

DENTAL MANAGEMENT OF DIABETIC PATIENTS: A CLINICAL REVIEW

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Abstract

Diabetes describes a group of metabolic diseases resulting from impaired insulin secretion, varying degrees of insulin resistance, or both. Management of the diabetic dental patients must take into consideration the impact of dental disease and dental treatment on the management of diabetes as well as an appreciation for the comorbidities that accompany long-standing diabetes. Those comorbidities include obesity, hypertension and dyslipidemia. Management of the diabetic dental patient should focus on periodontal health and the delivery of comprehensive dental care with minimal disruption of metabolic homeostasis and recognition of diabetic comorbidities.

Keywords: Diabetes mellitus - chronic hyperglycemia - retinopathy - macrovascular disease.

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PRISE EN CHARGE DES PATIENTS DIABÉTIQUES: UNE REVUE CLINIQUE

Résumé

Le diabète est une maladie chronique du métabolisme qui apparaît lorsque le pancréas ne produit pas suffisamment d'insuline ou que l'organisme n'utilise pas correctement l'insuline qu'il produit. La prise en charge des patients diabétiques au cabinet dentaire doit prendre en considération l'impact des maladies dentaires et des soins dentaires sur le contrôle du diabète, ainsi qu'une appréciation des comorbidités qui accompagnent le diabète. Ces comorbidités sont l'obésité, l'hypertension et la dyslipidémie. La prise en charge du patient diabétique devrait donc se concentrer sur la santé parodontale et la prestation des soins dentaires complets sans perturber l'homéostasie métabolique.

Mots-clés: diabète – hyperglycémie – rétinopathie – maladie macrovasculaire.

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Introduction

Diabetes mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction and failure of various organs, especially the eyes, kidneys, nerves, heart and blood vessels [1].

DM results when one of the following conditions occurs: insulin released from the pancreas is impaired or insulin action at peripheral tissues is impaired [2].

A deficiency in insulin or a problem with its metabolic activity can result in an increased blood glucose level (ie, hyperglycemia). Hyperglycemia leads to an increase in the urinary volume of glucose and fluid loss, which then produces dehydration and electrolyte imbalance [3]. This latter problem, if severe, may result in coma.

The stress of the disease also results in an increase in cortisol secretion. It is the inability of the diabetic patient to metabolize and use glucose, the subsequent metabolism of body fat, and the fluid loss and electrolyte imbalance that causes metabolic acidosis. It is the hyperglycemia and ketoacidosis coupled with vascular wall disease (microangiopathy and atherosclerosis) that alters the body's ability to manage infection and heal [3].

Based on the pathogenic processes, four types of diabetes are identified [4]:

- Type 1 diabetes: 5% of diabetics.
- Type 2 diabetes: 90% of diabetics.
- Gestational diabetes.
- Other: caused by various metabolic disorders, drugs or surgery.

The onset of symptoms is rapid in type 1 diabetes, and includes the classic triad of polyphagia, polydipsia and polyuria, as well as weight loss, irritability, drowsiness and fatigue [4]. Symptoms of type 2 diabetes develop more slowly, and frequently without the classic triad; rather, these patients may be obese and may have pruritus,

peripheral neuropathy and blurred vision. Opportunistic infections, including oral and vaginal candidiasis, can be present. Adults with long-standing diabetes, especially those with poorly controlled hyperglycemia, may develop microvascular and macrovascular conditions that can produce irreversible damage to the eyes (retinopathy, cataracts), kidneys (nephropathy), nervous system (neuropathy and paresthesias), and heart (accelerated atherosclerosis), as well as recurrent infections and impaired wound healing.

Gestational DM is defined as any degree of glucose intolerance with onset or first recognition during pregnancy [5]. In the majority of cases, glucose regulation will return to normal after delivery.

Diabetes and the oral manifestations

Several soft tissue abnormalities have been reported to be associated with diabetes mellitus in the oral cavity.

Xerostomia and dry mouth

Dry mouth is a common complaint among diabetic patients. This can be due to hyperglycemia, which leads to polyuria and can result in a lowering of fluids like saliva [6]. Xerostomia may also be a side effect of other medications such as antihistamines.

Xerostomia disrupts the normal saliva balance in the mouth, which leads to a number of oral and dental disorders such changes in taste, speech, and the ability to eat in addition to increasing the risk of cavities and infections [7]. Xerostomia also causes mouth tissues to become inflamed and sore, which in turn can make chewing, tasting and swallowing difficult and possibly lead to difficulties in controlling diabetes because of a reduced interest in eating and thus, an inability to properly maintain stable blood sugar levels.

