



## DIROFILARIA IMMITIS INFECTION IN A THREE YEAR OLD DOBERMAN: A CASE REPORT

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### ABSTRACT

A three-year-old male Doberman that was presented at the Veterinary Teaching Hospital of the University of Ibadan, Nigeria with the complaint of anorexia, bloody diarrhea and weight loss was diagnosed with a chronic form of heartworm disease based on the findings at the physical examination which included a complete blood count, liver function tests and thoracic radiography. The physical examination revealed that the dog's mucous membranes were pale and there was a copious bilateral mucopurulent ocular discharge present. There was subcutaneous oedema on the ventral thoracic region, while auscultation revealed tachypnea and an irregular heart rhythm. The results of the hematology and liver enzyme tests revealed moderate anaemia, which was normochromic and normocytic. There was mild neutrophilia, eosinopaenia and monocytopenia. Both the alkaline phosphatase (ALP) and aspartate transaminase (AST) were markedly elevated. Also, the serum albumin concentrations and the albumin/globulin ratio were both markedly lowered. The direct blood smear revealed that the dog was negative for both *Babesia canis* and *Ehrlichia canis*, but positive for microfilaria. The microfilaria was  $309 \pm 30 \mu$  in length and the anterior and posterior widths were  $12 \pm 2.4 \mu$  and  $9 \pm 1.6 \mu$ , respectively. The lateral thoracic radiograph showed that the heart was normal in size, while the pulmonary vasculatures were visible and within normal range. The health of the dog improved following treatment with levamisole and gentaprim. This case confirms the efficacy of levamisole in combination with gentaprim in the management of canine heart worm disease.

Key words: levamisole; *Dirofilaria immitis*; Doberman

### INTRODUCTION

Dirofilariosis, also known as heartworm infection, is caused by a slender filaroid nematode, *Dirofilaria immitis* (2). Although the disease has been reported in domestic cats, wolves, foxes, captive sea lions, coyotes, non-domestic cats and man, dogs are considered to be the only definitive host (2, 16). Humans as well as several other mammals act as accidental hosts in which the life cycle is not complete (4). Transmission of the parasite is mainly by bites from mosquitos of the genera *Aedes*, *Anopheles* and *Culex* (5, 6). The female worms are ovoviviparous and shed microfilariae into the blood stream, where they circulate for up to two to five years or until they are taken up by blood sucking culicidae with a blood meal. It takes approximately two weeks and two moults within the mosquito for the microfilaria (L1) to develop into the infective L3 stage. When a potential host is bitten by a mosquito, the infective L3 larva enters the host and within 70–110 days, the L3 stages would have completed their somatic migration into the host thorax and undergone two moults into the L5 stage. The L5 larvae enters the vascular system via penetration of peripheral veins to reach the pulmonary arteries and take another three months before it develops into an adult worm (14).

The pathology of heartworm infection is influenced by: the number of adult worms; duration of infection; shear stress of high blood flow associated with exercise; location of the worms; and the host immune status (8, 14). Three forms of the disease have been reported. Typically, heartworm disease occurs in dogs of any age, but it is commonly seen in dogs older than five years and which have had a long-standing or concurrent infection (2). The caval

syndrome is an acute disorder of young immature dogs in which large numbers of adult worms accumulate in the right atrium, vena cava and hepatic vein rather than the pulmonary artery (6). This is characterized by intravascular hemolysis, disseminated intravascular coagulation (DIC) and shock (14). The asymptomatic form of the disease has been associated with the early form of the disease in which there is insufficient number of adult worms in the pulmonary trunk (16). This form accounts for the vast majority of the total heartworm infection (1). Occasionally, ectopic infections in which adult worms were found in the anterior chamber of the eye, the skin and the central nervous system (CNS) have been reported (14).

Interest in the study of heartworm infection has grown recently because of the increasing incidence of the infection and the public health implications (11, 16). *D. immitis* infection is spreading progressively from the regions of sub-tropical climate to temperate areas (1). Within the last 20 years, *D. immitis* was reported to be endemic in America, Africa, Asia, Australia and Southern Europe (12). Imported cases of *D. immitis* infections have been reported from the United Kingdom, Netherland, Sweden, Hungary, Austria and Germany. Although heartworm infection is reported to be worldwide in distribution, it is not commonly reported in Nigeria. This paper reports a case of dirofilariasis in a three-year-old Doberman characterized by ventral subcutaneous oedema, diarrhoea and elevated liver enzymes, and treated with a single dose of levamisole hydrochloride at 4 mg.kg<sup>-1</sup> body weight and Gentaprim.

