Dental Plaque and Chronic Systemic Pathologies

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Abstract

There are some clinical and epidemiological studies that show a high prevalence of periodontitis and tooth loss in patients with diabetes mellitus, rheumatoid arthritis and cardiovascular problems. The objective of the present study was to evaluate by means of a literature review the relationship of the systemic condition and the oral cavity. Scientific evidence confirms that low glycemic control, inflammatory process in articulations or the presence of cardiovascular problems may be related to a condition of periodontal disease. Bone loss, deep pockets and loose teeth are characteristic of individuals with diabetes and rheumatoid arthritis that were reported and that when there is a presence of periodontal disease the risk of pathological cardiovascular manifestations considerably increases. From data found in the literature, there is an interrelationship between the periodontal disease and systemic diseases evaluated. The interaction between the two conditions reinforce the importance of a good communication between the patient's doctor and the dental surgeon, Always considering the possibility that both diseases may be occurring simultaneously, in order to ensure and early diagnosis of both. This new focus given to Periodontics suggests to health workers that the most important thing to prevent periodontal disease is the removal of dental biofilm, through mechanical therapy of scaling and root planing in order to avoid systemic problems that may compromise the health of the individual.

Keywords: Periodontitis; Diabetes Mellitus; Rheumatoid Arthritis; Cardiovascular Disease

Introduction

Increasingly technological advances and medical and dental research shows an old theory that “the oral cavity is our body’s front door.” There are several systemic conditions that seem to be definitely related to dental problems, especially problems of periodontal origin. According to the American Academy of Periodontology, periodontal origin of bacteria can enter the bloodstream, reaching major organs and begin new infections.

Evidence suggests that this process may contribute to the development of coronary heart disease; the onset and maintenance of diabetes above, respiratory diseases and osteoporosis. The periodontics has expanded its horizons, analyzing the human being as a whole, absorbing the concepts of medical periodontics, evaluating the responses of the host, its systemic conditions and risk factors. Periodontal disease due to its chronic and cyclical nature promotes a nearly constant inflammatory response may be responsible for part of the risk attributed to cardiovascular disease, diabetes (Sun et al., 2014) [1] and other systemic conditions such as rheumatoid arthritis (Geenwald, Kirkwood, 1999) [2]. The concept of focal infection (local infection can spread to other parts of the body) has been associated with periodontal conditions. By having its onset and perpetuation by bacteria periodontal disease can lead to constant bacteremia frames.

Periodontal disease can affect systemic diseases in three ways: as risk factors (factors that put individuals at risk for both conditions such as stress, gender, age), presence of biofilm (the constant presence without proper removal can perpetuate reservoirs of bacteria that has free access to the
blood stream) and the periodontal cytokine reservoir (due to the constant inflammation a high concentration of this inflammatory protein pro is constant, may cause cholesterol deposits). The evaluation of systemic conditions during history taking is essential for correct determination of diagnosis and periodicities of maintenance visits. The oral condition appears to be related to systemic conditions such as rheumatoid arthritis, diabetes mellitus and cardiovascular disease and the determination of this relationship is important for oral health condition is permanent in this population (de Oliveira, Watt, Hamer, 2010; Detert et al. 2010; Soskolne, Klinger, 2001)[3-5].

**Literature Review**

**Diabetes mellitus**

The associations observed between the state of oral health and chronic systemic pathologies, the biggest connection is between Periodontal Disease and Diabetes Mellitus. Diabetes affects about 177 million people worldwide and the World Health Organization (WHO) predicts that this number could double by 2030 due to population aging, incorrect eating habits, obesity and physical inactivity. Oral complications of this disease are many and include dry mouth, increased risk of dental caries and the presence of periodontal problems (75% of diabetic patients). Sun et al. [1], conducted a meta-analysis to understand whether periodontal treatment can improve glycemic control in type 2 diabetic patients were conducted electronic searches of MEDLINE, EMBASE and the Cochrane central register of clinical trials from 1980 to July 2012. Studies have shown the therapy periodontal glycemic control in diabetic patients with a minimum of three months of follow-up were included. Meta-analysis was performed with eight studies involving 515 participants. The results showed that the periodontal treatment can lead to a significant decrease in the level of HbA1c, and leads to a non-significant reduction in fasting plasma glucose (FPG) levels from baseline to three months. The standardized mean difference between intervention and control group was 0.69 mg / dl (95% confidence interval -0.27 mg / dl to 1.66 mg / dl, P = 0.158). This analysis indicated that periodontal treatment can improve glycemic control in type 2 diabetic patients with periodontal disease.

