

A retrospective study of cardiac hemangiosarcoma in dogs

Agnieszka NOSZCZYK-NOWAK¹, Marcin NOWAK², Urszula PASLAWSKA¹, Alicja CEPIEL^{1*}, Adrian JANISZEWSKI¹,
Maciej STASZCZYK¹, Jozef NICPON¹

¹Department of Internal Medicine and Clinic of Horses, Dogs and Cats, Faculty of Veterinary Medicine, Wrocław University of Environmental and Life Sciences, Wrocław, Poland

²Department of Pathology, Faculty of Veterinary Medicine, Wrocław University of Environmental and Life Sciences, Wrocław, Poland

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Abstract: Cardiac tumors account for a small proportion of all canine tumors, but hemangiosarcoma represents the most frequent cardiac tumor in many species. Hemangiosarcoma occur intrapericardially with pericardial effusion. In this case report, a retrospective study was conducted on 9 cases of canine hemangiosarcoma. In all the dogs the presence of a pericardial exudate was noted and in 5 cases it was the only lesion detected during the examination. All animals were subjected to necropsy and histopathology was performed in the heart, spleen, liver, kidney, and lung. In 5 cases the tumor was present exclusively in the atrial wall. In 4 cases it was present in the lumen of the right atrium. In 5 cases metastases were detected: in 2 cases to the lungs, in 2 cases to the spleen, and in a one case to the pericardium. The surgical procedure is difficult and may be effective in dogs in which no metastases have developed yet. In the remaining cases palliative therapy is the only option.

Key words: Dog, heart, hemangiosarcoma, tumor

1. Introduction

Hemangiosarcoma, a malignant neoplasm of endothelial cells, occurs more frequently in dogs than in other domestic animals. The etiology of hemangiosarcoma remains incompletely understood (1,2). It is the most frequently diagnosed primary tumor of the canine heart, but, because of low prevalence, only a few reviews about manifestation of this and other cardiac tumors are available (3). In cats, only single cases of hemangiosarcoma have been described to date (4). While hemangiosarcoma represents a frequent primary tumor of the spleen and skin, it has also been diagnosed in kidneys (5). The tumor occurs most frequently in older (more than 10 years old) dogs. Manifestation of the tumor exhibits no racial or gender preferences, although there are reports suggesting higher prevalence in large-breed dogs such as German Shepherds and Golden Retrievers (2,6-7).

We aimed to evaluate supravital and postmortem characteristics of cardiac hemangiosarcoma in dogs.

2. Materials and methods

The studies were performed on 9 dogs (5 bitches, 4 males), 6 to 13 years of age, of various breeds (1 American Stafford, 2 German Shepherds, 3 mongrel dogs, 1 small

bulldog, 1 Border Collie, 1 Labrador), weighing 9 to 56 kg. In all animals, supravital tests included blood morphology and biochemistry, cytological analysis of pericardial exudate, abdominal ultrasonography, chest X-ray, ECG, and ultrasonography of the heart. Morphological blood tests were performed using an Animal Blood Center abc VET analyzer. Biochemical tests included evaluation of activities of alanine aminotransferase (ALT), aspartate aminotransferase (AST), and alkaline phosphatase, and contents of urea, creatinine, bilirubin, total protein, albumins, Na⁺ and K⁺ ions, and total Ca level. The tests were performed using a MaxMat PI analyzer. The supravitaly sampled pericardial exudate was centrifuged in EDTA-containing tubes at 1500 rpm for 5 min. After decantation of the supernatant, a drop of sediment was applied to a microscope slide, smeared, and the preparation was fixed in Cytifix. Then the preparation was stained with hematoxylin and eosin.

All animals were subjected to necropsy and histopathology was performed in heart, spleen, liver, kidney, and lung. Sample tissue sections were fixed in 10% buffered formalin, dehydrated, and embedded in paraffin blocks. The sections were stained by hematoxylin and eosin. The sections were examined under a microscope.

