

Primary Pulmonary Chondrosarcoma in a Bitch

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ABSTRACT

Background: Primary lung neoplasms are uncommon in veterinary medicine, and when they develop, they are more frequently observed to be of epithelial origin. Although chondrosarcomas are the second most diagnosed type of neoplasm in dogs at skeletal sites, their development in extraskelatal tissues, including the spleen, aorta, heart, tongue, peritoneum, and lungs, corresponds to approximately only 1% of cases. Therefore, the occurrence of primary pulmonary chondrosarcoma is considered very rare in domestic animals. Considering the rare occurrence and scarcity of data regarding its development, the present report describes the clinical and pathological aspects of a case of primary pulmonary chondrosarcoma in a bitch.

Case: A 8-year-old mixed-breed bitch, weighing 14.2 kg, was examined at one private veterinary clinic with the principal complaint of prolonged respiratory distress and resistance to exercise. Clinical evaluation revealed tachypnea with expiratory dyspnea due to intense pleural effusion, tachycardia, and diffusely pale mucous membranes. Thoracocentesis was performed with drainage of 1000 mL of modified transudate, and fluid cytology, blood count, and chest radiography were performed. Cytological analysis of the thoracic fluid did not identify neoplastic cells, the blood count showed intense regenerative anemia, and the radiograph showed an extensive area of consolidation in the left caudal lung lobe, compatible with neoplasia. The results of the tests performed, in addition to the evolution of the clinical picture and the impossibility of performing the indicated surgical intervention, culminated in the patient's unfavorable prognosis, followed by euthanasia, necropsy, and histopathological evaluation of the collected material. Necropsy revealed a white neoplastic formation with reddish areas and firm consistency that diffused into the parenchyma of the left caudal lung lobe with invasion of the rib cage, fracture of the fifth and sixth left ribs, diaphragmatic metastasis, intense hydrothorax, and moderate hydroperitoneum. Microscopically, in the histological sections of the lung and diaphragm, poorly differentiated mesenchymal cells with moderate anisocytosis and anisokaryosis and interspersed with them, moderately differentiated chondrocytes surrounded by chondroid matrix, moderate anisocytosis and anisokaryosis, and a low mitotic index culminated in the diagnosis of primary pulmonary mesenchymal chondrosarcoma.

Discussion: Malignant epithelial neoplasms were suspected; however, the histopathological features observed were compatible with primary pulmonary chondrosarcoma. The characteristics of the fluid collected through thoracocentesis led to its classification as a modified transudate, which is often associated with neoplastic and hemorrhagic processes; both alterations were present in this case. The diagnosis of primary pulmonary chondrosarcoma was established based on the histopathological findings since the cell type and distribution observed in the present case were compatible with the typical pattern observed in extraskelatal chondrosarcomas. An unfavorable prognosis is common in cases of primary or metastatic lung neoplasm since, in most cases, the condition is identified in the advanced stages of the disease, making therapeutic management challenging. Given the increase in the number of dog deaths due to neoplasms in recent years, this case report may contribute to a better understanding of the biological behavior of pulmonary chondrosarcoma and assist in the choice of treatment to be adopted when required.

Keywords: dog, malignant neoplasm, mesenchymal; extra skeletal, respiratory system, pathology.

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INTRODUCTION

Primary lung neoplasms (PLNs) are considered rare in veterinary medicine, and their prevalence in dogs is 0.1 to 0.9% [10]. Although both epithelial and mesenchymal components of the lungs can give rise to neoplasms, most PLNs are epithelial malignant, and adenocarcinoma is the most frequently diagnosed type [1,4]

Chondrosarcoma is a malignant mesenchymal neoplasm that originates in chondrocytes and is the second most diagnosed bone tumor in domestic animals in the skeletal system; however, it rarely develops in extraskeletal structures [2]. Approximately 1% of chondrosarcomas develop in extraskeletal sites in dogs [9], including the tongue [15,19], mammary gland [23], retroperitoneum [14], spleen [11], heart [8], abdominal aorta [7] and lung [12,13].

