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Hepatobiliary fascioliasis: imaging characteristics with a new finding

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PURPOSE
The aim of this study was to present the imaging characteristics of patients with hepatobiliary fascioliasis and describe a new imaging finding.

MATERIALS AND METHODS
Imaging and clinical findings of five patients diagnosed with hepatobiliary fascioliasis were retrospectively evaluated. All patients were examined by abdominal ultrasonography (US) and computed tomography (CT); two were additionally evaluated by abdominal magnetic resonance imaging (MRI), magnetic resonance cholangiopancreatography (MRCP), and endoscopic retrograde cholangiopancreatography (ERCP). Diagnosis was confirmed by serology and parasitology tests in all patients.

RESULTS
Presenting complaints were abdominal pain in four patients, with fever in one of the four. All patients also had eosinophilia and abnormal liver function tests. In all patients, US examinations showed multiple hypoechoic nodules or parenchyma heterogeneity. CT examinations showed linear or branching, and nodular hypodense lesions in the liver. As a new imaging finding, hyperdense materials were identified in the dilated bile duct in one patient. MRI showed T1 hypo and T2 hyperintense areas of liver parenchyma in two patients, with peripheral enhancement in one of them. Filling defects and dilation of the intra-extrahepatic bile ducts were identified by US and MRCP in two patients. In these two patients *Fasciola* flukes were removed by ERCP. Medical treatment (triclabendazole) was successful in all patients.

CONCLUSION
Hepatobiliary fascioliasis is a rare disease which may have typical imaging findings in the liver and bile ducts as seen in our patients. Imaging characteristics with clinical findings may have a diagnostic clue especially in endemic areas.

Key words: • *fascioliasis* • *liver* • *ultrasonography* • *computed tomography* • *magnetic resonance imaging*

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Hepatobiliary fascioliasis is a parasitic infestation caused by the trematode *Fasciola hepatica*. There has been an increase in human fascioliasis worldwide in the last decade (1). Increased availability of cross-sectional imaging methods and awareness of the important role of imaging in diagnosis helped to reveal that fascioliasis is endemic in some parts of Central and South America, and some countries in the Mediterranean and Southeastern Asia (2, 3).

The main sources of infestation are contaminated water, watercress or other aquatic plants (3, 4). Humans are accidental hosts. Ingested infective form metacercaria excyst in the intestine, penetrate the bowel wall, enter the peritoneum and then pass through the liver capsule to enter the biliary tree (5). Human fascioliasis has two phases. The hepatic phase of the disease begins one to three months after ingestion of metacercariae, with penetration and migration through the liver parenchyma toward the biliary ducts. Common signs and symptoms of the hepatic phase are urticaria, right upper quadrant pain, fever, hepatomegaly, and marked eosinophilia. Mild hepatitis, subcapsular hemorrhage, and hepatic necrosis can also be detected. The biliary phase usually presents with intermittent right upper quadrant pain, with or without cholangitis or cholestasis (5–7).

In nonendemic areas, diagnosis can be difficult and usually delayed because of fascioliasis is not often encountered and symptoms may be confused with other hepatic or biliary disorders (3, 7). Radiologic findings are specific and helpful in the diagnosis of fascioliasis. Confirmation of the diagnosis is necessary and should be based on serology and parasitology tests (2, 3). Triclabendazole and bithionol are effective agents for treatment of fascioliasis (4).

The aim of this study was to present the ultrasonography (US), computed tomography (CT), and magnetic resonance imaging (MRI) findings of five cases with fascioliasis and present a CT finding not previously reported.

Materials and methods

Imaging and clinical findings of five patients diagnosed with hepatic fascioliasis in our hospital between 2003 and 2007 were retrospectively evaluated. The patients included three women and two men, with an age range of 40–63 years (mean ± SD, 55 ± 8.8 years). The study was approved by the institutional review board.

