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Pheochromocytoma Rare Cause of Uncontrolled Type 2 Diabetes Mellitus: A Case Report from Cameroon

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Abstract

Pheochromocytoma (PHEO) is a rare endocrine tumor from the chromaffin cells in the adrenomedullary gland and sympathetic/parasympathetic ganglia, secreting one or more catecholamines. It is frequently associated with hypertension and described in the literature as a cause of secondary diabetes mellitus. In patients with known persistent uncontrolled diabetes, PHEO is rarely mentioned as the cause of uncontrolled diabetes. The authors report a rare case of PHEO diagnosed in a 64-year-old female patient treated for 10 years with type 2 diabetes mellitus and hypertension. She was treated using a combination of insulin (2 injections) and Metformin 1000 mg twice a day. The glycemic control was poor (HbA1c-11%), and persistent High Blood Pressure (HBP). She presented with unexplained weight loss associated with permanent hyperhidrosis (sweating), affecting her quality of life and diffuse abdominal pain. The investigations confirmed the diagnosis of PHEO, which resection led to improvement of glycemic control and hypertension.

Keywords

Pheochromocytoma, Uncontrolled, Diabetes, Hypertension, Cameroon

1. Introduction

Glycemic imbalance in diabetic patients may result from several intercurrent factors and may also be the consequence of insulin resistance due to exogenous

utilization or endogenous hypersecretion of counterregulatory hormones (glucagon, epinephrine, glucocorticoids, growth hormone, etc.).

Endocrine disorders include pheochromocytoma (PHEO), which is a tumor from the chromaffin cells in the adrenomedullary gland and sympathetic/parasympathetic ganglia secreting one or more catecholamine: epinephrine, norepinephrine, and dopamine [1].

This tumor is rare with an estimated annual incidence of 2 - 8 per million population. Typical clinical manifestations include the Menard's triad with headaches, palpitations and sweating, associated with paroxysmal hypertension, but they can mimic many other disorders [2].

The hyperglycemia in PHEO is known to be caused by inhibition of insulin secretion, stimulation of glucagon secretion, and increased insulin resistance in the peripheral tissues.

In fact, physiologic studies have shown that activation of alpha- and beta-adrenergic responses are involved in decreased glycogenesis and increased glycogenolysis and gluconeogenesis in the liver and in the regulation of insulin and glucagon release (decreased insulin and increased glucagon secretion) in the pancreas [3] [4].

PHEO is a known cause of secondary diabetes mellitus described in the literature [5]-[7] and the prevalence of diabetes in patients with PHEO varies between 21% - 50% [4] [8] [9].

However, being a cause of secondary diabetes, PHEO is sometimes underestimated, and the reported cases have been late or incidentally diagnosed in the context of resistant antidiabetic treatment, ketoacidotic or hyperglycemic decompensation [10]-[14].

In Cameroon, from 1985 to 2009, 9 cases of PHEO were reported and 3 other cases of PHEO were found among 18 cases reported of adrenal tumors in a recent study, none of them was associated with diabetes [15] [16].

The reported cases demonstrate that surgical management (tumor resection) of pheochromocytoma leads to the improvement of glycemic control and hypertension.

The authors report a case of pheochromocytoma discovered in a known diabetic patient treated for ten years in Cameroon. The patient was clearly informed, and her consent to publish this case was obtained.

2. Case Presentation

64-year-old female patient with diabetes for 10 years, with a family history of diabetes and abdominal (android) obesity at the time of her diabetes discovery. Hypertension was discovered 2 years following the diagnosis of diabetes.

She presented in February 2024 with unexplained weight loss, associated with permanent hyperhidrosis (sweating) affecting her quality of life and diffuse abdominal pain evolving for several months in a context of uncontrolled grade 3 hypertension and hyperglycemic imbalance with an HbA1c of 11% and random

glycemia of 268 mg/dl. Her Waist circumference at the admission was 98 cm.

She was treated with 2 injections of premix insulin (Mixtard 30®), 34 units in the morning and 30 units in the evening and Metformin 1000 mg twice a day, with good observance and adherence.

Biochemical testing revealed elevated plasma metanephrines and chromogranin A (See Table 1). Other hormones were normal. Insulin and glucagon levels before and after surgery were not tested.

An abdominal CT scan identified a large, heterogeneous, oblong left adrenal tissue mass, with a necrotic fluid portion, with clear boundaries, measuring 105 × 79 × 68 mm. Its tissue portion was isodense with heterogeneous enhancement of density varying between 42 and 77 HU after injection of contrast agent (see Figure 1 and Figure 2).

The patient underwent a left adrenalectomy via the lumbar approach.

The histopathological analysis identified this tumor as pheochromocytoma.

Following surgical resection of the tumor, we observed normalization of blood pressure and improvement of glycemic control with an HbA1c of 7%. Afterwards, insulin was stopped, the patient remained on metformin alone.

Table 1. Hormone dosages.

