Evaluation of cases with *Fasciola hepatica* infection: experience in 6 children

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**ABSTRACT**

*Objective:* To evaluate 6 pediatric cases diagnosed as fascioliasis. *Methods:* Patients diagnosed as fascioliasis are retrospectively interpreted. *Results:* Herein 6 pediatric cases having a mean age of (12.7 ± 3.1) years with different complaints including fever, weakness, paleness, sweating, cough, headache, rectal bleeding, abdominal pain, and abdominal distension admitting to our hospital are evaluated. *Conclusions:* Diagnosis of fascioliasis needs a high index of suspicion supported by stool microscopy, serology, imaging procedures, and in difficult cases even liver biopsy. Triclabendazole resistance should be kept in mind in unresponsive cases.

**KEYWORDS**

Fascioliasis, Turkey, Trematoda, Pediatric cases, Triclabendazole, Child

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1. Introduction

Fascioliasis is an important chronic parasitic disease caused by two trematode liver fluke species: *Fasciola hepatica* (*F. hepatica*) and *Fasciola gigantica* (*F. gigantica*), infecting several mammalian species including cattle, goats, sheep, and humans[1,2]. *F. hepatica*, a zoonotic helminth, has a cosmopolitan distribution especially in temperate zones, while *F. gigantica* is found in tropical regions of Africa and Asia[3]. Infection occurs due to ingestion of water or uncooked aquatic plants such as watercress contaminated with metacercariae, which exist in the intestine, perforates the intestinal wall, enters the peritoneum, and passes through the liver capsule to settle in the biliary tree[2,4]. In the biliary tract, the mature fluke releases eggs, which are excreted in feces to complete the life cycle of the parasite[4]. The parasite usually infects the liver parenchyma and causes lesions, but rarely infects the extrahepatic tissues like brain and eye[5,8]. The illness of fascioliasis consists of an acute phase, which causes the patient having fever,
hepatomegaly, abdominal pain, eosinophilia, hemobilia, and hepatic nodules and a chronic phase which causes the patient having jaundice, angiocholitis, wasting, anemia, ascites, cardiac disorder, and pancreatitis[6,9,10]. In this report, we evaluated 6 children with different manifestations of fasciola infection.

2. Materials and methods

We evaluated 6 children admitting to Ankara Hematology Oncology Children’s Training and Research Hospital as fascioliasis between January 2008 to October 2012. Data entry included age, duration and kind of symptom, physical examination, laboratory study, treatment and outcome of the patient. For the laboratory study of parasite, microscopic examination, serological examination and cultures of the specimens were performed. Patients diagnosed with F. hepatica with microscopic and serological examination were included in the study whereas one patient with a suspected fascioliasis with abdominal ultrasonography but unproven with serological test was excluded from the study.

SPSS 16 software was used for all analyses. Values are expressed as the mean±SD unless otherwise stated. P<0.05 was considered statistically significant for all analyses.

3. Results

Six patients (three males, three females) between the age of 9 and 17 years [mean age; (12.7±3.1) years], with different complaints including fever, weakness, paleness, sweating, cough, headache, rectal bleeding, abdominal pain, and abdominal distension admitted to our hospital between November 2009 and June 2011. Mean duration of symptoms was 87.7 d (between 2 d and 1 year). Physical examination of the three patients revealed abdominal tenderness, hepatomegaly and pallor. However, other three had no signs in the physical examination. Half of the cases admitted to other centers before admission to our center and they had a story of drinking contaminated water. General characteristics of the patients were listed in Table 1.

In laboratory studies, mean hemoglobin was 11 g/dL; white blood cell count, 12x10^9/L; and platelet count of 397x10^9/L, respectively. Three children had a mild leukocytosis and thrombocytosis and one had significant leukopenia. Two patients had iron deficiency anemia. Peripheral blood smear revealed eosinophilia in all of the children and mean eosinophil ratio was 36%. C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) were also evaluated. CRP values were negative or slightly increased in all cases. However, the ESR was high in most patients and the mean ESR was 36.8 mm/h. Liver function tests including alanine aminotransferase (ALT), aspartate aminotransferase (AST), and gamma glutamyl transferase (GGT) were normal, except for a slight increase of AST and ALT in two patients. Only two patients serum immunoglobulin E levels were measured and one of them was approximately two times higher than the upper limit, while the other was 30 times higher than the normal values (Table 2).

