Pulmonary Capillariasis Mimicking Bronchial Carcinoma

Dušan Lalosćević, Vesna Lalosćević, Ivica Klem, Dušica Stanojev-Jovanović, and Edoardo Pozio*

Faculty of Medicine and Clinical Center, University of Novi Sad, Novi Sad, Serbia; Institute for Pulmonary Diseases, University of Novi Sad, Novi Sad, Serbia; Institute for Pulmonary Diseases, Sremska Kamenica, Serbia; Department of Infectious, Parasitic and Immunomediated Diseases, Istituto Superiore di Sanità, Rome, Italy

Abstract. Pulmonary capillariasis is a zoonotic disease caused by the cosmopolitan nematode *Capillaria aerophila*, which circulates among wild carnivorous and omnivorous mammals. Only 11 cases have been documented to date. We describe a cryptic case of pulmonary capillariasis in a Serbian woman that resembled a bronchial carcinoma.

INTRODUCTION

Pulmonary capillariasis in humans is a very rare event, with only 11 cases described to date.1-4 The etiologic agent, *Capillaria aerophila* (syn. *Eucoleus aerophilus, Thomix aerophilus*), is a widespread nematode that parasitizes the trachea and mainly the bronchi of carnivorous mammals.5,6 The clinical symptoms of human infection are bronchitis, coughing, mucoid or blood-tinged sputum, fever, dyspnea, and eosinophilia. As a general rule, human pulmonary capillariasis is diagnosed by detecting eggs, which are characteristic, in sputum and/or feces. Herein, we describe the first human case of pulmonary capillariasis reported in Serbia, resembling a bronchial carcinoma, which was diagnosed with the support of serology.

CASE REPORT

A 68-year-old woman was admitted to the Institute for Pulmonary Diseases in Serbia with a productive cough with purulent expectorates, fatigue, and anal and skin pruritus. One month earlier she had had mild fever (38°C), mild weight loss, and the same signs and symptoms observed on admission. At that time, her doctor diagnosed bronchopneumonia, and she was treated with antibiotics for 7 days (garamycin, 120 mg/d; azitromycine, 500 mg/d; ciprofloxacin, 1 g/d in two separated doses; and cephalor, 1.5 g/d in three doses). She showed no improvement, and on January 10, 2006, she was admitted to the above-mentioned institute. The woman had been living for many years in the countryside of Novi Sad (Serbia). In 1966, she had undergone an operative dilatation of the esophagus, after which she remained in good health.

On hospital admission, she had a body temperature of 37°C, a normal sinus rhythm, a blood pressure of 150/90 of mmHg, and a pulse of 80 beats/min. The leukocyte count was 11,300/mL, there were 48% neutrophils, 21% eosinophils, and 11% lymphocytes, 5% monocytes, and 4,900,000 red blood cells/mL, hemoglobin was 138 g/L, hematocrit value was 0.394, there were 215,000 platelets/mL, and the sedimentation rate was 30/60. Antibiotic therapy was begun with azitromycine (500 mg/d) and clindamycine (1.5 g in three daily doses). Antihypertensive therapy was also provided. To confirm the diagnosis, the serum sample was tested by an immunofluorescent antibody test (IFAT) using, as antigens, histologic sections from the trachea of a cat that was naturally and heavily infected with *C. aerophila*. In brief, the tracheal tissue was fixed in Bouin solution (saturated picric acid in water, formaline, and acetic acid, 30:10:2) and embedded in paraffin, according to routine histologic procedure. Sections of 5 μm were mounted on glass slides. The serum was diluted from 1:20 to 1:160, incubated in a moist chamber for 30 min-

* Address correspondence to Edoardo Pozio, Department of Infectious, Parasitic and Immunomediated Diseases, Istituto Superiore di Sanità, viale Regina Elena, 299 00161 Rome, Italy. E-mail: edoardo.pozio@iss.it
utes, rinsed with phosphate-buffered saline (PBS), and incubated with anti-human IgG fluorescein isothiocyanate (FITC) conjugate (Institute INEP, Belgrade, Serbia); it was rinsed again with PBS, mounted in PBS–glycerin, and examined by a UV microscope (DMLB; Leica, Wetzlar, Germany). The patient serum was positive up to 1:80 dilution. After UV examination, slides were stained with hematoxylin and examined at 100–1,000 magnifications by light microscopy. In the worm sections, the most fluorescent structures were the ovarian tissue and the eggs (Figure 2B). A serum sample from a child infected with *Toxocara* sp. was used as control. No cross-reaction was observed.

