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Toxocara canis and *Fasciola hepatica* Co-Infection Leading to Hepatic Abscess: A Case Report

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ABSTRACT

Toxocariasis is a zoonotic disease caused by ingesting eggs from soil contaminated with *Toxocara canis* and *Toxocara cati*, commonly found in feces of infected dogs and cats, leading to a range of clinical symptoms including fever, abdominal pain and gastrointestinal manifestations. Fascioliasis is also a zoonotic disease caused by liver flukes *Fasciola hepatica* and *Fasciola gigantica,* which can be contracted through consumption of contaminated water or aquatic plants, leading to various clinical features. Here, we report a case of a 39-year-old woman diagnosed with a liver abscess caused by co-infection of *T. canis* and *F. hepatica,* as confirmed by serological tests. Although the existence of a pet dog and an experience of eating raw water dropwort are potential clues for diagnosis, it cannot be determined as the source of infection because the source of infection has not been clearly identified. After administrating albendazole and triclabendazole sequentially, the patient showed improvement in blood test and imaging findings. Clinicians should be aware of parasitic co-infection and take appropriate management.

Keywords: Liver Abscess; Parasites; Infection; Zoonotic Disease

INTRODUCTION

Toxocara canis and *Toxocara cati* are parasites whose eggs mature in the soil and infect animals, such as dogs and cats. Humans get infected by consuming eggs in the soil contaminated with the feces of infected animals. The eggs hatch in the human intestine, and the larvae migrate through the intestinal wall into various tissues, such as the liver, lungs, central nervous system, and eyes. Most cases of *Toxocara* infection are asymptomatic; however, some individuals may experience systemic symptoms. Symptoms due to visceral larva migrans (VLM) depend on the affected organ, and may include fever, anorexia, hepatomegaly, rashes, pneumonia, and asthma. Symptoms due to ocular larva migrans may include visual loss, eye inflammation, or retinal damage.[1,2]

Fasciola hepatica is a trematode (fluke) that infects animals, such as cattle, sheep, and goats, and humans who consume contaminated water or aquatic plants. It is found in all continents, except Antarctica, and cases of infection have been reported in Korea as well. The clinical

symptoms of fascioliasis in the acute phase may include fever, right upper abdominal pain, eosinophilia, hepatomegaly, and abnormal liver function. In the chronic phase, symptoms may include inflammation and bile duct obstruction. Diagnosis and treatment of fascioliasis may be delayed in areas where the disease is uncommon, and the symptoms may be confused with other liver or biliary diseases.[3]

In this report, we have presented a novel case of hepatic abscess caused by co-infection with *T. canis* and *Fasciola hepatica*, which was diagnosed serologically and had not been reported previously.

CASE DESCRIPTION

A 39-year-old woman presented to our hospital with upper right abdominal pain. She had undergone intrauterine device insertion 8 months prior to the onset of dysmenorrhea. She had a pet dog at home and, although she did not enjoy eating raw meat, she had eaten raw water dropwort in the past. Three months prior, she had pain in lower and right upper abdomen, for which she underwent abdominal ultrasound at another hospital; however, no specific finding was obtained, and the pain was managed with analgesics. She was referred to Keimyung University Dongsan Hospital for perihepatitis, multiple hepatic abscesses, pelvic inflammatory disease, and splenomegaly, which were observed upon abdominal ultrasonography and computed tomography (CT) scan performed in the previous hospital (**Fig. 1A**).

Physical examination at the Keimyung University Dongsan Hospital revealed no significant findings, besides her right upper abdominal pain. Laboratory tests revealed leukocytosis (15,990/μL), increased eosinophil count (44.3%), and elevated gamma glutamyl transpeptidase (58, reference range: 6–42 U/L), fibrinogen (544.0 mg/dL, reference range: 200.0–400.0 mg/dL), C-reactive protein (4.0 mg/dL, reference range: 0.0–0.5 mg/dL), and procalcitonin (0.05 ng/mL, reference range: 0.000–0.046 ng/mL); all other biochemical test results were within normal ranges (**Table 1**).

