Ruptured functioning adrenal tumour, atypical presentation with renal colic and hypertension

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SUMMARY
Pheochromocytomas are uncommon tumours that originate in chromaffin cells. They are a representation of 0.1%–1% of all cases of secondary hypertension. Most pheochromocytomas are unilateral and benign, featuring catecholamine production, as well as the production of other neuropeptides. Pheochromocytomas are mostly located in the adrenal gland; the frequency of occurrence is highest between 30 and 50 years of age; however, up to 25% of cases may be linked to multiple endocrine neoplasia type 2, Von-Hippel-Landau disease and type 1 neurofibromatosis in the young. We present a case of ruptured left adrenal pheochromocytoma with an atypical presentation.

BACKGROUND
Pheochromocytomas are rare tumours that affect the sympathetic nervous system. They originate from the adrenal medulla chromaffin cells. Most pheochromocytomas are unilateral, at least in 90% of cases. The prevalence of bilateral disease is higher in the paediatric population and associated with genetic syndromes. Tumours are more common on the right adrenal medulla, with a higher preponderance to trigger paroxysmal hypertension. Conversely, left-sided tumours cause persistent hypertension. According to recent studies, these tumours are seen in at least 2–8 cases per million per year.1 It is also associated with less than 0.1% of hypertension cases, although 90% of patients with pheochromocytoma have hypertension.2 Pheochromocytoma presents with symptoms such as diaphoresis, headaches and palpitations. Elective surgery is considered as the gold-standard treatment. Of cases may be linked to multiple endocrine neoplasia type 2, Von-Hippel-Landau disease and type 1 neurofibromatosis in the young. We present a case of ruptured left adrenal pheochromocytoma with an atypical presentation.

The physical examination yielded that his blood pressure was 162/102 mm Hg, his monitored heart rate was 116 bpm, his respiratory rate was 21 per minute, his oxygen saturation was 98%, and he was afibrile.

CASE PRESENTATION
A 30-year-old Tunisian man has presented to Hamad General Hospital, a tertiary hospital in the state of Qatar, with severe left flank pain associated with headache. The patient was sweating, anxious, and in excruciating pain. He reported diffuse left-sided chest pain and shortness of breath. He denies fever, vomiting, diarrhoea, trauma, haematuria or any urinary manifestation. He had an episode of chest pain 1 month ago for which he was treated in another hospital as non-ST segment elevation myocardial infarction. The patient was married without children and a nonsmoker. The patient gave a history of high blood pressure a few months ago when his general practitioner started him on amiodarone 5 mg, which he used for a week and stopped with no follow-up. The patient had no known allergies.

The physical examination yielding that his blood pressure was 162/102 mm Hg, his monitored heart rate was 116 bpm, his respiratory rate was 21 per minute, his oxygen saturation was 98%, and he was afibrile.
Case report

He was fully conscious and had no neurological deficit. Chest and heart examination were unremarkable. The abdomen was distended with tenderness on the left side. His extremities examination showed equal bilateral peripheral pulses with no signs of deep vein thrombosis.

Bedside point-of-care ultrasound (POCUS) showed no hydronephrosis bilaterally, no free fluids, a normal diameter of the aorta. The heart has normal contractility, no right-sided strain and had no pericardial effusion.

INVESTIGATIONS
His complete blood count (CBC) showed leucocytosis and mild anaemia (haemoglobin 12.4 g/L and haematocrit 37.5 %). He had mild renal impairment as his creatinine was 170 µmol/L. His remaining blood investigations, including electrolytes and liver function, were within normal limits (table 1). Cardiac markers were within the normal range. Urine analysis was normal. His ECG did not show acute ischaemic changes. The chest X-ray was normal, with no pneumothorax or pneumonia.

CT of the abdomen and urinary tract (figure 1) showed a large soft tissue like lesion at the left adrenal region with hyperdensities. For the best illustration of the mass, the radiologist asked for a CT angiography (figure 2), which showed posteromedial active extravasation of contrast seen on the arterial phase fade mostly at the delay phase. This lesion measured 9.7×12.3×12.6 cm in transverse, anteroposterior and craniocaudal dimensions. The lesion was pushing the left kidney downward and laterally with severe surrounding fat stranding and perinephric fluid. No significant hydronephrosis was noted in both kidneys with normal kidneys enhancement bilaterally. No stones were noted along the kidney and urinary bladder axis.

