



Case report

Rare case of *Diectophyme renale* (Nematoda: Enoplida) and *Dirofilaria* sp. (Nematoda: Spirurida) in the subcutaneous tissue of a cat in Espírito Santo, Brazil

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ABSTRACT

Diectophyme renale is the largest parasitic nematode of animals. It is most often found in the right kidney, but can also occur in the urinary system, ears, free abdominal cavity, mammary gland, thoracic cavity, and more rarely in subcutaneous tissue. The genus *Dirofilaria* has specific parasitic characteristics according to its location, and may parasitize the respiratory tract or even the skin, varying according to species. This report describes a case of *Diectophyme renale* and *Dirofilaria* sp. in the subcutaneous tissue of a cat in the state of Espírito Santo, Brazil. An adult male mongrel cat showed physical enlargement in the left inguinal region, diagnosed as a subcutaneous nodule. Surgical excision and histopathological evaluation of the nodule were performed, and *Diectophyme renale* and *Dirofilaria* sp. were found inside. Diectophymosis and heartworm disease are present in Brazil and most other countries, but this is the unprecedented case of the association of *Diectophyme renale* and *Dirofilaria* sp. in the subcutaneous tissue of a cat.

1. Introduction

The nematode *Diectophyme renale* (Goeze, 1782), or giant kidney worm, is a parasite mainly found in the kidney, where its frequency is higher in the right kidney than in both kidneys. It is also occasionally found in the peritoneal cavity and more rarely in other organs [1, 2] and subcutaneous sites [3]. This parasite is of great importance, as it causes diectophymosis, which is a zoonosis and can cause damage to the renal parenchyma, renal colic, hematuria and peritonitis [4]. It predominantly parasitizes dogs (*Canis lupus familiaris*) [5] and foxes (*Cerdocyon mil*) [6], however, there are reports of sporadic cases of other mammals serving as atypical definitive hosts, such as cattle, horses, swine [7, 8]; seals [9], cats [10], rats [11] and humans [12]. In cats, only two cases were reported in abdominal cavity in Brazil [10, 13] and there are no reports in Espírito Santo State. In our state just one report in dogs were published [14].

The main species that cause dirofilariosis are *Dirofilaria immitis* and *D. repens*. They are transmitted by vectors to dogs and cats and have zoonotic potential. In addition, it can cause obstruction of the right ventricle and pulmonary artery, difficulty breathing and pneumonia [4]. Heartworm is

considered endemic in many countries in Asia, Europe and also in Brazil [15, 16, 17, 18]. The reports found indicate parasitism in canids [19], cats [20, 21], foxes [22], coyotes [23], pandas [24], bobcats [25] and humans [26, 27] and the parasitism in subcutaneous were reported in cats by some authors [21, 28], not registered in the state of Espírito Santo.

Diectophymosis and dirofilariosis are diseases present in Brazil and most other countries, but in the researched literature, we found only few reports of *Dirofilaria repens* in the subcutaneous tissue of a cat [21, 28]. Furthermore, no reports of subcutaneous diectophymosis in cats and no interaction between parasites were found. Thus, the aim of this communication is to report a case of coinfection by *Diectophyme renale* and *Dirofilaria* sp. in a nodule in the subcutaneous tissue of the inguinal region of a domestic cat in Espírito Santo state, Brazil.

2. Case presentation

An three-year-old male mongrel cat showed physical enlargement in the left inguinal region, characterized as a subcutaneous nodule. The animal was wandering and was rescued by the guardian in a periurban

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Figure 1. *Diectophyme renale* and *Dirofilaria* sp. in the subcutaneous tissue of a cat. (a) Adult male mongrel cat presenting swelling in the left inguinal region (asterisk) during the physical examination, diagnosed as a subcutaneous nodule; (b) Nodule detail (asterisk).

environment where there is a fauna composed predominantly of domestic animals and also a river in the riparian zone. In addition, the environment where the cat lived provided its contact with paratenic hosts (fishes, frogs, toads, turtles, etc) and intermediate hosts (annelids). Surgical excision and histopathological evaluation of the nodule were performed and *Diectophyme renale* and *Dirofilaria* sp. were found inside.

The cat, weighing five pounds, was referred for an elective orchiectomy procedure. During physical examination of the animal, an increase in volume was observed in the left inguinal region, diagnosed as a subcutaneous nodule (Figure 1 a,b). The animal was referred to the surgery department, where castration was performed, and during the evaluation of the abdominal region no changes were found.

Thirty days after castration, surgical excision of the nodule was performed. Sections were fixed in 10% formalin and sent to the Animal Pathology Laboratory of the Veterinary Hospital of Federal University of Espírito Santo for histopathological analysis.

On macroscopic examination, the nodule was 5.5×4.5 cm with irregular whitish-colored surface with blackened areas, surrounded by

adipose tissue and had firm consistency intersperse with soft areas. The parasite specimens had cylindrical bodies typical of nematodes, with different sizes and colors (Figure 2).

Microscopically, the diagnosis was intense diffuse pyogranulomatous inflammation, so the parasite specimens were sent to the Veterinary Parasitology Laboratory of the Federal University of Espírito Santo for identification. Parasitological examination revealed that the specimens were representatives of the Nematoda Order, since they were cylindrical body worms with cuticular attachments [1]. The largest specimen had reddish-brown color, measured 5.0×0.5 cm and had a small, simple posterior structure called the muscular and bell-shaped copulatory bursa, which is present in the male, thus being classified as *Diectophyme renale*. The other specimen (smaller) was whitish in color, elongated and filiform, measuring average 7.0×0.1 cm, with simple anterior extremity and no other apparent details, consistent with the morphology of the genus *Dirofilaria*. The specimens were identified according to Anderson [1] and Taylor [4] (Figure 2), using a pachymeter, a stereomicroscope and an optical microscope (40 and 100x).

