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Case Report / *Olgu Sunumu*

Exploratory laparotomic diagnosis of renal cystic echinococcosis in a domestic cat from Hatay province of Türkiye and its molecular confirmation

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Abstract: This case report was prepared to provide information about cystic echinococcosis detected in a twelve years old domestic cat during experimental laparotomy. In the anamnesis, there was a complaint of progressive abdominal swelling. As a result of clinical and radiological examinations, unknown intraabdominal formations were detected. At laparotomy, multiple cysts were detected on the right and left kidneys. Molecular analysis revealed that these cystic structures are larval forms of *Echinococcus granulosus*. The cysts are often found in the liver and lungs but they can arise less commonly in the brain, kidneys, muscle, bone and heart. Renal cystic echinococcosis is rare and this note describes it, confirmed by molecular analysis in a domestic cat. For this reason, it is thought that this note will contribute to the literature.
Keywords: Experimental laparotomy, kidney, Persian cat, renal cyst.

Türkiye'nin Hatay ilinden evcil bir kedide renal kistik ekinokokkozis'in eksploratif laparotomik tanısı ve moleküler doğrulaması

Özet: Bu olgu sunumu on iki yaşında evcil bir kedinin deneysel laparotomisi esnasında tanısı konan kistik ekinokokkozis hakkında bilgi vermek için hazırlandı. Anamnezde giderek büyüyen bir karın şişliği şikâyeti vardı. Klinik ve radyolojik incelemeler sonucunda karın içinde bilinmeyen oluşumlar tespit edildi. Laparotomide sağ ve sol böbrek üzerinde çok sayıda kistle karşılaşıldı. Yapılan moleküler analiz ise, kistik yapıların *Echinococcus granulosus*'un larvası olduğunu gösterdi. Kistler genellikle karaciğer ve akciğerlerde bulunurlar ancak daha az yaygın olarak beyin, böbrekler, kas, kemik ve kalpte ortaya çıkabilirler. Renal kistik ekinokokkozis nadirdir ve bu not evcil bir kedide moleküler analizle doğrulanmış olarak bunu açıklamaktadır. Bu nedenle bu notun literatüre katkı sağlayacağı düşünülmektedir.
Anahtar sözcükler: Böbrek, böbrek kisti, deneysel laparotomi, İran kedisi.

Cystic echinococcosis (CE) is an important parasitic disease caused by the dog tapeworm, *Echinococcus granulosus.* This parasite is widespread worldwide. The life cycle of *E. granulosus* occurs between two mammalian hosts. Definitive hosts are mainly dogs and the other canids. Intermediate hosts are sheep, goats, pigs, horses, cattle, and humans. Sometimes, dogs and cats act as intermediate hosts of *E. granulosus.* Thus, the disease can also occur in these animals. Intermediate hosts become infected by ingestion of parasite eggs, shed in the feces of the definitive host. Then oncosphere hatched from the eggs are passively transported via blood or lymph vessels to the liver, lungs or other organs and develop to hydatid cysts. Infection occurs in definitive hosts by ingestion of intermediate hosts' offals containing the larval stage of *E. granulosus* (8, 17).

