

Value of magnetic resonance cholangiopancreatography combined with dynamic contrast enhanced CT in differential diagnosis of benign and malignant biliary stricture.

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Abstract

Objective: To explore the value of Magnetic Resonance Cholangiopancreatography (MRCP) combined with Dynamic Contrast Enhanced CT (DCE-CT) in differential diagnosis of benign and malignant biliary stricture.

Methods: From Dec 2015-2016, 70 patients suffering biliary stricture were collected in our hospital to receive either conventional X-ray or magnetic resonance cholangiopancreatography combined with enhanced CT examination. With the gold standard of pathological and histological examination, effect and value of those two methods in the diagnosis of benign and malignant biliary stricture were estimated and compared.

Results: The combination of MRCP and DCE-CT is more sensitive and accurate than conventional X-ray examination in the diagnosis of benign and malignant biliary stricture. Stenosis length, wall thickness and CT difference in arterial phase, portal venous phase and delayed phase of patients with malignant biliary stricture were significantly higher than those of the patients with benign biliary stricture ($P<0.05$).

Conclusion: The application of MRCP combined with DCE-CT has significant effect in the differential diagnosis of benign and malignant biliary stricture.

Keywords: Benign and malignant biliary strictures, Magnetic resonance cholangiopancreatography (MRCP), Enhanced CT, Differential diagnosis.

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Introduction

Biliary stricture, a common disease in biliary tract, shows the symptom of cicatrice constriction of biliary tract caused by bile duct injury, recurrent cholangitis or congenital factors. Clinically, it is divided into benign and malignant biliary stricture as per their pathological types [1].

Early diagnosis and treatment are important to improve the prognosis of patients. MRCP and DCE-CT are the new diagnostic methods used for the clinical diagnosis of biliary tract diseases and have more and more clinical applications with the development of imaging technology.

In our hospital, MRCP and DCE-CT were performed in 70 patients with biliary stricture, and the results were compared with the results of conventional X-ray examination to evaluate the effect of MRCP and DCE-CT in the diagnosis of benign biliary stricture. The detailed results are described as following.

Materials and Methods

General information

From Dec 2015-2016, 70 patients with biliary stricture in our hospital were selected as the objects.

Inclusion criteria: Patients diagnosed with benign or malignant biliary stricture with confirmation of pathological examination; Patients volunteering to participate in the study and approved by Ethics Association of the hospital.

Exclusion criteria: Patients with other biliary tract diseases; Patients with the treatment of biliary tract surgery; Patients with the disease which effects the examination of biliary tract; Patients with haematological diseases; Patients with serious diseases of important organs such as heart, lung, kidney, spleen and stomach; Patients who have contraindications to imaging examination and patients with difficulty in cooperating with the study. Among 70 cases there were 32 of benign biliary stricture and 38 of malignant biliary stricture. The comparison

of the independent baseline examination between the patients with benign biliary stricture and those with malignant biliary stricture was carried out. The results were as follows, ($P > 0.05$, Table 1).

Table 1. General data analysis of the patients.

Group	Cases	Male/female	Age	Average age
Benign biliary stricture	32	18/14	40-78	62.3 ± 8.6
Malignant biliary stricture	38	21/17	41-79	62.4 ± 8.5
t	-	0.007	-	0.049
P	-	1.579	-	2.657

Methods

All patients were treated with conventional X-ray by way of Kaitesi Daojing X-ray machine followed by the treatment of magnetic resonance cholangiopancreatography combined with enhanced CT detection.

MRCP examination: All patients were treated with body coil examination of 8 channels by means of 1.5 T high field superconducting magnetic resonance imaging instrument produced by German Siemens Company. All these examinations were performed in the fasting state of 6 h and the patient were required to practice holding breath before the test. Patients were instructed to take a supine position and received the examination of multi position. The T2WI examination of TSE respiration-triggered cross section was implemented with the layer thickness as 4 mm, and coronal check of HASTE series was conducted with the thickness as 3 mm, in these ways localization image was achieved. Then the multi position examination of 2D thick layer and respiratory trigger coronary detection of 3D thin layer were implemented among the patients. With the complement of above examinations, the images were treated with related processes like fat transplanted and respiratory gating.

DCE-CT examination: All patients were examined in 6 h fasting state by way of Discovery CT 750 HD gemstone scanner produced by the U.S. GE and were treated with routine abdominal plain scan as well as dynamic enhanced scan with a

supine position, and before the enhanced scan, the patients were given an intravenous injection of contrast-medium-iodohexol (Yangtze River Pharmaceutical Group Co., Ltd. Zhunzi H10970323), 350 mg/ml, 1.2 ml/kg, at the rate of 3.5 ml/s, with the arterial phase CT scan conducted 28 s later, the venous phase scan 65 s later and the delayed phase scan 3-5 min later [2]. At the end of above examinations, the images were reconstructed and transmitted to the workstation for analysis with the blind test by 2 experienced imaging physicians and images of upgrading were jointly interpreted.

