HEPATOBILIARY IMAGING FINDINGS OF HUMAN PARASITIC INFECTIONS : A CASE REPORT

Thang Le Tran[1], Long Hoang Manh[1], Anh Le Xuan[1], Thach Pham Ngoc[1]

Summary

Parasitic infections due to protozoa and helminths are responsible for substantial morbidity and mortality wordwide. In recent decades the number of human parasitic infections were recognized significantly in Viet Nam. These diseases are increasing seem to be involved in poor sanitation, dietery habits, global climate changes and pathogens. Most of damaged organs were brain, liver, gallblader, biliary tract, lung, skin… but impacted on hepatobiliary system, with more severe complications. Radiological image findings can demonstrate characteristic changes and assist in the diagnosis of parasitic infections.

Keywords: *Parasitic, Fascioliasis, hepatobiliary imaging, amoebic abscess, hydatid disease.*

BACKGROUND

Human parasitic infections are a group of communicable diseases that prevail in tropical and subtropical regions. They are caused by a variety of pathogens, such as protozoa and helminths. They are prevalent in Central and South America, Africa and Asia1. Diagnosis of these infections are difficult, as the history and symptoms are nonspecific until the disease is in an advanced stage by when the parasite has reached the hepatobiliary system. Therefore, familiarity with the multimodality imaging features of lesions, in combination with an available confirmatory enzyme-linked immunoassay (ELISA), would be most helpful for early diagnosis. It is important to differentiate parasitic infection lesions from other hepatobiliary tract lesions by imaging. We present a case report of Fascioliasis and the characteristic findings of hepatobiliary imaging by Ultrasound, CT, MRI images of several parasitic infections.

1: National Hospital for Tropical Diseases

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Responsibility for the scientific content of article: *Thang Le Tran, National Hospital for Tropical Diseases*

Tel: 0912373287. E-mail: lethangmed@gmail.com

CASE PRESENTATION

Patient N.T.L was a healthy 59-year-old female who one month previously presented with intermittent fever, chills, fatigue with right upper quadrant pain, vomiting… She was treated in local hospital and that gradually resolved over 7 days, symptoms disappeared. The patient recovered but after one week, she was fever and abdominal pain again. She was admitted to the our hospital in August, 2022 for a presumed liver abscess. For many year she often eat raw vegetables. Examination showed minimal right quadrant discomfort, and was otherwise unremarkable. Investigation revealed Eosinophilia, which peaked at 43.4%. An abdominal ultrasound showed increased heterogeneous echogenicity of liver parenchyma in right lobe. A three phase abdomen CT showed ill-defined areas of hypodense and heterogeneous enhancement of the liver right lobe (Figure 1). Fasciola serologies at presentation by enzyme-linked immunosorbent assay (ELISA) were the positive at 1.789. And fascioliasis was considered a diagnosis. She was treated with cefoperazone and metronidazole, with a subsequent change to triclabendazole (Deworm), albendazol. The patient recovered and eosinophil count declined at 35.8%. After two weeks, the patient remain in good health and she was discharged from hospital.

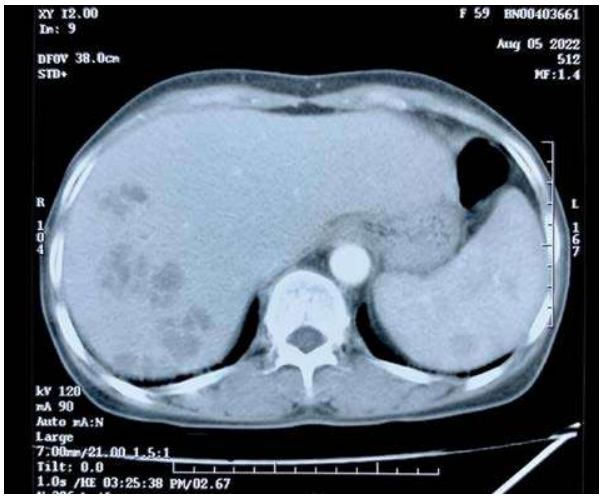

Figure 1. Enhanced CT images obtained during portal venous phase showed irregular contour and nonenhancing hypodense lesions in the liver right lobe

DISCUSSION

Fascioliasis is a trematode zoonosis, caused by Fasciola hepatica and Fasciola gigantica. Parasites infect herbivores, but also occurs in human who ingest the metacercaria found in freshwater plants. Infection in human is common in developing countries (South America, Africa, Asia). Vietnam is officially recognized as a country where Fasciola infection is endemic. Most human cases have been reported from Binh Dinh, Phu Yen, and Khanh Hoa provinces in Central Vietnam[1].

