



Pulmonary papillary adenocarcinoma with *Aspergillus versicolor* infection in a dog

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ABSTRACT

Papillary adenocarcinoma of the lungs is the most common primary lung adenocarcinoma, with the feature of papillary-like structure formation by cells. A dog was presented with the primary complaint of vomiting, hyporexia and increased respiratory effort. Thoracic radiography revealed increased soft tissue radiopacity of the right cranial lung lobe suggestive of possible consolidation or collapsed lung lobe, with generalised miliary nodular pattern throughout the other lung fields. The dog was euthanized humanely and necropsy was performed. Histopathology confirmed the diagnosis of primary pulmonary lung neoplasm (papillary adenocarcinoma) with *Aspergillus versicolor* infection identified through fungal culture and PCR. There have been several reports on humans and dogs with fungal infections that often mimic or coexist with pulmonary neoplasm. This is the first documented report of *A. versicolor* isolated from a lung neoplasm in a dog in Malaysia.

1. Introduction

Pulmonary tumours are not as common in domestic animals compared to humans [15]. Dogs with lung neoplasm commonly present with dyspnoea, coughing and lethargy with other comorbidities such as loss of body weight, anorexia, occasional vomiting and paraneoplastic syndrome specific to the type of neoplasm. Lung neoplasms in dogs are diagnosed through diagnostic imaging, mainly through radiography of the thorax and computed tomography [19]. Lung neoplasms are most often described as solitary masses that involve a single or multiple lung lobes, and can be diffuse in appearance.

Papillary adenocarcinoma of the lung is the most common type of lung neoplasm involving the adenocarcinoma histopathology type among domestic carnivores and ruminants [8]. Based on data from 1975 to 1985, a total 74.8% of all canine primary lung neoplasms are adenocarcinoma [12]. In humans, primary lung cancer is the most common type of cancer in several countries [13]. There are four common patterns of pulmonary adenocarcinoma in humans, namely papillary, acinar, bronchoalveolar and solid tumour with mucin production [8]; in veterinary medicine, adenocarcinoma is only divided into two patterns: papillary and bronchoalveolar [15]. The incidence of pulmonary neoplasm is relatively high among old-age dogs. The pathogenesis of the development of lung neoplasm in dogs is still not well

established.

Nasal aspergillosis is a common form of aspergillosis in dogs, but pulmonary aspergillosis can occur without involvement of the upper respiratory tract. *Aspergillus* spores can disseminate to other visceral organs [2]. Aspergillosis caused by *Aspergillus terreus* has been reported in German shepherd dogs, where it has been suggested that the genetic factors of this particular breed play a significant role in the acquisition of this disease, as disseminated *A. terreus* infections occur more often in this breed than in others [17]. The common clinical signs in dogs with disseminated aspergillosis are weight loss, pyrexia, inflammatory ocular disease, neurological deficits, muscular pain and/or weakness, spinal column pain and lameness [14]. The definitive diagnosis of disseminated or systemic aspergillosis is microbiological culture of the associated tissues and fluid samples. Early presentation of animals for diagnostic investigation can help with early treatment, and if treatment is delayed, the advanced stages of systemic aspergillosis could lead to the animal's death [2].

2. Case

An 8-year-old, male local dog was presented to a small animal practice in Kuala Lumpur, Malaysia, with the primary complaint of vomiting, hyporexia, increased respiratory efforts and epistaxis. The

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Fig. 1. (A) Lateral radiograph of the thorax. There is increased radiopacity at the cranioventral region of the lung field suggestive of pneumonia, atelectasis or primary lung mass, which may either be abscess or neoplasm. (B) Ventrodorsal radiograph of the thorax. There is increased radiopacity at the right cranial lung lobe with generalised intense miliary pattern throughout the lung suggestive of fungal infection or tumour metastasis.



Fig. 2. (A) General inspection. The body condition score of the dog was 1/9 (under ideal) according to the World Small Animal Veterinary Association (WSAVA) chart. (B) Lung. The lung was dark red with numerous multifocal to confluent, circumscribed, firm, grey, variable sized pyogranulomatous nodules ranging 1–10 mm in diameter disseminated throughout. (C) Dissected section of the lung parenchyma. Multiple whitish pyogranulomatous nodules were observed. (D) Abscess affecting the whole right cranial lung lobe. Arrow indicates new blood vessel formation. (E) Dissected section of right cranial lung lobe. Arrow shows pus and purulent material oozing out from the lung lobe parenchyma. (F) Liver. Several whitish multiple pyogranulomatous nodules (arrows) were observed on the liver parenchyma surface. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

dog had tremendous weight lost from its last visit 1 year ago for vaccination, where body weight decreased from 20.2 to 15.4 kg (25%). The clinical symptoms related to respiratory system began about 3 months prior to the clinic visit from early coughing and signs of becoming easily fatigued due to dyspnoea with open-mouth breathing during presentation. Thoracic radiography revealed, on lateral view, increased radiopacity at the cranioventral lung field with generalised miliary lung pattern (Fig. 1A), while on the ventrodorsal view there was increased radiopacity on the right cranial lung lobe with mild involvement of the medial lobe (Fig. 1B). An intact diaphragm was observed and there was a mildly obscured cardiac silhouette, most likely due to the generalised

intense miliary pattern and increased radiopacity superimposing a silhouette.

Due to the severity of the lung lesions and poor quality of life, the dog was euthanized and post-mortem was conducted. Upon general inspection, the dog had poor body condition, which was below the ideal body condition for dogs (Fig. 2A). Bilateral epistaxis was also noted. During the post-mortem examination of the thoracic cavity, the lung was diffusely tan, dark red and heavy. There were numerous multifocal to confluent, circumscribed, firm, greyish, variable-sized pyogranulomatous nodules varying from 1 to 10 mm in diameter disseminated throughout the lung lobes (Fig. 2B), including the lung

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