The patient, a 9-year-old, neutered male mixed breed.

ASK YOURSELF …

Which of the following diagnostic tests is most suggestive of an adrenal tumor?

A. Abdominal ultrasonography
B Elevated ACTH plasma level
C. Elevated 17-hydroxyprogesterone plasma level
D High-dose dexamethasone suppression
E. ACTH stimulation test

ACTH = adrenocorticotropic hormone; PU/PD = polyuria/polydipsia.

Atypical Hyperadrenocorticism in a Dog

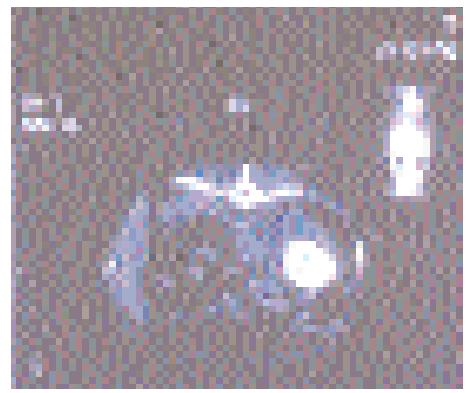
Michael Schaer, DVM, and James P. Farese, DVM, University of Florida

A 9-year-old, neutered male mixed-breed dog was presented for PU/PD of 2-months duration. The patient had been previously normal.

History. The dog showed a noticeable increase in drinking and urinating over the past 2 months. Appetite and exercise tolerance remained normal. The owners had the dog examined by their regular veterinarian, who also took blood samples and did a urinalysis as a routine evaluation screen. All clinical variables were normal, including serum cortisol levels as determined by an ACTH-stimulation test. The dog was subsequently referred for further evaluation.

Examination. Except for several isolated subcutaneous lipomatous masses that were confirmed with fine-needle aspiration and cytologic evaluation, no abnormal findings were noted. Thoracic and abdominal radiographs were normal, but abdominal ultrasonography showed a mass in the region of the cranial pole of the right kidney, which was compatible with a right adrenal mass but without apparent invasion of the caudal vena cava. Hemogram and serum biochemistry results were normal, including alkaline phosphatase levels. Urinalysis was unremarkable except for a specific gravity of 1.005. The ACTH-stimulation test was repeated, and the results showed a resting serum cortisol level of 1.2 µg/dl (normal, 0.5 to 6.0 µg/dl) and a post-stimulation level of 2.8 µg/dl (normal, 8 to 19 µg/dl). These clinical findings were compatible with an adrenocortical neoplasm in light of the history, which ruled out prior steroid use. The stored serum samples were sent to the University of Tennessee Clinical Endocrinology Service for an expanded steroid evaluation.

Clinical Course. On the evening of the referral, the dog had acute onset of vomiting and weakness. It was moved into the intensive care ward and was stabilized after receiving IV fluids. The patient seemed normal the next morning. At that time, contrast computed tomography was done and showed an abnormally enlarged, right-sided adrenal mass compressing but not invading the posterior vena cava. Increased fluid density compatible with hemorrhage surrounding the right adrenal and kidney regions was also noted. Surgery was scheduled for the following day.



Computed tomography showing the contrast-enhanced right adrenal neoplasm and hemorrhage, which appears as surrounding dense fluid.

continues

ATYPICAL HYPERADRENOCORTICISM

Correct Answer: A

Functional adrenocortical neoplasms suppress endogenous ACTH secretion. Both adrenocortical neoplasms and pituitary-dependent hyperadrenocorticism can produce increased amounts of 17-hydroxyprogesterone and other steroids in addition to cortisol. Although nearly all functional adrenocortical tumors fail to suppress during the high-dose dexamethasone suppression test, this can also occur in up to 20% of dogs with pituitary-dependent hyperadrenocorticism. **Abdominal ultrasonography is the correct answer because of the likelihood of an adrenal mass representing a neoplasm.** Other diagnostic features of adrenocortical tumors include ability to hypersecrete or failure to secrete cortisol using the ACTH-stimulation test; ability to cause low endogenous ACTH secretion; and demonstration of a mass lesion on plain radiographs, ultrasonography, or computed tomography. Failure to hypersecrete cortisol in response to ACTH along with demonstration of an adrenal mass on diagnostic imaging precluded the need for further diagnostics in this case.

