



Diagnostic Exercise

From The Davis-Thompson Foundation*

Case #: 111 Month: December Year: 2018

Contributors: Luís Antônio Scalabrin Tondo*, veterinary student; Alex dos Santos*, DVM, MS, PhD candidate; Mariana Martins Flores*, DMV, MS, Doctor in Veterinary Pathology. *Laboratory of Veterinary Pathology, Universidade Federal de Santa Maria (UFSM), Santa Maria, Rio Grande do Sul, Brazil.

Clinical History: A 13-year-old, medium-sized, intact female mongrel dog presented to a Brazilian veterinary hospital with a large tumor in the thoracic/sternal region. The physical exam did not reveal any cardiac or respiratory abnormalities. Blood tests and X-ray were performed (see below). A surgery was scheduled to remove the tumor; however, due to rapid tumor growth in the following days, the dog was submitted to euthanasia prior to the procedure.

Laboratory Findings: Blood tests revealed normochromic normocytic anemia, leukocytosis due to neutrophilia and increased alkaline phosphatase (1.059 IU/L [reference: 20-56 IU/L]). In the chest radiograph, a radiopaque mass was observed involving the sternal area and ribs and invading the thoracic cavity (Figure 1).

Necropsy Findings: At necropsy, the mass in the ventral thoracic/sternal region (Figure 2) measured approximately 18 x 13 x 11 cm, was firm, and was covered by skin. It was adhered to the musculature and caudal ribs and extended into the thoracic and abdominal cavities. The cut surface was firm to hard and white with soft red (hemorrhagic) areas. The mass involved at least four ribs. The lungs had three firm white nodules, up to 2 cm in diameter. In the endocardium (right atrioventricular valvular and chordae tendineae areas), there were multiple coalescing white, smooth, shiny, firm, 0.3 to 0.5 cm nodules (Figures 3 and 4).

Radiographic and Gross Images:

