Short Communication

The relationship between acute myocardial infarction and periodontitis

Mahmoud Khosravi Samani (DDS, MS) [1]
Farzad Jalali (MD) [2]
Seyyed Masud Seyyed Ahadi (DDS, MS) [3]
Seyyed Reza Hoseini (MD) [4]
Farhad Dabbagh Sattari (DDS, MS) [*1]

1- Department of Periodontics, Dental School, Babol University of Medical Sciences, Babol, Iran.
2- Department of Cardiology, Babol University of Medical Sciences, Babol, Iran.
3- Department of Pedodontics, Dental School, Babol University of Medical Sciences, Babol, Iran.
4- Department of Social Medicine and Health, Babol University of Medical Sciences, Babol, Iran.

*** Correspondence:**
Farhad Dabbagh-Sattari, Department of Periodontics, Dental School, Babol University of Medical Sciences, Babol, Iran.

E-mail: fdabaghsattari@yahoo.com
Tel: 0098 111 2291408
Fax: 0098 111 2291093

Received: 1 Jan 2013
Revised: 19 Feb 2013
Accepted: 25 Feb 2013

Abstract

Background: Periodontitis is common in adults and cardiovascular diseases (CVD) are the most common cause of adult death in the world. This study aimed to investigate the relationship between CVD and periodontitis.

Methods: Sixty patients with myocardial infarction (MI) as case and 63 subjects with periodontitis without MI as control were studied. Periodontitis was assessed according to Ramfjord periodontal diseases index and the number of missing teeth besides classic risk factors of MI were recorded.

Results: The patients who lost more than 10 teeth were at more risk of myocardial infarction (OR=2.73). There was a significant relationship between mean attachment loss and MI (p=0.0001). There was also a relation between attachment loss more than 3 mm and MI with OR of 4. Significant difference between mean PDI (periodontal disease index) was seen in case and control groups (p=0.0001). Subjects with PDI>4 were at more risk of periodontal diseases (OR=7.87).

Conclusion: The results show the presence of significant relation between periodontitis and MI which could serve as an alarm to treat periodontitis carefully.

Keywords: Periodontitis, Myocardial infarction, Attachment loss, Periodontal disease index (PDI)

Caspian J Intern Med 2013; 4 (2): 667-671

Cardiovascular diseases (CVD) are the most common cause of adult death in the world (1). Coronary diseases have chronic and acute risk factors. Atherosclerosis is a chronic risk factor for cardiovascular diseases and thrombosis is an acute one which obstructs the heart vessels leading to heart ischemia and finally cardiac infarction (2). Periodontitis, a bacterially induced, local, chronic inflammatory disease, destroys connective tissue and bone that support the teeth. It is a common disease, with mild to moderate forms affecting 30% to 50% of adults and the severe form affecting 5% to 15% of all adults in the United States (3).

Recent studies have shown the role of constant chronic infections in the process of atherosclerosis formation (4). Additionally, microorganisms involved in periodontal diseases can play a role in the formation of atheromatous plaques and given that periodontal disease is one the most common infectious diseases, as a chronic infection, it can be considered as an important risk factor for CVD (5, 6). Meanwhile, periodontitis is common with some manifestations of CVD including being prevalent in adult men, smokers, diabetics, people with stress and people with low socioeconomic level (7). Biological principles relating to periodontitis and acute myocardial infarction (AMI) including the direct effect of periodontal bacteria, the indirect effect of host mediators, the effect of lipopolysaccharide or endotoxin of periodontal bacteria and the effect of activated mononuclear phagocytes have been described. In 1998, Meyer and Herzberg had shown that Porphyromonas gingivalis (p. gingivalis) could lead to platelet aggregation (8).

Kuramitsu's work in 2001 showed that vesicles of outer membrane of P. gingivalis caused by the formation of lipid cell were an important characteristic of CVD. They also acted as a mediator in the oxidation of low density lipoprotein (LDL) and rupture of atherosclerotic plaque (9). Some bacteria of dental microbial plaque such as Streptococcus sanguis and P. gingivalis have a specific surface protein which is similar to platelet stimulating part of collagen and induces platelet aggregation and cause cardiac and cerebral ischemic disorders by formation of thrombosis (10). Several studies reported a relationship between periodontitis and MI (11, 12).

Because of the limited studies in this important issue in Iran, we decided to investigate the relationship regarding the high prevalence of periodontitis in the society and the importance of acute myocardial infarction as a threat of death in patients.

Methods

This case control study was performed in 123 patients and were divided into two groups; one with 60 cases and the other with 63 controls. The case group included patients who were admitted in the Cardiac Unit of Shahid Beheshti Hospital of Babol with the diagnosis of acute myocardial infarction using heart enzymes test and electrocardiography. The patients admitted in Department of Internal Medicine of Shahid Beheshti Hospital in that period were chosen as the control group. Exclusion criteria included, existence of a chronic disease except periodontal disease, endocarditis, immune system deficiency, total toothlessness, taking periodontal treatment in the past one year, taking OCPs, taking hormones after menopause, antibiotic therapy within 2 days before examination and patients with maxillofacial trauma.

