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Ruptured phaeochromocytoma—a lesson in acute abdomen

嗜鉻細胞瘤破裂——急性腹痛的啟示

Phaeochromocytoma may present as acute abdomen. This report is of a patient with spontaneous rupture of phaeochromocytoma who presented with abdominal pain and a tender abdominal mass. Ruptured phaeochromocytoma is a rare surgical emergency, with only 30 cases reported in the literature. The classical clinical triad of signs is intense vasoconstriction, tachycardia, and labile blood pressure. Computed tomography scanning of the abdomen is the investigation of choice, and a high index of suspicion is the key to diagnosis. Prompt recognition, appropriate supportive measures, and early surgical intervention can improve the likelihood of survival.

嗜鉻細胞瘤的病徵可以是急性腹痛。我們報告一名嗜鉻細胞瘤自行破裂的患者，她的病徵包括腹痛和腹部出現軟塊。嗜鉻細胞瘤破裂是罕見的外科緊急病例，在文獻報告中僅有30宗。這種病的三項典型臨床徵兆包括血管劇烈收縮、心動過速及血壓不穩定。電腦斷層掃描是可取的診斷方法，而高度警覺性是診斷的關鍵。及早發現、適當的支緩措施、和及早施行外科手術可以增加患者存活的機會。

Case report

A 35-year-old woman was admitted with a sudden increase in epigastric pain and left loin pain of 1 day's duration. Hypertension, albuminuria, and renal impairment had been identified 6 months prior to this admission at another hospital but the patient had declined further investigation. At this admission, she presented with gradual onset of epigastric and left loin pain for 2 weeks, with a sudden increase in severity of pain and associated dizziness. There were no other associated symptoms. At examination, she was pale and sweating, and peripheral vasoconstriction was evident. She had tachycardia, with a heart rate (HR) of 108 beats per minute, and her blood pressure (BP) was 219/130 mm Hg. The abdomen was not distended but a tender, non-pulsatile mass was palpable in the left upper quadrant. There was an incidental finding of heart murmur.

Bedside ultrasonography showed a large heteroechoic mass in the left upper quadrant of the abdomen, with pulsation evident inside. The aorta was normal in calibre, and there was no free fluid in the peritoneal cavity. A complete blood count showed a haemoglobin level of 80 g/L (reference range, 120-150 g/L) and a platelet count of 58 x 10^9/L (reference range, 150-450 x 10^9/L). Renal function was markedly impaired, with a urea level of 29.1 mmol/L (reference range, 2.5-6.6 mmol/L) and a creatinine level of 708 μmol/L (reference range, 62-115 μmol/L). Liver function was normal. Blood gas analysis indicated metabolic acidosis, and chest radiography revealed cardiomegaly. At this point, the patient was conscious and BP was 179/107 mm Hg.

Transfusions of blood and platelet concentrates were given for anaemia and thrombocytopenia. An echocardiogram was completed for suspected ventricular septal defect. Non-contrast computed tomography (CT) scan of the abdomen showed a large heterogeneous mass above the left kidney (Fig), with the kidney greatly displaced. Following the CT scan, the patient's condition began to deteriorate and her level of consciousness decreased. Her BP decreased to 103/46 mm Hg, with a HR of 111 beats per minute. The patient was resuscitated with 500 mL of colloid and 2 units of blood. The BP rapidly returned to

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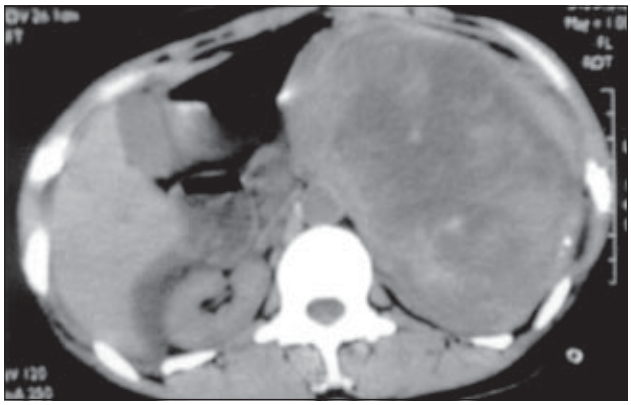

