TÜBİTAK

Turkish Journal of Veterinary and Animal Sciences

http://journals.tubitak.gov.tr/veterinary/

Case Report

Turk J Vet Anim Sci
(2018) 42: 496-499

doi:10.3906/vet-1804-84

Severe granulomatous hepatitis caused by *Capillaria hepatica* in a puppy

Aylin ALASONYALILAR DEMİRER[1,*], Ahmet AKKOÇ[1], Bayram ŞENLİK[2], İ. Taci CANGÜL[1]
[1]Department of Pathology, Faculty of Veterinary Medicine, Uludağ University, Bursa, Turkey
[2]Department of Parasitology, Faculty of Veterinary Medicine, Uludağ University, Bursa, Turkey

Received: 30.04.2018 • **Accepted/Published Online:** 28.08.2018 • **Final Version:** 12.10.2018

Abstract: This report describes the inflammation caused by *Capillaria hepatica* in the liver of a female stray dog of approximately 2 months old for the first time in Turkey. Histopathological examination revealed severe granulomatous hepatitis with occasional adult nematodes and abundant eggs in the hepatic parenchyma. The present case differs from the other capillariasis cases by the age of the dog and the presence of mature female parasites and severe inflammation.

Key words: *Capillaria*, dog, granulomatous, hepatitis, histopathology

1. Introduction

Dogs share the same environment with humans and thus can be host or reservoir of a wide variety of zoonotic parasites. One of these parasitic diseases is hepatic capillariasis, caused by *Capillaria hepatica*, also known as *Calodium hepaticum*.

C. hepatica is a cosmopolitan zoonotic parasite for which several aspects of transmission still remain unclear. This capillariid nematode infects the hepatic parenchyma of rodents (primary host) and various other mammals including rabbits, pigs, opossums, squirrels, foxes, cats, dogs, and human beings (1–4). Human capillariasis caused by *C. hepatica* poses a significant risk because the disease may become fatal due to severe liver damage (1,5). More than 160 human infections caused by *C. hepatica* have been reported worldwide (1). *Capillaria hepatica* is the only nematode that parasitizes the liver tissue during adult life. It has a direct and unusual life cycle whereby adult nematodes reside within the liver parenchyma of the host and deposit eggs. The eggs may only be released in the environment after death of the host (through decomposition of carcasses, predation, or cannibalism) and become infective under external environmental conditions. New definitive hosts become infected after ingestion of embryonated eggs (2,6). When embryonated eggs reach the liver via the mesenteric and portal veins, they mature to adult parasites in the liver parenchyma (2). However, eggs might also migrate to other organs including the lungs and kidneys (7).

Although serological diagnosis of hepatic capillariasis is possible, there is no commercially available kit. The diagnosis of untrue (or spurious) infection, in which no hepatic involvement occurs, is made by the observation of barrel-shaped eggs. However, in true infections fecal examination has no diagnostic value as the adult parasites in the liver are destroyed by inflammatory processes and the eggs remain in the liver tissue. Therefore, the most reliable method for *C. hepatica* infections in definitive hosts remains the necropsy of the animal and histopathological examination (1).

C. hepatica lesions are encountered incidentally and there are only a limited number of reports. Likewise, little is known about the epidemiology of *C. hepatica* in animals in Turkey and no detailed investigations have been performed. To the authors' knowledge, the presence of this nematode in dogs until now has not been reported in Turkey. Therefore, in this case we aimed to report the presence of *C. hepatica* in a stray puppy in Turkey for the first time.

2. Case history

A female stray dog of approximately 2 months old was presented to the Pathology Department at the Faculty of Veterinary Medicine, Uludağ University, Bursa, Turkey, for necropsy examination. The cachectic dog had no medical history; on external examination, the hind legs and tail were covered with watery stool. Postmortem examination revealed an enlarged liver with rounded edges and multifocally distributed pale, white-colored streaks on the

* Correspondence: aalasonya@uludag.edu.tr

surface of the left and right liver lobes. These foci extended into the subcapsular parenchymal tissue. No significant lesions were present in other organs.

