

Computed Tomography in Cats Infected by *Aelurostrongylus abstrusus*: 2 Clinic Cases

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ABSTRACT

The aim of our study was to obtain computed tomography (CT) images of cats infected by the lung nematode *Aelurostrongylus abstrusus* and to evaluate CT scanning for differential diagnosis. If infected cats do not pass the first-stage larvae in feces, it is very difficult to distinguish this parasitic infection from other respiratory diseases based on clinical signs or radiological findings. Computed tomography and x-ray images of the lungs of 2 severely infected cats were examined. Both animals showed significant lesions on CT scanning not enough for a definitive diagnosis, but more evident than in x-ray images.

INTRODUCTION

Aelurostrongylus abstrusus is a common parasite of the cat worldwide,¹⁻³ and infected

cats have been also found in Spain (Granada, Vizcaya, Santander, Asturias, and Burgos) and Portugal.^{4,5} In the USA, it is considered the most prevalent respiratory parasite of felines⁶ while estimated prevalence in Europe fluctuates between 1.1%⁷ and 22.2%.¹ Despite the relatively high number of infected cats, clinical disease is not reported very often⁸ although aelurostrongylosis is commonly described as the most frequent parasitic pneumonia of the cat.

Aelurostrongylus abstrusus is a very small nematode: the adult female is 50–80 µm wide and 9–10 mm long, while the adult male is 4–7.5 mm long.⁹ Adult worms are located deep in terminal bronchioles and alveolar ducts.¹⁰ Gravid females deposit their eggs that hatch into first-stage larvae (L1) and migrate to the upper respiratory tract, where they are swallowed and passed in the feces. The L1 are ingested by land gastropoda,

mainly snails and slugs (intermediate hosts)¹¹ in which they reach the third (infective) stage (L3). The L3 in the intermediate hosts may be eaten by birds and rodents, acting as paratenic hosts. Cats became infected by eating these paratenic hosts.^{12,13} After infection, the L3 penetrate the gastrointestinal mucosa and migrate through the blood vessels to the lungs where they develop into adults. After a prepatent period of 4 to 6 weeks, L1 are shed in the cat's feces, and the duration of the patency is about 4 months,^{12,14,15} but can be as long as 1 or 2 years.¹⁶ The shedding of L1 is not continuous.^{5,17}

Infected cats may harbor adult worms in their lungs during a long period of several years without passing L1 in the feces. In these cases, fecal analysis are negative and do not allow confirmation of the diagnosis by means of parasitological techniques.

In vivo diagnosis of aelurostrongylosis is based on L1 detection in feces or, additionally, by examination of tracheal washes. It has been described that the most useful fecal method is the Baermann technique.¹⁴ When fecal examination and/or tracheal wash are negative, CT scanning may be a helpful method for diagnosis and it could be a useful tool to differentiate aelurostrongylosis from other respiratory diseases with similar clinical signs like metastatic neoplasm, mycotic disease,¹² chronic bacterial bronchitis, or feline allergic bronchitis,⁸ even more so if we consider the high incidence of malignant feline neoplasm and the importance of an early diagnosis and treatment.

The purpose of our study was to obtain CT images of the lungs of cats infected with *A. abstrusus* and to evaluate CT scanning in differential diagnosis.

MATERIAL AND METHODS

Two crossbred male cats (*Felis catus*) of approximately 1 year of age, cat number 1 "preto" (1.7 kg body weight) and cat number 2 "peludo" (2 kg of body weight), were studied.

Clinical examination, blood analysis (urea, creatinine, alanine transaminase, pro-

tein, albumin, glucose, erythrocytes, and leukocytes), coprologic diagnosis using the Baermann technique, and FIV (feline immunodeficiency virus) and FeLV (feline leucosis) tests were done.

Morphological characteristics taken into account for the identification of L1 of *A. abstrusus* were size (350 to 400 $\mu\text{m} \times 17 \mu\text{m}$),⁸ and posterior end with a dorsal spine and an undulating tail as previously described.^{3,18}

After the clinical examination and laboratory analysis, x-ray study was carried out doing right and left latero-lateral and dorso-ventral radiographs of the thoracic region.

Finally, CT scanning study was done using a Philips Tomoscan M/EG scanner. Cats under sedation were placed in dorsal recumbence and held to the table with radiolucent clamps. Acquisition parameters were: slice thickness of 2 mm; exposure time of 2 seconds; 120 kV; 10 mA. Window width and window level were set for lungs.

