Respiratory Medicine Case Reports 10 (2013) 40–42

Contents lists available at ScienceDirect

Respiratory Medicine Case Reports

journal homepage: www.elsevier.com/locate/rmcr

Case report

Human pulmonary dirofilariasis presenting as a solitary pulmonary nodule: A case report and a brief review of literature

Abhishek Biswas [a, *], Patrick Reilly [b], Andrew Perez IV [b], Mohamed H. Yassin [c]

[a] Department of Internal Medicine, University of Pittsburgh Medical Center East, 2775 Mosside Boulevard, Monroeville, PA 15146, USA
[b] Pulmonary and Critical Care Medicine Division, University of Pittsburgh Medical Center Mercy, USA
[c] Infectious Diseases Division, University of Pittsburgh School of Medicine, USA

ARTICLE INFO

Article history:
Received 13 August 2013
Accepted 10 September 2013

Keywords:
Dirofilariasis
Solitary pulmonary nodule
VATS
Heartworm

ABSTRACT

Human pulmonary dirofilariasis (HPD) is an uncommon disease in the United States. *Dirofilaria* is commonly known as "heartworm" based on the false belief that the worm resides in the heart which was based on findings from early necropsy reports. The first case was reported as an incidental autopsy finding in 1941. Since then only 87 more cases have been reported so far. We present an interesting case of this rare zoonotic disease affecting an elderly gentleman who presented with a rapidly growing lung nodule. We present a brief review of literature concerning the diagnosis and management of this disease.

A 76-year-old male, a lifelong nonsmoker with a past medical history of bronchiectasis, atypical mycobacterial infection and pulmonary aspergillosis was evaluated for a progressively enlarging nodule in the lateral segment of the right middle lobe measuring about 13 mm × 8 mm in largest dimension (Fig. 1). An area of central necrosis within the nodule was also observed on the CT scan. Physical examination was unremarkable. A video-assisted thoracoscopic surgery (VATS) with wedge biopsy of the lesion was performed for suspicion of an underlying malignancy.

The pathology showed severe chronic bronchitis and bronchiectasis. There was an area of infarcted lung with fragments of necrotic material containing remnants of *Dirofilaria immitis* within this area of necrosis (Figs. 2 and 3).

Patient had an uneventful recovery and was discharged home. Pharmacological treatment was not considered since complete resection is thought to be curative. Multiple repeat imaging on follow up visits have not shown any recurrence.

1. Discussion

Dirofilaria sp are roundworms belonging to the phylum *Nematoda* which are known to infect a variety of mammals. Human dirofilariasis is usually transmitted by the bite of an infected mosquito, which acts as a vector and then transmits the third stage *D. immitis* larva into the skin. Other species namely *Dirofilaria repens*, and *Dirofilaria tenuis* are also known to infect humans but not in the United States. The first clinical case report of human pulmonary dirofilariasis (HPD) was described by Dashiell in 1961 [1]. It tends to be an incidental diagnosis on histopathological examination of lung tissue that has been biopsied on the suspicion of a cancer [2]. Historically, this is a disease of middle-aged adults with most disease reported in the age group between 40 and 50 years of age [3]. Young people undergo imaging less frequently than adults which may explain the higher incidence seen in the elderly. The disease has been reported to occur more commonly in the Atlantic and Gulf coast areas with most cases reported from Florida followed by Texas and South Carolina [3]. Mosquitoes feeding on the blood of the definitive host (domesticated dogs, wolves and foxes) transfer the infective stage larvae into the human subcutaneous tissue. The surviving larvae mature into adult worms, migrate to the heart and embolize into one of the branches of the pulmonary artery followed by the sequence of thrombosis, infarction and intense granulomatous inflammation. The lesion appears as a spherical infarct centered on the

* Corresponding author. Tel.: +1 412 706 0449; fax: +1 412 357 3641.
E-mail addresses: biswasa2@upmc.edu, abhibiswas78@gmail.com (A. Biswas).

