What Is Your Diagnosis?

In collaboration with the American College of Veterinary Radiology

Figure 1—Right (R) lateral (A), ventrodorsal (B), and left (L) lateral (C) thoracic radiographic images of a 15-year-old castrated male Tibetan Terrier with a left pelvic limb soft tissue mass that had grown substantially over the past month.

History

A 15-year-old 17-kg castrated male Tibetan Terrier was presented for evaluation of a soft tissue mass on the distal aspect of the left pelvic limb. The owner reported that the mass had grown substantially over the past month. The dog had a history of myxomatous mitral valve degeneration, pulmonary hypertension, systemic hypertension, and arthritis.

On physical examination, the dog had a grade 3/6 holosystolic left-sided cardiac murmur, gingival hyperplasia, and vital signs within reference limits. There was a fluctuant, alopecic mass (approximately 2 cm in diameter) just proximal to the left tarsal pad, and the left popliteal lymph node was enlarged. Cytologic results of a fine-needle aspirate sample of the mass indicated that the mass was probably sarcoma. Thoracic radiography (**Figure 1**) was performed as part of staging for the disease.

Formulate differential diagnoses, then continue reading.

Diagnostic Imaging Findings and Interpretation

Thoracic radiography revealed a soft tissue nodule (approximately 1.9 cm in diameter) superimposed with the left second rib (**Figure 2**). This nodule was

more opaque than the adjacent mediastinal fat. Radiographic interpretation at that point was pulmonary metastasis with a ranked order differential diagnosis list that also included benign nodule (eg, granuloma) and summation of thoracic structures. There were also mild unstructured interstitial and bronchial patterns throughout the lung lobes, consistent with age-related changes, pulmonary infiltrates due to pulmonary hypertension (as was reported in the patient's history), or both. The cardiac silhouette was enlarged with straightening of the caudal dorsal margin on the lateral views with abaxial deviation of the mainstem bronchi on the ventrodorsal view. The cranial pulmonary vessels were radiographically normal. The liver was diffusely enlarged and had rounded margins, for which the differential diagnoses included normal variation, endocrine hepatopathy, inflammatory and infiltrative diseases, and primary (round cell tumor) and metastatic neoplasia.

To better evaluate the location and distribution of the thoracic nodule and whether additional nodules were present, the dog was sedated and positioned in sternal recumbency for thoracic CT (Aquilion 64, Cannon Medical Systems) in a soft tissue window (window width, 400 HU; window level, 40 HU), bone window (window width, 2,700 HU; window level, 350 HU), and lung window (window width, 1,600 HU; window level, -550 HU), each with a 1-mm slice thickness. There was a well-defined, ovoid, fat attenuating nodule (mean HU = -105; range, -35 to -66 HU obtained from 1-view of the transverse plane) in the left cranial pleural space that was approximately 1.4 X 1.2 X 0.7 cm and caused focal indentation of the

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Figure 2—The images are as in Figure 1. There is a soft tissue nodule (white arrow) superimposed with the left second rib and mild unstructured interstitial and bronchial (encircled) patterns throughout the lung lobes. The cardiac silhouette is enlarged, with straightening of the caudal dorsal margin (black arrow) and abaxial deviation of the mainstem bronchi (star).

adjacent cranial subsegment of the left cranial lung lobe (**Figure 3**). The pulmonary parenchyma was otherwise unremarkable. These findings were most consistent with a left cranial pleural lipoma. Other findings included left atrial enlargement (reported as myxomatous mitral valve degeneration) and left mainstem bronchial and caudal tracheal narrowing or collapse, likely due to chondromalacia.

Treatment and Outcome

The left pelvic limb tarsal mass was surgically debulked 26 days later, by which time, the mass had doubled in size to approximately 4 cm in diameter. The histopathology result revealed a grade 2 soft tissue sarcoma that was incompletely excised. At the 3-month postoperative recheck examination, there was no evidence of local mass recurrence, and results of recheck thoracic radiographic examination were static without any evidence of metastatic disease.

Comments

The thoracic radiography of the dog in the present report revealed a soft tissue nodule that was difficult to distinguish from metastatic disease. This case highlighted one of the basic principles of radiology, namely, opacities. Because fat and other soft tissue are similar in effective atomic numbers (eg, fat = 5.92 vs muscle = 7.46) and densities (eg, fat = 0.91 g/cm³ vs muscle = 1.0 g/cm³),¹ resulting in similar radiographic opacity, they can be difficult to distinguish on thoracic radiographic images. This is attributable to the digital radiographic algorithms and high kVp settings used in thoracic radiography that inherently decrease the level of contrast.

With the use of CT, we were able to confirm that the nodule was composed of adipose tissue (consistent with a lipoma), rather than other soft tissue. Thus, IV administration of contrast medium was not needed for further evaluation of the nodule in this dog. The HU scale used in CT identifies the basic

Figure 3—Transverse (A) and reformatted dorsal (B) plane thoracic CT images of the dog described in Figure 1 showing a fat attenuating nodule (long arrows) similar to the attenuation of fat in the subcutaneous tissues (short arrows), compared with that of the soft tissue of the right brachial musculature (arrowheads). The images are displayed in a soft tissue window (window width, 400 HU; window level, 40 HU) with a slice thickness of 1 mm. The mean and range HU values for each circled area of interest are shown in the respective adjacent text box. The dog's right side is toward the left in both images, and the dashed lines across each image represent the plane of the other image.

attenuation of material, such as gas (−1,000 HU), fat (−60 to −120 HU), water (0 HU), and cortical bone (> 1,000 HU). The HU measurements for a region of interest can be assessed easily on a CT viewer to

objectively determine the type of attenuation and, therefore, the type of tissue.

Alternatively, without the use of CT, we could have repeated thoracic radiography 4 to 6 weeks later to monitor the progression of the soft tissue nodule. Ultrasonography is another useful imaging modality that could subjectively differentiate fat from other soft tissues; however, it was unlikely that thoracic ultrasonography could have visualized this small nodule.

Lipomas are among the most common subcutaneous tumors in dogs. However, lipomas arising from noncutaneous locations, such as the viscera or body cavities, are rare, and a study shows that only 2% (4/179) of lipomas in dogs occurred at nonsubcutaneous sites.² Intracavitary lipomas have been reported to occur in the thoracic, abdominal, pelvic, retroperitoneal, and pericardial spaces.³⁻⁵ The dog of the present report had a left cranial pleural lipoma, which

highlighted the importance of including lipoma on the differential diagnosis list for thoracic soft tissue nodules, especially for those in the periphery of the thorax.

References

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