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Case Report

Case report: A giant hemorrhagic adrenocortical carcinoma causing cardiorespiratory embarrassment

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ABSTRACT

Background: Adrenocortical carcinoma (ACC) is a rare aggressive tumor that can be hormone or non-hormone secreting. It is usually associated with fatal outcomes due to its physiological hormonal interaction. We report a successful anaesthetic and surgical management for a patient who presented to us with a huge hemorrhagic ACC which was complicated with acute respiratory failure.

Case presentation: A 56-year-old lady presented to us with progressive abdominal distension and right hypochondriac pain for two months. She was anemic with elevated liver enzymes. Urgent computed tomography (CT) of the abdomen and pelvis showed a huge right supra renal mass. She subsequently developed respiratory failure due to splinting of diaphragm, of which successfully underwent an emergency exploratory laparotomy. Subsequent endocrine and histopathological work up showed an adrenocortical carcinoma (ACC).

Discussion: Suprarenal masses usually originate from the adrenal glands. They should be investigated to rule out phaeochromocytoma, which originate from the inner adrenal medulla or outer cortex to form ACC. The latter usually occur in women and of poor prognosis. Huge ACC may cause acute respiratory failure by way of splinting of diaphragm. Both anaesthetic and surgical teams should be well trained in handling patients who undergo adrenal surgeries.

Conclusion: A giant hemorrhagic functional ACC is extremely uncommon with very poor prognosis. Such conditions should be investigated to rule out phaeochromocytoma. Its potential neuro-hormonal interactions and anatomical correlations can cause fatal perioperative cardio-respiratory embarrassment. The anaesthetic and surgical teams should be capable in managing the hemodynamic instabilities that may present during surgical manipulation and resection of a large ACC.

1. Introduction

Suprarenal masses are commonly adrenal in origin and extremely rare malignancies. It often poses diagnostic challenges to clinicians due to its anatomical correlations and physiological disruptions. Most of the ACC lead to a state of hormone hypersecretion, thus carry a poor prognosis [1]. ACC had been reported to occur more frequently on the left side [2].

We herein report a case of a middle-aged woman with a huge right suprarenal mass which was complicated with acute respiratory failure, of which histopathological examination (HPE) showed ACC. Our search for similar presentations of ACC on Pubmed and Google Scholar has unexpectedly yielded too little results, which suggest this is may be one of the largest hormone-secreting hemorrhagic ACC ever being reported.

This work has been reported in line with the SCARE criteria [3].

2. Case presentation

A 56-year-old lady presented with a 2-month history of intermittent right hypochondriac pain, which was associated with worsening abdominal distension, bilateral pedal edema, and dark-colored urine. She claimed to have a weight loss of 9kg over one month. She denied chest pain, palpitation, hirsutism, anxiety, shortness of breath, fever, and vomiting.

Clinically, our patient was jaundiced and pale. She was tachypneic with respiratory rate of 28 breaths per minute, blood pressure (BP) of

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114/73 mmHg, pulse rate (PR) of 102 beats per minute, and oxygen saturation (SpO_2) of 94% on room air. Her weight and height, respectively, were 55.0 kg and 162 cm, placing her Body Mass Index (BMI) at 21.0 kg/m^2. Further examination revealed a huge tender palpable mass extending from the right hypochondrium to the right lumbar region measuring 19 cm × 15 cm in size. It was associated with gross ascites and reduced air entry over the right lower zone of lung.

She was anemic with a hemoglobin (Hb) of 73 g/L (normal values: 120–150 g/L), while the total white blood cells (TWBC) and platelet levels were within normal values. Her liver function tests (LFT) showed gross elevations of direct bilirubin at 132 μmol/l (normal values: 0–5 μmol/l), aspartate transaminase (AST) at 92 U/L (normal values: 5–34 U/L), alanine transaminase (ALT) at 389 U/L (normal values: 5–35 U/L) and alkaline phosphatase (ALP) at 198 U/L (normal values: 40–150 U/L) as well as reduced albumin at 18 g/L (normal values 35–50 g/L). The arterial blood gas (ABG) under high flow oxygen 10 L/min showed a mixed respiratory and metabolic acidosis with mild hyperlactatemia. Her chest X-ray did not reveal any evidence of pneumonia or malignancy. An urgent Computed Tomography (CT) of the abdomen showed a hypervascular right suprarenal mass measuring at 14.6 cm × 13.1 cm x 18.3 cm. The mass appeared to be impinging on the biliary tree, causing dilatation of the common bile duct. Besides that, multiple hypervascular lesions were observed in the liver parenchyma. Our provisional diagnosis was huge hemorrhagic adrenal tumor with hepatic metastasis. Other possible differential diagnoses were pheochromocytoma, renal cell carcinoma and pancreatic carcinoma.

