HYPEREOSINOPHILIA AND LIVER MASS IN AN IMMIGRANT

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Abstract. Human infection with the sheep liver fluke Fasciola hepatica is a global zoonosis that usually parallels the prevalence of infection in sheep and other ruminants. The disease is endemic in South and Central America, Puerto Rico, the Caribbean region, many parts of Africa, Asia, the Middle East, Australia, and China. There have been a number of focal outbreaks reported from Europe, including southern France and the Mediterranean region. Since acute fascioliasis has rarely been reported in the United States, physicians in this country frequently overlook the diagnosis. Therefore, we report a case of acute human fascioliasis and review the pathogenesis, diagnosis, and treatment of this disease in a recently arrived immigrant.

CASE REPORT

A 26-year-old woman from the Dominican Republic was well on arrival in the United States in late February 1997. One month later she presented to a local hospital complaining of several hours of severe, sharp, right upper quadrant pain radiating to the right shoulder, with fever and chills. She denied a history of gallstones, jaundice, use of nonsteroidal anti-inflammatory drugs or oral contraceptives, urinary changes, or recent trauma. On admission to the hospital her temperature was normal, and she had mild right upper quadrant tenderness without hepatosplenomegaly or masses. A test result for β–human chorionic gonadotropin was negative, and she had peripheral eosinophilia (27%). An abdominal computed tomography (CT) scan with intravenous contrast demonstrated a $6.0 \times 5.0 \times 4.0$ cm complicated, heterogeneous, necrotic mass in the right lobe of the liver, which extended from the dome to the inferior border, and laterally to the capsule. The mass contained internal septations with surrounding parenchymal hemorrhage (Figure 1A). An IgG-enzyme immunoassay result for antibodies to *Echinococcus granulosus* was low positive.

The patient was then transferred to our institution for further management. She denied exposure to farm animals, dogs, or fresh water, but she had frequently eaten uncooked "berro" or watercress (*Nasturtium officinale*). Other family members were well. She had a temperature of 36.9°C, clear lungs, and no liver tenderness or hepatosplenomegaly. One week later her white blood cell was 16,800/mm³ with 5,200/mm³ eosinophils (31%). She had an alkaline phosphatase level of 124 U/liter, an alanine aminotransferase level of 32 U/liter, and a bilirubin level of 0.5 mg/dL. Review of the CT scan revealed the above noted findings, which were considered inconsistent with a hydatid cyst because of the absence of either a capsule or calcification, and the presence of hemorrhage within the cavity. A repeat CT was unchanged. Results of ameba serology and Western blot for echinococcus were negative, and stool specimens contained *Blastocystis hominis* and *Endolimax nana*. Serum tested negative for antibodies to *Fasciola hepatica* (Falcon assay screening test–enzyme-linked immunosorbent assay [FAST-ELISA]; Departamento de Patologia y Medicina de Laboratoria, Universidad de Puerto Rico, San Juan, PR). The following week, the eosinophilia count peaked at 7,000/mm³ (46%) and gradually decreased thereafter. Findings on magnetic resonance imaging were consistent with a ruptured hepatic hem-

angioma or adenoma; however, a tagged red blood cell scan ruled out the former. Indirect immunofluorescence (IIF) tests for antibodies to *Fasciola hepatica* performed on serum obtained one and two weeks after the negative FAST-ELISA result revealed increasing titers of 1:80 and 1:160, respectively (1:20 borderline positive; Laboratoire de Parasitologie-Mycologie, Groupe Hospitalier Cochin, Paris, France). The result of an immunoelectrophoresis test was also positive, showing three bands on the first serum and four bands on the latter one.

The patient was treated with a single dose (10 mg/kg , 700 mg) of triclabendazole (Fasinex®; Novartis, Basel, Switzerland). A CT scan 12 weeks later (Figure 1B) showed almost complete resolution of the lesion. Subsequent stool examinations remained negative for *F. hepatica* eggs up to 16 weeks after presentation. Her symptoms have not recurred and the eosinophilia and the other laboratory test results have returned to normal levels. One year later her eosinophil count was 200/mm³ and she remained well.

