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What Is Your Diagnosis?

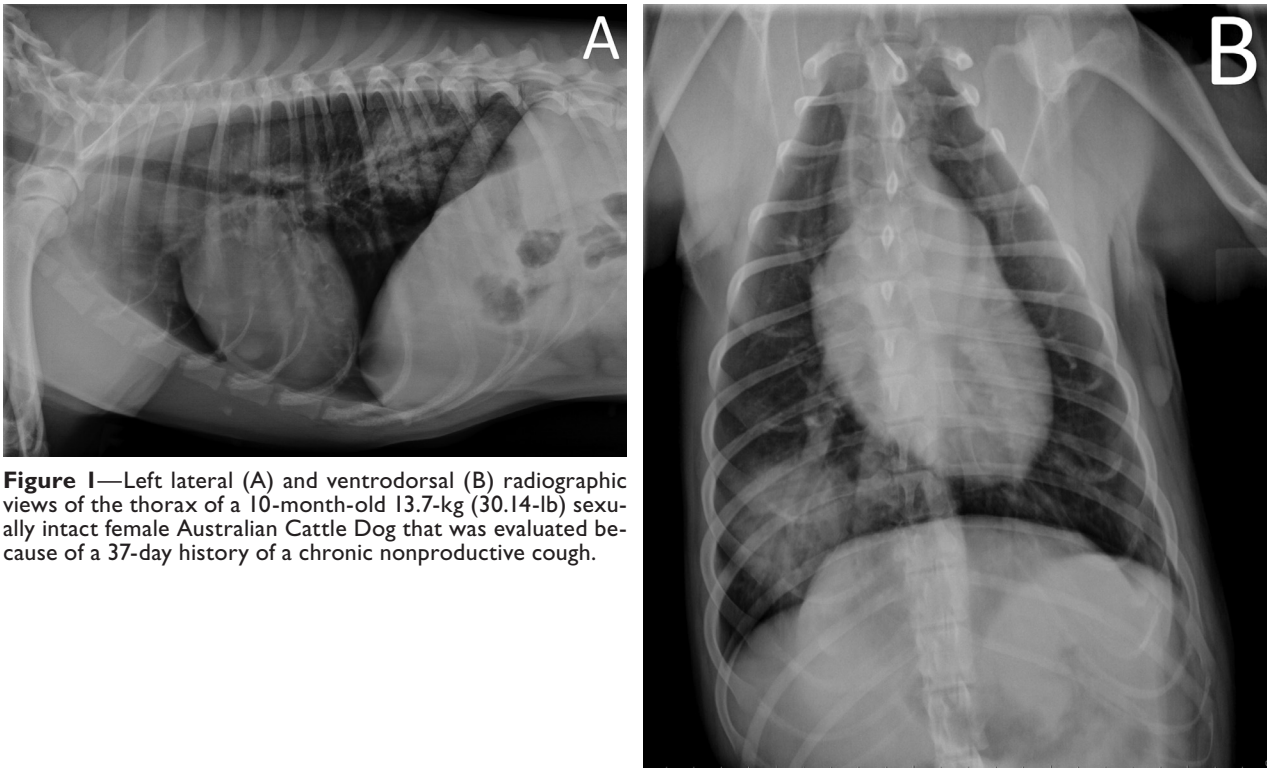

Figure 1—Left lateral (A) and ventrodorsal (B) radiographic views of the thorax of a 10-month-old 13.7-kg (30.14-lb) sexually intact female Australian Cattle Dog that was evaluated because of a 37-day history of a chronic nonproductive cough.

History

A 10-month-old 13.7-kg (30.14-lb) sexually intact female Australian Cattle Dog was referred because of a 37-day history of a chronic nonproductive cough. Initially, antimicrobial treatment with doxycycline was administered for 10 days with no improvement. The dog's vaccination status was up to date for core vaccines as well as for a *Leptospira* vaccine, but the dog was due for an intranasal *Bordetella bronchiseptica* vaccine.

The patient was clinically stable at the time of hospital admission. No abnormalities were detected on physical examination, and the dog had a body condition score of 5/9. No cough was elicited with tracheal palpation, and lung sounds were normal on thoracic auscultation. Findings on CBC revealed a mature neutrophilia, (20,034 cells/µL; reference range, 3,000 to 12,000 cells/µL), mild monocytosis, and mild thrombocytosis. Results of serum heartworm antigen testing and fecal flotation testing for gastrointestinal parasites were negative. Three-view thoracic radiography was performed **(Figure 1)**.

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

This report was submitted by Rohan A. Shah, BS, and Jeffrey D. Ruth, DVM; from the Department of Diagnostic Imaging, Virginia-Maryland College of Veterinary Medicine, Virginia Tech, Blacksburg, VA 24061.