2213-0071
http://dx.doi.org/10.1016/j.rmcr.2013.09.002

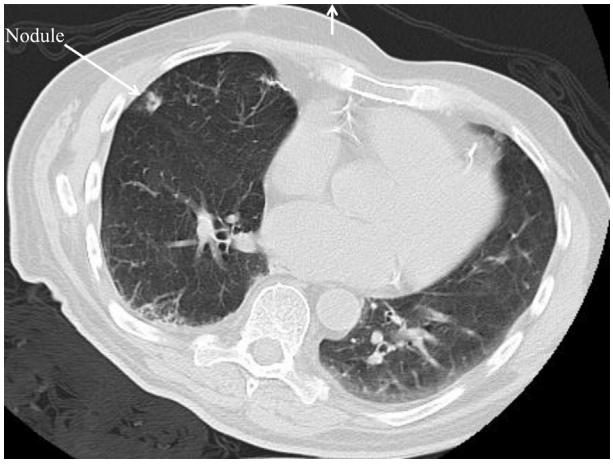

Fig. 1. Ring shaped nodule in the right middle lobe.

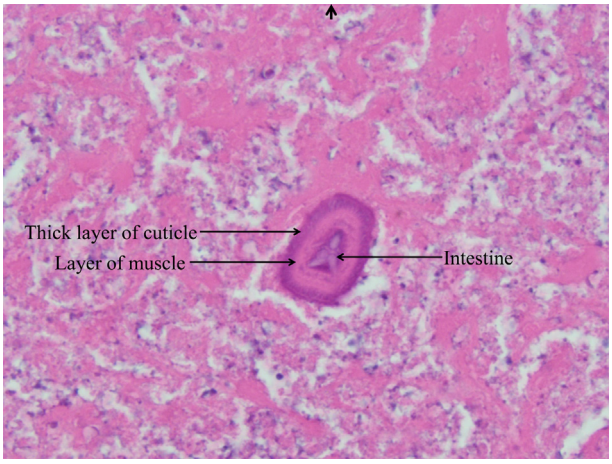

Fig. 3. Same worm at 360× demonstrating the arrangement of the internal organs.

obstructed artery and thus mostly located at the lung periphery. A predilection for the right lower lobe has been noted [4]. These worms have also been known to infrequently infect other organs of the human body such as the brain, skin, eye, urinary bladder, portocaval shunt, peritoneal cavity and the testicle [5]. These are however, quite rare.

More than half of *Dirofilaria* infections are asymptomatic. The most important symptoms include cough, chest pain, fevers, eosinophilia and hemoptysis. A case-series from Japan reported that 67% of patients were asymptomatic [6]. Another case-series reported from the Texas reported 10 cases of which 5 patients were completely asymptomatic, 3 patients had cough and 1 patient each had presented with shortness of breath and hemoptysis respectively [3].

A definitive diagnosis of dirofilariasis could be achieved by tissue biopsy for histopathology and molecular testing (PCR) [7,8]. Wedge biopsy has the highest yield but Fine Needle Aspiration Cytology (FNAC) has been reported to be of diagnostic value in one case report [9]. The disease should be considered as a differential diagnosis in any patient coming from an area known to be endemic for canine dirofilariasis [3]. Suspicion is stronger in those with a single lung nodule less than 3 cm in size, who are asymptomatic or have minimal symptoms [10]. The differential diagnosis of such nodules includes wide range of malignancies, infections as well as immunological disorders.

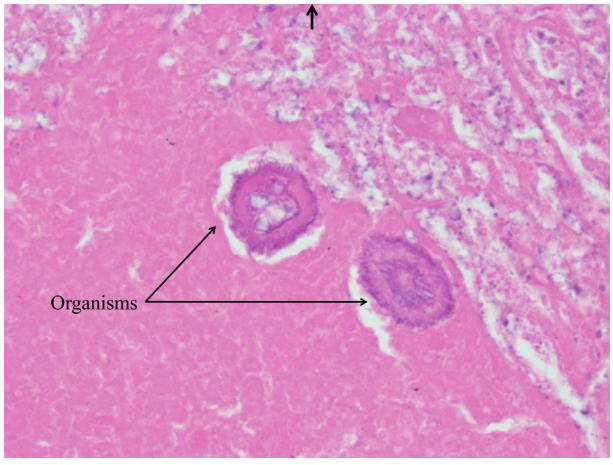

Fig. 2. Image taken at 260× showing cross section of an adult worm.

Systemic eosinophilia is relatively uncommon; only 17% in the Japanese series were noted to have eosinophilia [6]. Serological studies have poor sensitivity (50%) in detecting antibodies to *D. immitis* because of cross reactivity with other nonfilarial parasites [6,11,12]. Inhabitants of endemic areas can have anti *D. immitis* antibodies through years of exposure to larval antigens without getting the disease or even through cross reactivity to other filarial antigens [13].

