Association between Chronic Periodontitis and Acute Myocardial Infarction: A Case-control study in Isfahan

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ABSTRACT

Introduction: Chronic periodontitis has been associated with cardiovascular diseases. The hypothesis that oral, especially periodontal, infections have potentially serious systemic implications, is now gaining credence.

Methods and Materials: Cases were 45-60 years old patients who had been hospitalized in one of cardiologic care units or emergency wards of Isfahan Medical University, for acute myocardial infarction (AMI). Controls had no evidence of acute myocardial infarction, all receiving comprehensive periodontal examination. Information such as age, socioeconomic state, smoking, and diabetes history were obtained from hospital records and direct interview. A total number of %6 people participated in our study, based on informed consent, were designated as two groups of case and control. The association between mean attachment level and number of missing teeth with studied groups were analyzed with SPSS statistical software.

Results: The association of the mean attachment level and also the number of missing teeth with case status were statically significant associated ($P<0.05$).

Conclusion: The results are in accordance with those reports that show the positive association between these two diseases. Our findings suggest that the patients who demonstrate evidence of attachment loss around several teeth, at routine dental visit can be identified as being at risk for future AMI. Such subjects should be referred for medical and periodontal examination and treatment.

Key words:

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Introduction

Periodontal disease is one of the most wide spread chronic diseases world-wide [1]. It is an infectious condition that results in inflammatory destruction of the investing and tooth supporting periodontal tissues (gingiva, periodontal ligament, and alveolar bone). Epidemiological and clinical researchs over the last 30 years have transformed our understanding of etiology, distribution, and progression of periodontal disease [2]. On the other hand, Cardiovascular diseases are common in adults and are the main cause of morbidity/mortality in developed countries [3].

Approximately 1.3 million cases of nonfatal acute myocardial infarction (AMI) are reported each year, with an annual incidence of approximately 600 per 100000 individuals in the United States [4]. In Isfahan, it is an estimated that 183 per 100000 individuals have suffered from AMI in 2002 and 198 per 100000 in 2003 [5].

Several epidemiological and case-control studies have indicated the association between cardiovascular disease (CVD)

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and chronic periodontitis [6]. Recent data have also shown that viral and bacterial infections may also contribute toacute thromboembolitic events and therefore cause myocardial infarction [7, 8]. On the other hand, periodontal diseases are a group of inflammatory diseases whose principal etiologic agents are bacteria and their by-products [9]. Also, there are several studies confirm that heart diseases are the most commonly found systemic conditions in patients with periodontal diseases [10].

In 2003, G. Rutager Persson et al [11] did a clinical research on chronic periodontitis and its significant relationship with acute myocardial infarction. They studied 80 subjects with clinically confirmed AMI and 80 matched control subjects with no evidence of cardiovascular disease, all receiving a comprehensive periodontal examination. Statistical analysis in their research demonstrated a difference in the proportion of sites with a periodontal probing depth≥ 6.0mm (2.7% for non-AMI and 12.1% for AMI group, 95% CI: -2.8 to 0.01, P<0.05) (OR: 14.1:1, 95% CI: 5.5 to 28.2, P<0.0001).

Cueto A. and his colleagues [12], in 2004, designed a case-control study in a Spanish population to determine whether periodontitis was a risk factor for acute myocardial infarction. This study was conducted of 149 Spanish patients aged between 40 and 75 years old, with 72 cases (AMI patients) and 77 controls (trauma patients). Periodontitis was measured as the percentage of sites with clinical attachment loss greater than 3mm. Finally, in a bivariate analysis, males, older patients, smokers, and those with hypertension, diabetes, or hypercholesterolemia, showed an increased risk of acute myocardial infarction. The association between periodontitis and acute myocardial infarction was high and significant in both the unadjusted (odds ratio= 4.42, P< 0.001) and adjusted analyses (odds ratio = 3.31, P = 0.005).

However, lack of association between periodontal disease and CVD has also been reported [13, 14].