Abdominal ultrasonography performed at the Dongsan Hospital 3 days after an external hospital CT scan showed a newly developed complicated fluid collection in the right perihepatic cavity, compared to that in the preceding examination, and subsequently, percutaneous catheter drainage (PCD) was performed. The hepatic abscess was in an immature state, as per the cavitogram, and catheter insertion was not performed. *Ureaplasma parvum* and *Escherichia coli* were detected in a sexually transmitted infection test of the lower genitourinary tract. Considering Fitz-Hugh-Curtis syndrome, the intrauterine device was removed. After PCD, the patient received third-generation cephalosporins

Table 1. Serial laboratory findings

Variables	Admission day	2 wk after taking antibiotics	2 wk after taking albendazole	20 wk after taking triclabendazole	43 wk after taking triclabendazole
WBC, 10^3/uL	15.99	9.13	9.66	7.39	5.75
EOS, %	44.3	51.8	55.7	5.8	6.1
IgE, IU/mL	Not present	167	144	18.8	13.6
AST, U/L	19	31	44	17	18
ALT, U/L	26	30	57	11	11
CRP, mg/dL	4.0	0.7	1.2	Not present	Not present

WBC = white blood cell, EOS = eosinophil, IgE = immunoglobulin E, AST = aspartate transaminase, ALT = alanine transaminase, CRP = C-reactive protein.

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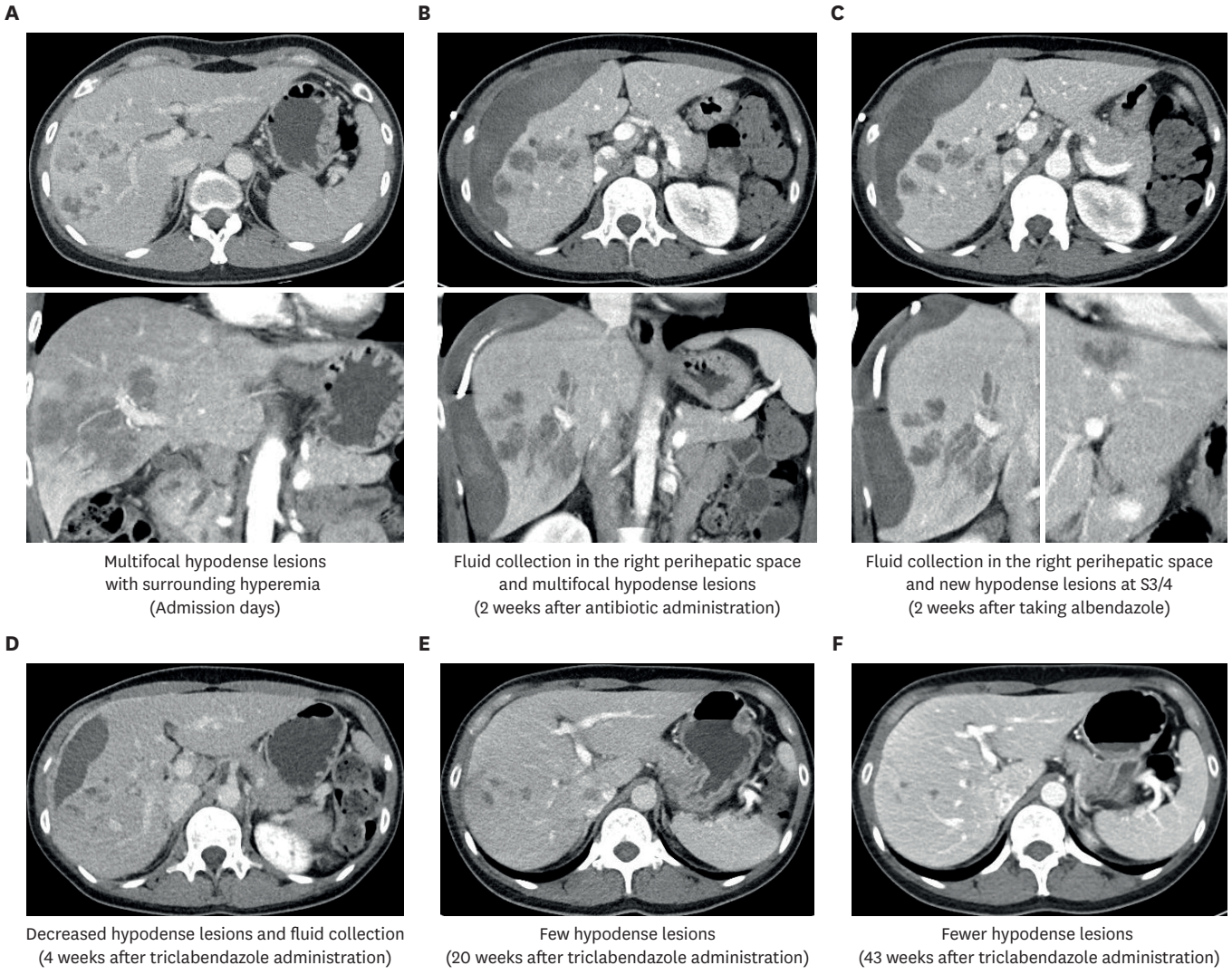