Considering the rare occurrence and scarcity of data regarding its development, the present report describes the clinical and pathological aspects of a case of primary pulmonary chondrosarcoma in a bitch.

CASE

A 8-year-old mixed-breed bitch, weighing 14.2 kg, was examined at one private veterinary clinic with the principal complaint of prolonged respiratory distress and resistance to exercise. During clinical examination, tachypnea with expiratory dyspnea, tachycardia, diffusely pale mucous, and pulmonary rales compatible with pleural effusion were identified on auscultation. Therefore, a complete blood count, chest radiography, thoracentesis, and cytology of the collected material were requested.

Blood count revealed severe regenerative anemia (22% hematocrit) and leukocytosis with mild neutrophilia (neutrophils corresponded to 80% of the counted leukocytes). Thoracentesis culminated in the drainage of 1000 mL of transudate of a reddish color that was intensely turbid with a neutral pH, a density of 1036 osm/kg, protein concentration of 5.2 g/dL, contained 3.5×10^9 red blood cells/dL, and 175×50 nucleated cells/dL, and no neoplastic cells. Thoracic radiography revealed an extensive area of consolidation in the left caudal lung lobe, compatible with neoplasia (Figure 1).

Given the results of the complementary examinations, it was decided to hospitalize and monitor the animal to stabilize its clinical status. During this period, supportive fluid therapy¹ [lactated Ringer - 50

mL/kg/day, IV] and pharmacological intervention with an anti-hemorrhagic² [Tranexamic acid[®] - 10 mg/kg, VO, TID, for 3 days] were performed until the re-establishment of hematological parameters. A vitamin supplement was prescribed for home use³ [Eritrós Dog[®] - 18 g, VO, SID], tramadol hydrochloride⁴ [Tramadol[®] hydrochloride 50 mg - 4 mg/kg, VO, BID, until further recommendations] for pain control and anti-inflammatory meloxicam⁵ [Meloxivet[®] 2 mg - 0.1 mg/kg, VO, SID, for 5 days].

Blood counts were performed on the 1st, 4th, and 7th days of hospitalization, and after the evaluation of the last examination, the animal was released after stabilizing the hematological parameters. However, the patient returned 15 days after the 1st consultation with clinical signs similar to those initially reported: moderate regenerative anemia (28% hematocrit) and moderate leukocytosis (neutrophils corresponded to 86% of counted leukocytes). Additionally, 400 mL of transudate was drained from the thoracic cavity (Figure 2).

Due to the blood counts performed during the follow-up of the animal (Table 1), the radiographic results, and the progression of the clinical status, a computed tomography scan followed by lobectomy and partial or total excision of the neoplasm were performed. Given the impossibility of performing the suggested procedures and the advanced development of the condition, the dog was considered to have an unfavorable prognosis. Therefore, the dog was euthanized and underwent necropsy, followed by a histopathological analysis of the collected material.

At necropsy, the most relevant findings were a white neoplastic formation with reddish areas and firm consistency that diffused to the parenchyma of the left caudal lung lobe with invasion of the thoracic cavity (Figure 3), fracture of the 5th and 6th left ribs, diaphragmatic metastasis (Figure 4), intense hydrothorax, and moderate hydroperitoneum.

Microscopically, the lung and diaphragm fragments revealed dense neoplastic cell proliferation, non-encapsulated, non-delimited, poorly vascularized, and infiltrative growth. In some areas, neoplastic cells organized in a mantle were observed, fusiform and poorly differentiated, with basophilic and poorly delimited cytoplasm and basophilic and hyperchromatic nuclei ranging from elongated to ovoid (Figure 5). Interspersed with these cells, aggregates of reasonably differentiated chondrocytes organized in mantles or

Table 1. Demonstration of the progression of hematological parameters throughout the case, highlighting the days of stabilization of the animal (blue) and regression of the advances achieved with the therapy instituted (red).