Parasite examinations and cultures of stool were performed because of marked eosinophilia and possible parasitic diseases. There was no parasite eggs in stool of two children. However, one patient had F. hepatica eggs and the other one had Hymenolepis. nana (H. nana) eggs

### Table 1

| Patient | Gender | Age (year) | Application time | Presenting symptom | Physical examination |
|---------|--------|------------|------------------|--------------------|---------------------|
| 1       | Male   | 10         | 4 months         | Abdominal pain and distension | Abdominal tenderness |
| 2       | Male   | 17         | 2 months         | Fever, sweating, cough, headache | Normal |
| 3       | Male   | 9          | 1 month          | Abdominal pain | Normal |
| 4       | Female | 14         | 1 week           | Weakness, paleness, headache | Hepatomegaly |
| 5       | Female | 11         | 2 d              | Weakness, paleness, fever | Paleness |
| 6       | Female | 15         | 1 week           | Rectal bleeding | Normal |

### Table 2

Laboratory findings of the patients.

| Patient | WBC (×10^9/L) | Hg (g/dL) | Plt (×10^9/L) | Eo (%) | CRP (mg/dL) | ESR (mm/h) | IgE (IU/mL) | Liver functions |
|---------|---------------|-----------|--------------|--------|-------------|------------|-------------|-----------------|
| 1       | 13.7          | 13.3      | 586          | 36     | 0.18        | 91         | –           | Slight increase in AST |
| 2       | 17.4          | 15.5      | 246          | 72     | 1.24        | 45         | 30000       | Normal |
| 3       | 16.5          | 11.6      | 429          | 50     | 0.53        | 34         | 241         | Slight increase in ALT |
| 4       | 12.0          | 7.1       | 689          | 50     | 0.15        | 8          | –           | Normal |
| 5       | 3.1           | 4.8       | 155          | 8      | 1.13        | 29         | –           | Normal |
| 6       | 9.5           | 13.8      | 282          | 4      | 0.15        | 14         | –           | Normal |

WBC: White blood cells; Hg: Hemoglobin; Plt: Platelet; Eo: Eosinophil; CRP: C-reactive protein (normal: 0–0.8); ESR: Erythrocyte sedimentation rate (normal: 0–20 in 1 h); IgE: Immunoglobulin E (normal: 0–100); AST: Aspartate aminotransferase; ALT: Alanine aminotransferase.
in direct examination of stool. One of the patients was positive for Giardia antigen and the other was positive for Blastocystis hominis (B. hominis) eggs, Iodamoeba butschlii (I. butschlii) cysts and Giardia lamblia (G. lamblia) antigen. Serological examination was also performed for all patients with possible parasitic diseases. In some patients, Toxoplasma gondii (T. gondii) and Toxocara canis (T. canis) were detected in serological studies by ELISA. At the same time, some parasites including Echinococcus granulosus (E. granulosus) and Entamoeba histolytica (E. histolytica) were excluded with these studies. The only serological finding that are common for all children was positive indirect hemagglutination (IHA) test for F. hepatica at different titrations of between 1/312 and 1/5120 (Table 3).

Two patients had signs of infection for five different parasites at the same time. The patients with multiple parasites were evaluated for immune deficiency diseases, but none of them had primary immune deficiency.

Abdominal ultrasonography was performed for all patients positive IHA tests for F. hepatica. Although two patients had normal abdominal ultrasonography findings, all the others had different changes in liver parenchyma and concomitant lymph nodes, enlarged in different locations of abdomen (Table 4).

Eventually, 5 children diagnosed as having F. hepatica by serologically or stool examination were treated with triclabendazole at a dosage of 10 mg/kg per day orally for 3 consecutive days and this treatment was repeated after 10 d. One patient was positive for F. hepatica, IHA and E. histolytica ELISA tests at the same time and was treated with oral metronidazole for two weeks. However, this patient was unresponsive to treatment because of persistent symptoms and had positive serum PCR tests for F. hepatica and T. canis after metronidazole cure. This patient had subcapsular hypoechogenic lesion with 66 mm×55 mm diameter and uncertain contours in posterior segment of right liver lobe in the abdominal ultrasonography after treatment. Abdominal magnetic resonance showed hepatosplenomegaly with capsular peripheral wedge-shaped and not clear contoured lesion, 67 mm×70 mm×95 mm in size at the right lobe of liver, with spherical lymph node at portal hilum about 20 mm×30 mm in size and heterogeneous enhancing focal area, 25 mm in diameter and multiple millimetric foci at upper pole of the spleen after metronidazole cure. Thoracic computed tomography and eye examination were performed because of positive PCR for T. canis, which were normal. Albendazole treatment for T. canis and triclabendazole for F. hepatica were initiated for this patient. After triclabendazole treatment, titration of the F. hepatica IHA levels decreased, eosinophilia returned to normal levels, and symptoms related to the parasitic infection improved within a few months. In one patient, abdominal pain and a significant increase in liver function tests was observed for approximately two months after initiation of therapy. Abdominal ultrasonography of the case showed a cystic lesion with septations, 11 mm×8 mm in size in the left medial lobe of liver. The patient was treated with triclabendazole for the second time. Liver function did not return to normal levels with the second cure and liver biopsy was performed; which resulted in chronic hepatitis.