Wedge resection of the nodule by itself is usually considered curative and medical treatment is not recommended [14]. There are suggestions indicating the use of ivermectin with or without Diethylcarbamazine (DEC) for treatment but are not widely accepted [15].

HPD has been misinterpreted as a lung cancer on chest imaging, thus accounting for unnecessary surgical interventions at times. In view of the possibility of missing the worm on biopsy studies, we would suggest additionally checking DNA PCR and ELISA for *dirofilaria* antigens on the specimen [16].

Due to the widespread presence of the disease among the canine host population throughout the United States, a sub-pleural coin shaped lesion (usually <3 cm) in an asymptomatic patient should alert the clinician to the possibility of HPD as being one of the differential diagnoses [5].

Conflict of interest

Authors confirm that they have not received any financial support in preparation of this manuscript and do not have any relationships to disclose.

References

[1] Dashiell GF. A case of dirofilariasis involving the lung. Am J Trop Med Hyg 1961;10(1):37–8.
[2] Ro JY, Tsakalakis PJ, White VA, Luna MA, Chang-Tung EG, Green L, et al. Pulmonary dirofilariasis: the great imitator of primary or metastatic lung tumor. A clinicopathologic analysis of seven cases and a review of the literature. Hum Pathol 1989;20(1):69–76.
[3] Ciferri F. Human pulmonary dirofilariasis in the United States: a critical review. Am J Trop Med Hyg 1982;31(2):302.
[4] Mulanovich EA, Mulanovich VE, Rolston KV. A case of dirofilaria pulmonary infection coexisting with lung cancer. J Infect 2008;56(4):241–3.
[5] Skidmore PJ, Dooley DP, DeWitt C. Human extrapulmonary dirofilariasis in Texas. South Med J 2000;93(10):1009–10.
[6] Miyoshi T, Tsubouchi H, Iwasaki A, Shiraishi T, Nabeshima K, Shirakusa T. Human pulmonary dirofilariasis: a case report and review of the recent Japanese literature. Respirology 2006;11(3):343–7.

[7] Yamashiro T, Inoue A, Tamiya T, Suzuki N, Moriki T, Araki K. The usefulness of immunologic methods for diagnosis and follow-up study of a case of pulmonary dirofilariasis. Nihon Kyōbu Shikkan Gakkai Zasshi 1989;27(6):747.
[8] Magono N, Yosimatu H, Suzuki Y, Yamada E, Kasai Y, Masuya D, et al. A case of pulmonary dirofilariasis diagnosed by biopsy, immunological tests and the clinical course without operation. Nihon Kokyuki Gakkai Zasshi J Jpn Respir Soc 2009;47(6):467–70.
[9] Hawkins A, Hsiu JG, Smith 3rd RM, Stitik F, Siddiky M, Edwards O. Pulmonary dirofilariasis diagnosed by fine needle aspiration biopsy. Acta Cytol 1985;29(1):19–22.
[10] Asimacopoulos P, Katras A, Christie B. Pulmonary dirofilariasis. The largest single-hospital experience. Chest J 1992;102(3):851–5.
[11] Glickman LT, Grieve RB, Schantz PM. Serologic diagnosis of zoonotic pulmonary dirofilariasis. Am J Med 1986;80(2):161–4.
[12] Akao N. Human dirofilariasis in Japan. Trop Med Health 2011;39(1 Suppl. 2):65.
[13] Fleisher AG, Messina JJ, Ryan SF, Hopkins KS. Human pulmonary dirofilariasis: does diagnosis require thoracotomy? Ann Thorac Surg 1988;45(4):447–8.
[14] Echeverri A, Long RF, Check W, Burnett CM. Pulmonary dirofilariasis. Ann Thorac Surg 1999;67(1):201–2.
[15] Jelinek T, Schulte-Hillen J, Loscher T. Human dirofilariasis. Int J Dermatol 1996;35(12):872–5.
[16] Nagano I, Zhiliang W, Nakayama M, Takahashi Y. A simple method to design PCR primer to detect genomic DNA of parasites and its application to Dirofilaria immitis. Mol Cell Probes 1996;10(6):423–5.