DISCUSSION

Acute fascioliasis is infrequently recognized in the United States because there are few diagnostic tests available and it is too early in the infection to find the characteristic eggs in the stool. In the present case, hypereosinophilia and a large necrotic hepatic lesion in a patient who frequently consumed fresh watercress were the major reasons to suspect the diagnosis. The history of ingestion of uncooked freshwater plants, especially watercress, is almost always obtained. On occasion, infection can occur by drinking untreated fresh water containing the infective larvae. Urticaria, which is frequently seen in acute fascioliasis, was not evident in this patient.

Mature flukes inhabit the biliary tree where they deposit unembryonated eggs. These immature eggs pass down the bile ducts into the duodenum and eventually to the environment with the feces. After 9–15 days, miracidia hatch and penetrate various species of lymnaeid snails, the first intermediate hosts. After 4–7 weeks, they leave the snail as free-swimming cercariae and either encyst on various aquatic plants or sink to the bottom, in either case, developing into metacercariae. Humans are infected by drinking contaminated fresh or field water, or by consuming uncooked aquatic plants, especially watercress (berro), algae (algas), tortora, and kjosco.[1] Metacercariae excyst in and then penetrate through the duodenal wall. Migrating in the peritoneum, the
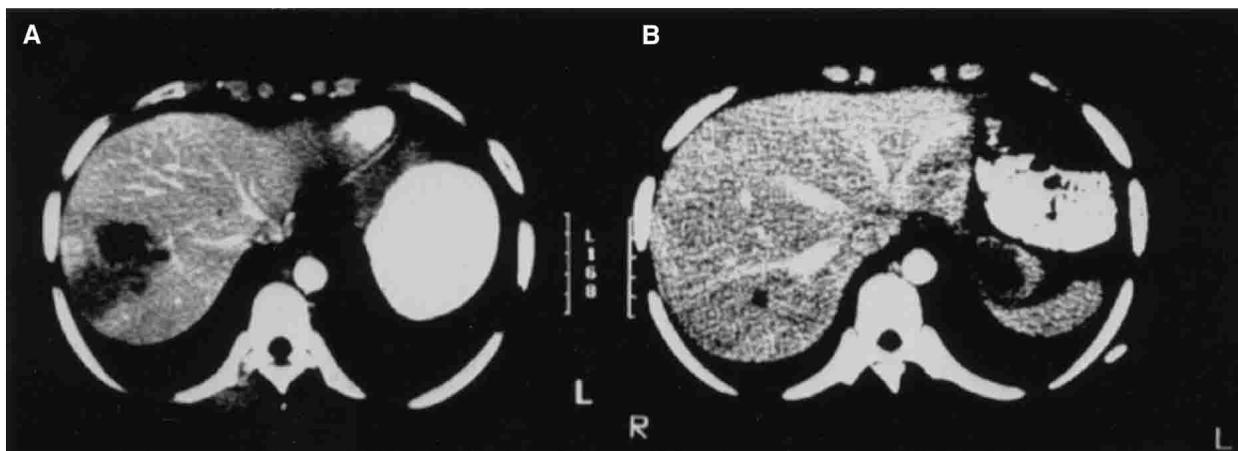
FIGURE 1.   **A**, Computed tomography scan of the patient at admission showing a large hypodense mass with internal septations and surrounding parenchymal hemorrhage, but no capsule or calcification. **B,** A follow-up scan 12 weeks later shows nearly complete resolution of the lesion.

invading immature flukes perforate Glisson's capsule and burrow through the parenchyma, causing focal hepatic necrosis and abscesses. They next invade the bile ducts, mature there in approximately 3–4 months, and initiate egg-laying, which may continue for many years. The presence of mature flukes in the bile ducts may provoke epithelial hyperplasia, desquamation, thickening, and dilatation. Heavy infection may cause extensive periductal fibrosis and hemobilia.

