What Is Your Diagnosis?

In collaboration with the American College of Veterinary Radiology

Figure 1—Right lateral (A) and ventrodorsal (B) thoracic and cranial abdominal radiographic images of a 7-year-old 16.1-kg spayed female Miniature Australian Shepherd referred for evaluation of progressive abdominal distention. The images are published with permission by Dr. Victoria Harvey, the copyright holder with all rights reserved. Anyone wishing to reproduce the images is directed to contact Dr. Victoria Harvey (Victoria.Harvey@banfield.com) from Banfield Pet Hospital, 2847 Chad Dr, Eugene, OR 97408.

History

A 7-year-old 16.1-kg spayed female Miniature Australian Shepherd dog was evaluated because of a 1.5-week history of progressive abdominal distention, lethargy, hyporexia, and 1 observed episode of vomiting. The referring veterinarian performed a CBC and serum biochemical analyses, and results were unremarkable.

On referral examination, the dog had vital signs within reference limits and a palpable abdominal fluid wave. The remaining findings from physical examination were clinically normal. Based on the

dog's palpable fluid wave, diagnostic abdominocentesis was performed, and cytologic results were consistent with a modified transudate (nucleated cell count, 700 cells/ μ L; total protein concentration, 4.4 g/dL). Our top differential diagnosis considered for the dog's abdominal effusion was cardiovascular disease or portal hypertension. Radiographic images (**Figure 1**) provided by the referring veterinarian were reviewed.

Formulate differential diagnoses, then continue reading.

Diagnostic Imaging Findings and Interpretation

Thoracic radiography performed by the referring veterinarian revealed decreased serosal detail in the abdomen and a soft tissue opacity on the caudodorsal aspect of the cardiac silhouette (**Figure 2**). The caudal vena cava appeared distended, with a subjectively tortuous course.

Echocardiography with the use of a phased-array 3.0- to 8.0-MHz transducer (iE33, Philips Medical Systems) revealed a large, intracavitary, right atrial mass

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Figure 2—Same images as in Figure 1. There is decreased serosal detail in the abdomen. The cardiac silhouette has a protruding soft tissue opacity structure (arrows) on the caudodorsal aspect but otherwise appears appropriate. The caudal vena cava (asterisks) appears distended and subjectively tortuous. The images are published with permission by Dr. Victoria Harvey, the copyright holder with all rights reserved. Anyone wishing to reproduce the images is directed to contact Dr. Victoria Harvey (Victoria.Harvey@banfield.com) from Banfield Pet Hospital, 2847 Chad Dr, Eugene, OR 97408.

Figure 3—Two-dimensional (A) and color-flow Doppler (B) transthoracic echocardiographic images from the right parasternal short axis at the level of the heart base of the dog described in Figure 1. There is an intracavitary right atrial mass (asterisks); however, the right atrial and right ventricular chamber sizes are subjectively normal. Blood flow turbulence is evident in the right atrium associated with the mass obstructing caudal venal caval return. The vertical numeric scale to the right of each image is depth in centimeters.

Ao = Aorta. RA = Right atrium. RV = Right ventricle.

(approx 2.5 X 2.8 cm) that was associated with the dorsal right atrial wall and obstructed caudal vena caval blood flow throughout diastole (**Figure 3**). The associated increase in caudal vena caval hydrostatic pressure resulted in ascites. The cranial vena caval blood flow was unobstructed, and there was no pericardial effusion nor pleural effusion present. The considered list of differential diagnoses for the mass included hemangiosarcoma, paraganglioma, ectopic thyroid carcinoma, lymphoma, and myxoma.

Treatment and Outcome

Options for further treatment included 3-D imaging of the mass by cardiac-gated thoracic CT in preparation for either surgical excision or palliative treatment options (eg, endovascular stent or vascular conduit). The owner declined further treatment and elected euthanasia. Necropsy revealed a roughly spherical (approx 3.5 cm), dark red mass that almost completely occluded the caudal vena caval lumen. Histologically, the expansile mass was well-demarcated, expanded the right atrial myocardium, and invaded adjacent vascular tissue. Neoplastic cells were arranged in small packets of polygonal cells supported by delicate, well-vascularized stroma, suggestive of a neuroendocrine tumor. Grimelius staining revealed argyrophilic cytoplasmic granules in the neoplastic cells, whereas Churukian-Schenk staining did not. Furthermore, immunohistochemistry (IHC) staining for calcitonin and thyroglobulin did not label neoplastic cells, confirming the diagnosis of malignant paraganglioma¹ in the right atrium of this dog.

Comments

Intracardiac neoplasms are generally rare in dogs, with hemangiosarcoma being the most common cardiac neoplasm to produce a mass within the lumen of a heart chamber and the most common intracardiac neoplasm specifically of the right atrium or right auricle in dogs.^{2,3} Less common differential diagnoses include paragangliomas (as diagnosed in the dog of the present report) and ectopic thyroid tumors such as thyroid follicular tumors (IHC staining positive for thyroglobulin) and thyroid C-cell tumors (IHC staining positive for calcitonin).^{2,3}

Radiography and echocardiography were both instrumental in achieving a working diagnosis for the cause of the abdominal effusion in the dog of the present report, which allowed the dog's owner to make an educated medical decision. The dog's mass had a similar echocardiographic appearance to that in a previously published case report⁴ of a functional right atrial chromaffin paraganglioma in a dog, which similarly occluded the caudal vena cava without affecting the cranial venous return. However, a definitive diagnosis required histopathologic analysis, including IHC staining, and findings for the dog of the present report highlighted the importance of performing more than 1 argyrophil histochemical stain to detect these granules in such tumors.⁵

Antemortem intracardiac tumor sampling is rarely performed by veterinary cardiologists given the attendant risks. Should treatment have been elected, contrast-enhanced CT would have been useful in providing 3-D anatomic detail to provide needed insight for treatment options.

Acknowledgments

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