Case Report

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Presenting with polydipsia and polyuria and diagnosed with central diabetes insipidus, the 75-year-old woman had a 5-year history of controlled type 2 diabetes mellitus.

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ABSTRACT

Background : A rare condition known as central diabetes insipidus (or CDI) is characterized by excessively diluted urine due to a deficiency in antidiuretic hormone. It is uncommon for diabetes mellitus and CDI to coexist without hereditary conditions like Wolfram syndrome. Diagnosing this combination of illnesses is crucial but also difficult because thirst, polydipsia, and polyuria are the symptoms of both conditions. There have been a few documented instances of CDI occurring in people with type 2 diabetes mellitus (T2D). We describe a unique instance of CDI that occurred in a T2D patient who was older. This paper seeks to explore indicators for the early diagnosis of CDI in T2D and to explain the clinical course.

Case Report : T2D symptoms, such as thirst, polydipsia, and polyuria, were experienced by a 70-year-old Japanese woman. The symptoms and hyperglycemia improved with the onset of medical treatment. Between 9% and 6% was the drop in the glycated hemoglobin level. Still, she maintained stable glycemic control, but five years later, at the age of seventy-five, she reverted to polydipsia, polyuria, and thirst. (6.3 L/day), which is a considerable amount of urine. An analysis of urine glucose came back negative. In contrast to the urine, which had a low osmolality of 125 mOsm/kg, the plasma had a high osmolality of 321 ma. It was determined that CDI was the cause of a substantial rise in urine osmolality when vasopressin was administered. Effective symptom relief was obtained with desmopressin treatment.

Conclusions : In patients with diabetes mellitus, including T2D, this case emphasizes the importance of treating CDI as an uncommon but significant concomitant illness, especially in those who present with thirst, polydipsia, and polyuria despite well-controlled glycemia.

KeyWords : Central Diabetes Insipidus • Desmopressin • Polyuria • Type 2 Diabetes Mellitus

INTRODUCTION

Background

A rare endocrine condition called central diabetes insipidus (CDI) is characterized by excessively diluted urine due to a deficiency in the posterior pituitary hormone arginine vasopressin (AVP), sometimes referred to as antidiuretic hormone [1-3]. The objectives of CDI treatment include lowering excessive urine and thirst, as well as addressing and stabilizing the electrolyte imbalance and water shortage. The preferred course of treatment is desmopres- sin, a synthetic AVP analogue.

Chronic hyperglycemia brought on by inadequate insulin activity is a hallmark of diabetes mellitus, a metabolic illness [4,5]. Based on the underlying cause, diabetes mellitus can be categorized. The most prevalent type of diabetes mellitus is called type 2 diabetes (T2D), and it is typified by impaired insulin sensitivity and a relative, as opposed to an absolute, insulin shortage.

Diagnosing co-occurring CDI and diabetes mellitus is crucial and difficult because the two illnesses share symptoms such as polydipsia, polyuria, and thirst [1-4].

Numerous examples of co-existing CDI and diabetes mellitus have been documented in patients with Wolfram syndrome, an uncommon autosomal recessive neurological illness that is characterized by CDI, optic nerve atrophy, juvenile-onset diabetes mellitus, and sensorineural deafness [6]. Rarely can diabetes mellitus and CDI coexist without hereditary problems [6, 7]. Patients with polyglandular autoimmune syndrome have been documented to have both type 1 diabetes mellitus and CDI co-existing [8]. There have been various reports of CDI with T2D [9–14] or diabetic mellitus of other etiologies

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[15–18], while the etiological connections are yet unknown. Since the number of patients with T2D has been rising [19], it is crucial to understand the clinical features of CDI that arise in patients receiving treatment for the disease, even though only a small number of cases have been documented [10,11]. Here, we describe an uncommon instance of an elderly T2D patient who experienced CDI. Sharing the clinical course and discussing hints for the early detection of CDI in T2D patients are the objectives of this report.

Case Report

A 70-year-old Japanese woman with polydipsia, polyuria, pollakisuria, and thirst that began two months ago brought her to a primary care physician. There was paternal T2D in her family background. No member of the family experienced any neurological or renal tract abnormalities, deafness, or vision loss. The patient did not consume alcohol or smoke cigarettes. She had no prior history of radiation therapy, brain surgery, cerebrovascular illness, or brain tumors. In her 20s, she weighed about 46 kg, but over time, she gained 51 kg.