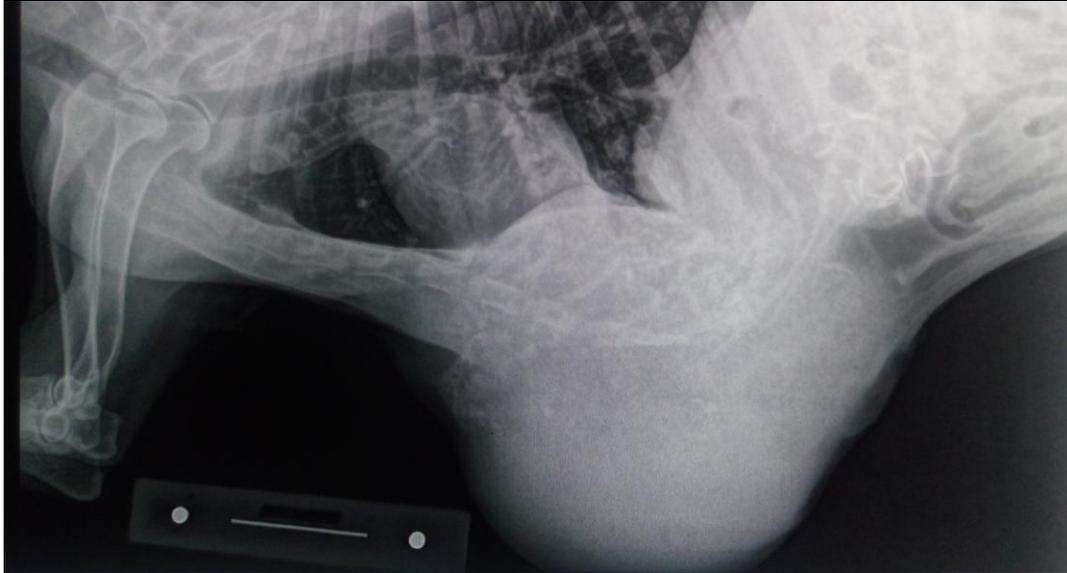


Figure 1

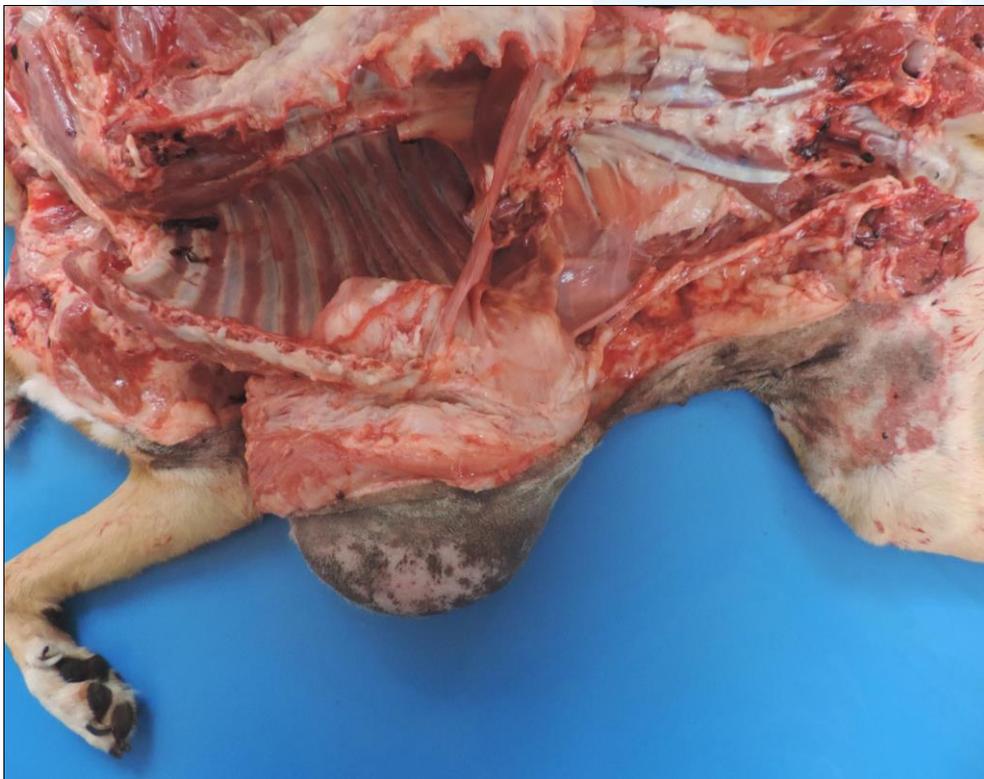


Figure 2



Figure 3

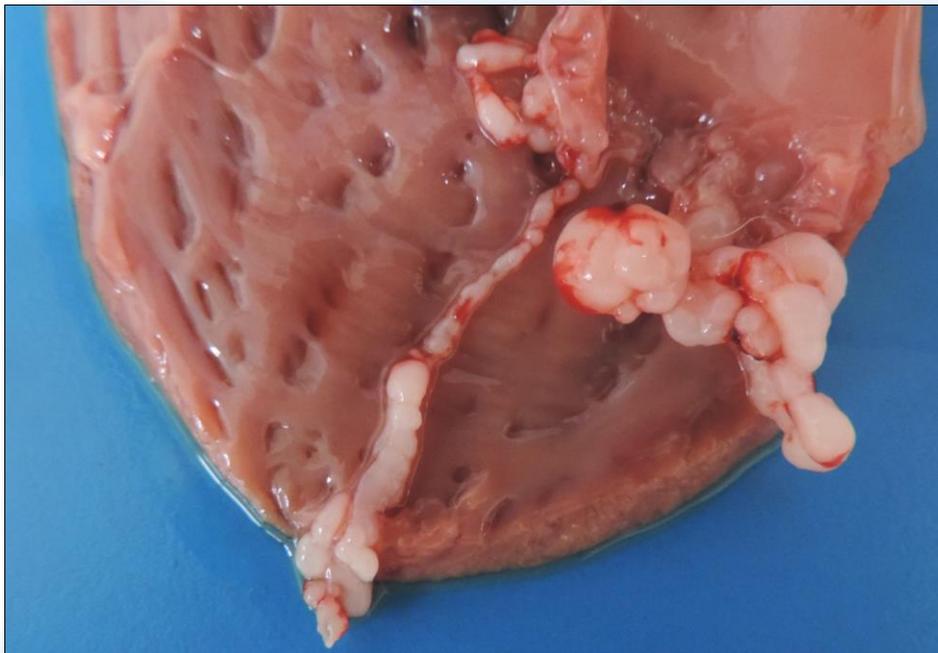


Figure 4

Follow-up Questions: Morphologic diagnoses (mass involving the ribs and the endocardial nodules); potential physical exam finding associated with the cardiac lesion; potential findings in other organs.

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Associate Editor for this Diagnostic Exercise: Mariana Flores

Editor-in-chief: Vinicius Carreira



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Answer Sheet

Title: *Dog, ribs and endocardium, osteosarcoma with pulmonary and endocardial metastases*

Contributors: Luís Antônio Scalabrin Tondo*, veterinary student; Alex dos Santos*, DVM, MS, PhD candidate; Mariana Martins Flores*, DMV, MS, Doctor in Veterinary Pathology. *Laboratory of Veterinary Pathology, Universidade Federal de Santa Maria (UFSM), Santa Maria, Rio Grande do Sul, Brazil.

Diagnosis: Ribs, osteoblastic osteosarcoma with pulmonary and endocardial metastases.

Microscopic findings: Histologically, the mass involving the ribs was composed of a moderately cellular, partially encapsulated and locally invasive neoplastic proliferation. The neoplastic cells were loosely arranged within an eosinophilic, organized matrix (osteoid). This matrix had few mineralized areas. The cells were polygonal, small to medium-sized, with scant eosinophilic cytoplasm and a round to oval nucleus with large, conspicuous nucleolus. Mitotic figures (15 per 10 high power fields) and vascular invasion were frequent. The endocardial (Figures 5 and 6) and pulmonary nodules consisted histologically of the same neoplastic population as that seen in the primary mass. The endocardial neoplastic proliferation formed nodules within the endocardial connective tissue lined by intact endothelium. No lesions were seen within the myocardium.

