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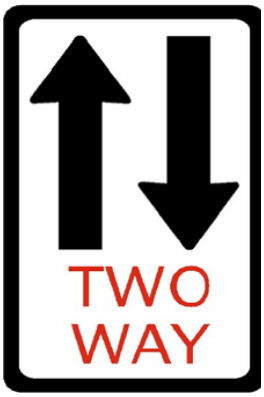
DIABETES AND PERIODONTAL DISEASE

A Two-Way Street



If you have diabetes, you know that it's important to regulate your blood sugar levels for the wellbeing of your body from head to toe. Diabetes affects more than 21 million individuals in the United States. Approximately 6 million of these individual have the disease but are undiagnosed. More than 171 million individuals worldwide have diabetes and it has reached epidemic status. But, you may not know that what happens to you from head to toe can affect your diabetes. Diabetes is also recognized as an important risk factor for more severe and progressive periodontitis, infection or lesions resulting in the destruction of tissues and supporting bone that form the attachment around the tooth.

Most people think of gum disease, or periodontal disease, as in infection localized to the oral cavity with tissue destruction confined to the mouth. However, mounting research over the last 20 years provides evidence that the pathways of inflammation link oral infections, such as periodontal disease, to whole body damage. The strongest evidence of a link relates to diabetes and periodontal disease. Periodontal disease has been reported as the sixth complication of diabetes, along with neuropathy, nephropathy, retinopathy, and micro- and macrovascular diseases. Many studies have been published describing the bidirectional interrelationship exhibited by diabetes and periodontal disease. Studies have provided evidence that control of periodontal infection has an impact on improvement of glycemic control evidenced by a decrease in demand for insulin and decreased hemoglobin levels. Periodontal disease often goes unrecognized by physicians who treat diabetic patients. People with diabetes are much more susceptible to periodontal disease and once periodontal disease is established in a diabetic patient, metabolic control (glycemic control or blood sugar levels) of diabetes is complicated from the constant reservoir of gram-negative anaerobic bacteria that sit at the bottom of the gum pockets producing infection and low grade inflammation throughout the body. That is why the relationship between diabetes and periodontal disease is sometimes referred to as a two-way street, and the reason why diagnosis and treatment of periodontal disease, just like optimal glycemic control, are essential in the medical management of diabetes.

Diabetes and periodontal disease are common chronic diseases observed in the U.S. population. These diseases are thought to be associated biologically, and a number of reviews and studies have proposed mechanisms to explain the relationship, including *1)*

microvascular disease, *2)* changes in components of gingival crevicular fluid, *3)* changes in collagen metabolism, *4)* an altered host response, *5)* altered subgingival flora, *6)* genetic predisposition, and *7)* nonenzymatic glycation.

Accumulation of advanced glycation end products (AGEs) as a result of the chronic hyperglycemic state or diabetes, coupled with the presence of infection and an exaggerated host response, may provide a viable explanation for the clinical outcomes observed in diabetic patients with periodontal disease.

Bacterial products such as endotoxin or lipopolysaccharide (LPS) also play a role in propagating an inflammatory response in the host through the Toll-like protein receptors (TLRs) and thus can induce an inflammatory cascade. These receptors play an important role in the innate immune response. Gram-negative periodontal infections particularly seem to result in increased insulin resistance. Periodontal patients with infecting microorganisms, such as *P. gingivalis, Tannerella fosythenis, and prevotella intermedia*, have significantly higher serum marker of inflammation such as C-reactive protein (CRP), IL-6, and fibrinogen than subjects without periodontitis. Although nutrophil function is often diminished in the diabetic, the phagocytic cells of the monocyte lineage exhibited upregulation hyperresponsiveness with significantly higher production of pro-inflammatory cytokines and mediators.

In addition, in vitro studies of monocytes from people with diabetes have shown a hyperresponsive phenotype with over expression of pro-inflammatory mediators such as interleukin 1- beta, tumor necrosis factor-alpha, and prostaglandin. In similar in vivo studies, patients with periodontitis and diabetes were found to have significantly higher levels of local inflammatory mediators compared to systemically healthy individuals with systemically healthy individuals with periodontal disease.

