MRCP: Imaging pitfalls and improvement with morphine administration

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Purpose: MRCP evaluation of biliary and pancreatic ductal anatomy and pathology is challenging with nondistended ducts. IV morphine is often used in nuclear scintigraphy to improve biliary duct visualization. The purpose of this study is to determine if IV morphine administration improves biliary and pancreatic duct dilatation at MRCP.

Methods: 20 patients, 10 patients with normal biliary or pancreatic ducts and 10 patients with diseased biliary or pancreatic ducts, will undergo MRCP before and after administration of 0.04 mg/kg of IV morphine. 2D and 3D MRCP images will be acquired before and after morphine administration on a 1.5-T scanner (Philips Gyroscan ACS-NT Powertrak 6000 Release 8.1 software). The imaging protocol will include breath hold, heavily T2-weighted single-shot turbo spin echo (SSTSE-MRC) images in thick (55-mm slab thickness, 256 x 256 matrix with 1024 reconstruction, 320 x 320mm FOV, TR/TE/FA 5000/650/90 in coronal & coronal-oblique planes) and thin (5 mm slice thickness, 256 x 192 matrix with 512 recon, TR/TE/FA 20349/180/90 in coronal plane) sections, thin section long TE axial images (4mm skip 0.4 thickness, 60 slices, 256x 204 matrix, TR/TE/FA 1036/180/90) will be obtained with a free breathing technique, and a 3D MRCP sequence (70 slices at 1mm thickness, 256 x 179 matrix with 512 recon, 320 x 320 mm FOV, TR/TE/FA 1500/450/90). The optimal timing of the post-morphine MRCP images will be determined by evaluating post-morphine images obtained at 10, 20 and 40 minutes in the first 5 patients.

A radiologist blinded to whether the images were obtained pre or post-morphine will tally the number of ducts visualized including the cystic, extrahepatic bile, main right and left hepatic, right anterior and posterior segmental, left segmental, accessory pancreatic, proximal and distal pancreatic ducts. Subsequently, the pre and post-morphine images will be evaluated simultaneously to determine which data set demonstrated better overall duct visualization. All findings of anatomic variants and pathologic diagnosis will be correlated with ERCP, surgery and pathology when available.

Results: 15 patients, 10 normal and 5 diseased, have undergone MRCP without and with IV morphine thus far. 24 biliary segments in these 15 patients and 23 pancreatic duct segments have demonstrated improved distention and conspicuity after morphine administration. The most commonly improved post-morphine biliary distention was seen in the intrahepatic segmental ducts (n=20). All 15 patients demonstrated better overall duct visualization post-morphine on the simultaneous evaluation.

Post morphine MRCP images improved evaluation of pseudodefects, malignancies including cholangiocarcinoma and intraductal pancreatic mucinous tumor (IPMT), and anatomic variants, such as an accessory left posterior duct arising from the right hepatic duct and a quadrification anomaly of intrahepatic ducts.

Conclusion: IV morphine increases distention of the biliary and pancreatic ducts, providing improved evaluation of nondistended biliary systems in liver donor evaluations. It is a helpful adjunct in patients with biliary and pancreatic disease such as cholangiocarcinoma and IPMT.