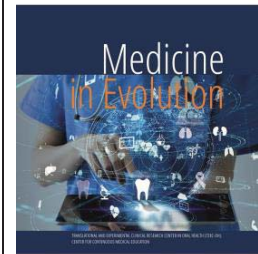


Peculiarities of tooth extraction in patients with diabetes



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Abstract

Tooth extraction is one of the most common procedures in oral and dental surgery, and in the case of diabetic patients this procedure must be managed with greater care.

Several soft and hard tissue disorders of the oral cavity have been reported to be associated with diabetes mellitus. These include periodontal diseases (periodontitis and gingivitis), salivary dysfunction leading to a reduction in salivary flow and changes in the composition of saliva and taste dysfunctions, neuro-sensory mucosal disorders, fungal and bacterial infections and also lesions of the oral mucosa in the form of stomatitis, geographic tongue, benign glossitis, fissured tongue, traumatic ulcer, lichen planus and angular cheilitis. Post-extraction complications such as delayed wound healing, increased risk of bleeding and wound infection have been reported in patients with diabetes.

The present work intends to identify the impact of diabetes on dental extraction, in terms of post-extraction wound healing and the development of complications.

Keywords: Dental extraction, diabetes, post-extraction complications

INTRODUCTION

Diabetes mellitus is a chronic disorder of carbohydrate metabolism characterized by the inability to regulate and control blood glucose levels due to insulin deficiency or resistance.

Oral manifestations and complications of diabetes include dry mouth (xerostomia), dental caries (including root caries), periapical lesions, gingivitis, periodontal disease, oral candidiasis, burning sensations (especially glossodynia), altered taste, geographic tongue, coated and fissure, oral lichen planus, recurrent aphthous stomatitis, increased tendency to infections and poor wound healing (Figure 1). The intensity of diabetes complications is usually proportional to the degree and duration of hyperglycemia [1].

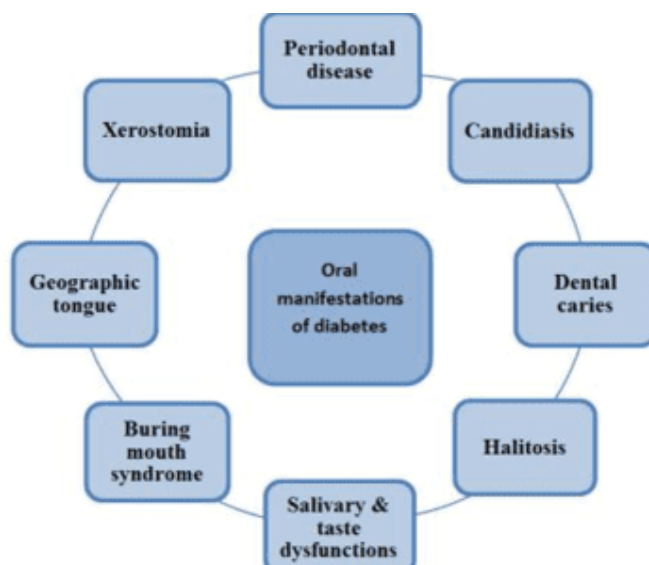


Figure 1. Oral manifestations among diabetic patients [2]

The need for tooth extraction is determined after a thorough clinical and radiological evaluation, taking into account the patient's local and general conditions.

In the specialized literature, there is evidence to support that diabetic patients present an increased risk of infection or delayed healing following surgical procedures [3,4].

Regarding the extraction procedure in diabetic patients, dentists need to better understand the factors that affect glycemic control in order to improve the management of these patients in the dental office. In the specialized literature, there is a lack of information regarding the determination of the maximum permissible blood glucose level recommended for emergency tooth extraction in patients with diabetes.

Based on the diabetes guidelines established by the American College of Endocrinology (ACE), the safety scale of favorable glycemic ranges for patients with diabetes was structured (Table 1) [5].