DIFFERENTIAL DIAGNOSIS
The patient presented to the emergency department with a picture of acute renal colic with a hypertensive emergency in the form of high blood pressure, chest pain and shortness of breath. His ECG did not show ischaemia. Bedside POCUS did not show hydronephrosis bilaterally and normal diameter aorta. Cardiac markers were within the normal range. The contrast-enhanced CT abdomen concluded that there was a large left adrenal region haematoma with active bleeding.

TREATMENT
The patient had a CT of the abdomen and urinary tract showed a significant soft tissue lesion at the left adrenal region. The radiologist preferred to do another CT angiogram while the patient was on the table, which showed bleeding from the left adrenal mass. The patient’s clinical condition was monitored by serial measurement of the vital signs, CBC, arterial blood gases, and urine output. The patient received intravenous phentolamine (alpha-blocker) to control his blood pressure. During this procedure...

Table 1  Baseline blood investigations

<table>
<thead>
<tr>
<th>Investigation</th>
<th>Result</th>
<th>Normal range</th>
</tr>
</thead>
<tbody>
<tr>
<td>White cell count</td>
<td>20×10⁹/L</td>
<td>4.00–10.00×10⁹/µL</td>
</tr>
<tr>
<td>Haemoglobin</td>
<td>12.4 g/L</td>
<td>13.0–17.0 g/dL</td>
</tr>
<tr>
<td>Haematocrit</td>
<td>37.5 %</td>
<td>40.0%–50.0%</td>
</tr>
<tr>
<td>Mean corpuscular volume</td>
<td>80.3 fl</td>
<td>83.0–101.0 fl</td>
</tr>
<tr>
<td>Mean corpuscular haemoglobin concentration</td>
<td>32.8 g/dL</td>
<td>31.5–34.5 g/dL</td>
</tr>
<tr>
<td>Platelets</td>
<td>302×10³/µL</td>
<td>150–400×10³/µL</td>
</tr>
<tr>
<td>Urea</td>
<td>10.2 mmol/L</td>
<td>2.8–8.1 mmol/L</td>
</tr>
<tr>
<td>Creatinine</td>
<td>170 µmol/L</td>
<td>70–115 µmol/L</td>
</tr>
<tr>
<td>Sodium</td>
<td>137 mmol/L</td>
<td>135–145 mmol/L</td>
</tr>
<tr>
<td>Potassium</td>
<td>4.0 mmol/L</td>
<td>3.6–5.1 mmol/L</td>
</tr>
</tbody>
</table>

Figure 1  CT of the abdomen and urinary tract showed a large soft tissue like lesion at the left adrenal region with hyperdensities within (red arrow), pushing the left kidney downward and laterally with severe surrounding fat stranding and perinephric fluid.
period, the patient was haemodynamically stable, and there was no drop of haemoglobin (12.4 g/dL) and haematocrit (37.5 %). Left adrenal artery angioembolisation after 12 hours from the patient’s presentation on a life-saving basis was done (figure 3). No immediate complications were encountered, and there was no extravasation postembolisation.

Postangiography, the patient was admitted into the surgical intensive care unit (ICU), where he continued to have tachycardia with high blood pressure; oral prazosin 1 mg (alpha-blocker) was commenced, and the blood pressure was monitored every 1 hour through an arterial line measurement (table 2).

Serial CBC showed a drop in haemoglobin to (7.1 g/L) and haematocrit (23.3 %), and the patient’s condition deteriorated, so three units of packed red cell count were transfused, then he was taken for emergency laparotomy. Later, the patient did well with an uneventful postoperative course.

**Figure 2** CT abdominal angiography showed posteromedial active extravasation of contrast seen on the arterial phase (red arrow), venous phase (blue arrow), and fade mostly at the delay phase (green arrow).

**Figure 3** Transarterial selective left adrenal artery embolisation; selective catheterisation of the left superior adrenal artery (A), selective catheterisation of the left inferior adrenal artery (B), embolisation with a tiny amount of 350–500 particles (C).
OUTCOME AND FOLLOW-UP
The patient had a smooth postoperative course, and his blood pressure improved on alpha-blocker medications. He was discharged and following with the endocrine and oncology team in outpatient clinics. The surgical pathology report showed a pheochromocytoma with mitotic figures greater than 4/10 per high-power fields (2), high cellularity (2), large nests or diffuse growth (2) and focal or confluent tumour necrosis (2). So, the total Pheochromocytoma of the Adrenal Gland Scaled Score was 8 over 20 (Scores exceeding four predicts an aggressive potential and aggressive behaviour). He underwent a regular follow-up CT scans and a regular follow-up with catecholamines in urine yearly, and he did not show recurrence until now (figure 4).

