Letter to the Editor

Ultrasonographic and magnetic resonance imaging findings of hepatic ascariasis: a case description of an adult

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Submitted Sep 20, 2024. Accepted for publication Feb 04, 2025. Published online Feb 26, 2025.
doi: 10.21037/qims-24-1805
View this article at: https://dx.doi.org/10.21037/qims-24-1805

Introduction

The liver is one of the most commonly parasitized or invaded organs, with cases mainly occurring in regions and populations with poor health conditions (1). Parasites that parasitize or cause diseases in the liver include *Schistosoma*, *Clonorchis sinensis*, *Echinococcus granulosus*, etc. (2). *Ascaris* infection of the liver is rare, and there are even fewer imaging reports. Here, we report a case of an adult patient diagnosed by histopathological biopsy as having liver nodules caused by *Ascaris* egg infection. The ultrasonographic and magnetic resonance imaging (MRI) features of the nodules were compared with the pathological findings.

Case presentation

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this article and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

A 69-year-old male underwent an abdominal computed tomography (CT) scan at a local hospital due to pain and discomfort in the right upper abdomen for one month and a fever for one day. The CT showed that it was not inflammation of the biliary system because the gallbladder and common bile duct were normal. But the CT revealed a low-density nodule in segment VI of the liver with unknown properties. The patient then attended our outpatient clinic for hepatitis B virus (HBV) (–), tumor markers (–), liver and kidney function (–), and routine blood (–) examinations. MRI showed abnormal signals in segment VI of the liver, indicating a high possibility of inflammatory lesions. It was recommended that the patient be followed up after anti-inflammatory treatment. After 5 days of intravenous treatment with cefoperazone sodium and sulbactam sodium 2 g twice per day, the patient was given oral cefdinir capsules (100 mg) three times per day for one week. After the patient's symptoms improved, he returned to Tongde Hospital Affiliated to Zhejiang Chinese Medical University (Tongde Hospital of Zhejiang Province) for an ultrasound imaging review. The gray scale ultrasound (*Figure 1*) showed that the nodule on the patient's liver segment VI had not significantly shrunk. Furthermore, contrast-enhanced ultrasound (CEUS) using 2.4 mL of the contrast agent SonoVue showed relatively high enhancement in the arterial phase and relatively low enhancement in the portal vein and delayed phase (*Figure 1*). The ultrasound doctor recognized that both inflammatory and tumor lesions were possible. Subsequently, the patient was admitted for an ultrasound-guided core needle biopsy. The patient was a farmer who grew vegetables in the suburb of Mount Huangshan. He did not present with chest pain, nausea, vomiting, diarrhea, or yellow staining of the skin and sclera. He had a normal

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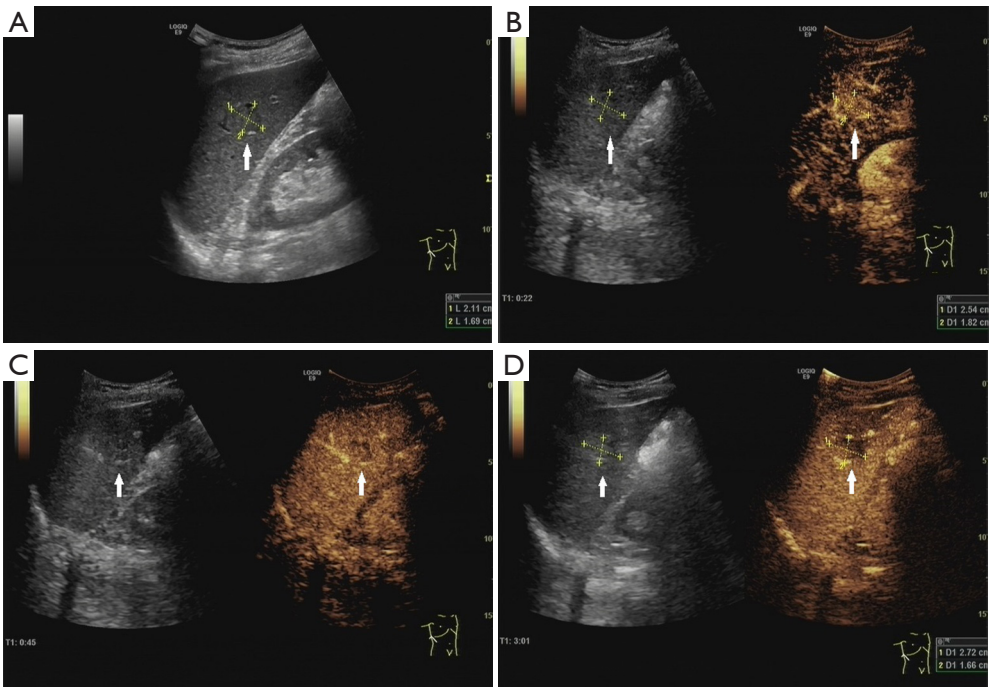

