

Oral Disease as a Risk Factor for Acute Coronary Syndrome – Single Center Experience

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Abstract

Objective: Poor oral health is common in the United States. The incidence of periodontal disease in young adults in USA is around 7-10%. The current review finds that periodontal disease is associated with a 24% increase in the risk for CHD.

Background: Evidence for a link between periodontal disease and several systemic diseases is growing rapidly. Current evidence suggests that periodontitis is associated with an increased likelihood of coronary heart disease, diabetes and metabolic syndrome. In recent times there has been increasing awareness that immune responses are central to atherogenesis and a mechanism by which infection may initiate and facilitate the progression of atherosclerosis. The passage of periodontal pathogens, and their products, through ulcerated epithelium into the circulation, leading to bacteraemia and/or provocation of systemic immune and inflammatory responses is of concern. In a meta-analysis, periodontal disease increased the risk for incident CHD by a risk ratio of 1.24. Almost 1/3 of diabetes has severe periodontal disease.

Methods: A retrospective analysis was performed from January 2007 to December 2009 in all acute coronary syndromes admitted in Providence Hospital's Heart Institute, who are less than 50 years old. Patient charts were reviewed. Patient's demographics and traditional risk factors were charted. Patients were called and specific questions regarding periodontal disease were asked.

Results: A total of 130 patients were included in the analysis. 97 patients (70%) responded. The Patients were matched to the baseline demographics and traditional risk factors. Periodontal disease is found almost among 37% of patients in this study, which is approximately four and a half times the expected prevalence for this age group according to the findings of The National Health and Nutrition Examination Survey, 1999-2004. There is no increase in MACE events because of small sample size.

Conclusion: The mouth is, thus, a significant contributor to both the total burden of infection and inflammation and, hence, to overall health and well-being. The examination of the oral

cavity is often neglected. Our findings support considering periodontal disease as a nontraditional risk factor for coronary artery disease and thus the implementation of screening for both primary and secondary prevention. We also recommend patient compliance with the American Dental Association recommendations regarding basic oral health.

Keywords: Periodontal Disease, Coronary Heart Disease, Nontraditional Cardiovascular Risk Factor

Introduction

Periodontitis is a chronic inflammatory disease affecting the tooth and supporting structures. This disease results from the growth of Gram negative bacteria which cause breakdown of the bone surrounding the teeth. The World Health Organization identifies several risk factors for oral disease including poor living conditions, diet, nutrition, and oral hygiene, use of tobacco and alcohol, and limited access to oral health services (1). The estimated prevalence of periodontal disease in dentate adults in the United States is 34.4% with 21.8% having a mild form and 12.6% having a moderate to severe form (2). Worldwide severe periodontitis affects 5-20% of adult populations (1). The National Health and Nutrition Examination Survey (NHANES III) (data collected from 1999-2004), found the prevalence of periodontal disease in people between the age of 20 and 64 to be 8.52%.

Periodontal disease has been implicated as a nontraditional risk factor for cardiovascular disease. Traditional risk factors include hypertension, diabetes mellitus, hypercholesterolemia, and smoking. The mouth is a significant contributor to the body's total burden of both infection and inflammation. Chronic low level bacteraemia that occurs with chewing and tooth brushing and the presence of chronic inflammation are possible mechanisms. It has been reported that 18-30% of all carotid atheromas are colonized by *P. gingivalis* and *A. actinomycetemcomitans*, two pathogens associated with periodontal disease (3). Multiple studies have found a correlation between periodontitis and vascular disease. Jimenez et al found an association between a history of periodontitis and cerebrovascular disease that was independent of established cardiovascular risk factors (hazard ratio 3.52; 95% confidence interval 1.59-20.7) (4). The Normative Aging Study found severe periodontitis to have a 1.85 increase in risk of death and a 1.5 increase in risk of coronary artery disease (5).

We retrospectively reviewed the cases of 97 adult patients younger than 50 years of age who presented to the Heart Institute at Providence Hospital and Medical Centers with acute ST segment elevation myocardial infarction in order to identify the prevalence of periodontal disease in this population.

Methods

We performed a retrospective chart review of 130 consecutive patients who presented to the Heart Center at Providence hospital in Southfield Michigan and Providence Park Hospital in Novi Michigan with acute ST segment elevation myocardial infarction (STEMI) between January 2007 and December 2009. Inclusion criteria were patients presenting with acute STEMI and age less than 50 years. All eligible patients were included. Baseline demographics and clinical risk factors were obtained by chart review including age, gender, past medical history, tobacco use, and family history. Patients were then contacted by phone and asked specific questions regarding the presence of dental cavities, gum disease, or visits to the dentist within the last year secondary to tooth pain.

