

Chemodectoma located in left atrium in dog – 11-month survival with the use of palliative therapy

OLGA SZALUŚ-JORDANOW¹, MARTA STABIŃSKA-SMOLARZ²,
MICHAŁ CZOPOWICZ³, MAŁGORZATA DZIUBIŃSKA-OSKIERA⁴,
RAFAŁ SAPIERZYŃSKI⁵, AGATA MOROZ³, MARCIN MICKIEWICZ³

¹Department of Small Animal Diseases with Clinic, ³Division of Veterinary Epidemiology and Economics,

⁵Department of Pathology and Veterinary Diagnostics, Institute of Veterinary Medicine,
Warsaw University of Life Sciences, Nowoursynowska 159c, 02-776 Warsaw, Poland

²Veterinary Clinic Astra, Kardynała Stefana Wyszyńskiego 12, 41-200 Sosnowiec

⁴Medicavet Veterinary Clinic, Bohdanowicza 9, 02-776 Warsaw, Poland

Received 23.03.2021

Accepted 10.05.2021

Szaluś-Jordanow O., Stabińska-Smolarz M., Czopowicz M.,
Dziubińska-Oskiera M., Sapieryński R., Moroz A., Mickiewicz M.

Chemodectoma located in left atrium in dog – 11-month survival with the use of palliative therapy

Summary

The aim of this study was to present a clinical case of chemodectoma located in the left atrium in a dog. Chemodectoma is a heart base tumor, neoplasms that occur in the proximity of major blood vessels. A presumptive diagnosis is made based on location and appearance of the tumor in echocardiography examination. In advanced diagnostics computed tomography (CT) and magnetic resonance imaging (MRI) are used. Final diagnosis is made mainly during autopsy based on histopathological examination or less commonly in veterinary medicine on a histopathological examination of the tissue taken during a biopsy or of the entire removed tumor. In literature few methods of treatment are presented, including surgery, chemotherapy and radiotherapy. In an 8-year-old male French bulldog a tumor in the left atrium was detected. The tumor filled almost the entire left atrium, additionally pericardial effusion and ascites were observed. For treatment, tarantula cubensis extract (Theranecron) was used. After the introduction of Theranecron the patient felt significantly better. Theranecron may be one of the possibilities of palliative therapy in the case of diagnosing inoperable chemodectoma.

Keywords: chemodectoma, electrocardiography, heart base tumors, Tarantula cubensis extract

Cardiac tumors are relatively rare in dogs and cats. They account for only a minor percentage of all neoplasms found in dogs. The most common cardiac tumors are hemangiosarcoma (HSA), heart base tumors (chemodectoma) and lymphoma. The incidence of a heart base tumor among all heart tumors in small animals is estimated at 27.9% (4, 15). In addition, the following cardiac tumors are also being reported: myxomas, rhabdomyosarcomas and chondrosarcomas (11). Clinical symptoms mainly depend on the tumor location and size. These neoplasms can cause no clinical symptoms or clinical signs can vary from mild up to severe, life-threatening ones. Clinical symptoms may depend on the histological type, but they mainly result from the tumor's influence on the hemodynamics of blood flow or are due to fluid or blood accumulation in the pericardial sac (15). In everyday veterinary practice, the most useful diagnostic tool is transthoracic echocardiography, but also more advanced diagnostic tools such as computed tomography (CT), positron tomography (PET) scans

and magnetic resonance imaging (MRI) are used (9). Treatment options include surgery, chemotherapy and radiotherapy.

Heart base tumors are neoplasms that occur in the proximity of major blood vessels. Their growth is assessed as slow and sometimes for many months or years they do not give any clinical symptoms and can be found accidentally. Larger tumors put pressure on the heart tissue including the aorta or pulmonary artery, making it difficult for blood to flow from the left or right ventricle. Heart base tumors are most common in brachycephalic breeds such as Boxers, English and French Bulldogs, and Boston Terriers. It is assumed that due to the specific structure of the skull, chronic hypoxia causes irritation and overgrowth of chemoreceptors (5, 11, 12). Heart base tumors include non-chromophilic paragangliomas (aortic carcinoma, nonchromaffin paraganglioma) and adenomas or adenocarcinomas originating from ectopic thyroid tissue (5-10%) (12). The chemodectoma is a tumor derived from chemoreceptor cells originating

most frequently from the aortic body or carotid glomus (10). Histologically, there are two types of cells from which the tumor may arise. Type I are neuroendocrine cells, which may produce and secrete catecholamines and serotonin and type II – stromal cells (11). Chemodectomas are non-functional and are most often described as essentially benign with low metastatic potential (15). However, there are individual studies in literature describing the presence of metastases in the lung tissue, liver, heart muscle, and also in the brain and bones (11).

