Serologic Findings in Hepatic Ascariasis: A Case Report

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NAGAKURA, K., TSUTSUMI, Y., MORIYA, H., NAKAZAKI, H. and KAWAI, K. Serologic Findings in Hepatic Ascariasis: A Case Report. Tohoku J. Exp. Med., 1992, 167 (2), 121-126 —— A 56-year-old Japanese woman underwent partial hepatectomy for intrahepatic cystic masses. Before operation, the patient had been diagnosed as liver abscess due to Ascaris infection serologically. The excised hepatic lesions consisted of encapsulated old abscesses, with a few calcified parasitic ova and numerous Charcot-Leiden’s crystals microscopically seen in necrotic exudate. However, no parasitic worms were found in the cystic cavity. The eggs in the tissues were indistinguishable from other helminthic ova morphologically, but stained positively for Ascaris antigens by the indirect immunoperoxidase method. The results indicate that the serologic diagnosis of intrahepatic ascariasis may be feasible, practical, and reliable. —— Ascaris lumbricoides; hepatic ascariasis; liver abscess; immunohistochemistry; serodiagnosis

The wanderlust and propensity for entering small orifices of Ascaris parasites are well known. Migration of adult worms through Vater’s ampulla often causes biliary obstruction and pancreatitis (Manson-Bahr and Bell 1987). In its invasion into hepatic biliary tract an adult worm carrying intestinal flora may reach the liver and cause an abscess there. Sporadic cases of such liver abscess are briefly mentioned in major textbooks of tropical medicine and parasitology (Beaver et al. 1984; Manson-Bahr and Bell 1987; Gutierrez 1990). Although there are many cases reported from various countries, no investigators have been able to diagnose it serologically. In this paper, we report a case of liver abscess caused by ascarides, in which the initial tentative diagnosis was confirmed by serologic data.

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Case Report

A 56-year-old Japanese female, a resident in a farm village in Akita Prefecture, underwent biliary tract surgery (choledocholithotomy) in 1986. In late 1989, about six months prior to the present admission, she began to complain of epigastralgia. In April 1990, multiple cystic masses in the left lobe of the liver were pinpointed. On admission (in May 1990), a mass with a diameter of 6.0 cm was palpable in the left hypochondrium. Ultrasonography and computed tomography revealed multiple low-density cystic lesions located in S3 position of the liver. Initial laboratory data were as follows: red blood cell count, \(4.15 \times 10^6/\text{mm}^3\); hemoglobin, 11.6 g/100 ml; hematocrit, 35.5%; leukocyte count, 9,600/mm³; eosinophils, 4.0%; platelet count, 2.7 \times 10^5/mm³; erythrocyte sedimentation rate, 60 mm/hr (normal range 1-15 mm/hr); and C-reactive protein (CRP), 1.29 mg/100 ml (<0.06 mg/100 ml). Serum gamma globulins registered 24.5% (9.3%-18.5%), with IgG and IgM levels being 2,190 mg/100 ml (1,110-1,820 mg/100 ml) and 247 mg/100 ml (50-180 mg/100 ml), respectively. The levels of IgA and IgE were within normal limits. The patient had a mild disturbance in liver function, with an elevated serum alkaline phosphatase activity of 369 U/liter (30–111 U/liter).

Stool examinations for ova and cysts of parasites, as well as perianal swabs for Enterobius, were negative. To confirm the parasitic infection on admission, the patient's serum was examined by several serologic tests. An indirect fluorescent antibody test for Entamoeba histolytica (Nagakura et al. 1989) was negative. Radioallergosorbent test (RAST)-IgE test for Ascaris was also negative. The enzyme-linked immunosorbent assay (ELISA) with a battery of helminthic antigens (Nagakura et al. 1990) confirmed the nematode infection but failed to distinguish between species because of a number of strong cross-reactions. In Ouchterlony's diffusion-in-gel tests (Nagakura et al. 1990), three bands

