Hypoglycemia Associated with Dental Implant Surgery in Patients with Diabetes: A Case Series

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Abstract
Poor control of diabetes, improper diet, and lack of oral and dental hygiene may be effective in causing changes in the oral cavity. Oral and dental complications of diabetes include gingival enlargement, periodontitis, dental caries, dry mouth, and halitosis. Given the above, this study was conducted with the aim of reporting the clinical characteristics and signs of 9 patients who exhibited hypoglycemic symptoms during implant placement. In this study, the clinical characteristics of 9 patients who presented for dental services, including implant placement, were reported. It was observed that all 9 patients had a history of diabetes, and during the provision of dental services, they experienced a drop-in blood sugar ranging from mild to severe degrees, and the necessary treatment measures were performed for all of them. Performing dental services, especially the surgical and stressful stages of implantation, affects the glycemic control status in diabetic patients and severely increases the risk of hypoglycemia.

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Introduction

Disease prevention means applying strategies to reduce the impact of risk factors in the development of a specific disease or to enhance factors that reduce susceptibility to the disease [1]. Diabetes is a non-communicable disease that is considered an epidemic [2]. For several reasons, including the high prevalence of this disease, its irreversible complications, and the economic and psychological burden resulting from its onset, this disease is regarded as important and significant. The treatment of diabetes has imposed significant economic pressure on patients and countries, exposing patients to direct and indirect costs resulting from the illness [3-5].

Diabetes affects various types of patients. Type 1 diabetes can occur at any age, but its prevalence is much higher in childhood than in adulthood. Gestational diabetes is a condition where women develop abnormal glucose tolerance during pregnancy, which is associated with increased maternal and fetal complications, as well as long-term complications in the mother and child [6, 7].

The care and treatment of diabetic patients consume a significant percentage of health system budgets, and it is estimated that the medical costs for a diabetic patient are between 2 to 5 times higher than those for healthy individuals. Diabetes complications include long-term damage, impaired function, and failure in various organs [8, 9].

The progressive nature of diabetes and its complications exacerbate the patients' conditions, leading to various sequelae. In fact, diabetes has numerous complications, including vascular complications. Diabetes is a known risk factor for heart disease, leading to poorer outcomes and complications in patients [10, 11].

Poor control of diabetes, improper diet, and lack of oral and dental hygiene may contribute to changes in the oral cavity. Oral and dental complications of diabetes include gingival enlargement, periodontitis, dental caries, dry mouth, and halitosis [12-14]. In fact, the prevalence, progression, severity, and extent of chronic oral diseases are significantly increased in diabetic patients.

Furthermore, oral and dental diseases are reported to be 2 to 4 times more common in diabetic patients than in other patients [15-18]. Periodontitis is inflammation of the tissues supporting the tooth, caused by a specific group of microorganisms [19]. This disease leads to the progressive destruction of periodontal ligaments, alveolar bone, and gingival recession accompanied by periodontal pocket formation. Thus, with the destruction of tissues, the tooth is lost [20, 21].

Given the above points, this study was conducted with the aim of reporting the characteristics and clinical signs of 9 patients who exhibited hypoglycemic symptoms during implant placement.

Case Report

In this study, the clinical profiles of 9 patients who presented for dental services, including implant placement, were reported. It was observed in all 9 patients that they had a history of diabetes, and during the provision of dental services, they experienced a drop-in blood sugar from mild to severe degrees, and the necessary treatment measures were performed for all of them.

Patient Number 1

The patient was a 45-year-old male with Type 2 diabetes who had a history of cardiovascular diseases, including hypertension. Besides high blood pressure, the patient had no other chronic illnesses. The patient presented to the clinic in the afternoon shift at 8:30 AM. During the clinical history taking, the patient did not report any history of diabetes, but during the implant placement procedure, he showed signs of hypoglycemia, for which 115 was called, and the patient was referred to the hospital.

Patient Number 2

The patient was a 39-year-old male with Type 2 diabetes who reported no history of any chronic diseases. The patient presented to the clinic in the afternoon shift at 4:00 PM. During the file creation and clinical history taking, the patient reported signs of diabetes. The patient also stated that he had no problems regarding hypoglycemic symptoms. However, during the surgery, symptoms of hypoglycemia appeared. At that moment, the patient's blood sugar was checked with the device available in the clinic, and since the patient's blood sugar was in the range of 87, the necessary treatment measures were taken immediately, and the patient reported relative improvement.

Patient Number 3

The patient was a 48-year-old male with diabetes who reported a history of stroke and hypertension. The patient was admitted in the afternoon shift at 5:20 PM, and during file creation and clinical history taking, he reported having diabetes but did not report any evidence of hypoglycemia. During the surgery, the patient experienced mild hypoglycemia, his blood sugar was checked and was in the range of 80, at which point the necessary treatment measures were taken, and the patient reported relative improvement.