After obtaining the written consent from the patients, their name, age, sex, admission time, education, marital status, location, blood lipid level, blood pressure, and MI history, history of hereditary cardiovascular diseases, diabetes, smoking, and exercise were recorded in a questionnaire. Both groups were examined after 2-6 days of admission in the hospital. Height, weight, blood pressure, body mass index and intraoral examinations with similar conditions were recorded. In oral examination, all teeth excluding the third molar teeth were examined using Michigan periodontal probe and the number of missing teeth was recorded. Periodontal diseases, loss of attachment and inflammation were assessed according to periodontal diseases index ramfjord (13). Mesial, distal, buccal, and lingual sites of six teeth were dried and the severity of gingival inflammation around six teeth was examined. The distance from the free gingival margin to the bottom of gingival sulcus was recorded for mesial, facial, distal, and lingual aspects of each six teeth. If the gingival margin was on cementum, its distance from cementoenamel junction (CEJ) was recorded as a minus value. The distance from CEJ to bottom of gingival sulcus was measured by subtracting these two numbers. This distance (from CEJ to bottom of gingival sulcus) is the loss of attachment level. In Ramfjord method, to measure this distance is called indirect method of measuring periodontal loss of attachment.

The Periodontal disease index (PDI) score for each tooth was measured on the basis of assessing gingival inflammation and the depth of gingival sulcus associated with CEJ according to mean scores for each aspect of tooth. If gingival sulcus had no apical extension to CEJ in all sites, then PDI score for tooth is called gingival score. Finally, PDI score for each patient was computed by dividing the total teeth scores to the number of examined teeth. If any of the ramfjord teeth was missing, then no other tooth was replaced according to periodontal disease index ramfjord.

After data collection, to investigate the relationship between infarction and classic risk factors of heart diseases (blood lipid, location, education, age, marital status, blood pressure, history of myocardial infarction, history of hereditary cardiovascular diseases, diabetes, smoking, and exercising) and the number of missing teeth, PDI index and attachment loss, they were analyzed using chi-square, independent t-test and multivariate logistic regression when appropriate. The difference with $p<0.05$ was considered significant.

Results

The mean ages of patients in case and control groups were 54.97±9.68 and 55.89±11.9 years, respectively. The relation of acute myocardial infarction with PDI, number of missing teeth, attachment loss and classic risk factors of AMI were assessed separately with multivariate logistic regression analysis (table 1).

The subjects who lost more than 10 teeth were at more risk of myocardial infarction (OR=2.73). There was a

significant relationship between the mean attachment loss and AMI (p=0.0001). There was also a relation between attachment loss more than 3 mm and AMI with odds ratio of 4. We found a quite significant difference between mean PDI in case and control groups (p=0.0001) and people with PDI>4 were at more risk of MI (OR=7.87) (table 1, 2).

Table 1. relationsheep between MI and periodontal indeces in both groups

Variable	Case n=60	control n=63	Odds ratio (OR)	P value
Loss of teeth				
>10	45 (75%)	33 (52.4%)	2.72	0.009
<10	15 (25%)	30 (47.6%)	(1.26-5.86)	
Mean±SD	13.08±4.58	11.65±5.82		0.021
Loss of attachment				
>3mm	42 (70%)	11 (17.5%)	4.00	0.0001
<3mm	18 (30%)	52 (82.5%)	(2.29-7.03)	
Mean±SD	3.89±1.32	2.60±0.75		0.0001
PDI score				
>4	30 (50%)	4 (6.3%)	7.87	0.010
<4	30 (50%)	59 (93.7%)	(2.95–21.01)	
Mean±SD	4.58±0.4	4.22±0.24		0.0001

PDI, Periodontal Disease Index

Table 2. Odds ratio for some important variables in patients with and whitout MI

Variable	Age adjusted odds ratio (95% CI)	P value
Age	1.155	0.676
PDI score (< or > 4)	2.32 (0.59- 8.42)	0.100
loss of attachment (< or > 3mm)	8.79 (2.36- 32.66)	0.001
Number of missing teeth (< or > 10)	5.44 (1.65- 17.94)	0.005
Diabetes	1.73 (0.50- 5.94)	0.038

PDI, Periodontal Disease Index

Discussion

In our study, there was a significant difference between mean PDI of case and control groups. Also, the people with PDI>4 were at more risk of periodontal diseases with odds ratio of 7.87. With the use of multivariate logistic regression, the mean attachment loss and mean number of missing teeth were more significant than the other risk factors. In this study, like some other studies, there was a significant association between AMI and the number of missing teeth. Also, the people with more than ten missing teeth had a higher risk of MI with odds ratio of 2.727 which corresponds with Moghaddas' study (14). In Holmlund's work in 2010, the mortality caused by CHD and CVD was predictable from the number of remaining teeth in which people with ten or fewer teeth were seven times at more risk of death caused by CHD than the ones with twenty five or more teeth (15). In the current study, there was a totally significant relationship between the mean attachment loss and AMI which could be

seen in some similar studies (14, 18, 20). Moreover in our study, attachment level more than 3mm had a relation with AMI which corresponds with Moghaddas' study in which they found an association between attachment level more than 4 mm and two and three vessels disease (14). In a similar study, Stein in 2009 showed that periodontitis were seen more in patients with AMI (16). Blaizot et al. in 2009, with a meta-analysis on 29 observational studies found a relationship between periodontal diseases and CVD like the findings of other researchers (14, 18-20).