RESULTS

Both cats were asymptomatic and serologically negative for FIV and FeLV. Blood analysis did not reveal any disturbance, although cat number 1 showed slight hypoalbuminemia of 2.6 g/dL (normal values: 3.4–4.5 g/dL). Fecal analysis confirmed the presence of L1 of *A. abstrusus* in the fecal samples of both cats.

The results of the x-ray study are shown in Figure 1. Thoracic radiographs of cat number 1 revealed small, poorly defined nodular opacities throughout the lung fields but involving the caudal lung lobes more heavily. Lesions detected in x-ray images from cat number 2 were similar to those described in cat number 1 although to a lesser extent.

Computed tomography scanning study results are presented in Figures 2–4. Computed tomography images of cat number 1 showed multiple small hyper-attenuating areas ("brown glass") that were widely distributed throughout the lung fields and an

increased bronchial diameter. Caudal lung lobes were more severely affected and moreover disorganization of the pulmonary parenchyma was evident.

Computed tomography images of cat number 2 also showed small hyper-attenuating areas affecting mainly the caudal lung lobes, but lesions were less severe than in cat number 1.

DISCUSSION

It has been reported that most cats infected by *A. abstrusus* do not show any clinical signs,¹² thus some authors consider this parasitic infection only a sub-clinical condition.¹⁹ This idea is supported by the fact that the majority of the infections are diagnosed incidentally at post-mortem examination. In our study, both cats were asymptomatic, agreeing with the aforementioned. Conversely, other authors have described clinical signs that can range from mild coughing to severe wheezing and respiratory distress associated with this infection.

By means of the Baermann technique, we could demonstrated the presence of L1 in fecal samples of both cats confirming that coprologic analysis is a useful tool for the diagnosis of the infection by *A. abstrusus*.^{12,20}

Nodular patterns shown in thoracic radiographs have been reported by other authors¹⁰ who also mention bronchial, interstitial, and alveolar patterns as results of the

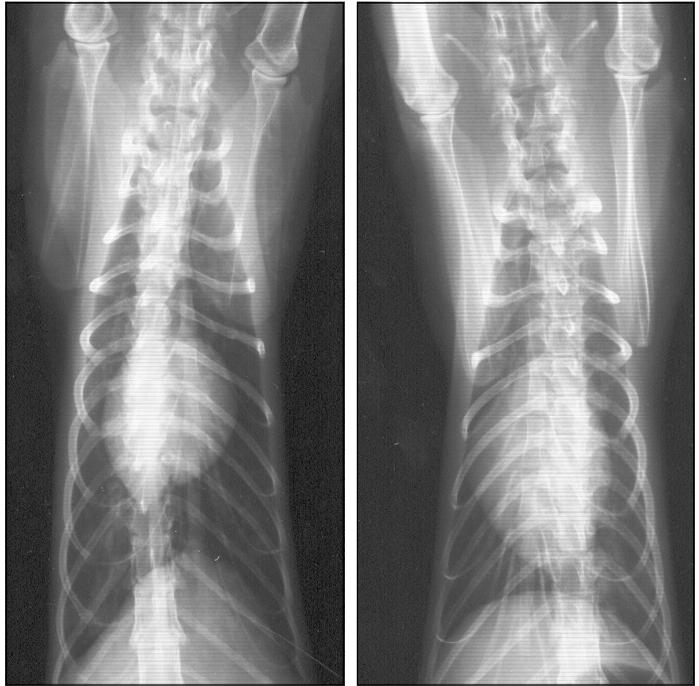


Figure 1. Ventro-dorsal radiographs of cat number 1 (A) and cat number 2 (B).

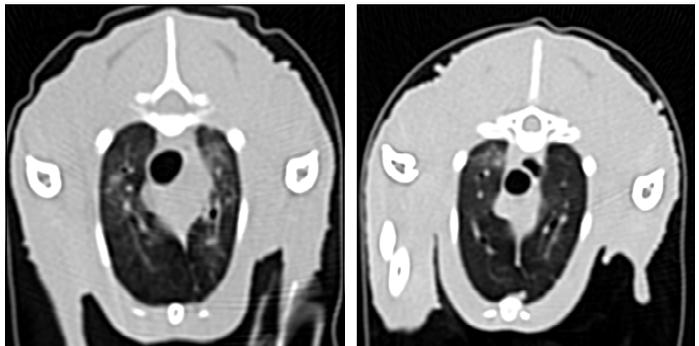


Figure 2. Computed tomography images of the cranial lung fields of cat number 1 (A) and cat number 2 (B) (small diffused hyper-attenuating areas occupying the dorsal part of the cranial lobes). Both lungs are affected in cat number 1 (A), while in cat number 2 (B), only the right one showed lesions.