Bascones et al. [6] rated improvement in both the clinical and immunological parameters of periodontitis and glycemic control in patients with diabetes after long-term treatment of periodontal disease. Moreover, the scientific evidence confirms that poor glycemic control contributes to a worse periodontal condition. The interaction between the two conditions underlines the importance of the need for good communication between the general practitioner and dentist on diabetic patients, always considering the possibility that the two diseases may be occurring simultaneously in order to ensure early diagnosis of both.

Epidemiological studies have found a high degree of association between diabetes and periodontal disease. It has also been shown that this relationship is bidirectional, periodontitis exerting an effect on diabetes. Thus, the high prevalence of periodontal disease in DM indicates the need to assess glucose levels in patients with periodontal disease. Intervention studies have shown that treatment of periodontal disease improves glycemic control (Table 1).

Izuora et al. [7], found evidence that the treatment of the periodontal disease reduces inflammation, improves the control of DM and reduces complications of DM. The objective was to evaluate the factors associated with periodontal disease in patients with DM and determine the impact of the periodontal treatment in inflammation and bone remodeling biomarkers associated with DM complications. In adult patients 30 years or older in the United States, that diabetes mellitus is associated with systemic inflammation, a known risk factor for cardiovascular and bone disease. 200 patients were recruited with DM to complete a questionnaire by the researcher of 48 items to assess socio-economic status, the state of oral health, the adequacy of oral care. They concluded that the prevalence of periodontal disease in patients with DM is associated with poor glycemic control and major complications of diabetes.

**Rheumatoid arthritis**

Rheumatoid arthritis is a chronic inflammatory autoimmune disease that affects not only joints but also displays systemic manifestations, which include fatigue, malnutrition and manifestations related to other organs such as the heart. The pathophysiological mechanisms involved in the injuries that accompany RA are multifactorial, with the participation of inflammatory mediators, oxidative stress among others. It can be associated with heart disease. Indeed more than 50% of the excess mortality in RA is attributed to cardiovascular diseases. The elevation of inflammatory mediators levels is seen as one of the responsible for the increase in atherosclerosis and cardiovascular risk in patients with RA. Additionally, the inflammation may be associated with cardiac remodeling, regardless of the vascular effects of atherosclerosis (Table 2).

Salemi et al. [8], rheumatoid arthritis (RA) is an immune-mediated polyarthritis; no pathogen was identified for the disease. A patient with RA, periodontal infection caused by whose appearance was observed after the treatment of periodontitis, in the absence of therapy (AR) specifies, here reported for the first time. Patient with 61 years showed aggregate migrant arthritis against citrullinated protein antigens positive. X-ray of the maxillary second molar had chronic apical periodontitis. After the treatment, remission was observed in the absence of therapy (AR) specifies. Periodontitis may have a role in the pathogenesis explained by the enzymatic action of Porphyromonas gingivalis. Treatment
<table>
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<tr>
<th>Authors</th>
<th>Patients</th>
<th>Study/ Treatment/ Methods</th>
<th>Results</th>
<th>Conclusion</th>
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<td>Sun et al. [1]</td>
<td>Meta-analysis with eight studies involving 515 participants.</td>
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<td>The treatment of periodontal disease can improve glycemic control in patients with periodontal disease and DM</td>
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<td>Izuora et al. [7]</td>
<td>200 patients with DM above 30 years old.</td>
<td>A questionnaire of 48 items to assess socio-economic status, the state and adequacy of oral health.</td>
<td>The periodontal treatment reduces inflammation, improves the control and reduces complications of DM.</td>
<td>The prevalence of periodontal disease in patients with DM is associated with poor glycemic control and major complications of DM.</td>
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DM: Diabetes Mellitus type 2

