Original Article

Evaluation of Morphological Changes in Hepatic Parenchyma, Bile Ducts, and Hepatic Vasculature in Patients with Oriental Cholangiohepatitis using Ultrasonography

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Abstract

Objective: The objective of this study is to study the morphological changes in hepatic parenchyma, to characterize the intra and extrahepatic ductal changes and to study the morphological changes in vasculature of the liver in patients with oriental cholangiohepatitits (OCH). **Materials and Methods:** All documented or newly diagnosed cases of OCH, referred to the department of radiodiagnosis and imaging from Departments of Surgical Gastroenterology and Medical Gastroenterology were evaluated by ultrasonography (USG) and color Doppler study. The dilatation of the intrahepatic as well as extra-hepatic ducts was noted. The morphological changes in the liver parenchyma as well as hepatic vasculature were studied. **Results:** USG showed calculi in 53 (98.1%) cases, ductal dilatation in 52 (96.3%), and worms within biliary ducts in 10 cases (18.5%). Among parenchymal changes, atrophy was seen in 9 cases (16.6%), space-occupying lesion was seen in seven cases (12.9%), and peri-portal echogenicity in 10 cases (18.5%). Significant association was found between atrophic segments and reduced/absent blood flow in the affected segmental portal venous branches. **Conclusion:** USG is the preferred primary examination. Further imaging depends on the USG findings, the patient's symptomatology, the clinical problems, and the intended mode of treatment. **Advances in Knowledge:** USG plays a pivotal role in the evaluation of oriental cholangiohepatitis in the low resource settings where higher modalities like MRI are not available, especially in the remote areas of developing countries, as it has high degree of accuracy in the diagnosis of OCH.

Keywords: Cholangiohepatitis, imaging, ultrasonography

Introduction

Oriental cholangiohepatitis (OCH), also known as recurrent pyogenic cholangitis and intrahepatic pigmented stone disease, is characterized by chronic biliary obstruction, stasis, and stone formation, leading to the recurrent episodes of acute pyogenic cholangitis, presenting as recurrent attacks of fever, chills, abdominal pain, and jaundice.[1] Bile ducts are dilated or focally stenotic, harboring soft, pigmented stone or mud, and enteric bacteria can be cultured from the bile.[2] The wall of the bile ducts is thickened by fibrosis and inflammatory cell infiltration. The disease is endemic to South East Asian countries,[3] but sporadic cases have been reported in Europe[4] and South Africa.[5] Hepatolithiasis is difficult to eradicate, and no single effective treatment exists for this disease. Historically, the treatment of choice has been surgical resection of the affected portion of the liver and biliary-enteric anastomosis to allow adequate drainage of bile.[6,7]

Often the first-line investigation in the workup for patients with recurrent pyogenic cholangitis, sonography typically shows dilatation of the biliary tree. Characteristically, there is disproportionate dilatation of the extrahepatic and central intrahepatic ducts, with little if any dilatation of the more peripheral biliary ducts.[8,9]

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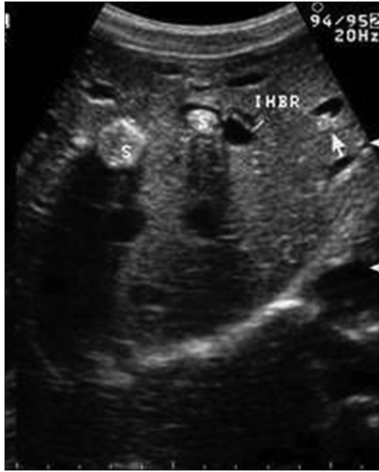

Figure 1: Ultrasonography showing dilated intra-hepatic ducts with echogenic, shadowing calculi within the dilated intra-hepatic ducts

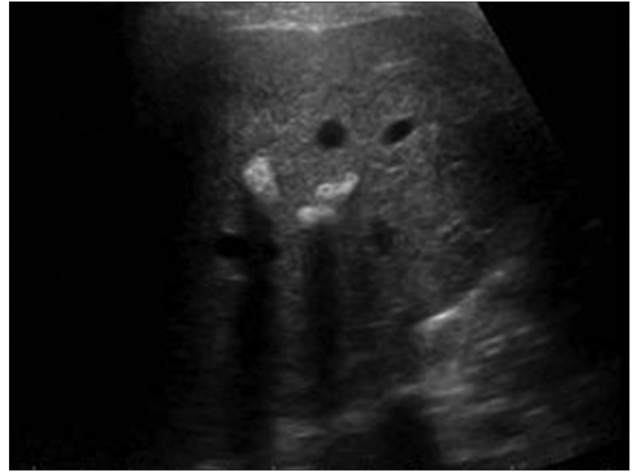

Figure 2: Ultrasonography showing echogenic, shadowing foci representing calculi in intra-hepatic biliary ducts

