Case report

An atypical presentation of type 1 diabetes

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Abstract

Type 1 and type 2 diabetes have been described historically as occurring in distinct patient populations; however, atypical demographics are becoming more frequent as the prevalence of diabetes increases, crossing boundaries of ages. Some of these cases can be challenging to diagnose clinically as the patient symptomatology and progression can differ from the standard features of type 1 and 2 diabetes. Our case is an example of a patient whose type 1 diabetes presented atypically with characteristics often associated with type 2 diabetes. Patient presentations such as this are uncommon, with our patient having presented with the "textbook" characteristics of type 2 diabetes. When first diagnosed with diabetes mellitus type 2, the patient was 60 years old, had a BMI around 30 and experienced a gradual onset of symptoms over the course of several months. At the age of 64, the patient tested positive for GAD65 autoantibodies following a year of declining glycemic control and was re-evaluated and classified as a type 1 diabetes patient. Subsequent insulin injections resolved his diabetes-related complications which included polyuria, weakness and weight loss and improved his glycemic control. This case provides an example of an unusual clinical presentation of type 1 diabetes and serves to raise awareness for atypical presentations of diabetes to improve accurate classifications at earlier stages.

Keywords: *endocrinology; type 1 diabetes; type 2 diabetes; atypical diabetes*

Introduction

Diabetes mellitus is a metabolic disease characterized by insulin deficiency and/or insulin resistance. Type 1 diabetes results from the autoimmune destruction of pancreatic β cells and is typically found in younger patients while type 2 diabetes occurs due to insulin resistance and is most often found in middle aged to older adults. Each type has been associated with a distinct patient population, however, there are reports of cases with atypical demographics characterized by a crossover in age, weight and other factors [1, 2].

These rare cases are difficult to identify clinically and may require antibody testing to confirm the diagnosis. The incidence of atypical presentations of diabetes mellitus is unknown, however, with the rise in diabetes cases over the past several decades and an expected increase of 54% between 2015 and 2030 [3], a concomitant increase in atypical cases can be reasonably expected.

Case report

This case describes a 64-year-old Caucasian male who was referred for evaluation and treatment of diabetes mellitus which was first diagnosed at the age of 60. At the age of 60 he presented with minimal clinical signs of diabetes mellitus, including mild fatigue, and was diagnosed with type 2

diabetes due to hyperglycemia and elevated HbA1c. He was treated as a type 2 diabetes patient for four years before being placed on insulin at the age of 64 following a significant deterioration in glycemic control. He had no known risk factors for diabetes mellitus and was screened with self-monitoring of blood glucose (SMBG). His past medical history was significant for elevated thyroid stimulating hormone (TSH), but otherwise no significant abnormalities.

Clinical Progression

On 10/28/2020, the patient presented with a multi-day history of polyuria and weakness with deterioration since his previous visit on 7/3/20. Following a weight loss of 5.4 kg during the previous several days, the patient weighed 84.4 kg with a BMI of 29.1. He rarely checked his blood glucose but measured a value of almost 500 mg/dL at home during this time and a value of close to 400 mg/dL in office. On a physical exam, the patient did not appear weak or ill and reported no changes in vision or neurologic symptoms. He reported consistency in taking metformin and glimepiride, with sertraline being added a few months prior. Because of the significant hyperglycemia and concerns of potential diabetic ketoacidosis, he was injected with 20 units of insulin degludec, given 5 units of insulin lispro with instructions for later use and

asked to drink 5 cups of water while in office. (*Note*: treatments vary among providers)

At his follow up on 11/5/2020, he improved with no significant incidences of hyperglycemia, though he experienced blood sugar spikes after breakfast. Along with dietary interventions to mitigate post-breakfast spikes, Insulin degludec increased to 23 units daily and 5 units of insulin lispro with meals. Metformin and Glimepiride were discontinued.

During his visit on 3/29/2021, the patient stated his diabetes was not well-controlled and had variable glucose ranges with hypoglycemia typically occurring before dinnertime. He had a temperature of 36.4°C, weight of 90.7 kg, height of 171.5 cm and BMI of 30.86. The physical exam findings were normal with no foot ulcers or other visible abnormalities. He also had an intact sensory exam. The patient had a recent c-peptide of 0.5 ng/mL on 12/24/2020 and an HbA1c of 7.4% (normal 4.2–5.7%).

