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Case Report

Dioctophyma renale (Goeze, 1782) Infection in a Domestic Dog from Hamedan, Western Iran

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Abstract

Dioctophyma renale infection is found in a wide range of mammalian species, typically in temperate areas of the world. Here, we report for the first time, the parasitism of a domestic dog by *D. renale* in Hamedan, Iran, a mountainous cold region, lacking significant amounts of rainfall, high humidity and temperature. A 2.5 yr old male mixed breed dog was presented with a two months history of progressive hematuria and muscle weakness. Complete blood count and serum biochemistry were performed with results indicating impaired renal function. Urinalysis, showed hematuria as well as parasitic eggs, suggestive of *D. renale* infection. Urinary system ultrasonography revealed a hypoecogenic tubular structure in the right kidney. The animal was treated with fenbendazole (45 mg/kg, PO, QD - five days) and ivermectin (0.02 mg/kg, SC, single dose). One week later, repeated laboratory examination confirmed presence of at least one alive worm in the affected kidney. A unilateral nephrectomy was performed; one female (60 x 5 cm) and one male (30 x 3.8 cm) live worm were taken out of the extremely thin walled right kidney. One month later, due to failure of the remained kidney and poor condition, the patient deceased. We conclude that dioctophymosis can be found in cold and or relatively dry area. Moreover, the results showed that the worm was not affected with common anthelmintic drugs.

Introduction

Dioctophyma renale (Goeze, 1782) is a member of Dioctophymatidae, due to which size, known as the giant kidney worm (1). In the *D. renale*'s life cycle, an aquatic oligochaete annelid (*Lumbriculus variegates*) ingests eggs containing first-stage larvae of the parasite. From this stage on, there are three routes of transmission. In the

first of case, third and fourth stages of larva maturation may occur within the annelid, which can then directly become infective to mammals; in the second route, a second stage larva in an annelid may be ingested by a fish or a frog, which then develops into third and fourth stages in definitive hosts' tissue. In the third route, a crayfish (*Cambarus* spp.) containing the infected annelid may be ingested by fish or frogs. In this way, some investigators consider fish and frogs as transporters (2-3).

After these possible modes of transmission, the location of adult parasites in the body of definitive host is related to the site where the infecting larva penetrates the digestive tract. For instance, if the infecting larva passes the gastric wall at the lesser curvature, it develops among liver lobes; at the greater curvature, however, it may migrate to the left kidney. If the infective larva penetrates the duodenal wall, it fixes itself in the right kidney (1, 4).

Although the *D. renale* has a worldwide distribution, it has been frequently reported from temperate regions of the world. There have been reports of infestation of wild carnivores and domestic dogs with sporadic reports of atypical hosts including humans (1, 5-8).

The objective of this article is to report the first case of parasitism by *D. renale* in a domestic dog from Hamedan, Iran. This region ecologically does not experience significant amounts of rainfall, high average humidity and temperature.

Case Report

In January 2014, a 2.5 yr old male mixed breed dog was sent to the clinic of Faculty of Veterinary Science, Bu-Ali Sina University, Hamedan, western Iran, with a history of severe hematuria and muscle weakness for more than two months. The patient lived in an urban house where allowing the animal to walk around his house. It is worthy noted that his house was not close to water sources.

During the clinical evaluation, the animal presented mild dehydration, hyperemic mucous membranes, and weakness. There was no elevation of body temperature. Urinalysis, complete blood count (CBC), and serum biochemistry were performed. Results showed leukocytosis with left shift neutrophlia, anisocytosis and microcytosis. In addition, the animal's renal function was completely disrupted with serum creatinine values of 4.6 mg/dL (reference value: 0.8–1.8 mg/dL), serum urea of 58 mg/dL (reference value: 15–40 mg/dL), and severe hematuria (Table 1). Microscopic examination of urine sample showed parasitic eggs morphologically compatible with *D. renale* (Fig. 1). The patient received medical treatment (Fenbendazole 45 mg/kg, PO, sid, for five days and Ivermectin 0.02 mg/kg, SC, single dose).

The animal was next subjected to urinary system ultrasonographic examination, in which his right kidney was estimated to be 7.3 cm at its greatest diameter with a thin cortex. The kidney appeared to contain a tubular structure with a hypoecogenic wall and a thickness of approximately 0.4 cm (Fig. 2). The ultrasound findings as well as clinical observation and laboratory results suggested parasitism by *D. renale*. The other kidney showed a moderate hydronephrosis with approximately 1 cm thickness of cortex and a dilated pelvis.

After seven days, urine analysis, CBC, serum biochemistry, and abdominal ultrasonography were repeated. Results showed that the right kidney had still at least a live worm. Therefore, a unilateral nephrectomy was suggested as a routine method.

Then, an exploratory laparatomy was performed through which, a progressive destruction of the renal parenchyma was seen that leaved only a thin cortex- it looked as though there was a thin capsule containing the worm and hemorrhagic effusion inside - with a mild adhesion to its adjacent peritoneum. After ligating the renal vessels and removing the right kidney, the abdominal wall was closed routinely. Enrofloxacine (5 mg/kg, IM bid) and tramadole (2 mg/kg, PO tid) were prescribed as post-operative medication.

Two worms were taken out of the right kidney, placed in saline solution and sent to the laboratory of Parasitology of the Faculty, where they were identified, photographed and fixed in ethanol-formalin-acetic acid solution (Fig. 3).