PERIODONTITIS AND CARDIOVASCULAR OUTCOMES IN PATIENTS WITH DIABETES

There is evidence that dental infection is associated with coronary atherosclerosis and that bacterial DNA has been identified in atherosclerotic plaques, and other studies have related dental infection to the incidence of coronary events

The Dental Atherosclerosis Risks in Communities Study is one of the studies providing evidence of a relationship between periodontal infection and presence of subclinical atherosclerosis. Also, data available from the Insulin Resistance Atherosclerosis Study has shown that chronic hyperglycemia was positively associated with increased intimal-medial wall thickness (IMT). This study demonstrated an independent association between fasting glucose and individuals with established diabetes and IMT.

ORAL COMPLICATIONS OF DIABETES

- Xerostomia
- Infection
- Dental caries
- Candidiasis
- Lichen Planus
- Burning mouth syndrome
- Poor wound healing

Xerostomia and Dental Caries

Etiology of xerostomia is associated with a non-inflammatory, non-neoplastic enlargement of the parotid gland believed to occur in 25% of patients with moderate to severe diabetes and especially in patients with type 1 diabetes and poor metabolic

control.

Diabetes can lead to marked dysfunction of the secretory capacity of the salivary glands. This process is often associated with salivary gland dysfunction.

Individuals with xerostomia often complain of problems with eating, speaking, swallowing, and wearing dentures. Dry, crumbly foods, such as cereals and crackers, may be particularly difficult to chew and swallow. Denture wearers may have problems with denture retention, denture sores, and the tongue sticking to the palate. Patients with xerostomia often complain of taste disorders (dysgeusia), a painful tongue (glossodynia), and an increased need to drink water, especially at night.

In patients with xerostomia, development of dental caries can be rampant and severe and, if left untreated, can result in infection of the dental pulp and tooth abscess. .

Dental caries may be found at the cervical margin or neck of the teeth (the area where the tooth meets the gum) or the incisal margins (the edges or biting surfaces of teeth). Dry mouth is often exacerbated by activities such as hyperventilation, breathing through the mouth, smoking, or drinking alcohol.

Candidiasis

Oral candida is an infection of the yeast fungus *C. albicans.* Candida is present in the oral cavity of almost half of the population and has been shown be prevalent in people with diabetes as well. Studies have shown a higher prevalence candida in diabetic versus nondiabetic individuals.

The manifestation of candida can occur in many different forms and include median rhomboid glossitis, atrophic glossitis, denture stomatitis, and angular cheilitis.

Candida does not generally become a problem until there is a change in the chemistry of the oral cavity that favors candida over the other microorganisms present. Contributing factors to infection are salivary dysfunction, a compromised immune system, and salivary hyperglycemia.

Lichen Planus

Oral lichen planus is a chronic inflammatory disease that causes bilateral white striations, papules, or plaques on the buccal mucosa, tongue, and gingivae. Erythema, erosions, and blisters may or may not be present. The pathogenesis of the disorder is unknown.

The aim of treatment is to eliminate mucosal erythema, ulceration, pain, and sensitivity. This may involve topical or systemic steroid management. The use of steroids in individuals with diabetes may present additional complications, such as antagonism of insulin and subsequent hyperglycemia. Therefore, therapy by the dentist should be done in close consultation with the physician to avoid adverse reactions and drug interactions.

Burning Mouth Syndrome

A combination of factors appears to play a role in this process. Burning mouth syndrome is a chronic, oral pain condition associated with burning sensations of the tongue, lips, and mucosal regions of the mouth.

Generally, there are no detectable lesions associated with the syndrome, which is based solely on patient report of discomfort.

The pathophysiology is mainly idiopathic but can be associated with uncontrolled diabetes, hormone therapy, psychological disorder, neuropathy, xerostomia, and candidiasis.

Treatment is targeted at the symptoms and requires attention to glycemic control, which

will result in reduction of other complications involved in the process.

Dental Infection

Diabetic patients who have good control over blood sugar levels (good glycemic/metabolic control) can prevent or delay the onset and slow the progression of the complications associated with diabetes, particularly retinopathy, nephropathy, and neuropathy.

People with diabetes are much more susceptible to periodontal disease and once periodontal disease is established in a diabetic patient, metabolic control (glycemic control or blood sugar levels) of diabetes is complicated from the constant reservoir of gram-negative anaerobic bacteria that sit at the bottom of the gum pockets producing infection and low grade inflammation throughout the body. That is why the relationship between diabetes and periodontal disease is sometimes referred to as a two-way street, and the reason why diagnosis and treatment of periodontal disease, just like optimal glycemic control, are essential in the medical management of diabetes.

