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Original Research Article

Effect of Smoking on RANKL\OPG Axis in Chronic Periodontitis Patients

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Abstract: Smoking is recognized as one of the major risk factors for chronic periodontitis. RANKL/OPG axis is involved in the regulation of bone metabolism in periodontitis. The objective is to study the effect of smoking on salivary levels of RANKL and OPG in chronic periodontitis. Fifty five subjects with chronic periodontitis with ages range from 24-64 years and 25 apparently healthy volunteers their ages and sexes were matched with the patients were participated in this study. Patients who smoked a minimum of 10 cigarettes per day for 2 years were included in the smoker periodontitis group (25), the remainder of the patients who never smoked were assigned to the non smoker periodontitis group (30). Saliva samples were collected from all patients and control the levels of salivary level of RANKL and OPG were determined using enzyme linked immunosorbent assays. The current findings were showed that there are no significant differences in median levels of RANKL and OPG between smokers and non-smokers patients, ($p>0.05$). In addition there are no significant differences in ratio of RANKL/OPG between smokers and nonsmokers groups of patients ($p>0.05$). The present study revealed that cigarette smoking had no effect on the salivary levels of RANKL and OPG.

Keywords: Smoking, chronic periodontitis, RANKL, OPG

INTRODUCTION

Smoking is recognized as one of the major risk factors for chronic periodontitis [1]. It is associated with degradation of the periodontal tissues leading to attachment loss, bone loss and eventually tooth loss if left untreated [2]. In several studies, smokers' risk of having periodontitis is 5 to 6 times as great as non-smokers. The relative risk is particularly higher among younger populations [3]. A clear dose-response relationship between periodontitis and smoking has also been reported by several studies [4-6]. Furthermore, smokers suffer from a higher incidence of tooth loss even in periodontally treated and well-maintained populations [7].

Numerous studies have attempted to explain the mechanisms of action of smoking in the pathogenesis of periodontitis, but they are still poorly understood. So far, the effects of smoking on subgingival microflora [8], gingival vasculature [9], neutrophils [10], serum IgG [11], and circulating levels of cytokines [12, 13,14] have been reported. Although the findings from these studies are conflicting, they indicate that smoking may interfere with several reparative and destructive factors in the pathogenesis of periodontitis. One of the main diagnostic features of periodontitis is alveolar bone loss. Several studies have shown that smokers have more severe alveolar bone loss than non-smokers [14, 15]. In addition, smokers also suffer from more progression of bone loss than non-smokers in longitudinal studies [16, 17]. Smoking is also related to higher incidence of localised alveolitis, and delayed alveolar healing in extraction sockets [18].

This relationship is interesting as smoking not only affects alveolar bone it also affects bone. In general smoking has been reported to impair osseous healing, affect bone mineral [19], and lower mineral density in postmenopausal women [20]. Bone remodelling is a coupled process between bone formation and bone resorption. It is regulated by molecular interactions between RANKL, RANK and OPG [21]. This has been demonstrated in disease models such as rheumatoid arthritis and periodontitis [22]. Therefore; this study was performed to study the effect of smoking on salivary levels of RANKL and OPG in chronic periodontitis.

SUBJECTS AND METHODS

Fifty five patients with chronic periodontitis (38 male and 17 female) were enrolled in this study, their age range from 24 to 64 years. They were from attendants seeking treatment in the department of periodontics, College of Dentistry, Baghdad University from Novmber 2012 to Janraury 2013. Patients who

smoked a minimum of 10 cigarettes per day for 2 years were included in the smoker periodontitis group (25).

Diagnosis was made by specialized dentists in the College. All the cases had received no treatment with no complain of chronic or systemic diseases. The saliva obtained from patients were analyzed for RANKL and OPG by using commercially available ELISA and performed as recommended in leaflet with kits, (Human RANKL and OPG ELISA Kit/ Cusabio/China).

Statistical Analysis

It was assessed using P (Mann-Whitney-test), P (Bonferroni-test). Correlation between the different parameters was calculated by the spearman test and p values of $P<0.05$ were considered significant.

RESULTS

Surprisingly, the present study revealed that cigarette smoking had no effect on the salivary levels of RANKL and OPG. Findings in tables (1and 2) were showed that there are no significant differences in median levels of RANKL and OPG between smokers and non-smokers patients, ($p>0.05$). In addition there are no significant differences in ratio of RANKL/OPG between smokers and nonsmokers groups of patients ($p>0.05$), as observed in table (3).

Table-1: Differences in salivary RANKL level between smokers and non-smokers patients

Serum RANKL	Smokers (N=30)	Non-smokers (N=25)	P (Mann-Whitney)
Range	(250-6.21)	(284.34-6.21)	
Median	60.6	39.85	0.173^{NS}
Inter-quartile range	(45.6-85.4)	(10.3-77)	
Mean Rank	31.22	25.32	

NS=Not significant ($p>0.05$)

Table-2: Differences in salivary OPG level between smokers and non-smokers patients

Serum OPG	**Smokers (N=30)**	**Non-smokers (N=25)**	**P (Mann-Whitney)**
Range	(24.8-2.3)	(57-2.5)	
Median	15.48	13.55	0.478^{NS}
Inter-quartile range	(10.86-19.3)	(9.83-17.41)	
Mean Rank	29.68	26.6	

Table-3: Differences in RANKL/OPG ratio between smokers and non-smokers patients

Ratio serum RANKL/OPG	Smokers N=30	Non-smokers N=25	P (Mann-Whitney)
Range	(13.85-0.3)	(34.24-0.35)	
Median	4.32	2.62	0.156^{NS}
Inter-quartile range	(2.51-9.04)	(1.04-8.59)	
Mean Rank	31.36	25.2	

DISCUSSION

Smoking is considered one of the most important environmental risk factors in modifying periodontitis. A key pathway in bone destruction involves the RANK/RANKL/OPG axis. Therefore, studies are warranted to determine the effect of smoking on the concentration of RANKL and OPG in periodontitis. It is noteworthy, there are few studies published to date that have looked specifically at the effect of smoking on serum levels, salivary levels and gene expression of RANKL and OPG in periodontitis patients.

Interestingly, the present study revealed that cigarette smoking had no effect on the salivary levels of RANKL and OPG, this result was similarly to previous study reported by [23], who found that smoking was not influence on RANKL and OPG levels in patients with chronic periodontitis. But this result is different from other studies [23-25]. The study by [25], measured both RANKL and OPG concentrations in serum and found that periodontitis patients who were also current smokers had reduced levels of OPG and higher RANKL: OPG ratio as compared with periodontitis patients who were never smokers. Another group detected gene expression in gingival tissues for both mediators in periodontitis patients and showed similar results, [24]. On the other hand, Buduneli *et al*. [23] selected 67 untreated chronic periodontitis and 44 maintenance patients and established RANKL and OPG salivary levels, demonstrating that RANKL and OPG may be affected by smoking. In conclusion the present study revealed that cigarette smoking had no effect on the salivary levels of RANKL and OPG in periodontitis patients.

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