

Laparoscopic Resection of a Virilizing Adrenocortical Tumor

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ABSTRACT

Virilizing adrenocortical tumors are rare. Laparoscopic unilateral adrenalectomy with serum androgen surveillance may provide curative treatment for benign, functional adenomas. Herein, we describe a case of laparoscopic resection of a testosterone-producing adrenal tumor in a sixteen-year-old female.

Key Words: Laparoscopy, Virilizing, Testosterone, Adrenal cortex.

INTRODUCTION

Adrenocortical tumors (ACTs) are rare in the pediatric population and make up only 0.2% of childhood cancers.¹ Virilizing tumors are neoplasms that secrete androgens and manifest clinically as masculinization in females. Common signs and symptoms include hirsutism, acne, increased muscle mass, amenorrhea, and clitoromegaly. Such tumors arising in the adrenal cortex are rare, but virtually all cases are symptomatic.² The differential diagnosis includes tumors of the gonads and pituitary as well as polycystic ovarian syndrome, congenital adrenal hyperplasia, and exogenous steroid exposure. The workup involves measurement of glucocorticoids and androgens, a dexamethasone suppression test, and abdominal computed tomography (CT) scanning.

Surgical unilateral adrenalectomy is curative in neoplasms that have not locally invaded or metastasized. Traditionally, there have been 4 distinct approaches the surgeon can choose from. The open approaches are anterior transabdominal, thoracoabdominal, flank/retroperitoneal, and posterior. Secondary to the advances in laparoscopic instrumentation and techniques, there has been a progression towards laparoscopic adrenalectomy, either by a transabdominal approach or retroperitoneal approach.

We report one case of a virilizing ACT in a 16-year-old female that was excised laparoscopically.

CASE REPORT

A 16-year-old, competitive, high school female athlete was seen with symptoms of virilization. The patient reported several years of vague fatigue and in the last year hirsutism. This had been associated with secondary amenorrhea. The patient's menses began approximately at age 11 to 12, but she then developed long intervals between menstrual cycles. Her other developmental milestones had been normal. The patient's past medical history was unremarkable otherwise. On physical examination, the head and neck revealed evidence of hirsutism and acne. The patient had been shaving along the lateral face and the under surface of her chin and slightly over the upper lip area. She had well-defined musculature increases in her upper and lower extremities but within

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normal parameters of appearance for a female. She had a normal-sounding voice that was not deep. Her abdomen was soft and flat. There was no palpable abdominal mass. She was Tanner stage V for pubic hair and IV for breasts, with evidence of clitoromegaly.

The patient had a thorough workup that included cortisol, estradiol, testosterone, dehydroepiandrosterone (DHEAS), and progesterone testing, all of which were normal with the exception of the testosterone level that was 1558 pg/mL, 20 to 40 times normal levels. The DHEAS in her saliva was also 4 times normal. All of these pointed to a testosterone-secreting tumor. These testing results led to a CT of the abdomen to evaluate for abnormalities of the adrenal glands, and a large left adrenal mass was identified (**Figure 1**). The lesion was approximately 8 cm in its largest diameter. The right adrenal gland appeared normal. The remainder of the abdominal CT was normal.

A decision was made to remove the left adrenal gland laparoscopically. The splenic reflection was then taken all the way up to the gastroesophageal junction allowing the spleen and tail of the pancreas to fall forward and the tumor to be seen. The tumor mass was a deep red color and superficially covered with prominent vessels. It was relatively smooth in its appearance and there were areas of speckled yellow consistent with the adrenal origin. Along its medial and inferior aspect, there seemed to be a tongue of normal adrenal gland that was compressed inferiorly. The separation between the kidney and the mass could be initially seen without dissection. The dissection was then completed, and the gland was freed from the retroperitoneum. A specimen bag was used for re-

moval through the camera trocar site. This site was then expanded to accommodate passage of the gland that happened at approximately 4 cm in dimension.