Liver specimens were fixed in 10% neutral buffered formalin, processed by routine methods, and stained with hematoxylin and eosin (H&E) and periodic acid–Schiff (PAS). Upon determination of the parasitic disease, the sizes of eggs and adult nematodes were measured using an analysis program (Analysis Life Science Series Sort Imaging System, Olympus, Japan).

3. Results and discussion

At necropsy, lesions were confined to the liver and tissue samples were collected. Histopathological examination revealed multiple granulomas in the hepatic parenchyma with/without the presence of numerous eggs and adult nematodes. The granulomas contained large numbers of macrophages, lymphocytes, and a few multinucleated giant cells and these inflammatory foci were surrounded by fibrosis (Figures 1A and 1B). The eggs were barrel-shaped with bipolar plugs in longitudinal section and the eggshell had two-layered wall. The outer layer had prominent radial striations while the inner layer was eosinophilic and homogeneous (Figures 1C and 1D). Histological morphology was consistent with *Capillaria hepatica*. Ten bipolar eggs were measured and the average egg size was about 50.1 µm in length and 30.4 µm in width. Meanwhile, many female adult nematodes with numerous eggs in their reproductive systems were also observed in liver sections. These nematodes had hypodermal bacillary bands and

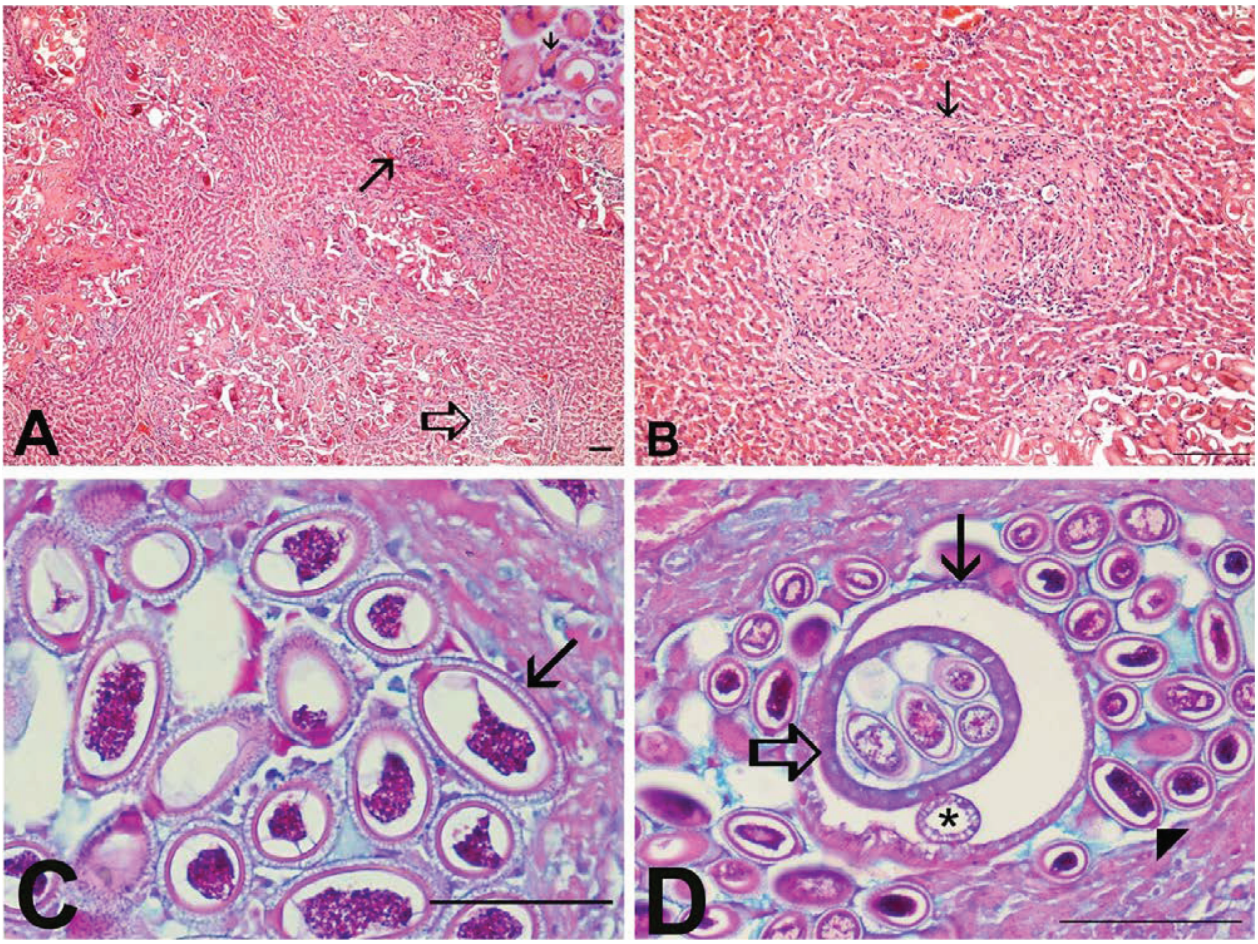

Figure 1. A) Multiple foci of *Capillaria hepatica* eggs surrounded by granulomatous inflammation including giant cells and fibrosis. Granulomatous foci and giant cells (arrow), inflammatory cells (open arrow). Inset: Arrow depicts a giant cell, H&E, bar = 60 µm. B) Granuloma (arrow) in liver surrounded by mononuclear inflammatory cells and fibrosis. There are no *C. hepatica* eggs present. H&E, bar = 100 µm. C) Barrel-shaped *Capillaria hepatica* egg with a two-layered wall (arrow), PAS, bar = 50 µm. D) Cluster of eggs is observed within the parenchyma, surrounding the cross-section of an adult nematode (arrow), including centrally located glandular uterus (open arrow) and intestine (asterisk). Eggs are also present within the uterine tract of the adult female. Arrowhead depicts characteristic bipolar plugs of the egg, PAS, bar = 100 µm.

