

## Isolated DHEAS production by an adrenal neoplasm: Clinical, biochemical and pathologic characteristics

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### ARTICLE INFO

### ABSTRACT

Androgen-secreting adrenal neoplasms have a low incidence, usually secrete multiple hormones, and may present with hirsutism, acne, and alopecia. We report an exceedingly rare case of a purely dehydroepiandrosterone-sulfate (DHEA-S) secreting adrenal neoplasm found incidentally on cross sectional imaging. The clinical, biochemical, and pathologic findings of this neoplasm are described.

### Introduction

Adrenal neoplasms are often found incidentally during imaging studies performed for other reasons. The prevalence of these so-called “incidentalomas” ranges from 1.4% to 15% and increases with age. The vast majority (>90%) of adrenal neoplasms are benign, nonfunctional adenomas. Of the remaining functional adrenal tumors, most secrete aldosterone, cortisol, or catecholamines. Androgen or estrogen secreting incidentalomas are much less common and raise suspicion for adrenocortical carcinoma.<sup>1,2</sup>

Purely androgen secreting adrenal adenomas are rare, but have a higher incidence in women. Clinically, these tumors may present with hirsutism of the face, chest, and back, as well as acne. Clitoral enlargement, irregular menses, and hypertension are less frequent. Serum concentrations of testosterone, dehydroepiandrosterone (DHEA), dehydroepiandrosterone-sulfate (DHEA-S), and androstenedione can be elevated in these tumors that usually overproduce more than a single androgen.<sup>1,2</sup> To our knowledge, isolated DHEA-S production by an adrenal neoplasm has not been reported. We describe the clinical, biochemical and pathologic features of an adrenal neoplasm with isolated DHEA-S production and otherwise normal serum concentrations of other androgens, cortisol and aldosterone.

### Case presentation

A 57 year old G4P4 post-menopausal Indian female being evaluated for chronic ileitis was incidentally found to have a 4 cm right adrenal mass on CT scan. Her past medical history was notable for type 2 diabetes mellitus, Crohn’s colitis, and hypertension. She had no history of amenorrhea prior to menopause. She denied any dietary supplements containing DHEA or DHEA-S. She reported generalized hair thinning on the scalp. She denied deepening of voice, acne and excessive hair growth on the face, back, or chest. Physical examination confirmed mild hair thinning to the crown and frontal scalp. There was no clitoromegaly.

Biochemical evaluation included a serum DHEA-S concentration on two separate occasions of 671 and 741 mcg/dL (nl. 26–200). Other serum androgen concentrations were normal including a free testosterone of 2.3 pg/mL (nl. 0.6–3.8); DHEA of 2.41 ng/mL (nl. 0.60–5.73); and androstenedione of 0.529 ng/mL (nl. 0.130–0.820). Circulating concentrations of cortisol, aldosterone, estrone, estradiol, and metanephrines were within normal limits. Plasma ACTH concentration was not suppressed; serum FSH and LH concentrations were appropriately elevated for the post-menopausal state.

CT imaging revealed a heterogeneous 4 cm right adrenal mass that contained several areas measuring less than 8.7 Hounsfield units on non-contrast imaging. An MRI demonstrated a 4.1 × 3.3 cm heterogeneously enhancing adrenal mass abutting the right hepatic lobe (Fig. 1A). Arterial phase imaging showed delineation between the adrenal tumor

**Abbreviations:** DHEA, Dehydroepiandrosterone; DHEA-S, Dehydroepiandrosterone-sulfate; ACC, Adrenocortical Carcinoma; ACTH, Adrenocorticotropic Hormone; FSH, Follicle Stimulating Hormone; LH, Luteinizing Hormone.

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Fig. 1. (In color): Post-contrast MRI of right adrenal mass (1A); Gross specimen following right robotic adrenalectomy (1B)

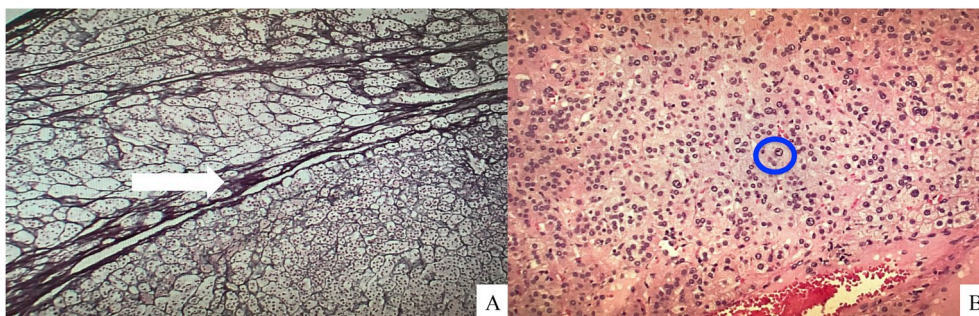


Fig. 2. (In color): Neoplasm separated by fibrous capsule (2A); Mild focal pleomorphism (2B)