After the tests, the patients were performed endoscopic and surgical treatment in proper time and their pathological tissues were collected to conduct routine pathology examination.

Observation index

The respective sensitivity, specificity and accuracy in terms of conventional X-ray as well as MRCP and DCE-CT treatment in the diagnosis of benign and malignant biliary stricture with the gold standard of the pathology examination result [3].

Statistical methods

Diagnostic effects were described as percentage and the imaging results of MRCP and DCE-CT mean ± SD. Chi square-test and t-test were applied of statistical significance, $P < 0.05$. Statistical software: IBM SPSS 19.0 and Microsoft office excel.

Results

Diagnostic effects of conventional X-ray and MRCP combined with DCE-CT in the treatment of benign and malignant biliary stricture

There was higher sensitivity, specificity and accuracy in the diagnosis of benign and malignant biliary stricture when the patients were treated by MRCP combined with and DCE-CT compared with the conditions when the patients were treated with conventional X-ray examination of statistical significance ($P < 0.05$, Table 2).

Table 2. Comparison of the diagnostic results of the two methods.

Methods		Pathology		Sensitivity	Specificity	Accuracy
		Benign (n=38)	Malignant (n=32)			
X-ray	Malignant	28	8	73.7 (28/38)	75.0 (24/32)	74.3 (52/70)
	Benign	10	24			
MRCP and DCE-CT	Malignant	37	1	97.4 (37/38)	96.9 (31/32)	97.1 (68/70)
	Benign	1	31			
χ^2		-		8.61	6.335	14.933
P		-		0.032	0.029	0.017

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Image analysis of MRCP combined with DCE-CT in patients with benign and malignant biliary stricture

Of patients with malignant biliary stricture, stenosis length and wall thickness as well as CT difference of arterial phase, portal

venous phase and delayed phase were significantly higher while the stricture diameter was strikingly lower than those of the patients with benign biliary stricture of statistical significance ($P < 0.05$, Table 3).

Table 3. Image analysis of MRCP and DCE-CT in patients with benign and malignant biliary strictures.

Group	Stenosis length	Wall thickness	Stricture diameter	Arterial phase	Portal venous phase	Delayed phase
Benign	9.4 ± 5.8	2.2 ± 0.5	2.1 ± 0.8	16.2 ± 11.4	28.4 ± 15.8	24.6 ± 12.7
Malignant	15.7 ± 7.2	3.3 ± 1.4	0.3 ± 0.3	31.2 ± 12.6	55.3 ± 14.6	53.6 ± 14.1
t	3.979	4.22	12.852	5.181	7.396	8.967
P	0.019	0.041	0.008	0.022	0.015	0.035

Conclusion

The combination of MRCP and DCE-CT is more sensitive and accurate than conventional X-ray examination in the diagnosis of benign and malignant biliary stricture. Thus, the application of MRCP combined with DCE-CT has significant effect in the differential diagnosis of benign and malignant biliary stricture.

Discussion

Biliary stricture, with moderately high clinical incidence, results from wall thickening, hyperplasia of fibrous tissue and narrowing bile duct lumen possibly caused by many factors like calculus of bile duct, cholecystolithiasis, gallbladder stones, iatrogenic injury, abdominal trauma and cholangitis diseases [4,5]. Biliary stricture may cause not only such complications as cholestasis, cholangitis, calculus of bile duct and biliary tract infection, also gallbladder and liver cell injury if serious. In addition, with the malignant biliary stricture posing a threat to the safety of the patients, to strengthen the early diagnosis and treatment becomes the basis for improving the prognosis of the patients [6-8].

Due to the big differences in treatment and prognosis method between benign and malignant biliary stricture, timely understanding the pathological type to give targeted therapy becomes the key to improving the prognosis of patients [9,10]. Imaging examination is a common way for the clinical diagnosis of the disease. Biliary disease was previously treated with traditional X-ray examination, which has unclear image with poor effects and the possibility of misdiagnosis and missed diagnosis [11,12]. In this study, the sensitivity, specificity and accuracy of MRCP combined with DCE-CT in the diagnosis of benign and malignant biliary stricture were significantly higher than those of conventional X-ray examination. The related research by Jianhui et al., accuracy of MRCP combined with DCE-CT examination result (96%) of benign and malignant biliary stricture was significantly higher than that of conventional X-ray examination result (76%), with which the result of this study is consistent, indicating the combined examination of MRCP and DCE-CT has significant effects on the diagnosis of benign and malignant biliary stricture [13]. MRCP is a method of displaying the structure of

T2 relaxation time by using T2 weighted pulse sequences. It has the advantages of non-invasion, simple and fast process of detection, capability of clearly showing morphology of bile vessel, specific positions, length, and diameter and wall thickness of the bile duct stricture, effectively assisting in the decision of the patient's disease conditions [14-16]. Besides, the DCE-CT detection can both enlarge the inspection scope and clearly show lesions of low density, thus improving the detection effects [17,18]. The combination of MRCP and DCE-CT examination will further enhance clarity of the anatomical images with structures of gallbladder wall as well as the surrounding tissues seen. It also enables to obtain imaging status of tissues with different density by one-time exposure, thus improving the image quality and helping to further increasing the evaluation of patient's conditions [19,20]. The quantitative analysis results of the MRCP combined with DCE-CT examination showed that the difference in stenosis status and CT result of patients with benign and malignant biliary stricture, thus signifying the joint inspection of MRCP and DCE-CT can effectively help the diagnosis of benign and malignant biliary stricture.

