SHORT COMMUNICATION

Human subcutaneous dirofilariasis caused by *Dirofilaria immitis* in a Greek adult

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**Summary**  
Human dirofilariasis is a zoonotic infection caused by worms of the genus *Dirofilaria*. Most reported cases involve *Dirofilaria repens*, and *D. immitis* infection has been rarely reported. Canines act as a reservoir for the infection, while human infections are sporadic. Human dirofilariasis has been widely reported in South Europe; however, the worldwide distribution constantly changes. We herein report an extremely rare case of subcutaneous trunk dirofilariasis in a 45-year-old immunosuppressed woman, caused by *D. immitis*. The parasitic infection was detected using ultrasonography. The infection was confirmed by a polymerase chain reaction-based method and was attributed to *D. immitis*.

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**Introduction**  
Human dirofilariasis is a zoonotic infection caused by worms of the genus *Dirofilaria*, which includes more than 40 different species. Dogs, foxes, cats, and, rarely, raccoons are natural reservoirs of the infection, while human infections are sporadic and can be caused by only six species \[1,2\]. *Dirofilaria repens*, the most commonly occurring species, is associated with subcutaneous and ocular–periocular lesions in humans, whereas *D. immitis*, which is rare, could cause serious pulmonary and heart lesions, mainly in carnivores and sporadically in humans \[3\]. Fewer than 30 cases of *D. immitis* infection have been
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reported in Europe; furthermore, the criteria for histologic–microbiologic diagnosis have been doubtful in 16 of these cases [3]. In Greece, cases of subcutaneous, ocular, and lung infection have been reported [4–6].

**Case presentation**

A 45-year-old woman presented to an outpatient clinic for clinical evaluation of a subcutaneous nodule. She had been treated with steroids for systemic lupus erythematosus (SLE) and acenocumarol for pulmonary emboli due to SLE. The patient lived in the countryside and had a family farmyard with small animals and a pet dog; she worked in a butcher’s shop. The patient had observed an erythematous, painful, rigid, immobile, and inflamed subcostal nodule at the right hypochondrium. Antibiotics were prescribed, but the changes in the color and size of the nodule were limited. Her family doctor proposed an ultrasonography (US), which revealed a mobile parasitic-like structure inside the abscess (Fig. 1). After surgical removal of the nodule, a long, yellowish-semi-transparent thin filariform formation was observed (Fig. 2). However, the organism could not be characterized by optical microscopy.

DNA was extracted from the parasite with the Nucleospin® Tissue kit (Macherey-Nagel), following the manufacturer’s instructions, and panfilarial polymerase chain reaction (PCR) was performed. Primers specific for the 12S rRNA region were constructed by alignment of partial and complete mitochondrial genome sequences of two parasitic filarial nematode species, *D. immitis* and *D. repens*, which are epidemiologically important in the Greek population. The sequences of the PCR products were compared with those deposited in GenBank, showing in a 100% similarity and 100% coverage with the 12S rRNA gene of *D. immitis* and 90% similarity and 88% coverage with the 12S rRNA gene of *D. repens*. Thus, the causative organism was determined to be *D. immitis*. Real-time PCR results were positive for *D. immitis* and negative for *D. repens*. Thus, the diagnosis of *D. immitis* infection was confirmed.

**Discussion**

*Dirofilaria* includes more than 40 species, of which, only a few are known to infect humans (*D. repens*, *D. immitis*, *D. tenuis*, *D. urisi*, *D. subdermata*, and *D. striata*) [1,6]. Humans are a dead-end host, and they might acquire an infection via mosquito bites by the *Aedes*, *Culex*, and *Anopheles* genera, which are the main vectors of the disease [3]. The larvae can invade all tissues, mature into adults worms, and/or die, resulting in a chronic inflammation with foreign-body giant cells.

*D. repens* is a parasite of dogs and cats and is the main cause of dirofilariasis in Europe, Asia, and Africa [2]. In particular, dirofilariasis is mainly seen in South Europe (mainly Italy but also Serbia, Croatia, and Greece), although spread to countries previously free of *Dirofilaria* infection (Germany and Eastern Europe) has been observed recently [1,7]. This spread can be attributed to the increased transport of pets with microfilariae, new vectors (*Ae. Albopictus*), and increased density due to warm climate changes, outdoor human activities, and closer and domestic contact with dogs [2,3].
Dirofilariasis may manifest as subcutaneous nodules localized to the face or ocular and pericardial regions as well as in other exposed areas such as the extremities and thoracic wall. Reported cases describe the involvement of the epididymis, spermatic cord, breast, and omentum [1,4,5]. Pulmonary dirofilariasis may present as isolated lung nodules (coin lesions) and may mimic lung tumors with signs of invasion [6,8]. Ocular dirofilariasis may be subconjunctival, intravitreal, or intraorbital [8].

Surgical excision or biopsy is possibly the best modality to confirm the diagnosis. Eosinophilia and IgE elevation are rarely observed and are thus of limited value [4]. Diagnosis of dirofilariasis by histopathology has disadvantages, such as when the morphology of the nematode is changed due to an inflammatory response, when the nematode is immature, or when the specimen is affected by surgical manipulations [1,3]. The final diagnosis may be achieved by PCR, which also helps identify the Dirofilaria species.

Almost 30 cases of human D. immitis infection have been described in Europe; however, the validity of the diagnosis has been contested in some of these cases based on the tests performed and the histological criteria employed. D. immitis infection was confirmed by PCR in only one of the reported cases [3]. D. immitis is injected into humans by intermediate hosts. It seldom resides and matures in the subcutaneous tissues and reaches the right ventricle, where it dies. Its fragments then reach the pulmonary artery, where emboli could develop in small branches [9]. Orihel and Eberhard [10] have also reported some cases of pulmonary emboli caused by D. immitis infection. The patient reported here had a history of pulmonary emboli. However, we do not suppose the existence of a link between the pulmonary emboli and exposure to D. immitis because the two episodes were separated by several years. Furthermore, the patient had no other symptoms such as cough, chest pain, or hemoptysis and fever.

Although Dirofilaria infections are rare, health care practitioners, surgeons, and pathologists should be aware of their possibility, so that the parasite can be precisely identified, especially in endemic areas. Arriving at a definitive diagnosis of dirofilariasis remains a challenge. Taken together with the findings of Foissac et al. [3], our experience indicates that a PCR-based method might be a safe and effective diagnostic technique for dirofilariasis.

Conflict of interest

There is no conflict of interest to declare.

References