CLINICAL STUDY OF CT, B ULTRASOUND AND NUCLEAR MAGNETIC RESONANCE IMAGING IN DIAGNOSIS OF EXTRAHEPATIC BILE DUCT STONES

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ABSTRACT
To further improve diagnosis and treatment effect of extrahepatic bile duct stones and seize the best opportunity for treatment, this paper conducted in-depth research of the diagnostic value of abdominal CT, B ultrasound and nuclear magnetic resonance imaging in the diagnosis of extrahepatic bile duct stones, covering 2320 cases of extrahepatic bile duct stones admitted in 5 hospitals from June 2014 to June 2015. All patients underwent abdominal CT, B ultrasound and nuclear magnetic resonance imaging. The diagnostic results of different detection methods were compared and analyzed by professional image analysis staff. The results show that the detection rate of nuclear magnetic resonance imaging is significantly higher than that of abdominal CT and B ultrasound, with the difference between the two groups P<0.05, statistically significant. The detection rate of CT is significantly higher than that of B ultrasound, difference value P<0.05, statistically significant. At the same time, the detection rate of nuclear magnetic resonance imaging is also higher than that of CT and B ultrasound in the diagnosis of extrahepatic bile duct stones with diameter less than 8cm, with P<0.05, statistically significant. Comparison of CT and B ultrasound detection results reveal no significant difference in the detection rate (P>0.05). Therefore, this study proves that in the diagnosis of extrahepatic bile duct stones, the detection rate of nuclear magnetic resonance imaging is higher, with diagnosis obviously better than CT and B ultrasound examination. But clinical diagnosis experience shows that B ultrasound examination has high specificity and costs less. Therefore, the author believes that diagnosis of extrahepatic bile duct stone in the process of clinical examination depends on the situation of actual patient condition and economic status.

Key words: Abdominal CT, B Ultrasound, Nuclear Magnetic Resonance Imaging, Extrahepatic Bile Duct Stones, Diagnostic Value.

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Introduction
Extrahepatic bile duct stones, a relatively common disease, mainly occurs in the bile duct, commonly hepatic duct stone. Extrahepatic bile duct stones can be divided into primary and secondary. Primary accounts for the majority, which refers to primary bile duct stones, mainly bile pigment stones or mixed stones (Figure 1) [1-2]; secondary refers to gallbladder stones in the bile duct, mainly cholesterol gallstone. High risk groups for extrahepatic bile duct stones are middle aged 35-50, and the elderly. Nevertheless, with continuous acceleration of rhythm of life, change of diet and sleep habits, risk among young people around the age of 20 gradually increases. Once the disease attacks, patients will have upper abdominal pain, chills, fever, liver area tenderness and obvious percussion pain, recurrent pain in liver side and the lower chest, discomfort and other clinical manifestations, which make patients suffer from seasickness. For extrahepatic biliary stones, the main clinical features are biliary obstruction and infection, which can induce severe biliary obstruction and acute biliary infection, and will involve the entire biliary system (Figure 1). Bile duct wall will be significantly thickened due to congestion, edema, hyperplasia and fibrosis. To improve the condition of the disease, early diagnosis and treatment are needed. Although extrahepatic bile duct stones is a common
disease, it is because of improper body protection in daily life and difficulty detecting it in the early stage. Only when people have hot and cold stimuli, or other symptoms of discomfort does awareness increase. Moreover, some people do not pay attention to body protection, regard extrahepatic bile duct stones as just a kind of mild disease, with the result that the disease may eventually develop into cholangiocarcinoma and other serious diseases with passage of time, and may eventually threaten life\textsuperscript{(3-4)}.

Currently, clinical diagnoses of extrahepatic bile duct stones feature image examination, and digestive endoscopic retrograde cholangiopancreatography serves as the gold standard for diagnosis. In addition, abdominal CT, B ultrasound and nuclear magnetic resonance imaging play an important role in the diagnosis of extrahepatic bile duct stones. B ultrasound is usually adopted for diagnosis of extrahepatic bile duct stones in clinical practice\textsuperscript{(5)}. Images that can be observed by color doppler ultrasound feature red and blue, with red for probe orientation and vice versa for blue.

This technique can observe internal organ blood flow. With continuous progress and development of medical technology, the method of B ultrasound examination tends to be more diverse, with three-dimensional B ultrasound gradually popularized and applied. 3D ultrasound can reconstruct multiple 2D graphics into three-dimensional images through a special probe, generally 3D reconstruction is used where two-dimensional image is of interest; four-dimensional ultrasound technology applies three dimensional ultrasound images plus a time dimension parameter.

The technology can obtain three-dimensional images in real time and goes beyond the limit of traditional ultrasound. Abdominal CT is also a common method for examination of extrahepatic bile duct stones. CT can show liver outline, size, density and internal structure. Extrahepatic bile duct is not developed for normal liver, and shown at dilatation. Dilated bile duct manifests as arborization low density image with hepatic portal extending to the liver\textsuperscript{(6)}.