4. Discussion

Fascioliasis is a zoonosis caused by F. hepatica and less commonly F. gigantica, distributed in some countries such as Spain, France, Germany, Great Britain, Bolivia,
Iran, Peru, Austria, Norway, United States, Portugal, China and Turkey[6,9,11,12]. F. hepatica is a flat and leaf-shaped trematode. It’s life cycle consists of 7 stages including egg, miracidium, sporocyst, redia, cercaria, metacercariae, and adult fluke. The parasite has two hosts of intermediate and definitive hosts. Mammals like sheep, goats, and cattle are usually definitive hosts and infected by ingesting metacercariae form[5,12,13]. Human, the accidental host, get the disease by drinking contaminated water with metacercariae, eating watercress, lettuce, alfalfa or spinach plants, and using contaminated kitchenware[6,6]. Only half of our cases had suspicious history of drinking contaminated water, whereas there was no history about disease transmission in the others.

The metacercariae excav in the small intestine, penetrate the intestinal wall, move into the peritoneal cavity, and invade into the liver parenchyma through the capsule. About six weeks later, the parasites settle down in the biliary tract where they become mature and produce eggs that are excreted with stools[6,12,13]. If the larvae accidentally lose their own way to the liver; they reside in the other organs or systems and cause ectopic fasciolasis[10]. The disease includes 4 clinical periods: (1) Incubation phase, from the ingestion of metacercariae to the first symptoms; (2) Acute phase, migration of the fluke to the bile ducts, with symptoms of fever, abdominal pain, respiratory symptoms, gastrointestinal disturbances, hepatomegaly, splenomegaly, ascites, anemia, and jaundice; (3) Latent phase, maturation of the parasites and starting of ovoposition with eosinophilia, gastrointestinal complaints and relapses of acute symptoms; (4) Chronic phase with bile duct obstruction, cholecystitis, cholangitis, liver abscess, hemorrhage, lithiasis, and cirrhosis. The chronic stage may be asymptomatic and extended for years if the disease remains untreated[14,18]. Our patients were compatible with the acute phase in terms of symptoms, but some were in the latent phase due to eosinophilia and the laboratory findings. The highest level of eosinophilia is determined in the last period of acute phase and the beginning of the chronic phase[19].

According to the literature, laboratory studies generally demonstrate anemia and leukocytosis, but hyperleukocytosis is very rare. Immunoglobulin levels may be elevated, especially IgE, as observed in our two patients[20,21]. Anemia was also observed in our two cases. Furthermore, low levels of CRP in all our patients and high ESR of four patients supported the knowledge that fasciolasis is a chronic infection.

Fasciolasis is difficult to diagnose on admission, because it is uncommon. After the disease is clinically suspected, diagnosis should be confirmed with the appearance of F. hepatica egg by a parasitologist in the feces. However, stool examination alone may not be enough for the diagnosis in all stages of the infection, because the parasite cannot produce eggs before invasion of biliary tract[22]. Besides examination of stool, serological tests as indirect hemagglutination are more valuable for diagnosis and can be used in all stages, including the acute stage when the eggs are not excreted in the feces yet, and in the evaluation of the treatment outcome[6,23]. In this study, only one patient’s stool examination was positive for F. hepatica eggs, while IHA tests of all patients were positive. Because, all our patients were in acute or latent phase and the eggs were not excreted in the feces yet.

Two of our patients had signs of infection for five different parasites at the same time including G. lamblia, B. hominis, H. nana, I. butschlii, E. histolytica, R. canis and T. gondii. Marcos et al. showed that children may have more than one intestinal parasites, such as, in descending order of prevalence: G. lamblia, A. lumbricoides (A. lumbricoides), E. histolytica, H. nana, Trichuris trichiura, Enterobius vermicularis and Strongyloides stercoralis[19]. In the same study, one child had seven species of intestinal parasites and only A. lumbricoides infection was associated with F. hepatica among these different species of intestinal parasitis.

