Malignant transformation of a mature teratoma of the adrenal gland

A rare case report and literature review

Miao Niu, MDa, Ailian Liu, MDa,* Ying Zhao, MDa, Lu Feng, MDb

Abstract

Rationale: Adrenal mature TMT is very rare. So far, only two cases have been reported.

Patient: We report a rare case of malignant transformation of a mature teratoma in the right adrenal gland of a 36-year-old Chinese female. The patient had been asymptomatic until physical exam identified a palpable mass in the right abdomen. Abdominal non-enhanced computed tomography (CT) scan showed a huge tumor with mixed density in right adrenal region, which had cystic components, fat, calcifications, and separations. Contrast-enhanced CT showed significant enhancement of the cyst wall and septations as well as mural nodules. In addition, the patient had four abnormal laboratory results, including cortisol 773.58 mol/L ↑ (reference range 118.6 to 618 mol/L), adrenocorticotropic hormone (ACTH) 70.980 pg/ml ↑ (reference range 7.2 to 63.3 pg/ml), aldosterone 317.84 pg/ml ↑ (reference range prone: 49.3–175 pg/ml; Standing: 34.7–275 pg/ml; 24h urine 2.84–33.99 ug/d), and vanillyl mandelic acid (VMA) 22.38 mg / 24 h ↑ (reference range 0–13.6 mg / 24 h) which to our knowledge have not been reported by any adrenal mature teratoma’s reference literature.

Diagnoses: It was initially diagnosed as a right adrenal hamartoma by the radiologist. Final pathology confirmed it as malignant transformation of a right adrenal mature teratoma, which is extremely rare.

Interventions: Laparoscopic resection is usually the treatment of choice for adrenal teratoma and our case report is no exception.

Outcomes: This article is a case report, no outcomes.

Lessons: Non-enhanced CT findings of a mass with cystic change, fat, calcification and separation are suggestive of a teratoma. If there is significant enhancement of the cyst wall and septations as well as mural nodules in contrast-enhanced CT, then adrenal TMT should be considered. In addition, abnormal levels of hormones including cortisol, ACTH, aldosterone and VMA may also aid in the diagnosis of adrenal TMT.

Abbreviations: ACTH = adrenocorticotropic hormone, CT = computed tomography, Hu = Hounsfield unit, TMT = teratoma with malignant transformation, VMA = vanillyl mandelic acid.

Keywords: adrenal gland, malignant transformation, teratoma

1. Introduction

Teratoma is a solid tumor composed of different histological components and usually involves more than 2 germ layers. It can be divided into 3 types: mature cystic and solid teratomas that are benign; immature teratomas that can be divided into immature, slightly mature, and fully mature subtypes based on the degree of differentiation. The biological characteristics of these tumors range from benign to borderline and malignant mature teratomas with malignant transformation, which most often manifest as development of solid components superimposed on pre-existing cystic components. Malignant teratomas demonstrate 3 histological forms: immature teratomas; teratomas with other malignant germ cell tumor components; and teratoma with malignant transformation.[1] Adrenal mature teratomas with malignant transformation (TMT) is extremely rare.

2. Case report

A 36-year-old Chinese female who was found to have a huge mixed density mass in the right adrenal region on an outside hospital computed tomography (CT) examination. One week later, she was referred to our hospital for consultation. She denied any symptoms or weight loss. Physical examination showed no bulging flank sand no tenderness or pain to percussion in the bilateral renal region. Laboratory results are as follows: cortisol 773.58 mol/L ↑ (reference range 118.6 to 618 mol/L), ACTH 70.980 pg/ml ↑ (reference range 7.2–63.3 pg/ml), aldosterone 317.84 pg/mL ↑ (reference range prone: 49.3–175 pg/mL; Standing: 34.7–275 pg/mL; 24h urine 2.84–33.99 pg/day), and VMA 22.38 mg/24 h ↑ (reference range 0–13.6 mg/24 h). Angiotensin I and Angiotensin II were normal (Table 1). The levels of other hormones were not examined. Ultrasonography showed a
Table 1

| Hormone name | Result       | Reference range     | Unit       |
|--------------|--------------|---------------------|------------|
| Cortisol     | 773.58 mg/L  | 118.6–618 mg/L      | mg/L       |
| ACTH         | 70.98 pg/mL  | 7.1–63.3 pg/mL      | pg/mL      |
| Aldosterone  | 317.84 (Standing) | Prone: 49.3–175 pg/mL | Standing: 34.7–275 pg/mL |
| Angiotensin I| 2.74 ng/ml/h | Regular diet: 0.05–0.79 ng/ml/h | |
| Angiotensin II| 68.57 ng/ml/h | Regular diet: 28.2–52.2 ng/ml/h | |

24-h urine volume: 2000 mL

VMA: 22.38 mg/24 h

ACTH = adrenocorticotropic hormone, VMA = vanillyl mandelic acid.

