

What Is Your Diagnosis?

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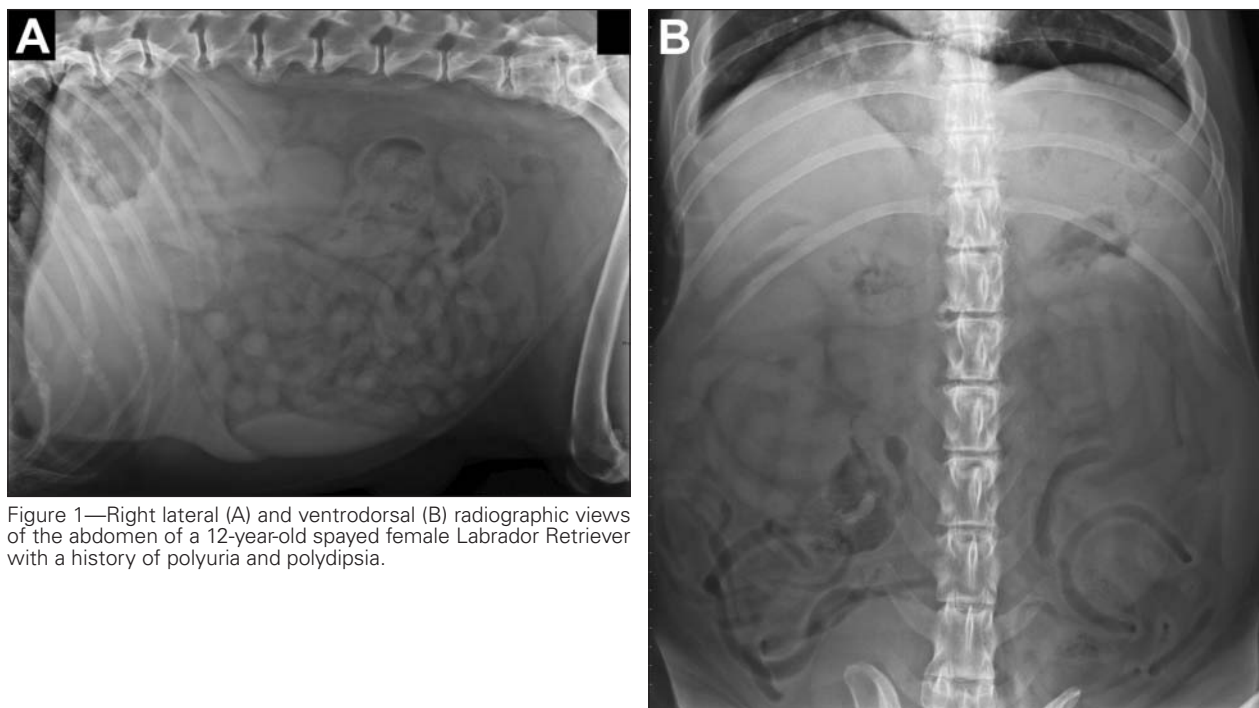


Figure 1—Right lateral (A) and ventrodorsal (B) radiographic views of the abdomen of a 12-year-old spayed female Labrador Retriever with a history of polyuria and polydipsia.

History

A 36-kg (79-lb) 12-year-old spayed female Labrador Retriever was referred to the Foster Hospital for Small Animals for evaluation. The dog had a history of profound polyuria and polydipsia of several months' duration. On initial evaluation, the dog was laterally recumbent, and signs of moderate pain in the cranial aspect of the abdomen were noted on palpation. A fundic examination revealed retinal hemorrhages in the right eye and a luxated lens in the left eye. Oscillometric systolic arterial blood pressure was 180 mm Hg, and oscillometric diastolic arterial blood pressure was 100 mm Hg; hypertension was believed to be responsible for the ocular pathological findings. Pertinent findings on CBC, plasma biochemical analysis, and urinalysis included neutrophilia (33.2×10^3 neutrophils/ μL ; reference interval, 4.9×10^3 neutrophils/ μL to 16.9×10^3 neutrophils/ μL), hypokalemia (potassium concentration, 2.1 mEq/L; reference interval, 3.7 to 5.4 mEq/L), hypomagnesemia (magnesium concentration, 1.4 mEq/L; reference interval, 1.8 to 2.6 mEq/L), and hyposthenuria (urine specific gravity, 1.005). Findings on thoracic radiographs were unremarkable. Orthogonal radiographs of the abdomen (Figure 1) were obtained.

