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CASE REPORT

Inapparent Right Atrial Fibrosarcoma in a Dog

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ABSTRACT

A 5-year-old male French Bulldog was referred to the surgery service and the preanaesthetic evaluation was considered within normal limits. Ten days later, the dog was submitted for severe respiratory distress. An intrathoracic mass was observed in the radiographic and ultrasound studies. The owner decided to euthanize the dog. On necropsy, a mass was found expanding the right atrial wall and partially collapsing the right atrium. Histologically, the mass was diagnosed as a primary cardiac fibrosarcoma.

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INTRODUCTION

Cardiac tumors are uncommon in animals, being the hemangiosarcoma the most frequently observed cardiac neoplasm. In dogs, the prevalence of primary cardiac sarcomas is reported as less than 1% of all primary heart tumors (Madarame *et al*., 2004; Aupperle *et al*., 2007; Speltz *et al*., 2007). In general, the clinical features associated with cardiac neoplasms depend on the size and the location of the tumor, being the non-specific symptoms of low-output heart failure the more common, although sudden death also has been reported (Yamamoto *et al*., 2013). This paper describes a primary cardiac fibrosarcoma in an adult dog with a sudden onset presentation of the clinical signs due to the neoplasia.

History and clinical examination: A 5-year-old intact male French Bulldog was referred with a history of cryptorchidism and an ulcerated nodule in the mandible. The preanaesthethic evaluation revealed tachycardia and the typical snoring of the breed, moderate eosinophilia, mild hyperglycemia and a mildly increased ALT value. The radiographic study (Fig. 1a and 1b) showed moderate sternal recumbency of the heart and tracheal elevation on the lateral view, and was considered within normal limits for the age and breed of the dog.

An orchiectomy and excision of the nodule were scheduled accordingly. However, ten days later, the dog came back manifesting anorexia, severe apathy, diarrhea and abdominal distension. The physical exam revealed a serious respiratory disorder showing wheezes, tachycardia, delayed capillary filling time, marked abdominal distension with fluid wave and hypothermia. Hematological and biochemical findings showed mild hypoalbuminemia and hypoproteinemia, severe hyperglycemia, mild increase of the plasma urea concentration, hyponatremia and hypochloremia.

On the radiographic study, an increased opacity including an air bronchogram was identified on the right cranial lung lobe area (Fig. 2a, 2b) associated with moderate pleural scalloping. Also some fissure lines were seen on the left cranial lung lobe area compatible with a smaller volume of pleural fluid compared to the right side. The cardiac silhouette was difficult to evaluate due to the presence of free pleural fluid. A presumptive diagnosis of alveolar disease at the right cranial lung lobe with focal pleural fluid accumulation in both cranial hemithorax was made.

On the ultrasonographic exam of the thoracic cavity, a heterogeneous mass (5.2 x 3.9 cm) with round borders was found on the cranial and dorsal aspect of the right hemithorax, surrounded by a moderate amount of anechogenic fluid (Fig. 3). An ultrasound guided fine needle aspiration puncture was performed in the mass. The cytology showed clusters of fusiform, mesenchymal cells and some macrophages, and a presumptive diagnosis of intrathoracic sarcoma was made.

On the ultrasound exam of the abdomen, a moderate amount of free anechoic fluid was found. An abdominocentesis was performed obtaining an amber-yellow fluid sample which showed a non-septic modified transudate.

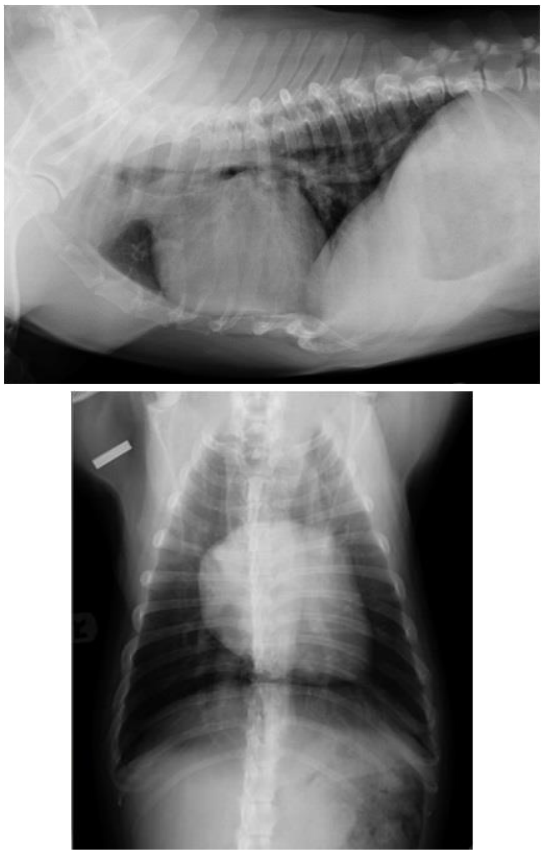

Fig. 1 (a, b): Radiographic study of the thorax on initial presentation.