Patient Number 4

The patient was a 53-year-old male with a history of diabetes and no history of any other chronic disease. The patient presented to the clinic in the afternoon shift at 8:00 PM. Since the initial surgical procedures were performed during the first visit, the patient already had an active file with clinical signs and disease history. The patient had symptoms of hypoglycemia *before* the dental procedures, for which reason the provision of dental services was stopped for the patient.

Patient Number 5

The patient was a 58-year-old female with a history of diabetes and a history of Acute Coronary Syndrome. The patient presented to the clinic in the morning shift at 9:25 AM. During the clinical file creation and history taking, the patient stated that she had injected her insulin but had not eaten breakfast. Given that the patient insisted on receiving dental services without consuming breakfast, the necessary explanations were provided, but the patient showed no inclination to eat breakfast or cancel the implant surgery. Therefore, contact was made with the patient's family, who possessed the necessary health literacy, to provide the necessary guidance to the patient. Upon the patient leaving the clinic, she showed initial signs and symptoms of hypoglycemia, and her blood sugar was checked with the glucometer in the clinic, which measured 91.

Patient Number 6

The patient was a 56-year-old female with diabetes and a history of Rheumatoid Arthritis. The patient presented to the clinic in the afternoon shift at 8:22 PM. The patient was undergoing the second stage of implant placement, and the necessary procedures were performed for her. However, after the implant placement, upon leaving the clinic, she developed initial symptoms of low blood sugar, at which point the secretary prevented her from leaving. She was referred back to the clinic, and the necessary treatment measures were performed for her.

Patient Number 7

The patient was a 34-year-old male with diabetes and no history of any other chronic disease. The patient presented to the clinic in the afternoon shift after performing physical exercises. During the dental surgical procedures, he showed symptoms of low blood sugar, for which the necessary measures were taken, and the progression of hypoglycemia was prevented.

Patient Number 8

The patient was a 31-year-old female with diabetes and a history of visiting a psychiatrist due to an anxiety disorder. The patient presented to the clinic in the morning shift at 10:22 AM. During file creation, the patient reported having diabetes but did not mention anything regarding anxiety-related issues. However, during the dental surgery, the patient developed symptoms of anxiety followed by a drop-in blood sugar, for which the necessary measures were taken.

Patient Number 9

The patient was a 58-year-old male with a history of diabetes and underlying conditions including a history of stroke, knee replacement, cardiovascular diseases, hospitalizations, and a history of allergies. The patient presented to the clinic in the afternoon shift at 5:40 PM. Since the patient was known and had a clinical file and history from 2 months prior for previous visits, a new history was not taken. The patient showed no symptoms of blood sugar drop during the dental services. However, after leaving the clinic and on the way home, he experienced symptoms of hypoglycemia, which

were managed by the patient's son.

Discussion

According to the findings in the 9 reviewed patients who presented to the clinic for dental services, there was evidence of hypoglycemia symptoms. In the study by Dababneh *et al*., a 5-year-old Jordanian boy with Glycogen Storage Disease Type Ib (GSD-Ib) presented to the clinic in February 2014 with severe oral symptoms (gingivitis and recurrent ulcers). The patient simultaneously had multiple systemic symptoms, including hepatomegaly, hypoglycemia, and neutropenia [22]. In the case report by Tian *et al*., an 89-year-old Type 2 diabetic male experienced severe acute hypoglycemia immediately after the induction of general anesthesia. His blood glucose level dropped from a baseline of 4.0 mmol/Lto 0.96 mmol/L (post-anesthesia induction) [23].

In the study by Rad *et al*., 116 patients with diabetes were evaluated for dental health, periodontal tissues, dryness and burning sensation, and mucosal changes. According to the results of the study, gingivitis, periodontitis, and dry mouth were the most common symptoms observed among the patients [24]. In the cohort study by Rezvaninejad *et al*., the prevalence of candidiasis was 10.42%, herpes was 5.06%, oral pigmentation was 13.91%, and erythroplakia was 0.94%. Also, the incidence of erythroplakia was higher in patients receiving insulin than in other patients [25]. Also, in the study by Khoshbakhti *et al*., diabetic (T2DM) patients had significantly more probing depth, tooth mobility, furcation involvement, and missing teeth than the control group, and had higher DMFT and dry mouth indices. In fact, chronic periodontitis and its more severe symptoms are more prevalent in T2DM patients, and implementation of targeted therapeutic interventions is essential to improve oral health outcomes [26].

Conclusion

Dental services, especially the surgical and stressful stages of implant placement, affect the glycemic control status in diabetic patients and severely increase the risk of hypoglycemia.

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