Determine whether additional imaging studies are required, or make your diagnosis from Figure 1—then turn the page →

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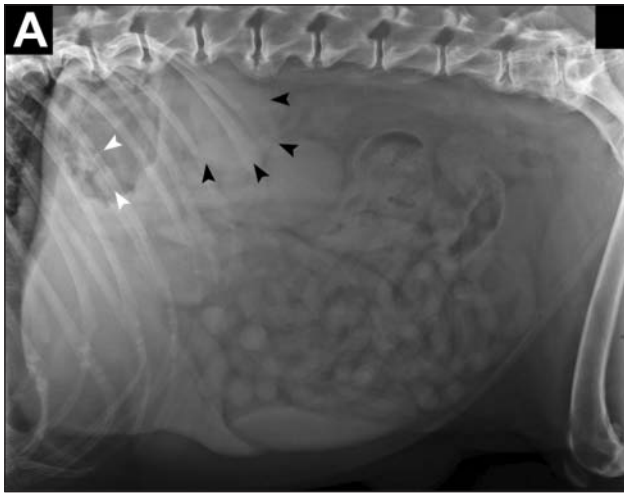
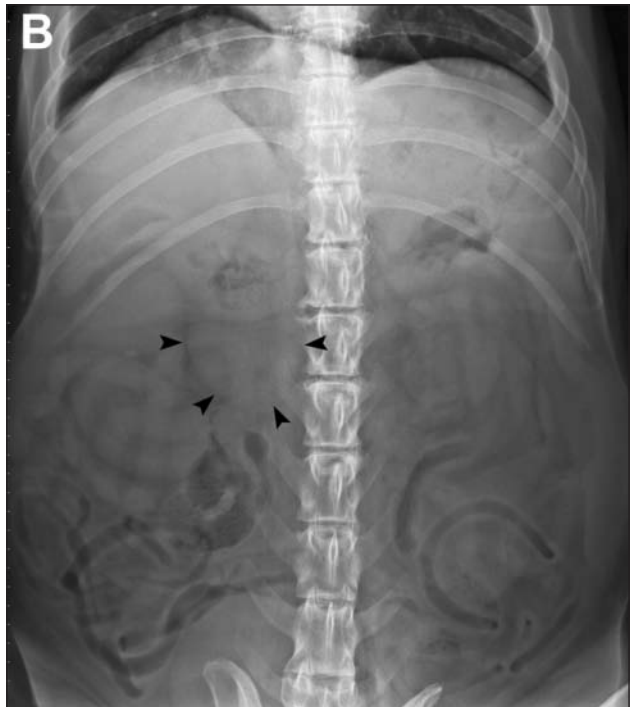


Figure 2—Same radiographic views as in Figure 1. A large soft tissue mass is evident in the right cranial aspect of the retroperitoneum (black arrows). The stomach is moderately distended (white arrows).



Diagnostic Imaging Findings and Interpretation

The stomach is moderately distended (Figure 2). The small intestines are fluid filled and normal in diameter. Fecal material is noted within the cecum and colon. A mass is present in the right cranial portion of the retroperitoneum caudal to the stomach and medial to the right kidney.

Abdominal ultrasonography was performed to characterize the retroperitoneal mass (Figure 3). A heterogeneous, round 5.09-cm-diameter mass with smooth edges was identified in the location of the right adrenal gland. The mass displaced the aorta and caudal vena cava. Within the caudal vena cava, there was markedly turbulent and echogenic blood flow, with multiple intraluminal filling defects, likely representing thrombi or tumor invasion. The left adrenal gland was mildly enlarged (11 mm) with a normal shape and heterogeneous appearance. Pheochromocytoma and adrenal cortical adenocarcinoma are the most likely differential diagnoses for the right adrenal mass. The most likely differential diagnosis for enlargement of the left adrenal gland is hyperadrenocorticism or adrenal adenoma. Although rare, the possibility of bilateral adrenal tumors cannot be ruled out.