During his visit on 5/17/2021, the patient stated his diabetes was well-controlled. He used an insulin pump and continuous glucose monitoring (CGM) sensor between 5/4/2021 and 5/17/2021. Between those dates, his blood glucose was 88% in range with no significant hypoglycemia since beginning insulin pump use. He gained 3.6 kg since 3/29/2021 with no new development of diabetes-related symptoms. Table 1 presents the most important laboratory parameters.

Table 1. Select laboratory results

12/10/20		
Insulin Growth Factor 1	255 ng/mL (high)	Normal: 46-219 ng/mL
Fibrinogen	530 mg/dL (high)	Normal: 276-471 mg/dL
2/18/21		
Urea nitrogen	25 mg/dL (high)	Normal: 6-23 mg/dL
Creatinine	1.1 mg/dl	Normal: 0.7–1.3 mg/dl

Diagnosis and outcome

The patient tested positive for a concentration of 16 IU/mL of GAD_{65} autoantibodies on 3/29/2021, indicating a diagnosis of type 1 diabetes. Likewise, he tested positive for Thyroid Peroxidase

antibodies (TPO) at 499 IU/mL, confirming his diagnosis of autoimmune thyroid disease, Hashimoto thyroiditis in this case.

As indicated on Table 2, the patient's HbA1c levels rose from 9.1% to 13.5% in about 9 months before being treated with insulin in November 2020. While taking insulin

in the form of insulin lispro and insulin degludec, his HbA1c levels dropped from 13.5% to 7.4% in under 4 months. Based on the continuous glucose monitoring (CGM) values between 5/4/21 and 5/17/21, the Glucose Management Indicator (GMI)

predicted an HbA1c of 6.4% just 7 months after the first insulin injection. Likewise, his glycemic control improved with a blood glucose 88% in range with no significant lows as of 5/17/21.

Table 2. HbA1c level evolution

Date	HbA1c
1/13/20	9.1%
7/3/20	10.4%
10/29/20	13.5%
First administration of Insulin in November 2020	
12/24/20	8.8%
2/18/21	7.4%
5/4/21-5/17/21	*Expected HbA1c (GMI) = 6.4%

*Glucose Management Indicator (GMI) - Approximated laboratory A1C level expected based on continuous glucose monitoring (CGM) values

Discussions

Type 1 and 2 diabetes have clinically distinct pathophysiologic etiologies. These discrete pathologies lead to unique presentations for each type and are useful in informing clinical diagnostic practices as well as treatment regimens. The clinical determination of type 1 vs. 2 diabetes is made with consideration of factors including the patient's age, body composition, symptom progression and clinical presentation. Type 1 diabetes typically manifests in young patients, often before the age of 14, who frequently appear thin and have a sudden onset of symptoms, with diabetic ketoacidosis presenting as the first sign of disease in many cases. Type 2 diabetes, on the other hand, often develops around the age of 45 or later and is associated with obesity and metabolic syndrome and usually has a gradual onset.

As both types of diabetes generally have distinct etiologies, diagnosis can often be made based on patient demographics. However, atypical cases can exist in contravention of diagnostic norms. The case detailed above discusses one such patient whose clinical characteristics and progression matched closely with the criteria for type 2 diabetes, even though his pathophysiology

pointed to type 1 diabetes. While his initial diagnosis of type 2 diabetes was made based on his clinical characteristics, antibody tests significant for glutamic acid decarboxylase 65 autoantibody (GAD_{65}) confirmed his diagnosis with type 1 diabetes [3]. While rare, similar atypical cases of diabetes have been reported [1, 2]. With the increasing number of diabetes cases expected in the coming years [4], unusual cases such as the case presented above may become more common. To ensure timely and accurate diagnosis and management of patients with atypical cases of diabetes, we seek to raise awareness of cases which do not adhere to presentational or diagnostic norms.

Key Messages

• It is known that atypical cases of diabetes exist and can complicate the diagnosis of diabetes mellitus.

• This manuscript provides evidence that atypical cases can present with symptoms typically associated with another type of diabetes.

• The case described is an example of a type 1 diabetes patient presenting with several classic features of type 2 diabetes.

Conflicts of interest

There are no personal, financial, or other conflicts of interest to disclose.

Consent for publication

Written informed consent from the patient has been taken and is available for review by Editor in chief of the journal.

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