A case report

An 8-year-old male French Bulldog was referred to the clinic. The symptoms reported by the owner were poor appetite and weakness, lasting for about a week. Ultrasound examination was performed, and a moderate ascites was observed. The same day echocardiography was performed. In the examination pericardial effusion was detected. The layer of accumulated fluid was measured and was up to 2.5 cm. Additionally a homogeneous proliferative mass in the left atrium was detected. This tumor filled almost the entire lumen of the left atrium (3.1 cm × 3.6 cm) (Fig. 1) and resulted in a very pronounced blood flow impairment in the left atrium. Additionally, the color-coded Doppler examination revealed mitral regurgitation with a velocity of 1.69 m/s, as well as insignificant regurgitation of the tricuspid valve. The examination had been supplemented with an ECG test, which showed normal heart rhythm. A pericardiocentesis was performed. After procedure dexamethasone at a dose of 0.2 mg/kg b.w., furosemide at a dose of 1 mg/kg b.w., enalapril at a dose of 0.5 mg/kg b.w. were administered. The patient was discharged home with the recommendation of a control visit the next day. After 24 hours, the owner noticed a slight improvement in the patient's clinical condition. The dog began to eat and was less lethargic. In the control echocardiography a smaller volume of pericardial effusion was diagnosed. Recommendations have been modified. Furosemide and dexamethasone were discontinued and prednisone at a dose of 1 mg/kg body weight 2 times a day was administered. At the same time, the supply of enalapril at a dose of 0.5 mg/kg body weight ones a day was maintained. The next control of the patient was performed 2 weeks after. At that time, the patient's clinical condition was stable – there was no episode of dyspnea, the dog's appetite was good. Despite this, the dog lost 1.5 kg and still had not recovered to its pre-disease clinical state. The echocardiographic examination revealed only an insignificant volume of pericardial effusion. Due to a moderate improvement in the clinical condition and significant weight loss in such a short time, an experimental therapy was decided upon the consent of the owner. Theranecron (*Tarantula cubensis* extract) was introduced into the treatment based on the results of Guliken et al. (2). The drug was injected subcutaneously once a week at a dose of 2.5 ml/dog. After the introduction of Theranecron, the patient felt significantly better. The appetite returned to normal, the dog was more active and willing to play with the dog he was living with. A control echocardiographic examination was performed, which showed no pericardial effusion, dimensions of previously described mass located in the left atrium decreased (3 cm × 3.1 cm). The previously recommended therapy was continued and the patient returned for regular control visits once a month. Echocardiography was

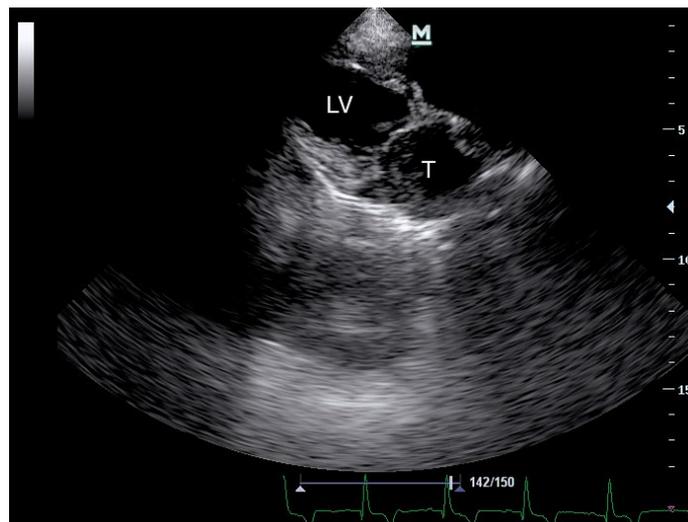


Fig. 1. Right long axis view, visible tumor filled almost entire lumen of the left atrium

performed each time and its result did not differ significantly from the previous one. During this time, the dog's clinical condition improved significantly and, according to the owner, the dog behaved as before the illness. Since the diagnosis, the dog survived 11 months in good condition. Sudden cardiac death occurred when he was attacked by a much larger dog.

