

Case Report

Human pulmonary dirofilariasis with secondary myocarditis

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Abstract

Dirofilariasis is a little-known zoonosis, with dogs and cats as definitive hosts. It is caused by nematodes and transmitted by mosquito bites. We report the case of a 67-year-old man with a consumptive syndrome with two subpleural pulmonary opacities. A transthoracic lung biopsy revealed a *Dirofilaria* worm. Myocardial nuclear magnetic resonance (NMR) demonstrated dilated cardiomyopathy after myocarditis related to dirofilariasis. Human infection is rare and occurs accidentally. The most common radiological alteration is a mainly subpleural coin lesion. Dirofilariasis is a neglected emergent disease and knowledge about it is important for differential diagnoses from neoplastic pulmonary nodules.

Keywords: Dirofilariasis. Zoonosis. Pulmonary nodule.

INTRODUCTION

Dirofilariasis is an infection caused by nematodes of the genus *Dirofilaria*¹. It is a zoonotic disease affecting dogs and cats (definitive hosts) which commonly causes heart and lung disease in these animals but species like *D. immitis*, *D. repens* and *D. tenuis* can also be found infecting humans^{1,4}.

This heartworm disease is more prevalent in the southern US and along the Mediterranean coast of Europe where winters are milder, facilitating the reproduction of mosquitoes².

In the Piedmont region of Italy, while domestic dogs did not receive chemoprophylaxis between 1966 and 1967, they were subjected to analysis in 1991-1992 which showed a fourfold increase in infection by *Dirofilaria immitis* and a three-fold increase in the extension of the endemic area¹.

The first case of human heartworm infection in the United States was reported in 1941 in the city of New Orleans. The first human pulmonary case, which recovered after thoracotomy, was reported in the same country in 1961³. In a 1982 US review of 60 human cases, the median age was 52 years for males and, 49 years for females, prevalent at a ratio of two men to one woman. Forty-one percent of cases were symptomatic with at least one of these symptoms: fever, cough, hemoptysis, malaise, or chest discomfort⁴.

Human infection is rare but can show a high potential occurrence in the presence of increased zoonoses. Thus, we present here a brief report of a case with *Dirofilaria* infection as the final diagnosis in order to show the clinical presentation of the patient, the diagnostic challenge and his clinical course, including myocarditis as the secondary manifestation.

CASE REPORT

A 67-year-old man was admitted to the University Hospital of the Ribeirão Preto Medical School, São Paulo University, due to a consumptive syndrome associated with respiratory symptoms. The patient was a former banker, now retired and living for 8 years near the city of São Miguel do Araguaia-GO, Brazil (13.2735° S, 50.1638°W) on a boat on the Araguaia

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River, having contact with riverine populations. After noticing a decline of his general condition in the preceding months, he sought medical attention and was diagnosed with heart failure. He started taking medications including corticosteroids because of worsening arthralgia due to gouty arthritis. At admission, he reported persistent intermittent coughing starting 3 months prior, associated with hemoptysis and undetermined involuntary weight loss, but had no fever or night sweats. He reported cardiopathy of unknown etiology as well as gouty arthritis, and had been taking 20 mg/day of prednisone for 1 year. However, he had discontinued prednisone for 14 days before admission and therefore manifested with presumed adrenal insufficiency: nausea, vomiting, abdominal pain and postural hypotension.

Upon examination, the patient was slightly dehydrated, his pulse was 90 beats per minute and arterial pressure was 90 mmHg x 60 mmHg. A vesicular murmur was present and was diminished in the left pulmonary base, without adventitious noise, and his respiratory rate was 18 breaths per minute. Gouty tophi were present in the proximal interphalangeal dorsal region of the feet and halux, with no evidence of arthritis.

A complete investigation into the respiratory and consumptive syndromes was initiated for differential diagnosis, including lung cancer, tuberculosis and fungal infection as main diagnostic hypotheses.

High resolution computed tomography (HRCT) revealed two subpleural pulmonary opacities (**Figure 1**), suggesting an inflammatory or infectious process and mediastinal lymph nodes smaller than 1.0 cm, some in atypical sites, leading to a differential diagnosis between granulomatous disease (fungus) and neoplasia (lymphoproliferative or metastatic dissemination).

Three negative sputum smear microscopies and a negative rapid sputum molecular test (TB-TRM) eliminated the possibility of pulmonary tuberculosis. Counterimmunoelectrophoresis for paracoccidioidomycosis, aspergillosis, and histoplasmosis antibodies was negative and ruled out fungal lung infection. Serology for HIV, hepatitis B and C, and syphilis was negative and biochemical tests demonstrated discrete renal injury without association with other changes, as shown in **Table 1**.