Results

Ninety seven of 130 total patients were successfully contacted by telephone, giving us a 70% response rate. In our study group 70% were male, mean age was 45 years (range 30 to 50), and mean body mass index was 32 kg/m². In the total population 54% had hypertension, 21% diabetes, 51% hypercholesterolemia, 63% were current tobacco users, and 33% had a family history of coronary artery disease (table 1). The prevalence of periodontal disease was 37% (n=36) (determined by answering yes to at least one question regarding their oral health). Baseline characteristics, including gender, smoking status, family history, and prior diagnosis of hypertension, diabetes mellitus, and hypercholesterolemia were not significantly different between the patients with or without periodontal disease (table 2 and graph 1).

Discussion

We found the prevalence of periodontitis in our population of patients less than 50 years of age who presented to our hospital with STEMI to be 37%. We were able to contact 70% of our targeted population which we feel is adequate to draw conclusions on our patient population. This is much higher than the reported prevalence of 8.52% in the general population of people age 20 to 65 as reported in NHANES III. Periodontitis has been suggested to be a non-traditional risk factor for coronary artery disease. Our results support this as a possibility.

There are two mechanisms that likely contribute to the development of coronary artery disease in patients with periodontal disease. First, chronic low grade inflammation promotes the progression of vascular pathology including atherosclerotic plaques. It has been proposed that oxidized lipids within the vessel wall and hemodynamic strain provide the initial inflammatory stimuli (6). In response endothelial and intimal cells produce various adhesion molecules and inflammatory cytokines which recruit and activate immune cells which produce more cytokines and perpetuate the inflammatory process. Second, chronic infection leads to a hypercoagulable state with increases in fibrinogen and white blood cell counts along with platelet aggregation mediated by bacteria such as *P. gingivalis* (7).

The Periodontitis and vascular events (PAVE) trial was a multicentered, randomized, controlled trial to examine the effects of periodontal disease treatment on secondary prevention of cardiovascular disease (8). They randomized 303 patients with periodontal disease and recent

cardiovascular events to a “community care” group who received oral hygiene instruction and a referral for periodontal care and an “intensive treatment” group who received oral hygiene instruction plus scaling and root planning. Patients were followed at 6 and 12 months. Upon secondary analysis they found that treatment group, when compared to the subset of who received no treatment at all, reduced high sensitivity C-reactive protein (hs-CRP) levels in patients with a hs-CRP level >3 mg/L. High sensitivity C-reactive protein is a marker for systemic inflammation and is also considered a nontraditional risk factor for cardiovascular disease.

The results of both the PAVE trial and our survey suggest that oral health does impact ones overall health. Screening for oral hygiene should be incorporated into routine primary care physical exams. All at-risk patients should also undergo risk factor reduction including smoking cessation and diabetes education. It is also reasonable to screen all patients with a primary cardiac event for the presence of periodontal disease. Once disease is identified patients should be counseled on oral hygiene and referred for appropriate treatment. We support the promotion of regular dental checkups, along with twice daily tooth brushing and flossing as recommended by the American Dental Association (9). Further research is needed in order to establish a causative link between periodontal disease and coronary artery disease.

Limitations

It is not possible to establish a cause and effect relationship with a retrospective study. Actual dental exams would have been ideal however given the retrospective nature of this study we would not have had an adequate response if we requested the patients to go to a dental office. The investigators conducting the PAVE trial determined dental exams must be performed at the time of initial hospitalization in order to obtain adequate patient participation. Dental exams would have allowed us to both verify and quantify the severity of disease.

Conclusion

Our study supports the consideration of periodontal disease as a nontraditional risk factor for coronary artery disease. We found a 37% prevalence of periodontal disease in our target population of adults less than 50 years of age presenting with STEMI. This is significantly higher than the 8.52% prevalence in adults aged 20 to 64 identified in the NHANES III survey. Possible causative mechanisms include chronic low grade inflammation and transient bacteraemia leading to metastatic infection and metastatic inflammation. The preponderance of evidence suggests that it is reasonable to screen patients for oral disease and counsel them in risk factor reduction, including smoking cessation and diabetes education. Hospitalization for an acute coronary event may be an opportune time for additional screening and reinforcement of basic oral hygiene.

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Table 1: Patient demographics (n = 97)

Mean Age	45 years (range 30-50)
Mean BMI	32 kg/m ² (range 24-56)
Male gender	68 (70%)
Hypertension	53 (54%)
Diabetes mellitus	21 (21%)
Hypercholesterolemia	49 (51%)
Current tobacco use	61 (63%)
Positive family history for CAD	32 (33%)

Table 2: Comparison between patients with and without periodontal disease

	Oral Disease n=36	No oral disease N=61	P value
Gender (male)	27 (73%)	41(68%)	=0.7
Hypertension	20 (54%)	33 (55%)	=0.9
Diabetes	12 (32%)	9 (15%)	=0.09
Tobacco use	21 (57%)	25 (30%)	=0.3
Hypercholesterolemia	18 (48.6%)	31 (51%)	=0.9
Family History	12 (32.4%)	20 (33.3%)	=1.0

Graph 1: Comparison of patients with and without periodontal disease