Radiological examinations are very useful in the diagnosis of fasciolasis. The movement of parasite in the gall bladder and liver lesions formed by the organism can be detected by ultrasonography. Although not specific, diagnostic ultrasonography findings of fasciolasis include heterogeneity of the liver by multip, scattered, poorly defined hypo-isoechoic lesions, periportal lymph node enlargement, dilatation of the common bile ducts or intrabiliary hiliar channels and thickening of the gallbladder and echogenic, non-shadowing multipl particles in the gallbladder or in the common bile ducts. Similarly, in studies of contrast-enhanced CT and MRI, specific views suggestive of fasciolasis can be detected[24,28]. While ultrasonographic images of our four patients were compatible with fasciolasis, two patients showed normal abdominal ultrasonography.

Triclabendazole at a dosage of 10 mg/kg per day, orally, is the most effective drug for treating liver fluke infections in both acute and chronic phases. The course of treatment should be repeated after a certain period. Metronidazole, chloroquine, praziquantel, albendazole, and bithionol are the alternative drugs for F. hepatica infection[29,31]. We treated our cases with triclabendazole with two cycle of treatments. This treatment was used in a patient after metronidazole therapy was unsuccessful. Albendazole and triclabendazol treatments were used together in one of patients. There was a complete response for all patients having received this treatment, whereas recurrence occurred in one patient due to triclabendazol resistance.

F. hepatica is not seen rarely, whereas this infection may be overlooked in Turkey. Fasciolasis is an important public health problem and should be considered in children with non-specific symptoms and significant eosinophilia. If the disease is suspected strongly, serological tests should also
be performed in cases with normal stool examination.

**Conflict of interest statement**

We declare that we have no conflict of interest.

**Comments**

**Background**

Fascioliasis is an important chronic parasitic disease localized at different localization of world and have wide spectrum of symptoms including fever, hepatomegaly, abdominal pain, eosinophilia, hemobilia, hepatic nodules, jaundice and angiocholitis.

**Research frontiers**

Studies are performed to estimate the prevalence of fascioliasis in Turkey and Asia. Challenging process of diagnosis and differential diagnosis became easier with the help of these studies.

**Related reports**

Several reports including patients with fascioliasis from Spain, France, Germany, Great Britain, Bolivia, Iran, Peru, Austria, Norway, United States, Portugal, China and Turkey were reported. The parasite has two hosts of intermediate and definitive hosts. Mammals like sheep, goats, and cattle are usually definitive hosts and infected by ingesting metacercaria form while human, the accidental host, get the disease by drinking contaminated water with metacercariae, eating watercress, lettuce or spinach plants, and using contaminated kitchenware.

**Innovations & breakthroughs**

This study had focused on fascioliasis and challenging process of diagnosis and differential diagnosis, since it has non–specific symptoms except significant eosinophilia.

**Applications**

The results of this research was applied in differential diagnosis.

**Peer review**

The authors reported their experience with the fascioliasis cases. The results of this article will lead the clinicians to consider fascioliasis for non–specific symptoms associated with eosinophilia.

**References**

[1] Marella A, De la Rubia JE, Sotillo J, Bernal D, Carmona C, Villavicencio Z, et al. Leucine aminopeptidase is an immunodominant antigen of Fasciola hepatica excretory and secretory products in human infections. Clin Vaccine Immunol 2008; 15: 95–100.

[2] Aksoy DY, Kerimoglu U, Oto A, Erguven S, Arslan S, Unal S, et al. Infection with Fasciola hepatica. Clin Microbiol Infect 2005; 11: 859–861.

[3] Mas–Coma S, Bargues MD, Valero MA. Fascioliasis and other plant–borne trematode zoonoses. Int J Parasitol 2005; 35: 1255–1278.

[4] Lim JH, Kim SY, Park CM. Parasitic diseases of the biliary tract. AJR Am J Roentgenol 2007; 188: 596–603.

[5] Andrews SJ. The life cycle of Fasciola hepatica. In: Dalton JP, editor. Fascioliasis. Wallingford: CAB International; 1999. p. 1–29.

[6] Arjona R, Riancho JA, Aguado JM, Salesa R, González–Macías J. Fascioliasis in developed countries: a review of classic and aberrant forms of the disease. Medicine 1995; 74: 13–23.

[7] Vercelli–Retta J, Lagios MD, Chandrasoma P. Fasciola hepatica and parasitic eosinophilic granuloma of the liver. Am J Surg Pathol 2002; 26: 1238.

[8] Zhou L, Luo L, You C, Wang B, Xu J, Liao L, et al. Multiple brain hemorrhages and hematomas associated with ectopic fascioliasis in brain and eye. Surg Neurol 2008; 69: 516–521.

[9] Almondras JM, Rivera MJ, Seijas MJ, Almen DJK. Hepatic fascioliasis in children: uncommon clinical manifestations. Arq Gastroenterol 1997; 34: 241–247.

