

Periodontal diseases and cardiovascular diseases - the established link

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ABSTRACT:

Oral disease particularly periodontal disease may place certain patients at increased risk of developing cardiovascular disease and stroke. An association exists between periodontal disease and Cardiovascular disease. It is unknown whether this relationship is causal or coincidental. Most studies demonstrated positive associations between periodontal disease and cardiovascular disease. More recent studies have enhanced the specificity of infectious exposure definitions by measuring systemic antibodies to selected periodontal pathogens or by directly measuring and quantifying oral Microbiota from subgingival dental plaque. Results from these studies have shown positive associations between periodontal disease and cardiovascular disease.

Key words: Atherosclerosis, Cardiovascular disease, bacteria, periodontal

INTRODUCTION

Cardiovascular diseases make up the most prevalent category of systemic disease in many developing countries, and increase in prevalence with age. Atherosclerosis is a progressive disease process that involves the large- to medium-sized muscular and large elastic arteries. It can lead to ischemic lesions of the brain, heart or extremities, and can result in thrombosis and infarction of affected vessels, leading to death.¹ The impact of atherosclerosis on overall health is staggering. World Health Organization statistics indicate that in 1995, cardiovascular diseases were responsible for 20 percent of deaths worldwide (14 million people).² In some developing countries, cardiovascular disease accounts for about 50 percent of deaths.³ For years, dentists have noticed that certain characteristics are common to patients with periodontitis and patients with cardiovascular disease. Both cardiovascular disease and periodontal disease are more likely to occur in people

who are older, in men, in people of lower educational status with fewer financial resources, in those who smoke, in people who have stress and in those who are socially isolated. The classical risk factors for cardiovascular diseases are hypertension, hypercholesterolemia and cigarette smoking—account for only about one-half to two-thirds of all cases of the disease. Research has shown that atherosclerosis is more common in patients with periodontitis.² This suggests that periodontal disease and cardiovascular disease may have similar causative pathways.

POTENTIAL BIOLOGICAL MECHANISMS

Most of the studies have shown that there is an association between periodontal disease and cardiovascular disease. These associations have been demonstrated across diverse populations and appear to be independent of traditional risk factors.

Two biological mechanisms that may explain the relationship between cardiovascular disease and periodontal disease are

- 1) Bacteria from periodontal disease may enter the circulation and contribute directly to the atheromatous or thrombotic processes.
- 2) Systemic factors alter the immunoinflammatory process involved in both periodontal and cardiovascular diseases.

ROLE OF INFECTIONS IN ATHEROSCLEROSIS:

Infectious agents may cause injury directly to the epithelium and partially activate the inflammatory response seen with atherosclerosis. There is evidence that infection with certain bacteria, such as *Chlamydia pneumoniae*, *Helicobacter pylori*, cytomegalovirus and other periodontopathic bacteria are associated with heart disease. Haraszthy and colleagues⁹ studied 50 carotid atheromas via polymerase chain reaction. Seventy-two percent of the surgical specimens indicated bacterial content and 44 percent of the atheromas contained at least one of the periodontal microorganisms studied (*Porphyromonas gingivalis*, *Prevotella intermedia*, *Bacteroides forsythus* and *Actinobacillus actinomycetemcomitans*). People with severe periodontitis have the strongest link to cardiovascular disease. These people also have the greatest amounts of pathogenic bacteria and systemic factors that may contribute to an altered immunoinflammatory response.

COMMON SYSTEMIC FACTORS INVOLVED IN PERIODONTAL AND CARDIOVASCULAR DISEASES

Considerable evidence has identified atherosclerosis as an inflammatory disease. This hypothesis, which is also known as the Ross “Response to- Injury Hypothesis,^{10, 11} explains how inflammation relates to atherosclerosis. Ross Hypothesis suggests that injury to the epithelium causes the initial lesion, leading to a chronic arterial inflammatory process³. During this inflammatory process, monocytes migrate through the endothelium into the underlying tissue, where there is a proliferation of smooth muscle cells. Hydrolytic enzymes, cytokines, chemokines and growth factors are released as a result of activation of the monocytes (macrophages) into the blood vessel, resulting in further damage and focal necrosis. A major feature of this process is lipid accumulation, and the atheromatous plaque can become covered with a fibrous cap over the focal necrotic area in the later stages of this process. This fibrous cap also may erode and rupture, leading to thrombus formation, arterial occlusion and infarction. Certain people may be genetically predisposed to experience a hyper inflammatory response

When stimulated by a bacterial challenge such as periodontal disease, these people may produce higher levels of proinflammatory cytokines, particularly interleukin-1, prostaglandins (in particular, prostaglandin E₂) and tumor necrosis factor (in particular, tumor necrosis factor- α). These biological mediators can have a direct effect on the periodontal pocket, as well as on the vascular endothelium and smooth muscle. In the periodontal pocket, these mediators cause vasodilatation and increased vascular permeability. This is followed by inflammatory cell recruitment, connective-tissue degradation and bone destruction. The result of recruitment of inflammatory cells into the major blood vessels is the proliferation of vascular smooth muscles, vascular fatty degeneration and intravascular coagulation. People who are genetically predisposed to this proinflammatory response may be at a higher risk of developing periodontal disease and cardiovascular disease. Prospective interventional studies are needed to determine the exact link between periodontal disease and cardiovascular disease, as well as to evaluate whether periodontal treatment may reduce the risk of developing cardiovascular disease.

In 1989, Mattila and colleagues¹² revived a century-old hypothesis relating chronic infections with vascular disease found higher combined levels of caries, periodontitis, periapical lesions and pericoronitis more frequently in patients with recent myocardial infarction than in healthy control patients. Syrjanen and colleagues¹³ observed relatively poor oral health among patients who had experienced a recent stroke compared with control patients who had not experienced stroke. Morrison and colleagues¹⁴ observed that participants with periodontal disease had more risk of developing fatal coronary heart disease and experiencing stroke even after controlling for smoking status by classifying current smokers according to the number of cigarettes smoked per day.

Desvarieux and colleagues¹⁵ reported similar findings between tooth loss and carotid atherosclerosis. Grau and colleagues¹⁶ provide important information concerning the specificity of the hypothesis to periodontal disease; they reported a 400 percent increase in stroke risk associated with periodontitis but found no relationship between caries and stroke. Wu and colleagues¹⁷ found strong positive associations between periodontal disease and stroke in the same NHANES population. Reports from the United States¹⁷ and Germany^{18,19} have provided evidence that the association between periodontal disease and CVD might be stronger among men than among women. The possibility that novel risk factors might partly explain some of the sex differential in CVD risk is intriguing.¹⁹

CONCLUSION:

Evidence continues to support an association among periodontal infections, atherosclerosis and vascular disease. Ongoing observational and focused pilot intervention studies may inform the design of large scale clinical intervention studies. Recommending periodontal treatment for the prevention of atherosclerotic Cardiovascular disease is not warranted based on scientific evidence. Periodontal treatment must be recommended on the basis of the value of its benefits for the oral health of patients, recognizing that patients are not healthy without good oral health. However, the emergence of periodontal infections as a potential risk factor for cardiovascular disease is leading to a convergence in oral and medical care that can only benefit the patients and public.

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