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CASE REPORT

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Bilio-pancreatic anomalies obscured with MRCP

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In this article the authors discuss whether or not diagnostic potential of MR cholangiopancreatography is strong enough to replace direct cholangiography in all cases. The pre- surgery analysis of a variety of pancreato-biliary disorders diagnosed using MRCP images is presented with the emphasising the importance of source images. Six cases of pancreato-biliary disorders are presented in which MRCP indicated the place of ductal stenosis as well as the morphologic variants or ductal uninspected shape which is critical for surgery or planned drainage. Coronal and axial MRCP source and MIP images were obtained with 0,5T Gyroscan NT. Anomalies of the biliary or pancreatic ducts included two cases of choledochal cystic dilatation; two cases of aberrant biliary ducts, one case of gallbladder duct variant.and a case of an additional pancreatic duct. In 3 out of 6 cases, the MRCP source images produced using the complementary method supplied more complete information concerning ductal junctions than the MIP images. Whereas in 3 out of 6 cases, both kinds of images were equally reliable. In 4 out of 6 cases, endoscopy was performed, and in 2 cases ERCP images were not diagnostic for ductal anatomy. However, full delineation of biliary and pancreatic ducts was complete in all MRCP images. MRCP within source images and maximum intensity projections show particular promise for the assessment of pancreatobiliary anomalies in order to reduce the number of higher-risk endoscopic interventions. The technique should be the method of choice in cases of suspected pancreato-biliary anomaly resulting from any imaging modality and is helpful for planning the optimal drainage method. In the long run this practice would reduce the number of ducts damaged during surgery.

key words: magnetic resonance (MR), bile ducts, pancreatic ducts, variants

INTRODUCTION

Noninvasive diagnostic procedures such as ultrasonography and computer tomography (CT) are usually used in preliminary examinations during the assessment of biliary and pancreatic disorders. However, CT is confined to axial slice only and the accuracy of ultrasound varies widely depending on the state of the patient, the examiner, and the equipment. On the other hand, endoscopic retrograde cholangiopancreatography (ERCP) and percutaneous transhepatic cholangiography (PTC), being invasive procedures, should be used as therapeutic methods only [8].

The gallbladder, biliary and pancreatic ducts are essentialy fluid-filled structures surrounded by parenchymal or adipose tissues, which give excellent duct-to-background contrast on static fluid magnetic resonance (MR) images. The procedure that produces source

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tomographic images or projections is called magnetic resonance cholangiopancreatography (MRCP).

MRCP is a non-invasive technique, which allows multiplanar analysis of biliary and pancreatic ducts in of all their anatomic segments without the injection of a contrast medium and with no need for dilatation due to the pressure effect of the contrast medium injected using direct cholangiographic techniques [8].

Promising clinical applications include imaging of pre- and post-surgery patients with biliary and pancreatic disorders and cases of biliary and pancreatic duct anomalies [7].

The aim of the work is to present the role of MRCP source and projection images as comprehensive, noninvasive imaging modality in the evaluation of biliary and pancreatic duct variants and other anomalies associated with a variety of pancreato-biliary disorders with special interest in the way they implicate the interventional procedures.

MATERIAL AND METHODS

Cholangiopancreatographic MR images (3DTSE 1800/700) were acquired in the axial and coronal planes from 6 patients (2 men, 4 women, average age 56.3 years old) who were directed to MR examination after ultrasonography disclosed cholestasis. In 4 cases, ERCP was performed with a Pentax ED-3440T with support to supply biliary drainage performing sphincterotomy during all procedures and inserting endoprosthesis in 3 cases. The list of biliary and pancreatic duct anomalies, as well as the disorders due to which the diagnostic and therapeutic procedures were undertaken, are presented in the Table 1.

CASE REPORTS AND DISCUSSION

MRCP images obtained in 6 patients including MIP reconstructions and source, tomographic images are presented on Figures 1–10.

