Live *Dirofilaria immitis* found during coronary artery bypass grafting procedure

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Abstract

*Dirofilaria immitis* is a parasite transmitted by mosquito bites, where the most common primary hosts are dogs, cats and some wild animals. Humans become accidental hosts after being bitten by an infected mosquito and the number of such infections has rapidly increased during the last decade. We present a patient in which a live *D. immitis* has been found during myocardial revascularization. To the best of our knowledge, live *D. immitis* found in the substernal area during open heart surgery has never before been described. *D. immitis* in humans most often cause pulmonary nodules known as ‘coin lesions’ which are benign and asymptomatic, but it is very important for thoracic surgery that they are considered in the differential diagnosis of pulmonary nodules. Video assisted thoracic surgery has been proven as the best method for diagnosing and treating pulmonary dirofilariasis.

Keywords: *Dirofilaria* • Sternum • Coronary artery bypass surgery • VATS

INTRODUCTION

Dirofilariasis is a zoonosis where the most common primary hosts are dogs, cats and some wild animals. Humans become accidental hosts after being bitten by an infected mosquito. Dirofilariasis commonly appears in tropical areas but there is an increasing number of cases in the temperate climate zones of Europe—mostly in southern Europe—and in the last 10 years it has spread to northern Europe, which is explained by global warming effects and also by zoonosis being better tracked in Europe than in the other areas of the world. In the last 50 years there have been around 780 cases of human dirofilariasis, mostly in Mediterranean countries [1]. We present a patient in which a live *D. immitis* has been found during myocardial revascularization. To the best of our knowledge, live *D. immitis* found in the substernal area during open heart surgery has never been described before.

CASE REPORT

The patient was a 61-year-old man who was admitted for unstable angina. He had hyperlipoproteinemia (hyperlipidaemia), a history of myocardial infarction and a percutaneous coronary intervention (PCI) to the circumflex artery (CX). A coronary angiogram showed triple-vessel coronary artery disease. After median sternotomy during harvesting of the left internal thoracic artery (LITA) a live, moving white helminth (parasitic worm) 10 cm long and 1 mm wide (Fig. 1, Video 1) was found in the substernal area and was carefully removed in full. A microbiologist was consulted and, after a morphological analysis had been conducted, he identified the helminth as *D. immitis*. The exact location of the *Dirofilaria* was between the endothoracic fascia and the parietal pleura (Fig. 2). After the finding and extirpation, a triple aorto-coronary bypass was conducted, and the patient was stable and was transferred to the intensive care unit (ICU).

In anamnestic data we found that the patient lived in and had never travelled outside Croatia, had been in constant contact with dogs and pigs on his farm and that he had worked in the water supply industry, consequently spending a lot of time near great rivers and was often bitten by numerous mosquitoes. He denied having eye or skin changes, coughing, haemoptysis or unresolved fever. During the preoperative assessment, blood work had been done and his leukocyte, eosinophil, CRP and IgE levels were normal. His chest X-ray was normal. Postoperatively, serological testing was conducted and no antibodies to *Echinococcus, Strongyloides stercoralis, Ascaris lumbricoides* or *Toxocara canis* were detected.

In control follow-up two years after the operation, serological testing was again negative. Thorax and abdominal CT scans were normal and blood work showed a mildly elevated IgE level (110 IU/ml) and a normal level of eosinophil.

DISCUSSION

The parasite found in the patient’s thorax was a helminth genus *Dirofilaria*. Natural hosts for this parasite are dogs, cats, foxes and some other wild animals. This helminth can, in exceptional cases, be transferred to humans by the bite of an infected vector, usually a mosquito, but flies, ticks and lice are also mentioned as possible vectors. Two species of *Dirofilaria* are described as...
having caused human infections: *D. immitis* and *D. repens*. Mature female *D. immitis* can reach up to 30 cm in length and 3–4 mm in width, while males reach about half that size [1]. The helminth found in our patient was about 10 cm long and 1 mm wide and thereby matched the adult male of the species. After the mosquito bites an infected host the parasite grows to the infective microfilaria producing stage, in which shape they are transmitted by another bite to a new host where they continue to develop to adulthood [1].

