MR Cholangiography in patients with biliary complications after liver transplantation: Which sequence enables diagnosis and differentiation best?

S. Kinner[1], A. Dechêne[2], S. C. Ladd[1], T. Zöpf[2], G. Gerken[2], G. Antoch[1], M. Forsting[1], and T. C. Lauenstein[1]

[1]Department of Diagnostic and Interventional Radiology and Neuroradiology, University Hospital Essen, Essen, NRW, Germany, [2]Department of Gastroenterology and Hepatology, University Hospital Essen, Essen, NRW, Germany

Introduction:

Liver transplantation is a widely accepted procedure for patients suffering from end-stage liver disease. Biliary complications after transplantation occur in these patients in up to 30%. They include strictures of the biliary anastomosis (AST) or the intra- and extrahepatic bile ducts (ITBL; ischemic type biliary lesions). Both findings present with a dilatation of the intra- and partially extrahepatic bile ducts.

Endoscopic retrograde cholangiopancreatography (ERCP) is the gold standard to diagnose biliary strictures. The procedure, however, is invasive and linked with post- or interinterventional risks. MR Cholangiopancreaticography (MRCP) has evolved as an attractive, non-invasive alternative to ERCP during the last two decades. Considerable improvements of MRCP could be achieved and biliary strictures can now be depicted with high accuracy by means of high resolution MRCP (1,2). However, there is no agreement which imaging technique of MRCP provides best results for the visualization of biliary pathologies. Therefore, we aimed to compare different MRCP sequences with regard to their diagnostic accuracy of depicting AST and ITBL lesions.

Materials and Methods:

40 patients (21 men, 19 women, mean age 49years) with clinical suspicion of biliary obstruction after liver transplantation were studied. MRC was performed on a 1.5T scanner (Magnetom Avanto, Siemens Medical Solutions) using (a) 2D single shot RARE (rapid acquisition with refocused echo; TR = 3.16,TE = 1.1, flip angle = 150°, acquisition matrix 512; slice thickness 80mm), (b) 2D T2w HASTE (Half Fourier Acquisition Single Shot Turbo Spin Echo; TR = 1.1,TE = 88, flip angle = 150°, acquisition matrix 256; slice thickness 4mm) (c) 3D RST (high-resolution navigator corrected) T2w TSE (TR = 2000, TE = 920, flip angle = 180°, acquisition matrix 384; slice thickness 2mm), and (d) 2D TrueFISP (TR = 4.3,TE = 2.15 ,flip angle = 69°, acquisition matrix 256; slice thickness 4mm) sequences. ERCP was performed no later than 48h after MRI.

Two abdominal radiologists reviewed the images in a consensus mode. The sequences were separately evaluated in a randomized order. The RST sequence was evaluated as source images as well as maximum intensity projection (MIP). Furthermore, all sequence types were assessed together in a separate session. Presence of strictures was assessed as well as the diagnostic confidence on a 4-point scale (1 = certainly stenosis, 2 = presumably stenosis, 3 = presumably no stenosis, 4 = certainly no stenosis). Sensitivities and specificities for each sequence were evaluated with ERCP serving as the gold standard.

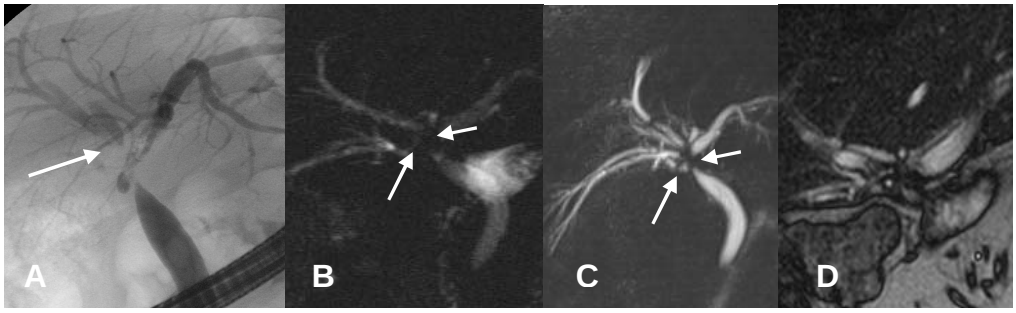

Fig. 1: ERCP (A) and corresponding MRCP (B-D) in a patient with ITBL showing multiple stensoses of the hilar region and consecutive dilatation of the intrahepatic bile ducts (see arrows). The pathology is clearly depicted by the HASTE sequence (B) and the navigator triggered T2 TSE sequence (C). The FISP sequence (D) fails to visualize the pathology due to presence of adjacent vessels.

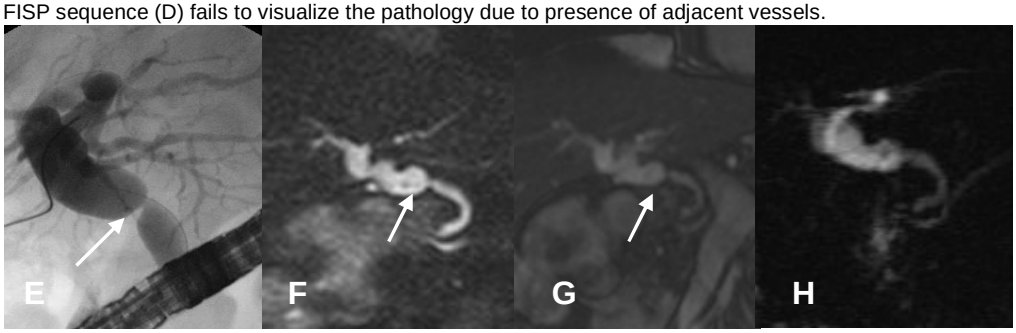

Fig 2: ERCP (E) and corresponding MRCP (F-H) of a patient with anastomosis stenosis (arrows). The pathology is clearly depicted by the RARE sequence (F) and the TrueFISP sequence (G). The HASTE sequence (H) does not provide detailed information in this case and the stenosis can be missed.

Results:

The RARE sequence was most sensitive (95%) for the detection of AST while ITBL was visualized best by means of the 3D navigator-corrected MRCP sequence (sensitivity 89%). The highest specificity for the detection of anastomosis stenosis was found with RARE and TrueFISP sequences (specificity 92%). Concerning the visualization of ITBL only moderate specificity rates (71%) were found for HASTE and RARE images. When all MRCP sequences were considered 100% sensitivity could be reached for ITBL as well as for AST. Specificity for AST amounted for all sequences together to 92%, while evaluation of all sequence types together reached a specificity of 71% for ITBL.

Table 1: Sensitivities and specificities for the evaluated MRCP sequences with regard to the type of biliary strictures.

		HASTE	RARE	RST source images	RST MIP	FISP	all
AST	sensitivity	67%	95%	67%	75%	50%	100%
	specificity	76%	92%	84%	92%	92%	92%
ITBL	sensitivity	78%	88%	89%	89%	50%	100%
	specificity	71%	71%	43%	71%	67%	71%

Discussion and Conclusion:

Diagnosis of biliary strictures with MR Cholangiopancreaticography is feasible and provides a non-invasive alternative to ERCP. Our results underline the value of different MRCP sequence types for the depiction of the various forms of biliary stenoses. Thus, a clinical protocol should not be based on a single MRCP sequence alone.

References:

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