thick glandular uterine walls and intestines (Figure 1D). The average size of six adult females was about 223 µm × 111 µm, with an average uterus size of about 75 µm × 58 µm, average intestine size of about 30 µm × 25 µm, and hypodermal bacillary bands varying between 4.8 and 6.6 µm. Atrophy of hepatic cords and sinusoidal dilatation were present in liver sections.

Although *C. hepatica* is a worldwide-distributed parasite, information on the prevalence of canine hepatic capillariasis is rather limited (6,7). There is only one report of *C. hepatica* in Turkey (8). During a hantavirus survey conducted in Giresun Province of Turkey, Çelebi et al. (8) detected the eggs and degenerated adult worms of *C. hepatica* microscopically in the grossly yellowish-white lesions in a trapped mouse. To the best of our knowledge, the present report is the first case of *C. hepatica* infection with a severe course in a puppy in Turkey. This case was detected in spring season. Our result is in agreement with the observation of Lloyd et al. (6), who reported that the highest infection rates with this liver helminth were observed in the spring. High levels of starvation and cannibalism in rodent nests in late winter may explain why the highest incidence of infection is seen in the spring season. On the other hand, in our study region heavy rainfall and mild temperature periods are observed in spring months. Warm and moist conditions create favorable conditions for the development of *C. hepatica* and lead to release of eggs from the decayed host liver.

In this study, characteristics of *C. hepatica* eggs, such as barrel-shaped bipolar plugs and two-layered eggshell, were consistent with those in previous reports (6,7). In addition to the eggs, adult female *C. hepatica* was observed in the liver of the puppy. As far as we know, in canine cases reported by different authors (6,7,9) only the eggs of the parasite were detected and no adult parasites were found. The presence of eggs in the absence of adult parasites in other studies suggests that adult parasites were degenerated.

Macroscopically, the granulomas in the liver are observed as yellow-white streaks through the capsule (2). Upon the gross examination of our case, the lesions in the liver were preliminarily interpreted as calcified necrotic foci; therefore, only the liver tissue was sampled. Hence, *C. hepatica* infections should be considered in the differential diagnosis of necrotic foci at necropsy.

