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Dental treatment and diabetes mellitus

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Abstract

Diabetes mellitus (DM) is a systemic disease, which affects general health. There are also many side effects on the oral health. Dental practitioners have to be aware of the concomitant oral manifestations in diabetic patients in order to provide accurate dental and surgical treatment. It is important to treat diabetic patients properly and on time, because untreated oral infection may lead to poor glycemic control on one hand, and on the other hand, undetected diabetes mellitus leads to failure in dental treatment.

Keywords: diabetes mellitus, tooth extraction, dental treatment

Diabetes mellitus – influence on oral health and treatment

Diabetes mellitus (DM) is endocrine disease, which leads to high levels of blood sugar. It can be classified into four general categories, according to the American Diabetes Association (1):

1. Type 1 diabetes (due to autoimmune β-cell destruction)
2. Type 2 diabetes (due to a progressive loss of β-cell insulin secretion frequently on the background of insulin resistance)
3. Gestational diabetes mellitus(diagnosed in second and third trimester of pregnancy)
4. Specific types of diabetes due to other causes - monogenic diabetes syndromes, diseases of the exocrine pancreas, and drug- or chemical-induced diabetes

The most common types of DM are type 1 and type 2. DM type 1 is represented in younger patients. Children with DM type 1 suffer often from bad oral hygiene, halitosis, plaque retention and calculus (2). Therefore patients with DM type 1 must undergo routine dental check-up und cleaning every 4-6 months in order to maintain good oral hygiene and oral health.
Dental practitioners are dealing predominantly with diabetes type 2. This type of diabetes mellitus is represented mainly in older people, and most of them have other diseases also. As a metabolic disease, diabetes affects many organs and systems as well the oral cavity. In general, diabetes damages the large and small blood vessels which can lead to heart attack, stroke, eye problems, kidney problems and polyneuropathy. The most common oral symptoms are (3):

- Burning mouth and taste disturbances;
- Xerostomia;
- Decreased salivary secretion;
- Multiple carious lesions and caries in unusual places (root caries);
- Delayed wound healing;
- Increased incidence of infection;
- Enlarged gingival tissues bleeding easily upon manipulation;
- Periodontal disease (occurs more frequently and progresses more rapidly than in healthy patients);
- Others

Higher levels of candida infection are also associated with diabetes mellitus (4)(5), and especially in DM patients with periodontitis(6). People with diabetes are susceptible to oral candidiasis as a result of dehydration which affects the body in general and salivary glands in particular. The decrease in salivary flow rate and saliva pH promotes the increase of colonization of Candida species in the oral cavity (7)(8).
Some of the DM manifestations concern directly dental surgical and implantologic treatment. Delayed wound heling, persistent bleeding after surgical and implantological treatment, implant failure, severe infection that can lead to life threatening conditions can be the consequences of undertreated or untreated diabetes.
On the other hand, untreated oral infection, as well as any other infection in the body, may lead to poor glycemic control. It induces higher levels of blood sugar, which worsen the general condition of the diabetic patients. Dental practitioners have to be aware of this fact and treat them promptly.
Type 1 DM I is treated usually with insulin injection or pump, and type 2 diabetes treatment is aimed at increasing the effectiveness of the endogenous insulin using metformin and glitazones (9). DM drugs may also affect the general and oral health. The main side effect of all glitazones is water retention, which leads to swelling and rarely to decompensation of heart failure. Glitazones reduce also bone mineral density and increase the risk of fractures in women, which may additionally complicate surgical and/or implantological treatment. Dental practitioners have to manage the side effects of the disease and the medication in order to provide appropriate treatment of DM patients.

Dental treatment – influence on disease's course

Dental treatment combined with inadequate blood sugar control can lead to hyperglycemia or hypoglycemia, which can outgrow to life threatening conditions. Both conditions can lead to coma, but the treatment is radically different. Hypoglycemia is associated with low levels of blood sugar. The most frequent symptoms are hunger, sweating, irritability, visual disturbances and other. In non-complicated cases, the intake of sugar or fast carbohydrates can lead to normal levels of blood sugar, and more severe cases must be treated with IV glucose. In normal cases, the oral or IV intake of carbohydrates is enough and dental treatment can continue after measuring the blood sugar level. Hypoglycemia, caused by wrong insulin dosage, is more severe case, which can lead to serious life threatening situation – the IV administration of glucose must be followed by intensive care treatment (10).
Hyperglycemia is medical condition, which is associated with high blood sugar levels. Severe, diabetic hyperglycemia can cause diabetic ketoacidosis (DKA) and hyperosmolar hyperglycemic state (HHS), which are two of the most serious acute complications of diabetes. Treatment of patients with DKA and HHS uses significant health care resources, and for that reason is carried out in specialized hospitals (11).
The aim of dental practitioner is to evaluate the risk for future dental treatment in diabetic patients. Routine dental treatment and surgical treatment should be done in well controlled and moderately controlled patients.
Morning dental treatments are advisable in diabetic patients due to higher cortisol levels which lead to higher blood sugar and so low risk of hypoglycemia (12). In diabetic type 1 patients or type 2 patients with insulin therapy, dentists have to make the appointments comply with specific insulin therapy. For patients using short- and/or long-acting insulin therapy, appointments should be scheduled so they do not coincide with peak insulin activity, which increases the risk of hypoglycemia (12).