Our patient was closely monitored in the intensive care unit (ICU) and planned for an elective resection of suprarenal mass while she was carefully worked up for pheochromocytoma by sending her serum and urine for metanephrine, normetanephrine, and cortisol respectively.

Unfortunately, she developed respiratory distress the next day, requiring emergency tracheal intubation and inotropic support. There were increasing and persistent ventilation difficulties requiring high positive end-expiratory pressure (PEEP) of 12cmH20 and fraction of inspired oxygen (FiO_2) of up to 0.8 to sustain SpO_2 of >92%. The ABG showed type 2 respiratory failure and worsening anemia with Hb of 61 g/L. Considering the possibility of diaphragmatic splinting caused by hemorrhagic suprarenal tumor, the patient was posted for an emergency exploratory laparotomy.

General anesthesia with muscle relaxation was administered in the operating theatre. Immediately, the peak airway pressures were constantly high at 38 cmH20, limiting tidal volumes (TV) to just 200–250 ml. As a result, the patient needed PEEP of 14 cmH20 and FiO_2 of 1.0 to prevent hypoxemia. The patient showed significant improvement in oxygenation and ventilation after resection and evacuation of the suprarenal tumor that weighed 1.02 kg which measured 19 cm × 12 cm x 8 cm in size (Figs. 1 and 2). PEEP and FiO_2 were weaned down gradually to 6 cmH20 and 0.5 respectively while her TV was achieved at 350–400 ml with an airway pressure of 20–23 cmH20. Intraoperatively, the patient was hypotensive and required noradrenaline infusion up to 1.2 mcg/kg/min. There were no massive fluctuations of her hemodynamics when the surgeons manipulated the tumor. She received 8 units of packed cells, fresh frozen plasma (FFP), platelets, and cryoprecipitate transfusion on top of 3.7 L of crystalloids and colloids. There were about 2.8 L of hemorrhagic fluids removed from the abdominal cavity. Multiple para-aortic lymph nodes were resected. The liver surface was smooth and bile ducts were compressed by the large tumor. However, there were no tumor seedlings seen around the nearby organs.

Despite a stormy course, she was successfully weaned off noradrenaline at the end of the surgery. Her postoperative stay in ICU was uneventful and she was successfully extubated the next day. At the same time, her LFT gradually improved as evidenced by reducing trend of the liver enzymes.

Histological examination of the tumor showed the presence of malignant cells in diffuse nodular, trabecular, and alveolar patterns. The malignant cells were large, contained pleomorphic vesicular nuclei, and showed presence of capsular and vascular invasion. Large areas of necrosis with scattered mitotic figures were also observed. Immunohistochemically, the adenocarcinoma was positive for vimentin, CKAE1/AE3, and synaptophysin but not for Melan A and chromogranin. Examination of the lymph nodes and peritoneal fluid tested negative for metastatic tumor cells.

Our patient's endocrine work-up was received five days later and it showed gross elevations of serum cortisol at 1172 nmol/L (normal

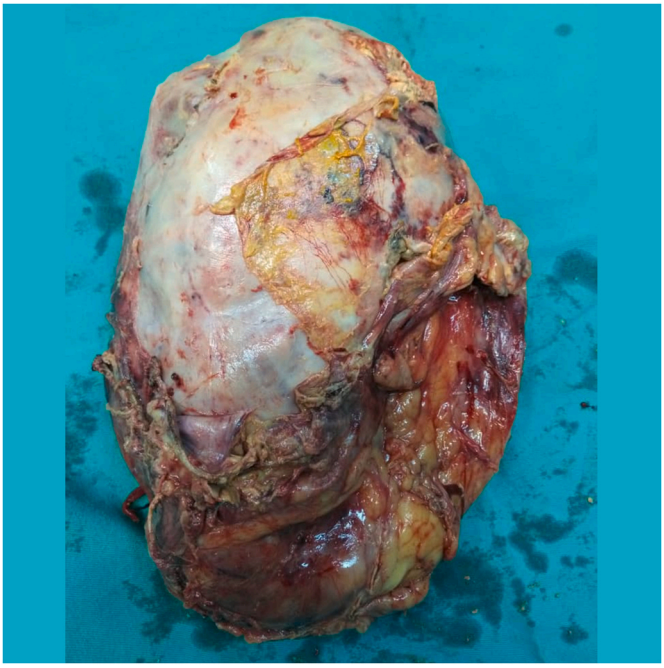

Fig. 1. Huge and bulky surgical specimen measuring 19cm × 12cm x 8cm in dimension.