As this case involved a stray dog, there was no medical history or anamnesis. Therefore, age determination was based on the body condition and presence of deciduous teeth with absence of permanent incisors and it was decided that the puppy was approximately 2 months old (10). Although the age of the animal was very young in this study, she might have come into contact with rodents or contaminated water or foods such as garden compost heaps before.

Histopathologic examination of liver biopsy is still the cornerstone of diagnosis of *C. hepatica* infections primarily invading the liver (1). Therefore, in our study, observation of the basic morphohistological characteristics of liver infection was employed in the evaluation of *C. hepatica* infection in a puppy. Although this approach is the most common and the least expensive method in routine practice, it has some limitations as the characteristic egg-containing granulomas and adult worms may not be invariably present in liver sections. Different molecular assays such as PCR thus may greatly contribute to the diagnosis of hepatic capillariasis. During the necropsy of our case, the lesions observed in the liver were not considered to be parasitic and therefore no fresh tissue was sampled. No molecular study was initiated as formalin fixation largely disrupts the genetic material in tissue samples.

We believe that this case report is a contribution to the epidemiology of *C. hepatica* in Turkey and shows that stray dogs are another potential host for the parasite. The presence of domestic rodents is known to play a role in the epidemiology of human capillariasis. Stray dogs and other homeless animals that come in contact with rodents and contaminated foods might increase the risk to human health and they might contribute to the dissemination of eggs and serve as a source of infection for other animals and humans. Therefore, although this parasite affects mainly rodents, its presence in other animals should not be disregarded. The increase of stray dog numbers in Bursa Province may pose a high risk for human capillariasis. The prevalence of this parasite tends to increase with the density of rodents. The presence of *C. hepatica* in a puppy in this case report suggests that examination of rodent populations for this parasite is required in Bursa Province.

As a consequence, even though hepatic capillariasis is an uncommon infection, it should be taken into consideration as a fatal zoonotic parasite. Zoonotic cases have been reported in humans worldwide and children below the age of 8 years are in the highest risk group due to their habit of geophagy (1,5). Control of rodent populations, sanitary disposal of dead animals, and improved hygiene should be considered for public health.

References

1. Fuehrer HP, Igel P, Auer H. *Capillaria hepatica* in man, an overview of hepatic capillariosis and spurious infections. Parasitol Res 2011; 109: 969-979.
2. Landolfi JA, Karim BO, Poynton SL, Mankowski L. Hepatic *Calodium hepaticum* (Nematoda) infection in a zoo colony of black-tailed prairie dogs. J Zoo Wildl Med 2003; 34: 371-374.
3. Mowat V, Turton J, Stewart J, Lui KC, Pilling AM. Histopathological features of *Capillaria hepatica* infection in laboratory rabbits. Toxicol Pathol 2009; 37: 661-666.
4. Redrobe SP, Patterson-Kane JC. *Calodium hepaticum* (syn. *Capillaria hepatica*) in captive rodents in a zoological garden. J Comp Pathol 2005; 133: 73-76.
5. Keven K, Bengisun JS, Altuntas F, Akar H, Nergizoglu G, Kutlay S, Duman N, Erbay B. Cystic infection of the liver in a maintenance haemodialysis patient. Nephrol Dial Transplant 2001; 16: 859-860.
6. Lloyd S, Elwood CM, Smith KC. *Capillaria hepatica* (*Calodium hepaticum*) infection in a British dog. Vet Rec 2002; 151: 419-420.
7. Stokes R. *Capillaria hepatica* in a dog. Aust Vet J 1973; 49: 109.
8. Çelebi B, Taylan Özkan A, Babur C. Capillaria hepatica in mouse (*Apodemus flavicollis*) from Giresun province of Turkey. Turk Parazitol Derg 2014; 38: 208-210.
9. Quadros RM, Weiss PHE, Miletti LC, Moura AB. Occurrence of *Calodium Hepaticum* eggs in feces of dogs and cats in Lages, Santa Catarina, Brazil. Rev Inst Med Trop Sao Paulo 2016; 58: 6.
10. The Humane Society of the United States. How to Determine a Cat's or Dog's Age. Washington, DC, USA: Humane Society; 1996.