

Original Research Article

Effects of Smoking on Vertical Bone Loss in Patients with Chronic Periodontitis

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Abstract: Smoking is an important environmental factor in chronic periodontitis and other oral cavity diseases. The aim of this study was to evaluate the effects of smoking on vertical bone defects in patients with chronic periodontitis attending Department of Periodontology of Bandar Abbas Dental School. This study was conducted on 90 patients (45 smokers and 45 nonsmokers) with a clinical indication for panoramic radiography. Demographic information and frequency of tooth brushing was recorded. Then, the patients were divided into 2 groups based on smoking. The smokers were divided into 3 groups based on amount of smoking: light (less than 4.5 pack/year), moderate (between 4.5 to 15 pack/year), and heavy smokers (more than 15 pack/year). Vertical bone loss was assessed in panoramic radiographs by measuring the distance between bone level and cemento-enamel junction (CEJ) and also angulation of bone in all dentition. A distance more than 2 mm with obvious angulation to the mesial or distal surface of the root was considered as vertical bone loss. Amount of vertical bone loss was recorded in mm. Prevalence of vertical bone loss was 60% in nonsmokers and 93.3% in smokers, which indicates a significant difference ($P < 0.001$). Moreover, a strong correlation was found between amount of smoking and severity of bone loss. Degree of bone loss was associated with age in nonsmokers ($P = 0.001$), but not in smokers ($P = 0.059$). Also, vertical bone loss did not correlate with gender both in smokers and nonsmokers ($P = 1.000$ and $P = 0.088$, respectively). Moreover, presence of vertical bone loss was not associated with frequency of brushing in both groups ($P = 0.650$ and $P = 0.072$, respectively). Vertical bone loss was significantly more frequent in smokers compared to nonsmokers. Also, a strong correlation existed between amount of smoking and severity of bone loss.

Keywords: Smoking, cemento-enamel junction (CEJ), panoramic radiography

INTRODUCTION

Chronic periodontitis is considered as one of the main reasons for tooth loss. The course and severity of chronic periodontitis is affected by several systemic, local, and environmental factors [1]. Smoking is an important environmental factor in chronic periodontitis. Nicotine causes vasoconstriction in gingival blood vessels and thus reduces gingival blood flow and gingival crevicular fluid. Maintenance of this hypoxic condition can lead to suppression of immune system in the region and finally resorption of alveolar bone. Another effect of smoking is increased production of prostaglandin E2 which attributes to bone resorption [2]. Moreover, smoking increases the temperature of the oral cavity to 42 °C and causes denaturation of proteins,

cell damage, and hyperkeratosis [3]. Therefore, currently cigarette smoking is considered as an important risk factor in different oral diseases including chronic periodontitis [4]. Therefore, currently cigarette smoking is considered as an important risk factor in different oral diseases including chronic periodontitis [4].

One of the most common periodontal lesions in smokers is vertical bone defects [5]. This type of bone resorption is usually associated with infrabony pockets. The aim of this study was to evaluate the effects of smoking on vertical bone defects in patients with chronic periodontitis attending Department of Periodontology of Bandar Abbas Dental School.

MATERIAL AND METHODS

This study was conducted on 90 patients (45 smokers and 45 nonsmokers) attending Department of Periodontology of Bandar Abbas Dental School in 2016 with a clinical indication for panoramic radiography. Inclusion criteria were patient age between 18 to 70 years, absence of systemic disease, and presence of at least 20 teeth. Exclusion criterion was reluctance of patients to participate in the study.

Demographic information was obtained by questionnaire. Frequency of tooth brushing was also recorded. Then, the patients were divided into 2 groups based on smoking. The two groups were controlled in regard to age, sex, and frequency of brushing. The smokers were divided into 3 groups based on amount of smoking: light (less than 4.5 pack/year), moderate (between 4.5 to 15 pack/year), and heavy smokers (more than 15 pack/year).