All the CT scans were obtained using a 4-channel multislice CT scanner (Sensation 4, Siemens Medical Solutions, Erlangen, Germany). US examinations were performed with a sonoline Antares ultrasound scanner and a 2–5 MHz linear-array transducer (Siemens Medical Solutions, Erlangen, Germany). MR imagings were obtained using a 1.5 T MR unit (Avanto, Siemens Medical Solutions, Erlangen, Germany). All CT and MR images

of each patient were analyzed by one radiologist with seven years of experience in abdominal radiology. All five patients were examined by abdominal US and CT; two were additionally evaluated by MRI and MR cholangiopancreatography (MRCP). In two patients, adult *Fasciola* flukes were removed by endoscopic retrograde cholangiopancreatography (ERCP). Hematological and liver function tests were performed in all patients. Diagnosis was confirmed in all patients by serologic methods using enzyme-linked immunosorbent assay (ELISA). Diagnosis was also confirmed by parasitological examination of removed parasites in two patients.

Results

Presenting complaints were abdominal pain in four patients; one of these patients also had fever. One patient was asymptomatic, and common bile duct (CBD) dilation was found incidentally during routine abdominal US control for operated breast carcinoma. All patients also had eosinophilia, abnormal liver function tests, and positive serological test for *Fasciola hepatica*. Imaging findings of the patients are summarized in Table. US examination showed multiple hypoechoic nodules (n = 3) and heterogeneity in the liver parenchyma (n = 1) in four patients. Extrahepatic (n = 2) and intrahepatic (n = 1) bile duct dilation were identified on US examination in two patients.

CT examinations showed multiple hypodense linear or branching lesions and multiple hypodense nodular nonenhancing lesions with different size in the liver parenchyma in four patients (Figs. 1, 2). Lesions tended to be subcapsular–peripheral in location. Typical lesions of the liver parenchyma were best identified on portal venous phase. Two patients had periportal (n = 2) and peridiaphragmatic (n = 1) lymph node enlargements. One of these two patients had also capsular enhancement of the liver and anterior perihepatic fat tissue involvement (Figs. 3a, b). Mild hyperdense materials in the dilated intrahepatic bile duct (Fig. 4a), and thickening and enhancement of the gallbladder wall in the equilibrium phase on enhanced CT (Fig. 4b) were identified in one patient.

MRI examinations showed ill-defined slightly hyperintense areas on T2-weighted images in the liver parenchyma in 2 patients. T2 hyperintense and T1 hypointense multiple nodules with no enhancement, and T2 hyperintense and T1 hypointense lesion with peripheral enhancement were identified in one (same) patient. (Figs. 2b, c). Filling defects and dilation of the intrahepatic and extrahepatic bile ducts were identified by MRI and MRCP (Figs. 4c, d) and ERCP examinations in two patients. *Fasciola hepatica* flukes were removed by ERCP in these two patients. Presumptive diagnosis of three patients with fascioliasis (patients 2, 3, and 4) was established by imaging findings. Tru-cut liver biopsy was carried out in one patient (patient 1) from a peripheral enhanced nodular lesion. The microscopic examination of the biopsy materials was consistent with eosinophilic abscess, granulomatous hepatitis, cholestasis, and congestion. US and CT findings were suggestive for pericholangitic abscess in one patient (patient 5) with irregular hypoechoic and hypodense areas in the left lobe of the liver. Medical treatment (triclabendazole, 10 mg/kg for 2 days) was successful after removing the *Fasciola he-*

Table. Imaging findings of five patients with hepatobiliary fascioliasis

		Patient #				
Method	Imaging findings	1	2	3	4	5
US	Multiple hypoechoic nodules	+	+	–	+	+
	Heterogenity of the liver parenchyma	–	–	–	+	–
	IHBD or CBD dilatation	–	+	+	–	–
CT	Multiple, hypodense, linear or branching lesions	–	–	–	+	+
	Multiple hypodense nodular lesions	+	+	–	+	+
	Hyperdense lesion	–	+	–	–	–
	Gallbladder wall thickening and enhancement	–	+	–	–	–
	Periportal lymph node enlargement	–	–	–	+	+
	Capsular enhancement of the liver	–	–	–	–	+
	Perihepatic fluid	–	–	–	–	+
MRI	T2 hyper / T1 hypointense liver capsule with enhancement	–	–	NP	NP	NP
	Ill defined slightly hyperintense areas on T2	+	+	NP	NP	NP
	T2 hyper / T1 hypointense nodules, no enhancement	+	–	NP	NP	NP
	T2 hyper / T1 hypointense lesion with peripheral enhancement	+	–	NP	NP	NP
MRCP	IHBD or CBD dilatation	–	+	NP	NP	NP
	Filling defect in bile duct	–	+	NP	NP	NP

US, ultrasonography; CT, computed tomography; MRI, magnetic resonance imaging; MRCP, magnetic resonance cholangiopancreatography; NP, not performed; CBD, common bile duct; IHBD, intrahepatic biliary duct; (+), present; (–), absent.

