Magnetic Resonance Cholangiopancreatography: The Usefulness of A Negative Oral Contrast Agent – Mixture of Barium Sulfate and Magaldrate

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Introduction

Magnetic resonance cholangiopancreatography (MRCP) is an emerging non-invasive technique for direct visualization and evaluation of the biliary and pancreatic duct [1-3]. Signals from the regional gastrointestinal tract may obscure the bile ducts and degrade the diagnostic efficacy of MRCP. A mixture of barium sulfate and gastric antacid has been proved as a low cost, well tolerated, and effective negative gastrointestinal contrast agent for abdominal MRI [4]. The purpose of this study is to evaluate the usefulness of a negative oral contrast agent (mixture of Barium sulfate and Magaldrate) in MRCP.

Materials and Methods

Three groups of patients were included: 1) Group I (n=18): MRCP before and after administration of oral contrast, 2) Group 2 (n=130): MRCP without oral contrast, 3) Group 3 (n=125): MRCP with oral contrast.

All MR examinations were performed with a 1.5-T unit (Gyrosan ACS-NT; Philips Netherlands). All patients had fasted for at least 3 hours before examination. A mixture of 200 ml Barium sulfate (120% W/V) and 50 ml Magaldrate (37.5 mg/dl) suspensions was given orally 10 minutes before MR examination in patients who underwent MR study with oral contrast. MRCP was performed using a three-dimensional, non-breath-hold, fat-suppressed, respiratory-triggered, heavily T2-weighted, turbo-spin-echo sequence (TR/TE: 7000/1000, turbo factor 116) with acquisition in the coronal plane.

The images were read blindly by three radiologists. Image quality was assigned as four grades: excellent, good, fair, and poor. Bowel interference was also assigned as four grades: grade 0 (no bowel signal intensity), grade I (intensified signal intensity that does not affects the reading), grade II (intensified signal intensity in part of the gastrointestinal tract adversely affects the reading), and grade III (intensified signal intensity in the gastrointestinal tract makes reading difficult). MRCP was evaluated for the efficacy in depicting normal and diseased bile ducts and pancreatic duct. The intermodality agreement between MRCP and direct cholangiography in the determination of the levels and causes of obstruction was also evaluated. The overall accuracy of the MRCP and conventional MRI in diagnosing pancreaticobiliary diseases were calculated. The differences in each item between group 2 and group 3 were compared and analyzed statistically.

Results and Discussion

Thirteen (72%) of the 18 patients in group 1 showed better image quality and fewer bowel interference on MRCP with oral contrast than without oral contrast. In average 60% of group 2 and 74% of group 3, the image quality of MRCP was assessed as good or excellent by the three observers (p<0.05). Significant bowel artifacts (grade II or III) were noted in 46% of group 2 and 25% of group 3 (p<0.001). MRCP depicted more than 3 hepatic segments in 99% of patients who had dilated intrahepatic ducts (IHD) and in 65% of cases who had non-dilated IHD in group 2; and in 99% and 73%, respectively in group 3. MRCP depicted main hepatic duct, gallbladder, cystic duct, extrahepatic duct, dilated pancreatic duct (PD) and non-dilated PD in 100%, 89%, 73%, 99%, 94 and 78% of cases, respectively in group 2; and in 100%, 92%, 76%, 98%, 93% and 81% of cases, respectively in group 3. The obstruction levels and characters determined by MRCP were agreed by direct cholangiography in 98% of malignant obstruction and 89% of benign obstruction in group 2; and 91% and 93%, respectively in group 3. The overall accuracy in diagnosing pancreaticobiliary disease were 81% in malignant diseases, 86% in benign diseases and 82% in stone diseases in group 2; and 88%, 89% and 82%, respectively in group 3. Most patients could tolerate well to this mixture of Barium sulfate and antacid. No side effect was seen. The cost of this contrast agent was low. From this study, administration of this negative oral contrast agent significantly reduced bowel artifacts and improved the image quality of MRCP. Additionally, it could also provide a good negative gastrointestinal contrast needed for the conventional T2-weighted MR images.

Conclusion

Administration of Barium sulfate and Magaldrate mixture as a negative oral contrast agent could reduce bowel artifacts and, thereby, improve image quality and diagnostic efficacy of MRCP.

References