**Table 1.** Recent studies relating dental plaque accumulation and Diabetes Mellitus.
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<td>Salemi et al. [8]</td>
<td>Patient with 61 years old with aggregate migrant arthritis</td>
<td>Periodontal treatment consisted of full-mouth scaling and root planing with accurate oral hygiene instructions.</td>
<td>After its treatment, arthritis remission has been observed in the absence of specific RA therapy</td>
<td>Periodontitis may have a role in the pathogenesis explained by the action of <em>P. g.</em></td>
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<td>Coburn et al. [9]</td>
<td>Six self-report periodontitis questions were evaluated in patients with RA and OA</td>
<td>Questions were validated against a reference standard of severe and moderate-to-severe periodontitis based on full-mouth examination</td>
<td>Self-report performed similarly in RA and OA, with individual question specificity for periodontitis ≥ 68% and sensitivity from 9.8% to 45%.</td>
<td>Patient self-report, when combined with other risk factors, performs well in identifying periodontitis among patients with RA and OA.</td>
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<td>Pons Fuster et al. [10]</td>
<td>44 patients with RA and 41 control subjects (above 18 years old)</td>
<td>Each patient underwent a full periodontal examination.</td>
<td>BOP was significantly greater in the RA group than the control. PI was significantly higher in the RA group versus the control group. RA patients showed a 0.13 increased risk of periodontal disease.</td>
<td>RA patients had an increased risk of periodontal disease and should be instructed to intensify their oral hygiene.</td>
</tr>
<tr>
<td>Payne et al. [11]</td>
<td>Literature review.</td>
<td>Evaluation of case-control studies examining the relationship between rheumatoid arthritis (RA) and periodontitis.</td>
<td>Current evidence suggests that an association exists between periodontitis and RA.</td>
<td>More studies and samples are needed to determine the relationship between these two diseases and if periodontal treatment can reduce the severity of RA.</td>
</tr>
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Pg.: *Porphyromonas gingivalis*; RA: rheumatoid arthritis; OA: osteoarthritis; BOP: Bleeding on probing; PI: Plaque index

Table 2. Recent studies relating dental plaque accumulation and Rheumatoid Arthritis.
of periodontitis should be considered in AR prophylaxis and management.

Coburn et al. [9], evaluated the performance of self-reported related to periodontitis the benchmark set in patients with rheumatoid arthritis (RA) and osteoarthritis (OA) after evaluation of factors associated with periodontitis. Six self report were assessed in patients with RA and OA against a reference standard for severe periodontitis, moderate and severe. Multivariate regression was used to evaluate the performance of self report alone, age, sex, education, smoking and a combination of the above. bone loss, deep pockets and loose teeth, AR disease characteristics were explored. The self like that in (AR) and (OA) was observed radiographically greater alveolar bone loss among patients who reported bone loss, deep pockets and loose teeth. Patients with RA, “loose teeth” has been associated with positive rheumatoid factor and increased disease activity. combined patients with other risk factors have a good performance periodontitis identification with the (AR) and (OA). Related bone loss have great validity in these subgroups of patients.

Pons-Fuster et al. [10], assessed the presence of periodontal disease in patients with rheumatoid arthritis (RA), compared with a control group. The study included 44 patients diagnosed with RA according to the American Rheumatism Association (ARA) attending the Hospital Morales Meseguer Rheumatology Service (Murcia, Spain), and 41 control subjects. Patients under the age of 18 and suffering from diseases that can affect the immune system were excluded. Age, sex, smoking, alcohol consumption and body mass index were recorded. Each patient underwent a complete periodontal examination. Bleeding on probing and plaque index was significantly higher in RA patients than the control. Patients with RA showed an increased risk of 0.13 periodontal disease. RA patients had an increased risk of periodontal disease and therefore these patients should be instructed to intensify their oral hygiene regimes.