Various techniques have been developed to obtain MRCP images including 3D TSE, RARE and HASTE. The established modes of turbo spin-echo imaging that are useful for MRCP include: 2D multislice, 3D multiple-slab, and single shot techniques. [5, 8, 9]. 3D fast turbo spin-echo sequences, however, are somewhat time consuming and it is possible to obtain projection images and source,

Figure 1. Female. 21 yr. Choledochal cyst. MIP reconstruction.

Table 1. Patients — bilio-pancreatic anomalies and associated disorders

	Sex/Age	ERCP	Biliary or pancreatic duct anomaly	Associated disorder	Procedure
1	Female/21 yr	Not performed	Choledochal cyst with histology as in the gall blader	Chronic cholangitis	Hepaticojejunostomy
2	Female/72 yr	Diagnostic	Choledochal cystic dilatation	Cholecystolithiasis	Hepaticojejunostomy and cholecystectomy
3	Female/77 yr	Not diagnostic	Parallel cystic duct	Pancreatic carcinoma	ERCP, then pancreatoduodenectomy
4	Female/75 yr	Diagnostic	Aberrant right posterior hepatic duct	Pancreatic carcinoma	Pancreatoduodenectomy
5	Male/45 yr	Failed	Additional pancreatic duct	Ampular carcinoma	Pancreatoduodenectomy
6	Male/48 yr	Not possible	Aberrant right posterior hepatic duct	Benign stricture of an astomosis after hepaticojejunostomy	Percutaneous dilatation and drainage

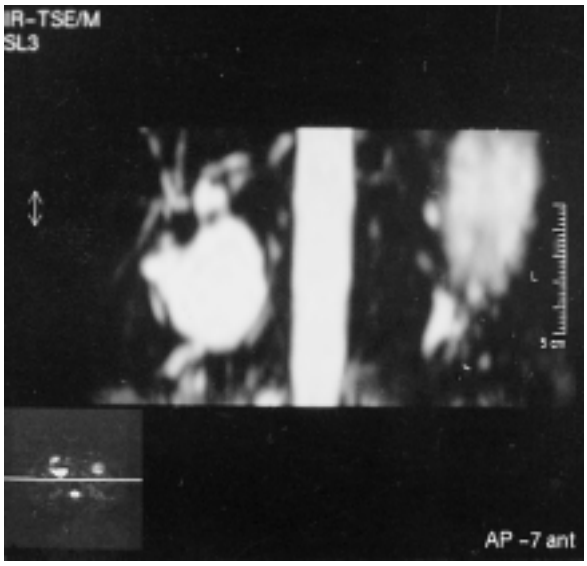

Figure 2. Choledochal cyst. Source image — similar identification supported as in the MIP image.