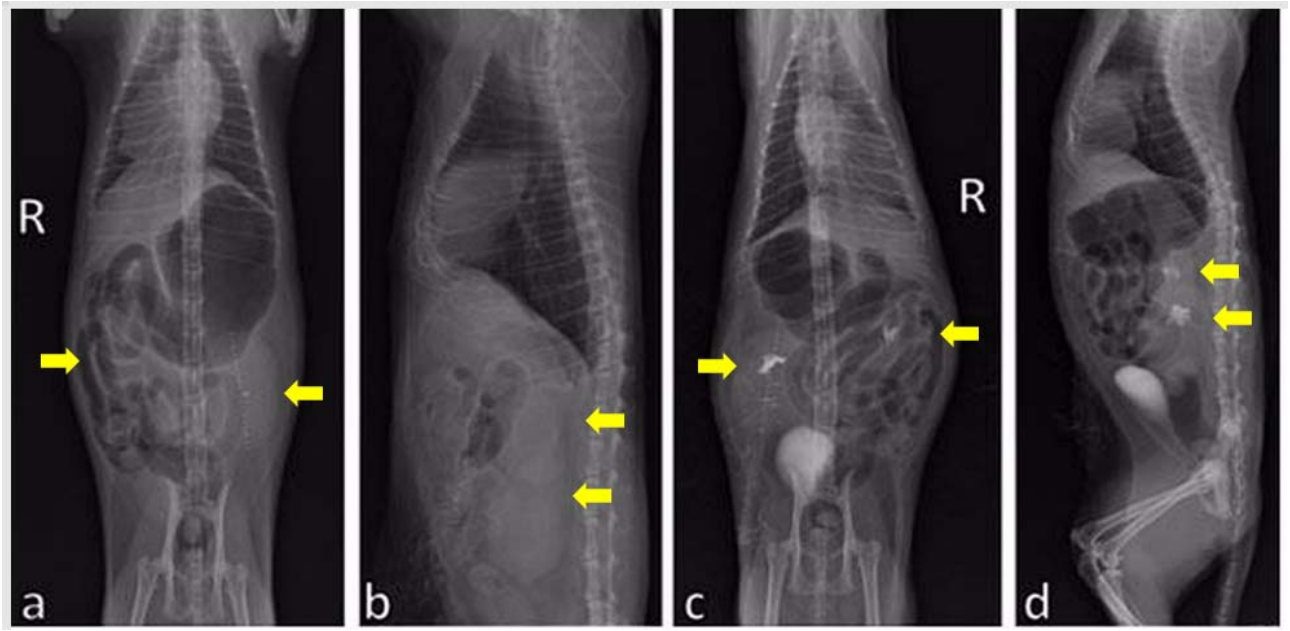

Figure 1. Preoperative direct abdominal VD (a) and LL (b) radiographs and appearance of the patient's enlarged and deformed kidneys on urinary system contrast (urography) abdominal VD (c) and LL (d) radiographs.

Echinococcus genus comprises different genotypes; *E. granulosus sensu stricto* (*s.s.*) (G1-G3), *E. equinus* (G4), *E. ortleppi* (G5), *E. canadensis* (G6-G7, G8, G10), *E. felidis*, *E. oligarthrus*, *E. vogeli*, *E. multilocularis* ve *E. shiquicus* (3, 11, 14). In the world, *E. granulosus sensu stricto* G1 was detected in cats by molecular analysis (1-3, 8). Oguz et al. (12) also reported that this genotype in a 2-year-old stray cat, in the Van province of Türkiye for the first time.

A 12 years old, female Persian cat (neutered, 3.5 kg) comprised the material of this case study. The cat was brought to the Department of Surgery in Veterinary Health Practice and Research Hospital, Hatay Mustafa Kemal University. After the anamnesis of abdominal swelling, unknown intraabdominal formations were detected by clinical and radiological examinations (Figure 1). Iohexol (400 mg/kg IV, 350 mg / 100 ml, Opakim, Türkiye) was used in urography. After all diagnostic procedures, it was decided to perform an exploratory laparotomy. General anaesthesia was applied to the cat by using xylazine HCl 2 mg/kg IM and ketamine 10 mg/kg IM (after 5 minutes), and maintained with isoflurane inhalation anesthesia. The abdominal region of the patient was prepared for the surgery in the dorsal recumbency position. The abdominal cavity was accessed through incisions to skin, subcutaneous connective tissues, *linea alba*, and peritoneum with a ventral midline surgical approach. Intraabdominal organs and surrounding structures were examined. During exploration, multiple cysts were detected on the right and left kidneys. Significant enlargement of both kidneys and darkening in color were observed macroscopically. The cyst samples were taken by ligating with absorbable (4-0 no.) suture from the root so that the integrity of the cysts was not disrupted and the liquid content did not disperse. After the process, the peritoneum, abdominal muscles and subcutaneous connective tissues were closed with a simple continuous suture and the skin with simple interrupted sutures using absorbable (2-0 no.) suture. These cysts were sent to the parasitology laboratory. During the recovery, vital function monitorization revealed the patient died due to respiratory and cardiac arrest within 12 hours. The animal owner refused the offer to perform an autopsy.

The cysts were thoroughly smashed with a sterile scalpel and washed 5 times with phosphate buffered solution. DNA extraction was performed using the tissue kit and the extracts were stored at -20°C until used. Polymerase Chain Reaction (PCR) was applied as described by Eslami et al. (5). The nucleotide sequences of the primers targeting 882 bp region of the Cox 1 mitochondrial DNA gene of *E. granulosus* were F1 5'-GAATTTA CCGCGTTTGAA -3' and R 5'-CTTATATAAGAACCTAACGAC-3'. Primers were obtained from a commercial company in a lyophilized form. DNase-RNase-free water was added to the F1 primer 568 µl and to the R primer 517 µl and diluted to 100 pmol/1 µl. 2.5 µl 10X PCR buffer, 2.5 µl 25 mM $MgCl_2$, 2.5 µl 2.5 mM dNTP, 5U/µl Taq DNA Polymerase, 20 pmol from each of the primer pairs and 5 µl of template DNA were added to the PCR mix. The preliminary denaturation stage was 5 min at 95ºC in PCR amplification. It was carried out 35 PCR cycles as 45 sec

at 94ºC denaturation, 60ºC annealing and 72ºC elongation. The final elongation was done 10 min at 72ºC after the last cycle. PCR products were run on a 2% agarose gel, at room temperature, 100 V and 500 mA, for 45 minutes and the gels were evaluated under UV light and photographed (Figure 2).