The pathologic specimen consisted of a 138 g adrenalectomy measuring 9.5x6.0x3.5 cm. A cut section revealed a well-circumscribed, red-brown tumor with focal hemorrhagic areas (**Figure 2A**). A thin ribbon of residual adrenal gland was present. The tumor cells contained abundant eosinophilic cytoplasm and small central nuclei with inconspicuous nucleoli (**Figure 2B**). No mitoses were seen in 30 examined high-power fields. No necrosis, severe nuclear atypia, vascular invasion, or invasion into periadrenal soft tissue was identified.

The patient was discharged on postoperative day 2. Laboratory values on that day showed a normal cortisol and a normal serum testosterone level of less than 20 ng/dL. Follow-up will include monitoring adrenal androgens to document chemical evidence of remission, including DHEAS, testosterone, estradiol, and cortisol. Annual CT will be obtained to evaluate the retroperitoneum for recurrence.

DISCUSSION

Virilizing ACTs are extremely rare. The differential diagnosis of hyperandrogenism includes exogenous use of anabolic steroids, adrenal causes, and extra-adrenal causes. The adrenal causes are congenital adrenal hyperplasia, adrenocortical adenoma (ACA), adrenocortical carcinoma (ACC), and exaggerated adrenarche. The extra-adrenal causes are polycystic ovary, adrenal rests, ovarian tumors, testicular tumors, adrenal hyperplasia secondary to a pituitary adenoma or ectopic secretion of ACTH or CRH, hyperprolactinemia, and acromegaly.

ACTs are reported to occur in infancy through childhood, with a reported incidence of 0.3 per million. Fifty percent to 80% of these tumors lead to virilization alone, and 20% to 40% occur with Cushing's syndrome.³

Distinguishing between a benign and malignant ACT can be difficult, even with pathology. The best determination of malignancy is the clinical course. Prognostic indicators, such as tumor size, weight, and histological grade, have yet to have their significance studied substantially. Additionally, there are no good histologic criteria for distinguishing adenoma from carcinoma. A recent study of adrenal cortical neoplasms in the pediatric population reported an increased probability of malignant clinical behavior with tumor weight greater than 400 g, tumor size greater than 10.5 cm, vena cava invasion, capsular inva-



Figure 1. Abdominal computed tomography showing an 8-cm left adrenal lesion (borders marked with arrows).