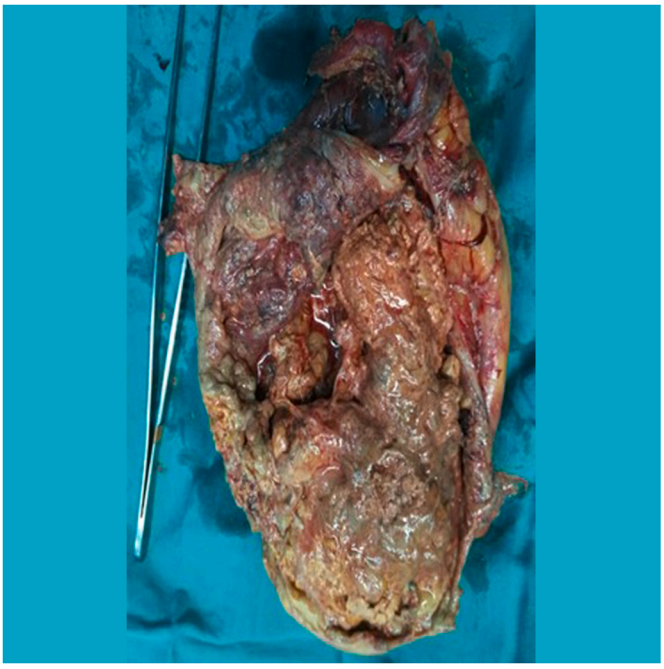

Fig. 2. Cut opened tumor showing a solid cystic tumor with variegated cut surface of tan yellowish necrotic tissue and pink hemorrhage. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

values: 170–635 nmol/L), serum aldosterone at 0.32 nmol/L (normal values: 0.05–0.28 nmol/L), and estrogen at 44.05 pmol/L (normal values in postmenstrual women: <40 pmol/L) with a reduced ACTH at 1.37 pmol/L (normal values: 2.2–13.3 pmol/L). The serum and urine for metanephrine and normetanephrine were within normal values. A CT of brain, thorax, abdomen, and pelvis was done three weeks later did not reveal any evidence of metastatic lesions or new growths in the abdomen. This coincides with her diagnosis of ACC with staging of T2N0M0. Upon follow-up 1 month after the surgery, she was well and commenced on mitotane as adjuvant chemotherapy. She responded well to the treatment and is currently on regular yearly surveillances.

3. Discussion

Suprarenal masses are usually adrenal in origin. Histologically, they can originate from either the outer cortex of glandular tissue forming ACC or from the inner medulla of nervous tissues causing malignant pheochromocytoma. ACC are often diagnosed incidentally with an approximate annual incidence of 0.5–2 per 1,000,000 population and is the commonest indication for adrenalectomy. The median age of diagnosis is 55 years old [1,2,4]. Besides that, it is more common in females but more aggressive in older patients with a 5-year survival rate of 17–47% [5].

Approximately 60% of the ACC are hormone secreting and commonly produce cortisol and androgens [6]. Hormone-secreting ACC in adults usually causes overproduction of glucocorticoids and androgens which will result in Cushing's syndrome alone or mixed Cushing's and virilization syndrome [7]. Symptoms associated with glucocorticoid excess usually develop rapidly and patients may experience weight gain, body weakness and insomnia. On the contrary, most patients with non-functioning ACC present with clinical manifestations due to tumor growth such as abdominal fullness or flank pain, or constitutional symptoms such as anorexia and weight loss [8].