Table 1. Safety scale of blood glucose levels for patients with diabetes [6]

Blood glucose level	Excellent	Good	Acceptable
Fasting blood glucose	72-109 mg/dl	110-144 mg/dl	145-180 mg/dl
2 hours after meal	90-126 mg/dl	127-180 mg/dl	181-234 mg/dl

On the other hand, there is also a classification for risk assessment in terms of fasting blood glucose levels in diabetic patients (Table 2).

Table 2. Risk assessment based on glyceimic levels [6]

Blood glucose level	Assessment of the level of risk
≤ 50 mg/dl	Dangerously low
70-90 mg/dl	Low
90-120 mg/dl	Normal
120/160 mg/dl	Medium
160-240 mg/dl	Grown
240-300 mg/dl	Very high, signals an escaped diabetes under control that requires specialist consultation
≥ 300 mg/dl	Severe, requires emergency medical attention

The fasting blood glucose level of 240 mg/dl is a critical point for any dental treatment. When the blood glucose level reaches 240 mg/dl, the warning signs of diabetes appear: tingling of the hands or feet, dizziness, nausea, vomiting, diarrhea [7]. An emergency tooth extraction at a glucose level of 240 mg/dl will lead to severe infection and delay healing.

To perform a tooth extraction, blood glucose levels may be considered acceptable as long as the dental treatment can be performed with minimal risk, and there are no signs of uncontrolled diabetes. A fasting blood glucose level of 180 mg/dl is considered a cut-off point for scheduled tooth extraction. A blood glucose level (2 hours after a meal) of 234 mg/dl is a cutoff point for an emergency tooth extraction [8,9].

Poor glyceimic control predisposes to a number of vascular complications and more. Microcirculatory impairments in particular have a significant influence on postsurgical wound healing. In diabetic patients, changes in capillaries, such as thickening of their walls, lead to altered permeability, preventing leukocyte migration to the site of extraction and amplifying the hyperemic reaction [10,11]. These changes lead to delayed healing and increase the risk of post-extraction wound infection, which can manifest as post-extraction haemorrhage, post-extraction abscess, alveolitis and osteitis [12,13].

Aim and objectives

The aim of this paper is to analyze the frequency and intensity of complications that occur in diabetic patients and in patients with both diabetes and other comorbidities following the surgical procedure of tooth extraction.

Another aim was to draw the attention of dentists and dento-alveolar surgeons to the fact that patients with diabetes represent a risk category in dental treatment, requiring a special pre- and post-operative management, so that they can be reduced to minimum risk of possible complications.

MATERIAL AND METHODS

Patients diagnosed with diabetes who required extraction treatment and presented themselves at the Timișoara Oral and Maxillo-Facial Surgery Clinic were included in the study.

The patients were informed about the medical research and expressed their consent in writing, according to Order of the Ministry of Health 1411 of 12.12.2016, annex 1 to the methodological norms - Form for expressing consent of the informed patient.

Patient selection and inclusion criteria:

1. Adult patients (over 18 years);

2. Both sexes;
3. Patients diagnosed with diabetes who suffered post-extraction complications;
4. Patients who suffer from diabetes, but also have other associated conditions.
5. Patients who have had one or more dental extractions;
6. Patients from the Timișoara Oro-Maxillo-Facial Surgery Clinic database for the possibility of patient monitoring.

Exclusion criteria:

1. Minor patients (under 18);
2. Patients with acute infectious processes;
3. Patients with existing malignant tumors in the head and neck;
4. The existence of associated conditions that contraindicate tooth extraction;
5. Noncompliant patients to treatment.
6. Patients who have not been diagnosed with diabetes.

The data obtained from the anamnesis and those from the observation sheets were noted in the dental evaluation sheet specially designed for this purpose. The data were obtained through clinical examination, questionnaire-interview and paraclinical examination (laboratory analyzes and dental radiographs).

