A periodontal health assessment of hospitalized patients with myocardial infarction

Abstract

Background: Recent researches have known long term infections such as periodontal disease to be related with the process of atherosclerosis. Periodontitis causes peripheral inflammation and immune cell stimulation which leads to an increase in C-reactive protein (CRP) and IgA Ab and there is a definite relation between cardiovascular disease, CRP increase and Periodontitis. The aim of this study was to evaluate the periodontal health status of patients with myocardial infarction who were hospitalized in Babol and Sari Hospitals.

Methods: This descriptive study was done on 95 men and women age ranging from 40 to 70 years old hospitalized due to myocardial infarction diagnosis in Babol and Sari Hospitals. Periodontal health, of patients evaluated via Cowell Bleeding Index, Green and vermillion Debri Index, Tooth Mobility, Clinical attachment Level on Ramfjord teeth. Data were analyzed with SPSS and Kruskal-Wallis test and Mann-whitney test.

Results: Considered indexes were evaluated in 81 men and 14 women studied which showed no significant difference among them in the average BI (p=0.52), average tooth mobility (p=0.117) and average CAL index (p=0.745). The only significant difference between men and women was found in average DI index (p=0.08). There was a significant difference between average CAL in Ramfjord teeth of upper and lower jaw (p=0.002).

Conclusion: According to high prevalence of periodontitis in our study, periodontitis may be a risk factor of cardiovascular disease, it should be pointed out that here is the cardiologists’ emphasis on their patients referring to the dentists.

Key words: Periodontitis, Myocardial Infarction, Clinical Attachment Level, Bleeding Index, Debri Index.


The most common death cause in American adults aged over 65 years is cardiac diseases (1). In general, cardiovascular diseases have two main risk factor groups (acute and chronic). Atherosclerosis as a chronic risk factor with narrowing cardiac vessels and thrombosis as an acute one, with blocking cardiac vessels; that can cause cardiac ischemia and finally infarction (2). Recent researches have known long term infections such as periodontal disease related to the process of atherosclerosis (3). This disease is one of the initiators of cardiovascular complications (4).

It is observed that periodontal pathogens have caused atherosclerotic lesions. Periodontitis causes peripheral inflammation and immune cell stimulation which leads to an increase in C-reactive protein (CRP) and IgA Ab and there is a definite relation between cardiovascular disease, CRP increase and periodontitis (5). Periodontal bacteria can penetrate the circulation and then set off to the main organs and make new infections (6). Some of the bacteria responsible for periodontal disease such as prophyromonas gingivalis and tanerella forsythus and campylobacter rectus are among the atherosclerosis-causing bacteria (7) and recent studies have shown the ability of prophyromonas gingivatis in attacking endothelial cells.
This process can also define some of the relations between periodontal and cardiac disease (8). In Holmlund’s study in 2009, it was observed that among the patients with periodontal disease; the IgG level against prophyromonas gingivatis was higher in those suffering from acute myocardial infarction (AMI). Moreover, it defined that people suffering from MI show more periodontal bone loss (PBL), deep periodontal plaques and more bleeding sites during probing when compared to the control group (9). It was shown in Pussinen’s study that the increase in IgG for women and IgA for men could be an identical factor (10). Furthermore, patients suffering from MI had more frequency of PD (PD≥ 4 mm) when compared to controls (11).

Czerniuk et al. Cueto et al. and Pussinen et al. have indicated that periodontal disease is related to MI (10, 12, 13). Elter and Kaisare have stated that the number of lost teeth is associated with cardiac ischemia statistically (14, 15). Holmlund et al. explained that the number of teeth is associated with the incidence of age-related MI but has no relation to hypertension (16).

The aim of this study was to evaluate the periodontal health status of patients with Myocardial infarction who were hospitalized in Babol and Sari Hospitals.

**Methods**

This is a descriptive-analytical study and the study population included 95 men and women age ranging from 40 to 70 years old who were hospitalized due to myocardial infarction. The number of the studied population was determined based on prior studies (17, 18). Periodontal health, bleeding indicator (19), debris indicator (20), tooth mobility (19) and clinical level of attachments (19) were evaluated on Rumjford teeth (including 6 1 4 1 4 teeth).

If these teeth were absent, the following teeth were examined and if those were absent too, the patients were excluded from the study. On the other hand, the data included gender, age, systemic disease, drug intakes, the number of infarction incidence, the time of the last infarction and duration of hospitalization were gathered from each patient’s file and recorded in their forms. In order to perform this study, all patients (as they had complete bed rest) were examined while lying down in the same position in the hospital bed in an upright position. In the evaluation of bleeding index, based on periodontitis, it was taken to gingival sulcus of buccal and lingual sides of the Ramfjord tooth. After evaluating the bleeding index on buccal and lingual side of the tooth, its average was measured for each patient. In order to define debris index, dental probe was used in Green and vermillion Debri Index method. After grading of the lingual and buccal surfaces for each tooth, the average index was determined for each patient.

