# Primary Pulmonary Tumor in the Canine Patient:
# A Case Report of Chondrosarcoma

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## Introduction

Although information concerning canine pulmonary tumors is widely available, they are still relatively uncommon in the veterinary field. One of the most commonly diagnosed primary neoplasms in the lungs of dogs is a carcinoma. According to Ogilvie's research, 97.2% of cases were pulmonary carcinomas.[1] Primary mesenchymal tumors of the lung, however, are very rare, and there is a limited amount of literature that describes them. Primary chondrosarcomas in the dog are most often skeletal in origin, such as the nasal cavity, ribs, and pelvis. They are much less frequently extra-skeletal in origin, such as omentum, lung, and aorta.[2]

## History and Presentation

An 8 year old female spayed white Boxer presented to the Mississippi State University College of Veterinary Medicine, Small Animal Surgery Department on August 17, 2016 for thoracic computed tomography, and again on September 6, 2016 for surgical removal of a lung mass. The patient originally presented to the rDVM in September of 2015, where a solitary lung mass was visualized within the left caudal lung lobe via a 3-view thoracic radiograph study. Around May of 2016, the patient developed an increased frequency of coughing, especially when lying down. After returning to the rDVM July of 2016 for a re-check, repeat thoracic radiographs revealed that the mass had grown in size.

Upon presentation, the patient was bright, quiet, alert, and responsive with a body condition score of 6/9. A mild, non-productive cough was heard while walking to and from the waiting and exam rooms. The vital parameters were normal, with a temperature of 101 degrees F, heart rate of 100 beats per minute, and respiratory rate of 24 breaths per minute, but shallow breathing

was noted. Cardiac and thoracic auscultation were normal, with the exception of decreased lung sounds on the left side. Muscle fasiculations were present after palpation around the T1-T9 and sacral areas along the spine, and the left popliteal lymph node was subjectively larger than the right.

This patient had been receiving naturopathic thyroid supplements (Thymex 7930 and Thytrophin PMG) and naturopathic anti-cancer agents (Concentrated Stasis Breaker, Reishi Forte, Ginseng and Gecko/Ren Shen Ge Jie Soro, Harmonize the Qi/Xiao Chai Hu Tiang) once the mass was discovered in 2015. Essential oils were used for flea and tick prevention, and vaccinations were up to date. The main clinical signs exhibited were intermittent cough, mild exercise intolerance, and a decreased appetite.

**Pathophysiology**

Interestingly, the Boxer breed has been shown to have an apparent predisposition to pulmonary neoplasia when compared to other canine breeds.[3] In dogs, chondrosarcomas occur most often in medium to large breeds, particularly Boxers, German Shepherds, and other mixed breeds.[4] A recent case report in 2016 described the third ever documented case of a primary lung chondrosarcoma, and it was in a Boxer.[5]

Chondrosarcomas closely resemble benign tumors of cartilage, and typically don't show many indications of malignancy, such that the appearance of one mitotic figure can indicate malignancy.[6] They involve the flat bones more than long bones in all species, and most commonly the ribs, turbinates, and pelvis of dogs.[4] They tend to grow more slowly, but can extend into the cortex of soft tissues, and reach a large size.[6] Most chondrosarcomas are well

advanced before presenting to a veterinarian. Although successful surgical removal is possible, recurrence is common.[6]

**Diagnostic Approach/Considerations**

Patients that are ultimately diagnosed with a primary lung tumor can often times present for something unrelated, such as a routine check up or a different clinical abnormality of concern.[7] It has been reported that up to 30% of patients with a primary pulmonary tumor will be diagnosed without clinical signs.[8] One study reported that clinical signs were not noted until the pulmonary tumor grew to at least 3 cm in size.[9] Other clinical signs that have been documented are dyspnea, lethargy, anorexia, weight loss, hemoptysis, and lameness.[3,7,8]

For our patient, a complete blood count, biochemistry profile, and urinalysis were obtained. The only abnormality from these tests was a monocytopenia, rare poikilocytosis, and a few echinocytes/burr cells. In this case, the cells were most likely produced in response to hyponatremic dehydration .[10] With the patient having already had two different 3-view thoracic radiograph studies, a computed tomography scan was requested to further characterize the mass within the left caudal lung field.