She experienced thirst, polydipsia, pollakisuria, and polyuria when she was 70 years old. When she saw her primary care physician two months later, the physician observed a 3-kg reduction in body weight and hyperglycemia with a high glycated hemoglobin (HbA1c) reading of 9.0%. The patient was put on diet therapy, oral hypoglycemic medications (sitagliptin, 50 mg/day), metformin, 500 mg/day), and the antihypertensive medication amlodipine, 2.5 mg/day), after being diagnosed with type 2 diabetes with mild dyslipidemia and hypertension. Her polydipsia, pollakisuria, polyuria, and thirst all subsided as her hyperglycemia gradually recovered. Her hemoglobin A1c dropped to about 6%.

At the age of 75, the patient experienced thirst, polydipsia, polyuria, and pollaki- suria without any accompanying symptoms like headache or head injuries. She went to see her primary care physician. Urine glucose testing came back negative, but a blood test showed fasting plasma glucose and HbA1c values of 105 mg/dL and 6.7%, respectively. When it was initially believed that she had a bladder issue, oral solifenacin succinate (5 mg/day) was started. She was referred to our hospital and admitted since her symptoms continued.

Upon physical examination, her height was 150 cm, her weight was 43 kg (body mass index: 19.1 kg/m2), her blood pressure was 140/63 mmHg, her pulse rate was 69 beats per minute, and her body temperature was 36.7°C. She produced 6.3 liters of pee per day. She had a parched mouth. Peripheral edema, chest rales, or heart murmurs were not seen.

Laboratory tests (Table 1) showed low urine osmolality (Uosm; 125 mOsm/kg), high plasma osmolality (Posm; 321 mOsm/kg), and high serum sodium (158 mEq/L) and chloride (121 mEq/L). The amount of AVP in plasma was 0.6 pg/mL, which is quite low [20]. These findings revealed that the kidneys' incapacity to concentrate urine and preserve bodily water led to hypertonic dehydration and hypotonic polyuria. We thought about insipidus diabetes.

We skipped the water deprivation test and the hypertonic saline test since the patient had severe plasma hyperosmolality [2,3,21]. Rather than administering intravenous vasopressin (5 units), we conducted the vasopressin administration test, which demonstrated a sharp increase in Uosm from 73 to 509 mOsm/kg and a decrease in urine output from 140 to 15 mL/30 min within 2 hours (Table 2). A diagnosis of CDI was made when a notable 100% increase in Uosm ruled out nephrogenic diabetic insipidus [2,3,21].

No anatomical anomalies in the brain, including the pituitary gland, hypothalamus, or hypoph-yseal stalk, were found using magnetic resonance imaging (MRI). On T1-weighted images, however, the posterior pituitary's strong signal intensity was absent. Idiopathic CDI was consistent with these findings [2,3,22].

On the fourth day of admission, the patient was started on 60 μg of oral desmopressin per day to treat CDI. Due to her polyuria, thirst, and electrolyte imbalance, the dose was gradually increased. There was no anterior pituitary dysfunction found using dynamic assays for anterior pituitary hormone secretion.

Serum autoantibodies against several organs were assessed to look into any co-existing autoimmune illnesses [23]. The patient's thyroglobulin autoantibody test resulted in a positive result (94.0 IU/mL; reference range, <28.0 IU/mL). A normal-sized thyroid gland had coarse, low echogenicity on neck ultrasonography, which suggested Hashimoto thyroiditis [24]. Treatment with synthetic thyroid hormone was not necessary because the patient's serum levels of free thyroxine (1.11 ng/dL) and thyroid-stimulating hormone (3.79 μIU/mL) were both normal (Table 1).

The patient had a fasting plasma glucose of 114 mg/dL and a HbA1c level of 6.6% in relation to her diabetes mellitus (Table 1). Her C-peptide immunoreactivity was 1.8 ng/mL, and her blood immunoreactive insulin level was 3.4 μU/mL. The results of tests for pancreatic islet autoantibodies, including zinc transporter 8 antibody, insulin antibody, insulinoma-associated antigen-2 antibody, glutamic acid decarboxylase antibody, and insulin antibody, were negative. These results were in line with a diagnosis of type 2 diabetes that included a largely intact endogenous insulin synthesis capacity. There was no diabetic retinopathy found by funduscopy. The patient's Achilles tendon reflexes were normal, and she did not have any numbness in her hands or feet.