Headed for measuring clinical attachment level, from CEJ of each tooth to the sulcus depth in both buccal and lingual sides were measured using periodontal probe and the average was determined for each patient.

For measuring tooth mobility, one side of the tooth, it was held with metal instrument and the other side with the index finger and moved in bucco-lingual and vertical directions and the tooth mobility was graded based on tooth movement. The data was entered to SPSS statistical software and was analyzed using Kruskal-Wallis and Mann-Whitney tests when appropriate.

**Results**

Among the patients suffering from acute myocardial infarction who were hospitalized in Sari and Babol hospitals, 164 patients were excluded from the study due to the absolute absence of teeth, 4 due to being uncooperative and 3 of them was because of their young age. From the study on 95 patients, these results were obtained. The systemic disease condition of the cases was as follows: high blood lipid profile (24 cases), diabetes (22), hypertension (8), kidney transplant (1) and the duration of hospitalization were 1-10 days. Eighty one patients were males and 14 females. The patients’ age range was between 40-70 years old mean 52.9±9.9 and their distribution in different age groups was as follows. Forty one patients were in 40-51 years old group, 28 in 51-60 and 26 in 61-70 years old group. The range of tooth mobility, average BI, average DI, average CAL index were (0-2), (0-1.67), (0-3), (0-11) respectively (Table 1,2). We found these results while evaluating the average studied indexes (Table 3). The considered indexes were evaluated in studied men and women which showed no significant difference among them in the average BI (p=0.52), average tooth mobility (p=0.117) and average CAL index (p=0.745). the average DI index was only significant difference between men and women found (p=0.08), in men is larger.
Table 1: frequency and percentage of average TOOTH MOBILITY, BI and DI in patients suffering from MI.

<table>
<thead>
<tr>
<th>Average tooth mobility</th>
<th>Frequency</th>
<th>Percentage</th>
<th>Average BI</th>
<th>Frequency</th>
<th>Percentage</th>
<th>Average DI</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>62</td>
<td>65.3</td>
<td>0</td>
<td>57</td>
<td>60</td>
<td>0</td>
<td>3</td>
<td>3.2</td>
</tr>
<tr>
<td>0.17</td>
<td>7</td>
<td>7.4</td>
<td>0.17</td>
<td>3</td>
<td>3.2</td>
<td>0.17</td>
<td>3</td>
<td>3.2</td>
</tr>
<tr>
<td>0.33</td>
<td>4</td>
<td>4.2</td>
<td>0.33</td>
<td>11</td>
<td>11.6</td>
<td>1</td>
<td>12</td>
<td>12.6</td>
</tr>
<tr>
<td>0.5</td>
<td>8</td>
<td>8.4</td>
<td>0.5</td>
<td>8</td>
<td>8.4</td>
<td>1.17</td>
<td>8</td>
<td>8.4</td>
</tr>
<tr>
<td>0.83</td>
<td>3</td>
<td>3.2</td>
<td>0.67</td>
<td>3</td>
<td>3.2</td>
<td>1.33</td>
<td>8</td>
<td>8.4</td>
</tr>
<tr>
<td>1.5</td>
<td>4</td>
<td>4.2</td>
<td>0.8</td>
<td>2</td>
<td>2.1</td>
<td>1.5</td>
<td>10</td>
<td>10.5</td>
</tr>
<tr>
<td>1.67</td>
<td>3</td>
<td>3.2</td>
<td>0.83</td>
<td>4</td>
<td>4.2</td>
<td>1.67</td>
<td>2</td>
<td>2.1</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>4.2</td>
<td>1</td>
<td>4</td>
<td>4.2</td>
<td>1.83</td>
<td>2</td>
<td>2.1</td>
</tr>
<tr>
<td>Total</td>
<td>95</td>
<td>100</td>
<td>1.67</td>
<td>3</td>
<td>3.2</td>
<td>2</td>
<td>12</td>
<td>12.6</td>
</tr>
</tbody>
</table>

Moreover, the studied parameters in different age groups were evaluated which showed no significant difference between average tooth morbidity (p=0.48), BI (p=0.69) and DI (p=0.19). Simply CAL was significant when it was in different age groups (p<0.001) while evaluating the association between the average studied indexes with the frequency of infarction in the patients, there was no significant difference between average mobility (p=0.11) and DI (p=0.40) indexes in two groups of first infarction and more than one infarction groups; even though we found a significant difference between BI (p=0.04) and CAL index (p<0.001) and the frequency of infarction in patients. There was a significant difference between average CAL in Ramfjord teeth of upper and lower jaw (p=0.002). When CAL of each Ramfjord tooth of all patients was measured, the difference between the founded averages was statistically significant (p<0.001) and the most CAL was observed in the 6 teeth of the patients.

Table 2: frequency and percentage of average CAL in patients suffering from MI.