Monitoring of hematological parameters				
	Day 1	Day 4	Day 7	Day 15
Red blood cells (millions/mm ³)	2.90	2.93	4.14	3.43
Hematocrit (%)	22.00	27.00	35.00	28.00
Hemoglobin (g/dL)	7.33	9.00	11.60	9.33

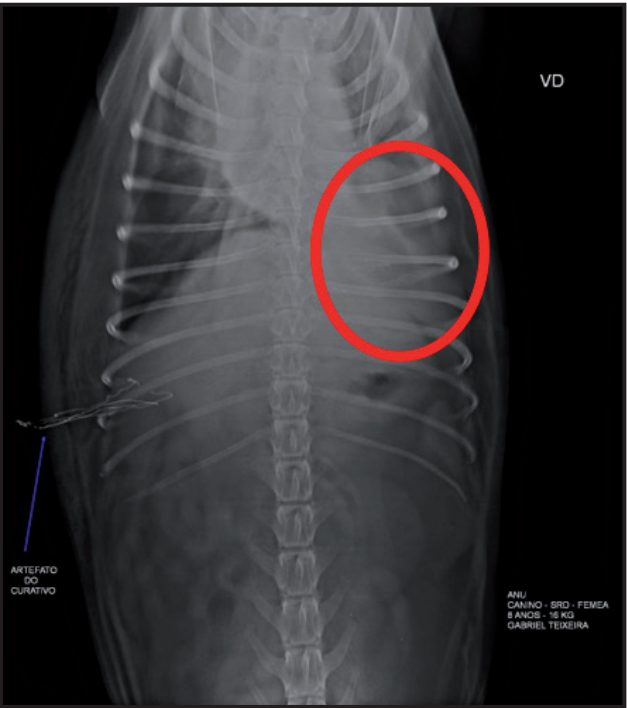


Figure 1. Thoracic radiograph shows a radiographic image in ventrodorsal view that suggests continuity of the cardiac silhouette (highlighted in red) compatible with consolidation of the left caudal lung lobe. This radiographic appearance is suggestive of neoplastic formation.



Figure 2. Fluid collected from the thoracic cavity via thoracentesis 7 days after the animal was released.

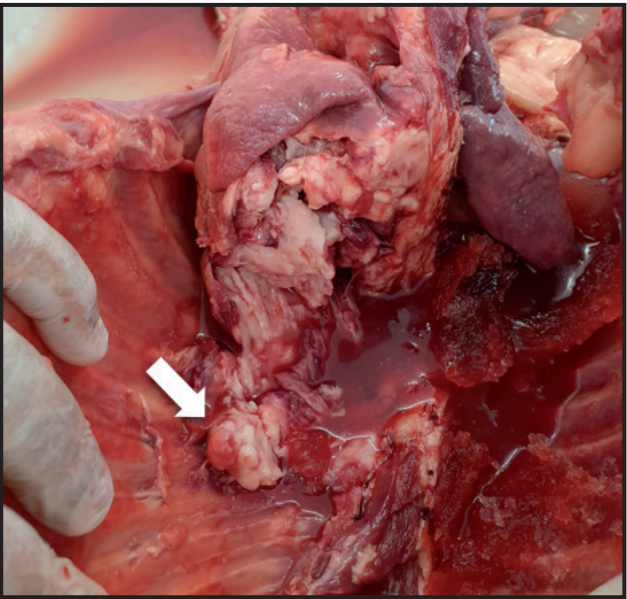


Figure 3. White mass with foci of hemorrhage extensively occupying the left caudal lung lobe and caudally adherent to the rib cage (arrow).