Clinical suspicion of fascioliasis disease may arise in patients complaining of right upper abdominal pain, fever, fatigue, dyspepsia, jaundice and skin rashes. The clinical fascioliasis course consists of two phases: First a hepatic parenchymal phase in which immature larvae invade the liver parenchyma, followed by a ductal phase characterized by the excretion of larvae into the bile duct[2].

Ultrasonography (US) findings include focal hypoechoic or hyperechoic lesions or diffuse involvement of the liver. In serious infection, multiple small hypoechoic nodular and branching linear lesions with irregular distribution in the subcapular areas of the liver parenchyma can be observed. Ductal ectasia may be observed with the duct wall thickening and periductal fibrosis, followed by an increase in biliary dilatation and tortuousness of the intrahepatic ducts[2].

Computed tomography (CT) findings in the parenchymal phase of hepatic fascioliasis include multiple, small, round clustered hypodense lesions, with peripheral contrast enhancement. Hypodense nodular lesions arise in the subcapsular area after ingestion of the metacercariae, progressing to tortuous, clustered lesions. Focal liver capsule thickening and enhancement can be demonstrated on CT images, secondary to penetration of the parasites into the Glisson capsule (Figure 2).

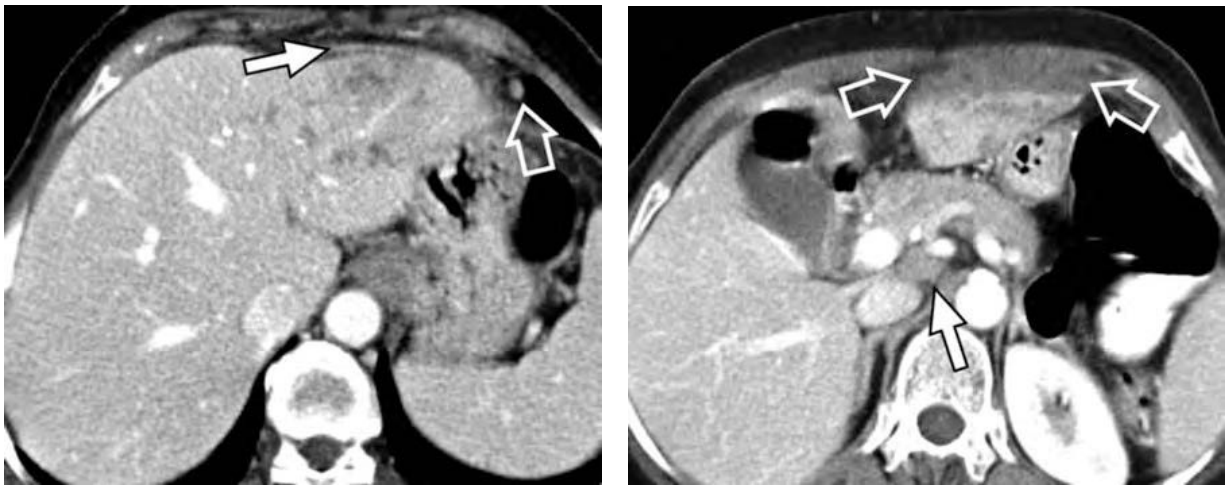

Figure 2. Patient is presenting with right upper abdominal pain and fever. Enhanced CT images obtained during portal venous phase showed irregular linear and nonenhancing hypodense nodular lesions in the liver left lobe, capsular enhancement[2]

Magnetic Resonance imaging (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. Parenchymal clustered lesions show hypointensity on T1W images, hyperintensity on T2W with peripheral enhancement after contrast administration[2].

Complications of Fasciola hepatica infections include acute cholangitis, cholecystitis, unilocular or multifocal abscesses. Acute cholangitis, with hepatic abscess formation, may also show nodular hypoattenuating lesions and branch formations. Parenchymal invasion of F. hepatica may result in unilocular or multifocal abscess formations that appear as hypodense fluid collections, with the capsule formation mimicking pyogenic abscess on CT images. F. hepatica abscesses may have hyperdense content, possibly due to pus or hemorrhage. Acute cholecystitis also can be seen as gallblader dilatation with irregular wall thickness and enhancement on CT images[2]. Other complications are subcapsular hematoma, hemorrhage, pseudo-aneurysm. Subcapsular hematoma in the liver is a rare complication of the hepatic migration of flukes during the hepatic phase. The association of a subcapsular hematoma or pseudo-aneurysm of the liver with eosinophilia suggests either polyarteritis nodosa or invasive hepatic fascioliasis. On rare occasions, the bleeding may be life-threatening because of its severity[2].