Comments

On the basis of the history of polyuria, polydipsia, systemic hypertension, hypokalemia, and bilateral adrenal abnormalities, primary hyperaldosteronism (functional adrenal cortical adenocarcinoma) was suspected. However, a pheochromocytoma could also have been responsible for the patient's hypertension. Hyperaldosteronism was confirmed by a high serum aldosterone concentration ($> 3,794$ pmol/L; reference interval, 14 to 957 pmol/L). Definitive diagnosis of primary hyperaldosteronism is now made on the basis of hyperaldosteronemia with concurrent hyporeninemia in dogs with appropriate clinical signs and diagnostic imaging results. However, at the time the dog of this report was evaluated, there were no commercial laboratories eval-

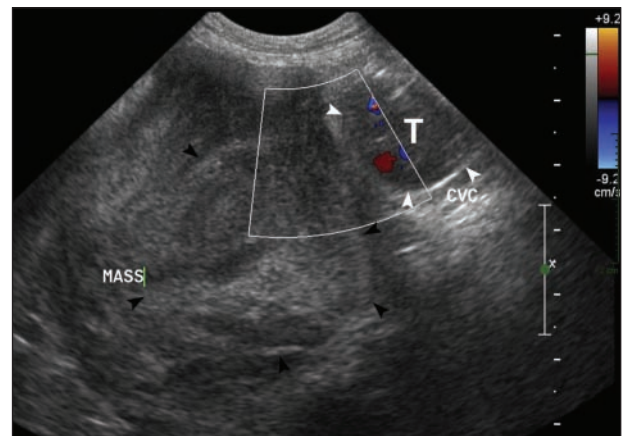


Figure 3—Transverse ultrasonographic image with color flow Doppler imaging in the region of the right adrenal gland of the same dog as in Figure 1. Notice the large, heterogeneous mass (black arrows) in the region of the right adrenal gland near the caudal vena cava (white arrows) and decreased blood flow around a caval thrombosis or tumor thrombus (white T). Vertical scale on left indicates distance in centimeters.

uating canine serum renin concentration; a presumptive diagnosis of primary hyperaldosteronism was made on the basis of diagnostic imaging findings along with a markedly increased serum aldosterone concentration. Surgical right adrenalectomy and caval thrombectomy was declined by the patient's owners because of procedural risks. Long-term management consisted of spironolactone and potassium gluconate administration. Initially the dog clinically improved with treatment, but was returned 3 months later for euthanasia because of deteriorating quality of life. Postmortem examination revealed a pheochromocytoma in the right adrenal gland with caval invasion and metastasis to the liver, lungs, and omentum. In addition, an adrenal cortical

adenoma was present in the left adrenal gland that was assumed to be the cause of the hyperaldosteronism.

Rare reports¹ of an adrenal cortical adenoma concurrent with a pheochromocytoma in the contralateral adrenal gland can be found in the literature. Pheochromocytoma is a tumor of the chromaffin cells of the adrenal medulla or sympathetic paraganglia and results in excessive secretion of catecholamines.¹ Adrenalectomy is the definitive treatment for a pheochromocytoma, although the prognosis is guarded to poor if vascular invasion is present.¹ Primary hyperaldosteronism is an uncommon endocrinopathy in dogs. Aldosterone is produced in the zona glomerulosa of the adrenal cortex and is primarily regulated by potassium concentrations and the renin-angiotensin system.² Aldosterone maintains intravascular volume through retention of sodium and maintains potassium homeostasis by promoting

potassium excretion.³ Primary hyperaldosteronism is usually caused by a unilateral adenoma of the zona glomerulosa of the adrenal gland, resulting in excess aldosterone production and subsequent polyuria, polydipsia, hypokalemia, and hyposthenuria.^{2,4} Medical management for hyperaldosteronism includes spironolactone and potassium supplementation.³

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2. Guyton AC, Hall JE. The adrenocortical hormones. In: *Textbook of medical physiology*. 10th ed. Philadelphia: WB Saunders Co, 2000;869–883.
3. Johnson KD, Henry CJ, McCaw DL, et al. Primary hyperaldosteronism in a dog with concurrent lymphoma. *J Vet Med A Physiol Pathol Clin Med* 2006;53:467–470.
4. Kooistra HS, Galac S, Buijtels JJCWM, et al. Endocrine diseases in animals. *Horm Res* 2009;71(suppl 1):144–147.