

Relationship of Dental and Oral Pathology to Systemic Illness

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THE CLASSIC DENTAL DISEASES, caries and periodontal disease, are commonly thought to have little effect on systemic health. These diseases result from infections by microbes with highly specific adhesion mechanisms in the mouth.¹ Systemic disease resulting from infectious oral microbes is generally recognized to occur in patients with immunological and nutritional deficiencies, such as when individual host defenses are compromised, allowing oral microbes to gain systemic access. Systemic complications from oral microbes are usually thought to be confined to only a few specific clinical scenarios, such as bacterial endocarditis.² Given this perspective, it is understandable that primary care physicians pay little attention to oral microbial infections and dental diseases.³

However, in view of the results of recent studies that examined the relationship of oral and dental infections to chronic cardiovascular disease and other systemic illnesses, such inattention can no longer be justified.^{1,3-5} Additionally, changing demographics in the United States suggest that an aging population will increasingly present medically significant oral problems. In this article, we review recent studies on dental disease prevalence, the systemic impact of dental infections, and age-associated oral medical problems.

Prevalence of Dental Diseases

Dental diseases are among the most common of human maladies, with widespread tooth loss due to caries and periodontal diseases. Over the last 50 years, there has been remarkable

progress in limiting the effects of dental disease, particularly in preventing caries in industrialized countries.⁶ There has also been substantial progress in the nonsurgical control of periodontal diseases, although not as dramatic as results seen for caries reduction.⁷ Theoretically, most people should expect to maintain a functional dentition throughout their lives. For instance, the US Department of Health and Human Services Healthy People 2010 initiative asserts that "oral health is an essential and integral component of health throughout life."⁸ Unfortunately, many persons in industrialized countries, and most in nonindustrialized countries, fail to realize this expectation. For example, while more than 50% of all US children aged 5 to 17 years in 1988-1991 had no caries in their permanent dentition, approximately 25% of children in this age group accounted for 80% of the caries measured.⁹ These latter children are disproportionately clustered among economically disadvantaged minorities.¹⁰

While the extent of this disparity appears to have diminished recently, socially and economically disadvantaged US children still experience higher caries rates than their nondisadvantaged peers.¹¹ Other industrialized countries, such as the United Kingdom,¹² have experienced similar trends. Thus, while the overall prevalence of dental caries may be decreasing, it remains a significant health problem for certain segments of the population.

Periodontal diseases, on the other hand, are still prevalent in industrialized societies. Among the noninstitutionalized US adult population, 50% display some sign of gingival disease, and nearly 35% have some form of periodontitis.^{13,14} As with caries, these diseases are more prevalent among

members of minority groups and economically disadvantaged persons. Severe periodontitis is much more prevalent in blacks and Mexican Americans than in whites, and in persons with less than a high school education.^{13,14} For both caries and periodontitis, socioeconomically disadvantaged groups can benefit from targeted primary care and prevention efforts.¹⁴

Dental Infection as a Risk Factor for Atherosclerotic Disease

Over the last decade, accumulating evidence has linked dental infection to an increased risk of atherosclerosis and thrombosis.^{4,15,16} The data implicate a variety of microorganisms and tissue sites. Although there is still no definitive proof of a causal relationship,¹⁶ epidemiological and clinical data suggest that chronic dental infection may be an independent risk factor for atherosclerotic disease after adjustment for other known risks such as age, sex, race, poverty, hypertension, smoking, and serum cholesterol.^{4,15-17} Additionally, recent placebo-controlled trials suggest there may be beneficial effects of antibiotic treatment in reducing the risk of recurrent ischemic events in patients with coronary heart disease.^{18,19}

In particular, we call attention to the ongoing research into the role of dental infection in chronic cardiovascular disease. Several prospective studies have demonstrated a significant association between dental infection and atherosclerosis or coronary heart disease.²⁰⁻²³

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For example, DeStefano et al²⁰ studied a national cohort of US adults, aged 25 to 74 years, from 1971-1974 and again from 1985-1987. In men younger than 50 years with periodontitis there was an almost 3-fold relative risk of death from coronary heart disease compared with such men who were free of periodontal disease at baseline.

