



Periodontitis Disease

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Abstract: Studies have revealed possible link between periodontitis and different systemic diseases. There is need to review this interesting subject. The aims are: to provide a comprehensive literature that can easily be consulted, on the subject; to draw the attention of health practitioners to the impact of oral health on the general well-being; and to emphasize the need for a deeper interaction between medical and dental training. The Medline database was searched for relevant literature by combining each of the following terms, “oral health,” “oral infection,” “periodontitis,” with “systemic diseases.” Manual library search and review of bibliographies of published literature were also conducted. Periodontitis is a constant potential source of infection and has been considered as a separate risk factor for some cardiovascular, respiratory, endocrine, musculoskeletal, and reproductive system related abnormalities. Oral health impacts on the general well-being, and if comprehensive health care is ever to be achieved, oral health should not be seen as a separate, distant, and less important area of health, which is totally unrelated to lifespan and its quality.

Key words: Oral health, periodontitis, systemic diseases.

INTRODUCTION

Not too long ago, literature evidence began to suggest a possible link between chronic inflammatory periodontitis and a number of systemic diseases.[1–4] A chronic oral infection such as periodontitis is a constant potential source of infection and has been considered as a separate risk factor for cardiovascular diseases, cerebrovascular diseases, peripheral arterial disease, respiratory diseases, and low birth weight.[5] In addition, periodontitis has been described as a potential risk for increased morbidity and mortality for diabetes, insulin resistance, rheumatoid arthritis, obesity, osteoporosis, and complications of pregnancy.[2,3] In fact, a case of pyogenic liver abscess caused by periodontal bacteria had been reported.[5]

Some of these conditions may in turn increase the incidence and severity of periodontal disease by modifying the body's immune response to periodontal bacteria and their by-products.[6] Evidence suggests a bi-directional relationship between periodontitis and systemic diseases.[6] The possible

mechanisms or pathways linking oral infections to secondary systemic effect are: metastatic spread of infection from the oral cavity as a result of transient bacteremia, metastatic injury from the effects of circulating oral microbial toxins, and metastatic inflammation caused by immunological injury induced by oral micro-organisms.[4,6,7]

There is tendency for medical and dental specialists to see patient management from regional rather than systemic point of view. In the light of the ever increasing available facts on the role of oral infections like periodontitis on multifarious systemic disorders, it has become necessary to undertake a literature review on the subject. The aims are: to provide a comprehensive literature that can easily be consulted, on the subject; draw the attention of health practitioners to the impact of oral health care on the general well-being; and to emphasize the need for a deeper interaction between medical and dental trainings.

CHRONIC PERIODONTITIS

Chronic periodontitis, also known as adult periodontitis, is an infectious inflammatory disease caused by the bacteria of the dental plaque, resulting in the progressive destruction of the tissues that support the teeth, i.e. the gingival, the periodontal ligament, cementum, and the alveolar bone.[8,9] Periodontal disease is characterized by periods of exacerbation interspersed with periods of remission and presents a local microbial burden that initiates local inflammation and local tissue destruction.[10]

Etiopathology

Periodontitis is an infective condition attributable to certain pathogens, namely, *Aggregatibacter actinomycetemcomitans*, *Porphyromonas gingivalis*, *Bacteroides forsythus*, *Prevotella intermedia*, *Campylobacter rectus*, *Treponema denticola*, *Fusobacterium nucleatum* and so on. Crevicular fluid often contains inflammatory mediators and the oral pathogens associated with periodontitis. The mechanism underlying this destructive process involves both direct tissue damage resulting from plaque bacterial products and indirect damage through bacterial induction of the host inflammatory and immune responses.[10]

Risk factors

Stress, aging, alcohol consumption, depression, environmental exposure (e.g., cigarette smoking), and a number of systemic conditions such as diabetes mellitus.[8,9]

Signs and symptoms

Plaque accumulation, calculus formation, gingival redness and swelling, gingival bleeding and suppuration which may occur either spontaneously or when subjected to probing, halitosis (bad breath), and loss of alveolar bone. Others include: deepening of the gingival crevice resulting in the formation of a pathological periodontal pocket, root exposure due to gingival recession, and increased tooth mobility. Severe forms of the disease may lead to tooth migration, compromised esthetics, impaired masticatory function, and tooth loss ultimately.[8,9]

Epidemiology

Periodontitis is an infection of global prevalence and affects individuals of all ages, but the disease is more common in elderly individuals. The increased prevalence, extent, and severity in older age groups reflect the cumulative effect of a prolonged exposure to the established risk factors.[8,9]