To sum up, the application of MRCP combined with DCE-CT has notable effects in the diagnosis of benign and malignant biliary strictures, which assists the diagnosis and treatment of the disease by making the quantification of biliary stricture effectively understood.

References

1. Shibin, Liu Y, Zeng F. Differential value of magnetic resonance cholangiopancreatography combined with enhanced CT in diagnosis of benign and malignant biliary stricture. *Chin Med Imaging* 2015; 23: 597-613.
2. Han W. Magnetic resonance imaging in the diagnosis of low-order biliary obstructive diseases. *Chin Foreign Med Treatment* 2015; 34: 173-174.
3. Lu J. Differential value of magnetic resonance cholangiopancreatography combined with enhanced CT in diagnosis of benign and malignant biliary stricture. *Med Equipment* 2015; 28: 24-25.

4. Zuoluo. Imaging etiological diagnosis of biliary acute pancreatitis. *World Clin Med* 2015; 9: 290.
5. Fu H, Li M. The value of MRCP and CT in diagnosis of biliary obstructive diseases. *J Med Imaging* 2013; 23: 631-632.
6. Chen X, Sheng A, Chen Y. Application of low field magnetic resonance (MR) imaging in the diagnosis of biliary obstructive diseases. *Chin Folk Med* 2015; 23: 112-115.
7. Deng S, Que J. Application value of magnetic resonance cholangiopancreatography in postcholecystectomy syndrome. *Mod Med Health* 2014; 30: 1452-1456.
8. Chen Z, Sun C, Pan Y. The value of ERCP in diagnosis and treatment of biliary obstructive diseases in elderly patients. *J Guiyang Med Univ* 2014; 39: 402-405.
9. Qin Y. The clinical value of conventional epigastrium MRI scan combined with cholangiopancreatography in the diagnosis of cholangiocarcinoma. 2015; 28: 381.
10. Deng F. Clinical analysis of postoperative biliary stricture after liver transplantation by means of endoscopic retrograde cholangiopancreatography (ERCP). *Chin Arch Gen Surg* 2015; 11: 124-128.
11. Li W, Dong M, Li Y. The effect of ERCP on diagnosis and treatment of bile leakage after liver transplantation. *Tianjin Med J* 2016; 44: 518-521.
12. Cao W, Gan Y, Sun L. Differential diagnosis of congenital biliary dilatation. *J Med Imaging* 2016; 26: 460-463.
13. Liu J, Liu X. Differential diagnosis of magnetic resonance cholangiopancreatography combined with enhanced CT in treatment of benign and malignant biliary strictures. *Chin Med Edu* 2016; 8: 1.
14. Zhang T, Zheng R, Xu E. Effect's comparison between double contrast radiography test and enhanced MR Imaging in diagnosis of periampullary diseases. *Chin J Hepatic Surg* 2014; 2: 165-169.
15. Yang X, Liu W, Deng X. Clinical value of preoperative MRCP and LC intraoperative cholangiograph in diagnosis of cholecystolithiasis combined with potential choledocholithiasis. *Chongqing Med J* 2016; 45: 2070-2072.
16. Lai Q, Jiang T, Gu P. Diagnostic value of contrast-enhanced ultrasonography and magnetic resonance imaging in diagnosis of biliary complications after liver transplantation. *Jiangxi Med J* 2013; 27: 1279-1300.
17. Liang P, Fang H, Chen G. Application value of minimum intensity projection combined with gall-tubule imaging by curved planar reformation in multi-slice spiral CT for diagnosing hilar cholangiocarcinoma. *Chin J Med Imaging* 2013; 21: 648-651.
18. Wu X. Comparative analysis and application evaluation of CT and MRCP imaging in the diagnosis of biliary system stone. *Chin J CT MRI* 2016; 14: 80-82.
19. Fang W, Xu G, Yu H. Value of IDUS, CT and MRCP in diagnosis of malignant biliary obstruction. *Zhejiang Med J* 2016; 38: 201-204.
20. Chen J, Li J. Clinical analysis of preoperative CT enhancement and biliary reconstruction in treatment of hilar cholangiocarcinoma. *J Med Imaging* 2016; 26: 2113-2116.

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