Possible physical exam finding associated with the cardiac lesion: A possible finding during auscultation of this dog would be heart murmur. Valvular insufficiency caused by these nodules could also cause signs of right congestive heart failure, such as ascites, hepatomegaly, dyspnea and exercise intolerance. However, no such findings were noted in this dog.

Potential other organs affected: metastases are most commonly noted in the liver, brain, skeleton and lymph nodes.



Figure 5

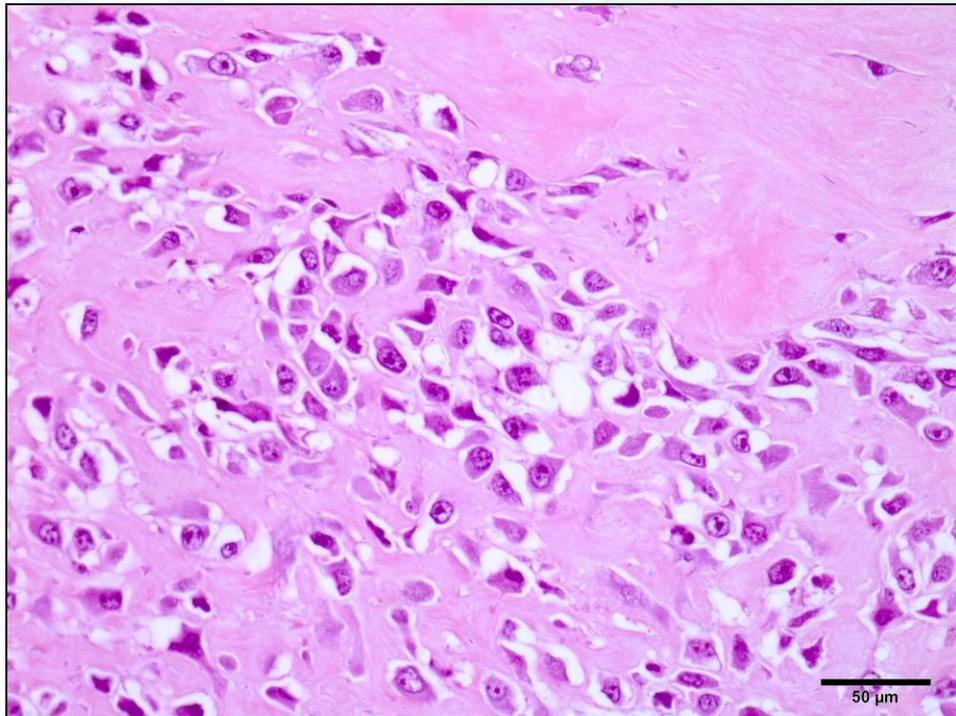


Figure 6

Discussion: Osteosarcomas are the most common primary tumors of bones in dogs and are among the most common causes of canine mortality due to cancer. Osteoblastic osteosarcomas are histologically characterized by abundant production of non-mineralized matrix (osteoid) by neoplastic osteoblasts. Dogs of large breeds are at higher risk of developing osteosarcomas when compared to those of small breeds. Approximately 25% of canine osteosarcomas affect the axial skeleton, of which 50% affect the head and 50% affect the ribs, vertebrae or pelvis. Ribs are an uncommon primary site of axial osteosarcomas in dogs, corresponding in one retrospective study to only 12 cases in a total of 116 dogs with axial osteosarcoma (Heyman et al. 1992). Most rib tumors arise near the costochondral junction. Metastases are very common, are generally hematogenous, and occur frequently to the lungs. Other organs may also be affected, including liver, brain, skeleton and lymph nodes. In a study of primary rib tumors in 54 dogs, osteosarcomas were the most frequent diagnosis (34/54), followed by chondrosarcomas (15/54), hemangiosarcomas (3/54) and fibrosarcomas (2/54) (Pirkey-Ehrhart et al. 1995).

Primary and secondary tumors affecting the heart may be located in the pericardium, myocardium or endocardium. Although tumors (mainly metastatic) affecting the myocardium are not uncommon in domestic animals, those exclusively affecting the endocardium are considered rare in veterinary and human medicine. Some of the uncommon reports of primary and secondary tumors affecting the endocardium include a primary endocardial spindle-cell sarcoma in a dog (Wohlsein et al. 2005) and several carcinomas metastatic to the endocardium in people (Morgan & Gray 1976, Mountzios et al. 2010, Won-Son et al. 2012). Although it was not possible to clearly determine the mechanism of spread of the endocardial metastases in this dog, hematogenous route was considered the most likely. The endocardial lesion of this dog affected only portion of the right atrioventricular valve; however, if the dog had lived longer, valvular insufficiency with regurgitation could have developed, which would have been noted clinically through the presence of heart murmur. Other clinical signs associated with right congestive heart failure could also have developed, including abdominal distention (ascites), hepatomegaly, dyspnea and exercise intolerance.

References and Recommended literature:

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