Pulmonary Dirofilariasis*  
The Largest Single-Hospital Experience

Panayiotis J. Asimacopoulos, M.D., F.C.C.P.; Anthony Katras, M.D.; and Byron Christie

Pulmonary dirofilariasis caused by *Dirofilaria immitis*, the dog heartworm, is a rarely reported pulmonary lesion. It most often appears as a solitary pulmonary nodule, often mistaken for a primary or metastatic lung tumor, and the diagnosis is not often established until thoracotomy with excisional lung biopsy is performed. Sporadic reports of pulmonary dirofilariasis in the United States total only 87 cases. The ten resections of pulmonary dirofilariasis at the Methodist Hospital in Houston, Tex, represent the largest reported series of cases originating at a single hospital. We present an overview of the pathogenesis of this disease, its clinical manifestations and epidemiologic features. The prevalence of pulmonary dirofilariasis appears to be increasing. Thus, surgeons and pathologists need to be aware of this etiology of granulomatous pulmonary lesions.

(Chest 1992; 102:851-55)

CASE REPORTS

Case 1
A 48-year-old woman, who is a nonsmoker, was referred to our hospital in August 1989 for evaluation of a 0.8-cm smooth, well-circumscribed, noncalcified nodule in the right middle lobe found on a routine chest x-ray film. The patient was totally free of symptoms.

Case 2
A 67-year-old man, who is a smoker, underwent routine physical examination in August 1989. He had had coronary artery bypass surgery eight years earlier. A chest x-ray film showed a smooth 1-cm noncalcified lesion in the left upper lobe. The patient had no pulmonary symptoms.

Case 3
A 74-year-old woman, who is a nonsmoker, was found to have a 2-cm calcified lesion in her right lower lobe on a routine chest x-ray film in June 1989. She was completely asymptomatic.

Case 4
A 65-year-old woman, who is a nonsmoker, had a routine chest x-ray film in December 1988 for follow-up after mastectomy. A noncalcified coin-sized lesion was found in the left upper lobe. Radiographic imaging of the chest revealed a 2-cm lesion. A fine needle biopsy done prior to thoracotomy revealed only necrotic cells. The patient had no symptoms.

Case 5
A 46-year-old man, who is a smoker, presented to our hospital in August 1998 with a history of intermittent cough. A chest x-ray film revealed a 1 cm noncalcified lesion in the left lower lobe.

Case 6
A 65-year-old man, who is a smoker, was found to have a 1-cm noncalcified coin-sized lesion in the right lower lobe on a routine chest x-ray film in February 1985. He had a history of mild chronic obstructive pulmonary disease associated with moderate shortness of breath.

Case 7
A 42-year-old woman, who is a smoker, was found to have a 1.5-cm noncalcified coin-sized lesion in the right lower lobe during preoperative screening for removal of a thyroid goiter in 1993. The patient was asymptomatic.

*From the Department of Surgery, Baylor College of Medicine, and The Methodist Hospital, Houston, Texas. Manuscript received September 24; revision accepted November 18. Reprint requests: Dr. Asimacopoulos, 6550 Fannin, Suite 2317, Houston 77030
CASE 8

A 59-year-old woman, who is a smoker, presented to our hospital with a one-year history of mild hemoptysis. In August 1982, a chest x-ray film showed a 2-cm noncalcified coin-sized lesion in the right lower lobe.

CASE 9

A 59-year-old man, who is a smoker, was noted to have a noncalcified coin-sized lesion of approximately 1.5-cm in size, shown on a chest x-ray film in the left lower lobe during a routine physical examination in June 1974. He had intermittent coughing but was otherwise free of symptoms.

CASE 10

A 49-year-old woman, who is a smoker, had a routine chest x-ray film in January 1970, which showed a 4.5-cm noncalcified lesion in the right lower lobe. The patient had a history of right lower lung pneumonia approximately 11 months prior to admission to the Methodist Hospital. Her only symptoms were occasional cold sweats and cough.

A preoperative diagnosis of pulmonary dirofilariasis was not made in any of our ten patients. Eosinophilia was present in one of our
patients (10 percent). Calcification of the nodule was present in one of our ten patients (10 percent). Each patient had a wedge resection of the lesion and recovery was uneventful in all patients. All ten patients resided in Texas.

**Discussion**

The first report of a human infection from *Dirofilaria* was in 1887 when de Magalhaes reported finding one male and one female worm in the left ventricle of a male child from Rio de Janeiro, Brazil, as reported by Robinson et al.6 Subsequently in the United States, *Dirofilaria* was identified in the pulmonary artery in 1940 and in a pulmonary infarction in 1961.4 Since that time, 87 cases from the United States have been recorded in the literature (Fig 1). In no instance have microfilariae been found circulating in the blood. Man is a dead-end host who may acquire an infection when bitten by infected mosquitoes. It is believed that *D immitis* does not normally survive in the subcutaneous tissues but occasionally is able to migrate to the right ventricle where it develops into a sexually immature worm. When death of the worm occurs, it is washed into the pulmonary artery and embolization occurs.5 (Fig 2).