They have registered:

- demographic data: age, gender, occupation, background;
- medical history: general conditions, associated medication, type of diabetes, duration of disease evolution, blood sugar and HbA1c value;
- type of food.

A statistical analysis was also carried out regarding the total number of patients, the ratio according to age and gender, the percentage of development of certain post-extraction complications such as post-extraction hemorrhage, abscess, alveolitis or osteitis and the incidence of the development of these complications in association with other co-morbidities.

Continuous variables in the statistical analysis are presented as mean \pm standard deviation. Continuous variables were compared using the Student T test. Categorical variables are expressed as numbers and/or percentages and are compared with the Person Chi-square test.

All statistical tests are 2-tailed and with a $P < 0.05$ value considered statistically significant. All statistical analyzes including odds ratio (OR) were performed in IBM SPSS Statistics (Statistical Package for the Social Sciences) version 20.

A number of 102 patients diagnosed with diabetes mellitus (both type 1 and type 2) who underwent the dental intervention of dental extraction were included in the study, the statistical analysis including a variety of demographic parameters, anamnestic or associated with periprocedural complications.

RESULTS

Statistical analysis of demographic data

Age and gender are the main demographic parameters included in the statistical analysis of this study. The gender distribution of the studied group is represented in Figure 2. The average age of the statistically analyzed group was 66.89 ± 9.49 years, the range of values being included between a minimum of 32 years and a maximum of 85 years. The variation of the number of cases correlated with the ages of the patients is represented in Figure 3.

Statistical analysis of anamnestic data

The analysis of anamnestic data was aimed at detecting and dividing patients according to the type of diabetes, but also according to associated comorbidities.

Diabetes – 87.3% of the patients included in the study have type 2 diabetes (89 cases), the percentage of those with type 1 being significantly lower (13 cases, 12.7%) (Figure 4).

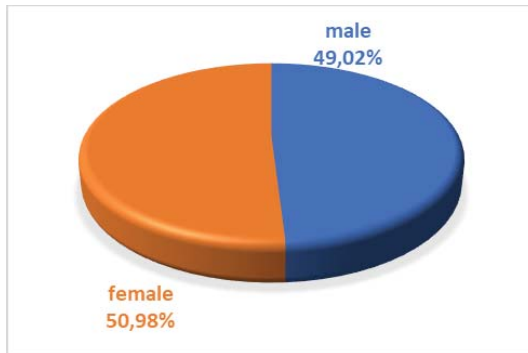


Figure 2. Distribution of cases according to gender

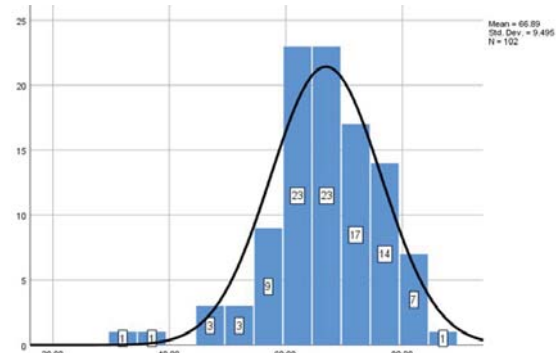


Figure 3. Variation of the number of cases in relation to the age of the patients

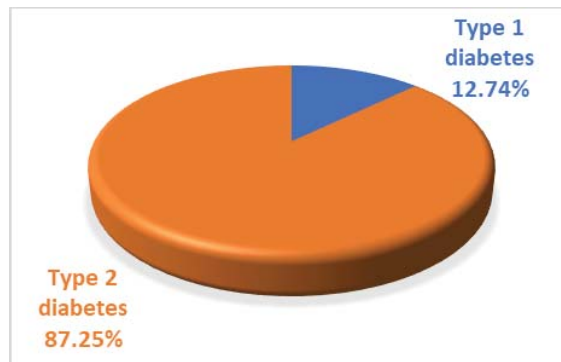


Figure 4. Distribution of cases according to type of diabetes

Arterial hypertension was part of the clinical picture of 78.4% of patients, while ischemic heart disease (30.4%), angina pectoris (12.7%) and atrial fibrillation (19.6%) were objectified in low percentages in the statistically analyzed batch. Among the valvular diseases, special attention was directed to the presence of aortic or mitral insufficiency which were present as comorbidities in 23.5% (24 cases) of the patients (Figure 5, Table 3).