The aim of this study, with the regard of high prevalence of periodontitis on the one hand and high rate of mortality because of myocardial infarction on the other hand, was to investigate the relationship between these two disease in a case-control study in Isfahan.

Methods and Material

This study was designed as a matched case-control study to determine the presence , absence, and severity of periodontal attachment loss in case and control groups. The clinical examinations were preformed on bed side at the Coronary Care Units (C.C.U) or emergency wards of Chamran and Khorshid Cardiac hospitals. Periodontal examination for caseswas usually performed a few days after admission for MI in the hospital. Cases were identified as 40-65 years old patients who had been hospitalized in one of the mentioned Cardiology Units.

The inclusion criterion to be as a case of AMI was the examination of a cardiologist, based on history of chest pain, associated with typical electrocardiogram (ECG) changes and elevation of certain serum enzymes. The criteria for excluding an AMI patient from the study were:

1) diagnosis of more than one chronic disease, before hospital admission, 2) diagnosis of endocarditis or / and other infectious disease, 3) suffering from diabetes, 4) completely edentulous patients or having less than 10 teeth in oral cavity, 5) those who had received periodontal treatment within the preceding 6 months to the AMI, 6) patients with maxillofacial trauma, 7) patients who were using immunosuppressant drugs or being under chemotherapy at the time of admission, and 8) smokers.

Control group were also selected among patients or persons in the same age range who had undergone surgery in one of those hospitals, due to gall bladder stones or abdominal hernia.

All control subjects also received comprehensive medical examination at the same hospital by cardiologist, including an

ECG and were excluded to have any evidence of myocardial infarction. Other exclusion criteria for control group were the same as the eight mentioned factors for the case group. A total number of 56 persons were divided into two groups of case [28] and control [28] including 15 males and 13 females in each group.

All participating subjects at the baseline signed an approved informed consent. For the case group, a total number of 58 patients between 40-65 years old who were suffering from AMI were invited to participate as a case for this study.

The base line medical evaluation included a postal questionnaire for subject and for a close informant, structured conducted interview, review of patient records, an examination by a medical practitionerand also information from hospital records.

Information on smoking was available from the interview and questionnaires.

The social class was judged based on subjects' occupation and educational level including three groups of; low, medium, and high.

Presence of myocardial infarction was based on clinical examination by a cardiologist and hospital records information e.g. signs and symptoms of MI, ECG, and laboratory finding.

Dental examination

A dental examination was carried out for each participant consisted of a questionnaire, and clinical examination.

Although ouraim was to study periodontal status, but the number of missing teeth were also recorded.

Periodontal examination was determined using a William's probe, non-magnifying dental mirror, and portable lamps.

Variables were pocket depth which was measured on the sixth Ramfjord teeth and considered to be representative of the whole mouth (maxillary right first molar, maxillary left central incisor, maxillary left first premolar, mandibular left first molar, mandibular right central incisor, and mandibular right first premolar) [15]. The distance from the cementoenamel junction to the bottom of gingival sulcus is a measurement of periodontal attachment loss, which is measured with a probe at the mesial, mid-marginal, and distal sites on the buccal and lingual aspects of each tooth.

Ramfjord's method for measuring this distance is commonly referred to an indirect method measuring periodontal attachment loss.

Statistical analysis

The possible association of dental parameters i.e. attachment level, number of missing teeth, and case status were analyzed. The SPSS statistical PC software version 11.5 was used. Descriptive statistics were performed. Paired t–test was used to assess the differences of studied variables between two groups.

Results

Evidence of an association between periodontitis and acute myocardial infarction was found in the present study.

We found out that there were significant differences between means of attachment loss and missing teeth with subjects status (no-AMI, AMI subjects).

Table 1 is showing the increasing number of case group in relation to increasing amount of attachment loss.

On the other hand, the number of missing teeth has been increasing with case status (table 2). In table 3, also the mean difference between numbers of missing teeth and attachment loss is compared.

Also, in this study the relation between severity of periodontitis and severity or type of myocardial infarctionis was shown.Tests on these variables show that, there was no significant association between mean of attachment loss and type of MI. This disassociation may not be confirmed because of the low number of patients and classification of the AMI group to eight subgroups.