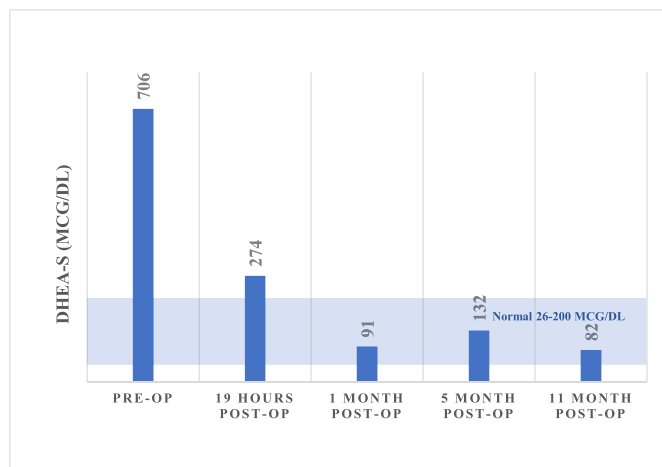


Fig. 3. Pre and post-operative DHEA-S levels.

and the liver capsule.

The size of the lesion and the biochemical abnormality were considered risk factors for malignancy, and robotic assisted laparoscopic right adrenalectomy was performed. There was no evidence of adjacent organ involvement intraoperatively. The post-operative course was uncomplicated, and the patient was discharged on the second post-operative day.

Grossly, the right adrenal gland weighed 46 g and measured 5.8 × 4.5 × 3.7 cm (Fig. 1B). Histologically, it appeared as a partially encapsulated nodule (Fig. 2A) with dilated vasculature composed of cords and islands of cells with mild focal pleomorphism separated by a reticulin framework with uniform thickness and size (Fig. 2B). There was no evidence of vascular invasion or anaplasia, and the tumor cells showed a

low mitotic rate consistent with an adrenal adenoma.

Post-operatively the serum DHEA-S concentration fell to 274 mcg/dl at 19 hours post-adrenalectomy with the mean pre-operative concentration having been 706 mcg/dL. At 1 month post-adrenalectomy DHEA-S had fallen to 91 mcg/dL and remained normal at 11 months of follow-up (Fig. 3). Clinically, there was thickening of her scalp hair following resection of the adrenal adenoma.

### Discussion

Androgen secreting adrenal neoplasms are rare. To our knowledge, we report the first description of isolated DHEA-S production by an adrenal neoplasm.

The serum concentration of DHEA-S was more than 3 times the upper normal limit suggesting that the 4 cm adrenal mass was the source of the DHEA-S. The serum half-life of DHEA-S is between 7 and 22 hours. The isolated DHEA-S production by the adrenal neoplasm was confirmed by the rapid decrease in the DHEA-S serum concentration by 60% within 19 hours of resection and subsequent normalization. Adrenal vein sampling was not performed pre-operatively, since the relatively long DHEA-S half-life would likely have precluded finding a central to peripheral gradient.

The pre-operative normal concentrations of androstenedione, DHEA, and testosterone demonstrate that this neoplasm was producing only DHEA-S and no other androgens. Although rare, most androgen secreting adrenal neoplasms produce multiple androgens.<sup>1,2</sup> The pathological findings suggest that this was a benign adenoma.

Most adrenal tumors are found incidentally on cross-sectional imaging. The diagnosis and management of such incidental findings is dependent on tumor size, imaging features, and hormone production. All adrenal incidentalomas should undergo functional workup at initial diagnosis since up to 10% may exhibit excess hormone secretion.<sup>3,4</sup>

Radiologic evaluation can provide insight into the threat posed by

incidentally detected adrenal masses. Tumor size is important since only 2% of adrenal masses less than 4cm in size are malignant while up to 25% of tumors greater than 6cm represent adrenocortical carcinoma (ACC).<sup>5</sup> In this case, we used MRI as an adjunct to help identify the soft tissue plane between the adjacent liver and the right adrenal gland, so that we were confident that the adrenal mass could be removed laparoscopically. Management decision-making for this lesion included the size greater than 4 cm and androgen production that increased the risk of adrenal cortical carcinoma necessitating resection for definitive diagnosis.

### Conclusion

We describe the clinical, biochemical, and pathologic findings of an exceedingly rare adrenal adenoma with isolated DHEA-S production.

### Consent

N/A.

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### Declaration of competing interest

None.

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