Address correspondence to Dr. Shah (rashah89@vt.edu).

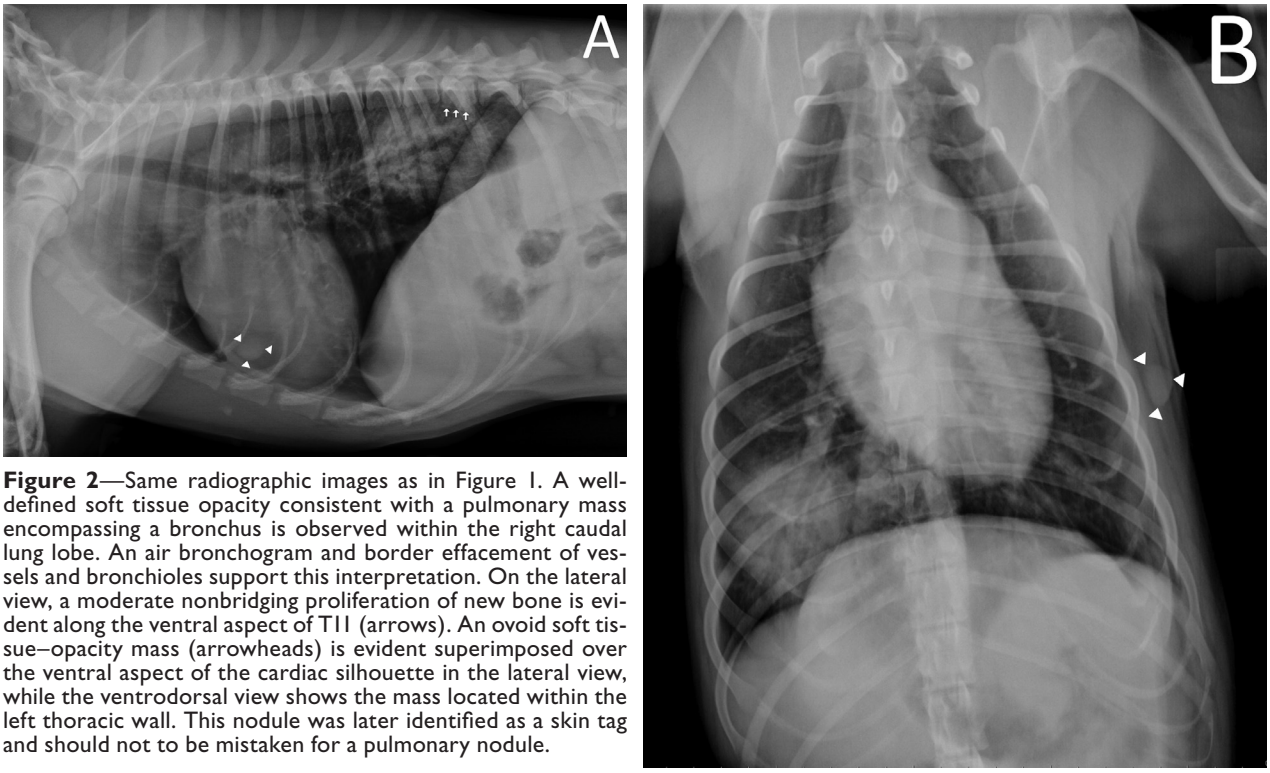

Figure 2—Same radiographic images as in Figure 1. A well-defined soft tissue opacity consistent with a pulmonary mass encompassing a bronchus is observed within the right caudal lung lobe. An air bronchogram and border effacement of vessels and bronchioles support this interpretation. On the lateral view, a moderate nonbridging proliferation of new bone is evident along the ventral aspect of T11 (arrows). An ovoid soft tissue–opacity mass (arrowheads) is evident superimposed over the ventral aspect of the cardiac silhouette in the lateral view, while the ventrodorsal view shows the mass located within the left thoracic wall. This nodule was later identified as a skin tag and should not to be mistaken for a pulmonary nodule.

Diagnostic Imaging Findings and Interpretation

A focal soft tissue mass with irregular margins encompasses the bronchus in the dorsal aspect of the right caudal lung lobe **(Figure 2)**. The remainder of the lung is radiographically normal. On the lateral view, well-defined proliferative new bone growth that does not clearly bridge the intervertebral space to T12 is evident on the ventral aspect of T11. Confirmation of this new bone growth is not possible in the orthogonal projection because of its location on the ventral aspect of T11. Incidentally, an ovoid cutaneous soft tissue nodule is present on the left ventral aspect of the thoracic wall, superimposed over the ventral portion of the cardiac silhouette in the lateral view, representing a skin tag.