In recent years, a number of clinical studies have shown that nuclear magnetic resonance imaging enjoys significant diagnostic value in the diagnosis of extrahepatic bile duct stones, but due to financial and other reasons, its application is not extensive. In this paper, the diagnostic results of the three diagnostic methods are further analyzed, with the specifics shown in the following.

Method

\textbf{General information}

Specific subjects of the research are 2320 cases of extrahepatic bile duct stones treated in 5 medical institutions, including 1236 cases of male patients, 1086 cases of female patients, aged between 20-82 years and averaging 59.3+14.3 years. All patients in this group met clinical diagnostic criteria, and patients with intrahepatic bile duct stones and without abdominal CT, B ultrasound and nuclear magnetic resonance imaging were excluded.

\textbf{Examination methods}

The instruments used in this research were superconducting magnetic resonance scanner, spiral scanner, multi function ultrasonic diagnostic instruments existing in various medical institutions. Abdominal CT examination: routine scan and enhanced scan for patients. Patients fasted 6 hours before examination, and consumed 600-800ml warm water before examination, with layer thickness of pitch at 5mm and 1mm for reconstruction; B ultrasound: abdominal probe frequency was 3.5MHz; nuclear magnetic resonance imaging: patients had 3-4 hours fasting before examination, with: coronal B-TFE, cross section respiratory triggered breath T2W-SPAIR-RT, MRCP-HR-3D and T1W in the same direction as breath holding\textsuperscript{(7-10)}.

\textbf{Comparison method}

Summary diagnosis of the above three examination methods: digestive endoscopic retrograde cholangiopancreatography examination results were the gold standard for evaluation of diagnosis of the various examination methods, and detection rate of the three were compared.
Statistical methods

This study used SPSS19.0 statistics software for data analysis and processing, with count data denoted by n,% and tested by chi square test. When P<0.05, the difference is statistically significant.

Results

In this study, 2320 patients received complete detection. Abdominal CT test results (Figure 2) shows that 1186 patients out of 2320 patients were diagnosed with calculi, with 51.12% detection rate; B ultrasound examination results (Figure 3) show that 1365 patients out of 2320 patients were diagnosed with calculi, with 58.83%detection rate. The results of nuclear magnetic resonance imaging (Figure 4) show that 1956 cases were diagnosed with calculi, with 84.31% detection rate. Therefore, B ultrasound and abdominal CT test results do not have statistical significance. However, the results of nuclear magnetic resonance imaging were significantly better than that of abdominal CT and B ultrasound. The difference between the two groups, P<0.05, is statistically significant.

CT refers to electronic computer tomography, with relatively high density resolution, extremely easy to diagnose high density calculi, but with relatively low resolution for muddy stones and equidensity stones prone to misdiagnosis. Most stones manifest as high density shadows in CT examination, with direct signs of stones as the target sign. Nuclear magnetic resonance imaging, as a noninvasive imaging method, doesn’t have rays, can clearly display the biliary system without contrast agent, and can provide shadow graphs of the bile duct system in multiple perspectives. Nuclear magnetic resonance imaging takes advantage of abdominal tissue with fluid and inherent differences between adjacent tissue and T2 weighted imaging to perform cholangiopancreatography. It can very sensitively show extrahepatic bile duct stones, especially for T2 weighted images with low motor phase sensitivity which manifests as a weak signal. Also, there are different manifestations for T1 weighted images.

Discussion

In this study, the detection rates of abdominal CT, B ultrasound and nuclear magnetic resonance imaging for extrahepatic bile duct stones were compared and analyzed. Results reveal that nuclear
magnetic resonance imaging enjoys the highest detection rate, followed by CT examination and B ultrasound. But for stones with less than 8cm diameter, no significant difference exists between CT and B ultrasound examination. B ultrasound examination, although having a relatively low detection rate, has high specificity, which thus is relatively ideal for detection of some small stones and with relatively high economic efficiency. In clinical diagnosis, patients with extrahepatic gallstones can first choose B ultrasound examination as this examination can clearly show bile duct stones and bile duct dilation images. CT examination can be considered when doubt exists in the above examination results or when the above examination is unsuccessful. Through PTC and ERCP, location, number, size of stones can be clearly observed and biliary obstruction sites and degree of obstruction can be accurately judged. ERCP or FIE examination can be carried out on patients if necessary. Clinical research in recent years confirms that although B ultrasound examination has a relatively low detection rate for extrahepatic bile duct stones, it has relatively high specificity, economic efficiency, and is easily accepted by patients. As a result, it can still be useful as a preferred method for hepatobiliary abnormality detection. If patients have obvious extrahepatic bile duct stone symptoms, ERCP or MRCP examination can be performed for further diagnosis.

References