Associated systemic diseases

Chronic periodontitis is associated with the incidence of coronary heart disease (CHD) among younger men, independent of established cardiovascular risk factors.[11] Cumulative evidence supports a causal association between periodontal infection and atherosclerotic cardiovascular disease or its

sequelae.[12] The possible link may involve direct and indirect effects of the periodontal infection; an alternative pathway may be related to genetic and other host factors that increase the susceptibility to both atherosclerosis/thrombosis and chronic periodontitis.[13–16] Studies have shown that periodontitis results in higher systemic levels of C-reactive protein, interleukin (IL)-6, and neutrophils.[7] These elevated inflammatory factors may increase inflammatory activity in atherosclerotic lesions, potentially increasing the risk for cardiac or cerebrovascular events.[17,18] These systemic markers of inflammation are also said to serve as predictors of present and future cardiovascular events and disease.[19] In addition, oral bacteria have been found in carotid atheromas and it is reported that some oral bacteria may be associated with platelet aggregation, an event important for thrombosis.[17,18] Evidence that suggests an association between chronic oral infections and myocardial infarction had also been presented.[20]

Following a previous systematic review of the association between respiratory diseases and oral health, it was concluded that there is a fair evidence of an association of pneumonia with oral health and that a good evidence exists that improved oral hygiene and frequent professional oral health care reduce the progression or occurrence of respiratory diseases among the high-risk elderly living in nursing homes, especially those in intensive care units.[21] Scannapieco et al.[22,23] showed that lung function decreased with increasing periodontal attachment loss. Therefore, they concluded that a potential association between periodontitis and chronic pulmonary diseases like chronic obstructive pulmonary disease (COPD) may exist.[22,23] In one of the studies by Scannapieco et al.,[22] they found a nearly fivefold increase in chronic respiratory diseases in subjects that had poor oral hygiene when compared to those with good oral hygiene. Poor oral hygiene and periodontitis influence the incidence of pulmonary infections, especially nosocomial pneumonia episodes in high-risk subjects.[23] The oral cavity has long been considered a potential reservoir for respiratory pathogens.[24] The mechanism of infection could be aspiration of oral bacteria capable of causing pneumonia into the lungs, colonization of dental plaque by respiratory pathogens, followed by aspiration.[24] Other mechanisms include: alteration of the mucus surface by salivary enzymes in periodontitis, leading to an increase in adhesion and colonization of respiratory pathogens; destruction of salivary pellicles on pathogenic bacteria by periodontal disease-associated enzymes; and alteration of respiratory epithelium by cytokines from periodontal disease, facilitating the infection of the epithelium by respiratory pathogens.[25]

People with moderate to severe periodontitis have been found to have a higher risk of suffering from rheumatoid arthritis.[26] It has been suggested that periodontal disease could be a causal factor in the initiation and maintenance of the autoimmune inflammatory response that occurs in rheumatoid arthritis.[27] de Pablo *et al.*[27] stated that if this assertion is proven, chronic periodontitis might represent an important modifiable risk factor for rheumatic disease. It is thought that a remarkable similarity in the pathogenesis of periodontal diseases and rheumatoid arthritis exists.[28] A poorly modulated inflammatory response is believed to drive both diseases, resulting in oxidative stress induced tissue injury.[28] In addition, there has been an increasing interest in the interrelationship between systemic osteoporosis, oral bone loss, tooth loss, and risk factors for these conditions,[29] and a positive correlation between systemic bone mass and oral bone loss had been shown.[30]

Studies have shown that there is a significant association between preterm birth and/or low birth weight and periodontitis, irrespective of parity, race, and maternal age.[31–35] It has also been stated that periodontitis appears to be an independent risk factor for poor pregnancy outcome[36] and preliminary evidence suggests that periodontal intervention may reduce this adverse pregnancy outcome.[37] This is said to occur because bacterial infection results in the activation of cell-mediated immunity and the subsequent production of cytokines such as interleukins (IL-1, IL-6) tumor necrosis factor (TNF- α), and prostaglandins (PGE₂), which have been implicated in the mechanism of

labor.[10,38,39] The recently proposed mechanism of labor suggests that the intra-amniotic levels of these mediators rise steadily throughout pregnancy until a threshold is reached at which labor is induced.[10,38,39] Thus, it raises the possibility that the presence of infection results in an abnormally elevated production of the normal physiological mediators of parturition, which may trigger births, also resulting in low birth weight.[10,38,39] It is also hypothesized that sub-clinical infections such as periodontal disease contributed to premature delivery and low birth weight as a result of pathogenic microorganisms, or indeed their microbial products such as lipopolysaccharide (LPS), reaching the uterus via the blood stream, inducing cytokine release in the deciduas or in the membranes, resulting in increased prostaglandin, or indeed uterine muscle contraction.[10,38,39] Recently, it was discovered that pregnant women with periodontal disease are more likely to develop gestational diabetes mellitus than are pregnant women with healthy gum.[40]