All panoramic images were obtained by one device (Planmeca, Proline, Helsinki, Finland). Vertical bone loss was assessed in panoramic radiographs by measuring the distance between bone level and cemento-enamel junction (CEJ) and also angulation of bone in all dentition. A distance more than 2 mm with obvious angulation to the mesial or distal surface of the

root was considered as vertical bone loss. Amount of vertical bone loss was recorded in mm. Statistical analysis was performed by Statistical Package for the Social Sciences (SPSS, version 22, NY, USA).

RESULTS

Patients age ranged between 18 to 65 years (mean±SD=38.32±9.90). Table 1 demonstrates demographic information, frequency of brushing, and amount of smoking of the participants. Prevalence of vertical bone loss was 60% in nonsmokers and 93.3% in smokers. The difference between prevalence of vertical bone loss in smokers and nonsmokers was statistically significant (P<0.001). Moreover, Kendall’s tau-c correlation coefficient was 0.650 (P<0.001), which indicates strong correlation between amount of smoking and severity of bone loss. According to Mann Whitney test, degree of bone loss was not associated with age in smokers (P=0.059). However, in nonsmokers severity of bone loss was significantly associated with age (P=0.001). Also, vertical bone loss did not correlate with gender both in smokers and nonsmokers (P=1.000 and P=0.088, respectively). Based on Fisher’s exact test, presence of vertical bone loss was not associated with frequency of brushing neither in smokers nor in nonsmokers (P=0.650 and P=0.072, respectively).

Table 1: Gender, frequency of brushing, and amount of smoking of the participants

| Variable | | Number (Percentage) |
|-------------------------------|------------------|---------------------|
| Gender | Female | 64 (71.1%) |
| | Male | 26 (28.9%) |
| Frequency of brushing per day | 0 | 14 (15.6%) |
| | 1 | 55 (61.1%) |
| | 2 | 20 (22.2%) |
| | 3 | 1 (1.1%) |
| Amount of smoking | Nonsmokers | 45 (50%) |
| | Light-smokers | 27 (30%) |
| | Moderate-smokers | 10 (11.1%) |
| | Heavy-smokers | 8 (8.9%) |

DISCUSSION

The difference between prevalence of vertical bone loss in smokers and nonsmokers was statistically significant. Also, a strong correlation was found between amount of smoking and severity of bone loss.

Nicotine causes vasoconstriction in gingival blood vessels and thus reduces gingival blood flow and gingival crevicular fluid. Maintenance of this hypoxic condition can lead to suppression of immune system in the region and finally resorption of alveolar bone. Although smoking may increase saliva flow in the early stages, however, prolonged smoking significantly reduces saliva flow and alters its microbial flora. This can result in acceleration in formation of calculus [6, 7]. In addition, low dose of nicotine can lead to increased neutrophil infiltration. However, excessive amount of nicotine inhibits the phagocytic function of neutrophils

and thus increases the risk of bacterial infections. Also by affecting polymorphonuclear cells and macrophages, higher doses of nicotine suppress the cellular immune response. Another effect of smoking is increased production of prostaglandin E2 which attributes to bone resorption [2]. Moreover, smoking increases the temperature of the oral cavity to 42 °C and causes denaturation of proteins, cell damage, and hyperkeratosis [3]. Therefore, currently cigarette smoking is considered as an important risk factor in different oral diseases including chronic periodontitis [4].

Similar to the results of the present study, according to Baljoon et al vertical bone loss is significantly associated to smoking [8]. Moreover, Haghghati et al reported that severity of bone loss is related to amount of smoking [9]. This finding is also

consistent with the results of our study. Rudziniski in his study in 2010 concluded that smoking deteriorated the periodontal status compared to nonsmokers with similar oral hygiene [10].

CONCLUSION

Vertical bone loss was significantly more frequent in smokers compared to nonsmokers. Also, a strong correlation existed between amount of smoking and severity of bone loss.

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