3. Discussion

According to the morphological characteristics, the parasite specimens located inside the subcutaneous nodule in the cat were classified as *Diectophyme renale* and *Dirofilaria* sp. *D. renale* had never been observed subcutaneously in a cat and had not been detected in association with *Dirofilaria*. Only the presence of *D. renale* has been reported in the subcutaneous tissue of humans [3, 27, 29]. Thus, we believe this is the first report of coinfection by *D. renale* and *Dirofilaria* sp. in the subcutaneous tissue of cats.

The sites of *Diectophyme renale* are considered widespread. Because they perform migrations during their life cycle in the host, these nematodes can be found in several locations, such as the kidneys (with the right kidney preferentially affected), abdominal cavity [1, 2], and rarely in other sites such as the thoracic cavity, testicle, ureter, bladder, uterus and mammary gland [30, 31, 32].

The presence of *D. renale* in the inguinal region is even more uncommon, only having been reported in dogs [33]. In 2009, the first case of diectophymosis in a domestic cat in Brazil was reported, which at necropsy revealed severe peritonitis associated with parasitism in the abdominal region by *D. renale*, with average length of 24 cm [10].

In the present case, the animal had a subcutaneous nodule in the inguinal region that contained parasites inside it. The specimen found in

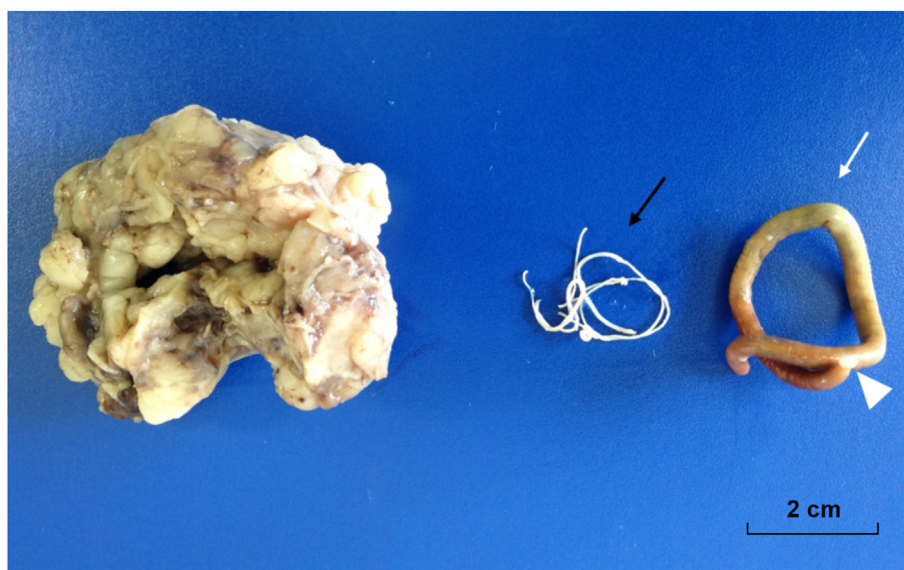


Figure 2. *Diectophyme renale* and *Dirofilaria* sp. in the subcutaneous tissue of a cat. 10% formalin-fixed nodule with uneven surface having whitish color with blackened areas and two parasite specimens: *Diectophyme renale* with reddish-brown color measuring 5.0×0.5 cm (white arrow), with small simple posterior muscular structure and bell-shaped copulatory bursa, only present in the male (white arrowhead), and *Dirofilaria* sp with whitish color, elongated and filiform body, measuring 7.0×0.1 cm, with simple anterior extremity and no other apparent details (black arrow).

association with *D. renale* is of the genus *Dirofilaria*, which measured 7.0 x 0.1 cm. *Dirofilaria* sp. is described as a nematode where mature females have length of 1.5–17 cm and diameter of 650 µm, whereas males are about 5–7 cm long by 450 µm in diameter.

The members of the Filarioidea superfamily of the genus *Dirofilaria* are elongated and thin nematodes that live outside the digestive tract. The subgenus *Dirofilaria* contains species ranging from worms that parasitize the cardiovascular system as well as members of the subgenus *Nochiella*, such as *D. ursi*, *D. repens*, *D. striata* and *D. tenuis*, which usually reside in the subcutaneous tissues of the definitive host and have prominent longitudinal ridges and thin striations on the cuticle [1].

The association of *Diocotophyme renale* and parasites of the genus *Dirofilaria* has not been previously reported. The presence of two specimens of nematodes of different species in the same nodule present in subcutaneous tissue is rare. The presence of *D. renale* in the subcutaneous tissue can be attributed to the migration of the species in the definitive host. This association has important relevance for veterinary medicine and public health, since humans can be afflicted with both parasites.

In conclusion, this report describes a rare case of *Diocotophyme renale* and *Dirofilaria* sp. together in the subcutaneous tissue of a cat in the state of Espírito Santo, Brazil. These nematodes are of great importance to public health, as they are potentially zoonotic parasites distributed throughout Brazil and most other countries. The report of the occurrence of *Diocotophyme renale* and *Dirofilaria* sp. has made it possible to identify their presence in an ectopic site and to alert veterinarians of the need to carry out complementary parasitological tests of urine and blood, and also to include parasitic agents as differential diagnoses in cases of swollen skin tissue.

Declarations

Author contribution statement

All authors listed have significantly contributed to the investigation, development and writing of this article.

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The authors declare no conflict of interest.

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No additional information is available for this paper.

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