CASE REPORT

Unusual presentation of pheochromocytoma

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SUMMARY

A 44-year-old woman, with a background of heart, lung and renal transplantation secondary to cystic fibrosis and type 1 diabetes, presented with tachycardia, hyperglycaemia, nausea and vomiting. She was initially managed for diabetic ketoacidosis with severe dehydration. However, persistent episodic hypertension and tachycardia led the investigating team to identify significantly raised urinary metanephrines and a left-sided adrenal mass; Iodine-123-meta-iodobenzylguanidine single photon emission computer tomography scan (MIBG SPECT/CT) showed avid uptake of tracer, confirming a left-sided pheochromocytoma. She was started on medical management and is awaiting an elective laparoscopic procedure. This case describes the presentation of a unilateral pheochromocytoma as ketoacidosis in a patient with type 1 diabetes with no other apparent precipitant. This highlights the metabolic counter-regulatory effect of excess catecholamines in addition to the inotropic/chronotropic effects that are associated with this adrenal tumour. Recognition of atypical signs and symptoms may point towards an atypical precipitant of diabetic ketoacidosis—a medical emergency presenting to front-line clinicians.

BACKGROUND

Front-line acute clinicians will generally manage the initial presentation of diabetic ketoacidosis. This case is important as it serves to remind clinicians of the varied presentation of pheochromocytoma, in this case diabetic ketoacidosis driven by pathophysiological catecholamine excess.

CASE PRESENTATION

A 44-year-old woman with a background of previous heart, lung and renal transplantation secondary to cystic fibrosis and type 1 diabetes, presented with tachycardia, hyperglycaemia (24.6 mmol/L), nausea and vomiting. On examination, she was in sinus tachycardia with systolic blood pressure of 210 mm Hg, non-feverish and clinically dehydrated. ECG showed sinus tachycardia with a heart rate of 120 bpm.

Blood tests on admission showed the following: white cell count $15.1 \times 10^9/L$, C reactive protein 5 mg/L, sodium 140 mmol/L, potassium 3 mmol/L, creatinine 129 $\mu\text{mol/L}$, lactate 17 mg/dL and glycated haemoglobin 53 mmol/mol. Bedside urinalysis showed 3+ ketones. A chest radiograph showed bilateral airway infiltrates suggestive of infective consolidation and pulmonary oedema. An echocardiogram was performed, which showed normal overall systolic function with a left ventricular ejection fraction of 55–60%.

Figure 1 CT scan showing left-sided partially necrotic adrenal mass (axial plane).

The patient was initially treated for diabetic ketoacidosis with intravenous fluids and a fixed-rate insulin infusion. Intravenous antibiotics were also administered empirically for suspected pneumonia and volume depletion was presumed to be driving a sinus tachycardia. She was subsequently transferred with type 1 respiratory failure to the intensive treatment unit (ITU), where she remained hypertensive. During the ITU admission, she experienced frequent hypertensive crises with systolic blood pressure recordings rising to 300 mmHg. In addition to respiratory support, she required intermittent haemofiltration for acute kidney injury.

Figure 2 CT scan showing left-sided partially necrotic adrenal mass (coronal plane).

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Table 1 Urinary metanephrines

	Metadrenaline	Normetadrenaline	3-Methoxytyramine
24 h Urine collection (urine volume 949 mL)	13.11 $\mu\text{mol}/24\text{ h}$ (0–1.2 $\mu\text{mol}/24\text{ h}$)	7.53 $\mu\text{mol}/24\text{ h}$ (0–3.3 $\mu\text{mol}/24\text{ h}$)	0.91 $\mu\text{mol}/24\text{ h}$ (0–2.5 $\mu\text{mol}/24\text{ h}$)

INVESTIGATIONS

An abdominal CT scan was requested, which showed a partially necrotic left-sided 4.5 cm adrenal mass (figures 1 and 2). Urinary free metadrenaline and normetadrenaline levels were found to be significantly raised with normal 3-methoxytyramine levels (table 1). On review of the initial clerking notes, it was documented that this patient had suffered from episodic headaches and palpitations in the past, and was due for further investigation by the Cardiology team. A subsequent 123I-MIBG SPECT/CT scan was requested and showed avid uptake of tracer in the left adrenal gland (figure 3). Phenoxybenzamine and labetalol were started with good effect, and she had no further episodes of hypertension nor of tachycardia. She made a good recovery over 2–3 weeks and was subsequently discharged with outpatient multidisciplinary team follow-up, in view of definitive surgical management.