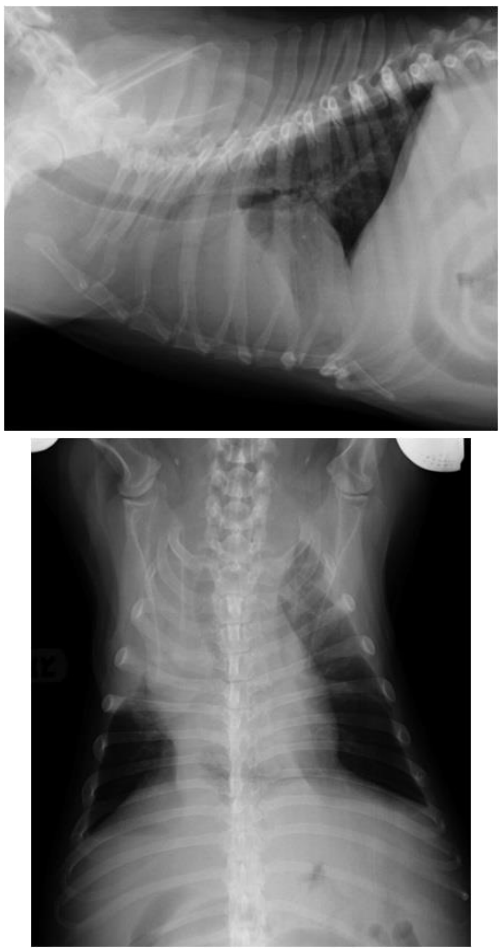

Fig. 2 (a, b): Radiographic study of the thorax 10 days after the initial presentation.

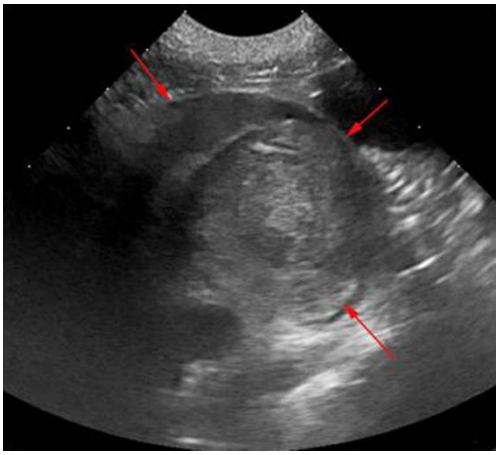

Fig. 3: Ultrasonographic image of the right hemithorax showing the presence of an heterogeneous round mass surrounded by fluid.

The dog received a broad-spectrum antibiotic, analgesia, diuretics and fluids. A thoracic drain was placed. An echocardiography and a computed tomography of the thorax were declined by the owner. The dog´s general condition deteriorated rapidly and was euthanized and submitted for necropsy.

Gross and histopathological findings: At necropsy, 500 ml of a serosanguinous fluid was present in the thoracic cavity, and approximately 50 ml of clear fluid was in the abdominal cavity. On the right atrial wall, there was a 4 x 3 x 2 cm round, firm, whitish and well-demarcated mass. The atrial wall was markedly expanded and it was partially filling the lumen of the right atrium (Fig. 4a). On cut surface, the mass was yellowish to reddish and firm. In the abdomen, the liver was slightly enlarged with fibrin deposits on the diaphragmatic surface of the hepatic capsule. On cut surface, there was an enhanced lobular pattern and abundant blood flow. The right testicle was in the abdominal cavity, caudal to the right kidney. The left testicle was located at the level of the inguinal ring.

Representative tissue samples were collected at necropsy and immersion-fixed in 10% neutral-buffered formalin. Tissues were processed routinely and stained with HE. Selected slides were also stained with Masson trichrome and Giemsa. Immunohistochemistry stain for vimentin (Dako), S-100 protein (Dako), pan-cytokeratin (Dako), melan-A (Dako), synaptophysin (Dako) and pan-actin (Dako) were performed using the Dako EnVision/horse peroxidase (Dako) method.

