










# Conservative treatment of ventricular tumors secondary to mammary neoplasia in dog: case report

Tratamento conservador de tumor de ventrículo secundário à neoplasia mamária em cão: relato de caso

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## Abstract

Cardiac neoplasms are uncommon, but secondary or metastatic neoplasms are relatively frequent, with an incidence 60 times higher than the primary ones. A particularly high frequency of metastatic cardiac involvement has been observed in lung squamous cell carcinomas, urinary tract tumors, and melanomas. However, the incidence is low because of breast tumors in dogs. Cardiac tumors may be symptomatic or, more commonly, an incidental finding observed during the investigation of unrelated problems. The clinical presentation is associated with that of a disseminated neoplasm, and cardiac metastases are generally asymptomatic, but should be considered in patients with a history of neoplasia who present with impaired conduction, breathlessness, cardiomegaly, or arrhythmias. The present report aimed to describe a clinical case of cardiac metastasis of breast neoplasia in a dog in which we focused on conservative clinical treatment and the importance of investigating the incidental clinical findings.

**Keywords:** endocardial tumor, pericardial effusion, clinical management.

## Resumo

As neoplasias cardíacas são incomuns, contudo as secundárias ou metastáticas são mais frequentes dentre estas, apresentando uma incidência 60 vezes superior às primárias. Uma frequência particularmente elevada de envolvimento cardíaco metastático tem sido observada em carcinoma epidermóide de pulmão, tumores do trato urinário e melanomas. Contudo, existe baixa ocorrência por conta de tumor de mama em cadelas. Os tumores cardíacos podem ser sintomáticos ou, mais comumente, achados incidentais, observados durante investigação de um problema não-relacionado. A apresentação clínica é relacionada à de uma neoplasia disseminada, sendo as metástases cardíacas, via de regra, assintomáticas, contudo devem ser lembradas em pacientes com história de neoplasia, que apresentem distúrbios de condução, sopro, cardiomegalia ou arritmias. O presente relato visa descrever um caso clínico de metástase cardíaca, decorrente de neoplasia mamária em cadela, onde o enfoque é o tratamento clínico conservador, bem como a importância da investigação dos achados clínicos incidentais.

**Palavras-chave:** tumor em endocárdio, efusão pericárdica, manejo clínico.

## Introduction

Cardiac tumors are neoplasms that originate from the internal lining, musculature, or pericardium of the heart (Mac Gregor et al., 2008). They may be primary or metastatic (Aupperle et al., 2007). The incidence of metastatic tumors of the heart is 1%, with the primary tumors showing higher frequency (Amano et al., 2013). They may affect the epicardium (most common), myocardium, or endocardium (Ware & Hopper, 1999).



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Pulmonary or mammary carcinomas can reach the pericardium and cause vessel compression, generating pericardial effusions, which can lead to cardiac tamponade (MacGregor et al., 2005). Further, pulmonary neoplasms may grow toward the pulmonary veins, affecting the mitral valve and causing obstructive symptoms (Burke et al., 2007).

Benign tumors are the most common, and both clinical and surgical treatments have favorable results with good life expectancy (Karigyo & Silva, 2014). However, malignant tumors do not benefit from the current conservative therapies (Hassan & Smith, 2012). Surgery, chemotherapy, and radiotherapy may prolong the survival of the patients by a few months but are not used as the treatment method (Shapiro, 2001).

The common effects and clinical signs of cardiac tumors are obstructions, embolizations, arrhythmias, and effusions (Burke et al., 2007). 1. Obstructions depend on the size. Atrial tumors may hinder atrioventricular-valve blood flow and mimic valvular stenoses (MacGregor et al., 2005). In ventricular cavities, they can obstruct the exit routes, with signs of dyspnea or syncope (Yeh et al., 2008); 2. Emboli can originate from the tumors or from the adjacent thrombi. Depending on the focus of origin, emboli can be small and multiple, mimicking vasculitis or endocarditis, or large, with occlusive events, such as stroke (Karigyo & Silva, 2014); 3. Infiltration of the tumor in the myocardium and in the conduction pathways or presence of the tumor mass may cause arrhythmias, leading to atrioventricular blocks, ventricular tachycardias, or death (Aupperle et al., 2007); 4. Finally, compression may reduce the oncotic pressure of the vessels and lead to extravasation of the pericardial fluid, causing effusion (Amano et al., 2013). The diagnosis of cardiac neoplasms is based on echocardiography and computed tomography (Jark et al., 2004; Bussadori, 2015).

Cardiac tumors should be included in the differential diagnosis (Mesquita et al., 2012) of patients with heart murmur, cardiac arrhythmia, and non-specific signs, such as fever and anorexia (Karigyo & Silva, 2014), especially in those with neoplasia in other regions of the body (Kealy & Mc Allister, 2005).

Treatment should be surgical resection, with chemotherapy and radiotherapy, and palliative, aimed at systemic care and improving quality of life of terminal patients (Shapiro, 2001).