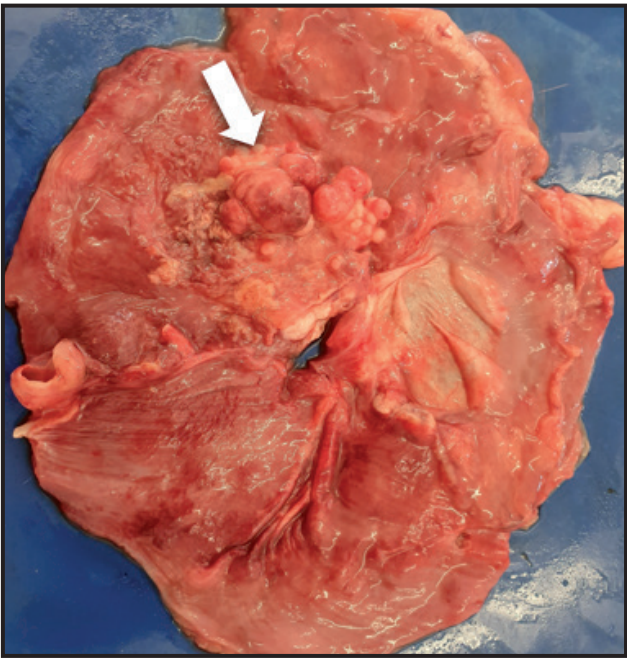


Figure 4. Multiple nodules located on the parietal surface of the diaphragm (arrow) ranging from a few millimeters to approximately 2 cm, with a firm consistency and slightly reddish color.

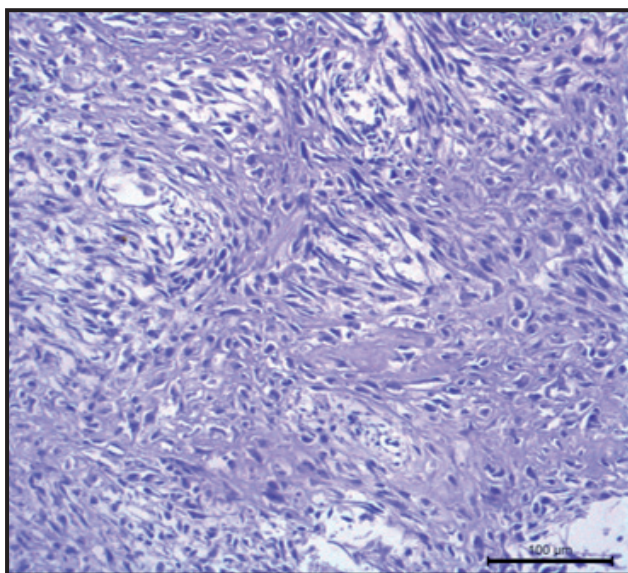


Figure 5. Primary pulmonary chondrosarcoma in a dog. Fusiform neoplastic cells organized in the mantle, poorly differentiated, with hyperchromatic nuclei ranging from ovoid to elongated [HE; 20x].

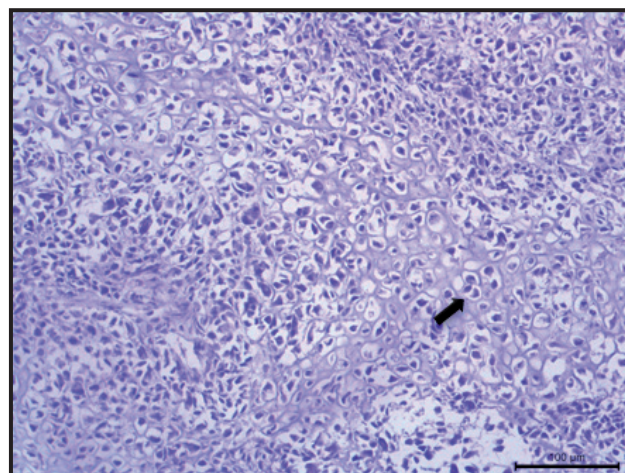


Figure 6. Primary pulmonary chondrosarcoma in a dog. Moderately differentiated chondrocytes surrounded by chondroid matrix organized in a mantle, sometimes binucleated (arrow), showing moderate anisocytosis [HE; 20x].

cords surrounded by chondroid matrix were observed (Figure 6), which showed moderate anisocytosis and anisokaryosis, basophilic nuclei ranging from rounded to elongated and occasional prominent and multiple nucleoli (until four nucleolus/nucleus), and a low mitotic index (1 to 2 atypical mitotic figures by 40x field).