## CASE REPORT

### Anamnesis

A three-year-old male Doberman was presented at the Veterinary Teaching Hospital of the University of Ibadan, Nigeria, with the complaint of anorexia, bloody diarrhea and weight loss. The dog was the only animal in the house and used mainly for security. The dog also came from an area not previously reported to be endemic for heartworms but endemic for mosquitoes. The owner did not observe any sign of coughing prior to this complaint. The dog had in the past been routinely wormed with mebendazole, ivermectin or levamisole hydrochloride. The dog had also been vaccinated against rabies, canine distemper, canine hepatitis and leptospirosis.

### Clinical findings

The physical examination revealed that the dog's mucous membranes were pale and a copious bilateral mucopurulent ocular discharge was present. The coat was rough with a moderate tick infestation and subcutaneous oedema was noticed in the ventral thoracic region. In addition, the dog was emaciated with a consistent rectal temperature ranging from 38.3°C to 38.6°C. There was tachypnea (86 breaths per min) with an irregular heartbeat (72 beats per min). However, there was no ascites or jugular pulse.

### Diagnosis

Ten millilitres of blood were taken from the cephalic vein and divided into ethylene diamine tetra-acetic acid (EDTA) and plain tubes for complete blood count, haemoparasite de-

tection and liver enzyme tests. In addition, both faeces and urine were collected for helminthes egg detection using the floatation technique and urinalysis using the dip sticks method (Mission Xpert, ACON Laboratories, USA). When microfilaria was detected on direct blood smears, another 5 ml of blood was obtained to confirm this diagnosis and classify the type of microfilaria using a Knott's test (4). Also, both left and right lateral and dorsoventral thoracic radiographs were also obtained using a portable X-ray machine (Philip, Practex).

The result of the hematology and liver enzyme tests (Table 1) showed that the dog had moderate anaemia, which was normochromic and normocytic. There was mild neutrophilia, eosinopaenia and monocytopenia. Both the alkaline phosphatase (ALP) and aspartate transaminase were markedly elevated. Also the serum albumin concentrations and the albumin/globulin ratio were both markedly lowered. The direct blood smear showed that the dog was negative for both *Babesia canis* and *Ehrlichia canis*, but positive for micro-

Table 1. Result of complete blood count and liver function test of the infected dog compared with reference values

Parameters	Infected dog	Reference values
PCV [%]	15	37–55
RBC [ $\times 10^{12}/l^3$ ]	3.5	5.5–8.5
MCV [fl]	68	60–77
MCHC [g.dl <sup>-1</sup> ]	33.2	32–36
WBC [ $10^9/l^3$ ]	14.4	6–17
Neutrophils [ $10^9/l^3$ ]	12.2	3–11.4
Monocytes [ $10^9/l^3$ ]	0	0.15–1.35
Eosinophils [ $10^9/l^3$ ]	0	0.1–0.75
Lymphocytes [ $10^9/l^3$ ]	2.2	1–4.8
ALP [IU. l <sup>-1</sup> ]	698	0–98
ALT [IU. l <sup>-1</sup> ]	70	0–57
AST [IU. l <sup>-1</sup> ]	192	0–48
Total proteins [IU. l <sup>-1</sup> ]	5.9	5.5–7.5
Albumin [IU.l <sup>-1</sup> ]	1.9	2.6–4.0
A. G. ratio	0.47	About 1

PCV – packed cell volume; RBC – red blood cells counts; MCV – mean corpuscular volume; MCHC – mean corpuscular haemoglobin concentration; WBC – white blood cell counts; ALP – alkaline phosphatase; ALT – alanine transaminase; AST – aspartate transaminase; A. G. ratio – albumin-globulin ratio



Fig. 1. Photomicrograph of a blood smear showing microfilaria of *Dirofilaria immitis*

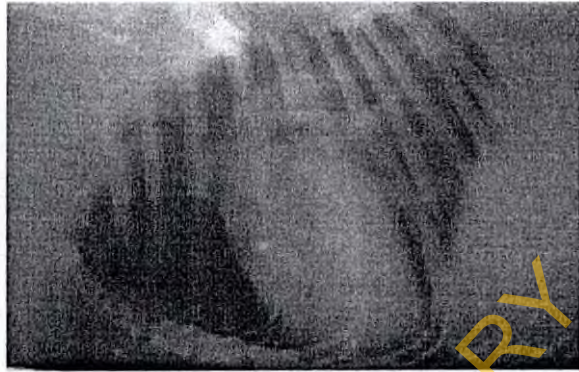


Fig. 2. Lateral radiograph of the chest. Note heart and vessel size are within normal limit

filaria with severe parasitemia (Fig. 1). The microfilaria was  $309 \pm 30 \mu$  in length and the anterior and posterior widths were  $12 \pm 2.4 \mu$  and  $9 \pm 1.6 \mu$ , respectively. Also the result of the fecal examination was negative for helminthes egg, while the urinalysis result was normal for all the parameters determined. The lateral thoracic radiographs (Fig. 2) showed that the heart was normal in size (vertebral heart score VHS=9.4). The pulmonary vasculature were visible and within normal range. Lung lobes were well aerated with the normal interstitial pattern.