* Correspondence: calicja@op.pl

3. Results

Morphological examinations of blood samples revealed significant alterations in dogs with metastases to the spleen and an elevated level of leukocytes in a dog with metastases to the lungs (Table 1). In all the dogs the presence of a serosanguineous pericardial exudate was noted. In 8 (88.9%) cases it was the main reason for weakening and asphyxia. In 5 cases presence of pericardial exudate was the only lesion detected during the examination. In none of the cases did the pericardial exudates contain neoplastic cells. In 2 cases sudden death of the dogs occurred due to rupture of the atrial wall, infiltrated by the tumor. Sizes of the tumors in all the dogs ranged from a few millimeters to 6 cm in diameter (Figures 1 and 2).

In 5 cases the tumor was present exclusively in the atrial wall. In 4 cases it was present in the lumen of the

right atrium. In 5 cases (55.5%) metastases were detected: in 2 cases to the lungs, in 2 cases to the spleen, and in 1 case to the pericardium. In 2 dogs with metastases to the lungs, chest X-ray examination failed to confirm metastases. In 3 (33.3%) dogs supraventricular arrhythmia was detected. In 2 cases, ultrasonographic examination of abdominal cavity demonstrated tumors in the spleen.

Histopathological examination of the isolated tumors demonstrated that the tumor structure consisted of various-sized bands and nests of pleomorphic tumor cells, separated by fine septa of connective tissue. In several sites, neoplastic cells enclosed spaces of various size, filled with vast numbers of erythrocytes and formed slit-like blood vessels (Figure 3). A high proportion of the cells manifested an elongated, spindle-like shape, pronounced atypia, and low degree of differentiation. In many places numerous

Table 1. Character of supravital alterations and necropsy data in the studied group of dogs.

No.	Breed	Age (years)	Sex	Body weight (kg)	Echo	ECG	USG	X-ray chest	Blood analysis	Necropsy pattern
1	American Stafford	7	F	26	pericardial exudate	premature supraventricular beat	no lesions	no lesions	normal	tumor 4 cm × 6 cm, strictly linked to epicardium of right atrium and pericardium bloody lesion in wall of right atrium
2	German Shepherd	6	F	34	pericardial exudate	normal	no lesions	no lesions	normal	atrial rupture resulting in death of the dog numerous tumors in spleen, tumor in right atrium
3	German Shepherd	9	M	42	pericardial exudate	normal	no lesions	no lesions	normal	tumor in wall of right atrium
4	Mongrel dogs	13	M	9	pericardial exudate	normal	tumors in spleen	no lesions	anemia (Hb = 6.1 mmol/L; RBC = 4.4 T/L)	bloody lesion in wall of right atrium
5	Mongrel dogs	11	M	56	tumor in right atrium	premature supraventricular beat	no lesions	no lesions	normal	tumor in right atrium, strictly linked to myocardium
6	Mongrel dogs	8	F	17	pericardial exudate	normal	no lesions	no lesions	normal	atrial rupture causing death of the dog numerous tumors in spleen, single tumor in right atrium
7	Boxer	9	M	29	pericardial exudate	normal	no lesions	no lesions	WBC = 17.1 G/L	tumor in right atrium
8	Border Collie	10	F	27	pericardial exudate	normal	no lesions	no lesions	normal	tumor in right atrium
9	Labrador	9	F	31	tumor in right atrium	premature supraventricular beat	tumors in spleen	no lesions	anemia (Hb = 431 mmol/L; RBC = 3.6 T/L)	tumor in right atrium and in spleen



Figure 1. Hemangiosarcoma. Tumor mass located out of the right atrium.

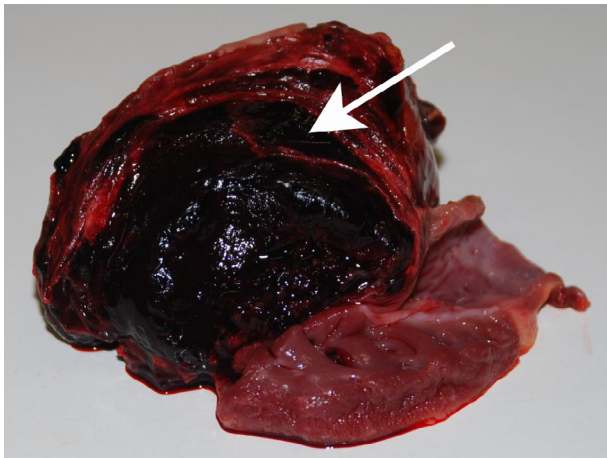


Figure 2. Note strict connection between tumor mass and muscle of right atrium (arrow).