[10] Rangheard AS, N’Senda P, Dahan H, Tubiana JM, Arrivé L. Peritoneal location of fascioliasis mimicking a peritoneal carcinomatosis. J Comput Assist Tomogr 1999; 23: 699–700.

[11] Molloy JB, Anderson GR. The distribution of Fasciola hepatica in Queensland, Australia, and the potential impact of introduced snail intermediate hosts. Vet Parasitol 2006; 137: 62–66.

[12] Maguire JH. Trematodes (schistosomes and other flukes). In: Mandell GL, Bennett JE, Dolin R, editors. Mandell, Douglas, and Bennett’s principles and practice of infectious diseases. 6th ed. Philadelphia: Churchill Livingstone; 2005. p. 3276–3285.

[13] Duan YL. Fasciola hepatica. In: Sun X, Li CP, Zhang JS, editors. Diseases of parasites: trematodiases. In: Meyers WM, Neafie RC, Marty AM, Wear DJ, editors. Pathology of infectious diseases. Washington DC: Armed Forces Institute of Pathology and American Registry of Pathology; 2000. p. 49–92.

[14] Valero MA, Santana M, Morales M, Hernandez M, Mas–Coma S. Risk of gallstone disease in advanced chronic phase of fascioliasis: an experimental study in a rat model. J Inf Dis 2003; 88: 787–793.

[15] Marcos LA, Maco V, Castillo M, Terashima A, Zerpa R, Go–tuzzo E. Reporte de casos de fascioliasis en el Instituto Especializado de Salud del Niño Lima–Perú (1988–2003). Rev Gastroenterol Peru
[18] Timoteo O, Maco V, Neyra V, Yi PJ, Leguia G, Espinoza JR. Characterization of the humoral immune response in alpacas (Lama pacos) experimentally infected with Fasciola hepatica against cysteine proteinases Fast and Fas2 and histo–pathological finding. Vet Immunol Immunopathol 2005; 106: 77–86.

[19] Marcos L, Maco V, Samalvides F, Terashima A, Espinoza JR, Gotuzzo E. Risk factors for Fasciola hepatica infection in children: a case–control study. Trans R Soc Trop Med Hyg 2006; 100: 158–166.

[20] Zhou L, Luo L, You C, Wang B, Xu J, Liao L, et al. Multiple brain hemorrhages and hematomas associated with ectopic fascioliasis in brain and eye. Surg Neurol 2008; 69: 516–521.

[21] Makay O, Gurcu B, Caliskan C, Nart D, Tuncyürek M, Korkut M. Ectopic fascioliasis mimicking a colon tumor. World J Gastroenterol 2007; 13: 2633–2635.

[22] Saba R, Korkmaz M, Inan D, Mamikoğlu L, Turhan O, Günseren F, et al. Human fascioliasis. Clin Microbiol Infect 2004; 10: 385–387.

[23] Apt W, Aguileria X, Vega F, Miranda C, Zulautay I, Perez C, et al. Treatment of human chronic fascioliasis with triclabendazole: drug efficacy and serologic response. Am J Trop Med Hyg 1995; 52: 532–535.

[24] Price TA, Tuazon CU, Simon GL. Fascioliasis: case reports and review. Clin Infect Dis 1993; 17: 426–430.

[25] Koe Z, Ulusan S, Tokmak N. Hepatobiliary fascioliasis: imaging characteristics with a new finding. Diagn Interv Radiol 2009; 15: 247–251.

[26] Lim JH, Kim SY, Park CM. Parasitic disease of the biliary tract. AJR Am J Roentgenol 2007; 188: 1596–1603.

[27] Han JK, Choi BI, Cho MJ, Han MC, Kim CW. Radiological findings of human fascioliasis. Abdom Imaging 1993; 18: 261–264.

[28] Kabaalioglu A, Cubuk M, Senol U, Gevikol C, Karaali K, Apaydin A, et al. Fascioliasis: US, CT, and MRI findings with new observations. Abdom Imaging 2000; 25: 400–404.

[29] Brennan GP, Fairweather I, Trudgett A, Hoey E, McCoy, McConville M, et al. Understanding triclabendazole resistance. Exp Mol Pathol 2007; 82: 104–109.

[30] Bulbuloglu E, Yuksel M, Bakaris S, Celik M, Kokoglu OF, Kale IT. Diagnosis of Fasciola hepatica cases in an operating room. Trop Doct 2007; 37: 50–52.

[31] Mansour–Ghanaei F, Shafaghi A, Fallah M. The effect of metronidazole in treating human fascioliasis. Med Sci Monit 2003; 9: 127–130.