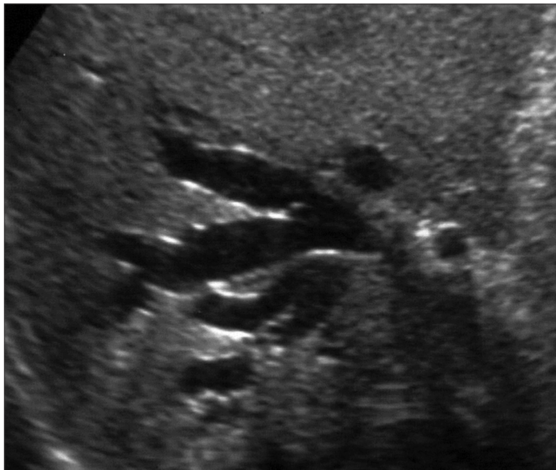

Figure 3: Ultrasonography showing dilated central intra-hepatic duct with tapering toward periphery

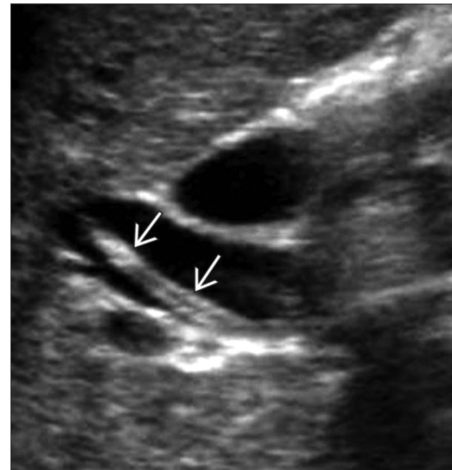

Figure 4: Ultrasonography showing double-linear echogenic structure suggestive of worm within dilated CBD

Although intrahepatic calculi may be identified in up to 90% of patients, they can be obscured by pneumobilia, which is also a common finding in recurrent pyogenic cholangitis.[10,11] The calculi can be single or multiple, intra or extrahepatic or both, and may or may not be calcified, resulting in variable echogenicity and acoustic shadowing.

The development of focal liver lesions raises the possibility of biloma or abscess formation when hypoechoic or anechoic. The sonographic features of malignancy are variable; cholangiocarcinoma may be hypo-, iso-, or, less commonly, hyperechoic relative to the liver.[12]

Percutaneous aspiration or drainage can be performed under sonographic guidance and can allow differentiation between biloma and abscess when uncertainty exists.[13] Percutaneous fine-needle aspiration or core biopsy of suspected neoplasms can also be performed under sonographic guidance.

Aim and objectives

1. To study the morphological changes in hepatic parenchyma in patients with OCH
2. To characterize the intra and extra-hepatic ductal changes in patients with OCH
3. To study the morphological changes in vasculature of liver in patients with OCH.

Materials and Methods

This study was conducted in the department of radiodiagnosis and imaging in collaboration with departments of surgical gastroenterology and medical gastroenterology. It was a prospective observational study.

Inclusion criteria

All documented or newly diagnosed cases of OCH referred to the department of radiodiagnosis and imaging from Departments of Surgical Gastroenterology and Medical Gastroenterology.

Exclusion criteria

1. Patients with intrahepatic or extrahepatic duct dilatation due to other causes
2. Patients with a history of claustrophobia

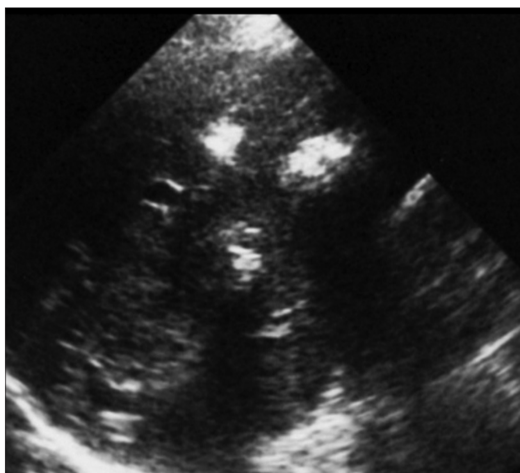

Figure 5: Ultrasonography showing echogenic, shadowing foci representing calculi in dilated intra-hepatic biliary ducts with thickened fibrotic wall