Caries

Due to the low sugar diets followed by most DMs, many do not have a lot

of carious lesions, restorations, or enamel decalcification [8]. Exceptions are the cervical caries noted in type 2 DM with high sugar diets, those that drink soft drinks, and those with xerostomia. If the patient also has oral fungal infections, the topical antifungal medications have high sugar content and can promote caries.

Candidiasis

Another manifestation of diabetes and an oral sign of systemic immunosuppression is the presence of opportunistic infections, such as oral candidiasis. Fungal infections of oral mucosal surfaces and removable prostheses are more commonly found in adults with diabetes. *Candida Pseudohyphae*, a cardinal sign of oral *Candida* infection, have been associated significantly with cigarette smoking, use of dentures and poor glycaemic control in adults with diabetes [9]. Salivary hypofunction also may increase the oral candidal carriage state in adults with diabetes [10].

Periodontal disease

Large number of investigations have provided the evidence that type 1 and type 2 diabetes increase the risk and severity of periodontitis [11, 12], and vice versa periodontitis has been shown to have impact on diabetic status by using rodent studies although the underlying mechanism has not been discussed [13]. The association between diabetes mellitus and periodontal disease is therefore considered to be bidirectional: diabetes as a risk factor for periodontitis and periodontitis as a possible severity for diabetes. In fact, aggressive periodontitis is recognized as the sixth serious complication of diabetes [14].

Treatment of periodontal disease in DMs is similar to treatment in non-DMs. One major difference is the strong collaboration required by the dental professional with the patient's medical caregivers. Studies showed that there can be a temporary increase in the control of DM when periodontal disease is controlled. Proper oral

hygiene care may arrest periodontal disease if treatment is aimed at daily plaque removal and timely calculus removal [15].

Taste disturbances

Taste is a critical component of oral health that is affected adversely in patients with diabetes [16]. One study reported that more than one-third of adults with diabetes had hypogeusia or diminished taste perception, which could result in hyperphagia and obesity [17]. This sensory dysfunction can inhibit the ability to maintain a proper diet and can lead to poor glycemic regulation.

Other oral manifestations include oral lichen planus, trigeminal neuralgia, traumatic ulcers and irritation fibromas.

Dental management considerations

Diabetes mellitus is not a curable disease. Any patient who has cardinal symptoms of diabetes (polydypsia, polyuria, polyphagia, weight loss, weakness) but has not been diagnosed, should be referred to a physician for diagnosis and treatment.

To minimize the risk of intraoperative emergency, clinicians need to consider a number of issues before initiating the dental treatment [Lalla].

Medical history

It's important for clinicians to take a good medical history at the first appointment. They should ask patients about recent blood glucose levels and frequency of hypoglycemic episodes, as well as the antidiabetic medications, their dosage and their times of administration [5].

Blood glucose monitoring

Depending on the patient's medical history, medication regimen and procedure to be performed, dentists may need to measure the blood glucose level before beginning any procedure, especially to prevent the risk of a hypoglycemic event [5].

For glycemic control, it is recommended that the HbA1c level (monitored every three months) be maintained at less than 7 percent. If daily blood glucose monitoring is performed, fasting blood plasma levels should be less than 120 mg/dl and blood glucose levels two hours postprandial should be less than 150 mg/dl. For every 1 percent HbA1c level, there is an associated increase in complication rates for both microvascular and macrovascular diseases.

Also, elective procedures should be postponed if the fasting glucose is either less than 70 mg/dl. It has been emphasized that when blood glucose level is less than 70 mg/dl, there is risk of hypoglycemia [18].

Antibiotic coverage

Patients with poorly controlled diabetes are at risk of developing oral complications because of their susceptibility to infection and sequelae, and likely will require supplemental antibiotic therapy [19]. Anticipation of dentoalveolar surgery (involving mucosa and bone) with antibiotic coverage may help prevent impaired and delayed wound healing. Orofacial infections require close monitoring. Cultures should be performed for acute oral infections, antibiotic therapy initiated and surgical therapies contemplated if appropriate (for example, incision and drainage, extraction, pulpextomy). In cases of poor response to the first antibiotic administered, dentists can select a more effective antibiotic based on the patient's sensitivity test results.

Diet

Dental treatment can result in postoperative discomfort. This may necessitate changes in the diet, especially in cases of extensive dental therapy [5]. Because diet is a major component of diabetes management, diet alterations that are made because of dental treatment may have a major impact on the patient. The clinician may need to consult the patient's physician prior to therapy, to discuss diet modifications

and required changes in medication regimens. Another diet change occurs when patients are placed on orders to take nothing by mouth (NPO) before dental treatment, a common recommendation before conscious sedation. Consultation with the patient's physician may be needed to adjust the dose of insulin or oral agents in this situation [5]. Physicians often recommend reducing the insulin dose that immediately precedes lengthy or extensive dental procedures.