Some cases of fascioliasis may remain asymptomatic and be discovered incidentally2. In our patient case, the presence of the Eosinophilia, clinical suspicion of the fascioliasis, imaging findings suggested the diagnosis and positive serology test results are required for confirmed diagnosis. Eosinophilia are common feature in parasitic infections but after receiving treatment, eosinophil count still had residual in the serum for months later. An enzyme immunoassay has a reported sensitivity of 99% and specificity higher than 90% in patients with hepatic abscess. However, the presence of antibodies may reflect prior infection, and interpretation can be difficult in endemic areas. Patients with negative results by ELISA do not reflect the possibility of parasitic infection due to recently infection, chronic exposure or patients with poor immune responses[3,6]. Therefore US, CT and MRI images with characteristic features are useful in aiding diagnosis.

The diagnosis of fascioliasis is often difficult because many other parasitic infections must be included in the differential diagnosis:

Clonorchiasis, Opisthorchiasis. In Vietnam Clonorchiasis, Opisthorchiasis caused by Clonorchis sinensis or Opisthorchis viverrini, which reside in human biliary tract. Ultrasound findings of Clonorchiasis include diffusely dilated intrahepatic ducts, bile duct wall thickening, and non-shadowing echogenic foci within the bile ducts and floating in the gallbladder[3,4]. The most common CT findings of Clonorchiasis are diffuse, uniform dilatation of the peripheral intrahepatic bile ducts without obvious dilatation of the larger hepatic bile duct, extrahepatic duct or a focal obstructing lesion (Figure 3). Contrast-enhanced duct wall thickening is believed to reflect prominent periductal inflammation and fibrosis.

Figure 3. Recurrent pyogenic cholangitis with Clonorchis sinensis infestation. Contrast-enhanced CT image shows diffuse dilatation of intrahepatic bile ducts, especially in peripheral portion of bile ducts (arrows)[3]

MR imaging has been used in diagnosis of various diseases of the biliary system, and MR imaging can show the characteristic findings of clonorchiasis with diffuse, mild dilation of the small intrahepatic bile ducts, particularly in the periphery of the liver[4]. (Figure 4).

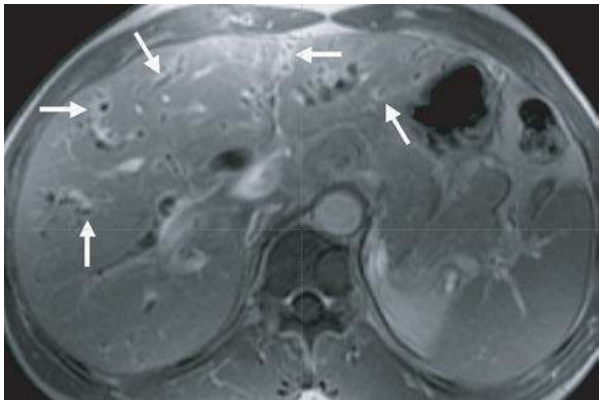

Figure 4. Periductal enhancement of mildly dilated intrahepatic bile ducts (arrows) on hepatic arterial phase of dynamic study of gadolinium-enhanced transverse MR image, which possibly represents active infection[4]

Cholelithiasis, cholangitis, cholecystitis, biliary tract obstruction, pyogenic hepatic abscess, pancreatitis, and cholangiocarcinoma are reported to be long-term complications of Clonorchiasis[4]. Differential diagnosis of Clonorchiasis on CT images include intraductal papillary mucinous biliary neoplasm, cholangiocarcinoma, recurrent pyogenic cholangitis, primary sclerosing cholangitis, and Caroli's disease[3,4]. However, the characteristic CT findings of Clonorchiasis, which appear as uniform, pipelike, mild dilatation of the intrahepatic ducts up to the subcapsular region of the liver, are quite different from those of other bile duct diseases.