The present study aimed to describe conservative palliative care, preserving the quality of life of a woman with a ventricular tumor secondary to breast neoplasia.

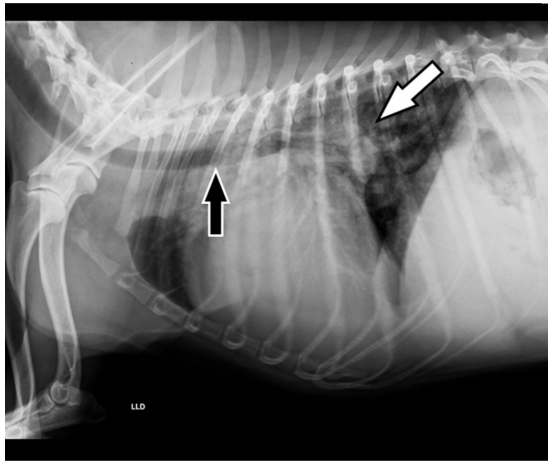
## Historical findings

For clinical and preoperative evaluation, a 15-year-old teckel with restrictive dyspnea and mammary nodule for two years was submitted to the Respiratory Cardiology and Respiratory Diseases Service of the Small Animal Veterinary Hospital. The tutor reported that the bitch had extreme fatigue and loss of appetite.

Physical examination revealed positive cough reflex, hyperkinetic pulses, restrictive respiration, and hepatosplenomegaly. Pulmonary auscultation revealed crepitation all over the chest, while the cardiac sounds were muffled. In addition, restrictive breathing with tachypnea, rectal temperature of 39.8 °C, and capillary perfusion time of 2 s were observed. The thoracic percussion was hypersonic, with isolated submachine points. The systemic systolic blood pressure was 140 mmHg. Radiographic examination of the chest revealed peribronchial and alveolar infiltrates in the caudal lung fields, mainly in the peri-hilar region, with a dorsal displacement of the trachea and main bronchi (Figure 1) and an overall increase in the cardiac silhouette, suggestive of pericardial effusion (Figure 2).

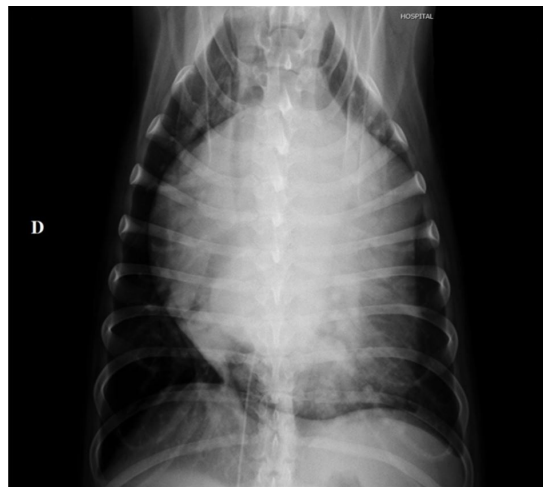
The pericardial effusion was confirmed using T-FAST (*Thoracic Focused Assessment with Sonography for Trauma*), at which point the presence of cardiac tamponade was detected, and pericardiocentesis was continued (Figure 3). Electrocardiogram monitoring was recommended in this procedure to detect possible findings of needle contact with the myocardium during drainage. Electrical alternation (Figure 4A) and ventricular premature complexes (VPC's) (Figure 4B) were observed during electrocardiographic recording. After the drainage, 50 mL of serous-hemorrhagic fluid was obtained, which was sent for cytological examination and analysis for spoliation of possible cancer cells.

Laboratory tests revealed normocytic and hypochromic anemia, elevated alkaline phosphatase and urea, and decrease in phosphorus and ionic calcium.



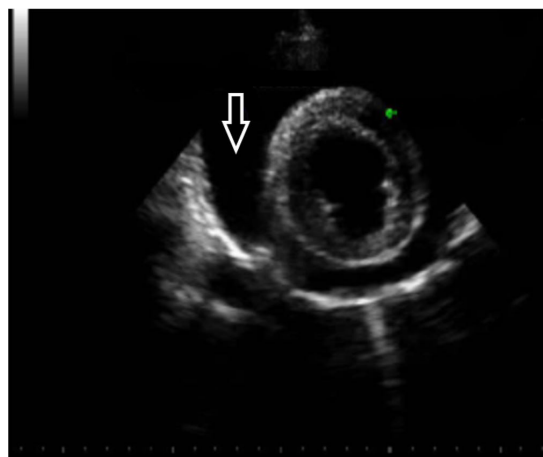
**Figure 1.** Thoracic radiographic image in the right lateral view showing alveolar pattern in the perihilar region (filled arrow), enlargement of the cardiac silhouette, and dorsal displacement of the trachea (arrow outline).

**Source:** Veterinary Hospital of Small Animals.



**Figure 2.** Thoracic radiographic image in the ventro-dorsal view showing an increase in the cardiac silhouette with pericardial effusion.