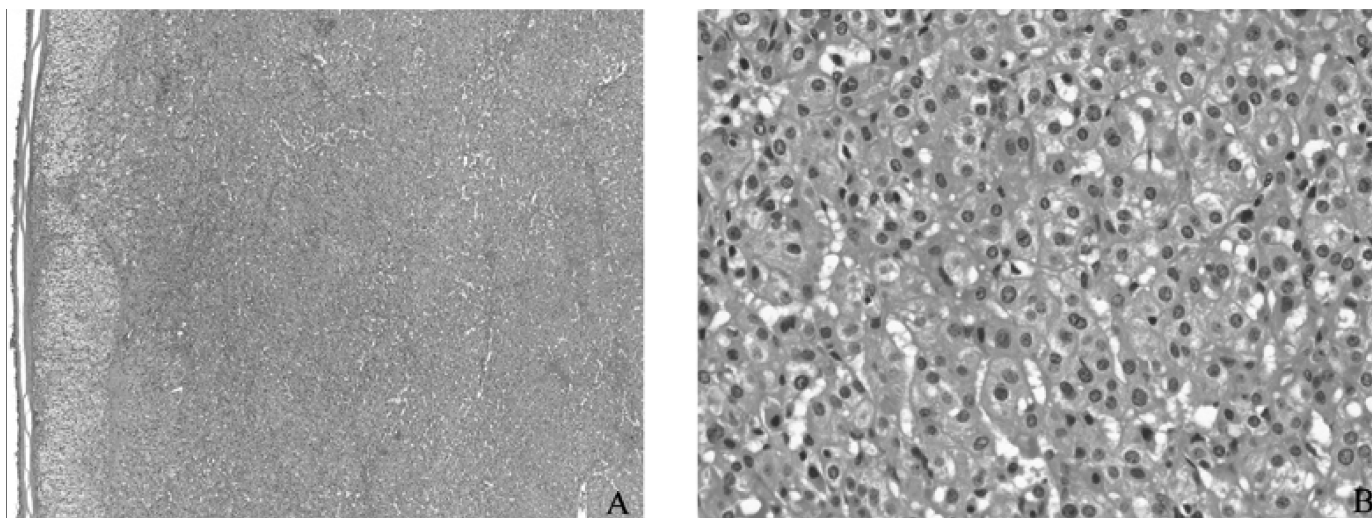


Figure 2. Adrenocortical tumor microscopic aspects: A. Adrenocortical neoplasm with compressed adrenal cortex (left portion of field); B. Tumor cells have abundant eosinophilic cytoplasm and small round nuclei (hematoxylin & eosin).

sion, vascular invasion, confluent necrosis, severe nuclear atypia, increased mitotic rate, and the presence of atypical mitoses.⁴

Whether an ACT is hormonally silent (nonfunctional) or hormone secreting (functional) does not predict survival. Rather the stage, localized, regional, or metastatic, of the ACT is a better indicator of survival. A positive correlation has been shown between clinical stage and urinary levels of steroid metabolites. Virilization is the most common presentation, followed by Cushing's syndrome.^{3,5,6} Benign ACTs were less likely to present with Cushing's syndrome. The most common sites of metastases are the lung and liver. Metastases should be resected if possible.⁵

The operative technique used depends on the associated disease, the overall health of the patient, bilaterality, and the surgeon's experience with each procedure. The posterior and flank/retroperitoneal approach offer the advantage of not entering the peritoneal cavity. This leads to less postoperative pain, ileus, and respiratory insufficiency.^{7,8} This is best suited for benign, small to moderate sized masses. The anterior/transabdominal approach offers excellent exposure and is the preferred method for large or malignant tumors.⁹ All major visceral vascular structures that are potentially involved can be accessed through this approach. In rare cases, the thoracoabdominal approach may be necessary in the case of giant malignant lesions when extensive exposure is needed.⁹ This approach has a high potential for morbidity. Laparoscopic adrenalectomy offers 2 techniques, the transabdominal and retroperito-

neal. Compared with the open procedure, many studies have shown a postoperative hospital stay of 2 to 3 days, decreased blood loss, and decreased need for narcotics in the laparoscopic group.¹⁰⁻¹³ The transabdominal approach has the advantages of a large working space, anatomic landmarks, and overall success.¹⁴ The retroperitoneal approach has the advantage of not entering the peritoneal cavity, no need to retract organs, and a likely decrease in postoperative ileus.^{11,15} On the other hand, this approach offers a smaller working space, fewer landmarks, and is usually restricted to tumors smaller than 5 cm. The main contraindication to laparoscopic surgery is suspected malignancy.⁹ We used a laparoscopic transabdominal approach, which was necessary secondary to the size of this tumor. The laparoscopic approach of tumors larger than 6 cm has been shown to be safe.¹⁶ We approach all ACT cases laparoscopically through a transabdominal approach, unless they are >12 cm to 15 cm, or evidence is clear cut that local organ invasion has occurred. We will also approach some small cancers laparoscopically.

In this case, pathologic criteria were not met for a carcinoma classification. In fact, the rapid normalization of serum testosterone levels within 48 hours suggests, but does not prove, a curative laparoscopic excision of an adenoma as seen in previous cases.¹⁷ In addition to short-term follow-up for resolution of the masculinizing signs and symptoms, we suggest annual testosterone screening for 5 years.

CONCLUSION

Testosterone-producing adrenocortical tumors are rare. Laparoscopic unilateral adrenalectomy with measurement of serum androgens provides a feasible and effective method of treatment.

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