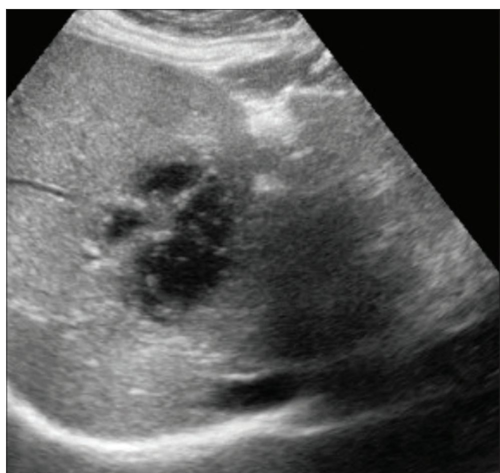

Figure 6: Transverse ultrasonography scan showing well-defined heterogeneous, predominantly cystic lesion, suggestive of an abscess, within the right lobe of the liver

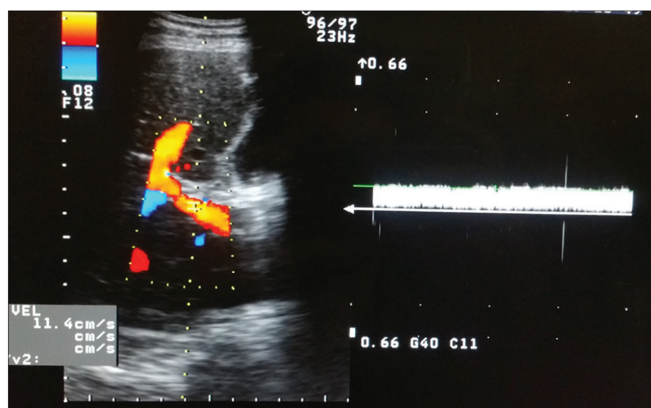

Figure 7: CDFI showing color flow and spectral waveform of portal vein with peak velocity of 11.4 cm/s

3. Patients with metallic implants, cardiac pacemakers, and cochlear implants.

Examination techniques and imaging protocols

Color Doppler ultrasonography

All ultrasonography (USG) studies were performed using 3–5 MHz curvilinear and 5−7 MHz linear array probes on AlokaProsound SSD-3500SX machine. Stone was considered to be present when an echogenic focus with or without shadowing was seen within the dilated bile ducts or when an echogenic focus with shadowing was seen within the liver parenchyma.

The extra-hepatic ducts were considered normal if they were <6 mm in diameter at the common hepatic duct.

- Mildly dilated: 7–10 mm
- Moderately dilated: 11–15 mm
- Markedly dilated: 16 mm

The intra-hepatic bile ducts were considered dilated if duct diameter was equal to or wider than half of the diameter of the accompanying portal venous branches.

Doppler USG was used to assess the portal blood flow.

Statistical analysis

Analysis of demographic data and baseline characteristics was done using percentage for categorical data, mean, and standard deviation for continuous data. Fisher's exact test and Chi-square test were used to assess the relation between portal blood flow and hepatic atrophy, $P < 0.05$ was considered as statistically significant. Statistical software SPSS v 20.0 was used as an analytical tool.

Results

The mean age in our study was 41.8 years (range 13–82 years) with standard deviation of 16.86 years. The maximum number of patients (44.4%) was in the age group of 21–40 years. Figures 1-7 display the USG images of various patients of Oriental Cholangiohepataitis in our study.

In our study, out of the total 54 patients, 30 (55.5%) patients were female and 24 (44.4%) were males with a female-to-male ratio of 1.25:1.

Out of 54 patients, USG showed calculi in 53 (98.1%) patients. USG could not show calculi in only one patient in our study.

Fifty-three patients showed calculi within the intra-hepatic ducts and twenty patients showed calculi in extra-hepatic ducts. None of the patient had calculi within extra-hepatic ducts only. In 33 patients, calculi were seen in both intra-hepatic and extra-hepatic ducts.

Twenty-six patients showed calculi within both the right and left intra-hepatic ducts. In 21 patients, calculi were seen within only left intra-hepatic ducts and only five patients had calculi within the right intra-hepatic ducts only.

In our study, stones were echogenic with shadowing in 41 cases (75.9%), non-shadowing in 7 cases (12.9%), both shadowing and nonshadowing in five cases (9.4%).

In our study, sonography demonstrated bile duct dilatation in 52 (96.3%) out of 54 cases.

In our study, extra-hepatic ducts were dilated in 43 cases (79.6%), intra-hepatic ducts were dilated in 45 cases (83%). Only intra-hepatic ducts were dilated in 9 cases (16.6%). Only extra-hepatic ducts were dilated in six cases (11.1%). Among intra-hepatic ducts only left lobe duct dilatation was seen in 14 cases (26%) and only right lobe ducts were dilated in 3 cases (14.8).