Payne et al. [11] critically assessed case-control studies that examined the relationship between rheumatoid arthritis (RA) and periodontitis, two chronic inflammatory diseases common to the pathogenesis. It was analyzed how AR can exacerbate or initiate periodontal disease. Testing well-designed clinical multicenter longitudinal studies and samples are needed to determine the temporal relationship between these two diseases and periodontal treatment can reduce the severity of RA or prevent its onset.

**Cardiovascular diseases**

Periodontal disease is an inflammatory process of infectious origin, which causes destruction in periodontal protection and support. Because it is caused by microorganisms, the disease is considered a focus of infection. From data in the literature, there is an interrelationship between periodontal disease and cardiovascular changes. This new focus given to Periodontology suggests to health professionals that the most important way to prevent periodontal disease is the removal of dental plaque by mechanical and / or chemical means, in order to avoid systemic problems that may compromise the health of the individual (Table 3).

Noguchi et al. [12] evaluated the association between chronic oral disease and coronary heart disease. Participants were male workers aged 36-59 years from a financial firm in Japan. The data were taken from the annual examinations to workers. The questionnaire assessed the oral situation of the participants, and was classified into three types: periodontal score (I), periodontitis (II), and tooth loss (III). It was determined the incidence of myocardial infarction (MI) in annual health records exams. Of the 4,037 candidates in the 2004 base year, 3081 workers were chosen for analysis, and 17 had MI within 5 years. Periodontal score was associated with increased MI, II and III Similar to 95%. Periodontal disease can be a mild risk factor, more independent for MI among Japanese male workers.

Li et al. [13] evaluated the effects of periodontal therapy in the presence of cardiovascular disease (CVD) in patients with chronic periodontitis. Electronic data surveyed were Trials of the Cochrane Oral Health Group Register, Cochrane Central Register of Controlled Trials, Medline via Ovid, Embase via Ovid, CINAHL via Ebsco, OpenGrey, The National Institutes of Health Trials Register were searched, the World Health Organization (WHO) Registration Clinical Trials Platform. Randomized Clinical Trials (RCTs) were considered elective. We selected studies in patients with chronic periodontitis and cardiovascular disease in a study of secondary prevention, or not DVC in a study of primary prevention, intervention group with periodontitis received active therapy and not a periodontal treatment in the control group. They were involved 303 participants with ≥ 50% with coronary artery blockage or a coronary event three years, but the previous three months were not included. The study was at high risk due to lack of monitoring data. It was compared in studies scaling and root planning (SRP) for a period of 6 to 25 months. There were no reports of deaths from all causes or related to CVD. Evidence of very low quality were insufficient to support periodontal therapy and recurrence of CVD in patients with chronic periodontitis. There was found no evidence for primary prevention.

Bokhari et al. [14] evaluated the possible association between periodontitis and systemic biomarkers in patients with coronary heart disease periodontitis. Patients were examined with periodontitis aged 30 years. Linear regression showed stronger associations between periodontitis and systemic parameters: the strongest was found between the BOP and C reactive protein (CRP) levels. BOP was the only meaningful
Periodontitis and coronary heart disease, BOP is greatly associated with systemic CRP levels; this association has an important local inflammatory load capacity for systemic inflammation.

Discussion

Periodontitis is inflammation and infection of the ligament and alveolar bone, may have significant effects on the general health and vice versa, i.e., a number of systemic diseases and conditions can be potential risk factors for periodontitis. There is a growing interest in recent years in the relationship between periodontal disease and systemic health that has marked and connected to periodontal and systemic disease as a two-way [15]. Periodontal disease is considered the sixth complication of diabetes and is well documented in the literature that individuals with diabetes mellitus are at high risk of suffering from periodontal disease. In fact, not only is the prevalence of periodontal disease that is increased in diabetic patients, also the progression and severity is faster and more aggressive. Diabetes mellitus is an extremely important disease of periodontal standpoint. It is a complex metabolic disorder characterized by chronic hyperglycemia.