#### Therapy

The dog was treated with a single subcutaneous injection of levamisole hydrochloride (Levadex®, Pantex) at the rate of  $4 \text{ mg.kg}^{-1}$  and combination therapy of Gentamycin, Trimethoprim and Sulphadimethoxazine (Gentaprim®, Invesa) at the rate of  $5 \text{ mg.kg}^{-1}$  body weight once daily for five days. Serial blood samples were obtained and screened for microfilaria on days 7, 9 and 11 post treatment.

The health of the dog improved following treatment with levamisole and gentaprim. Microfilaria were absent from the blood samples collected on days 7, 9 and 11 post treatment. The dog was discharged to the owner about two weeks after presentation and there has been no complaint of illness since then.

#### DISCUSSION

Anorexia, weight loss, lethargy, exercise intolerance, cough and dyspnoea are common signs associated with heartworm disease (2, 6). The dog in this report also presented with diarrhea, anemia and irregular heart rhythm. The heart rhythm may be associated with the moderate anemia or an indication of an early cardiac dysfunction probably secondary to the heart worm infection. An electrocardiographic examination would have indicated the type of arrhythmia; however it was not performed in this case. The exact link between the heartworm disease and the diarrhea in the dog is unknown.

The diarrhoea cannot be attributed to helminth infection since the fecal examination was negative for helminthes egg. However, it is of interest to note that the diarrhea stopped following administration of levamisole and gentaprim. In addition, the ventral subcutaneous oedema may be suggestive of congestive heart failure

About fifteen adult worms would be required to produce the disease with clinical signs in dogs (14). Factors eliminating the number of adult worms present include destruction of worms by host immune reactions and the destruction of microfilaria by macrolides such as ivermectin (15). It is logical to say that the dog in this report presented a stage II chronic heart worm disease characterized by anaemia and congestive heart failure. Although, we were unable to determine the number of adult worms from the pulmonary arteries and right ventricles of the dog, the severity of the disease in this dog may be related to the age and the routine use of macrolides as antihelminthics.

Radiographic examination is often carried out as part of the diagnostic protocol for dogs with heartworm disease to determine the severity of the cardiovascular involvement. The usual findings may include pulmonary arterial enlargement and right ventricular enlargement (3). The result of the radiographic examination did not reveal any change in chamber dimension or pulmonary vasculature suggesting that the thoracic radiograph of the dog was normal and that cardiovascular involvement in the disease was very minimal. However, it should be noted that pulmonary radiographs could be normal in up to 14% of symptomatic dirofilariasis cases (14). The radiographic findings may be associated with the number of worms in the pulmonary artery (8).

The result of the liver test and serum protein was suggestive of liver disease. Elevated hepatic enzymes and hypoalbuminemia are findings reported in 10–30% of heartworm disease (2, 5). It is however surprising that in spite of the moderate hypoalbuminemia; the urine of the dog was negative for protein. The hypoalbuminemia may however be associated with protein losing gastro-enteropathy with the attending diarrhoea.

The management of heartworm disease is either directed towards the elimination of the infective larva stage (microfilaria) or the adult worms. Melarsormine, an adulticidal organoarsenical compound is the drug of choice for the treatment of canine heart worm disease due to its efficacy and safety (9). The drug was reported to be safe with a mean retention time five times longer than thiacetarsamide (10). Macrolide agents such as ivermectin and mibemycin, as well as, levamisole are effective microfilaricidal drugs commonly used for the treatment and prophylaxis against canine heart worm infection. It is of interest to note that the administration of 4 mg/kg levamisole hydrochloride and daily injections of Gentaprim<sup>®</sup> resulted in the disappearance of microfilaria from the peripheral blood and an improvement in the clinical signs. This further confirms the efficacy of levamisole has a microfilaricidal agent, and may probably be due to its immune modulating effect. This finding also suggested that routine use of levamisole hydrochloride and ivermectin in this environment might have been responsible for the putative low prevalence status of heartworm infection in Nigeria.

Finally, heartworm infection is zoonotic. Human cases of heartworm infection have been reported to be increasing due to increased traveling to heartworm endemic areas (6, 7). Worldwide, approximately 150 cases of heart worm infections have been reported, mostly from Japan and the USA (13). The isolation of *Dirofilaria immitis* in this dog further stresses the need to carry out a serological survey on dogs to ascertain the true prevalence of the disease in Nigeria. In conclusion, the combination of levamisole and gentaprim was found to be effective against the clinical signs produced by chronic heartworm infection in the dog.

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