Amoebiasis is a protozoan disease that affects 10% of the world population with a high prevalence in Mexico and South Africa, some areas in the Middle East, South and Southeast Asia[5]. Amoebic liver abscesses are caused by Entamoeba histolytica, and infection is acquired by ingesting food or water containing the protozoan.

E. histolytica exists in 2 forms: The cyst stage, which is the infective form, and the trophozoite stage, which causes the invasive disease. Invasion by E. histolytica into mesenteric venules can result in the amoebae entering the portal circulation and travel to the liver where they typically form large abscesses[6].

Ultrasound and CT scanning of the abdomen are both very sensitive but nonspecific for the detection of amoebic abscesses. The majority of amebic liver abscesses are solitary lesions, although there can occasionally be multiple lesions, and they are more often found in the right lobe than the left[5]. An amebic abscess appears as a hypoechoic lesion, with low-level internal echoes and absence of significant wall echoes. The lesion is typically oval or round and located near the liver dome[5,6].

Figure 5. Contrast CT image demonstrates right lobe amoebic liver abscess. The abscess is homogenous and single, which is a typical wall thickness finding[5]

At late stage, post contrasted CT images are well-defined round lesions, with complex fluid attenuation values. A thick enhancing wall with peripheral edema is characteristic of the CT findings for amoebic abscess of the liver (Figure 5). Another important imaging feature of the amoebic abscess of the liver is the presence of extrahepatic manifestations such as involvement of chest wall, pleural cavity, pericardium, and adjacent viscera, due to the extension of the amoebic liver abscess. Amebic abscesses have homogeneous low-signal intensity and high-signal intensity on T1W and T2W MR images, respectively. After healing, the periphery of the abscess may calcify and form a round, thin rim[5].

The most important complication is abscess rupture. Depending on the location of the abscess within the liver, the abscess may rupture into the peritoneum, the pleural space, or the pericardial space. Approximately 7% of amebic liver abscesses rupture into the peritoneum, causing subphrenic abscesses and peritonitis. Between 7% and 20% will rupture into the pleural space causing empyema. Other complications include bacterial superinfection of the amebic liver abscess and thrombosis of the hepatic vein or inferior vena cava6. Differential diagnoses of an amebic liver abscess are Pyogenic abscesses and Fascioliasis, however, these infections are multiple small, well-defined hypodense lesions and fascioliasis usually involve the subcapsular areas of the liver[5,6].

Hydatid cyst disease

The hydatid cyst (HC) disease, which is caused by Echinococcus granulosus, is an endemic parasitosis in the sheep-raising areas of the world including Mediterranean basin, North Africa, Central Asia, South America. There are two main species of the Echinoccocus tapeworm: *Echinoccocus granulosus* more common and *Echinococcosis alveolaire/ multicocularis*, less common but more invasive with main hosts are dog, fox and other livestocks as sheep, pig, goats and cattle[7].

The liver is the most common site of infection in adults. It is a life-threatening condition because tumor-like growths form in the liver. Other organs, such as the lung and brain can be affected. Diagnosis of HC is mainly based on imaging. However, serologic tests can provide specific confirmation of HC both in the clinical and community screening studies. The 2001 WHO classification of hepatic hydatid cysts is used to assess the stage of hepatic hydatid cysts on ultrasound and is useful in deciding the appropriate management depending on the stage of the cyst[7].

Gharbi and WHO Ultrasound characteristics:

Type 1: CE1 Unilocular cyst + wall + internal echogenicities.

Type 2: CE3 Detached membrane.

Type 3: CE2 Multivesicular, multiseptated cyst, daughter cysts.

Type 4: CE4 Heterogeneous cyst, no daughter vesicles.

Type 5: CE5 Cyst with a wall calcification.

(WHO: World Health Organization, CE: Cystic Echinococcosis).

Under CT images, a hydatid cyst usually appears as a well-defined, hypoattenuating lesion with a distinguishable wall (Figure 6). Coarse wall calcifications are present in 50% of the cases, well enhanced wall post contrast enhancement8. The hydatid cysts appears hypointense on T1W images and markedly hyperintense on T2W images; when present, the daughter cysts are hypointense relative on both the T1W and T2W images8.

