus leading to reduced serum cholesterol and triglycerides concentrations. The results showed that there is a significant association between periodontal disease treatment and reduced blood lipids levels. The possible mechanism is the association between bacterial endotoxin placing LPS in the systemic circulation, and then stimulated secretion of inflammatory cytokines and the resulting changes in lipid metabolism and developing hyperlipidemia. Since hyperlipidemia increases the risk of arteriosclerosis and cardiovascular diseases, controlling the local infections such as periodontal infections is important.

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