Hormones	Patient's Results	Standard ranges
Plasma metanephrines	260 ng/l	(N: 65 ng/l)
Plasma nometanephrines	10,038 ng/l	(N:196 ng/l)
Chromogranin A	1651 ng/ml	(N <102 ng/ml)
TSHus	1.44 mUI/l	(N: 0.27 - 4.20)
PTH intact	38 ng/l	(N: 5 - 60)
Calcitonine	<0.60 ng/l	<10 ng/l
Ionized calcium	1.07 mmol/l	1.05 - 1.35 mmol/l

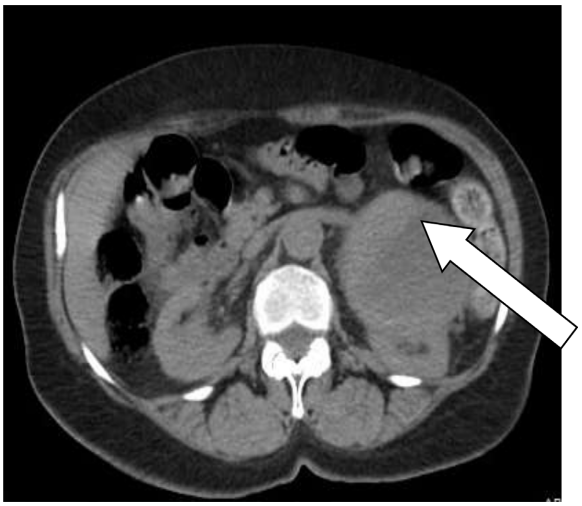

Figure 1. CT scan before contrast injection.

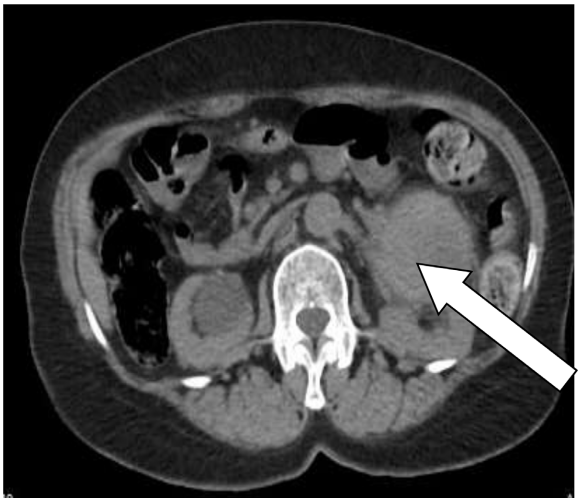

Figure 2. CT scan after contrast injection.

3. Discussion

Diabetes is frequently associated with pheochromocytoma [4] [8] [9], as described pathophysiologically the interplay between disorders of glucose homeostasis and PHEO resulting from high circulating levels of catecholamines is mainly the product of compromised insulin secretion from the β-cells in the pancreas, decreased glucose uptake in the peripheral tissues, and increased insulin resistance [3].

Similarly to the cases reported in the literature by other authors [5]-[7], despite the delay of diagnosis in our case, the hypothesis of diabetes secondary to pheochromocytoma is not totally excluded,

However, our patient was diagnosed and treated with type 2 diabetes for ten years based on clinical and epidemiological features (age, family history and android obesity) also at the time of diagnosis of diabetes there were not clinical signs (paroxysmal hypertension, headaches, palpitations and sweating) of pheochromocytoma. These arguments are likely in favor of pheochromocytoma occurring in a known T2DM patient with persistent uncontrolled diabetes, treatment-resistant hypertension and clinical manifestations leading to its diagnosis.

Unlike our case, Rehaima *et al.* reported a case of PHEO diagnosed simultaneously with diabetes [17].

There are some described cases of delay of diagnosis or misdiagnosis of pheochromocytoma, while diabetes is found to be the main clinical manifestation [18] [19].

The 3-year delay in diagnosis of pheochromocytoma was reported by Saito *et al.* in the context of persistent uncontrolled diabetes [18].

Other authors have reported cases of acute decompensation of diabetes with ketoacidosis due to pheochromocytoma [20] [21].

Concerning biochemical diagnosis, we found elevated plasma metanephrines and chromogranin A, on the other hand Bole *et al.* and Saito *et al.* tested and found elevated both urinary and blood metanephrines [18] [19].

In our case, the morphological diagnosis was confirmed by imaging, particularly

CT, which revealed a large unilateral left adrenal tumor. In the cases reported by Bole *et al.*, MRI revealed a bilateral mass, while Saito *et al.* found an abdominal mass using ultrasound and Isotani *et al.* performed both, first of all ultrasound, then CT scan [18]-[20].

The glycemic control and blood pressure were significantly improved in our patient following tumor resection, with the reduction in HbA1c as reported by other authors [9] [22].

Following the postoperative management of diabetes, taking into account the history and the duration, we observed an improvement in treatment, leading to total cessation of insulin therapy and continuation of metformin. Nevertheless, we do not recommend a total cessation of diabetes treatment.

Our patient presented with risk factors (age and high body mass index) considered factors of the irreversibility of diabetes in patients with pheochromocytoma even after tumor resection [9] [23] [24].

4. Conclusions

This clinical case highlights the importance of detailed investigations of causes of persistent uncontrolled diabetes and hypertension considering treatment despite good observance and adherence, excluding all frequent causes.

Although rare, PHEO may be an etiology of secondary diabetes or an unusual cause of uncontrolled treated diabetes.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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