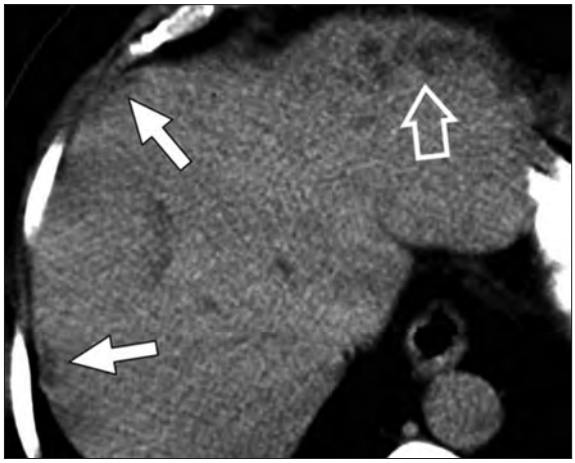

Figure 1. Patient 4: a 56-year-old man who presented with right upper abdominal pain and fever 15 days after a trip to Africa. Non-enhanced CT image shows linear *(arrows)* and branching *(open arrow)* hypodense lesions of the liver parenchyma subcapsular-peripheral in distribution.

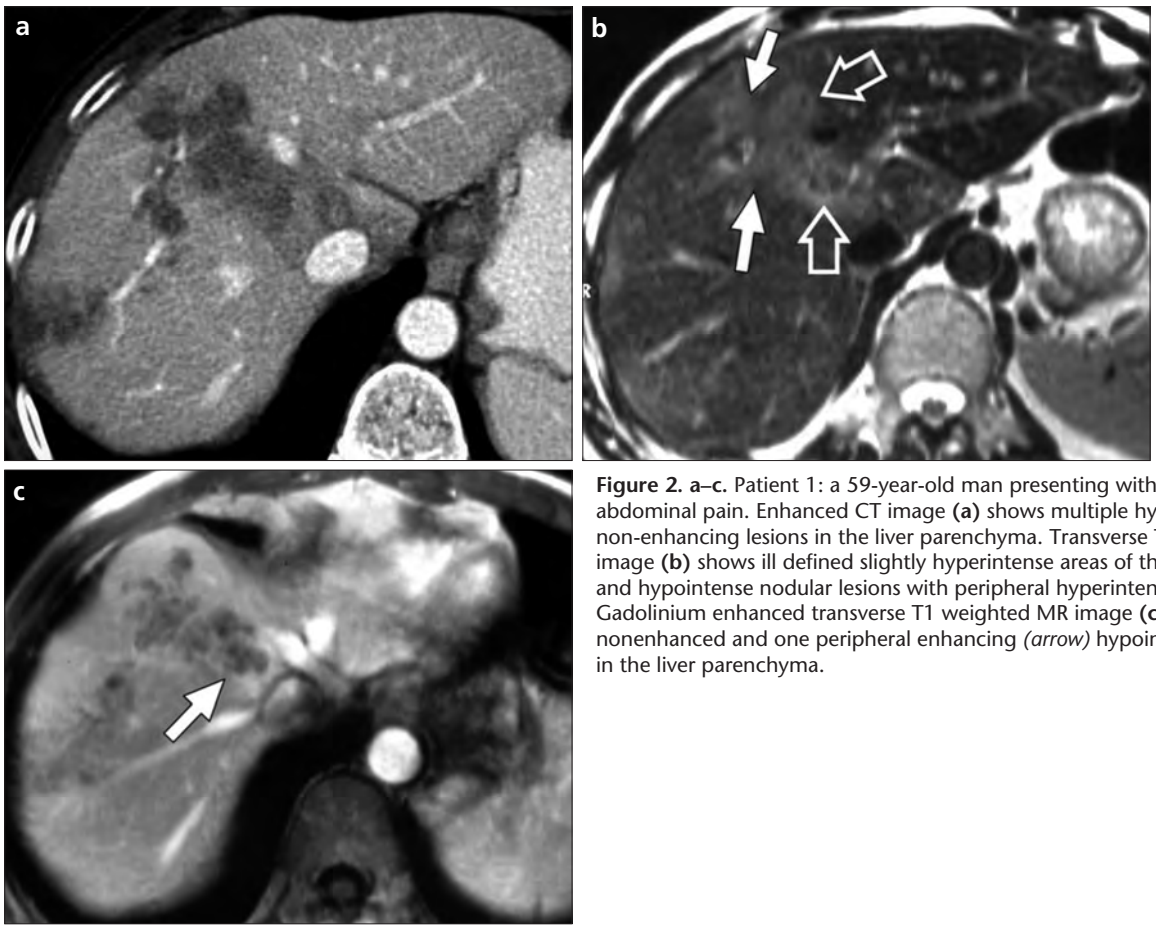

Figure 2. a–c. Patient 1: a 59-year-old man presenting with right upper abdominal pain. Enhanced CT image **(a)** shows multiple hypodense nodular non-enhancing lesions in the liver parenchyma. Transverse T2 weighted MR image **(b)** shows ill defined slightly hyperintense areas of the liver *(arrows)*, and hypointense nodular lesions with peripheral hyperintensity *(open arrows)*. Gadolinium enhanced transverse T1 weighted MR image **(c)** shows mostly nonenhanced and one peripheral enhancing *(arrow)* hypointense nodular lesions in the liver parenchyma.

patica flukes by ERCP in two patients, and without intervention in the other three patients. Follow-up imaging studies were performed 4–29 months (15.2 ± 10.6 months) after the initial examination in all patients as follows: US in three patients; US and CT in one patient; and US, CT, and MRI in one patient. Clinical and radiological improvements were demonstrated in all patients after treatment.

Discussion