Fig. Computed tomography scan of the abdomen showing a large heterogeneous mass over the left kidney. The kidney is greatly displaced

190/103 mm Hg. The patient was taken to the operating theatre for emergency laparotomy. During the induction phase of anaesthesia, she was noted to have pulmonary oedema with pink frothy sputum. Laparotomy revealed 300 mL of blood-stained fluid in the peritoneal cavity, and the presence of a tumour, 25 cm in diameter, adhering to the tail of the pancreas—the tumour had ruptured retroperitoneally, with blood tracking along both paracolic gutters. The tumour was confirmed as an adrenal tumour on the basis of the blood supply. En-bloc resection of the left adrenal gland, spleen, and pancreatic tail was performed as the adrenal tumour could not be separated from these organs. The patient developed hypotension and bradycardia towards the latter part of the operation requiring inotropic support in the form of adrenaline injection and infusion.

Postoperatively, multi-organ failure occurred. The patient had persistent hypotension and heart failure despite adrenaline and noradrenaline infusion. Electrocardiography showed T inversion over the inferior leads and chest leads. She also had respiratory failure requiring ventilator support, acute renal failure requiring haemodialysis, and disseminated intravascular coagulation necessitating fresh frozen plasma and platelet concentrate transfusion. Unfortunately, the patient did not respond to this aggressive treatment and she died 37 hours after surgery. The final histopathology and coroner autopsy reports confirmed findings of ruptured phaeochromocytoma of the left adrenal gland, submassive necrosis of the liver, hypertensive heart disease, and benign nephrosclerosis of the kidneys.

Discussion

Spontaneous rupture of an adrenal phaeochromocytoma is rarely seen, but can be lethal because of the low index of suspicion and the dramatic clinical course. The classical presentation of phaeochromocytoma is persistent or paroxysmal hypertension, and it is said to account for 0.1% of all cases of hypertension.[1] Other presenting features include palpitations, headache, sweating, pallor, tremors, and anxiety.[2] Phaeochromocytomas are vascular tumours and small areas of haemorrhage or haemorrhagic necrosis are commonly found at elective resection of tumours.[3] Very occasionally, phaeochromocytoma can present as an abdominal emergency due to haemorrhagic necrosis of the tumour, with or without rupture, causing retroperitoneal or intraperitoneal bleeding. To the best of our knowledge, there are 30 cases of ruptured phaeochromocytoma documented in the literature.[1-9] Summarising the presenting features of 26 reported patients, it was found that 23 had abdominal, loin, or flank pain, most commonly upper unilateral hypochondrial pain, which was occasionally associated with tenderness. A palpable mass was detected in approximately 30% of patients. Tachycardia (n=20), vasoconstriction (n=17), and labile BP (n=17) were common clinical signs, and vomiting (n=13) and leukocytosis (n=11) were sometimes seen.[1,2,4,5,8]

The clinical diagnosis of ruptured phaeochromocytoma may be difficult. A complete history may lead to the suspicion of phaeochromocytoma in the presence of classical symptoms. However, less than one third of patients present with such a history.[6] Chronic symptoms are usually non-specific such as headache or anxiety. Few patients present with documented phaeochromocytoma. Some case reports of phaeochromocytoma have noted tumour rupture soon after the start of α-blocker therapy, for example phentolamine, with the drug thought to have precipitated bleeding.[8,9] Anticoagulants such as warfarin and prochlorperazine have also been reported as precipitating haemorrhagic necrosis.[1,7,8] Therefore, a high index of suspicion is essential for prompt recognition of the condition and the institution of appropriate treatment.

The classical signs of ruptured phaeochromocytoma are intense vasoconstriction, tachycardia, and labile BP.[5] Attention should be paid to patients who present with excessive vasoconstriction in relation to shock—signs of intensive vasoconstriction (cold, sweating, pale extremities)—but are not hypotensive. Tachycardia reflects sympathetic stimulation from catecholamines. Labile BP is a key feature.[5] Tumour rupture causes release of catecholamines into the circulation, resulting in severe hypertension.[9] As the tumour becomes necrotic, it no longer continuously secretes catecholamines, thus reducing circulating catecholamines. The cardiovascular system adjusts to the high level of catecholamines by down-regulation of the catecholamine receptor and subsequent reduction in blood volume. The cardiovascular system cannot quickly adjust to the sudden loss of stimuli and severe hypotension thus follows.[9] These patients, while in apparent shock, are responsive to a surprisingly small volume of fluid because they are volume depleted but have not had massive fluid or blood loss.[5] This patient had acute pulmonary oedema (APO). This has been described as one of the presenting features of phaeochromocytoma but all reported cases were associated with paroxysmal hypertension causing increased end-diastolic pressure and left ventricular failure.[2] It has been suggested that cardiomyopathy and APO could result from the specific action of excessive catecholamines

