

## What Is Your Diagnosis?

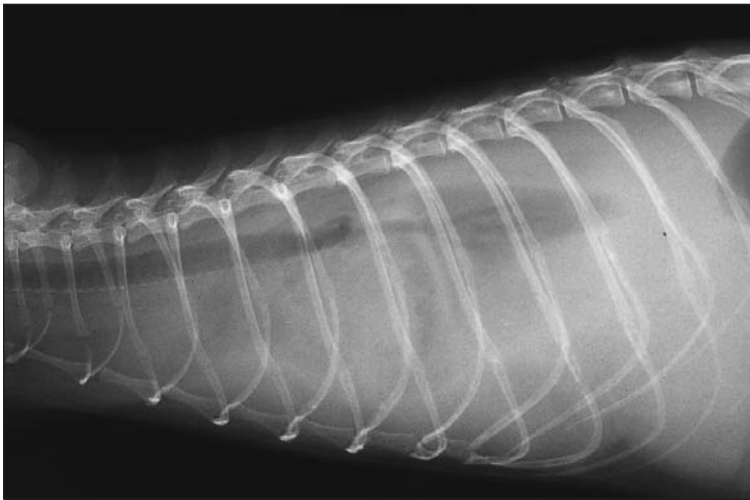
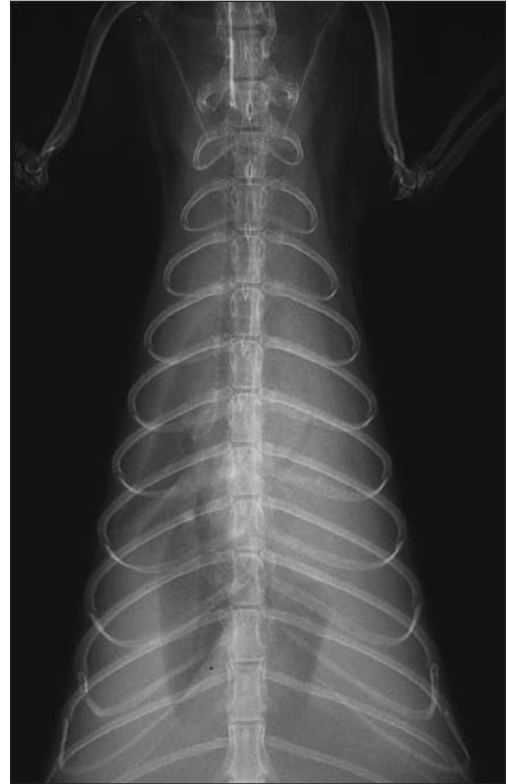


Figure 1—Lateral (left) and ventrodorsal (right) radiographic views of the thorax of a ferret evaluated because of acute onset of labored breathing.



### History

A 2-year-old spayed female ferret was evaluated because of acute onset of labored breathing. According to the owner, the ferret had appeared healthy 2 days prior to evaluation but was dyspneic and listless the day before evaluation. The affected ferret was housed indoors in a cage with an apparently healthy ferret, and there was no known history of trauma.

The ferret was lethargic during physical examination. Abnormal adventitial sounds, including crackles, and a grade-II/VI systolic murmur were auscultated. Abdominal palpation revealed splenomegaly. Serum biochemical analyses and CBC were performed; the only abnormality detected was an inverse serum calcium-to-phosphorus concentration ratio. Thoracic radiographs were obtained (Fig 1).