Fig. 1. Serial computed tomography findings. (**A**) Multifocal hypodense lesions with surrounding hyperemia (Admission days). (**B**) Fluid collection in the right perihepatic space and multifocal hypodense lesions (2 weeks after antibiotic administration). (**C**) Fluid collection in the right perihepatic space and new hypodense lesions at S3/4 (2 weeks after taking albendazole). (**D**) Decreased hypodense lesions and fluid collection (4 weeks after triclabendazole administration). (**E**) Few hypodense lesions (20 weeks after triclabendazole administration). (**F**) Fewer hypodense lesions (43 weeks after triclabendazole administration).

and metronidazole. The bacteria were not identified in the culture test performed on perihepatic fluid, and the culture test performed on peripheral blood was also negative. After 5 days of antibiotic therapy, a follow-up CT scan was performed due to persistent fever; the hemoperitoneum was found to still be present, and a new liver abscess was detected. Then, the PCD catheter was changed thereafter. Two weeks after antibiotic administration, abdominal CT revealed no improvement in the hepatic abscess or perihepatic hemoperitoneum. Multiseptate low-attenuation lesions in liver segments 5/8 and 7 were still observed, and drainage was continued through the percutaneous catheter; however, there was no change in the hemoperitoneum (**Fig. 1B**). No specific strain was detected in the additional culture tests performed on perihepatic fluid and peripheral blood.

Eosinophilia persisted, but parasitic stool examinations for helminth and protozoa were negative. After 3 weeks of antibiotic therapy, serum-specific immunoglobulin (Ig) G antibody

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against *T. canis* using enzyme-linked immunosorbent assay (ELISA) showed positive results. (1.07, negative < 1.0 index). This test was conducted by an external institution using a commercial ELISA kit (Bordier Affinity Products SA, Crissier, Switzerland). The patient was treated with albendazole for five days. However, 2 weeks after starting albendazole, a new hepatic abscess was found on follow-up CT (**Fig. 1C**), and eosinophilia persisted. The response to albendazole treatment was insufficient. Sequentially, the results of the other ELISA tests were obtained. The ELISA tests for *Clonorchis sinensis* (0.631, negative index < 1.0) and *Paragonimus westermani* (0.505, negative index < 1.0) were negative, but the result for *F. hepatica* was positive (0.523, positive index > 0.300). These tests were also conducted by external institutions. The ELISA for F. hepatica was performed by an external institution using their own in-house testing method with the crude antigen, while the rest were conducted using commercial kits known as GENEDIA Cs/Pw Ab ELISA (Green cross MS, Yongin, Korea). She received triclabendazole (2 doses of 10 mg/kg) orally and was maintained in a stable condition. The patient was discharged and scheduled for outpatient follow-up.

Twenty weeks after triclabendazole administration, her white blood cell count was 7,390/μL (5.8%) without eosinophilia, and her IgE count was within the normal range (**Table 1**). Hepatic abscesses and perihepatic fluid collection improved on follow-up CT. Forty-three weeks after taking triclabendazole, both hepatic abscess lesions and perihepatic hemoperitoneum further improved on CT scan (**Fig. 1D-F**). Blood test results for eosinophil and IgE levels were within the normal range (**Table 1**).

DISCUSSION

Human parasitic infections are common, affecting more than 1.5 billion people worldwide. Parasites that affect the liver and biliary ducts are diverse, including nematodes (roundworms), cestodes (tapeworms), and trematodes (flatworms or flukes). Diseases and deaths caused by parasitic infections occur due to the host immune response.[4] Parasitic infections of the liver and biliary tract can lead to recurrent cholangitis, cirrhosis, liver failure, and cancer, and are also associated with liver abscesses.[3]

According to a previous study, the annual incidence rate of pyogenic liver abscesses in Korea is 10.9 cases per 100,000 people. The incidence rate is likely to increase if causes other than bacterial infections are considered.[5] Research on liver abscesses related to parasites other than *Entamoeba histolytica* is rare, with individual case reports of liver abscesses caused by *F. hepatica* being predominant.[6,7] Data on liver diseases caused by parasitic co-infections are very scarce. In Korea, some cases of liver abscesses resulting from *C. sinensis* and *Fasciola sp.* co-infections have been reported,[8] whereas in China, cases of liver abscesses caused by both trichinellosis and fascioliasis have been reported.[9] Till date, no case of liver abscess caused by co-infection with *T. canis* and *F. hepatica* has been reported in the literature.