Histologically, replacing and effacing the normal cardiac muscle there was a non-encapsulated, poorly circumscribed neoplasia composed of spindle cells arranged in bundles (Fig. 4b). Neoplastic cells presented indistinct cell borders and moderate amount of finely granular eosinophilic cytoplasm. Nuclei were round to oval, with clear chromatin and one to two basophilic nucleoli in the majority of the cells. There was moderate anisocytosis and anisokaryosis and mitotic index was 14 mitoses by 10 fields at 400x (Fig. 4c). Neoplastic cells were positive for vimentin (Fig. 4d) and negative for others antibodies (Fig 4e). The trichrome stain showed thin bundles of collagen between the neoplastic cells and some remnant fibers of the original cardiac muscle (Fig. 4f). No metastases of this neoplasia were observed in

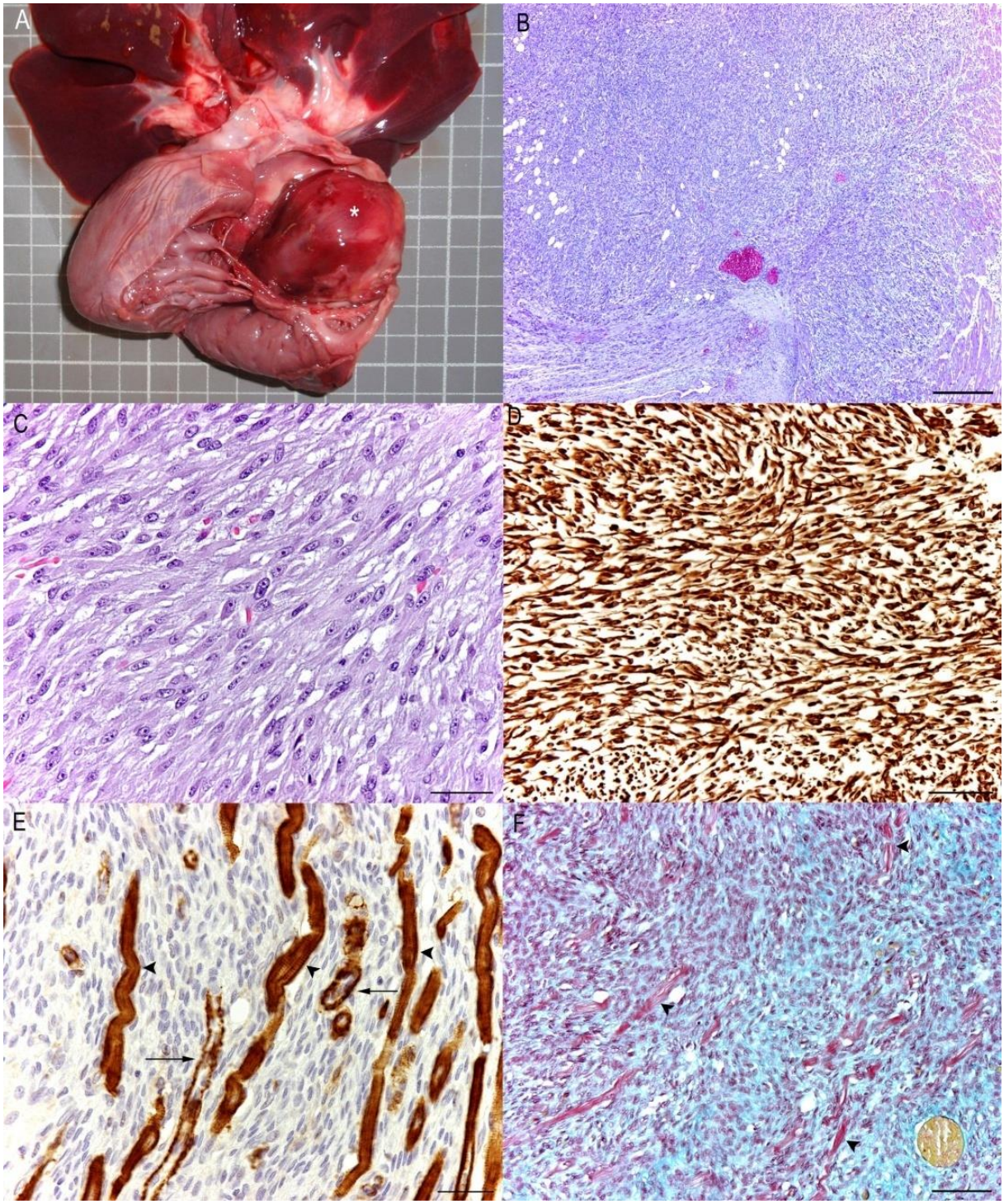

Fig. 4: a. The right atrial wall was expanded with a firm reddish mass (asterisk). b. Heart: Poorly circumscribed moderately cellular spindle cell neoplasm. HE. Bar=200 μm. c. Neoplastic cells presented indistinct cell borders and moderate amount of eosinophilic cytoplasm with round to elongate nuclei. HE. Bar=25 μm. d. Neoplastic cells were positive for vimentin. Mayer's hematoxylin counterstain. Bar=20 μm. E. Neoplastic cells were negative for pan-actin. Cardiomyocytes (arrowheads) and vascular smooth muscle (arrows) were positive. Mayer's hematoxylin counterstain. Bar=20 μm. F. Trichrome stain showed thin bundles of collagen between the neoplastic cells and some remnant fibers of the original cardiac muscle (arrowheads). Bar=50 μm.

other tissues. Based on the morphology of the neoplastic cell and the inmunohistochemical features this neoplasia was diagnosed as fibrosarcoma.

In the liver, there was severe diffuse hepatic congestion. The lung presented severe diffuse congestion and multifocal fibrin thrombi. The skin nodule was diagnosed as a low grade mast cell tumor attending their histological features. No other significant findings were observed in the remaining tissues.

DISCUSSION

This report describes the case of a dog with a right atrial fibrosarcoma that did not show any clinical or imaging signs at presentation but developed rapid changes within a period of ten days. Clinical findings in animals with cardiac neoplasia include non-specific symptoms such as anorexia, coughing, apathy, weakness, paresis, vomiting and abdominal enlargement; sudden death also

has been reported (Aupperle *et al*., 2007). In this case, only tachycardia was found on presentation, without typical signs of right-sided congestive heart failure as murmurs or muffled sounds due to pericardial effusion (Madarame *et al*., 2004).

The presence of abdominal and pleural effusion is a non-specific finding that can result from a variety of diseases. In this case, the laboratory evaluation of the free abdominal fluid showed a modified transudate (Dempsey *et al*., 2011) due to the cardiac mass that was filling the lumen of the right atrium causing a low-output heart failure.

