

Ultrasonography in predicting and screening liver cirrhosis in children: A preliminary study

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Abstract

AIM: To evaluate the value of ultrasonography in predicting and screening liver cirrhosis in children.

METHODS: Twenty-eight children with liver cirrhosis of various etiologies were examined by routine ultrasonography. A percutaneous liver biopsy guided by ultrasound was also performed on each patient, and the results of liver biopsy and ultrasonography were compared.

RESULTS: When compared with the biopsy results, ultrasonography in combination of clinical and laboratory findings gave accurate diagnoses of children liver cirrhosis. Although ultrasound imaging of children with liver cirrhosis revealed abnormal characteristics, these images were not specific to this disease, thus reinforcing the necessity of ultrasound-guided liver biopsy in the diagnosis of children liver cirrhosis.

CONCLUSION: Ultrasonography is reliable in the diagnosis of children liver cirrhosis, and its usefulness should be stressed in the screening and follow-up of high-risk pediatric patients.

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INTRODUCTION

Cirrhosis of the liver is a morphological entity, and it has been assumed to be an end-stage condition of all chronic active liver diseases. There are many types of liver cirrhosis, including posthepatic, alcoholic and mixed types of cirrhosis, and congestive, biliary and parasitic cirrhosis, etc. The etiological factors underlying this disease, as well as its morbidity, have been shown to be different in different geographical regions^[1-8]. It should be mentioned that morphological changes are different in liver cirrhosis, which include the structural changes not only in the parenchymal disorganizations, but also in the stromal vascular changes in the cirrhotic process^[9,10]. It has been widely accepted that ultrasonography is a useful diagnostic procedure for advanced liver cirrhosis. However, liver cirrhosis of children and its applicable techniques are usually different from those of adults. Several types of the cirrhosis resulted from metabolic diseases including glycogen storage disease and hepatolenticular degeneration are rare in adults. In children,

the onset of cirrhosis is often occult. Children cirrhosis lacks the early typical clinical symptoms as seen in adult patients, thus contributing to its frequent misdiagnosis^[11]. Unfortunately, reports on children cirrhosis are few. To determine if ultrasonography could be of clinical value in predicting the etiology of children cirrhosis, we performed this test in 28 children whose cirrhosis was confirmed by histopathology.

MATERIALS AND METHODS

Patients

We studied 45 children with clinically and ultrasonically suspected cirrhosis of the liver. Only 28 children (23 males and 5 females) aged from 11 months to 12 years (mean 7.9 years) who had a definite biopsy were included in this study. The other 17 children who had no biopsy were excluded.

All the patients were regularly evaluated by clinical assessment, biochemical tests, ultrasound study, and liver biopsy when clinically indicated. Among them, six had chronic hepatitis, and two lived in areas with a high prevalence of *Schistosoma mansoni* while the other 20 had no known etiology. In eight cases, their mothers were positive for HbsAg, among these cases three had hepatitis B. In three cases, their fathers were positive for HbsAg, among these cases one had hepatitis B. In two cases, both parents were positive for HbsAg. Seventeen patients came to hospital because of indigestion or abdominal bloating, four because of diarrhoea, and one each because of dyspneic respiration, bellyache, or jaundice. One patient was identified during routine physical examination.

Sonography

Ultrasonography was performed by conventional techniques with a high-resolution, real-time scanner (Sonoline AC) equipped with 5 MHz and 7 MHz rectilinear array or convex scan probes combined with a puncture guider. Liver size was assessed according to routine methods (transverse and longitudinal sections, relationship between the hepatic border and the right kidney). The contour of the liver (smooth and nodular) was observed. The ultrasound patterns of the liver (nonspecific hepatomegaly, homogeneously increased echogenicity, heterogeneously increased echogenicity, and nodular liver) were observed. The presence of ascites, signs of portal hypertension, and splenomegaly were also recorded.

Ultrasound guided biopsy was performed on all the patients, each biopsy was subsequently examined immunohistochemically.

RESULTS

The diagnosis of children cirrhosis was confirmed in the 28 cases by histopathology, and liver cirrhosis was classified into six groups: post-hepatitis B, biliary disease, congestive disease, schistosomiasis, glycogen storage disease and hepatolenticular degeneration cirrhosis according to the results from biopsy (Table 1).