Scheduling considerations for diabetic dental patients

Morning appointments are recommended, preferably 1 1/2 hours after breakfast and morning meds to avoid the peak action time for those who take insulin injections and since the endogenous cortisol levels are generally higher at this time. Do not schedule appointments during lunch breaks or as the last appointment of the day before dinner since blood sugar levels can be low and oral health care procedures can interfere with eating. In the case of type 1, ask the patient to bring their own monitoring device to the appointment to monitor their glucose if there is any question as to their control.

For patients who take insulin, the greatest risk of hypoglycemia will thus occur about 30 to 90 minutes after injecting lispro insulin, 2 to 3 hours after regular insulin, and 4 to 10 hours after NPH or Lente insulin. For those who are taking oral sulfonylureas, peak insulin activity depends on the individual drug taken. Metformin and the thiazolidinediones rarely cause hypoglycemia.

For the above mentioned reasons, it's advised to avoid dental appointments when the patient:

- Has not had meds or eaten
- Has cold, or flu, or tiredness
- Has not recently seen their physician
- Has levels <70 mg/dl or >150 mg/dl
- Has had a recent emergency.

Management of potential complications

Certain patients may need a medical consult before elective dental treatment [20]. Many of them may have complications such as cardiovascular disease, renal disease, blindness, or side effects from related medications. It is vital for the dental professional to always be prepared for emergency situations and immediately control any serious oral infections.

Hypoglycaemia

The most common complication of diabetic mellitus that can occur in the dental office is a hypoglycemic episode [21]. If insulin or oral antidiabetic drug levels exceed physiological needs, the patient may experience a severe decline in his or her blood sugar level. The maximal risk of developing hypoglycemia generally occurs during peak insulin activity. Initial signs and symptoms include mood changes, decreased spontaneity, hunger and weakness. These may be followed by sweating, incoherence and tachycardia. If untreated, possible consequences include unconsciousness, hypotension, hypothermia, seizures, coma and death.

Preventing such complication requires:

- Thorough medical history and consultation with physician to assess glycemic control, disease severity and medications with hypoglycemic potential.
- Monitoring of the blood glucose level and the dietary intake before treatment.
- Avoidance of peak activity periods of insulin or oral antidiabetic medications.
- Recognition of signs and symptoms of low blood glucose level and timely administration of carbohydrate source (oral, intramuscular, intravenous)

Salivary gland dysfunction and oral burning

Salivary gland dysfunction might play a role in the onset of the syn-

drome of burning mouth syndrome (BMS). Radiation therapy, some systemic diseases, and a variety of pharmacologic agents [22], known to be capable of inducing a decrease in salivary flow rate [23] have reportedly been associated with increased incidence of BMS [24].

BMS may represent a complex of multiple diseases with overlapping symptoms [25]. Consequently, dealing with a syndrome which is poorly defined by symptom(s) without regard to etiology actually causes more problems relative to diagnosis and management.

However, maintaining an adequate oral hydration (saliva substitutes, sugarless gums, water, ice chips) and the restriction of caffeine and alcohol intake can help reduce the symptoms [26].

Infection and delayed wound healing

Wound infection is a major complication in diabetic patients [27]. Factors such as age, obesity, malnutrition, and macrovascular and microvascular diseases may contribute to wound infection and delayed wound healing especially in the type II diabetic patient. In addition, hyperglycemia caused by decreased insulin availability and increased resistance to insulin can affect the cellular response to tissue injury.

At the cellular level, an increase in the number of acute inflammatory cells, absence of cellular growth, and migration of the epidermis have been observed [28]. Patients with diabetes have impaired leukocyte function, and the metabolic abnormalities of diabetes lead to inadequate migration of neutrophils and macrophages to the wound, along with reduced chemotaxis [29, 30]. Such cellular changes would predispose individuals to an increased risk of wound infection.

In order to prevent such complication, frequent dental visits may help to control plaque formation and to identify risk factors for periodontal disease, caries and oral candidiasis.

Conclusion

Managing the care of patients with DM in the dental office should not pose a significant challenge. Hypoglycemia is the major issue that usually confronts dental practitioners when they are treating patients with DM, especially if patients are asked to fast before undergoing a procedure.

Finally, having well-controlled blood glucose levels is important for infection prevention and proper healing. At the same time, patients are needed to be made aware of regular periodontal maintenance schedule and oral hygiene.

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