mixed echotexture mass in the right adrenal region measuring 8.6 cm × 7.2 cm with well-circumscribed borders and no significant blood flow. Abdominal nonenhanced CT revealed a well-defined and mixed density mass measuring 8 cm × 7 cm × 6.1 cm in the right adrenal region. The bulk of the mass is of low attenuation, with CT values around 23 Hounsfield units (Hu). An area along the right border of the mass showed even lower density, with an average Hu about -106 Hu. In addition, a patchy area of hyperdensity is noted in the left aspect of the mass, with CT values averaging 882 Hu. This mass was surrounded by circular hyperdense rim and contains hyperdense internal septations that have CT values around 25 Hu (Fig. 1). Postcontrast CT showed no significant enhancement of the lower density areas, while both the separations and hyperdense rim showed significant enhancement (CT values for the arterial, portovenous, and delayed phases were about 59, 72, 72 Hu, respectively). Intense enhancement of mural nodules was noticed on all 3 postcontrast phase images, but not observed on noncontrast CT images (Fig. 2). Normal right adrenal gland could not be identified. Compression of the liver and upper pole of the right kidney was noted in both coronal and sagittal planes (Fig. 3). There were no enlarged lymph nodes.

2.1. Surgical and pathological findings

First, fat surrounding right kidney was removed by laparoscopic operation, in order to expose the right kidney. The tumor was noted to arise from the right adrenal gland and caused inferior displacement of the right kidney. Blood vessels around tumor were separated out carefully. Finally, the tumor was resected. Gross appearance showed right adrenal tumor with lipid, hair, and local bone tissue, and measuring about 9 cm × 6 cm × 7.5 cm in size. Microscopic appearance showed the tumor has a fibrocystic wall inside which brain tissue, fat, squamous cells, blood vessels, and glandular epithelium were found. There is obvious atypia of the glandular epithelial cells that show large nuclei, dark staining, increased nucleus-to-cytoplasm ratio, nuleoloi, and mitosis, in tubular or sieve-like arrangements. The pathological diagnosis was the right adrenal mature TMT– (adenocarcinoma) (Fig. 4).

3. Discussion

Mature TMT is extremely rare and is usually found in gonadal organs, either the ovary or the testis. It occurs in 1% to 2% of ovarian mature cystic teratomas and 2% to 3% of testicular teratomas. Mature TMTs originating outside the gonads have been described only in the mediastinum, stomach, brain, and sacrococcygeal region. But adrenal mature TMT is quite rare. So far, by using “adrenal teratoma malignant transformation” as keywords and searching PubMed for publications in the past 20 years, we were able to retrieve some relevant references. Among these references, only 2 articles reported adrenal TMT. Adrenal teratomas accounts for about 0.13% of all adrenal tumors. Clinically, adrenal teratomas usually occur in young women, in the right adrenal gland, and 90% are benign. Patients tend to have no symptoms in the early stage. Most of the cases were incidentally identified during hospital physical examination. As the tumors grow, symptoms such as low back pain and paroxysmal abdominal pain may occur due to compression of adjacent organs or secondary infection. In our case report, the patient initially had no symptoms and was first diagnosed as having a right adrenal hamartoma by the radiologist. It is possible that hamartoma and teratoma have...
similar components, including fat, smooth muscle, fibrous tissue, blood vessels, and calcification, but cystic change is relatively rare for hamartomas. One of the characteristics of our case is that there was intense enhancement of mural nodules, which is usually not found in benign adrenal teratomas. We therefore can infer that intensive enhancement of mural nodules may be used as an imaging sign for adrenal TMT. Distant metastasis of adrenal TMT was only described in 2 articles, with involvement of the

Figure 2. (A) (Nonenhanced CT) and (B–D) (Enhanced CT). (B–D) Enhanced CT showed no significant enhancement in the low density cystic and fatty areas, while the hyperdense peripheral rim and internal septations showed significant enhancement. Intense enhancement of mural nodules was noted on contrast enhanced CT (B–D) but not noncontrast CT (A).

Figure 3. (A, B) Arterial phase coronal (A) and sagittal (B) reformation images showing compression and displacement of the right lobe of the liver and upper pole of the right kidney by the adrenal area mass.
There were no signs of metastasis in our patient. Last but not least, none of the references mentioned the changes of laboratory values of cortisol, ACTH, aldosterone, and VMA[6–8,10,13,14,16,17] while our case showed altered levels of these hormones. As we all know, according to the hypothalamus–pituitary–adrenal axis, elevated cortisol can reduce the adrenocorticotropic hormone, but in our case, the levels of these 2 hormones were both elevated. Besides, of hormones regulated by the renin-angiotensin-aldosterone axis, only the aldosterone level was elevated and the angiotensin level was normal. In addition, the VMA level was also elevated. However, it is a pity that the patient did not undergo the cortisol suppression test. So, we could only infer that all the elevated hormonal levels may indicate that the tumor is a functional tumor that has an effect on the secretion of adrenal hormones, or the tumor itself secretes hormones.

In conclusion, adrenal mature TMT is very rare. Nonenhanced CT findings of a mass with cystic change, fat, calcification, and separation are suggestive of a teratoma. Once diagnosis is made on a nonenhanced CT, contrast-enhanced CT is required to detect the presence or absence of enhancing components. If there is a significant enhancement of the cyst wall and septations as well as mural nodules, then adrenal TMT should be considered. In addition, abnormal levels of hormones including cortisol, ACTH, aldosterone, and VMA may also aid in the diagnosis of adrenal TMT.

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