Figure 1 Ultrasonographic findings of this case. (A) Gray-scale ultrasound showed that the hypoechoic nodule in S6 segment of liver was about 2.1 cm ×1.7 cm in size, with unclear boundary and irregular shape (B) the nodule showed hyperenhancement in the arterial phase (22 s) of CEUS. (C) The nodule showed low enhancement in portal venous phase (45 s) of CEUS; hepatic vessels can be seen beside the nodule. (D) The nodule showed low enhancement in the delayed phase (181 s) of CEUS. The white arrows indicate the nodule in the liver. CEUS, contrast-enhanced ultrasound.

appetite and no obvious wasting, no chronic disease, and no history of contact with epidemic areas, industrial poisons, dust, or radioactive substances. A routine fecal examination showed *Ascaris* eggs under a microscope. Under ultrasound guidance, a core needle biopsy was performed on the right liver nodule. The biopsy pathology showed large areas of necrosis and eosinophils in the nodule, and calcified and necrotic parasitic eggs were visible. Combined with the patient's routine fecal examination, it was considered that the parasitic eggs were *Ascaris* eggs. The patient was ultimately diagnosed with an intrahepatic *Ascaris* egg infectious nodule. The patient was treated with albendazole tablets (400 mg) twice per day for 3 months. One year later, a follow-up ultrasound showed that the nodule on the liver was smaller.

Discussion

Ascaris lumbricoides is one of the common human parasites. About 700 million people worldwide are infected with *Ascaris* sp. (3). Ascariasis is one of the most important public health problems in China and even in developing countries around the world (4). Previously, the infestation rates in China, were very high; however, according to estimates published in 2015, this has decreased to 0.9% (5). *Ascaris* lumbricoides have incredible "resilience" and can thrive in various environments. Ascaris parasitized on humans can cause stomach pain, vomiting, diarrhea, appetite and weight loss, fever, fatigue and other symptoms (6). *Ascaris* infestation is mainly caused by accidental ingestion of eggs from contaminated soil, water, and food. The patient in this report was a farmer who had been exposed to soil for many years. He was most likely infected by accidental ingestion of *Ascaris* eggs through contaminated soil.

Migration to the liver combined with infection is a rare complication of ascariasis. It has been reported that when the infection focus is small, the symptoms are mild, but when the infection focus is large, the symptoms can include abdominal pain, liver abscess, liver hemorrhage, and even death (7-9). The infection foci of hepatic *Ascaris* are distributed in the intrahepatic portal vein and around the bile duct. Consistently, the intrahepatic nodule in this report was located near the right hepatic portal vein (*Figure 1*). This characteristic is mainly related to the way roundworm infects the liver. The main means

