Radiology, Eletrocardiography and Echocardiography for the diagnosis of Angiostrongylus vasorum (Baillet, 1866) infection in dogs

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SUMMARY

Two groups of three crossbreed dogs were inoculated, respectively, with 50 and 100 larvae / KG of body weight of Angiostrongylus vasorum. For seven month they were submitted to radiography of the thorax, electrocardiographic and echocardiographic exams. Pulmonary densification, increase of the right ventricle and trunk of the pulmonary artery was observed. This paper shows the importance of the electrocardiogram and the methods of diagnosis per image in angiostrongylosis.

KEY-WORDS : Angiostrongylus vasorum - Dogs - Radiographic - Electrocardiographic - Echocardiographic.
Materials and methods

Ten crossbred dogs, 6 month old, were used in the experiment. Before the experimental period, feces were collected from these animals and examined for research of helminth’s eggs and larvae. Afterwards, all of them were treated with anti-helminthic in two doses (Nitroscanate - 50mg/Kg). New feces exams were effectuated from seven to seven days up to corroboration until negativity. All dogs were immunized against parvovirus, coronavirus and distemper virus, common diseases in dogs.

In the experimental period, the dogs were divided in three groups according to weight: Groups A and B each one with three dogs, with were inoculated with 50 infecting larvae of the parasite/Kg of body weight and 100 larvae/Kg of body weight respectively. The dogs of the group C (four animals) were not inoculated, being used as control. The infective larvae of A. vasorum were obtained by the previous infection in an intermediate host, an aquatic mollusc Biomphalaria glabrata, experimentally infected, with 400 first stage larvae by mollusc and maintained in laboratory during 16 days.

After 25 days of inoculation, the feces of these animals were collected daily and submitted to the Baermann exam to determine the pre-patent period. This period occurs between 38 to 42 days after the infection [11]. The animals were maintained in individual boxes in the animal houses of the Department of Parasitology, Federal University of Minas Gerais.

For the follow up of the animals on a cardiac pulmonary level, they were submitted the thorax radiographs, electrocardiographs and echocardiographs exams, where the first exam were effectuated before the inoculation (control exams) and subsequent intervals of 30 days, during the 7 months of the experimental period.

The radiographs were obtained in two positions: latero-lateral (LL) and dorso-ventral (DV) in the animals of the infected and control groups. The following parameters were evaluated: alterations of the pulmonary standard (bronchial and alveolar) according to the technique of MAHAFFEY et al. [8], conformation of the cardiac silhouette, elevation of the cardiac apex, pressure of the heart on the sternum according to MILLER & TILLEY [10] and elevation and tortuosity of the trachea. The alterations observed in the other organs were evaluated by a comparative visual method with the animal before the infection.

In the electrocardiographic exam electrodes fixed in four members and one electrode of precordial thoracic exploration were used. The registre speedd was 50mm/sec. For all the derivations as proposed by MILLER & TILLEY [10]. The cardiac frequency and rhythm, amplitude, intervals and electric axis were determined and measured according to the technique of EDWARDS [4].

For the echocardiographs the dogs were positioned in right and left lateral decubitus. The ultrasonography apparatus (MF5800A - FUKUDA) was composed by two modalities of echocardiography, two-dimensional (2D) and M modes, with a transducer of electronic sectorial scanning of 5.0 MHz. The images of the Two-bidimensional and M-mode were obtained from the left and right paraesternal regions, at the level of the 3rd and 5th intercostal spaces [13] and the M mode in the right paraesternal region in these intercostal spaces [7]. All data were registered and printed on thermosensitive paper and recorded in cassette tapes. The parameters evaluated were: qualitative observations of the heart, pericardial space and adjacent structures, global and segmental analysis of contractility and measure of the function of the left ventricle.

The calculi were effectuated in accordance with BOON et al. [1].

After seven months of the experimental period, all animals were treated with Levamisole 10mg/Kg during three consecutive days, for the observation of modifications in the clinical aspects and effectuation of the follow-up during all the experimental phase.

Results

The first elimination of larvae occurred on the 45th day after infection in three dogs and the subsequent ones on the 47th day after infection (d.a.i.), being determined the pre-patent period.

In two dogs of the group A, the lung revealed a bronchial (degree 3) and alveolar (degree 2) densification pattern in the peripheral region of the pulmonary lobe through the radiography. An animal presented an increased of the right cardiac chamber. The radiographic abnormalities of the group B observed in all animals, where the diffuse and generalized densification prevailed. These alterations persisted in two dogs until the 180th day after the inoculation and in another up to the end of the experimental phase. In this group, all animals presented hypertrophy of the cardiac chamber, it was verified the tortuosity of the trachea’s course and the elevation of the vena cava in one animal.