Since the patients with AMI and internal patients were admitted in different units, we could not use observer blind method to examine case and control groups. In this study, we used PDI and the number of missing teeth as a periodontal assessment index. PDI and the number of missing teeth show ultimate level of periodontitis because a longer time is needed for periodontal support destruction, thus, they show periodontal status of a person in the past and are appropriate indices for periodontal diseases in this study. The number of missing teeth is used in many similar studies (14, 18-20). Loss of attachment was also assessed in some studies (2, 14, 18, 20). In summary**,** the results show the presence of significant relation between periodontitis and MI which could be an alarm to treat periodontitis carefully.

Acknowledgments

The authors wish to thank the Chief and the nurses of the Cardiology Department of Shahid Beheshti Hospital, Babol, Iran for their help.

Funding: This study is a thesis of Seyyed Masud Seyyed Ahadi (No: 299)

Conflict of interest: There was no conflict of interest.

References

1. Genco RJ, Glurich I, Haraszthy V, Zambon J, Denardin E. Overview of risk factors for periodontal diseases and implications for diabetes and cardiovascular diseases. Compend contin Educ Dent 2001; 22: 21-30.
2. Beck Jd, Offenbacher S, Williams R, Gibbs P, Garcia R. Periodontitis: A risk factor for coronary heart disease. Ann periodontol 1998; 3: 127-41.
3. Friedewald VE, Kornman KS, Beck JD, et al. Periodontitis and Atherosclerotic Cardiovascular Disease. J Periodontol 2009; 80: 1021-32.
4. Offenbacher S, Elter JR, Lin D, Beck JD. Evidence for periodontitis as a tertiary vascular infection. J Int Acad periodontol 2005; 7: 39-48.
5. Geerts SO, Legrand V, Charpentier J, Albert A, Rompen EH. Further evidence of the association between periodontal conditions and coronary artery disease. J periodontol 2004; 75: 124-80.
6. Muller HP. Periodontitis and cardiovascular disease: An ecological fallacy. Eur J Oral Sci 2001; 109: 286-7.
7. Lilienfeld DE, Stolley PD. Foundation of epidemiology. New York: Oxford University press 1976.
8. Herzberg M, Meyer MW. Dental plaque, platelets, and cardiovascular diseases. Ann Periodontol 1998; 3: 152-58.
9. Kuramitsu HK, Qi M, Kang JC, Chen W. Role for periodontal bacteria in cardiovascular diseases. Ann periodontal 2001; 6: 41-7.
10. Scannapicco FA. Position paper of the American Academy of periodontology: Periodontal disease as potential risk factor for systemic diseases. J periodontol 1998; 69: 841-50.
11. Dorn JM, Genco RJ, Grossi SG, et al. Periodontal Disease and Recurrent Cardiovascular Events in Survivors of Myocardial Infarction (MI): The Western New York Acute MI Study. J Periodontol 2010; 81: 502-11.
12. Renvert S, Ohlsson O, Pettersson T, Persson GR. Periodontitis: A Future Risk of Acute Coronary Syndrome? A Follow-Up Study Over 3 Years. J Periodontol 2010; 81: 992-1000.
13. Newman MG, Takei H, Caranza FA. Carranza's Clinical periodontology. 9 th ed. Philadelphia: W.B saunders Co; 2002.
14. moghaddas H, Motamedi A. Relationship between periodontitis and ischemic heart disease. J Dent Sch 2003; 21: 126-33.
15. Holmlund A, Holm G, Lind L. Number of teeth as a predictor of cardiovascular mortality in a cohort of 7,674 subjects followed for 12 years. J Periodontol 2010; 81: 870-76.
16. Stein JM, Kuch B, Conrads G, et al. Clinical periodontal and microbiologic parameters in patients with acute myocardial infarction. J Periodontol 2009; 80: 1581-89.
17. Blaizot A, Vergnes JN, Nuwwareh S, Amar J, Sixou M. Periodontal diseases and cardiovascular events: meta-analysis of observational studies. Int Dent J 2009; 59: 197-209.

18. Cueto A, Mesa F, Braro M, Ocana-Riola R. Periodontitis as risk factor for acute myocardial infraction. A case control study of Spanish a adults. J periodontal Res 2005; 40: 36-42.
19. Emingil G, Buduneli E, Aliyev A, Aklili A, Atilla G. Association between periodontal disease and acute myocardial infarction. J Periodontol 2000; 71: 1882-6.
20. Kaisare S, Rao J, Dubashi N. Periodontal disease as a risk factor for acute myocardial infarction. A case-control study in Goans highlighting a review of the literature. Br Dent J 2007; 203: E5; discussion 144-5.