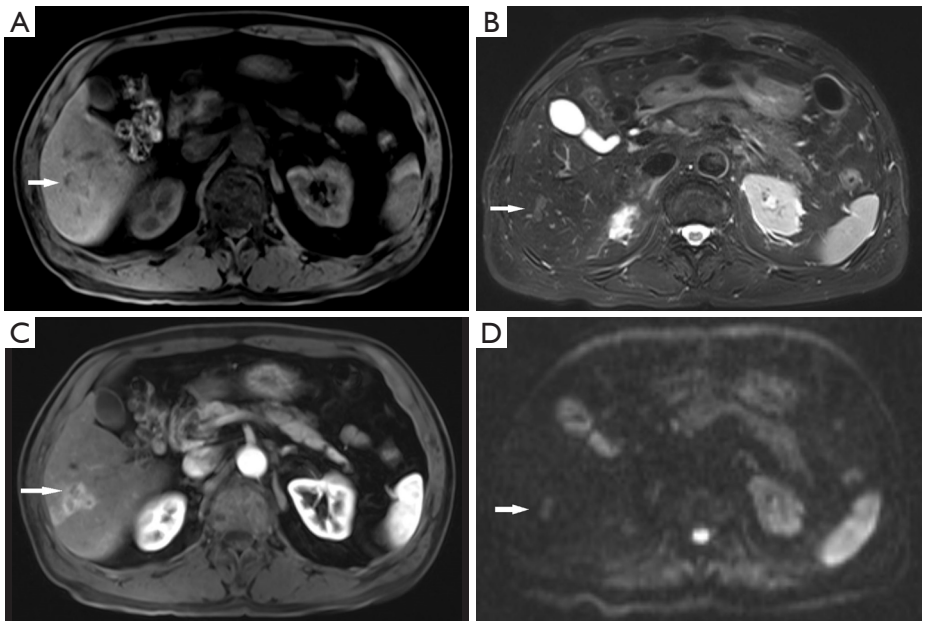

Figure 2 MRI of this case. (A) Irregular small patchy nodule can be seen in S6 segment of liver, showing low signal on T1WI. (B) Nodules showed equal-high mixed signal on T2WI. (C) In arterial phase, enhancement was seen at the edge of the nodule. (D) The nodule showed slightly higher signal on DWI weighted image with diffusion limitation. The white arrows indicate the nodule in the liver. DWI, diffusion-weighted imaging; MRI, magnetic resonance imaging; T1WI, T1-weighted imaging; T2WI, T2-weighted imaging.

of liver infection involves retrograde entry into the hepatic small bile duct or common bile duct through the ampulla of the duodenum followed by entry into the liver through the portal vein system to penetrate the Glisson sheath into the adjacent hepatic parenchyma, resulting in parasitism (10).

The liver damage caused by *Ascaris* infection includes mechanical damage and chemical stimulation damage. Pathologically, bleeding, necrosis, and liquefaction occur first, followed by inflammation. The pathological process is divided into three stages. In the early stage, eosinophils gather around the eggs, resulting in inflammation and necrosis. In this study, a varying number of foam cells and multinucleated giant cells were observed, and a small number of neutrophils, lymphocytes, and plasma cells could be seen. An eosinophilic abscess with a necrotic focus was formed after 16 hours. One week after the middle stage of the disease, a pseudotuberculous granuloma formed. Finally, cell atrophy and fibrosis occur in the latter stage, resulting in the formation of fibrous nodules, after which the healing stage begins (11). The biopsy and pathological sections of this case showed map-like areas of necrosis, with round necrotic calcified *Ascaris* eggs visible in the center of the necrotic area and more fibroblasts and eosinophils visible around the necrotic area. Based on this pathology, it was considered that the patient was in the early/middle stage of infection and had not entered the late stage yet. In different pathological stages of hepatic ascariasis, due to the different tissue components, the proportion of tissue cells also differs, and this inevitably leads to non-specific imaging findings.

