Ovarian thecal metaplasia of the adrenal gland in association with Beckwith-Wiedemann syndrome

Eslam Y Wassal, Mouhammed Amir Habra, Rafael Vicens, Priya Rao, Khaled M Elsayes

Beckwith-Wiedemann syndrome (BWS) is an overgrowth syndrome associated with increased risk to develop malignancies including adrenocortical carcinoma. Ovarian thecal metaplasia (OTM) of the adrenal gland is a rare mesenchymal lesion with an incidence of 2.4% to 4.3% in surgical specimens and 0.35% in autopsy series [1,2]. We report a 17-year-old female patient with BWS, associated with bilateral Wilms tumor, hepatic hemangiomas, pancreatic neuroendocrine tumor, and a phyllodes tumor of the right breast. Surveillance abdominal ultrasound identified a right adrenal mass that was further characterized by computed tomography and magnetic resonance imaging. Radiologically, this mass displayed features that overlap with adrenocortical carcinoma and pheochromocytoma but after pathological examination this proved to be an ovarian thecal metaplasia of the adrenal gland. Adrenal masses in BWS should raise the suspicion for adrenocortical carcinoma though other adrenal tumors including ovarian thecal metaplasia can be seen in these patients.
BWS, associated with bilateral Wilms tumor, hepatic hemangiomatosis, pancreatic neuroendocrine tumor, and a phyllodes tumor of the right breast, presented for periodic surveillance ultrasound examinations of both kidneys, which revealed a suspicious hypoechoic nodule in the right adrenal gland (Figure 1). The patient had no significant pain. There were no signs to suggest hormonal overproduction. Computed tomography (CT) scanning of the abdomen and pelvis was performed including non-contrast, arterial and venous post-contrast phases. On CT, this mass appeared as a well circumscribed oval shaped lesion measuring 3.5 cm × 2.6 cm in maximal transaxial dimensions abutting the upper pole of the right kidney. The mass was isodense to the kidney on non-contrast images (measuring 39 HU), demonstrated intense enhancement similar to the renal cortex on arterial phase images (measuring 222 HU), with decreased enhancement during the portal venous phase (169 HU) (Figure 2). No internal calcifications were seen on the non-contrast images.

Magnetic resonance imaging revealed the right adrenal mass lesion (Figure 3), which was markedly hyperintense on T2-weighted images and isointense to the muscle on T1-weighted images. There was no difference in signal characteristics between the in-phase and out-of-phase images to indicate the presence of microscopic fat. The mass demonstrated intense inhomogeneous enhancement on post-contrast series. In addition, a large lobulated mass was noted to involve the pancreatic tail.

She previously underwent bilateral partial nephrectomy for Wilms tumor, cleft palate and lip repair, surgical resection of a right breast Phyllodes tumor and abdominal laparotomy with resection of right perirenal/adrenal tumor, distal pancreatectomy for the neuro-endocrine tumor and splenectomy. The right adrenalectomy specimen weighed 35.6 g. Grossly, there was a well circumscribed brown tumor measuring 4.1 cm identified. Histologically, the lesion was composed of bland adrenal cortical cells without areas of necrosis or increased mitotic activity. There was no capsular or lymphovascular invasion noted. The adrenal cortical adenoma was positive for inhibin, calretinin and MART-1 and was negative for S-100 and WT-1, which confirmed the diagnosis. In addition to the adenoma there was a fibroblastic “radial-scar”-like spindle cell proliferation noted admixed with the adrenal cortical tissue and in continuity with the capsule. The spindle cell proliferation was positive for WT-1 and focally positive for inhibin and calretinin. The histologic features were consistent with adrenal ovarian thecal metaplasia (Figure 4).

**DISCUSSION**

The adrenal gland is very close to gonadal tissue embryologically as both originate in the region of the urogenital ridge. The existence of ectopic adrenal tissue in the periovarian region has been observed frequently. However,
The existence of ovarian tissue in the adrenal gland is an extremely rare finding\(^1\,^3\).

The pathogenesis of OTM is not fully known. It has been reported mostly in postmenopausal women and has been suggested that the foci of theca-like stroma in the adrenal gland may represent metaplasia from undifferentiated but embryologically competent mesenchymal cells of the adrenal capsule as a response to the elevated gonadotropin postmenopausal women\(^3\,^4\).

The clinical significance of these lesions is largely not yet understood; they can be functional and still may undergo neoplastic transformation\(^4\).

Pathologically, OTM appears as a hyalinized spindle cell nodule that is in direct continuity with the adrenal capsule and contains entrapped adrenal parenchymal cells with dystrophic calcifications\(^5\). It encloses a spectrum of fibroblastic-myofibroblastic proliferations that may rarely contain true ovarian stromal elements\(^2\,^5\). Since the features resemble a radial scar and there is no evidence of steroidogenic differentiation in most cases, the term “radial scar-like spindle cell myofibroblastic nodule of the adrenal gland” more accurately describes these lesions\(^2\).

BWS is an overgrowth syndrome with annual incidence of 1 in 13700 newborns\(^6\). BWS is associated with an increased risk of childhood cancer. The cardinal features of BWS include macroglossia, macrosomia, midline...
as the imaging features of OTM overlap with those seen in adrenocortical carcinoma and pheochromocytoma.

In conclusion, we presented the first case report describing ovarian thecal metaplasia (OTM) in the context of BWS with detailed imaging description of this entity. However OTM diagnosis is possible only after histological examination as the imaging features of OTM overlap with those seen in adrenocortical carcinoma and pheochromocytoma.

### Clinical diagnosis
Asymmetry of the left cheek, left is fuller than the right, mild hemihypertrophy noted between right and left upper limbs and right hand is longer than the left.

### Laboratory diagnosis
WBC 10 k/μL; HGB 13.3 mg/dL; plasma metanephrine and 24-h urinary collection for catecholamines and metanephrines were within normal limits.

### Imaging diagnosis
US showed suspicious hypoechoic nodule in the right adrenal gland, which appeared in computed tomography as an isodense mass to the kidney on non-contrast images with intense enhancement on arterial phase images, in magnetic resonance imaging the mass was markedly hyperintense on T2-weighted images and isointense to the muscle on T1-weighted images, with no difference in signal characteristics between the in-phase and out-of-phase images.

### Pathological diagnosis
Grossly, there was a 4.1 cm well circumscribed brown tumor. Histologically, the lesion was composed of bland adrenal cortical cells without areas of necrosis or increased mitotic activity. There was no capsular or lymphovascular invasion noted. The adrenal cortical adenoma was positive for inhibin, calretinin and MART-1 and was negative for S-100 and WT-1. In addition to the adenoma there was a fibroblastic “radial-scar”-like spindle cell proliferation noted admixed with the adrenal cortical tissue and in continuity with the capsule. The spindle cell proliferation was positive for WT-1 and focally positive for inhibin and calretinin.

### Treatment
The patient underwent surgical excision of the adrenal gland.

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