Thoracic ultrasonography was performed and revealed a nonspecific pulmonary infiltrate (images not shown). Ultrasound-guided fine-needle aspiration of the lung lesion was performed. Cytologic evaluation of the aspirate revealed marked pyogranulomatous inflammation and epithelial proliferation with atypia. No infectious organisms were observed.

Computed tomography was conducted with a 16-slice helical scanner[a] to determine the extent of the lung lesion and to further characterize the vertebral lesion. The patient was sedated with butorphanol and dexmedetomidine, and anesthesia was induced with propofol and maintained with isoflurane. The dog was in sternal recumbency and the CT images were acquired during a respiratory pause to minimize respiratory motion. Following a precontrast study, 31 mL of iopromide (370 mg of iodine/mL) was administered IV and a 3-minute postcontrast scan was acquired.

On CT evaluation, the pulmonary lesion (2 cm long × 4 cm wide × 5 cm high) was confined to the right caudal lung lobe. The lesion appeared as a focal well-demarcated alveolar pattern that was soft tissue attenuating (precontrast, 45 Hounsfield units; postcontrast, 130 Hounsfield units) and contained several dilated air-filled bronchi **(Figure 3)**. Within the lesion, the bronchus contained a spiculated 6-mm-diameter foreign body of lower attenuation than the surrounding tissue. A thick soft tissue attenuating pleural tag, which represented thickened interlobular septa of the lung, extended from the lung lesion toward the dorsomedial aspect of the right caudal lung lobe pleura, near the vicinity of T11 (not evident in Figure 3). Continuous periosteal reaction extended along and just caudal to the T11 vertebral body, without ankylosis **(Figure 4)**. The T11 vertebral body was sclerotic, and there was a linear arrangement of multifocal lytic lesions in the plane of the caudal physeal plate. Mild soft tissue swelling surrounded the vertebral lesion. On the basis of radiographic and CT imaging findings and cytologic findings, the presumptive diagnosis was pulmonary granuloma and infectious vertebral spondylitis secondary to inhalation of plant-based foreign material.

Treatment and Outcome

Bronchoscopic retrieval of the foreign object was unsuccessful, as mucus and small airway diameter pre-

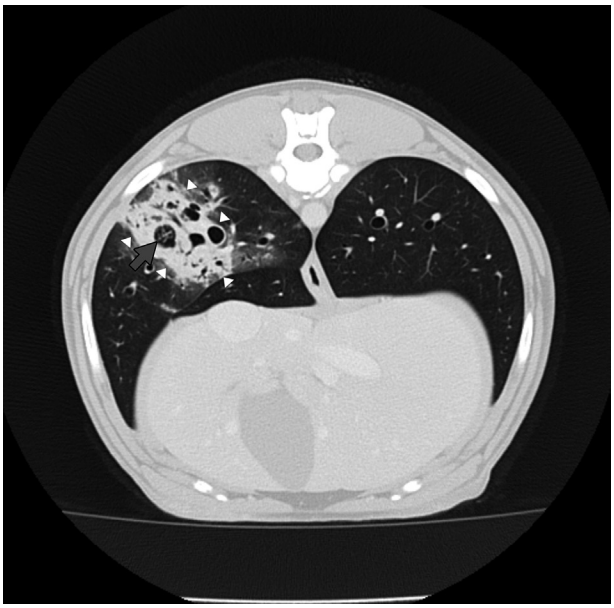

Figure 3—Postcontrast transverse CT image (230-mm display field of view; 3-mm-thick slices; 120 kVp; 300 mA) of the thorax at the level of the lung lesion of the dog in Figure 1. A focal, well-defined bronchocentric region of increased attenuation is evident within the right caudal lung lobe (white arrowheads). Notice that the bronchus contains an oblique spiculated 6-mm-diameter foreign body of lower attenuation than the surrounding tissue as well as gas foci (gray arrow). The postcontrast image was obtained 3 minutes after IV administration of iopromide.

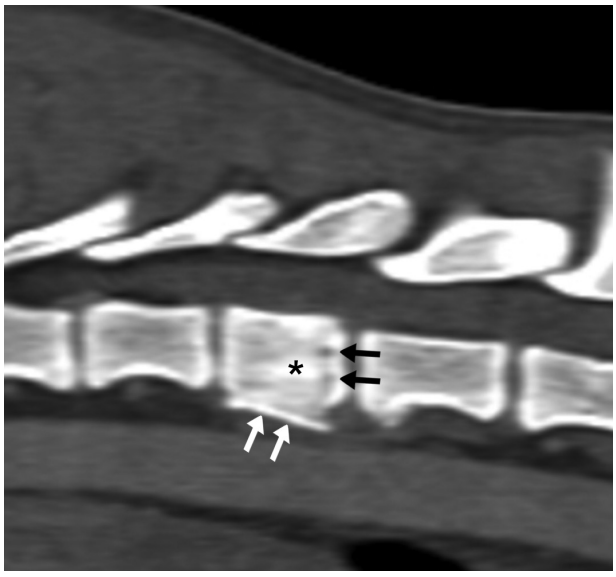

Figure 4—Parasagittal plane reconstruction CT image of T11 of the dog in Figure 1. Multiple foci of lysis are present in the caudal region of the vertebra and physeal plate (black arrows). Notice the multiple regions of sclerosis (asterisk) within the vertebral body. Proliferative new bone attenuation is apparent on the ventral aspect of the vertebra (white arrows).