DIFFERENTIAL DIAGNOSIS

A patient presenting with diabetic ketoacidosis requires immediate treatment as a medical emergency. Severe dehydration secondary to osmotic diuresis and vomiting may lead to hypovolaemia and contribute to haemodynamic instability, in

particular hypotension and tachycardia. Diabetic ketoacidosis may present *prima facie* or commonly be driven by underlying sepsis in a newly diagnosed or known type 1 diabetic. Therefore the collection of signs and symptoms of diabetic ketoacidosis described may mask underlying precipitants. In all patients with diabetic ketoacidosis, a septic screen will help to identify common causes of septic precipitants. Diagnoses that should be considered as a cause of accelerated hypertension include renal artery stenosis, hyperthyroidism, cocaine abuse and primary hyperaldosteronism. In this case, the unusual pattern of episodic hypertension and tachycardia, with evidence of associated renal organ failure with no obvious septic precipitants, suggested a possible underlying catecholamine excess leading to this presentation of diabetic ketoacidosis.

TREATMENT

The patient was started on oral phenoxybenzamine 10 mg once daily and oral labetalol 200 mg three times a day, and recovered well, remaining haemodynamically stable.

OUTCOME AND FOLLOW-UP

The patient is currently haemodynamically stable on alpha and beta blockade medication. She is currently awaiting resection of the left-sided phaeochromocytoma which is planned electively as a laparoscopic procedure.

DISCUSSION

Phaeochromocytomas are neuroendocrine tumours originating from adrenal medullary chromaffin cells or extra-adrenal paraganglionic cells, with approximately 80% of tumour originating in the former.¹ Sporadic tumours usually present between the ages 40–50 years, with a wide variety of symptoms and clinical

Figure 3 123I-MIBG SPECT/CT scan showing avid uptake of tracer in the left adrenal gland. (A) Axial plane (B) sagittal plane and (C) coronal plane.

signs including headache, hypertension, anxiety and tachycardia secondary to excessive catecholamine release.^{1 2} The classic triad of sweating, palpitations and headaches has previously been described.³ Pheochromocytomas may also present or develop into malignant tumours with poorer prognosis; 3-methoxytyramine has been shown to be a good biomarker to distinguish metastatic from non-metastatic disease.⁴

There have been only four published case reports of pheochromocytoma presenting as diabetic ketoacidosis in the peer-reviewed literature.^{5–7} In this case report, the presentation of diabetic ketoacidosis despite adherence to insulin therapy for type 1 diabetes control indeed suggested an alternate insult leading to ketoacidosis, which was found to be chronic catecholamine excess. Diagnosis of the underlying pheochromocytoma on initial presentation was delayed due to the more common presentation of severe dehydration and suspected infection, which may lead to haemodynamic instability. However, persisting episodic hypertension and tachycardia typical of catecholamine

excess led the team to investigate for a pheochromocytoma, which was revealed and successfully treated. Catecholamines are positively inotropic and are also important counter-regulatory hormones helping to prevent hypoglycaemia by promoting lipolysis, gluconeogenesis and glycogenolysis,⁸ alongside reducing peripheral uptake of glucose. Insulin resistance has been reported in approximately 50% cases of pheochromocytoma with varying mechanisms.⁸ Therefore, an individual with type 1 diabetes is susceptible to the effects of excess catecholamines: not only haemodynamic instability but altered carbohydrate and fatty acid metabolism leading to diabetic ketoacidosis.

Contributors JMP and DCDH both contributed to preparing and writing of the case presentation. JMP contributed to the literature search, inclusion of evidence base and writing of the manuscript. DCDH contributed to inclusion of the evidence base, sourcing images and writing of the manuscript.

Competing interests None declared.

Patient consent Obtained.

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Learning points

- ▶ Pheochromocytoma may rarely present as diabetic ketoacidosis.
- ▶ Common causes of diabetic ketoacidosis should initially be ruled out before considering neuroendocrine tumours as a cause.
- ▶ Excessive catecholamine production disturbs glycaemic control by directly affecting insulin sensitisation and glucose storage, in addition to promoting glycogenolysis and gluconeogenesis.
- ▶ Individuals with pre-existing type 1 diabetes are susceptible to the effects of excess catecholamines, in particular altered carbohydrate and fatty acid metabolism, leading to diabetic ketoacidosis.

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