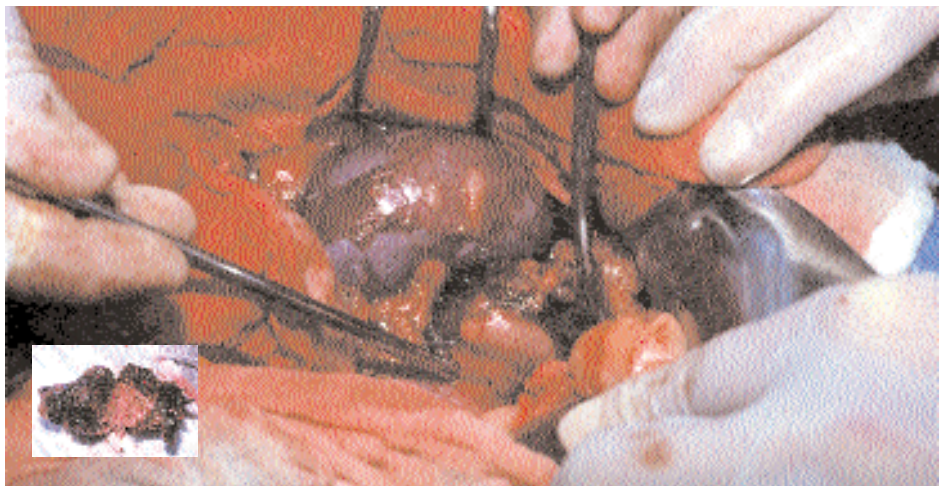
Surgical Findings. Intraoperative findings included a large retroperitoneal hematoma originating from a right adrenal mass. The hematoma was evacuated, and the tumor was resected without complication. Postoperative maintenance therapy consisted of 2 mg dexamethasone Q 12 H to supply the patient's daily glucocorticoid requirements. Recovery was uneventful. Adrenocortical carcinoma was diagnosed on histopathologic evaluation of the resected adrenal mass.

Follow-up. Prednisone 0.25 mg/kg was administered PO on a tapering dose for 2 weeks after surgery. The patient did well after discontinuation of the drugs. Steroid panels were done 2 weeks and 6 months after surgery, and results were normal except for a slight elevation in the resting estradiol level noted on the 6-month sample (**Table**).

Further Insights. The signs of acute vomiting and weakness during the first day of hospitalization were associated with peracute retroperitoneal hemorrhage. Because of this unexpected occurrence, it was fortuitous to be able to treat the dog with IV fluids early during onset, which stabilized the patient immediately.

Recent studies have shown that dogs with hyperadrenocorticism because of adrenal tumors or pituitary-dependent causes can produce abnormally elevated 17-keto-steroids (also known as sex corticoids) without causing elevations in the 11-hydroxycorticoid levels (cortisol)—a tendency clearly illustrated in this case. Perhaps monitoring these patients after surgery with periodic repeated steroid profiles can provide us with a long term biochemical marker that might reflect recurrent disease. Further studies will help answer this question.

See Aids & Resources, back page, for references, further reading, and contacts.



The adrenal tumor during surgical removal (inset) and after resection (above). Note the periadrenal hemorrhage.

STEROID PROFILE RESULTS*

Variable	Baseline Results	Normal Range	Post-corticotropin Results	Normal Range
Cortisol (ng/ml)	14/25/25.2	2.0–56.5	27.3/40.5/120.1	70.6–151.2
Androstenedione (ng/ml)	38.9/1.8/1.6	0.1–3.6	78.3/14.2/6.6	2.4–29
Estradiol (pg/ml)	62/65/75.6	23.1–65.1	58.2/66/62.1	23.3–69.4
Progesterone (ng/ml)	4.8/0.06/0.16	0.01–0.17	7.83/0.45/1.03	0.22–1.45
17-hydroxyprogesterone (ng/ml)	3.06/0.33/0.09	0.01–0.22	7.13/2.63/0.80	0.25–2.63
Testosterone (ng/ml)	0.16/0.03/0.02	0.01–0.24	0.14/0.03/0.03	0.02–0.42

**Profiles were done before surgery and 2 weeks and 6 months after surgery.*

ACTH = adrenocorticotropic hormone; PU/PD = polyuria/polydipsia.

TAKE-HOME MESSAGES

- Some dogs with hyperadrenocorticism can be diagnosed with the ACTH-stimulation test and an expanded endogenous steroid profile when cortisol studies are nondiagnostic.
- Some dogs with adrenocortical neoplasms can have tumor-associated retroperitoneal hemorrhage, which can be a life-threatening complication.