Acute fascioliasis may continue for several weeks to months and coincides with the migration of the larval flukes through the hepatic parenchyma. The acute symptoms subside soon after the larval flukes enter the bile ducts. Acute infection can be associated with mild to severe illness or may be asymptomatic.[1,2] This may be related to the number of invading larvae. The manifestations of acute infection include, anorexia, nausea, vomiting, fever, abdominal pain, (especially of the right hypochondrium), hepatomegaly, liver tenderness, urticaria, and hypereosinophilia; icterus is unusual. In chronic fascioliasis, most patients have few or no symptoms. However, a few patients may have right hypochondrium pain. If worms or eggs obstruct the extrahepatic biliary ducts, symptoms of choledocholithiasis may occur. Occasionally, the worms may invade the gallbladder and their presence may cause symptoms resembling cholelithiasis. Aberrant or ectopic sites of infection are common and include the heart, lungs, brain, skin, and intestinal wall, presenting as visceral larva migrans.

A definitive diagnosis of chronic fascioliasis can sometimes be made by finding characteristic eggs in feces, although this is not a sensitive method of detection.[1] Repeated stool examinations may be necessary to find eggs; most often, however, they are never demonstrated.[1] In acute fascioliasis, immature worms have not initiated ovipositing; therefore, stool examination is not helpful and, as in ectopic infections, serodiagnosis is required.

Serologic tests are essential to diagnose acute and chronic fascioliasis. These tests include the FAST-ELISA, an ELISA, indirect hemagglutination, complement fixation, IIF, counterelectrophoresis, and double diffusion.[1,3–5] Although these tests are quite sensitive, they may cross-react with other parasitic infections such as echinococcus and paragonimus.[1] In the present case, the patient initially was referred to our Tropical

Medicine Clinic for treatment of hydatid cyst disease when the serologic test result was interpreted at another institution as consistent with echinococcosis. The results of additional laboratory studies for fascioliasis, including the FAST-ELISA on serum obtained at admission, were negative. However, serum obtained one and two weeks later were strongly positive (IIF and immunoelectrophoresis). Recently, immunodiagnosis of human fascioliasis using cysteine proteinases (Fas1 and Fas2) as antigens was shown to be highly specific and sensitive.[6] Circulating *Fasciola* antigen has been detected in both serum and urine samples in patients by testing with monoclonal antibodies. The specificity of this assay was 100% and sensitivities were 98% and 97% for serum and urine, respectively.[7] An ELISA and micro-ELISA were used to detect antibodies to *Fasciola* in humans using excretory-secretory antigen. The sensitivity of each method was 100%; the specificity was 100% for the ELISA and 97% for the micro-ELISA.[8] These new diagnostic tests are promising advances in the reliable diagnosis of fascioliasis; however, they are currently not readily available.

Recently, triclabendazole (6-chloro-5-(2,3-dichlorophenoxy)-2-methyl thiobenizimidazole) has successfully (cure rate = 80–100%) eradicated acute and chronic fascioliasis in humans and various herbivores.[1,3,9] Praziquantel and bithionol (no longer available in the United States) are frequently ineffective.[1] The mechanism of action of triclabendazole has not been established. However, similar to other antihelmintic benzimidazole compounds, i.e., albendazole and mebendazole, it binds to tubulin. It is unclear if this is its major site of action. In this regard, it has been suggested that triclabendazole may inhibit protein synthesis in *Fasciola*. It is well tolerated and easily administered in one or two doses. Patients may develop mild right upper quadrant pain within 24–48 hours after administration, which is probably due to death of the fluke within the liver or bile ducts. Pharmacologic studies in humans suggest that significantly higher absorption of triclabendazole can be achieved if administered postprandially.[10] Recently, a new fasciolicidal agent derived from the stem of the *Commiphora molmol* tree proved effective in the treatment of *Fasciola*-infected humans; there were no reported adverse reactions to this agent.[11]

Individuals who have not been cured by oral drug therapy

have been treated successfully with endoscopic retrograde cholangiopancreatography and flushing of the biliary system with povidone iodide.[12] In this regard, there have been several reports of triclabendazole-resistant *Fasciola hepatica* in ruminants. Although not studied, it is possible that treatment failures in humans may have been due to resistance to triclabendazole.