Table 1: Demographic distribution of the cases and controls according to the level of attachment loss (in millimeters).

Attachment los	Case	Control
0 – 2 mm	3	7
2 – 4 mm	19	18
4 – 6 mm	6	3

Table .2: Demographic distribution of the cases and controls according to the number of missing teeth.

Missing	Case	Control
0 – 5	12	19
6 – 12	11	8
12 - 18	5	1

Table 3: Comparison between mean of attachment loss and missing in control and case groups.

Group Statistics

Group	N	Mean	Std. Deviation	Std. Error mean
Missing control	28	4.6786	3.47535	.65678
case	28	7.7857	5.12335	.96822
Attloss control	28	2.4657	.85053	.16074
Case	28	3.1146	1.05532	.19944

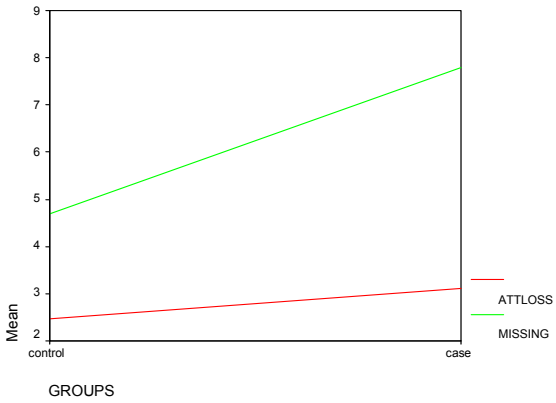

Figure1: Graphic distribution of attachment level and missing teeth means in control and case groups.

Discussion

Indeed, the relative risk of MI appears to be increased in the presence of periodontitis, even after the exclusion of other classical risk factors.

Organisms in subgingival plaques may also contribute to the thrombogenesis potentiality. For example, among seven putative periodontal pathogens, P.gingivalis has been shown to induce human platelet aggregation in vitro.

The thrombogenesis potentiality is also likely to be exacerbated in the presence of hyperlipidemia, a classic risk factor for MI [16].

In the presence of classical risk factors and periodontitis, polymicrobial bacteremia with several species contributing to the thrombogenesis potentiality may therefore increase the risk of MI occurrence; although, there is no study on the association between periodontal disease and MI in which all risk factors have been controled.

It seems that the pathogenic mechanisms underlying CHD, e.g. atherosclerosis, also manifeste in the periodontal tissues, thus the

periodontal destruction is the result, not the cause, of atherosclerosis and subsequent CHD and MI.

However, the correlation between coronary and carotid atherosclerosis is very weak [17], and it is therefore likely to be even weaker when gingival vessels are concerned.

If the observed association between MI and periodontal disease parameters is casual indeed, it has important implications in the nature for the high occurrence of periodontal infections in population would be expected to result in a reduced incidence and mortality from MI.

In this study patients with AMI were selected as cases. There was no significant difference in gender distribution between the AMI and control groups. The subject control group were younger than those in AMI group but it was not significant (controls mean of age was 54.39 years of old, and for the cases was 55.46)

Periodontal status was assessed by measuring the severity of attachment loss. Patients in AMI group had worse periodontal health than those in control group. Missing teeth were also more common among AMI patients than control group.

Our result agrees with the other findings; those who reports periodontal disease to be more common in AMI patients, compared to a control group.

In this study, we also excluded some of significant risk factors both in cardiovascular disease and in periodontitis e.g. smoking and diabetes, and also efforts had been made to enroll control subjects with more similar characteristics in regards to age, gender, and socioeconomic status.

As far as we know, this is the first report that discusses the importance of periodontal health relevance to the occurrence of AMI in Iranian population. Also, it is the first time that the severity and type of myocardial infarction, in relation to severity of periodontitis determined in all other research or articles published till today.

However, we agree with others [18] that cross-sectional studies, such as ours cannot be generalized to an entire population.

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