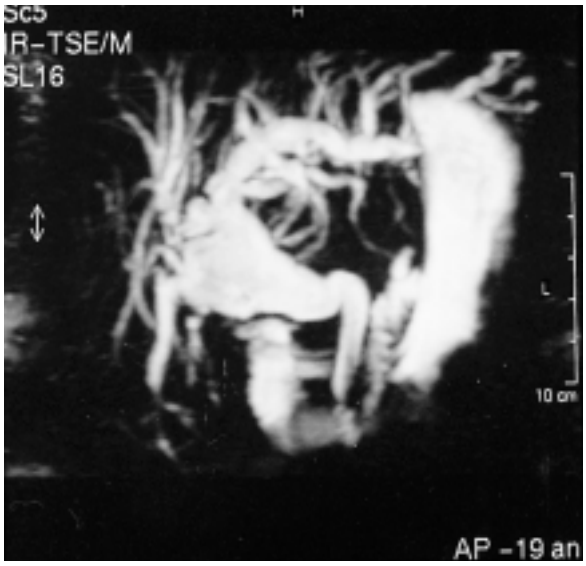

Figure 3. Female. 72 yr. Choledochal cystic dilatation. MIP reconstruction

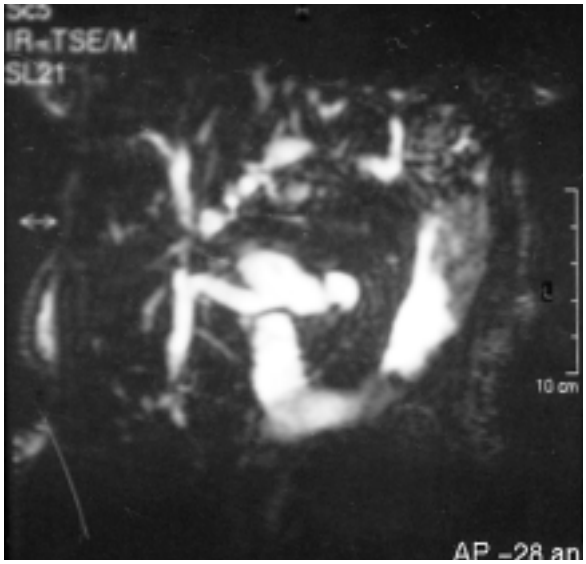

Figure 4. Source image — better delineation of anterior segmental hepatic duct insertion.

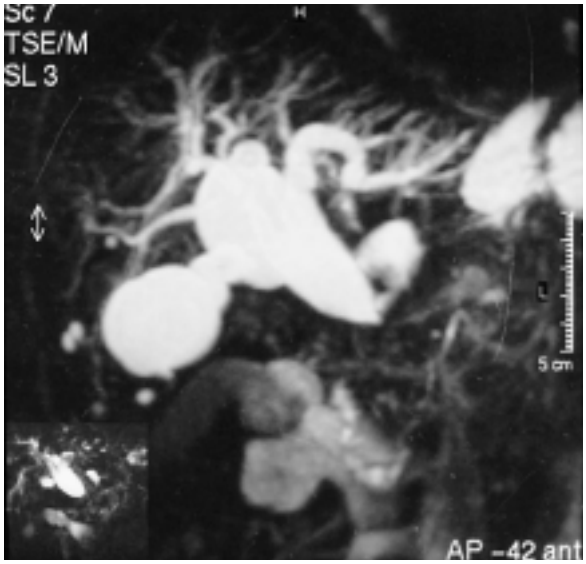

Figure 5. Female. 77 yr. Parallel cystic duct. MIP reconstruction.

tomographic images. Both of them are helpful in delineating the bilio-pancreatic system they are complementary to each other. MRCP performed at mid-field strength could have the same clinical value as a high field strength MRCP [5].

It is worth noting that images supported by MRCP delineate biliary and pancreatic ducts on both sides of a complete obstruction which could not be relieved during endoscopy or percutaneous drainage. For diagnostic purposes, MRCP is indicated in cases where ERCP failed, was incomplete or contraindicated (Figs. 5, 6 and 8, 9). Also prior to bilio-enteric surgery such results are regarded as a clear indication for the MR method [6–8] (Fig. 10).

Miyazaki [3] reported 100% diagnostic accuracy of MRCP in patients with choledochal cysts (Figs 1–4); 100% in those with congenital biliary atresia; and 69% in those with anomalous connections between the biliary and pancreatic ducts.

Variant anatomy of the bile ducts has also been evaluated with 2D turbo spin-echo MRCP [2]. Variants of the cystic and hepatic ducts may be important in planning laparoscopic cholecystectomy, and anomalies such as low or medial cystic duct inser-

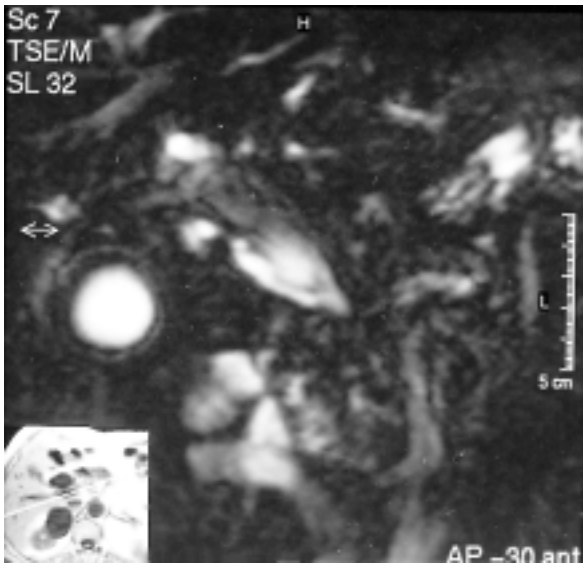

Figure 6. Clear delineation of the cystic duct connection to biliary duct.