**Clinical Features**

The typical picture of a patient infected with *Dirofilaria* is one who has a spherical nodule 1 to 3 cm in diameter (a coin-sized lesion) in the lungs discovered on a routine chest x-ray film or accidentally at autopsy or from minor symptoms such as cough. Lesions are usually found in the peripheral portion of the lung as a single nodule with a random distribution. Occasionally, two nodules have been reported in the same patient.6

Robinson and co-workers2 reviewed the clinical symptoms present in 47 patients with pulmonary dirofilariasis. Over half the patients (57 percent) were asymptomatic, while the most common symptoms were cough (23 percent), chest pains (17 percent), eosinophilia (15 percent), hemoptysis (9 percent) and fever (6 percent). All infections were found in adults. It is believed that clinical symptoms may occur when the worm dies in the heart and passes into the pulmonary artery and an infarct occurs. In our patients 60 percent were asymptomatic, while the most common symptoms were cough (30 percent), eosinophilia (10 percent), hemoptysis (10 percent) and cold sweats (10 percent).

**Pathology**

Macroscopically, the pulmonary lesion appears as a well-circumscribed, grayish-yellow nodule, 1 to 3 cm in diameter, surrounded by normal lung parenchyma (Fig 3A). Microscopically, there is a central zone of

![Figure 3A](https://example.com/figure3a.png)

**Figure 3A.** Macroscopic photograph of cross section of pulmonary granuloma caused by *D immitis* (case 8). B. Microscopic photograph of cross section of *D immitis* (*D*) within branch of pulmonary artery that resulted in surrounding necrosis and granulomatous response in case 8 (hematoxylin & eosin, original magnification ×220).
necrosis surrounded by a narrow, granulomatous zone composed of epithelial cells, plasma cells, lymphocytes and an occasional giant cell. The lesion is demarcated peripherally by fibrous tissue. The lung parenchyma around the lesion contains scattered collections of lymphocytes, macrophages, and eosinophils. A single worm, usually necrotic and often fragmented and focally calcified, is present in the lumen of a small artery (Fig 3B), but blockage is completed by intense fibroblastic proliferation. In almost all cases, the parasites are associated with thrombus formation within the pulmonary artery. It has been suggested that the worms release some kind of toxin which results in the disproportionately large globular area of necrosis which is not consistent with embolic infarction.

**Diagnosis**

The most likely person to acquire an infection is a Caucasian male 40 to 60 years of age who lives in an area endemic for canine dirofilariasis. However, in our study, six of the ten patients were female and range in age from 42 to 74 years. Dirofilariasis should be considered as a possible diagnosis in patients who develop a solitary pulmonary nodule 3 cm or less in diameter in any lobe of the lung and who are asymptomatic or have an associated, mild respiratory illness. In our series the largest nodule was 4.5 cm in diameter, and 60 percent of the nodules were found in the right lung (Fig 4), but no nodule was observed in the right upper lobe. There are many causes of well-defined pulmonary lesions which must be considered in a differential diagnosis, including carcinoma, tuberculosis, fungal infections and hamartomas. Radiography and tomographic scans are nonspecific.

Serologic tests for dirofilariasis have not been very helpful in diagnosis. Angiography of the right side of the heart and pulmonary artery for adult worms, transthoracic needle aspiration, examination of bronchial washings and biopsy and sputum cytology have not proved to be of any value in diagnosis. On two occasions, diagnosis of dirofilariasis has been made without surgical removal of the nodule. A fine needle aspiration biopsy of a noncalcified mass in the right upper lobe of the lung of a 62-year-old woman revealed cross sections of a worm identified as *D. immitis*. In the second case, a computerized axial tomography scan allowed a small lesion in a 52-year-old man to be aspirated with a percutaneous needle. Fragments of parasite were seen with the characteristic appearance of a lesion caused by *D. immitis*.

**Treatment**

No treatment other than surgery is available since it is the dead worm that is found in the lungs that is responsible for the pathology. A thoracotomy with wedge resection is normally performed immediately after a solitary pulmonary nodule has been identified to rule out carcinoma. However, should it be possible to develop a specific immunologic diagnostic test, surgery would probably not be indicated in most cases of dirofilariasis, since the evidence suggests no growth of the granuloma occurs and impairment of lung function is minimal. In those cases where diagnosis was confirmed by needle aspiration, surgery was not undertaken.

In conclusion, human pulmonary dirofilariasis rarely is suspected clinically at the present time. It is almost invariably misinterpreted as a primary or metastatic lung tumor on a chest x-ray film. The current serologic tests are of little diagnostic assistance, and the results of fine-needle aspirations largely have been unsatisfactory, with only two successful cases reported. Histologic examination of thoracotomy specimens is the only means for a definitive diagnosis. Nevertheless, the worm easily can be overlooked in histologic sections, and an erroneous diagnosis of pulmonary infarct or necrotizing granuloma of uncertain etiology may be made. Considering the incidence of the disease, a subpleural “coin-like” pulmonary lesion in the appropriate clinical and epidemiologic setting should alert the clinician, radiologist or pathologist to the possibility of Dirofilaria.

ACKNOWLEDGMENTS: Special acknowledgment is made to Dr. Dina Mody for her help in preparation of the pathology slides, to Dr. Alpert, pathologist, for her help in retrieving cases of dirofilariasis, and to Dr. Thomas Alexander of Tyler, Tex, for graciously supplying the original chest x-ray film for one of our patients, as well as to Natale McDaniel and Magdalena Price from the Pathology Department, and to Barbara Perry for her invaluable secretarial assistance.
Special acknowledgment also is made to the following faculty members of the Baylor College of Medicine for their contributions of cases used in this report: E. Stanley Crawford, M.D. (cases 8 and 9); Jimmy Howell, M.D. (case 7); Charles McCollum, M.D. (case 1); George C. Morris, M.D. (cases 2 and 6); John Overstreet, M.D. (case 3); Karl Tomm, M.D. (case 4); and Lee Lyman Tuttle, M.D. (cases 5 and 10).

REFERENCES