

Periodontal disease and diabetes

A two-way street

Brian L. Mealey, DDS, MS

Diabetes mellitus affects an estimated 20 million Americans, about 35 to 40 percent of whom have not received a diagnosis.¹ More than 9 percent of the adult population has diabetes, and both the incidence and prevalence are increasing every year.

The two main types of diabetes are classified primarily on the basis of their underlying pathophysiology.² Type 1 diabetes, which constitutes about 5 to 10 percent of all cases in the United States, results from autoimmune destruction of insulin-producing β -cells in the pancreas, leading to total loss of insulin secretion.³ Insulin is used by the body to facilitate the transfer of glucose from the bloodstream into the target tissues, such as muscle, where glucose is used for energy (Figure). Because a person with type 1 diabetes no longer produces endogenous insulin, glucose is unable to enter target cells and remains in the bloodstream, resulting in sustained hyperglycemia. A patient with type 1 diabetes must take exogenous insulin to remain alive—hence, the former name “insulin-dependent diabetes.”

ABSTRACT



Background. The association between diabetes and inflammatory periodontal diseases has been studied extensively for more than 50 years. The author reviews the bidirectional relationships between diabetes and periodontal diseases.

Conclusions. A large evidence base suggests that diabetes is associated with an increased prevalence, extent and severity of gingivitis and periodontitis. Furthermore, numerous mechanisms have been elucidated to explain the impact of diabetes on the periodontium. While inflammation plays an obvious role in periodontal diseases, evidence in the medical literature also supports the role of inflammation as a major component in the pathogenesis of diabetes and diabetic complications. Research suggests that, as an infectious process with a prominent inflammatory component, periodontal disease can adversely affect the metabolic control of diabetes. Conversely, treatment of periodontal disease and reduction of oral inflammation may have a positive effect on the diabetic condition, although evidence for this remains somewhat equivocal.

Clinical Implications. Patients with diabetes who have periodontal disease have two chronic conditions, each of which may affect the other, and both of which require frequent professional evaluations, in-depth patient education and consistent educational reinforcement by health care providers.

Key Words. Diabetes mellitus; periodontal diseases; periodontal therapy; inflammation.

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Type 2 diabetes, which constitutes about 85 to 90 percent of all cases, results from insulin resistance rather than from total absence of insulin production.³ Autoimmune destruction of β -cells does not occur in type 2 diabetes, and patients retain the capacity to secrete some insulin, although production often diminishes over time. Patients with type 2 diabetes can remain undiagnosed for years because hyperglycemia appears gradually and often without symptoms.³ Insulin resistance results in a decreased capacity to transfer glucose into target cells; thus, hyperglycemia develops.

STUDIES OF DIABETES AND PERIODONTAL DISEASES

The relationship between diabetes and periodontal diseases has been the subject of more than 200 articles published in English during the past 50 years. Interpretation of this research is made difficult by the numerous classifications for diabetes and periodontitis used over the years; varying clinical and radiographic criteria used to assess periodontal disease prevalence, extent and severity; evolving standards for the degree of glycemic control; and changing methods for assessing complications associated with diabetes. In addition, researchers and clinicians must use caution when comparing the results of different studies, because research has focused on assorted populations and often has included relatively few subjects or lacked controls.

Gingivitis. An overall assessment of the available data strongly suggests that diabetes is a risk factor for gingivitis and periodontitis.^{4,5} In a classic study of diabetes and gingivitis reported more than 30 years ago, the prevalence of gingival inflammation was greater in children with type 1 diabetes than in children without diabetes who had similar plaque levels.⁶ Ervasti and colleagues⁷ observed greater gingival bleeding in patients with poorly controlled diabetes than in control subjects without diabetes or in subjects with well-controlled diabetes. Subjects with type 2 diabetes also had greater gingival inflammation than did control subjects without diabetes; the highest level of gingivitis was found in subjects with poor glycemic control.⁸

The onset of type 1 diabetes in children has been associated with increased gingival bleeding, while improved control of blood sugar levels after initiation of insulin therapy resulted in decreased gingivitis.⁹ Using an experimental gingivitis pro-

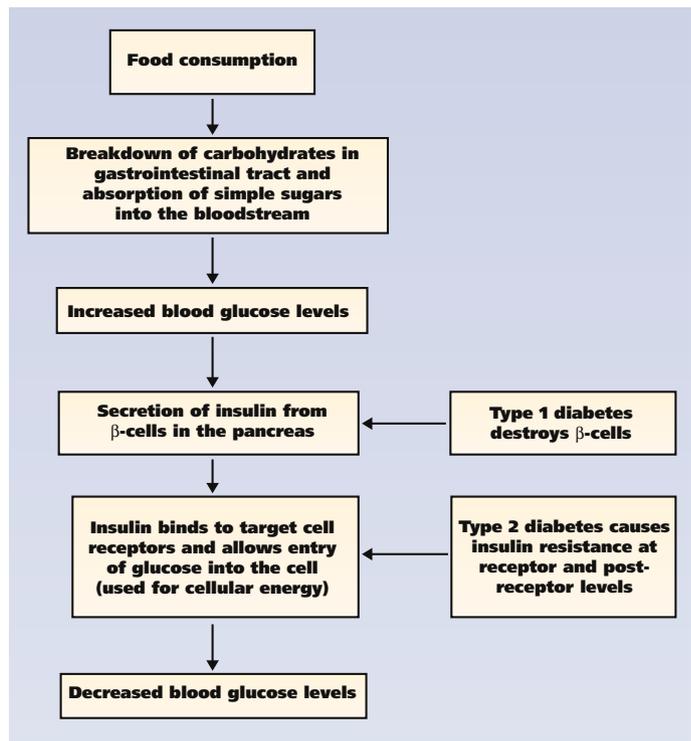


Figure. Carbohydrate metabolism, insulin and diabetes.

ocol, a recent longitudinal study showed more rapid and severe gingival inflammation in adult subjects with type 1 diabetes than in control subjects without diabetes, despite similar qualitative and quantitative bacterial plaque characteristics, suggesting a hyperinflammatory gingival response in people with diabetes.¹⁰

Periodontitis. Most of the evidence also suggests that diabetes increases the risk of developing periodontitis. In a classic cross-sectional study, type 1 diabetes was associated with a five-fold increased prevalence of periodontitis in teenagers.⁶ A recent case-control study confirmed that attachment loss is more prevalent and extensive in children with diabetes than in children without diabetes.¹¹ In addition, epidemiologic research supports an increased prevalence and severity of attachment loss and bone loss in adults with diabetes.^{12,13}

A multivariate risk analysis showed that subjects with type 2 diabetes had approximately threefold increased odds of having periodontitis compared with subjects without diabetes, after adjusting for confounding variables including age, sex and oral hygiene measures.^{12,13} In a meta-analysis of studies conducted before 1996 that included more than 3,500 adults with diabetes, Papapanou⁴ found a significant association

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