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Evaluation of biliary complications on magnetic resonance cholangiopancreatography and comparison with direct cholangiography after living-donor liver transplantation

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AIM: To evaluate the imaging characteristics of biliary complications following liver transplantation on magnetic resonance cholangiopancreatography (MRCP) and its diagnostic accuracy in comparison with direct cholangiography.

MATERIAL AND METHODS: In this prospective study, 34 patients being evaluated for possible biliary complications after living-donor liver transplantation (LDLT) with abnormal MRCP findings were followed up for information regarding direct cholangiography either endoscopic retrograde cholangiopancreatography (ERCP) or percutaneous transhepatic cholangiography (PTC) within 7 days of MRCP. Twenty-nine patients underwent ERCP and five patients underwent PTC.

RESULTS: Compared to findings at direct cholangiography, MRCP presented 96.9% sensitivity, 96.9% positive predictive value, and 94.1% accuracy for the detection of biliary complications. The sensitivity, specificity, positive predictive value, negative predictive value, and accuracy for detection of anastomotic strictures, biliary leak, and biliary stone or sludge on MRCP was found to be 100%, 84.6%, 91.3%, 100% and 94.1%; 72.7%, 95.7%, 88.9%, 88% and 88.2%; 80%, 100%, 100%, 96.7% and 97.1%, respectively.

CONCLUSION: MRCP is a reliable non-invasive technique to evaluate the biliary complications following LDLT. MRCP should be the imaging method of choice for diagnosis in this setting and direct cholangiography should be reserved for cases that need therapeutic interventions.

Introduction

Biliary complications are the second most frequent cause of transplant failure after acute rejection and remain a serious cause of morbidity and mortality in recipients after liver transplantation. In case of biliary complications post-liver transplantation, clinical examination and laboratory

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testing are often non-specific. Direct cholangiography techniques, including endoscopic retrograde cholangiopancreaticography (ERCP) and percutaneous transhepatic cholangiography (PTC), are associated with procedure-related complications, and are invasive and time consuming. A 10–24% complication rate has been reported after ERCP.[1–8] Magnetic resonance cholangiopancreaticography (MRCP) has been described as a non-invasive alternative to direct cholangiography for diagnosis of bile duct disorders. MRCP has excellent sensitivity (93–100%) in detecting biliary strictures, and can also offer a roadmap for the endoscopist in planning the necessary intervention.[9]

The aim of the present study was to evaluate imaging characteristics of biliary complications following liver transplantation on MRCP and its diagnostic accuracy in comparison with direct cholangiography.

Materials and methods

This prospective study was conducted at Indraprastha Apollo Hospital after approval by the institution ethics committee and after obtaining written informed consent from the patients. Data were collected from 34 patients who were being evaluated for possible biliary complications after living-donor liver transplantation (LDLT) from August 2013 to June 2015 having one or more of the clinical findings of jaundice, pruritus, abdominal pain, and fever along with deranged liver function tests. The serum values of bilirubin, glutamic–oxaloacetic transaminase (GOT), glutamic pyruvic transaminase (GPT), and alkaline phosphatase (ALP) were recorded at the time of the examination. All the patients included in the study underwent MRCP and were followed up for information regarding direct cholangiography findings, either ERCP or PTC, within 7 days of MRCP.

Radiological examination

MRCP protocol

Patients were asked to fast for 4 hour prior to the study in order to reduce fluid secretions within the stomach and duodenum, and reduce bowel peristalsis. MRCP was performed using a 3 T MRI system (Achieva, Philips, Best, The Netherlands), using a phased-array body coil. The protocol imaging parameters are shown in Table 1.

Direct cholangiography

Direct cholangiography was the reference standard. ERCP for all patients was performed by an experienced gastroenterologist and PTC by an experienced interventional radiologist.

Statistical analysis

Statistical testing was conducted with the Statistical Package for the Social Sciences (SPSS) version 17.0. Continuous variables are presented as mean ± standard deviation (SD), and categorical variables are presented as absolute numbers and percentage. Association between MRCP and direct cholangiography findings were compared using Chi-squared test. A p-value <0.05 was taken to indicate a significant difference.

Results

The majority of patients belonged to the 41–60-year age group (mean age 50.53 years, range 24–72 years). The study group was formed of 26 men and eight women (Table 2).

The diseases or associations of diseases that resulted in liver transplantation (LT) were cirrhosis due to alcohol in three cases, hepatitis C in 17 cases, hepatitis B in eight cases, and hepatocellular carcinoma in four cases. In two patients, the aetiology was not determined (cryptogenic cirrhosis).

In the present study, the mean time interval between transplantation and presentation with biliary complication was 218 days (7.1 months) and ranged from 16 days to 762 days (2 years and 1 month). All 34 patients had deranged liver function tests, with 100% of patients having elevated alkaline phosphatase (ALP) levels. The mean time to present with development of strictures was 176 days (5.8 months) with a range of 36–762 days, and the mean time to present with development of biliary leak was 42 days (6 weeks) with a range of 16–632 days.

The type of anastomosis present in the analysis from the 34 patients was duct to duct (choleochocholedochostomy) in 33 patients. Total number of anastomoses was 52. In three patients, biliary enteric anastomosis was performed, of which two cases had both duct-to-duct and biliary enteric anastomosis in view of multiple ducts in donors and an inability to maintain biliary continuity otherwise with

Table 1
Summary of magnetic resonance cholangiopancreatography imaging parameters.

Pulse sequence	Plane	TE (ms)	TR (ms)	Flip angle (degrees)	NSA	Section thickness (mm)	Comments
Survey	Multiplanar	8	3.2	25	1	15	
Right 3D TSE	Axial	740	1940	90	1	1.2	MIP reconstructions
Right 3D TSE	Coronal	740	2208	90	1	1.2	MIP reconstructions
BH 2D SSh T2 (thick slab)	Coronal	920	9446	90	1	40	16 sections with a radial acquisition and pancreatic head in centre
T2 TSE	Axial	68	1318	90	1	5	
T2 TSE SPAIR	Axial	68	1318	90	1	5	
T2 TSE SPAIR	Coronal	90	1544	90	2	5	
Diffusion-weighted images	Axial	55	1617	90	4	7	

TE, echo time; TR, repetition time; NSA, number of signal averages; 3D, three-dimensional; MIP, minimum intensity projection; TSE, turbo spin echo; BH, breath hold; SPAIR, SPectral Attenuated Inversion Recovery.

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