The CT scan revealed a sharply marginated, irregularly shaped to lobular, approximately 9cm x 6.5cm x 4.2cm, heterogenous, mixed density mass in the left caudal lung lobe with extensive mineralization. It was centered at the left main stem bronchus, invaded its lumen, extended along and within multiple branches of the left caudal main stem bronchus, and was 3cm caudal to the tracheal bifurcation. There were numerous pulmonary osteomata, moderate to severe sponylosis deformans throughout, and an incidental firearm projectile. At this time, complete surgical excision of the mass while under general anesthesia was discussed with the owners.

It is understandable that a CT scan of the thorax can be considered a necessary diagnostic tool for overall tumor involvement, as well as the preoperative assessment of pulmonary neoplasia. This form of imaging can detect pulmonary nodules as small as 1mm in size, and has been proven to have a 93% accuracy rate when assessing tracheobronchial lymph node and pulmonary metastasis when radiographs only had a 57% accuracy rate.[11] It also evaluates any invasiveness that the tumor(s) may have with surrounding tissues and blood supply.[11]

**Treatment and Management**

For a left unilateral tumor, such as in this case, a lateral thoracotomy and lobectomy can be performed. There is a study that is documented where 37 dogs and cats underwent resection of pulmonary lesions by surgical staples, and surgery was determined to be safe, fast, and efficient due to minimal complications.[12] There are also reports of removing primary lung masses via thoracoscopy, but one study showed that larger tumors can make it more challenging to manipulate the lung lobe in the thoracic cavity, and it can be difficult to see the hilus.[13] Consequently, conversion to a lateral thoracotomy procedure during surgery is a possibility in order to have better visualization. The 2-year survival rate in that same study was 44% for thoracoscopy and 56% for thoracotomy.[13]

On September 7, 2016, the patient was sedated with hydromorphone, anesthetically induced with ketamine and diazepam, and was maintained on isoflurane inhalant. An intercostal nerve block was performed on spaces 4-8 using bupivicaine, and cefazolin was given prior to surgery, and every 90 minutes therafter until completion. Positioned in right lateral recumbency, a routine fifth intercostal thoracotomy was performed. At this time, it was determined that a complete lobectomy of the left cranial lobe, along with a partial lobectomy of the left caudal lung

lobe would be performed. Once the mass was removed, a TA-30 vascular stapler was placed across the hilus of the lung. The margins were oversewn in a simple continuous pattern, and the lobectomy margins were evaluated for leakage of air from the bronchus and hemorrhage by filling the thoracic cavity with sterile saline. The saline was then removed using a Poole suction tip. This was performed 4 times until no sign of leakage was evident. The intercostal muscles and subsequent subcutaneous tissue were re-apposed, with residual air being aspirated from the thorax via thoracostomy tube during closure. A soaker catheter was also placed prior to skin closure for additional local pain control using Bupivicaine, and the skin was re-apposed. She was given carprofen subcutaneously and hospitalized in the intensive care unit for 4 days.

**Case outcome**

Histopatholgy revealed a 5cm x 4cm firm, white, well demarcated mass that was expansive, compressive, multilobulated, and nonencapsulated. It was composed of cells embedded in abundant dense pale grey to blue staining cartilaginous matrix. The cells were round to ovoid with moderate vacuolated cytoplasm, and medium-sized round to ovoid nuclei with densely stippled chromatin and one or more prominent nucleoli. Cells were occasionally binucleated. There were large areas of mineralization. Mitotic figures were 0-1 per high powered field. The mass compressed the adjacent lung and airway structures, and the large airways adjacent to the mass contained abundant mucinous material. Excision was complete. Since there was no evidence of another primary mass, the final diagnosis was a primary pulmonary chondrosarcoma. Adjunctive therapy concerning chemotherapy options were discussed, but ultimately not performed.

It has been approximately 11 months since the surgery, and the patient is reportedly doing great at home. The cough that was once displayed, completely resolved after surgery, and has not returned since. There has been no other abnormalities noted, and the patient actually has more energy and a bigger personality than before, according to owners.

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