The present study revealed that the most frequently seen imaging findings of hepatobiliary fascioliasis were multiple nodular lesions of the liver parenchyma which were hypoechoic on US, hypodense on CT and T2 hyper- and T1 hypointense on MRI (Table). Dilations and filling defects in the bile ducts were seen in patients presenting with the biliary phase of the disease. In one patient, mild hyperdense materials were identified in the dilated bile duct as a new imaging finding. In hepatobiliary fascioliasis, migration of the parasite from the liver parenchyma to the biliary duct can result in subcapsular hemorrhage in the liver parenchyma (8, 9). Wedge-shaped hemorrhagic infarction in the periphery of the liver was reported as a result of an experimental study on hepatobiliary fascioliasis (10).

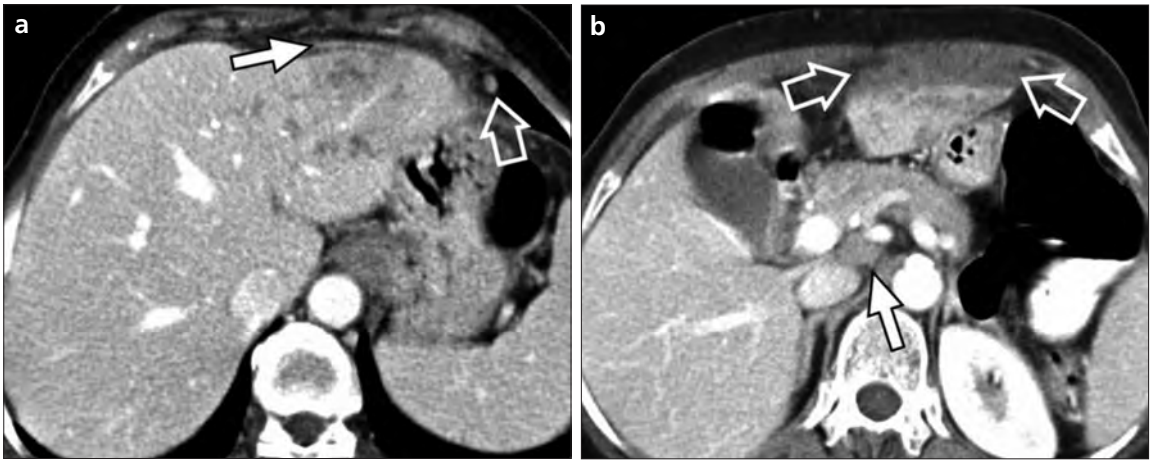

Figure 3. a, b. Patient 5: a 63-year-old woman presenting with right upper abdominal pain and fever. Enhanced CT images **(a, b)** obtained during portal venous phase showed irregular linear and nonenhancing hypodense nodular lesions in the liver left lobe, capsular enhancement **(***arrow,* **a)**, and peridiaphragmatic lymph node enlargement **(***open arrow,* **a)**. Perihepatic fat tissue involvement **(***open arrows,* **b)** and periportal lymph node enlargement **(***arrow,* **b)** are also seen.