A transthoracic lung biopsy guided by computed tomography was performed for a diagnostic definition. The morphological findings were a granulomatous nodule surrounded by a palisade of epithelioid histiocytes. In addition, fibroplasia with extensive central coagulative necrosis containing degenerate *Dirofilaria* worms with a parasite cuticle was observed (**Figure 2**).

A Doppler echocardiogram supported the previous diagnosis of heart failure with an ejection fraction of 26%. Myocardial magnetic resonance imaging showed a dilated cardiomyopathy

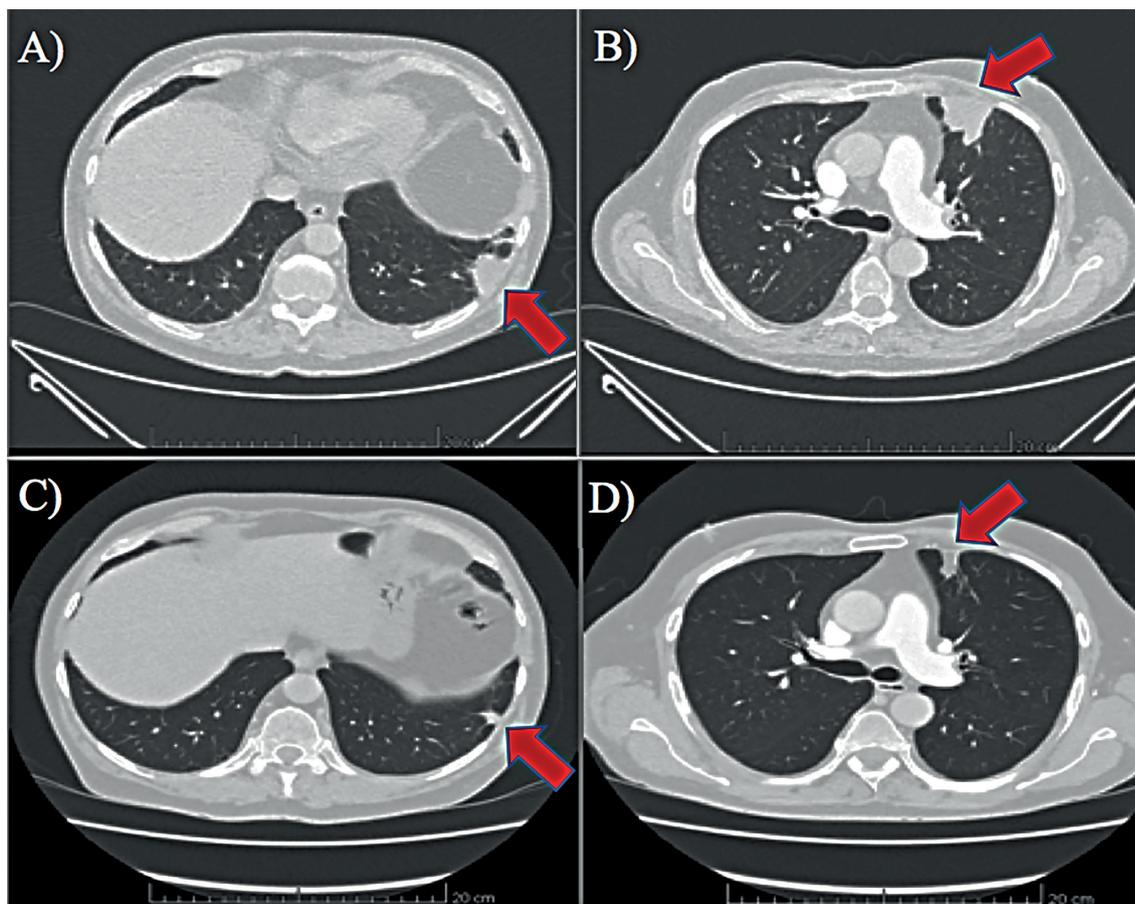


FIGURE 1: (A) and B) Admission computed tomography (CT) images. Subpleural pulmonary consolidations in segment IIIIE (3,9 x 3,7 cm) and segment IXE (2,3-5,2 cm); (C) and (D) Control CT after four months of the diagnosis and treatment with single dose of ivermectin, showing residual images of consolidations. The arrows in each frame point to the consolidations described.

TABLE 1: Biochemical, hematological, serological and tuberculosis tests at patient admission.