Humans as accidental hosts for *D. immitis* are considered to be 'dead-end' hosts and specimens found up to now in human tissue were sexually immature, were not producing microfilariae and, after a certain amount of time, died. There is a report of finding a gravid *D. immitis* in an immunocompromised patient who suffered from lymphatic leukemia, as well as finding microfilariae and gravid *D. immitis* in an immunocompetent patient, but this information is unconfirmed [1, 2].

It is considered that *D. immitis* most often causes pulmonary nodules. It migrates through the circulatory system to the right ventricle where it develops to adult stage, dies and embolizes pulmonary circulation, causing a small pulmonary infarction presented as solitary nodules called coin lesions. Coin lesions are most often solitary nodules in lung parenchyma, microscopically described as well-circumscribed granuloma [3].

Human pulmonary dirofilariasis is mostly an asymptomatic and benign condition but it is very important, because the differential diagnosis of pulmonary nodules includes lung carcinoma, histiocytosis, tuberculosis, thromboembolism, Wegener granulomatosis and some other diseases, and in most cases the correct diagnosis is determined intra-operatively.

In the last two years there have been numerous publications of subcutaneous and ocular dirofilariasis caused mainly by *D. repens* and pulmonary dirofilariasis caused mainly by *D. immitis*. There have been reported cases of dirofilariasis in unusual sites, such as large vessels, mesenterium, peritoneal cavity, spermatic cord and the liver, where coin lesions were found, which means dead *Dirofilaria* was accidentally found in pathohistological analysis of affected organs. Also, this worm has been found presented as an endometrial polyp in the patient’s uterus. Only four cases of cardiovascular dirofilariasis have been reported worldwide: one in Brazil, one in Japan and two in New Orleans in the United States [4]. There are two cases where live *Dirofilaria* were found in a human organism in the peritoneal cavity [5]. Live *D. immitis* has never before been found in this unusual location, nor has any similar event occurred during coronary artery bypass grafting.

In our case we identified *D. immitis* based on morphological characteristics and histopathological diagnosis. The level of eosinophiles in our patient’s blood work was normal, which is similar
to a previous study conducted in Japan [4]. In our patient we did not find coin lesions, therefore we can only assume that these changes would appear in the patient's lungs after migration and embolization if the helminth was not accidentally found in the patient's thorax during surgery and extirpated.

In conclusion, this unusual localization of visceral dirofilariasis caused by *D. immitis* has epidemiological and infectological significance and an importance for cardiothoracic surgery, because dirofilariasis must be considered when differentiating pulmonary lesions. Surgical removal of the helminth or lesions it causes is the only known therapy for human dirofilariasis. Medications are not used, since *D. immitis* does not produce microfilariae in humans and is generally found in isolation. Video assisted thoracic surgery has been proven as the best method in diagnosing and treating pulmonary dirofilariasis [4].

**Conflict of interest:** none declared

**SUPPLEMENTARY MATERIAL**

Supplementary material (Video 1) is available at EJCTS online.

**REFERENCES**


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**Figure 2:** This is a photo of our patient's opened thorax during the surgery, taken after the finding and the extirpation of the helminth. The tweezer is pointing to the exact location where the *Dirofilaria* was found – between the endothoracic fascia and the parietal pleura. 1: left lung; 2: LITA sternal retractor; 3: tweezer; 4: sternum; 5: parietal pleura; 6: endothoracic fascia; 7: epimyocardial electrodes; 8: surgical gauze; 9: subcutaneous tissue.

**Video 1:** Video of the live and moving *Dirofilaria immitis* found in the patient's thorax during the coronary artery bypass grafting procedure. It was taken after the finding and extirpation of the helminth.