Dynamic Contrast-Enhanced MR imaging of the Abdominal Solid Organ and the Major Vessel: Comparison of the Enhancement Effect between Gd-EOB-DTPA and Gd-DTPA

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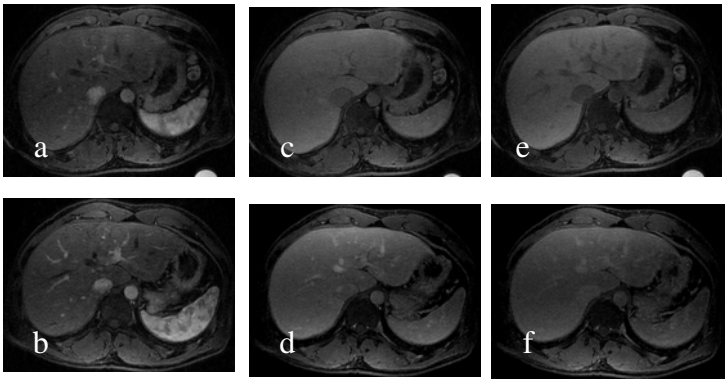
Purpose: Gadolinium ethoxybenzyl diethylenetriaminepentaacetic acid (Gd-EOB-DTPA: EOB) is a paramagnetic, ionic, and highly water-soluble contrast agent for hepatobiliary MR imaging. In addition to specific uptake by the hepatocytes, Gd-EOB-DTPA allows the assessment of tumor perfusion during the vascular phase like gadolinium diethylenetriaminepentaacetic acid (Gd-DTPA). Furthermore, the assessment of tumor perfusion during the vascular phase will be expected with not only liver but also other abdominal solid organs. In this study, we evaluated the difference in the enhancement of the abdominal solid organ and the major vessel on dynamic contrast-enhanced MR imaging (DCE-MRI) obtained with EOB and Gd-DTPA in the same subject.

Materials and Methods: A total of 13 healthy volunteers underwent repeat examination of abdominal MR examinations with DCE-MRI using either Gd-DTPA at a dose of 0.1 mmol/kg body weight or EOB at a dose of 0.025 mmol/kg body weight. DCE images were obtained at pre-contrast injection, arterial phase (AP: 25 seconds), portal phase (PP: 70 seconds), and equilibrium phase (EP: 3 minutes). The signal intensities (SIs) of liver at AP, PP and EP, the SIs of spleen, renal cortex, renal medulla, pancreas, adrenal gland, aorta at AP, and the SIs of portal vein and inferior vena cava (IVC) at PP were defined using region of interest measurements, and were used for relative enhancement (RE) calculation.

Results: The mean RE of liver (0.195 ± 0.140), spleen (1.35 ± 0.353), renal cortex (1.58 ± 0.517), renal medulla (0.548 ± 0.259), pancreas (0.540 ± 0.183), adrenal gland (1.04 ± 0.405), and aorta (2.44 ± 0.648) at AP as well as the mean RE of portal vein (1.85 ± 0.477) and IVC (1.16 ± 0.187) at PP in the EOB images were significantly lower than those (0.337 ± 0.200, 1.99 ± 0.443, 2.01 ± 0.474, 0.742 ± 0.336, 0.771 ± 0.227, 1.26 ± 0.442, 3.22 ± 1.20, 2.73 ± 0.42, and 1.68 ± 0.366) in the Gd-DTPA images (P<0.05 each). There was no significant difference in the mean RE of liver at PP between EOB (0.529 ± 0.124) and Gd-DTPA (0.564 ± 0.139). Conversely, the mean RE of liver at EP was significantly higher in EOB (0.576 ± 0.167) than in Gd-DTPA (0.396 ± 0.093) (P<0.001).

Conclusions: When using EOB in DCE-MRI of the abdominal MR imaging, differences of the enhancement effect and the enhancement pattern of solid organs with Gd-DTPA need to be considered. Lower arterial vascular and parenchymal enhancement with EOB compared to Gd-DTPA may require reassessment of its dose despite of the higher late venous phase liver parenchymal enhancement.



The Comparison of the Enhancement Effect of Liver Parenchyma between EOB and Gd-DTPA: (a): transverse postcontrast AP; (c): PP; and (e): EP 3D T1-weighted gradient-echo images with EOB. (b): transverse AP; (d): PP; and (f): EP 3D T1-weighted gradient-echo images with Gd-DTPA at the same level as (a), (c), and (e). The signal intensity of liver parenchyma in (a) is lower than that in (b), (c) is approximately equal with than that in (d), and (e) is higher than that in (f). Furthermore, the signal intensity of intrahepatic vessels in (e) decreases in comparison with (c), indicating washout of Gd-EOB-DTPA at the early stage after contrast media administration.