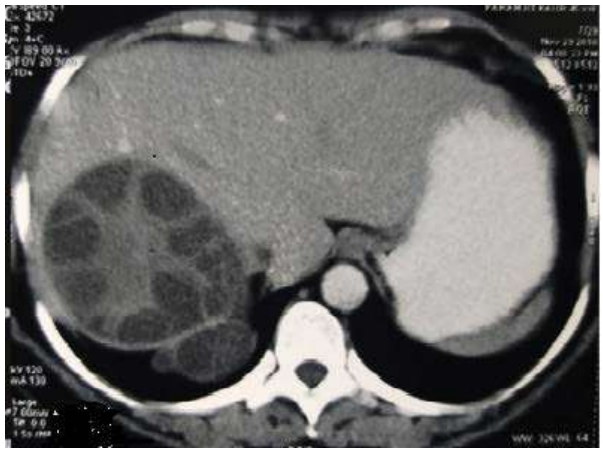

Figure 6. CT abdomen image showing liver large hydatid cyst: multiseptated cyst lying in peripheral location in segment VI and VII of right liver lobe[8]

Complications of hydatid cyst. Depending on the location, large cysts can cause compression of the adjacent viscera, bile ducts, portal or hepatic veins, or vena cava that causes obstructive jaundice, portal hypertension. Intrabiliary rupture is the most common complication of liver hydatid cysts. Rupture in to pleural space, peritoneum of a hydatid cyst is an uncommon, can occur spontaneously. Cysts may become infected after an episode of bacteremia or via a communication with the bile ducts[8].

Schistosomiasis (also known as bilharziasis, bilharziosis or snail fever) is a human disease syndrome caused by infection from one of several species of parasitic trematodes of the genus Schistosoma. The disease is a public health problem in tropical and subtropical regions of Africa, Asia, the Caribbean and South America.

Human Schistosomiasis is a chronic parasitic disease caused by infection with blood flukes (trematode worms), which is acquired through the skin while swimming or wading in contaminated freshwater. Symptoms of chronic infection may include abdominal pain, diarrhea, bloody stools, anemia, weight loss, and stunting. Hepatomegaly and splenomegaly indicate a severe hepatosplenic pathology, including portal hypertension[9,10]. Large bowel and rectum are mainly infected by S. japonicum or Schistosoma mansoni. Schistosoma haematobium infects the lower urinary tract and occasionally are prostate and female genital organs. S. japonicum resides in the mesenteric veins which drain to the liver, and therefore causes liver fibrosis after depositing in that organ. They observed a "network pattern of calcification" on ultrasound and a "tortoise shell" pattern on contrast CT images.

US can show an irregular liver surface (Figure 7), a hypertrophic left liver lobe, granulomas, mosaic patterns (echogenic septas between polygonal spaces in relatively normal liver parenchyma), dilatation of the portal vein and its branches, echogenic wall thickening, splenomegaly.

Figure 7. Ultrasound of the liver surface shows heterogenous echogenicity

Capsular calcifications, irregular liver contour, and periportal fatty tissue that extends to the capsule may also be seen. Septal and capsular fibrosis with parenchymal retractions may give the liver a characteristic tortoise shell appearance. Periportal fibrosis may be shown on CT images as decreased attenuation in areas surrounding the portal vein[10]. MRI is a sensitive method for the diagnosing of Schistosomiasis. The most specific MRI finding in Schistosomiasis is the appearance of periportal spaces: on T1-weighted images these spaces appear hypointense and on T2-weighted images, they seem hyperintense. The signal increases as T2-weighted images reflect the periportal inflammatory edema which is pathognomonic for schistosomal infection of the liver. This finding helps in the differentiation between inflammatory edema and periportal fibrosis

CONCLUSION

Parasitic hepatobiliary infections are diseases that may have radiological characteristic features in the liver, biliary tract as seen in patients. Fascioliasis are seen more in Viet nam with a non-specific clinical picture. It is important to distinguish Fascioliasis from alternative focal liver lesions via imaging. In the presence of Eosinophilia and abnormal liver function tests in patients with or without right upper abdominal pain, typical lesions images in the liver parenchyma or biliary tract may provide a diagnostic findings, especially in endemic areas. Misdiagnosis or late diagnosis of these diseases may be made due to patients coming from non-endemic areas, asymptomatic patients, nonspecific symptoms of gastrointestinal or hepatobiliary problems. Every clinicians should be familiar with multimodality imaging features and aware of the important role of radiological findings in diagnosis. The characteristic imaging findings with the presence of hepatobiliary symptoms, in combination with specific serologic tests can help clinicians to suspect and diagnose accurately of human parasitic infections.

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