		Laboratory Tests	
Urea (mg/dL)	67	TB-TRM * (sputum sample)	Negative
Creatinine (mg/dL)	2.10	Smear Microscopy (sputum sample)	3 negative samples
Sodium (mmol/L)	134.9	Mycobacteria culture (sputum sample)	3 negative samples after 42 days
Potassium (mmol/L)	3.90	Fungi CIE**	
Complete blood count		Paracoccidioidomycosis	Negative
Hemoglobin (g/dL)	12.7	Histoplasmosis	Negative
Hematocrit (%)	41	Cryptococcosis	Negative
White blood cells (n ^o / μL)	8.900	Aspergillosis	Negative
Neutrophils (n ^o / μL)	6.300	Elisa Anti -HIV	Negative
Eosinophils (n ^o / μL)	100	Elisa for Chagas Disease	Negative
Lymphocytes (n ^o / μL)	1.800	NA	NA
Platelets (n ^o / μL)	387.000	NA	NA
Uric acid (mg/dL)	7,1	NA	NA

*TB-TRM: GeneXpert test for Tuberculosis diagnoses. **counterimmunoelectrophoresis: fungi serology. **NA:** No Application.

with septal mesocardial fibrosis and small foci on the lateral wall, possibly as a consequence of myocarditis. Myocardial ischemia was excluded by performing myocardial scintigraphy.

The clinical management of the patient involved optimization of the therapeutic regimen for heart failure, pain control for gouty arthritis, and hydration, followed by a gradual reduction of corticosteroids. A single dose of oral ivermectin was prescribed for the dirofilariasis. The patient improved clinically.

After four months, tomography was redone and revealed almost complete resolution of the two pulmonary opacities (**Figure 1**). A new Doppler echocardiogram showed cardiac remodeling and improvement of the ejection fraction from 26% to 50%.

DISCUSSION

Dirofilaria worms are transmitted by the bite of infected mosquitoes, causing disease in cats and dogs. The vectors are arthropods of the genus *Culex*, *Aedes*, and *Anopheles*. The mosquito bites inoculate the L3 larval form, which undergoes two morphological changes until reaching the adult form. In the definitive host, the adult worm positions itself in the pulmonary arteries, causing arterial occlusion, pulmonary infarction, pulmonary hypertension, and cardiopathy⁵.

In accidental hosts, such as humans and other mammals, the *Dirofilaria* have a similar reproductive cycle, with the L4 form migrating to the small vessels of the pulmonary artery, thereby causing obstruction and inflammation. After death and disintegration of the parasite, the larva releases antigens, generating local vasculitis with the formation of granulomas and increased pulmonary infarction⁵.

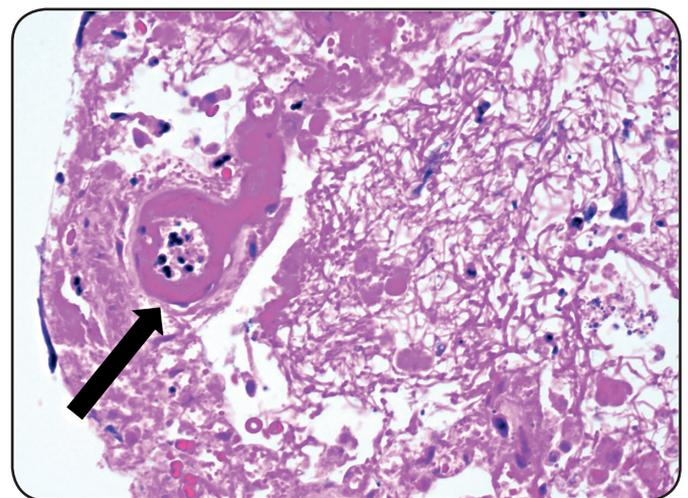


FIGURE 2: Morphological findings of patient's transthoracic lung biopsy. The black arrow indicates a degenerate rounded worm having an external eosinophilic uniform cuticle, diameter = 200 – 300 μm, surrounded by coagulative necrosis. (H&E stain, x 40).

Human infection is rare and may occur in asymptomatic, oligosymptomatic or symptomatic forms, the latter which includes fever, hemoptysis, dyspnea and chest pain^{1,5}. Dirofilariasis could manifest in the subcutaneous, periorbital, pulmonary or cardiac regions^{6,7}.

Regarding the diagnosis, a chest X-ray may show a solitary, spherical or wedge-shaped, non-calcified, and subpleural pulmonary nodule, with a less common presentation involving multiple lung nodules and pleural effusion⁸. A solitary

pulmonary nodule, also known as a coin lesion, is the most common finding in chest X-rays, ranging from 1 to 3 cm in diameter³. A complete blood count may show mild eosinophilia that resolves over time.

Dirofilariasis is rarely the first hypothesis raised in the presence of a solitary pulmonary nodule. The final diagnosis is usually obtained by anatomopathological analysis after total lesion exeresis, which may be a reason for the lack of reported cases of oral treatment with ivermectin or other drugs.

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Conflict of Interest: The authors declare that there is no conflict of interest.

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