on myocardial cells, giving rise to so-called 'acute catecholamine myocarditis'.[2] The resultant hypotension when associated with APO results in higher mortality.[2]

For patients with left-sided phaeochromocytoma, pain in the left upper quadrant is easily confused with precardial pain. Electrocardiogram of these patients may also show some signs in keeping with diffuse myocardial damage due to the chronic catecholamine stimulation. If the assumed diagnosis is myocardial infarction and the patient is not investigated further, death is likely.[9]

The major differential diagnosis to consider is leaking abdominal aortic aneurysm (AAA).[5] Computed tomography scanning of the abdomen is the most valuable examination for diagnosis. Blood tests for catecholamine levels are not useful and 24-hour urine testing cannot provide results within the timeframe needed in a clinical emergency. Furthermore, the dramatic clinical presentation seen may lead to immediate surgery without the opportunity for investigation.[1] Surgeons need to be alert to this possible diagnosis to optimise the patient's perioperative condition, however. The key feature of labile BP in ruptured phaeochromocytoma should be kept in mind as this poses a significant clinical challenge. In cases of leaking AAA, other major bleeding, or septic shock, a hypertensive phase or response to a small amount of fluid replacement is not expected.

Ruptured phaeochromocytoma is a surgical emergency. Emergency exploration is usually indicated, and is necessary to confirm the diagnosis. In an analysis of 12 patients with phaeochromocytoma and haemorrhagic necrosis with or without rupture, six patients had no surgery with one surviving, while six had immediate surgery with four surviving.[9] Immediate resection of the ruptured tumour is favoured, provided that appropriate perioperative preparation has been undertaken. Perioperative management by a multidisciplinary team, including physicians, surgeons, and anaesthetists/intensivists, is crucial for a good treatment outcome. Preoperatively, physicians should try to optimise the patient's BP control and fluid status. Hypertensive episodes can be controlled with intravenous phentolamine. Shock should be treated with phenylephrine infusion, and aggressive fluid and blood replacement given using central venous pressure guidance.[10,11] During the operation, anaesthetists should ensure appropriate anaesthesia to prevent a stress reaction that might cause a further surge in catecholamine release. Surgeons must avoid excessive manipulation of the tumour and minimise stimulation leading to catecholamine secretion. The intra-operative hypertensive response can be controlled with good anaesthetic support using a bolus phentolamine injection and the addition of labetolol for accompanying tachycardia. After tumour resection, the hypotensive phase should be anticipated and aggressively treated by anaesthetists and intensivists by means of fluid replacement and phenylephrine infusion. Extraordinarily high doses of phenylephrine may be needed due to the down-regulation of catecholamine receptors.[10,11]

Elective resection of phaeochromocytoma with pharmacological control is not associated with increased mortality.[4] However, the 26 reported patients with ruptured phaeochromocytoma had a mortality rate of approximately 50%.[1,2,4,5,8] The mortality rate may be as high as 81% for patients undergoing emergency surgery.[4] The outcome of surgery largely depends on appropriate resuscitative measures at the time of diagnosis and during the perioperative period.[5] Surgery in undiagnosed poorly prepared patients is associated with a high mortality rate.[7]

Conclusion

Ruptured phaeochromocytoma is a rare cause of acute abdomen and emergency surgery is usually indicated. Tachycardia, intense vasoconstriction, and labile BP are key features to note for early diagnosis. A high index of suspicion leading to prompt investigation, and early involvement of a multidisciplinary team, including endocrinologists, surgeons, anaesthetists, and intensivists, is necessary for appropriate resuscitation and treatment to improve the surgical outcome.

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