inflammatory response and even pleural effusions and pleural thickening. Radiological findings are not definitives in order to make a differential diagnosis with other lung diseases, like metastatic neoplasm, mycotic disease, primary tumors, tuberculosis, chronic bacterial pneumonia, and feline allergic bronchitis as mentioned

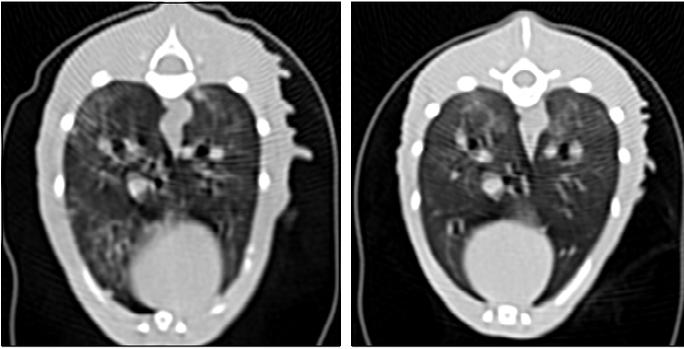


Figure 3. Computed tomography images of the caudal lung fields of cat number 1 (A) and cat number 2 (B) (transverse plane view through the heart apex). Bronchial markings are more prominent and poorly defined opacities are shown in the dorsal region of the caudal lung lobes.

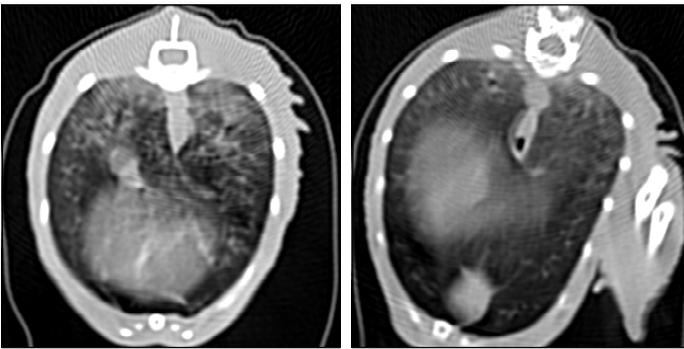


Figure 4. Computed tomography images of the caudal lung fields of cat number 1 (A) and cat number 2 (B) (transverse plane next to diaphragm). Diffused hyper-attenuating areas are widely distributed throughout the lung fields and the pulmonary parenchyma seems to be quite disorganized. Cat number 1 (A) is more severely affected than cat number 2 (B).

by some authors.^{8,12,19} Caudal lung lobes were more severely affected in both cats. A similar finding has been reported using conventional radiology and also has been noticed in post-mortem examinations.⁹ It has been proposed that this could be related to a severe parasitic infection in those lung lobes.

As far as we know, at present there are no records about CT scanning in feline aelurostrongylosis. The lung disturbances that we have detected in CT images were similar to those small nodular densities in thoracic radiographs but provided much more definition.

Computed tomography images also revealed an increase of bronchial diameter that has been reported in post-mortem exam-

inations, probably due to the irritation caused by the presence of eggs, larvae, and adult worms.^{3,21} This finding is not as evident after x-ray examination.

Computed tomography scanning provides higher resolution images of lung fields than conventional x-ray techniques and, therefore, it could be useful for the diagnosis of *A.*

abstrusus infection in cats due to the small size of this parasite (less than 1 cm) and the poorly defined nodular lesions that it produces. Moreover, unlike conventional radiology, CT is considered the most sensitive method for the detection of lung metastases or tumors.

Our results indicate that, as it happens with conventional x-ray techniques, it is very difficult to distinguish CT images of aelurostrongylosis from other infectious or inflammatory diseases of the

lungs. Nevertheless, in most cases of lung metastasis or neoplasm, CT scanning could be a good method for differential diagnosis with aelurostrongylosis.

Moreover, when multiple small hyper-attenuating areas and increased bronchial diameter appeared in CT images of the lungs of cats, mainly located in the caudal lung lobes, a specific test for the detection of *A. abstrusus* L1 in the feces or tracheal washes should be recommended.

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