Pathological examination revealed an irregular mass localized at the base of the heart with a dimension of approximately 5 cm (Fig. 2). The tumor was located in the left atrium, filling almost all of its lumen. The aorta was displaced to the right. On the cross-section, the tumor was solid, with a visible foci of hemorrhage. Sections were taken from the tumor for histopathological examination. The sections were stained using the hematoxylin-eosin method. The microscopic image revealed the presence of rich-cell parenchyma made of polygonal, extremely pleomorphic cells, arranged in lobules of different sizes, separated by thin bands of connective tissue. The cells had pleomorphic nuclei with distinct nucleoli, moderately acidophilic cytoplasm, sparse to abundant, with fine-grained structure. Nuclei were round, oval, or irregular, with severe to extreme anisokaryosis. Mitotic figures were common, with 0-3 mitoses per high power field. Large clusters of neoplastic cells, similar in structure to the primary tumor, were observed in the blood vessels of the myocardium. Based on the results



Fig. 2. Macroscopically, an irregular mass was found at the base of the heart, filling the entire lumen of the left atrium

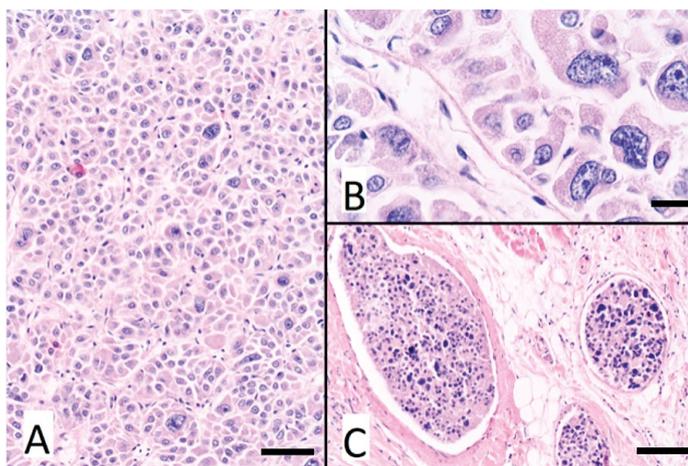


Fig. 3. A. Rich-cell parenchyma made of polygonal, extremely pleomorphic cells, arranged in variable sized lobules, by connective tissue; scale bar: 100 μ m. B. The cells had pleomorphic nuclei with distinct nucleoli; scale bar: 40 μ m. C. Visible large clusters of neoplastic cells, similar in structure to a primary tumor, in the blood vessels surrounding the heart; scale bar: 200 μ m. Hematoxylin-eosin stain.

of the examination, the final diagnosis was made: malignant chemodectoma (Fig. 3).

Discussion

In publications a few methods of treatment were presented, including surgery, chemotherapy and radiotherapy. Buchanan et al. (1) presented a case of surgical removal of most of the tumor mass using pulmonary bypass. Many dogs at the time of diagnosis are in a relatively advanced state such that surgical removal of the tumor is impossible. In one case report published by Magestro et al. (8), the authors described the use of radiation therapy in six dogs with chemodectoma. After radiation the reduction in tumor volume by 30-76% was observed. In the second report clinical improvement after procedure was observed in 5 out of 6 patients and in half of the patients some reduction of tumor size was documented (3). Because of some adverse effects such as cardiac arrhythmias or sudden death, which were described in publications describing the use of radiotherapy in the treatment of heart base tumors, careful case selection and thorough discussion of risks with pet owners are very important factors (6-8). However, arrhythmias were reported in dogs diagnosed with chemodectoma without radiation therapy, including life-threatening third degree atrioventricular block (14). The heart and lungs are susceptible to radiation induced damage, including acute pneumonitis, pericarditis, pulmonary and myocardial fibrosis, which may occur years after treatment (13). In humans, medical management with conventional cytotoxic chemotherapy has not proven to be efficacious (7). The drugs used in human medicine for advanced neuroendocrine tumors are tyrosine kinase inhibitors (TKI). Lew et al. (7) conducted research using tyrosine kinase inhibitors (Palladia) in dogs with chemodectoma. The results showed that treatment did not affect the size of the tumor, but the authors observed some improvement or complete resolution of clinical signs related to the tumor.

The survival time of our patient after the applied treatment was similar to that described after surgery resection using cardiopulmonary bypass (1). The introduction of Theranecron into treatment improved the patient's clinical condition and subsequent, regularly performed echocardiographic examinations did not reveal tumor growth. Since the recovery of the pre-disease clinical state took place only after the introduction of Theranecron into treatment, it can be assumed that the above drug may be useful in the palliative treatment of this type of tumors. Perhaps the clinical improvement and tumor growth inhibition were related to the local tumor growth control mechanism described in the case of Theranecron application in canine mammary adenocarcinoma, where its beneficial effect on apoptosis was described (2). After the above treatment, although the dog came to the clinic in life-threatening condition, with a large heart tumor, pericardial effusion and ascites, the survival time was almost a year. The use of therapy with Theranecron may be one of the possibilities of palliative therapy in the case of diagnosing inoperable chemodectoma.