The initial radiographic study of the thorax only showed mild signs of right-sided cardiomegaly. However, dramatic radiographic changes could be identified ten days later. Imaging findings at this time included the presence of a mass or abscess to the cranial aspect of the right hemithorax. Radiographs are relatively insensitive for the detection of cardiac neoplasia. An intracardiac mass was not included as a differential diagnosis at this time since radiographic features of pericardial effusion were not detected. A heart base neoplasia was also thought to be unlikely present due to the absence of bronchial o tracheal displacement (Foale *et al*., 2008). At this time, two-dimensional echocardiography and computed tomography were considered as essential methods for diagnosis, but there were refused by the owner. Thus, the precise localization of the mass was discovered at necropsy.

Severe hyperglycemia was found at presentation. No history of typical signs for diabetes mellitus was documented by the owner. The appearance of the pancreas, kidneys and adrenal glands was normal at necropsy and histological examination and no glucose supplemented fluids were given. Hyperglycemia can result from increased circulating glucocorticoids, catecholamines, and insulin resistance in critically ill patients (Paolisso *et al*., 1999). In this case, a single determination of blood glucose was performed although this parameter should have been monitorized to establish the origin.

The definitive diagnosis of cardiac tumor is based in gross, histopathological and inmunohistochemical findings. Primary cardiac tumors are rare in animals, with the hemangiosarcoma being the most common in dogs (Yamamoto *et al*., 2013). Other malignant mesenchymal tumors described in the heart include the fibrosarcoma, rhabdomyosarcoma, myofibroblastic sarcoma, malignant mesenchymoma, osteosarcoma, chondrosarcoma, spindle cell tumor or undifferentiated sarcoma (Ware and Hopper, 1999; Madarame *et al*., 2004; Asakawa *et al*., 2013; Rajagopalan *et al*., 2013).

The morphology of the neoplastic cells observed in our case is not consistent with hemangiosarcoma, osteosarcoma, chondrosarcoma or mesenchymoma and the negative stain for pan-actin rule out the tumors of muscle origin. Based on the morphology of the neoplastic cells and the immunohistochemistry results the tumor was diagnosed as a primary cardiac fibrosarcoma.

The cutaneous nodule observed on the chin was diagnosed as a low-grade mast cell tumor and it is unrelated to the clinical signs and cardiac neoplasia of the dog.

The prevalence of primary cardiac fibrosarcomas is reported as less than 1% of primary heart tumors in dogs (Ware and Hopper, 1999). The absence of centrilobular fibrosis and hemosiderin-laden macrophages in the liver was indicative of the acute stage of the hepatic congestion which is consistent with a rapidly-growing cardiac tumor.

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