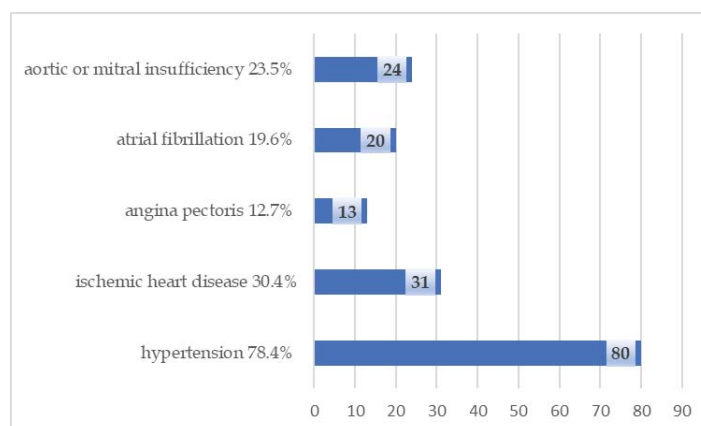


Figure 5. Distribution of cases according to the association of cardiac conditions

Table 3. The share of comorbidities according to the type of diabetes

		DIABETES MELLITUS				P value
		Type 1		Type 2		
		Number of cases	Percentage (%)	Number of cases	Percentage (%)	
GENDER	Female	8	61.5%	44	49.4%	0,415
	Male	5	38.5%	45	50.6%	
HYPERTENSION	Yes	10	76.9%	70	78.7%	0,887
	No	3	23.1%	19	21.3%	
ANTICOAGULANT TREATMENT	Yes	6	46.2%	44	49.4%	0,825
	No	7	53.8%	45	50.6%	
ISCHEMIC HEART DISEASE	Yes	4	30.8%	27	30.3%	0,975
	No	9	69.2%	62	69.7%	
ANGINA PECTORIS	Yes	1	7.7%	12	13.5%	0,559
	No	12	92.3%	77	86.5%	
ATRIAL FIBRILLATION	Yes	4	30.8%	16	18.0%	0,278
	No	9	69.2%	73	82.0%	
AORTIC OR MITRAL INSUFFICIENCY	Yes	2	15.4%	22	24.7%	0,459
	No	11	84.6%	67	75.3%	

Statistical analysis of post-extraction complications

The post-extraction complications manifested by the patients included in the study are: post-extraction hemorrhage, abscess, alveolitis and osteitis (Table 4).

Bleeding: 93.1% of patients did not have bleeding complications after dental extractions, but if these episodes were present, their frequency was associated with type 2 diabetes (prolonged and late form).

Abscess (5.9%) and alveolitis (2.0%) complete the list of complications, being objectified in low percentages of patients. Maxillary osteitis (18.8%), mandibular (14.7%) and bimaxillary (53.9%) completed the list of parameters included in the statistical analysis presented in the present paper, being entities more frequently associated with type 2 diabetes.