Acute fascioliasis should be suspected in immigrant patients with marked eosinophilia, liver abscess, and a history of ingestion of uncooked watercress or other aquatic plants. Triclabendazole appears to be the primary drug for treatment of acute and chronic fascioliasis.

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REFERENCES

1. Arjona R, Riancho JA, Aguado JM, Salesa R, González-Macías J, 1995. Fascioliasis in developed countries: a review of classic and aberrant forms of the disease. *Medicine(Baltimore) 74:* 13–23.

2. Bjorland J, Bryan RT, Strauss W, Hillyer GV, McAuley JB, 1995. An outbreak of acute fasciolasis among aymara indians in the Bolivian altiplano. *Clin Infect Dis 21:* 1228–1233.

3. Apt W, Aguilera X, Vega F, Miranda C, Zulantay I, Perez C, Gabor M, Apt P, 1995. Treatment of human chronic fasciolasis with triclabendazole: drug efficacy and serologic response. *Am J Trop Med Hyg 52:* 532–534.

4. Hillyer GV, Soler de Galanes M, Rodriguez-Perez J, Bjorland J, Silva de Lagrava M, Ramirez Guzman S, Bryan RT, 1992. Use of the Falcon assay screening test-enzyme-linked immunosorbent assay (FAST-ELISA) and the enzyme-linked immuno-electrotransfer blot (EITB) to determine the prevalence of human fasciliasis in the Bolivian altiplano. *Am J Trop Med Hyg 46:* 603–609.

5. Wattre P, Capron M, Capron A, 1978. Le diagnostic immunologique de la distomatose à *Fasciola hepatica* (à propos de 105 observations). *Lille Med 23:* 292–296.

6. Cordova M, Reategui L, Espinoza JR, 1999. Immunodiagnosis of human fascioliasis with *Fasciola hepatica* cysteine proteinases. *Trans R Soc Trop Med Hyg 93:* 54–57.

7. Mansour WA, Kaddah MA, Shaker ZA, al Assal FM, Derbala MF, 1998. A monoclonal antibody diagnoses active *Fasciola infection* in humans. *J Egypt Soc Parasitol 28:* 711–727.

8. Carnevale S, Rodriguez MI, Santillan G, Labbe JH, Cabrera MG, Bellegarde EJ, Velasquez JN, Trgovcic JE, Guarnera EA, 2001. Immunodiagnosis of human fascioliasis by an enzyme-linked immunosorbent assay (ELISA) and a micro-ELISA. *Clin Diagn Lab Immunol 8:* 174–177.

9. Stitt AW, Fairweather I, Mackender RO, 1995. The effect of triclabendazole ("Fasinex") on protein synthesis by the liver fluke *Fasciola hepatica. Int J Parasitol 25:* 421–429.

10. Lecaillon JB, Godbillon J, Campestrini J, Naquira C, Miranda L, Pacheco R, Mull R, Poltera AA, 1998. Effect of food on the bioavailability of triclabendazole in patients with fasciliasis. *Br J Clin Pharmacol 45:* 601–604.

11. Massoud A, El Sisi S, Salama O, Massoud A, 2001. Preliminary study of therapeutic efficacy of a new fasciolicidal drug derived from *Commiphora molmol* (myrrh). *Am J Trop Med Hyg 65:* 96–99.

12. Dowidar N, El Sayad M, Osman M, Salem A, 1999. Endoscopic therapy of fascioliasis resistant to oral therapy. *Gastrointest Endosc 50:* 345–351.

13. Robinson MW, Trudgett A, Hoey EM, Fairweather I, 2002. Triclabendazole-resistant Fasciola hepatica: beta-tubulin and response to in vitro treatment with triclabendazole. *Parasitology* 124 pt 3): 325–338.

14. Mitchell GB, Maris L, Bonniwell MA, 1998. Triclabendazole-resistant liver fluke in Scottish sheep, *Vet Rec* 146:200.

15. Overend DJ, Bowen FL, 1995. Resistance of *Fasciola hepatica* to triclabendazole. *Aust Vet J* 72:275–276.