Prophylaxis in diabetic patients before dental treatment

Antibiotic prophylaxis is often applied in diabetic patients with forthcoming surgical treatment, and there are two sides of preventive prescription of antibiotics. On one hand, when we give antibiotics to a patient, we can achieve better inflammation control, but on the other side antibiotic prescription without exact indications may induce antibiotic resistance and future more aggressive infections. Furthermore, prescription of antibiotics without indications leads to global resistance to specific antibiotic types, and non-curable infections in future. Also, there are a few evidence-based studies about preventive effect of antibiotic prophylaxis in cases of bacterial endocarditis (13). That makes questionable preventive prescription of antimicrobial drugs to patients without indications, but it does not mean that we do not have to be aware of infectious complications in diabetic patients. When we treat such patients with inflammatory complications, we have to prescribe antibiotics form penicillin group such as Amoxicillin, or Clindamycin in allergic patients (14), for one week. If the infection aggravates, it is recommended to obtain material (secretion, pus) for culturing and determination of antibiotic sensitivity.
We don't need to prescribe antibiotics to diabetic patients with well controlled DM for implant placement (in cases of minor surgery). In moderately controlled patients, we usually prescribe Amoxicillin or Clindamycin. Patients with poorly controlled DM are not recommended for dental implant treatment – it is a well-known fact that perioperative hyperglycemia implies a high risk for postoperative infection (15)(16). For non-emergency dental surgical procedures, it is more important to achieve better blood sugar levels than to prescribe antibiotics (17).

Dental treatment in diabetic patients

Dental treatment in diabetic patients, and disease's medical therapy also, is connected with blood glucose levels and HbA1c levels (18)(19)(20). It is well-known fact that infection leads to higher levels of blood sugar. When we treat diabetic patients with infection, we have to measure blood sugar and HbA1c levels so we can survey the consequences from the dental inflammation and normal blood sugar levels in past months.

If fasting blood glucose level reaches 240 mg/dl (13,3 mmol/l) this is a sign of hyperglycemia (21)(22)(23)(24)(25). Symptoms can be mild, moderate or severe, depending on the glucose levels and the time the body is subjected to poorly controlled DM. Maximum acceptable levels of blood glucose for removal of teeth in diabetics are 180 mg/dl (10,0 mmol/l)(before meal) and 234 mg/dl (13,0 mmol/l) (2 h after meal). Dental extractions or emergency surgical treatment can be done in specialized hospitals and in cooperation with endocrinologist who can decrease blood sugar levels and so reduce the treatment time.

HbA1c levels give us information about the blood sugar control over past up to 3 months. When we speak about DM type 2, we can divide patients in tree groups (26):

- Well controlled DM – HbA1c up to 7,5%;
- Moderately controlled DM – HbA1c from 7,6% up to 9%;
- Poorly controlled DM – HbA1c above 9%.

The goal in DM type 2 treatment is to achieve HbA1c levels under 6,5% (27). When we do dental treatment on DM patients we have to be aware of HbA1c levels. First group with HbA1c levels under 7,5% can be treated like non diabetic patients. In addition, patients with well-controlled diabetes can usually be managed conventionally for most surgical procedures (28).

Dental implants can be placed in patients with well-controlled diabetes, and possibly in those with moderately controlled disease. However, implant placement in patients with poorly controlled disease has an unpredictable prognosis and, if possible, should be avoided (28)(29). Other authors conclude that implant placement can be done in patients with poorly controlled DM (30). However, most of the studies show that complications after dental implant placement and surgical treatment are connected with HbA1c levels (31). Therefore, dental implant placement is a procedure, which can be postponed to a time when HbA1c levels are lower.

Dental extractions can be done in poorly controlled DM patients also, because glycemic control does not influence post-extraction healing in these patients (32). Further delay of dental extraction can lead to severe complications; therefore, dental extractions have to be done in poorly controlled DM patients with specific postsurgical infection control.

Conclusion

Diabetes mellitus is a disease which affects the general and oral health. Dental practitioners have to evaluate the treatment risks in DM patients and anticipate the consequences of delayed treatment in order to provide the best option for their patients.

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