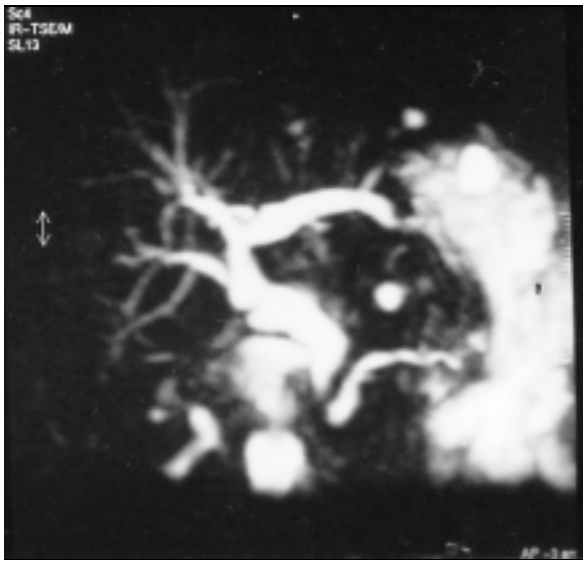

Figure 7. Female. 75 yr. Aberrant right posterior segmental hepatic duct. MIP reconstruction.

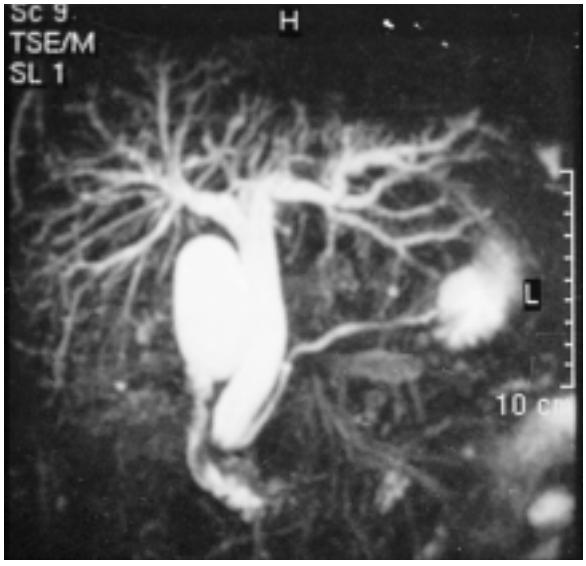

Figure 8. Male. 45 yr. Periampular tumor. MIP reconstruction. Biliary duct dilatation and a normal pancreatic duct.

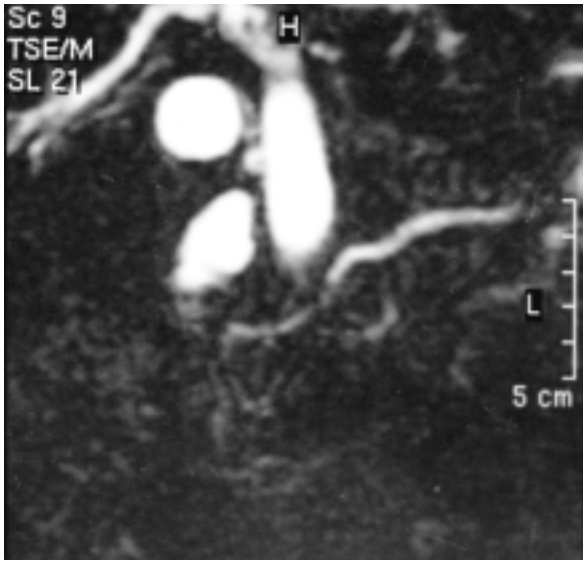

Figure 9. The source image shows a normal size pancreatic duct — the isthmal connection to an additional pancreatic duct.

tion, parallel cystic and hepatic ducts, and an aberrant right hepatic duct were demonstrated with high accuracy [10]. In cases of cholestasis, since MRCP is a valuable method to obscure the anatomy of biliary ducts it also helps when choosing the optimal drainage method. Furthermore, in cases of aberrant ducts or when changes of proximal hepatic paranchyma are revealed with CT or plane MRI scans, drainage can be directed to the largest segment of the intercommunicating ducts within a reasonable bulk of hepatic parenchyma, thereby avoiding drainage of atrophic segments [1]. Figures 7 and 10 present the cases of aberrant biliary ducts with well defined junctions.