In our study, sonography showed abscess in eight cases (14.8%). Nine cases (16.6%) among 54 cases showed atrophied segments on sonography and all the segments were localized to the left lobe. Peri-portal echogenicity was seen in 10 cases (18.5%).

In our series, 20 cases (37%) had gallstone, and 8 (14.85%) cases were operated for gall stone disease. Twenty-six patients had normal Gall Bladder (GB).

Nine patients showing right hepatic lobe atrophy on USG showed attenuated or absent flow in the segmental vessels on Color Doppler Flow Imaging (CDFI); however, in 45 patients with no evidence of atrophy, segmental blood flow was normal. The relation was statistically significant with $P < 0.001$ using the Chi-square test.

Twenty patients showing left hepatic lobe atrophy on USG, all patients showed attenuated or absent flow in the segmental vessels on CDFI; however, in 34 patients with no evidence of atrophy, segmental blood flow was normal. The relation was statistically significant with $P < 0.001$ using the Chi-square test.

Discussion

Oriental cholangiohepatitis (OCH), also known as recurrent pyogenic cholangitis/hepatolithiasis, is a complex disease that is characterized by intra-hepatic duct calculi, strictures and recurrent infection. In turn, cholangitis can result in multiple hepatic abscesses, further biliary stricture and in severe cases, progressive hepatic parenchymal destruction, cirrhosis and portal hypertension.

Historically, the treatment of choice has been surgical resection of the affected portion of the liver and biliary-enteric anastomosis to allow adequate drainage of bile.[6,7]

The results in our study were different from the study conducted by Lim *et al*.[14] In their study, calculi present in only the extrahepatic ducts were seen in 20 cases, compared to 0% in our study. Calculi in only intra-hepatic ducts were seen in seven cases as per their study; however, our study showed calculi in only intra-hepatic ducts in 33 cases. In their study, majority of the calculi were seen in the left hepatic ducts, 17 (85%) cases out of the total 20 cases. This was comparable to our study, which showed the result of 80% for the same variable.

The dilatation of extrahepatic and intrahepatic ducts was disproportionate, with extra-hepatic ducts more severely dilated than the intrahepatic ducts. The extrahepatic ducts were mildly dilated in 20 cases (37%), moderately dilated in 11 cases (20%), and markedly dilated in 13 cases (24%). There was little if any dilatation of the more peripheral biliary ducts. The distribution of duct dilatation was diffuse and unrelated to the location of calculi, especially in extra-hepatic ducts. The extra-hepatic ducts, both proximal to and distal to the stone, were diffusely dilated. The cause of the diffuse dilatation has been discussed. Repeated obstruction and inflammation may lead to progressive ductal destruction and loss of elasticity. In addition, inflammatory stricture of ampulla of Vater caused by irritation by the stone and/or excessive secretion of mucus caused by cholangitis appears to impede the passage of bile, creating diffuse bile duct dilatation.

The results were comparable to the study conducted on sonographic findings of oriental cholangiohepatitis by Lim *et al*.[14] In their study, of a total of 48 cases, 46 (96%) showed bile duct dilatation. Forty-one (85%) cases showed dilatation of the extrahepatic ducts. The extra-hepatic ducts were mildly dilated in 18 cases, moderately dilated in 10 cases, and markedly dilated in 13 cases. In seven cases (15%), the extra-hepatic ducts were not dilated.

The intra-hepatic ducts were dilated in 38 cases (79%). In 16 cases, intra-hepatic duct dilatation was limited to the left hepatic lobe. The intra-hepatic ducts were not dilated in 10 cases. Similar results were documented by a study conducted by Chau *et al*.[9]

As far as, the sonogaphic characteristics of calculi were concered, the results were comparable in both the studies.

Features of hepatic parenchymal disease that can be detected by sonography include periportal echogenicity, liver abscesses, bilomas, and atrophy; however, sonography can miss lobar atrophy. An associated cholangiocarcinoma which complicates up to 5% of patients[8] can be suspected on sonography.[12]

In our study, sonography showed space-occupying lesion, characterized as abscesses in eight cases (14.8%); however, one abscess turned out to be bilioma, on contrast-enhanced computed tomography images. Out of seven cases, four cases showed mass in the right lobe, whereas three cases showed mass in the left lobe. Cross-sectional imaging in our study revealed abscesses in 8 (14.8%) cases and bilioma in 1 case.