Regarding the electrocardiogram exam of the control dogs, the rhythm was sinusual and did not present alterations related to the cardiac frequency and to the tracing. However, an increase in the cardiac frequency was observed after 60th d.a.i. in infected animals (groups A and B) increasing on the 100th d.a.i.. In group A, one dog presented a tracing with P wave of 0,4s x0,03mV and interval PR of 0,06s after 90th d.a.i.. In this animal, as in another one the group, no alterations of duration and amplitude in the QRS complex were observed. Only one dog presented a slight increase in the duration of the QRS complex. The ST segment, QT interval, T wave and electric axis were normal in these animals. In group B all animals presented an increase of the QRS complex with the derivation I, II, III of two dogs was altered in 0,6 and 0,7 mV (I) since the 60th d.a.i. and in one dog since the 120th d.a.i.. Only one dog presented T wave in V10.

Through the two-dimensional mode echocardiography two animals from the group A and all the animals from group B presented hypertrophy of the right ventricle and enlargement of the trunk of the pulmonary artery (Figure 1). However, the M-mode confirmed alterations only in two animals (Figure 2). No alterations were observed in the measures of the functions of the left ventricle.

FIGURE 1. — Two-dimensional left parasternal long-axis echocardiography in a dog experimentally infected with 100 L3/Kg of weight (group B). AO - aorta ; VD - right ventricle ; AD - right atrium ; TP - pulmonary artery (enlargement - arrow).

FIGURE 2. — M-mode echocardiographic tracing of in a dog experimentally infected with infected with 100 L3/Kg of weight (group B). Analysis of left ventricle function (VE) and right ventricle dimension (VD). (Enlargement of right ventricle - vertical dotted).
In the exams effectuated 30 days after the treatment, it was observed that the pulmonary profile returned to normal with one of the dogs presenting a small area of pulmonary hepatization. Even after the treatment the cardiac silhouette maintained unaltered.

Discussion

The radiographic signs of angiostrongylosis have been described in dogs which were naturally and experimentally infected. However they are not specific and include areas of densification and pulmonary multifocal hemorrhagic.

The pulmonary and cardiac alterations through the radiography were observed from the 60th d.a.i. on the level of the lung and at the 90th d.a.i. for the heart, these results are similar to found by MAHAFFEY et al. [8] who observed these alterations seven and nine weeks after infection. In the animals infected com 50 larvae/kg body of weight bronchial and/or alveolar densification in the peripheral pulmonary region was predominant, but in the animals infected with the double number of larvae, the densification was diffuse and generalized in both lobes, showing a correlation between the number of larvae and the severity of the pathology. The increase of the rigth ventricle, globous cardiac silhouette and the support of the heart on the sternum were also observed through the radiography exam being more evident in dogs inoculated with a greater number of larvae. The same observations were made by MAHAFFEY et al. [8], PATTESON et al. [11] and MARTIN et al. [9].

Regarding the electrocardiogram, it was observed that the infected animals presented an increase in the cardiac frequency with no alterations of the rhythm. In group B, the intensity of the alterations in the tracing was greater, demonstrating that the number of larvae may interfere in the characteristics of the exam. An increase in the duration and in amplitude of the QRS complex an increase of the S and R waves in DI and DII, and an increase in the duration of the PR interval and P wave amplitude were observed and they could characterize hypertrophy and/or enlargement of the right an/or left ventricle, increase of left atrium and blockade of the left branch. In the analysis of the echocardiographic exams of the infected animals both in the 2D and M mode did not confirm the hypertrophy of the left chamber, but made clear an increase of the right ventricle besides the increase of the trunc of the pulmonary artery.

In some cases the definitive diagnosis of infection with A. vasorum may be difficult to be established. The positive identification of larvae in fecal sample by the Baermann method is the best diagnosis method when the infection is patent. However for the subclinical infections it is necessary to search good methods of diagnosis which help the clinician to elucidate the diagnosis. It is also important to remember that alterations present in this paper may occur in the other diseases, but also serve as an alert to the clinician to insert angiostrongilosis in differential diagnosis when these alteration are present. The use of diagnosis per image and electrocardiography may be used as a support in the diagnosis of dogs with the suspicion of this parasitosis, as also in the follow up of the clinician in the evolution of the disease and the after the treatment.

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References