The relation between MRCP and direct cholangiographic techniques is changing constantly, moving the diagnostic role into MRCP so that ERCP or PTC are performed only because of intervention. Additionally, anatomic factors such as periampullary diverticula, duodenal stenosis or cystic choledochoectasis, periampullary masses, ampulary calculi and postsurgical anatomy affect the ability to opacify the biliary tree by conventional ERCP [2]. Another benefit of performing MRCP is the reduction of the need to opacify the biliary and

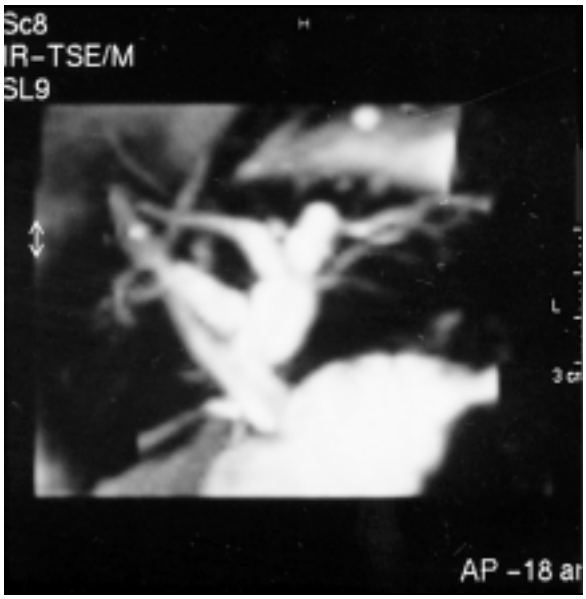

Figure 10. Male. 48 yr. Aberrant right posterior hepatic duct in the patient after hepaticojejunostomy.

pancreatic ducts during therapeutic ERCP what decreases the number of post-procedural inflammatory disorders.

Better visualisation of the normal pancreatic duct was obtained with source images than with MIP images (as can be seen in the series of Takehara [9]) 81% and 69% respectively.

In conventional MRCP, even involving normal patients, the main pancreatic duct may not be completely delineated. In patients with chronic pancreatitis, intravenous secretine administration may be helpfull in enhancing the delineation of the main pancreatic duct and its branches [4]. Despite the additional cost of secretin administration in MRCP studies, it is also helpful to improve the visualisation of anatomic variants such as the dorsal-dominant pancreatic duct. Despite the benefits, the method is seldom used. Source images are usually obtained with coronal and axial acquisition protocols. For detection of pancreatic duct abnormalities, the former plane is regarded as specially helpful [2, 5] (Figs 8, 9).

Reasons to investigate the patency of biliary-enteric anastomoses and the anatomy of the bile ducts include unexplained fevers, suspected cholangitis, pancreatitis, right-upper quadrant pain, as well as positive test results for abnormal liver function and jaundice. Due to long term complications it is necessary to perform secondary therapeutic procedure in 7–23% of cases. These procedures include surgery, percutaneous drainage or therapeutic ERCP when possible [6]. Starting these procedures without knowledge of the biliary and pancratic duct variants and anomalies means an increased risk of further complications.

CONCLUSIONS

MRCP within source images and maximum intensity projections show particular promise for the assessment of pancreatobiliary anomalies in order to reduce the number of higher-risk endoscopic interventions. The technique should be used as the method of choice in cases where pancreato-biliary anomaly is suspected from any imaging modality and is also helpful for planning the optimal drainage method. In the long run, it should reduce the amount of duct damage during surgery.

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