In a study conducted on sonographic findings of oriental cholangiohepatitis by Lim *et al*.,[14] two cases showed abscess among 48 cases. In a study conducted by Kim *et al*.,[10] abscess formation was seen up to 20% of OCH patients who underwent cross-sectional imaging. In our study, 9 cases (16.6%) among 54 cases showed atrophied segments on sonography and all the segments were localized to the left lobe.

None of the cases in our study was suspected to have neoplastic pathology on sonography.

Periportal echogenicity was seen in 10 cases (18.5%). Chau *et al*.[9] described periportal echogenicity representing pericholangitis and periportal fibrosis in 30% of their cases.

In our study, sonography showed worms in 10 (18.5%) cases, as linear tubular nonshadowing, echogenic foci within the biliary tree. Worms were seen in both the intrahepatic and extrahepatic ducts in three case (30%), only extra-hepatic ducts in four cases (40%), and only intra-hepatic ducts in three cases (30%).

Sonography is the best noninvasive modality for actual imaging of the offending parasites. Morikawa *et al.*[15] were able to capture flukes in motion within the peripheral bile ducts on M-mode sonography. Lim *et al*.[14] noted that the flukes are easiest to visualize in gall bladder.

Concomitant occurrence of gallstone in patients with oriental cholangiohepatitis has not been discussed in detail. In our series, 20 (37%) cases had gallstone, and 8 (14.85%) cases were operated for gallstone disease. Chau *et al*.[9] reported that 72% of patients with oriental cholangiohepatitis had gallstone disease. In a study by Lim *et al*.,[14] gallstones were present in 46% cases. Such a high frequency of concomitant gallstones in patients with OCH may be explained by the same mechanism as oriental cholangiohepatitis, that is, repeated infection of bile within the GB with resultant formation of stone.

Conclusion

We conclude that, in patients with hepatolithiasis, modern imaging aims at accurate delineation of biliary ducts and liver parenchyma. It directs planning of surgical or interventional treatment and serves to guide these procedures.

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Conflicts of interest

There are no conflicts of interest.

References

1. Cook J, Hou PC, Ho HC, Mcfadzean AJ. Recurrent pyogenic cholangeitis. Br J Surg 1954;42:188-203.
2. Ong GB. A study of recurrent pyogenic cholangitis. Arch Surg 1962;84:199-225.
3. Seel DJ, Park YK. Oriental infestational cholangitis. Am J Surg 1983;146:188-203.
4. Menu Y, Lorphelin JM, Scherrer A, Grenier P, Nahum H. Sonographic and computed tomographic evaluation of intrahepatic calculi. AJR Am J Roentgenol 1985;145:579-83.
5. Schulman A. Non-western pattern of biliary stones and the role of ascariasis. Radiology 1987;162:425-30.
6. Harris HW, Kumwenda ZL, Sheen-Chen SM, Shah A, Schecter WP. Recurrent pyogenic cholangitis. Am J Surg 1998;176:34-7.
7. Yoon HK, Sung KB, Song HY, Kang SG, Kim MH, Lee SG, *et al.* Benign biliary strictures associated with recurrent pyogenic cholangitis: Treatment with expandable metallic stents. AJR Am J Roentgenol 1997;169:1523-7.
8. Okuno WT, Whitman GJ, Chew FS. Recurrent pyogenic cholangiohepatitis. AJR Am J Roentgenol 1996;167:484.
9. Chau EM, Leong LL, Chan FL. Recurrent pyogenic cholangitis: Ultrasound evaluation compared with endoscopic retrograde cholangiopancreatography. Clin Radiol 1987;38:79-85.
10. Kim MJ, Cha SW, Mitchell DG, Chung JJ, Park S, Chung JB. MR imaging findings in recurrent pyogenic cholangitis. AJR Am J Roentgenol 1999;173:154-9.
11. Afagh A, Pancu D. Radiologic findings in recurrent pyogenic cholangitis. J Emerg Med 2004;26:343-74.
12. Nesbit GM, Johnson CD, James EM, MacCarty RL, Nagorney DM, Bender CE. Cholangiocarcinoma: Diagnosis and evaluation of resectability by CT and sonography as procedures complementary to cholangiography. AJR Am J Roentgenol 1988;151:933-8.
13. Chan FL, Man SW, Leong LL, Fan ST. Evaluation of recurrent pyogenic cholangitis with CT: Analysis of 50 patients. Radiology 1989;170:165-9.
14. Lim JH, Ko YT, Lee DH, Hong KS. Oriental cholangiohepatitis: Sonographic findings in 48 cases. AJR Am J Roentgenol 1990;155:511-4.
15. Morikawa P, Ishida H, Niizawa M, Masamune O. Sonographic features of biliary clonorchiasis. J Clin Ultrasound 1988;16:655-8.