**Source:** Veterinary Hospital of Small Animals.



**Figure 3.** Echocardiographic image in the left ventricular transverse section showing effusion (arrow outline) with cardiac tamponade.

**Source:** Service of Cardiology and Respiratory Diseases - UFRRJ.



**Figure 4.** Electrocardiographic tracing revealing: A. Electrical alternation (circles) and B. Premature ventricular complex (arrow outline).

**Source:** Service of Cardiology and Respiratory Diseases - UFRRJ.

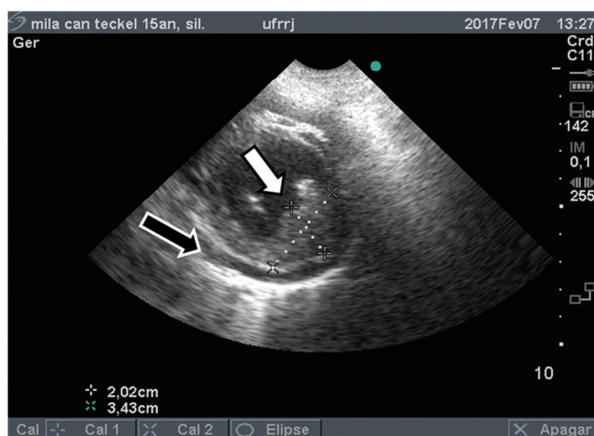
Abdominal ultrasonography showed hepatosplenomegaly, three circumscribed and irregular splenic nodules, with the largest one (3,74cm x 2,82cm) showing vascularization, and inguinal and sublumbar reactive lymph nodes.

Echocardiography showed thickening and insufficiency of the atrioventricular valve leaflets, increase in left atrium size, with an aorta of 1.8. Diffuse involvement of the left ventricular systolic function (shortening fraction: 28%) was observed, and hyperechoic formation, difficult to measure on the wall, was observed in the transverse section of the left ventricle. Discrete, non-drainable pericardial effusion was also seen.

Enalapril (0,3 mg/kg, BID), pimobendan (0,25 mg/kg, BID), spironolactone (2mg/kg, BID), furosemide (3mg/kg, TID), and omega-3(500mg, SID), were prescribed. At the reassessment after three days, the patient had regained activity and appetite. There was no pericardial effusion, and the breathing was normal. The vital signs were within the normal ranges. A slight crepitation was heard in the peri-hilar region, and the T-FAST examination showed discrete, non-draining effusion (Figure 5).

The only sign of abnormality that required treatment was the presence of polymorphic VPC's on the electrocardiogram, and amiodarone (1mg/kg BID) was added to the therapeutic protocol.

After seven days, the electrocardiogram showed isolated VPC's, without malignancy. Approximately 90 days after the diagnosis, the patient died. At necropsy, breast neoplasia was evident, with metastasis in the lungs, lymph nodes, heart, spleen, and liver. Histopathological examination proved that this was a case of primary adenocarcinoma with metastasis in the cardiac ventricle.



**Figure 5.** Echocardiographic image in the left ventricle transverse section showing irregularity in the left ventricle wall (filled arrow) and discrete pericardial effusion (arrow outline).

**Source:** Service of Cardiology and Respiratory Diseases - UFRRJ.

## Discussion

Effusion originating from the compression of the lymphatic vessels in the mediastinal region appears to justify the occurrence of cardiac tamponade. Although congestive heart disease was present, overtraining of the pulmonary inter-system, and not necessarily of the pericardial space, was expected (Amano et al., 2013).

In the present study, the pericardial fluid was analyzed to detect the cell type: primary or metastatic (Aupperle et al., 2007).

Emergency treatment of pericardial drainage and the establishment of congestive heart failure from vasodilatation by angiotensin-converting enzyme inhibitors (enalapril) reduced pulmonary hypertension and increased the force of cardiac contraction by the inodilator and inhibitor of phosphodiesterase III (pimobendan) with reduced accumulation of pulmonary edema and possible effusions associated with the diuretic action of spironolactone and furosemide (Johnson et al., 2011).

The presence of VPC's was related not only to the compression of the tumor conduction system but also to the release of cytokines in the bloodstream, generating a change in the electrical action potential to generate the impulse, which could be the origin of the paraneoplastic syndrome (Mac Gregor et al., 2008).

The establishment of oncological management minimized the paraneoplastic effects, and thus, reduced spoliation of cancer cells to the other organs, improving the clinical picture, as reported in the literature (Jark et al., 2004).

Although survival after the treatment was not prolonged, it should be noted that the diagnosis was late, which is common in veterinary medicine because of the lack of preventive medicine or limitation of diagnostic resources, such as computed tomography (Kealy & McAllister, 2005). In the medical practice for small animals, resources for precise diagnosis are necessary for clinical evaluation both in Brazil and other countries (Yeh et al., 2008).

## Conclusion

The use of this clinical report was fundamental to the success and elucidation of this disease, without exposing the patient to the stress of surgery or chemotherapy, with resolution using the palliative treatment for terminal patients, such as supportive medications, drainage of effusions, and oxygen therapy.

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