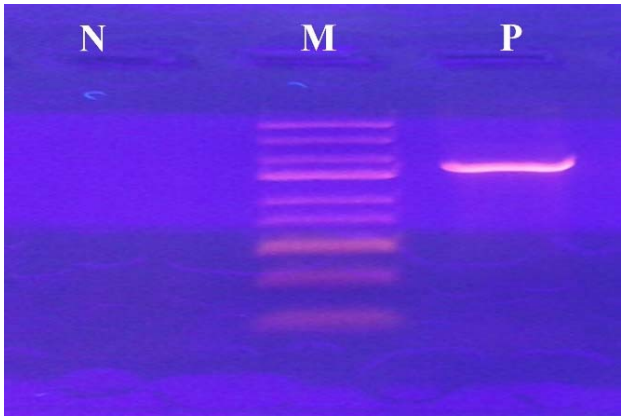

Figure 2. PCR product of the mitochondrial Cox1 gene, 882 bp, N: Negative control, M: Marker (100 bp), P: PCR product isolated from hydatic cysts.

There are very few studies on CE in cats in the world. CE was reported in a cat of unknown age in New Zealand, the cysts measuring 0.1-0.3 cm in diameter (10). Two dogs were tried to be infected with cysts from a cat with CE in Germany, one of which was infected. Only a few of these larval forms reached sexual maturity in the dog and were determined to be *E. granulosus* by measurement of adult parasites (16). In another case diagnosed morphologically in Ankara in 2002, free cystic structures ranging in size from 0.3-5.0 cm diameter were determined in the abdominal cavity of a two years old female stray cat with progressive abdominal swelling. However, a molecular diagnosis was not made in that case (4). *Echinococcus granulosus sensu stricto* G1, which is responsible for human CE cases worldwide (88.44%), was detected in cats by molecular analysis (1-3, 8, 13). Oguz et al. (12) reported that this genotype in a 2-year-old stray cat, in the Van province of Türkiye for the first time. Here, it was reported molecular detection of CE in a 12 years old, female domestic cat with abdominal swelling, in Hatay, Türkiye as a second case report.

In the case reports presented, cats generally domestic cat (1-3, 8) and keep indoors. Therefore, cats were infected maybe in these ways; contaminated food and water, consuming mechanical vectors such as houseflies crawling on dog feces, poorly washed raw vegetables, or unhygienic owner who has come into contact with an *E. granulosus*-infected dog.

Cats are not normally an intermediate host for *E. granulosus*. However, sometimes hydatid cysts can be coincidentally encountered in these animals. Although cats are in contact with the eggs of *E.granulosus*, which is thought to be commonly found in the external environment, the incidence of hydatid cyst in cats is low since cats are not the main hosts of the parasite. Indeed, Lizardo-Daudt et al. (9) tried to infect 11 domestic cats but was unsuccessful. In a case study reported by Armua-Fernandez et al. (1), an infected cat with CE was found to be highly positive for Feline Infection Virus, which is an immunosuppressive disease. Therefore, it can be suggested that CE may develop in immunocompromised cats. In many cases, the gender of the cat with hydatid cyst was determined as female (2, 3, 8, 12). It was also seen in a female cat in our case. Hormonal differences between male and female cats may trigger susceptibility to this disease. There is insufficient data on the epidemiology of the disease in stray and domestic cats. The prevalence of the disease is perhaps not as low as we think. Therefore, further studies are required to expand our knowledge regarding the epidemiology of feline cystic echinococcosis in Türkiye. In future studies, it will be useful to obtain information about the immune status of patients in terms of epidemiological perspective.

Cysts were found either free inside the abdominal cavity (1, 10) or attached to the liver (2, 8, 12) and spleen (3) in cats. In this case report localization of the cysts were kidneys. The cysts are often found in the liver and lungs but they can arise less commonly at the brain, kidneys, muscle, bone and heart (15). Kidneys are rare anatomic location for the cystic echinococcosis. In the world and Türkiye, renal cystic echinococcosis was reported in humans (6, 7, 15) but there is no record of renal echinococcosis in cats. This note describes the renal cystic echinococcosis, confirmed by molecular analysis in a domestic cat. For this reason, it is thought that this note will contribute to the literature.

As a result, CE should be taken into account in the differential diagnosis of abdominal distention cases in cats. Further studies concerning the prevalence of cystic echinococcosis in cats are required.

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Ethical Statement

This study does not present any ethical concerns.

Conflict of Interest

The authors declared that there is no conflict of interest.

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