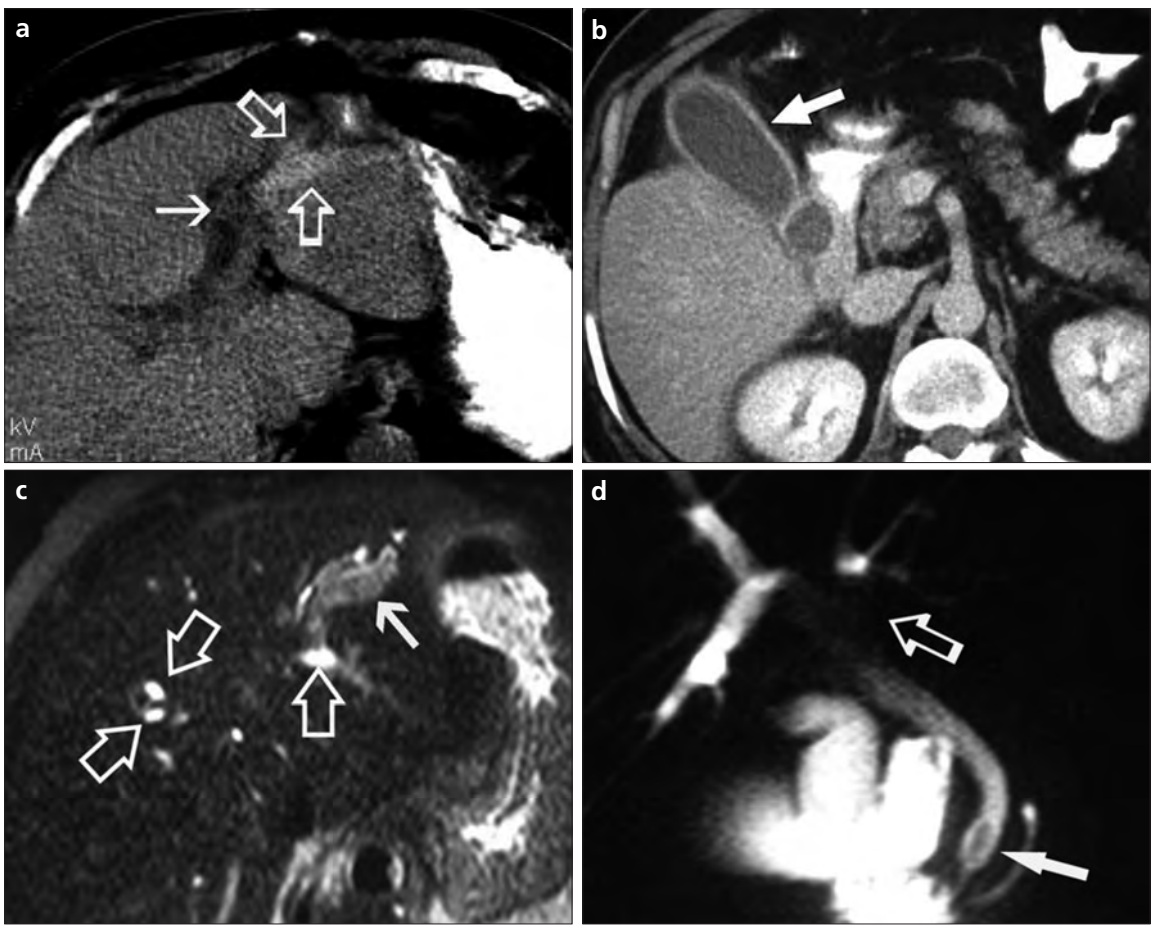

Figure 4. a–d. Patient 2: a 57-year-old man. Non-enhanced curved-planar reformatted CT image **(a)** shows mild hypodense material in the dilated left intrahepatic bile duct *(arrow)* and hyperdense areas compatible with hematoma in the proximal left intrahepatic bile ducts *(open arrows)*. Enhanced CT obtained at equilibrium phase **(b)** shows thickening and enhancement of the gallbladder wall *(arrow)*. Transverse T2 weighted MR image **(c)** obtained at the same level with **(a)**, shows that this lesion is hyperintense and located in the dilated left intrahepatic bile duct *(arrow)*. Mild dilation of the intrahepatic bile ducts *(open arrows)* is also seen. MRCP image **(d)** shows mild dilation of the intrahepatic bile ducts and common bile duct (11 mm), and shows complete filling defect in the left intrahepatic bile duct *(open arrow)*. Second filling defect with mild hypointense signal is seen in the distal common bile duct *(arrow)*.

In the biliary phase of the disease, ductal changes are observed predominantly in the central bile ducts (10). Adult parasites usually cause biliary epithelial hyperplasia and hypertrophy, resulting in thickening of the duct walls and periductal fibrosis (11). This finding is best observed on US as thickening of the biliary duct walls. Enhancement of biliary duct walls may be observed also on CT (3). Thickening and enhancement of the gallbladder wall may be seen as in our one case (12). Bile duct dilation may be seen related to the obstruction, as in our two cases. In one of these patients, a linear filling defect was seen in the CBD. Rarely a large cavitary lesion can be seen and may be as a result of reinvasion of the hepatic parenchyma by an adult worm and rupture of the bile duct (10). As a rare complication of fascioliasis, acute hemobilia related to the bleeding ulcer in the common bile duct may be seen (13, 14). A similar mechanism may affect intrahepatic bile ducts, and we thought that intrahepatic bile duct dilation and hyperdensity on CT seen in one of our cases were compatible with local obstruction and acute hematoma. Hemobilia associated with biliary fascioliasis has been reported (13), but, to the best of our knowledge, our case (patient 2) is the first reported CT demonstration of hyperdense material compatible with acute hematoma in the intrahepatic bile duct.