Similarly, Beck et al^{5,23} studied a population of 1147 military veterans from the Boston area during an average follow-up time of 18 years. After adjusting for age and other cardiovascular risk factors, they found that those who had periodontal bone loss (a key sequela of periodontal infections) had a statistically significant odds ratio of 1.5 for total coronary heart disease, and 1.9 for fatal heart disease. Several case-control and cross-sectional studies with different populations, measures of dental disease, and clinical end points have found similar associations.²⁴⁻²⁶ However, a causal relationship has yet to be shown, and the underlying biological mechanism of such a relationship is not well understood. Nonetheless, these studies all support the preliminary hypothesis linking dental infections to an increased risk for cardiovascular disease, although the strength of the association may vary according to the population studied.²⁷

Additional Possible Risks From Dental Infections

Dental infections have been linked to other systemic disorders. For example, Grau et al²⁸ found that chronic dental infections, especially periodontal infections, were associated with an increased risk for cerebrovascular ischemia. They compared a series of patients with cerebrovascular ischemia to control patients matched by age and sex, and concluded that poor dental status led to a 2.6-fold increased risk of stroke. In a longitudinal study, Beck et al^{5,23} found that individuals with a large amount of periodontal bone loss at baseline had almost 3 times the odds of developing stroke as those with little or no initial periodontal bone loss. Loesche et al²⁹ reported

similar results in a cross-sectional study of elderly men.

Periodontal infections have also been linked to a significantly increased risk for delivery of preterm, low-birth-weight infants.^{30,31} For example, in a case-control study of 124 mothers, Offenbacher et al³⁰ found that mothers with periodontal disease had more than 7 times the odds of delivering preterm, low-birth-weight infants. These associations, while intriguing, have not been as intensively studied as those suggesting a relationship between dental infections and cardiovascular disease. Nonetheless, poor dental health appears to represent an independent clinical marker for adverse health outcomes.

Links Between Oral Disease and General Health

Other medical conditions appear related to dental health. For example, Sjögren syndrome,³² which affects at least 1 million US individuals, leads to a loss of salivary gland parenchyma. Consequently, these persons experience an absence of saliva and its protective properties. They have increased risk of dental disease (eg, caries) as well as mucosal infections (eg, candidiasis), and often experience dysphagia and significant oral discomfort. Patients who receive therapeutic radiation for treatment for head and neck cancers (about 30 000 US patients per year) experience similar problems as a result of radiation damage to their salivary glands.³³ Patients with other cancers who receive cytotoxic chemotherapy often experience considerable oral toxicity.³⁴ Conversely, significant preexisting dental disease may complicate patient management during delivery of both chemotherapy³⁵ and head and neck irradiation.³⁶

Several age-associated medically significant oral problems can be expected to increase during the coming decades. The most common of these is drug-induced salivary hypofunction.³⁷ Complaints of dry mouth have been associated with approximately 400 pharmaceutical agents that are currently used in the United States. Patients with drug-

induced diminished salivary secretions experience the same clinical consequences as patients with Sjögren syndrome (ie, oral infections, dysphagia, oral discomfort), although these are generally reversible with discontinuation of the drug. In some patients, these adverse effects also can reduce compliance with the medication.

Critically ill patients and institutionalized elderly persons frequently have inadequate oral hygiene.^{38,39} This can result in a large oral microbial burden, subsequent microbial aspiration, and resultant respiratory tract infections.⁴⁰ For example, Fourrier et al³⁸ studied 57 consecutive patients in a medical intensive care unit. Dental plaque levels increased with time in the intensive care unit and showed higher levels of aerobic pathogens, which were frequently concordant with cultures of tracheal aspirates. Furthermore, dental plaque colonization on days 1 and 5 was significantly associated with a higher risk of pneumonia and bacteremia.

Attention to Dental and Oral Diseases and Resulting Medical Outcomes

It is a historical accident that oral and dental diseases are traditionally excluded from the medical curriculum, and we believe that it is unfortunate that medical students are still taught little about these diseases. Oral medical problems seem to fall between the usual professional responsibilities,⁴¹ resulting, we believe, in less than ideal patient care. We suggest that increased physician and patient awareness and attention to the medical relevance of dental infections and oral diseases will enhance patient outcomes, particularly for socioeconomically disadvantaged and frail elderly persons. The essential contribution of dental and oral diseases to health maintenance is still not widely appreciated, and we believe that many patients would benefit from its consideration by their primary care physicians. We also hope that future studies will continue to reintegrate and explore the role of oral diseases in human health.

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