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

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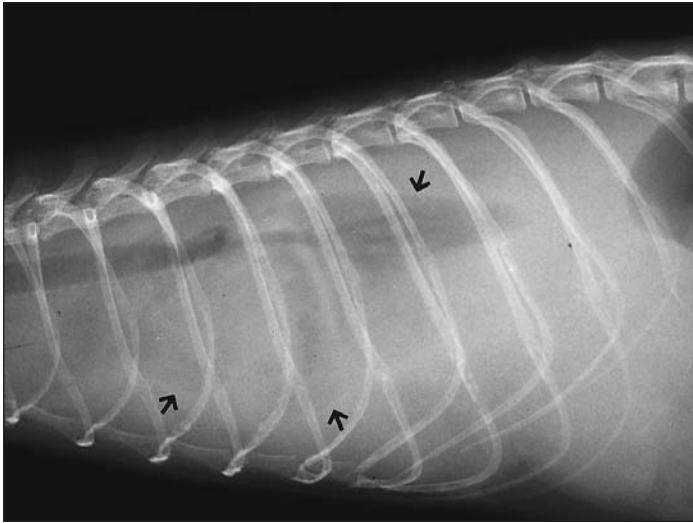
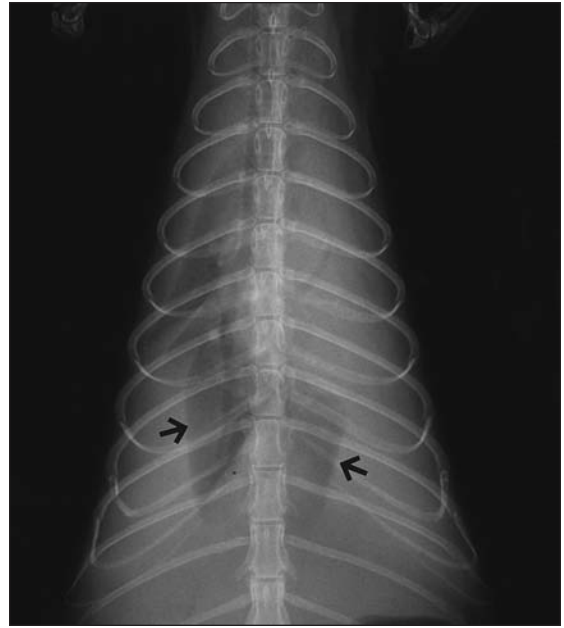


Figure 2—Same radiographic views as in Figure 1. The cardiac silhouette is not apparent because of severe pleural effusion. Notice the rounded borders of atelectatic lung lobes (arrows).



## Diagnosis

**Radiographic diagnosis.** Severe pleural effusion and pulmonary atelectasis (Fig 2).

## Comments

The cardiovascular structures and diaphragm could not be completely evaluated because of the large volume of pleural fluid. Diaphragmatic hernia was not suspected, because abdominal viscera were apparent caudal to the diaphragm. However, there was radiographic evidence of a small amount of free abdominal fluid. Thoracocentesis was performed to allow lung re-expansion. Forty-five milliliters of blood-tinged hazy pleural fluid (protein concentration, 3.5 g/dl) was obtained. Results of cytologic examination of this fluid were consistent with chylous effusion, possibly secondary to heart disease. Differential diagnoses included congestive heart failure, neoplasia, and heartworm disease.

To more thoroughly evaluate the heart, mediastinum, and pleural space, thoracic ultrasonography was performed (Fig 3). Parallel hyperechoic lines, consistent with adult heartworms (*Dirofilaria immitis*), were found within the right atrium and caudal vena cava. There was no evidence of a heart-based tumor. Final diagnosis was heartworm disease.

Because of the poor prognosis, the owners elected to euthanize this ferret. Necropsy revealed a dilated right atrium and ventricle. Four adult heartworms were detected within the right side of the heart. One heartworm extended into the caudal vena cava. *Microfilaria* were identified within alveoli. A small amount of abdominal fluid was also detected.

Although ferrets can become infected with *D immitis*, they are not a definitive host, and infection with only 1 or 2 worms can cause severe disease. Diagnosis of heartworm disease in ferrets can be difficult; recommendations for diagnosis follow the standard protocol for dogs. Ultrasonographic findings consistent with heartworm disease have been



Figure 3—Sagittal sonographic image of the heart, obtained at the left intercostal space, of the ferret described in Figure 1. The heart base is to the left and the apex to the right of the image. Parallel hyperechoic lines (arrows) in the right atrium are consistent with the ultrasonographic appearance of adult *Dirofilaria immitis*.

described in dogs and cats,<sup>1,3</sup> and ultrasonography for diagnosis of heartworm disease in aberrant hosts may prove more sensitive than available laboratory tests. Sonographic recognition of adult heartworms is dependent not only on the quality of the equipment used, but also on the skill of the ultrasonographer. Therefore, lack of detection of parallel hyperechoic lines may not rule out dirofilariasis. Recheck examinations are recommended when heartworm disease is strongly suspected.

## References

1. Glaus TM, Jacobs GJ, Rawlings CA, et al. Surgical removal of heartworms from a cat with caval syndrome. *J Am Vet Med Assoc* 1995;206:663–666.
2. Badertscher RR, Losonsky JM, Paul AJ, et al. Two-dimensional echocardiography for diagnosis of dirofilariasis in nine dogs. *J Am Vet Med Assoc* 1988;193:843–846.
3. Hutchinson CE, Crystal MA, Fasolo DM, et al. What is your diagnosis? *J Am Vet Med Assoc* 1994;204:523–524.