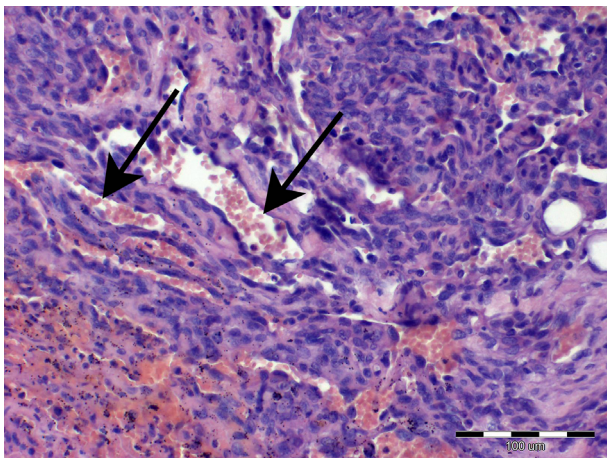


Figure 3. Neoplastic cells forming slit-like blood vessels (arrows).

figures of usually pathological mitotic divisions could be noted, although in some parts of the tumor, mitotic activity was very low. In certain peripheral zones of the tumor, aggressive infiltration of tumor cells into the myocardium was observed, linked to destruction cardiomyocytes

(Figure 4). In many places, extensive fields of hemorrhage were noted, with accumulation of hemosiderin grains, foci of necrosis and inflammatory infiltrates, with dominant content of neutrophilic granulocytes, individual lymphocytes, and macrophages (Figure 5). In 2 cases the presence of metastases was detected in the lungs (Figure 6) and spleen (Figure 7), in which neoplastic cells manifested a lower degree of differentiation as compared to that in the primary tumor.

4. Discussion

Hemangiosarcoma represents a tumor manifested in older dogs (3). The dogs studied in this case report were 9.1 years old. Diagnosis of cardiac hemangiosarcoma is difficult. False-negative results can be obtained in radiographic examination of the chest in more than half of the cases (8), as also confirmed by this study. The most frequent sign associated with the cardiac tumor was reported to

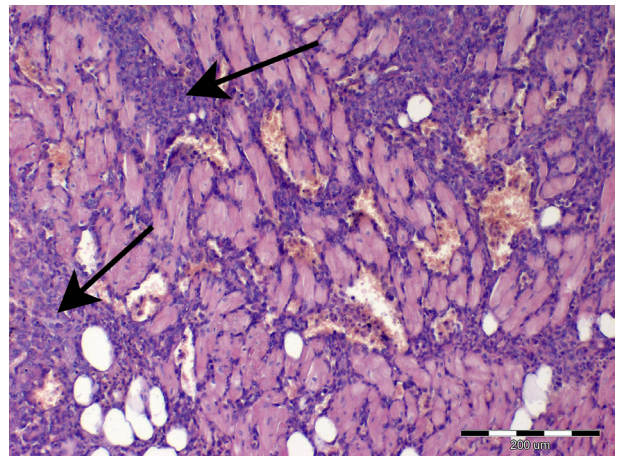


Figure 4. Neoplastic cells infiltrating wall of the right cardiac atrium (arrows).

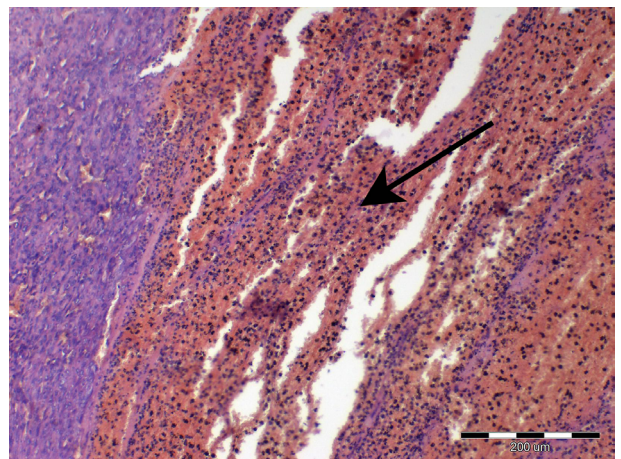


Figure 5. Massive hemorrhages in the center of the tumor (arrow).