While it has been established that people with diabetes are more prone to developing periodontal disease, new research is suggesting that periodontal disease may, in turn, be a risk factor for diabetes.[40,41] Periodontal disease can cause bacteria to enter the bloodstream and activate immune cells. These activated cells produce inflammatory biological signals (cytokines) that have a destructive effect throughout the entire body.[2,7,42] In the pancreas, the cells responsible for insulin production can be damaged or destroyed by the chronic high levels of cytokines. Once this happens, it may induce Type 2 diabetes, even in otherwise healthy individuals with no other risk factors for diabetes.[42–44] Because periodontal disease contributes to the progression of impaired glucose tolerance to diabetes mellitus and to hyperglycemia in individuals with established diabetes, proactive, preventive dental and diabetes self-care, as well as regular dental and diabetes assessment had been suggested as important management strategies.[45]

Earlier literature review showed that chronic periodontitis is an independent clinical high-risk profile for head and neck squamous cell carcinoma (HNSCC), especially in the oral cavity, followed by the oropharynx and larynx.[46,47] In a prospective cohort study by Michaud *et al.*,[48] a significant association was found between the history of periodontitis and risk of developing lung, kidney, pancreas, and hematological cancers. These associations are said to persist in a number of studies, after adjustment for major risk factors, including cigarette smoking and socioeconomic status.[49] However, the most consistent increased risk was noted in the studies of oral and esophageal cancers and periodontal disease. Gastric and pancreatic cancers had an association in most, but not all studies. Lung, hematological, and other cancers were less consistently associated or did not have sufficient studies to determine a predictable pattern.[50] Furthermore, Tezal *et al.*[51] reported that patients with periodontal disease were more likely to have poorly differentiated oral cavity squamous cell carcinoma (SCC) than those without periodontitis. These findings were said to have implications for practical and safe strategies for prevention, diagnosis, and treatment of HNSCC (please, check the second line above. The error in the abbreviation above was spotted and corrected). The possible link between periodontitis and malignancy is not clear, but lifetime cumulative infection exposure is being queried.[52]

Other oral health conditions impacting on systemic health

The oral cavity has a multitude of functions in relation to daily life such as: food intake, speech, social contact, and appearance. Poor oral health has thus the potential of affecting the quality of life.[53] Apart from chronic periodontitis discussed above, there are a number of other oral health conditions that impact on systemic health. For example, the number of teeth is a significant and independent risk indicator for early mortality and poorer general health status.[54,55] Masticatory disability has likewise been related to early mortality.[56] Oral health and nutrition have a synergistic relation.[57] Oral infectious diseases and acute, chronic, and terminal systemic diseases with oral manifestations affect the functional ability to eat as well as diet and nutrition status.[57]

The link between childhood oral diseases and obesity has been demonstrated by their increasing prevalence, potential cause and effect relationship, and the significant deleterious effect on the child's present and future oral and systemic health.[58] In addition, decayed teeth are particularly harmful to children's growth and development, and can severely jeopardize their health.[59] The severe impact of dental caries and its sequelae on the general well-being of both pediatric and adult patients in terms of pain and suffering, impairment of function, and effect on quality of life cannot be overemphasized.[60] Recently, asthma and epilepsy are being associated with higher caries experience.[61]

Historically, diseases of the oral cavity have been viewed separately from those of the rest of the body. In recent years, however, efforts have been made to recognize oral health as an integral part of overall health.[53,60] Promotion of oral health has, therefore, been suggested as a way to promote systemic health, since there is a possible role of oral infections as a risk factor for systemic disease.[61] It is imperative for medical and dental practitioners to take note of these recent findings. The best time to pass this knowledge across in our view is during the training of these professionals.

CONCLUSION

Oral health has a direct and or indirect impact on the overall general health. Medical specialists must recognize the emerging and increasing significance of this fact in comprehensive health care. Dentists must improve their knowledge and clinical exposure of relevant systemic conditions in order to interact and relate meaningfully with their medical colleagues. Regular dental checkup is strongly advocated in the light of current knowledge.

The argument by Yu-Kang and Giltorpe[52] that the reported link between periodontitis and systemic health outcomes is due to inadequate adjustment of smoking, a well-established risk factor for both periodontitis and systemic health, needs to be explored further.

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