![Fig. 1. Ouchterlony’s precipitation patterns developed between the patient’s serum (center wells) and a battery of helminthic antigens with (right panel) and without (left panel) preabsorption of the serum with Ascaris antigens. CRP, anti-human CRP monoclonal antibody; Ev, adult worm extract (AEX) of Enterobius vermicularis as antigen; Tc, Toxocara canis (AEX); Fh, Fasciola hepatica (AEX); Em, Echinococcus multilocularis (hydatid cyst extracts); As, Ascaris lumbricoides suum (AEX).](image-url)
were developed between the patient's serum and the body fluid of *A. lumbricoides suum* (Fig. 1, left). These bands were much stronger than those formed with adult worm extracts (AEX) of *Enterobius vermicularis* or *Toxocara canis*. No bands developed to the antigens of *Fasciola hepatica* (AEX) or *Echinococcus multilocularis* (hydatid cyst extracts). The bands of precipitation between the patient's serum and the *Ascaris* antigens did not fuse with the single band observed between the patient's serum and anti-human CRP monoclonal antibody, indicating that they are not related. Absorption of the patient's serum with body fluid prepared from *A. lumbricoides suum* resulted in the complete loss of reactivity to the antigens (Fig. 1, right). When the patient's serum was preabsorbed with the antigens of *Enterobius, Dirofilaria* or *Toxocara*, the reactivity to *Ascaris* was not affected (data not shown).

Lateral segmentectomy of the liver was performed on June, 1990. The cut surface of the excised liver grossly showed multiple, irregular cavities surrounded by dense fibrosis. The lesions were located mainly in the caudal part of the liver beneath the capsule. The abscess contained necrotic debris and exudate. No parasitic worms and their debris were found. The abscess wall was composed histologically of fibrosing xanthogranulomas. In 2 of 12 sections prepared from the abscess, clusters of parasitic ova of relatively large size (65-85 μm in length and 30-64 μm in width), with globular embryoid components and calcified eggshells, were found in the necrotic exudate. The egg embryo was not segmented and differentiated. Foreign body giant cells, occasionally phagocytizing the shell of the eggs, were observed in the xanthogranulomatous lesions. While intact eosinophils were rarely observed, numerous Charcot-Leiden’s crystals were noted in the abscess, indicating a previous massive infiltration of eosinophils.

The morphologic identification of the eggs in sections was difficult because of their swollen, deformation and calcification. However, the eggs were tentatively identified as *Ascaris* on the basis of the immunohistochemical demonstration (Fig. 2). The egg embryo

![Fig. 2. Tissue section showing parasitic eggs scattered in necrotic exudate within the abscess. The eggshells are calcified. Hematoxylin-eosin stain, ×120. Inset: Indirect immunoperoxidase demonstration of *Ascaris* antigens within the eggs (counterstained with methyl green, ×120). The condition of indirect immunoperoxidase demonstration was in accordance to Ref. 13.](image-url)
was stained strongly when the patient's serum was used as the primary antibody in the indirect immunoperoxidase test (Tsutsumi et al. 1991). Positive reactions occurred only within the eggs, not on the eggshell. As additional controls, sections incubated with normal human serum diluted 1:100 did not stain. The positive reactions did not occur when the patient's serum was preabsorbed with the body fluid of *A. lumbricoides suum* (1:2), nor when peroxidase-labeled anti-human IgA, IgM or IgE were used as the secondary antibody instead of the anti-human IgG (data not shown).

The patient made an uneventful clinical recovery after partial hepatectomy.

**DISCUSSION**

Ascariasis is a common helminthic disease of the mankind, especially endemic in the tropic and subtropics. One quarter of the world's population are infected with this parasite, and result in the death of about 10,000 children a year (WHO, 1967; *Lancet* editorial, 1989). With such a large percentage of the population infected, the occurrence of extraintestinal migration of ascarides was frequent (Thein-Hlaing 1987); in some parts of the world, liver abscess caused by *Ascaris* is commoner than amoebic liver abscess (Manson-Bahr and Bell 1987). On the contrary, the rarity of *Ascaris* liver abscess attested to by a review of large numbers of surgical operations on the biliary system in Japan (Hsu 1962) and by a report on 788 cases over a five-year period in China (Chang Chin-Che 1967). In Japan, a high incidence of ascariasis (62.5%) was recorded during the years between 1945-1955 (Kobayashi 1990). Moreover, 24 cases of the liver abscess caused by the intestinal parasite were reported during the half century between 1899-1955 (Hashimoto 1954; Kadohashi 1958).