During the outpatient follow-up visits, the patient’s blood pressure was controlled without medications, and he did not develop any pain. Whole-body fluorodeoxyglucose-positron emission tomography done on 2 September 2020, showed that there is no evidence of 6-[18F]fluor-1,3,4-dihydroxyphenylalanine avid lesion to suggest metastatic or recurrent disease.

DISCUSSION
Rupturing of adrenal pheochromocytoma is very rare. In the most cases, it can be lethal. The first report of this condition was done by Cahill. Since then, a total of 50 cases (38 cases of ruptured pheochromocytoma, and 12 cases of haemorrhagic) have been reported between the 1950s and 2000s globally. It has a 34% mortality rate globally.7–10 A 2008 study described a case of PMC after induction of general anaesthesia in the context of elective adrenalectomy for an established case of pheochromocytoma, despite the preoperative blockade.11 The clinicians aborted surgical resection, and the patient was moved to a facility and confined to the ICU for 6 days where his medical condition was stabilised, after which he underwent urgent adrenalectomy. The multisystem organ failure resolved, and the patient was discharged after a month.

A 2010 study reported a case of PMC that presented with encephalopathy and acute respiratory failure. In this case, surgical resection was carried out 11 days after a patient’s admission due to progressive deterioration of the patient’s medical condition.12 There was a significant improvement in the patient’s condition after the operation and resolution of the multisystem organ failure. However, the patient still had to undergo long-term haemodialysis due to chronic renal failure.

Another study reports the case of a patient who struggled with acute heart failure with cardiogenic shock refractory to inotropic pharmacotherapy. There was a need for the insertion of an intravascular balloon pump. The clinicians also considered extracorporeal membrane oxygenation. However, the physicians involved who took charge of the treatment chosen to perform emergent adrenalectomy. This resulted in a great improvement in the patient’s respiratory and haemodynamic status after surgery.13

Preoperative mortality is mostly caused by hypovolaemia due to haemorrhage, heart failure due to catecholamine cardiomyopathy, and respiratory disorder due to pulmonary oedema.10 The precise cause and mechanism of pheochromocytoma are not fully understood. Rapid tumour development and intratumoural haemorrhage may trigger an increase in capsule pressure, thus resulting in rupture. After rupturing, a huge amount of catecholamine is released into the general circulation, triggering severe headache, hypertensive crisis, nausea, vomiting, abdominal pain, ileus, sweating, pale skin and serum creatinine elevation.14 Pheochromocytoma before the operation is challenging. A report by Kobayashi et al shows that there is only a 30.2%
correct preoperative diagnosis rate. The difficulty in making a diagnosis may arise from the rarity of the incidence. Also, the determination of catecholamine levels in either urine or serum is not possible under emergency conditions.7

Surgical resection is the treatment of choice, and it may be done either through elective or emergency operation. The major prognostic factor is effective in controlling blood pressure with an α-adrenergic blockade and fluid replacement preoperatively. According to a literature review, emergency surgery carried out without proper control of blood pressure and wrong preoperative diagnosis has a strong link with poor prognosis.8 A study showed that of the two cases recorded in Korea where an emergency operation was done without control of blood pressure, one case died due to pulmonary oedema and heart failure.9 10 Patients who do elective surgery post medical therapy experience no mortality.10 Alpha-blockers like phenoxybenzamine are used for preoperative management of hypertensive crisis as they have the capability of blocking adrenoreceptors. Propranolol helps to resolve cardiac arrhythmia.15 Angiographic intervention is helpful for active bleeding and rupture, as seen in our patient. A study by Habib et al16 highlighted three ruptured pheochromocytoma cases with rupture and bleeding treated successfully by elective resection after blood pressure control via TAE. The glands are supplied by the superior, the middle and the inferior suprarenal arteries. These arteries originate from the inferior phrenic artery, the abdominal aorta, and the inferior suprarenal arteries. These arteries originate from the inferior phrenic artery, the abdominal aorta, and the inferior suprarenal arteries, respectively.17 Alpha-adrenergic blocker can also be used to achieve blood pressure control, the same with fluid infusion therapy or after stabilisation by TAE.13 Postoperative TAE helps with haemostasis and is devoid of complications like hypovolemic shock.16 Pains in the abdominal region are associated with stimulation of the α-adrenergic receptors, intestinal vascular smooth muscle constriction, and ileocolic sphincter contraction. Catecholamines circulating at high levels will cause a decrease in intestinal motility and tone.17 The application of TAE enhances haemostasis and consolidates the haematoma.20

REFERENCES

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