Urine volume dropped to about 1 L/day throughout CDI treatment, once desmopressin was increased to 300 μg/day (Figure 1). Her polydipsia, pollakisuria, polyuria, and thirst all subsided. Additionally, the serum levels of Uosm, Posm, and chloride also returned to normal. On day 28 of hospitalization,

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the patient was released from the hospital with instructions to continue receiving desmopressin medication and information about getting enough water each day.

For almost three years, the patient's clinical course has been uneventful.

DISCUSSION

The diagnosis of type 2 diabetes was supported by the clinical characteristics of diabetes mellitus in our patient, including islet autoantibody negative, comparatively maintained endogenous insulin secretory capacity, concomitant hypertension and dyslipidemia, and a family history of the disease [4,5]. Diabetes mellitus was managed medically with food therapy and oral hypoglycemic medications, which also prevented the onset of chronic problems such diabetic retinopathy. Nevertheless, the patient had thirst, polydipsia, and polyuria five years after the T2D occurred, and CDI was identified. In patients with diabetes mellitus, including T2D, this case emphasizes the importance of clinicians being aware of CDI as a rare but significant concurrent disease, particularly in patients who present with thirst, polydipsia, and polyuria despite well-controlled glycemia.

Cases of co-occurring T2D and CDI that have been reported have distinct on-set patterns at different ages. There were concurrent CDI and T2D in a 56-year-old male, although there were no abnormalities found on brain MRI [12]. Two months after undergoing brain surgery for a craniopharyngioma and developing hypopituitarism with CDI, an obese 16-year-old boy developed T2D associated with non-ketotic severe hyperglycemia [13]. In addition to being diagnosed with Klinefelter syndrome, an obese 41-year-old man who had received treatment for CDI for five years also had hyperosmolar diabetic coma [9]. Similar to our situation, there have also been a few instances of CDI developing in T2D patients [10,11].

The documented cases of co-occurring T2D and CDI had diverse on-set patterns at different ages. A 56-year-old male patient had both CDI and T2D at the same time, although his brain MRI revealed no abnormalities [12]. The 16-year-old boy who was obese and had hypopituitarism with CDI two months prior to brain surgery for a craniopharyngioma developed type 2 diabetes (T2D) with non-ketotic severe hyperglycemia [13]. An obese 41-year-old man who had been treated for CDI for five years was diagnosed with hyperosmolar diabetic coma in addition to Klinefelter syndrome [9]. There have also been a few cases of T2D patients acquiring CDI, which is comparable to our circumstance [10,11].She was diagnosed with CDI five years later, though, when she began to recur with thirst, polydipsia, and polyuria despite having her glycemia under control. Therefore, regular, adequate glycemic control not only helped us identify CDI early on but also eased the symptoms of hyperglycemia.

AVP deficit CDI can be acquired or inherited [2,3,21]. The underlying cause of hereditary CDI is mutations in the AVP gene, and symptoms appear progressively throughout infancy [25]. Numerous conditions can result in acquired CDI, including traumatic brain injury, brain surgery, tumors of the pituitary and hypothalamus, as well as inflammatory, infiltrative, autoimmune, and vascular conditions [2,3,21,26]. Nevertheless, a large number of acquired cases are idiopathic and lack a known cause [2–3]. In these idiopathic instances, autoimmunity may be the etiology [3–5], particularly in the presence of other autoimmune illnesses that are unique to particular organs [21–23].In this instance, the patient's CDI was most likely acquired because she had an advanced age at the time of her diagnosis and a negative family history of CDI. She had an autoimmune thyroid illness, but an MRI revealed no morphological abnormality in the intra- or suprasellar areas [24]. These results pointed to autoimmunity as a potential cause of her idiopathic CDI.

T2D has a diverse pathophysiology that includes both hereditary and environmental variables, such as obesity brought on by overeating and inactivity [4,5]. Type 2 diabetes (T2D) is not commonly linked to pancreatic autoimmunity, in contrast to type 1 diabetes mellitus. These results imply that there was no etiological connection between T2D and CDI in our patient.

CONCLUSIONS

We present an elderly patient diagnosed with CDI after developing thirst, polydipsia, and polyuria after five years of well-treated T2D. The symptoms were successfully relieved by desmopressin medication. In patients with diabetes mellitus, including type 2 diabetes, physicians should be aware of CDI as a rare but significant concomitant illness, particularly in those who present with thirst, polydipsia, and polyuria despite well-controlled glycemia.

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