On February 3, antihelminthic therapy was started with mebendazole (5 mg/kg/d for 6 days) and albendazole (15 mg/kg/d for 20 days). The eosinophil count slowly decreased. On Day 6 of treatment, the leukocyte count was 8,100/mm$^3$ (58% neutrophils, 12% eosinophils, 26% lymphocytes, and 4% monocytes). On February 17, the woman was discharged from the hospital and was followed as an outpatient until March 28, when the leukocyte count returned to normal.

**DISCUSSION**

*Capillaria aerophila* is a nematode worm of the superfamily Trichinelloidea. Adult male worms are up to 25 mm in length and 62 μm in width; adult females are up to 32 mm in length and 105 μm in width. In natural hosts, adult worms are localized in the mucosa of the trachea and bronchi, where they cause respiratory symptoms in heavily infected animals. Females excrete non-embryonated ova, which are deposited in the lungs, are coughed up, swallowed, and passed in the feces. Under favorable climatic conditions, the larvae develop in the eggs in the soil. The eggs may be ingested by earthworms,
where they hatch, and ingestion of earthworms can result in infection in animals. Infection may also be transmitted directly by the ingestion of embryonated eggs, which may have been the mode of transmission for the case described herein (e.g., consumption of vegetables not sufficiently washed). Once in the host, the larvae migrate to the lungs and invade the mucosa. Although the migration route is not known, it has been speculated that the larvae reach the respiratory tree through the blood and lymphatic vessels.7

Capillaria aerophila shows a cosmopolitan distribution in both domestic mammals (dog and cat) and wild mammals (e.g., wolf, coyote, red fox, arctic fox, raccoon dog, marten, badger, ferret, wild cat, opossum, and hedgehog), with the prevalence differing according to both host species and region.8–12

Ten free-living house cats of Novi Sad city (Serbia) were tested by scraping the tracheal surface; adult worms (both males and females with eggs) of C. aerophila were detected in all the animals. Three of these cats also harbored Aelurostrongylus abstrusus larvae (Dušan Lalošević, unpublished data).

Pulmonary capillariasis in humans has been documented in Russia and the Ukraine (eight cases), Morocco (one case), Iran (one case), and France (one case).1,2,4,13–15 Because a very limited number of human infections have been documented, the incubation period is unknown, although some authors believe that it could be similar to the prepatent period in animals (i.e., 25–40 days).7 With regard to the treatment of human infection, benzimidazole derivatives are generally used to treat nematode infection. In the past, thiabendazole was used, yet because of the side effects, it has been replaced by mebendazole and albendazole, which in this case were shown to be effective.

In the case described, the presence of C. aerophila eggs in the bronchial biopsy suggests that the worm/s died in the bronchi, and the tumor-like lesion was the abscess caused by the parasite. The case report of Semenova and Barabashkina16 was characterized by an abundant mucopurulent expectoration rich in C. aerophila eggs.

The increasing number of foxes and of stray dogs and cats living in urban areas could increase the occurrence of pulmonary capillariasis. This case clearly showed how diagnosis is difficult and that misdiagnoses such as pulmonary carcinoma can be made.

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Authors’ addresses: Dušan Lalošević, Hajduk Veljkova 1, Novi Sad, 21000 Serbia. Tel and Fax: 381-21-6624-138, E-mail: pasteurri@Eunet.yu; Vesna Lalošević, Trg Dositeja Obradović 8, Novi Sad, 21000 Serbia. Tel: 381-21-450-494, Fax: 381-21-459-978, E-mail: ibesna@polj,ns.ac.yu; Ivivan Klem, Institutski put 4, Sremska Kamenica, 21208 Serbia. Tel: 381-21-480-5100, Fax: 381-21-480-5385, E-mail: Klemm@neobee.net; Dušica Stanojev-Jovanović, Institutski put 4, Sremska Kamenica, 21208 Serbia. Tel and Fax: 381-21-480-5155, E-mail: dusicas@eunet.yu; and Edoardo Pozio, viale Regina Elena 299, 00161 Rome, Italy. Tel: 39-06-4990-2304, Fax: 39-06-4990-3561, E-mail: edoardo.pozio@iss.it.

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