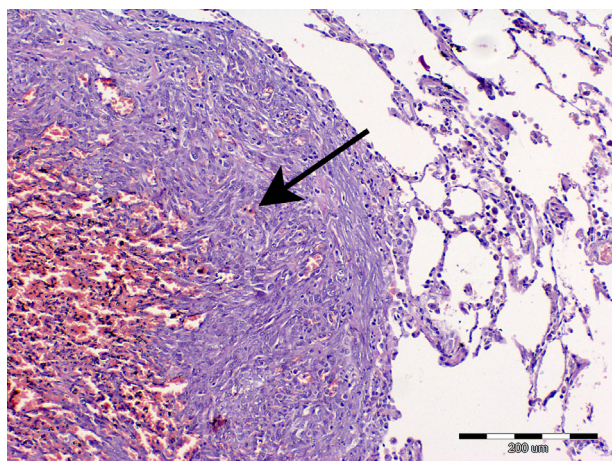


Figure 6. Metastasis of hemangiosarcoma cells to the right adcaudal lobe of lungs (arrow).

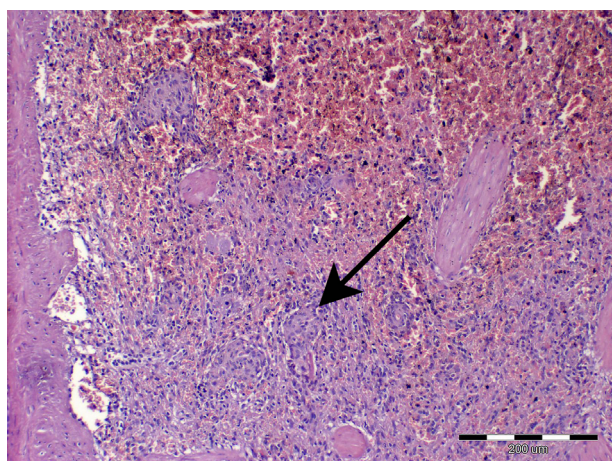


Figure 7. Metastasis of hemangiosarcoma cells to spleen (arrow).

involve pericardiac exudate (6), which was also seen in all the dogs of this study. Pericardiocentesis was used to improve clinical condition of the patient, but the pericardial exudate re-appears in all cases, as reported before (6,9). Unfortunately, results of the cytological examination of the exudate, which was obtained during the pericardiocentesis, proved to be negative, which has been confirmed in this study. In echocardiographic examination, occasionally the tumor can be visualized, most frequently originating from the right atrium (1,6). The tumor is always strictly linked to myocardium and its structure is nonhomogeneous. However, small tumors are unable to be visualized by the trans-chest echocardiographic examination frequently, and the only sign of their existence is the presence of pericardial exudate. Cardiac tamponade or atrial rupture is frequently the cause of death in dogs with cardiac hemangiosarcoma. Atrial rupture was the cause of sudden death in 2 dogs (22.2%) in this study. Following an ECG examination, atrial tachycardia or supraventricular arrhythmia is most frequently noted. In our study, rhythm disturbances were seen in 3 dogs (33.3%). Treatment of the malignant tumor involves surgery and chemotherapy (9–13). The surgical procedure is difficult and may be effective in dogs in which no metastasis has developed yet. In the remaining cases, palliative therapy represents the only option. Chemotherapy extends survival of dogs with hemangiosarcoma by a few months and the most effective schemes of chemotherapy are those that include doxorubicin. In the opinion of Ogilvie et al., complex therapy with vincristine, doxorubicin, and cyclophosphamide may extend survival of dogs with cardiac hemangiosarcoma by a mean of 316 days (12).

The main idea of the present study was to determine the prevalence and associated supravital and postmortem characteristics in cardiac hemangiosarcoma in dogs and compare the results with the available literature.

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