There are few reports of liver infection caused by ascaris diagnosed by ultrasound imaging or MRI imaging. Lin *et al.* (12) reported that three cases of hepatic ascariasis showed heterogeneous hyperechoic masses in the liver with blurred boundaries, and slender cord-like hyperechoic bands were faintly visible in the masses. Gao *et al.* (13) reported that liver infectious lesions caused by foodborne parasites is generally characterized by low signal intensity on T1-weighted imaging (T1WI), and high signal intensity on T2-weighted imaging (T2WI) on MRI, and the low signal fiber ring at the edge of the focus has strong diagnostic characteristics on T2WI. In this case of hepatic ascariasis, the liver nodule showed an irregular low echo on gray scale ultrasound (*Figure 1*) and irregular low-density areas on CT, with no specificity. Hepatic CEUS showed relatively high enhancement in the arterial phase and relatively low enhancement in the portal vein and delayed phase (*Figure 1*). The hepatic MRI revealed a low signal on T1WI, an equal-high mixed signal on T2WI, a slightly high signal on diffusion-weighted imaging (DWI), and enhancement at the edge of the arterial phase (*Figure 2*). In

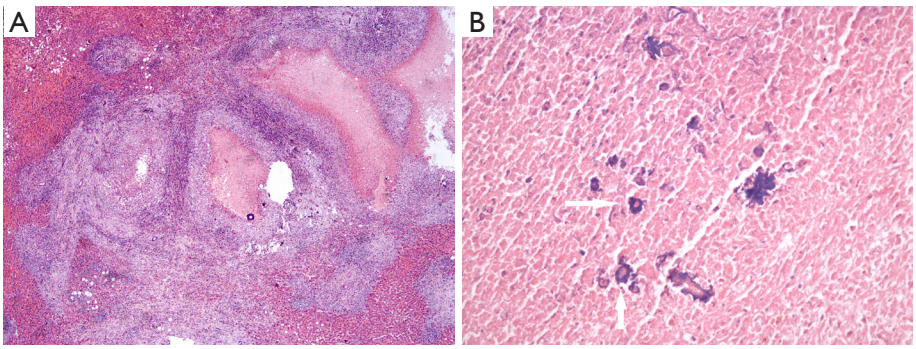

Figure 3 The pathological findings of this case. (A) The lesion showed map-like areas of necrosis, fibrous tissue hyperplasia and a large number of inflammatory cell infiltrations were seen around it, HE staining, ×40. (B) Round necrotic calcified *Ascaris* eggs can be seen in the center of the necrotic area, HE staining, ×200. The white arrows indicate the calcified *Ascaris* eggs. HE, hematoxylin-eosin.

this case, it was necessary to distinguish an *Ascaris* infection from an early bacterial hepatic abscess or liver cancer based on the CEUS and MRI findings. Ascaris lumbricoides, like other intestinal parasites, will also bring intestinal bacteria such as *Escherichia coli* into the liver during the process of worm migration through the intestine, which will work together with the worm itself to cause mixed infectious liver abscess in the liver and lead to fever and other symptoms. Compared with the mixed liver abscess caused by hepatic ascariasis, patients with a bacterial liver abscess often exhibit a high fever at the early stage, faster liquefication of the abscess to form a liver lesion, and more obvious blood inflammation indicators. The administration of commonly used antibacterial drugs can often inhibit the disease. Aside from the similar imaging features in this case of hepatic *Ascaris*, the inflammatory indicators of liver cancer are normal while the tumor indicators are elevated. Hepatic ascariasis is rare, and it is often not considered when making a diagnosis. The diagnosis requires a core needle histopathological biopsy or surgical histopathological removal and it can be made if the body of the *Ascaris* worm or eggs can be seen on the pathological section. The histopathological biopsy of the reported case showed multiple *Ascaris* eggs accompanied by calcification (*Figure 3*). Hepatic ascariasis is generally treated with medical deworming and the infection can be reduced after treatment.

Conclusions

This case offers a complete overview of hepatic ascariasis in an adult caused by *Ascaris* sp. infection. This report focuses on the ultrasonic and MRI findings with reference to the pathological stage of hepatic ascariasis in the hope that it can provide a reference for the daily work of imaging doctors.

Acknowledgments

None.

Footnote

Funding: None.

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://qims.amegroups.com/article/view/10.21037/qims-24-1805/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this article and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

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Cite this article as: Tian S, Hu J, Pan Q, Xu D. Ultrasonographic and magnetic resonance imaging findings of hepatic ascariasis: a case description of an adult. Quant Imaging Med Surg 2025;15(3):2666-2670. doi: 10.21037/qims-24-1805