vented observation of the structure. Right caudal lung lobectomy was performed. The abnormally firm and discolored lung lobe was excised, and the remainder of the thorax appeared normal. There were no gross abnormalities in the soft tissues ventral to the thoracic vertebrae. After surgery was complete, the removed lung lobe was transected and a plant-based foreign object was retrieved from the dilated bronchus. Histologic examination of lung tissue confirmed a diagnosis of diffuse, severe, pyogranulomatous bronchointerstitial pneumonia with follicular lymphoid hyperplasia, fibrosis, and pleuritis. There were no infectious organisms or neoplastic cells on H&E-stained sections. Aerobic culture of the lung tissue yielded only a few colonies of normal flora (ie, *Neisseria flavescens* and *Rothia mucilaginosa*). Lack of isolation of additional bacteria was likely the result of preoperative and perioperative antimicrobial administration.

The lesion associated with T11 was presumedly secondary infectious spondylitis associated with the lung lesion. The dog was prescribed a 4-week course of antimicrobial treatment with amoxicillin–clavulanic acid to treat any bacterial infection. As of 8 weeks after hospital discharge, the patient was clinically normal without signs of back pain or recurrence of cough.

Comments

Identification of a plant-based foreign body on CT images is not always possible, and a definitive diagnosis is often made during surgery or histologic examination of resected pyogranulomatous tissue.[1] Despite this, CT is useful in localizing the lesion within the thorax and determining the best approach for treatment (ie, surgery or endoscopic retrieval).[1,2] In the case described in the present report, identification of a spiculated intraluminal structure within the bronchocentric lesion provided the most convincing argument for a foreign body granuloma, and the object's shape and density were consistent with reports of evergreen plant foreign material.[3] Coupled with the patient's young age, chronic cough, encapsulated pyogranulomatous abscess, and inflammatory leukogram and seasonality of the lesion, plant foreign body inhalation was the most likely primary cause of both the clinical signs and lesion.[1,2]

Radiography alone has been shown to provide nonspecific findings in similar instances of plant foreign body inhalation, revealing a focal alveolar pattern but failing to identify the foreign material or additional smaller abscesses that are potentially present within the thoracic cavity.[2] Thoracic ultrasonography can often detect lung lobe consolidation and identify the foreign body if it is located in the thoracic wall.[2] In the dog of the present report, because the foreign body was in a gas-filled bronchus, ultrasonography was not informative. Because of the presence of mucus and the small diameter of the bronchus proximal to the foreign body, bronchoscopic identification and retrieval was unsuccessful.

In the present report, CT also allowed further characterization of the physeal lesion at T11, increasing confidence that this represented vertebral physitis. Vertebral physitis is an inflammatory or infectious disease that affects the caudal physes of the lumbar vertebrae in

young dogs.[4] The proximity of this dog's physeal lesion to the pulmonary lesion raised the possibility that the nearby vertebral physis became infected through direct inoculation from additional undetected foreign material or through the hematogenous route. The CT features of vertebral physitis in the dog of this report included widening of the caudal vertebral physis with irregular margins, similar to typical radiographic findings.

Footnotes

a. Toshiba Aquilon 16, Toshiba American Medical Systems Inc, Tustin, Calif.

References

1. Vansteenkiste DP, Lee KCL, Lamb CR. Computed tomographic findings in 44 dogs and 10 cats with grass seed foreign bodies. *J Small Anim Pract* 2014;55:579–584.
2. Schultz RM, Zwingenberger A. Radiographic, computed tomographic, and ultrasonographic findings with migrating intrathoracic grass awns in dogs and cats. *Vet Radiol Ultrasound* 2008;49:249–255.
3. Jones JC, Ober CP. Computed tomographic diagnosis of nongastrointestinal foreign bodies in dogs. *J Am Anim Hosp Assoc* 2007;43:99–111.
4. Jimenez MM, O'Callaghan MW. Vertebral physitis: a radiographic diagnosis to be separated from discospondylitis. *Vet Radiol Ultrasound* 1995;36:188–195.