DISCUSSION

Although the lung is one of the main organs affected by metastatic neoplasms in dogs and cats, PLN is rare, and carcinomas comprise the majority of diagnosed cases, with an even lower incidence of sarcomas [26]. Given this, epithelial neoplasms were initially suspected; however, the microscopic characteristics observed differed from those expected in this case.

The diagnosis of primary pulmonary chondrosarcoma was established based on the histopathological findings since the cell type and distribution observed in the present case were compatible with the typical pattern observed in extraskelatal chondrosarcomas [9]. Furthermore, when specifically described in the lung, such neoplasms are often poorly vascularized, may present multifocal necrotic areas, and occasionally demonstrate binucleated cells and a low mitotic index [11,24], which were also identified in this case.

In most cases, extraskelatal chondrosarcomas are not metastatic [11]. Metastases are rarely associated with PLN. Despite this, they can develop through hematogenous and lymphatic pathways in carcinomas and through direct contact between the

neoplasm and adjacent tissues in pulmonary sarcomas [3,18]. Therefore, it is believed that the development of diaphragmatic nodules and invasion of the aforementioned ribs are justified by the proximity between the lung and the tissues in question, which allows the migration of neoplastic cells and their establishment in the new place.

Considering the rarity of primary pulmonary chondrosarcoma in veterinary medicine, its clinical behavior is rarely discussed in animals. However, in human patients, symptomatic pulmonary obstruction, dyspnea, and pleural effusion have been described [25], and changes were also observed in this case. Although radiography is not a sensitive diagnostic tool in cases of canine lung neoplasms, it is considered an indispensable part of the screening protocol for primary and metastatic thoracic neoplasms, and its results enable the establishment of prognosis [5], which justifies its consideration as a parameter for evaluating the general condition of the animal in this case. It is worth noting that if resources are available, other diagnostic tools such as ultrasound [8] and computed tomography [5], as suggested in the present case, can be considered.

The information obtained through the cytological analysis of the pleural effusion characterized the fluid as a modified transudate (protein level ≥ 2.5 g/dL and from 1,000 to 8,000 nucleated cells/dL), which is often associated with neoplastic and hemorrhagic processes [21,22]. This helped to corroborate the findings in this case since the left caudal lung lobe was

extensively occupied by the neoplasm, which presented multifocal areas of hemorrhage. Recurrence of pleural effusion after thoracentesis and maintenance of the physicochemical characteristics of the fluid are also observed in other PLNs that progress to necrosis and hemorrhage, such as squamous adenocarcinoma [20].

In general, PLN in veterinary medicine is a challenge from a therapeutic point of view since in most cases they are diagnosed late when clinical and behavioral changes are manifested more expressively [6]. When possible, PLN undergoes surgical intervention with total or partial lobectomy and pneumonectomy with or without chemotherapy as a therapeutic indication [17]. This justifies the establishment of an unfavorable prognosis due to the impossibility of performing the indicated procedure and the severity of the lung injury inferred by radiography in this case. Despite this, the therapeutic management adopted in the present situation is in accordance with what is recommended as an alternative for the stabilization of hemorrhagic, inflammatory conditions and the cons-

tant pain associated with primary or metastatic lung neoplasms to the detriment of surgical intervention or even its performance [6,16,17].

The number of deaths from malignant neoplasms in dogs has increased in recent years, which may be associated with an increase in the life expectancy of these animals with the advancement of veterinary medicine [1]. Therefore, the exploration of data referring to infrequent neoplasms is important to facilitate the understanding of future cases and assist in the choice of treatment to be adopted when necessary.

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Declaration of interest. The authors declare no conflicts of interest. The authors alone are responsible for the content and writing of this manuscript.

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