Value of half-Fourier FSE with short ETS and long TE for respiratory-triggered three-dimensional MR cholangiopancreatography (MRCP) using parallel imaging for evaluation of bile duct branching pattern

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INTRODUCTION

Noninvasive examination with respiratory-triggered three-dimensional (3D) Magnetic resonance (MR) cholangiopancreatography (MRCP) provides excellent bile duct anatomy with high spatial resolution, and it is useful to evaluate branching pattern of intrahepatic bile duct. However, signals of portal vein sometimes remain significantly, which would interfere the interpretation of biliary tree on MIP images. In this study, we evaluated the usefulness of short echo train space (ETS) and long echo time (TEeff) half-Fourier FSE in relation to parallel imaging for 3D-MRCP, regarding demonstration of intrahepatic bile duct.

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MATERIALS AND METHODS

All MR examinations were performed using a 1.5-T clinical imager (EXCELART/XG, Toshiba, Tokyo), using a QD torso SPEEDER coil. MRCP was performed with respiratory-triggered 3D half-Fourier FSE using the following parameters; TR of 5000-7000, FOV= 28.2×29.7cm, matrix = 288×304, 2.2 mm thick slice, TI of 190msec, ETS of 5 and 12.5msec, TEeff of 240, 500, 750, 1000 msec, and parallel imaging factor of 1 to 2. Five healthy volunteers were examined (4 women and 1 man; age range 22-27 years). The quality of MRCP images was evaluated by 4 observers (1 radiologist, two surgeons, and one radiological technologist). The demonstration of portal vein and hepatic vein signal was evaluated as follows; score A of none to minimal, score B of present but not affecting the diagnostic evaluation, score C of present and affecting the diagnostic evaluation. The conspicuity of intrahepatic bile duct was evaluated as follows; score 1 of not-visible, score 2 of poor, score 2 of good, score 3 of excellent.

RESULTS

Blurring of bile duct was decreased and intrahepatic bile duct more clearly demonstrated on an image of ETS of 5 msec than that of 12.5 msec. However, portal and hepatic vein and hepatic parenchyma also demonstrated higher signal on an image of ETS of 5 msec than that of 12.5 msec, which significantly interfere the interpretation of bile duct. With an TEeff with shorter than 500 msec, the signal of portal vein and hepatic vein often remained, however with an TEeff with longer than 750 msec the signals of portal vein and hepatic parenchyma were significantly suppressed (Fig.1-2). In some case of cholecystitis, the demonstration of gallbladder was poor on an image with TEeff with 1000msec, which might be due to thick inflammatory bile. With use of parallel imaging, blurring effect of bile duct significantly decreased and made it easier evaluate small bile duct branch (Fig.3).

DISCUSSION

Using short ETS in 3D-half-Fourier FSE with parallel imaging factor of 2, blurring of bile duct was decreased and signal of bile duct increased; however, blood and hepatic parenchymal signals also increased. Long TEeff of 750msec or more could suppress the signals of portal vein and the hepatic parenchyma, therefore half-Fourier FSE with long TE in combination of short ETS and parallel imaging allows depiction of the bile clearly. Combining parallel imaging in short ETS and long TEeff half-Fourier permits less blurring and faster acquisition in MRCP examinations.

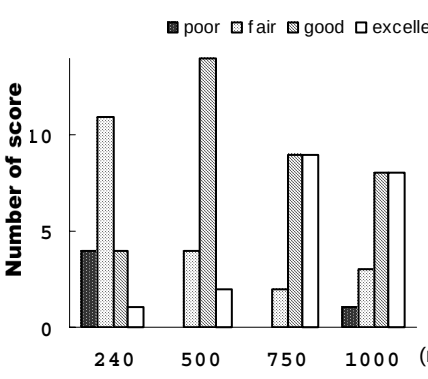

Fig.1 shows visualization of bile duct at different TEeff

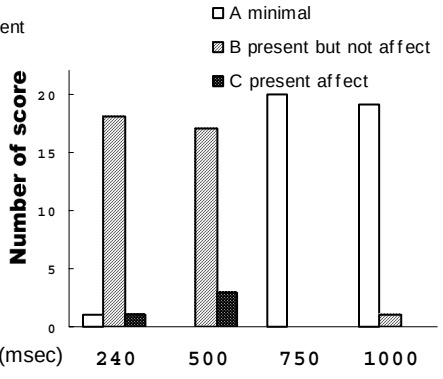

Fig.2 shows visualization of portal vein at different TEeff

In conclusion, MRCP with short ETS and long TEeff half-Fourier FSE combined with parallel imaging is useful for demonstration of intrahepatic bile ducts.

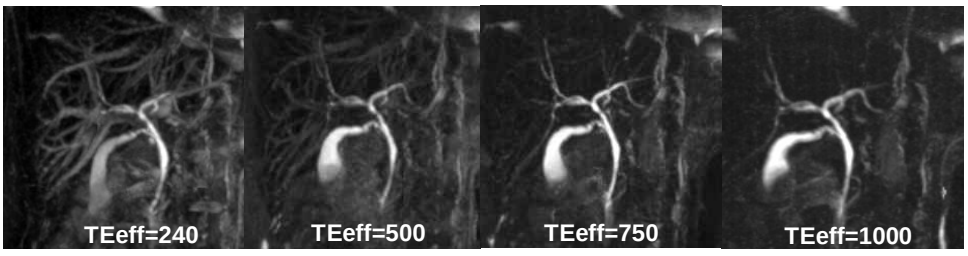

Fig.3 shows MIP images of 3D MRCP at different TEeff with parallel imaging factor 2.