Among the patients, most were post hepatitis B, accounting for 67.9 % (Table 1). The ultrasound patterns of post-hepatitis B cirrhosis were similar in appearance to the adult disease, with increased parenchymal echo, coarsened echo texture,

irregularities on the liver surface, abnormalities of the intrahepatic biliary tree and splenomegaly. Because the etiology of liver cirrhosis was multifactorial, each particular patient might have a different pathogenesis and different hepatic ultrasound changes. Sonography revealed intrahepatic cholangiectasis in three children with cholestatic cirrhosis. One case of congestive cirrhosis showed an enlargement of the venae hepaticae and inferior vena cava, and almost no change in the inner diameter of the vessels during respiratory movement. In two cases of schistosomiasis cirrhosis, who lived in an epidemic region for *Schistosoma mansoni*, a grid pattern was observed. By sonography, two patients with glycogen storage disease and one hepatolenticular degeneration showed relatively characteristic ultrasound patterns. The echo patterns of liver parenchyma of glycogen storage disease were found to have coarsened echo texture, but the surface of their livers appeared smooth. The pattern of hepatolenticular degeneration showed a coarsened parenchymal echo, with a normal distribution, and the route of the intrahepatic biliary duct was not altered.

Table 1 Diagnosis of children with cirrhosis

Classification	<2 years	2-7 years	8-12 years	Total	%
Post hepatitis B cirrhosis	1	2	16	19	67.9
Biliary cirrhosis		1	2	3	10.7
Congestive cirrhosis			1	1	3.6
Schistosomiasis cirrhosis			2	2	7.1
Glycogen storage disease		1	1	2	7.1
Hepatolenticular degeneration			1	1	3.6
Total	1	4	23	28	100

DISCUSSION

The value of ultrasonography in diagnosing cirrhosis of the liver has been recognized clinically^[12-14]. By observing the press extents of the surface of the left hepatic septum in front of the inferior vena cava, real time ultrasound could directly determine the degree of cirrhosis. Estimating the condition of esophageal varices by detecting portal hypertension was important in differentiating the source of gastrointestinal hemorrhage^[14]. Because the child liver was smaller in size, we obtained high-resolution ultrasound images by using high frequency probes (5 MHz and 7 MHz).

Our results showed that the echo pattern revealed by ultrasound in combination of the patient's medical history, could be useful in the diagnosis of children liver cirrhosis and prediction of its the etiology. Then, physicians could select appropriate subsequent diagnostic methods to confirm the diagnosis. Since ultrasound does not allow for the specificity of imaging, we suggest that percutaneous liver biopsy guided by ultrasound should be performed when possible, in order to provide the most accurate method for clinical diagnosis. Ultrasonic scans could localize areas for biopsy away from major vessels and the gall bladder.

Most children with chronic hepatitis have no history of acute hepatitis. Chronic hepatitis has few clinical symptoms and most children patients cannot be diagnosed early in the course of their disease. Thus, by the time they do present the symptoms, the disease is well advanced, and their prognosis is poor. Of the 28 children described here, only six had a previous history of hepatitis. More than half of them came to hospital because of indigestion and abdominal bloating. One patient was misdiagnosed as having biliary ascarid, and was not diagnosed as cirrhosis until bleeding of the digestive tract was observed following ineffective antihelminthic treatment. One child with chronic diarrhoea was found to have complications

of ascites. Children cirrhosis was thus easily misdiagnosed. For this reason, if a child manifests symptoms associated with cirrhosis, such as hypodynamia, poor appetite, nausea, vomiting, diarrhea, and intense stomach pains, an ultrasound examination and correlated clinical examination should be performed.

Of the 28 children in this study, 19 (67.9 %) had post-hepatitis B cirrhosis. China is a country with a high prevalence of hepatitis B infection. Perinatal infection is recognized as the predominant mode of transmission of the virus, resulting in many carriers of HbsAg. Infection occurred predominantly at or after birth by maternal-infant transmission, and might even occur as early as the oosperm stage^[15]. Embryos infected in the uterus have been reported to develop cirrhosis. Thus the children's parents who are positive for HbsAg or have a history of hepatitis B infection should be examined by ultrasound and correlated clinical tests at regular intervals. This may lead to an early detection of children liver cirrhosis.

In conclusion, ultrasonography can accurately reveal morphological characteristics and predict the etiologic factors underlying children liver cirrhosis. This technique can be used to screen high-risk groups and allows for early treatment.

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