The US, CT, and MRI findings of fascioliasis have been described and classified (3, 12, 13). The most common imaging findings of fascioliasis are multiple small nodular and branching linear lesions—frequently in the subcapsular areas of the liver parenchyma—that appear hypoechoic on US, hypodense on CT, and T1 hypointense and T2 hyperintense on MRI (4). Perihepatic-periportal lymph node enlargement is not a rare finding and can be seen by US and CT (3, 12). Rare imaging findings include dilation or wall thickening of biliary ducts on US, and CT or MRI evidence of enhancement, peripheral parenchyma enhancement of the nodular lesion, and involvement of the perihepatic tissues. MRI reveals findings similar to those seen on CT, with isointense or hypointense lesions on T1-weighted images, and isointense or hyperintense lesions with surrounding hyperintensity on T2-weighted images. MRI is helpful for determining the phase and activity of the disease and demonstrates various suggestive changes associated with traumatic hepatitis caused by the migration of the worm in the liver (15).

Diagnosis of the fascioliasis requires a high index of suspicion (15). Clinical suspicion of this disease may arise in patients complaining of right upper abdominal pain, fever, and jaundice. Some cases may remain asymptomatic and be discovered incidentally (3). The diagnosis is often difficult because many diseases must be included in the differential diagnosis. Similar abnormal US and CT findings may represent sclerosing cholangitis, liver abscess, malignancy, cholecystitis, ruptured hydatid cyst, and parasites such as ascariasis and clonorchiasis (4). In the presence of the eosinophilia or clinical suspicion of the fascioliasis, imaging findings may suggest the diagnosis; however, positive serology results or parasitology tests are required for diagnosis. CT is most useful imaging method for the hepatic phase, and US is more useful in the biliary stage of the disease (6, 16). CT and US are not only useful for confirmation of diagnosis but also helpful in follow-up to evaluate the efficacy of medical therapy.

In conclusion, hepatobiliary fascioliasis is a rare disease that may have typical imaging findings in the liver, bile ducts and gallbladder as seen in our patients. In the presence of eosinophilia and abnormal liver function tests in patients with or without right upper abdominal pain, typical lesions in the liver parenchyma or biliary tree may provide a diagnostic clue, especially in endemic areas.

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