Table 3. The proportion of complications associated with dental extractions according to the type of diabetes

		DIABETES MELLITUS				P value
		Type 1		Type 2		
		Number of cases	Percentage (%)	Number of cases	Percentage (%)	
BLEEDING	ABSENCE	10	76.9%	85	95.5%	0,836
	PRECOCIOUS	1	7.7%	0	0.0%	
	EXTENDED	1	7.7%	2	2.2%	
	DELAYED	1	7.7%	2	2.2%	
ABSCESS	YES	2	15.4%	4	4.5%	0,119
	NO	11	84.6%	85	95.5%	
ALVEOLITIS	YES	1	7.7%	1	1.1%	0,600
	NO	12	92.3%	88	98.9%	
MAXILLARY OSTEITIS	YES	1	7.7%	18	20.2%	0,278
	NO	12	92.3%	71	79.8%	
MANDIBULAR OSTEITIS	YES	1	7.7%	14	15.7%	0,445
	NO	12	92.3%	75	84.3%	
BIMAXILLARY OSTITIS	YES	5	38.5%	50	56.2%	0,231
	NO	8	61.5%	39	43.8%	

DISCUSSIONS

Several studies have been conducted to investigate the relationship between severe multi space infections of the oral maxillofacial region and diabetes mellitus. Infection is a risk factor for patients with untreated diabetes because there is an increase in blood glucose levels.

When the body tries to fight an infection, stress hormones such as cortisol and glucagon are produced, which trigger the release of glucose, causing blood glucose levels to rise significantly [14]. A study conducted by Zheng et al showed that uncontrolled diabetics had more serious infections, complications and longer hospital stays than patients without diabetes [15].

Patients with diabetes suffer from dehydration, which affects the body in general and the salivary glands in particular. Thus, the decrease in flow and salivary pH favoring the increase in the colonization of *Candida* species in the oral cavity [16,17]. Dental extractions can create a gateway for fungal infection in patients with uncontrolled diabetes. Mucormycosis of maxillary sinuses, also known as black fungus, a rare and acute fungal infection which is frequently lethal, were detected after dental extraction in poorly controlled diabetic patients [18,19].

Some studies [20,21] indicated that several factors might be associated with dental caries in patients with diabetes, such as daily eating habits, salivary glucose, and low salivary flow, others [22] reported no association. Therefore, tooth extraction due to tooth decay may not be associated with diabetes. Diabetes mellitus was significantly associated with tooth extraction due to periodontal disease [23].

International studies on post-surgical complications after tooth extraction in patients with diabetes are divided. A study in an oral surgery unit shows no statistically significant difference between post-extraction complications in diabetic and non-diabetic patients [24]. Another study showed that smoking showed no significant relationship with the intensity of pain, edema and trismus after extraction [25]. Another study shows that patients with type 1 diabetes and insulin-dependent diabetes type 2, if well controlled, tend to heal well after tooth extraction, with no statistically significant rate of post-extraction complications, including infection [26].

Khan et al. showed that complication rates among patients with comorbidities are four times higher than in healthy subjects [27].

Some studies have concluded that the use of anticoagulant drugs does not have a significant impact on postoperative healing after tooth extraction, provided the INR is maintained <3.0 and effective local hemostasis measures are administered [28,29].

Patients with diabetes and hypertension are at significantly high risk for premature microvascular and macrovascular complications [30,31]. Glycemic control improves microvascular disease. Blood pressure control as well as dyslipidemia are extremely important in the prevention of macrovascular diseases, in addition to glycemic control [32].

The association of the increased percentage of patients with type 2 diabetes with the presence of various comorbidities, especially hypertension, is explained by the literature by the fact that some of the risk factors involved in the etiopathogenesis of type 2 diabetes are cardiovascular diseases and hypertension. Thus, the diagnosis of type 2 diabetes of the patients included in our study may be secondary to another systemic condition.

Although it is generally agreed that diabetic patients are at increased risk of infection and delayed post-extraction wound healing, there is little published evidence to support this claim [3,26,33].

CONCLUSIONS

Management of extractions in diabetic patients is often a difficult task for dentists.

The higher the blood glucose level, the greater the chance that predisposing conditions for post-extraction complications in diabetics will increase sharply.

Dentists must take great care in managing insulin-dependent diabetic patients compared to non-insulin-dependent diabetics or non-diabetic patients.

Surgical treatment of diabetic patients highlights the need to implement early detection, screening and awareness programs to alleviate the burden of managing complications.

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