A gigantic ACC poses several important challenges to both anesthetists and surgeons. A functional adrenal tumor which secretes adrenaline, noradrenaline and glucocorticoid hormones can negatively affect the sympathetic adrenal medullary (SAM) axis and vessel tone. Patients should have their hormone levels worked up preoperatively to rule out pheochromocytoma. Once identified, they should be closely premedicated to prevent the effects of tumor releasing catecholamines by adequate alpha and beta receptors blockade. In our case, the patient deteriorated on the next day of hospitalization and had to be rushed to surgery because of her acute ventilator dependent respiratory failure despite not knowing the status of her catecholamines and hormonal levels. Nevertheless, we were vigilant perioperatively by prophylactic administration of hydrocortisone and vasopressors.

Our patient developed gross abdominal distention which was complicated with severe respiratory failure. A rapidly growing ACC causes capsular rupture and bleeding, leading to anemia and disseminated intravascular coagulopathy (DIVC). A concealed intra-abdominal hemorrhagic and ascitic fluids, once removed, will lose the tamponade effect, causing severe hypotension. Thus, the patient's cardiorespiratory systems should be vigilantly supported during the perioperative period.

A multidisciplinary approach is needed for the management of ACC. CT imaging of chest, abdomen and pelvis is needed to exclude distant metastasis. The use of adrenal biopsy is not recommended in fear of tumor spill, tumoral bleeding and precipitating an adrenal crisis [9,10]. Surgery is the definitive treatment for ACC. Complete en-bloc resection is recommended for all adrenal tumor suspected to be ACC along with the resection of nearby organs or structures. Fortunately, there was not much adhesion of the large tumor to its surrounding structures identified in our patient. The mass was clearly demarcated and removed by the surgeon. No other organs were resected apart from the tumor itself. Adjuvant chemotherapy with mitotane is recommended in adrenal tumors with uncertain malignant potential [11].

A large adrenal tumor upon initial presentation confers difficulties in differentiating between benign and malignant mass. A diagnosis of ACC requires HPE and immunostaining. Features associated with risk of malignancy include tumor weight of more than 400 g, size more than 10.5 cm and invasion of vena cava. Likewise, histopathological features suggestive of malignancy include severe nuclear atypia, diffuse architecture, microscopic necrosis and invasion of venous, sinusoidal and capsular structures. A Weiss score higher than 3 suggests malignancy [12,13]. Our patient scored five for the Weiss score, fulfilling the criteria for severe nuclear atypia, atypical mitoses, diffuse architecture, confluent necrosis, and capsular and vascular invasion. Based on the eighth edition of the TNM staging system, our patient was diagnosed of stage II ACC (T2N0M0); tumor was confined to the adrenal gland without local invasion or distant metastases and had a size >5 cm [13]. The prognosis for ACC is extremely poor. According to Montserrat-Ayala et al., the median survival time for all patients was 3.21 years. Risk factors which were associated with poor survival rates include old age at diagnosis, functioning tumors, and incomplete surgical resections [14,15].

In summary, a huge hemorrhagic hormone-secreting ACC is extremely rare with very poor prognosis. A thorough hematological, biochemical, and radiological imaging should be done to exclude phaeochromocytoma. An anaesthetist must be well-trained in adrenal surgery, especially in cases of huge ACC as they are challenging with potential cardio-respiratory instabilities during surgical resection.

4. Conclusion

A gigantic hemorrhagic functional ACC is extremely uncommon with very poor outcome. Such patients should be thoroughly investigated to rule out phaeochromocytoma. Its potential neuro-hormonal interactions and anatomical correlations can cause fatal perioperative cardio-respiratory embarrassment. The anaesthetic and surgical teams should be capable in managing the hemodynamic instabilities that may present during surgical manipulation and resection of a large ACC.

4.1. Patient's perspective

It is not a great experience to have a huge abdominal tumor of which I had unknowingly carried for the past two months. I am glad that the managing surgeons and anaesthetists were able to help and ensure my safety throughout. Now, I am feeling better and "free" from the discomfort.

Ethical approval

Not related as this is a case report.

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Authors' contribution

Dr Boon Tat Yeap, and Dr Janes Belinda Geil Nii Tan were the clinicians involved in the management of the patient perioperatively.

Dr Boon Tat Yeap, Dr Kai Ming Teah and Dr Nornazirah Azizan were the clinicians involved in this manuscript writing.

Registration of research studies

This is a case report. No human participants were involved.

Guarantor

Dr Boon Tat Yeap is the guarantor for this manuscript.

Consent

Written informed consent was obtained from the patient and parents for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Declaration of competing interest

The authors declare that no relevant or material financial interests exist.

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