<table>
<thead>
<tr>
<th>Average CAL (mm)</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>33</td>
<td>5.8</td>
</tr>
<tr>
<td>1</td>
<td>63</td>
<td>11.1</td>
</tr>
<tr>
<td>2</td>
<td>221</td>
<td>38.8</td>
</tr>
<tr>
<td>3</td>
<td>79</td>
<td>13.9</td>
</tr>
<tr>
<td>4</td>
<td>92</td>
<td>16.1</td>
</tr>
<tr>
<td>5</td>
<td>35</td>
<td>6.1</td>
</tr>
<tr>
<td>6</td>
<td>23</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>12</td>
<td>2.1</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>1.4</td>
</tr>
<tr>
<td>11</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>570</td>
<td>100</td>
</tr>
</tbody>
</table>

Discussion
Holmlund et al. stated that people with more crest bone loss have a higher relative risk for cardio-coronary diseases than those lower level of bone loss (9). When CAL quantity was measured in patients suffering from myocardial infarction, the average CAL of all patients was 2.83±1.79 mm. based on Carenza, mild periodontitis is characterized by loss of attachments by 1-2 mm, moderate periodontitis by 3-4 mm and severe periodontitis by 5mm (2); thus 94.2% of our cases had periodontitis; 49.9% of which were mild periodontitis, 30% moderate and 25.7% severe periodontitis. In Desvarieux et al. study in 2009, the quantity of CAL in patients suffered from AMI showed a significant difference when compared to healthy individuals (p=0.001, 4.5 mm versus 5.4 mm) (21) which is compatible to the present study. In this study BI=0 was observed in sixty percent of the patients. The average BI in all patients was 0.39±2.5 and also 96.8% had a DI more than zero. Debris is equivalent with bacterial plaque in this study. Some plaque forming bacteria such as campylobacter rectus, tannerella forsythus and prophyrmonas gingivatis are also among the known atherosclerosis-causing bacteria. This process can clarify some of the relations between periodontal diseases and cardiac diseases (7).

Czerniuk et al. reported the average percentage of plaque and bleeding indexes in patients was 46% (less than the present study) and 80% (more than the present study), respectively (12). In another research by Dorn et al, prophyrmonas gingivatis was introduced as a prominent factor in the plaque of patients suffering from MI, and in addition to prophyrmonas gingivalis, other bacteria such as tannerella forsythus and aggregation bacteria were observed in a greater number in MI group when compared to the control group (22). Frank et al reported that poor mouth hygiene is associated to many systemic diseases, one of which is myocardial infarction (23). Karhunen stated that the low mouth hygiene was related in an increased risk of sudden cardiac death (24).

The teeth mobility rate which is one of the other factors for periodontal health was also considered in the present study and an average of 0.56±0.29 was found an acceptable amount. Geerts revealed that the difference in periodontitis and its intensity, depth of probing, bleeding index, plaque index, furcation involvement and the amount of tooth mobility was significantly higher in patients suffered from cardiovascular diseases when compared to healthy individuals (25).

Desvarieux stated that men put up with periodontitis more than women (21). All the same in gender evaluation in our study, the debris index was significantly higher in men when compared to women, which shows inferior mouth hygiene in men. On the other hand, CAL in men was measured to be more than women which was not statistically significant. In our study, the inferior jaw CAL was more than the superior jaw and the most CAL was related to the first molar on the left lower side which we found no research on the subject among the studies related to periodontium. Furthermore, patients who were hospitalized due to their first infarction had a lower CAL and BI when compared to those hospitalized because of their several infarctions. This difference was significant and we found no similar study among other researches related to MI and periodontium, thus more studies are required on this matter.

Altogether, several cross sectional-longitudinal and case control studies have been conducted based on association between poor periodontal hygiene and cardiac diseases. Willershausen introduced periodontitis as a prohibiting factor for cardiovascular disease (26) or a study by Dorn in New York, USA showed periodontal disease to be a very important factor in causing cardiovascular incidents in patients with myocardial infarction (22).

Also, two other meta-analysis studies revealed a statistically significant difference between periodontal disease and acute myocardial infarction and recommended further studies in the different dimensions of this matter (13). The only study which denied the association between MI and periodontal disease was that of Hujoel et al which was a follow up study of 21 years (27). This finding maybe due to excessive deletion of the factors which are strongly associated with infections such as periodontal disease or there might be an incorrect categorization of periodontal disease from the beginning; meaning the individuals known to be healthy at the start of the study could get the disease within 21 years or patients known as periodontal patients could be treated in the meantime. Since there was high prevalence of periodontitis in our study, most similar studies introduce periodontitis to be an independent risk factor of cardiovascular disease; regardless of other classic risk factors, it should be pointed out here is the cardiovascular specialists emphasis on their patients referring to the dentists.

Acknowledgments
The authors gratefully acknowledge Dr. Payam Kabiri for his comments during the preparation of the manuscript and Dr. Reza Alizadeh for the statistical analysis of the data.

References