Identification of the worms was carried out using morphological keys as described by Soulsby (9). The worms were a pair of male and female *D. renale* measuring 30 cm long with a maximum width of 3.8 mm and 60 cm long with a maximum width of 5 mm, respectively.

Despite all efforts that carried out to keep the patient alive (including peritoneal dialysis) almost one month after nephrectomy, the animal passed away due to acute failure of the remained kidney.

Table 1: Laboratory findings of a mixed breed male dog with *Dioctophyma renale* infestation

Variable	Patient's values	Units
Hemogram		
Eritrogram		
Erythrocytes	6.73	$x10^6/\mu l$
Hematocrit	42.6	%
Hemoglobin	16.3	g/dl
MCV	63.3	fl
MCH	24.2	pg
MCHC	38.3	g/dl
Leucogram		
Leukocytes	16.7	$x10^3/\mu l$
Neutrophils	83	%
Lymphocytes	15	%
Eosinophils	0	%
Monocytes	2	%
Basophil	0	%
Platelets	144	$x10^3/\mu l$
Toxic neutrophils	++	
Biochemistry		
Urea	58	mg/dl
Creatinine	4.6	mg/dl
Uric Acid	0.2	mg/dl
Total proteins	5.6	g/dl
Urine analysis		
Specific gravity	1016	
PH	6	
Blood/ Hemoglobin	+++	
WBC	10-12	
Parasite eggs (*D. renale*)	12-14	

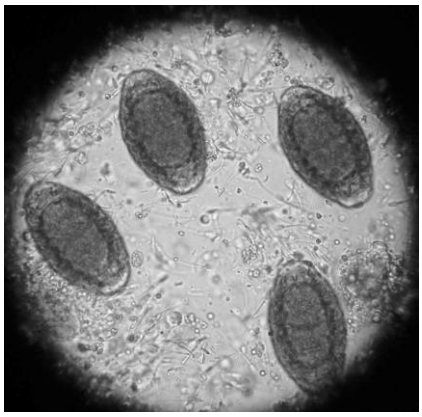

Fig. 1: The parasitic eggs were compatible with *D. renale* morphologically

Fig. 2: The right kidney appeared to contain a tubular structure with a hypoecogenic wall

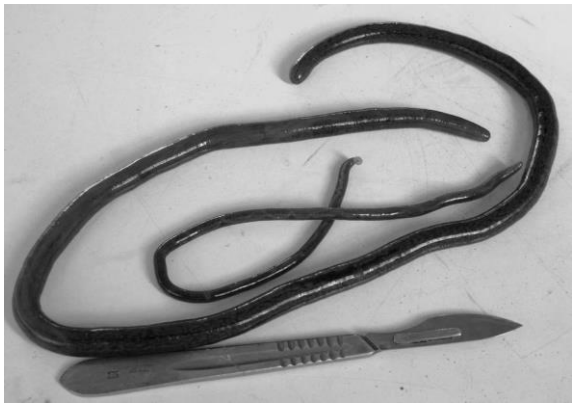

Fig. 3: The worms were a pair of male and female *D. renale* measuring 30 cm long with a maximum width of 3.8 mm and 60 cm long with a maximum width of 5 mm, respectively

Discussion

In Iran, *D. renale* was first reported by Sadighian and Amini from stray dogs of Shahsavar, in Caspian region, north of Iran (10). One year later, the first report of the infection in human from Iran was published (11). Recently, the worm has been found in the left kidney of a fox from shore region of the Caspian Sea (12). While the nematode has been mainly reported from temperate regions of other parts of the world, the presence of dioctophymatosis in a domestic dog in Hamedan as a cold region is unusual. Therefore, this paper objects to point out the possibility of parasitism by *D. renale* in non-tropical areas, as it has not already been reported from these regions. This report can extent our knowledge about the epidemiology of the giant kidney worm.

Transmission normally occurs through ingestion of a paratenic host or through water contaminated with annelid as the intermediate host (1, 13). The dog in this study has been lived in a semi-closed system, it may have become contaminated by either of the two routes, as the animal have had access to dam water as well as uncontrolled food such as frogs.

Ultrasonography is more specific for confirming diagnosis than radiography (7). In the longitudinal and transversal ultrasound examination of the infected kidney, a cylindrical structure with a double-layered wall could be observed, which was more externally hyperechoic and more hypoechoic internally with central echoes (14). This structure may be sometimes surrounded by fluid (7).

While radiographic examination is not specific for diagnosing this disease, it is strongly suggested to perform an excretory urography of suspected patient to reveal the rate of excretion from the kidney, therefore, estimating the degree of tissue damage (4, 7). Nevertheless, in this case, both kidneys were unfunctional and the prognosis was poor.

In addition, this report shows that common anthelmintic agents are not able to kill mature *D. renale* (6).

Despite the fact that renal parasitism by *D. renale* can cause total destruction of the renal parenchyma (15-17), there is no report to indicate that contralateral kidney may be affected by the parasitized one.

Conclusion

Since *D. renale* infestation in mammals is worldwide and transmission of the parasite to human is easy, veterinarians and physicians should consider *D. renale* infestation in the differential diagnosis of urological disorders and unknown abdominal cystic masses regardless of ecological condition.

Acknowledgements

The authors declare that there is no conflict of interests.

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