MR Cholangiography with Gd-EOB-DTPA: Biliary Enhancement Dynamics in Clinical Patients

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Purpose:

Gd-EOB-DTPA is a liver-specific MR imaging contrast agent that is taken up by hepatocytes and excreted into the biliary system. MR cholangiography can be obtained by means of three-dimensional T1-weighted imaging at the optimal scan delay after the injection of Gd-EOB-DTPA (1). The aim of the present study was to evaluate the biliary enhancement dynamics of Gd-EOB-DTPA at MR cholangiography in clinical patients.

Materials and Methods:

Consecutive 22 patients suspected of having liver tumors underwent Gd-EOB-DTPA-enhanced MR examinutesation with a 1.5-T system or a 3.0-T system (Signa Excite HD; GE Healthcare, Milwaukee, WI). The delayed (hepatobiliary) phases were acquired 10, 20 and 40 minutes after the injection of Gd-EOB-DTPA using a three-dimensional gradient-echo sequence (LAVA). The signal intensities of the common bile duct and liver parenchyma were measured and the contrast was calculated (C = SI $_{\text{common bile duct}}$ / SI $_{\text{liver parenchyma}}$). MR cholangiography by means of maximuminutestensity projection method using the three-dimensional data was visually evaluated using a five-point scale in regard to delineation of the biliary tracts; intrahepatic bile ducts, hepatic ducts, common bile duct, cystic duct, and gall bladder as follows; 5, excellent; 4, good; 3, fair; 2, slightly; 1, none. One-way analyses of variance and Scheffe's post hoc comparisons were performed to compare among the three acquisitions at 10, 20 and 40 minutes delay.

Results:

The mean contrasts at 20 and 40 minutes delay were significantly higher than that at 10 minutes delay ($P < .001$, $P < .001$, respectively, Fig 1). There was no statistically significant difference between 20 and 40 minutes delay. The delineation of the intrahepatic bile ducts, hepatic ducts, common bile duct, and cystic duct at 20 and 40 minutes delay was also significantly superior to that at 10 minutes delay (Fig 2). However, in the patient with hyperbilirubinemia, the biliary enhancement was observed only at 40 minutes delay. The delineation of the gall bladder at 40 minutes delay was significantly superior to that at 10 and 20 minutes delay, and also that at 20 minutes delay was significantly superior to that at 10 minutes delay (Fig 2).

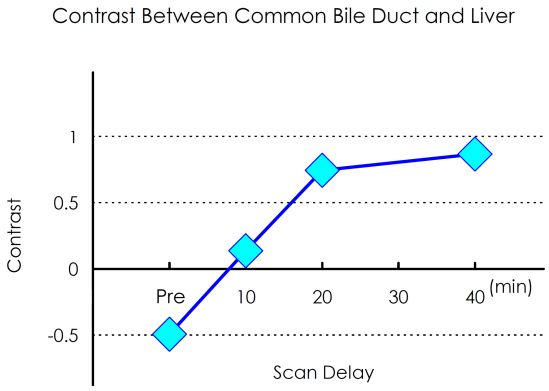

Fig 1. The graph shows the biliary enhancement dynamics.

Discussion:

The uptake of Gd-EOB-DTPA by hepatocytes is affected by liver function, particularly by serum bilirubin concentration (2). Therefore, the excretion of the Gd-EOB-DTPA was considered to be delayed in the patients having deterioration in liver function. Dahlström et al. investigated the biliary enhancement dynamics of Gd-EOB-DTPA in healthy subjects and reported that biliary enhancement was obvious 10 minutes post-injection for Gd-EOB-DTPA (3). In the present study, the enhancement of the common bile duct was obvious 20 minutes after the injection in the most clinical cases and the enhancement was significantly delayed in the hyperbilirubinemia case.

In conclusion, a 20-minutes delay after the injection was sufficient for the MR cholangiography with Gd-EOB-DTPA in the most clinical cases. However, a 40-minutes delay acquisition should be added in the cases having deterioration in liver function, particularly in the patients with hyperbilirubinemia.

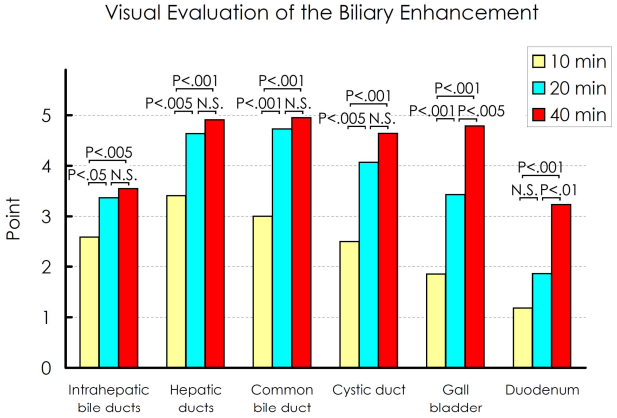

Fig 2. The graph shows the result of the visual evaluation.

References

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3. Dahlström N, et al. Contrast-enhanced magnetic resonance cholangiography with Gd-BOPTA and Gd-EOB-DTPA in healthy subjects. Acta Radiol. 2007;48:362-368.