The same is true for delaying the onset or slowing the progression of periodontal disease. However, for people with diabetes who have poor glycemic control (high blood sugar levels), the risk of infection becomes much greater. For instance, it is estimated that poorly controlled diabetic people are at a 2 to 4 times greater risk for developing periodontal infection than non-diabetic people. That is why it is important for diabetic patients to achieve and sustain the same level of glycemic control as a healthy, non-diabetic individual. Good glycemic control, an HbA1c value of less than 6% for most patients, significantly reduces the risk for the serious complications of diabetes noted above. Another important aspect of this 2-way street is the research that suggests chronic periodontal infection causes systemic inflammation that enhances insulin resistance and hyperglycemia. Insulin resistance makes it difficult for patients and their physicians to achieve and sustain optimal glycemic control, and increases the risk for coronary heart disease.

According to the American Diabetes Association, diabetes is not a single disease; it occurs in several forms and has complications that affect virtually every system of the body. If you have diabetes, you may be at a greater risk for developing other medical conditions, including periodontal diseases (also known as gum disease).

Periodontal diseases are chronic bacterial gum infections that inflame gum tissue and destroy the attachment fibers and supporting bone that hold your teeth in your mouth. Left untreated, the teeth may fall out or need to be removed. Periodontal diseases are the sixth leading complications of diabetes. Studies show that diabetic patients are up to 4.2 times more likely to develop periodontal diseases than those without diabetes. This is probably because diabetic patients are more susceptible to contracting infections.

Research suggests that the relationship between periodontal diseases and diabetes goes both ways - periodontal diseases may make it more difficult for people who have diabetes to control their blood sugar. Periodontal diseases may increase blood sugar, contributing to increased periods of time when the body functions with a high blood sugar. Consequently, it is important for diabetic patients to treat periodontal diseases to eliminate the infection. In fact, periodontal treatment has been shown to improve blood sugar levels in diabetic patients, suggesting that treating patients' periodontal diseases could decrease insulin requirements.

Most importantly, when a periodontal infection goes untreated in diabetic patients, this puts them at greater risk for developing the long-term complications

associated with diabetes and cardiovascular disease. There is also research to suggest that insulin-dependent diabetic individuals may be genetically predisposed to an exaggerated inflammatory response to gram-negative bacterial infections like those found in periodontal disease.

Currently there is no cure for diabetes or periodontal disease, but if you are a motivated patient who complies with your dental and medical providers' recommendations, these diseases can be controlled. Successful management of these diseases requires frequent monitoring of and careful attention to your immune system's response to treatment, and monitoring of both glycemic control (blood sugar levels) and periodontal status.

Healthy Habits for Diabetics

The following are recommendations often provided by healthcare providers to successfully control diabetes and periodontal disease:

• Maintain excellent oral hygiene including thorough brushing with toothpaste that contains triclosan/copolymer at least twice a day, the use of dental floss daily, and tongue brushing

• Undergo the treatment that your dentist or dental hygienist recommends for active periodontal disease

• Take all medications prescribed by physicians and dentists as indicated

• Have regular periodontal maintenance visits that include periodontal evaluation and re-treatment as needed

• Commit to smoking cessation if applicable

• Engage in adequate physical activity

• Reduce weight, if applicable

• Eat balanced meals with proper nutrition

• Comply with your healthcare provider's recommendations for HbA1c testing at least every 3 months, and request copies of the results be forwarded to your dentist, which allows your dental care provider to monitor your glycemic control against your periodontal status.

The good news is that if your diabetes is under control, you are less likely to develop periodontal diseases than someone whose diabetes is poorly controlled. A study published in the *Journal of Periodontology* concluded that poorly controlled diabetic patients respond differently to bacterial plaque at the gum line than well-controlled diabetic patients. Poorly controlled patients with diabetes also have more harmful proteins in their gum tissue causing destructive inflammation of the gums.
See your dentist for a periodontal evaluation, and begin taking care of your oral health today.

You may also want to visit the American Academy of Periodontology Web site at http://www.perio.org

Another very informative public Web site is http://www.floss.com