The definite identification of most cases in Japan has been performed by detection of parasitic eggs and/or worms or their debris in excised tissue after surgery or postmortem. When ascarides reaches into the liver through Vater’s ampulla, the worms die and are absorbed within a few days. The dead worm in the liver elicits the formation of a granuloma, with only eggs remaining (Gutierrez 1990). When an adult worm with intestinal flora reaches the liver, an abscess may be occur there. If a patient outlives it, the albuminous coat of eggs in the liver can be decorticated by foreign body giant cells, and the eggs were often deformed and calcified. Therefore, a definitive identification as *Ascaris* is possible only when the eggs and worm are found relatively intact and the typical ascarides debris was detected within the lesion (Beaver et al. 1984; Manson-Bahr and Bell 1987; Gutierrez 1990).

In some cases of ectopic liver lesions of *Ascaris*, supposedly caused by unmated female worms, only a few eggs containing unsegmented or undifferentiated embryos were observed in the lesion (Beaver et al. 1984). The unfertile eggs are larger (70 to 85 μm by 45 μm) than fertile ones, with a thin shell and irregular sharp. And the decorticated, deformed, and calcified eggs in the section were indistinguishable from that of fertile eggs of *Enterobius* and *Fasciola* (Gutierrez 1990). Thus, the present case seems due to the migration of unmated
Ascaris female(s) because a few eggs with a thin shell and unsegmented embryo has been detected.

According to the reviews published in Japanese of hepatic ascariasis (Hashimoto 1954; Kadohashi, 1958), 40% of defined cases of Ascaris liver lesions were caused by adult male worms. We have so far been able to find no reference written in the English on a case of liver abscess due to Ascaris male worm; the diagnosis in such case may be possible only when worm(s) are detected in the pathological specimen.

On the other hand, it is well known that there may not necessarily be any correlation between serologic reactions and the presence or absence of Ascaris eggs in the stool. In addition, antibodies to Ascaris often cross-react with antigens from other parasitic helminths. Therefore, serologic tests are supposedly of little help in the diagnosis of intestinal infestation by adult worms of Ascaris (Manson-Bahr and Bell 1987). As shown in Figs. 1 and 2, however, species-specific antibodies (IgG, but not IgE) reacting to Ascaris antigens were detected histochemically and serologically. To the best of our knowledge, the present report is the first case of liver abscess caused by Ascaris which was confirmed serologically.

Most of parasitic diseases caused by invasive helminths can be diagnosed by a battery of serologic tests. Of these serologic tests, Ouchterlony’s diffusion-in-gel test is the simplest method available. As previously demonstrated by Nagakura (1990), the conventional tests permitted a species-specific identification of Toxocara infection. The necessary materials cost little, and only a small amount of patient’s serum plus extracts from ascarids are needed for a reliable species-specific diagnosis. In the present case, the specific IgG antibodies reacting with Ascaris antigens was detected, and the immunoglobulin reacted strongly with Ascaris antigens regardless of gender; in Ouchterlony’s test, the positive reaction formed between the patient’s serum and body fluid prepared from adult male worms (Fig. 3). A precipitation line formed between the patient’s serum and adult female body fluid fused with major band occured between the serum and adult male

![Fig. 3. Ouchterlony’s precipitation patterns between the patient’s serum (center well) and Ascaris antigens. Ascaris female, body fluid separated from adult female worms of Ascaris lumbricoides suum; Ascaris male, body fluid separated from adult male of the same species. CRP, anti-human CRP.](attachment:image.png)
antigens, indicating the presence of antigenic epitope common between female and male. In addition, this is supported by the results from other serologic analyses including ELISA (data not shown). Thus, the serodiagnostic approach may be accurate in the case of ectopic liver migrations not only of *Ascaris* female, but unmated young female and male worms as well.

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**References**