Toxocariasis is diagnosed using serological or immunological methods, along with imaging tests.[10] Stool examination for ova and parasites is not very informative, since eggs are not excreted by humans.[11] Ultrasound and CT can be used to identify liver lesions associated with VLM.[12] Anthelmintic treatment, with albendazole or mebendazole, is recommended for moderate to severe symptoms, and antihistamines or corticosteroids can help alleviate allergic reactions.[1]

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Stool examination for eggs and serum antibody testing can be performed in suspected cases of fascioliasis. However, egg detection in stool is often not helpful for diagnosis.[13] If there are multiple round or oval, low-density liver lesions on a CT scan, fascioliasis may be suspected.[14] ELISA-based serological tests with high sensitivity and specificity are commonly used for diagnosis of fascioliasis.[15] Triclabendazole is a drug recommended by the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) in the United States.[16,17]

Generally, the cause of hepatic abscess is pyogenic, and if a liver abscess is confirmed with imaging studies, empirical antibiotic therapy is typically initiated as the first-line treatment. However, if there is no improvement despite proper antibiotic therapy, a rare cause, such as parasitic infection, should be considered. *Toxocara* infection is recognized as a potential cause, as the domestic population in Korea has a reported *Toxocara* seroprevalence rate of up to 51%, suggesting common exposure to *Toxocara*.[18,19] In cases with increased eosinophil count, a history of consuming raw liver, or raising pets, a hepatic abscess due to *Toxocara* should be considered. Even when appropriate treatment is provided using antiparasitic drugs, if there is no improvement in imaging studies or if there is persistent eosinophilia, the possibility of co-infection with other parasites, though uncommon, should also be considered. Fascioliasis is a rare parasitic disease, and its incidence in Korea remains unknown; only a few case reports have been published to date. Delayed diagnosis is possible owing to its rarity; therefore, caution should be exercised. In individuals with a history of travel to endemic areas or consumption of contaminated water or aquatic plants, such as water dropwort, hepatic fascioliasis should be considered. In the case of our current patient, she may have been exposed to *Toxocara* through the fecal-oral route because she had a pet dog, and she may have been additionally been infected with *Fasciola,* by consuming raw water dropwort. It is thought that this raw water dropwort may have been contaminated with the feces from cattle, sheep, or goats infected with *Fasciola*.

To exclude the possibility of cross-reactivity in serological tests for *Toxocara* and *Fasciola*, performing polymerase chain reaction tests could be helpful. However, due to the absence of commercial polymerase chain reaction kits and limitations in the laboratory setting, only serological tests and stool examinations could be performed. Despite these limitations, the high sensitivity of ELISA suggests its diagnostic value in detecting parasites. The ELISA for *Toxocara* targeted the excretory-secretory antigen of *T. canis* larvae and is known to have a sensitivity of 91% and a specificity of 86%.[20] Furthermore, clinical improvement, such as the resolution of eosinophilia, following the administration of the first anthelmintic drug, supports the diagnosis of toxocariasis. Due to a limited number of domestically reported cases of fascioliasis, there was insufficient data available to determine the sensitivity and specificity of the ELISA test for *F. hepatica*. Therefore, a cut-off method higher than the commonly used standard deviation threshold was employed to derive the serum test results. The improvement in blood tests and imaging findings after triclabendazole administration strongly suggests *Fasciola* infection. Cross-reactions are more likely to occur within trematodes, cestodes, and nematodes respectively. However, in this case, while the test of *Fasciola* was positive, ELISA tests for *C. sinenesis* and *P. westermani* were negative. Therefore, the possibility of cross-reactivity between *Toxocara* (nematode) and *Fasciola* (helminth worm) in this patient is considered low. Finally, the case report presented a patient who was diagnosed with hepatic abscess due to a co-infection with *T. canis* and *F. hepatica*, as confirmed by serological tests. Although the existence of a pet dog and an experience of consuming raw water dropwort are potential clues for diagnosis, it cannot be determined as

the cause of infection because the source of infection has not been clearly identified. Two different anthelmintic drugs were administered to treat the co-infection. After the treatment, the patient's blood test and imaging findings improved. In cases of hepatic abscesses, if conventional antibiotic therapy does not lead to improvement, a parasitic infection-induced hepatic abscess should be considered. Moreover, in rare cases where a diagnosed parasitic infection with hepatic abscess does not improve, the possibility of parasitic coinfection should be considered.

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