Reduced insulin production or a combination of both glucose results in the inability to be transported from the bloodstream into the tissue, which in turn uses, resulting in high glucose levels.
Diabetes is related to inflammatory mediators and has a two-way action. Patients with this condition are more likely to have periodontal disease, and patients who have periodontal disease for a long time, is likely to have diabetes [1,6,7]. Periodontal disease and rheumatoid arthritis share several related pathological similarities, especially the changes in the profile and level of cytokines and their antagonists. Thus, this immunoinflammatory imbalance is responsible for much of the tissue damage observed in the progression of these diseases. It has been observed increased prevalence of periodontal disease in individuals with rheumatoid arthritis, as well as reducing the severity of rheumatoid arthritis in control of the promoted infection with periodontal treatment.

Rheumatoid arthritis is a chronic inflammatory disease that occurs not only in the joints, most also exhibit systemic manifestations. The mechanisms involved in the injuries that accompany rheumatoid arthritis are multifactorial, occurring with the participation of inflammatory mediators, excessive stress among others. In rheumatoid arthritis, periodontal pathogenic bacteria cause destruction of both the periodontal tissue as well as the joints, by direct or indirect means. In the direct pathway by direct action of the increasing number of bacteria involved in periodontal destruction process goes to the joint via the bloodstream and that tissue degeneration joints by processes not yet defined. The indirect form occurs when inflammatory mediators increased in number promote a more intense symptoms framework in patients with RA. Control of periodontal disease in these patients seems to work as an inflammation in the oral cavity appears to influence the course of rheumatoid these patients [8-11].

Periodontal disease has been the subject of several studies due to possible relationship with other pathologies. One of the most studied relationships between these pathologies is that which occurs between periodontal disease and cardiovascular. Numerous studies have tried to show the existence of this relationship and point to the role of periodontal disease as a putative risk factor for cardiovascular disease.

Coronary heart disease is a major cause of morbidity and mortality in developed countries. The significant association between the periodontal disease index and the presence of cardiovascular disease, especially atherosclerosis, coronary heart disease and stroke, has been reported in previous studies. Only a few studies have indicated that there is no association between these pathological conditions.

Cardiovascular disease includes a large number of bacteria in the mouth that can cause invasion of coronary tissues as well as the increase in inflammatory mediators that cause cardiovascular problems [12-14,16]. Periodontitis is an infectious disease and the results in the destruction of the periodontal ligament and alveolar bone. The effects of systemic conditions in periodontal tissues have been well documented however, less information exists on the impact of periodontitis on systemic health. Currently, there are studies that suggest periodontitis association with bacteremia, bacterial endocarditis, cardiovascular disease, cardiovascular accident, stroke, diabetes, respiratory diseases and premature births.

There is a growing body of evidence that periodontal disease is associated with negative consequences for systemic health for individuals with certain diseases and conditions. To the extent that this is true, it is reasonable to expect that the successful treatment of periodontal disease can prevent or mitigate at least some adverse effects associated with medical conditions such as type 2 diabetes, rheumatoid arthritis, cerebrovascular disease, and adverse pregnancy outcomes. Direct formation of such bonds usually have difficulties arising from the long time of chronic disease course, complex and multifactorial nature of the medical results, end the ethical issues surrounding the controlled clinical trials. However, the preventive value of an intervention as simple and low risk to dental care in the treatment of patients with serious medical conditions justifies the efforts to determine whether and to what extent there is a causal link [17-20].

Conclusion

By means of this review, we can conclude that chronic periodontal disease may influence the course and symptoms of systemic disease diabetes mellitus, rheumatoid arthritis and cardiovascular disease.

References