References

- Buchanan J. W., Boggs L. S., Dewan S., Regan J., Myers N. C., Myers N. C.: Left paraganglioma in a dog: echocardiography, surgery and scintigraphy. *J. Vet. Intern. Med.* 1998, 12, 109-115.
- Gultiken N., Guvenc T., Kaya D., Ale Reha A., Serhat Ay Serhan, Ibrahim K., Briten E., Findik M., Schafer-Somi S., Asllan S.: Tarantula Cubensis extract alters the degree of apoptosis and mitosis in canine mammary adenocarcinomas. *J. Vet. Sci.* 2015, 16, 213-219.
- Hansen K. S., Theon A. P., Willcox J. L., Stern J. A., Kent M. S.: Long-term outcomes with conventional fractionated and stereotactic radiotherapy for suspected heart-base tumours in dogs. *Vet. Comp. Oncol.* 2021, 19, 191-200.
- Janus F., Nowak M., Noszczyk-Nowak A., Ciaputa R., Kandefer-Gola M., Paslawska U., Sapieryński R., Lopuszyński W., Otrocka-Domagala I.: Epidemiological and pathological features of primary cardiac tumours in dogs from Poland in 1970-2014. *Acta Vet. Hung.* 2016 Mar. 64 (1), 90-102.
- Kittelson M. D., Kienle R. D.: *Small Animal Cardiovascular Medicine*. Mosby 1998, 413-432.
- Kruckman-Gatesy C. R., Ames M. K., Griffin L. R., Boss M. K., Rao S., Leary D., LaRue S. M.: A retrospective analysis of stereotactic body radiation therapy for canine heart base tumors: 26 cases. *J. Vet. Cardiol.* 2020, Feb 27, 62-77.
- Lew F. H., McQuown B., Borrego J., Cunningham R., Burgess K. E.: Retrospective evaluation of canine heart base tumours treated with toceranib phosphate (Palladia): 2011-2018. *Vet. Comp. Oncol.* 2019, 17, 465-471.
- Magestro L. M., Gieger T. L., Nolan M. W.: Stereotactic body radiation therapy for heart-base tumors in six dogs. *J. Vet. Cardiol.* 2018, 20, 186-197.
- Mai W., Weiss C., Sleeper M.: Cardiac magnetic resonance imaging in normal dogs and two dogs with heart base tumor. *Vet. Radiol. Ultrasound* 2010, 51, 428-435.
- Noszczyk-Nowak A., Nowak M., Paslawska U., Atamaniuk W., Nicpoń J.: Cases with manifestation of chemodectoma diagnosed in dogs in Department of Internal Diseases with Horses, Dogs and Cats Clinic, Veterinary Medicine Faculty, University of Environmental and Life Sciences, Wrocław, Poland. *Acta Vet. Scand.* 2010, 52, 1-7.
- Noszczyk-Nowak A., Nowak M., Paslawska U., Rabczyński J., Nicpoń J.: Chemodectoma – guz podstawy serca. Opis przypadku. *Med. Weter.* 2008, 64, 828-831.
- Oyama M. A. i wsp.: *Kardiologia psów i kotów*. Elsevier Urban&Partner 2011, 222-237.
- Rancilio N. J., Higuchi T., Gagnon J., McNeil E. A.: Use of three-dimensional conformal radiation therapy for treatment of a heart base chemodectoma in a dog. *J. Am. Vet. Med. Assoc.* 2012, 15, 472-476.
- Schuller S., Van Israel N., Else R. W.: Third Degree Atrioventricular block and accelerated idioventricular rhythm associated with a heart base chemodectoma in a syncopal rottweiler. *J. Vet. Med.* 2007, 54, 618-623.
- Treggiari E., Pedro B., Dukes-McEwan J., Gelzer R., Blackwood L.: A descriptive review of cardiac tumours in dogs and cats. *Vet. Comp. Oncol.* 2017, 15, 273-288.

Corresponding author: Olga Szaluś-Jordanow DVM, PhD, DSc, Nowoursynowska 159c, 02-776 Warsaw, Poland; e-mail: olga_szalus_jordanow@sggw.edu.pl