

The usefulness of Gadoxetic Acid (Gd-EOB-DTPA)-enhanced MRI for follow-up study in patients of malignant hepatic tumors performed RF ablation: Correlated with four-phase MDCT

J-H. YOON^{1,2}, E-J. LEE², S-S. Cha², S-S. Han², S-J. Choi², O-W. Park², Y-J. LEE³, and S-J. PARK³

¹Department of Radiology, Liver Imaging Research Group, UCSD Medical center, Hillcrest, San Diego, CA, United States, ²Department of Radiology, Busan Paik Hospital, Inje University, College of Medicine, Busan, Korea, Republic of, ³Department of Internal Medicine, Busan Paik Hospital, Inje University College of Medicine, Busan, Korea, Republic of

Objective: To assess the diagnostic value of Gadoxetic acid (Gd-EOB-DTPA)-enhanced MRI for follow-up study in patients of malignant hepatic tumors performed RF ablation correlated with four-phase MDCT (Multi-detector Computed Tomography).

Materials and Methods: Institutional Review Board approval was obtained for this study and informed consent was obtained from all patients. Among the patients from July 2007 to May 2008, we enrolled 39 patients performed Gadoxetic acid (Gd-EOB-DTPA) MRI and four-phase (arterial, portal venous, and equilibrium) MDCT after RF ablation for the treatment of malignant hepatic tumors (total number: 46, HCC: 43, metastasis: 3 cases). Two observers independently reviewed MR and CT images in random order on PACS systems. Diagnostic values of these two diagnostic techniques for conspicuity of treated tumor margin, detection of residual tumor were assessed by the 5 point scale methods with receiver operating characteristic (ROC) curve analysis.

Results: There was no significant difference in size of the ablation zone on MR images and MDCT images. For conspicuity of differentiation between margin of native tumor and margin of treated mass, the mean value of MR imaging was higher (4.72 ± 0.502 in reader 1, 4.67 ± 0.474 in reader 2) than that of MDCT (3.41 ± 0.884 in reader 1, 3.37 ± 0.878 in reader 2). The differentiation degree between residual or remnant tumor and hyperemia using five scale methods, was definitely higher using MR images (reader 1: 1, reader 2: 0.5) than MDCT images (reader 1: 0, reader 2: 0.035), the mean values of the area under the ROC curve (Az) for Gadoxetic acid (Gd-EOB-DTPA)-enhanced MRI (reader 1: 0.998 ± 0.004 , reader 2: 0.974 ± 0.022) was significantly higher than that (reader 1: 0.654 ± 0.020 , reader 2: 0.727 ± 0.104) for triple-phase MDCT ($p=0.015$). The interobserver agreement rate between two readers for differentiation between residual or remnant tumor and hyperemia on MR imaging (0.928, almost perfect) was higher than that of MDCT (0.655, substantial) ($p\text{-value} < 0.05$). For detection of another satellite tumor, the conspicuity of MR images was higher than that of MDCT images. In our total 39 patients, 5 new hepatic nodules were detected at only MR images (2: DN, 3: HCC). This detection of another satellite tumors changed the treatment plan.

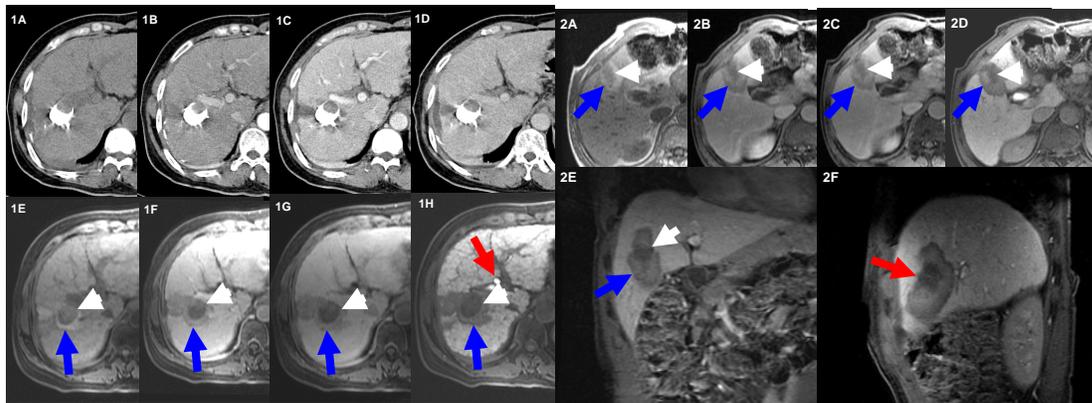


Figure 1. A 55-year-old woman having history of TACE performed RF ablation targeting viable HCC in washout site of Lipiodol. At MDCT performed at one day after RF ablation, there was not definite enhancing portion suspecting viable tumor in MDCT (Fig. 1A: precontrast, 1B: early arterial phase, 1C: portal venous phase, 1D: equilibrium phase), but not definite, because exact evaluation was difficult due to artifact associated with high density Lipiodol. Gadoxetic Acid (Gd-EOB-DTPA)-enhanced MRI definitely revealed peripheral tumor margin (white arrow) and ablation margin (blue arrow) without definite enhancement on precontrast (1E), early arterial phase (1F), portal venous phase (1G), and 30 minutes delayed phase (1H). Biliary contrast excretion was identified on 30 minutes delayed phase (1H, red arrow). The CT performance for differentiation of treated margin and tumor margin was fair in reader 1, intermediate in reader 2, but the MR imaging performance for conspicuity of tumor margin was excellent in both readers. For evaluation of remnant or residual tumor in CT was intermediate degree in both readers and that in MR imaging was definitely absent in both readers.

Figure 2. A 64-year old man receiving RF ablation performed Gadoxetic Acid (Gd-EOB-DTPA)-enhanced MRI (A: precontrast scan, B: early arterial phase, C: portal venous phase, D: 20 minutes delayed phase, E: coronal scan in portal venous phase, F: sagittal scan in portal venous phase, showing very irregular tumor margin (white arrow) showing low signal intensity zone on pre- and post-contrast image and high signal intermediate zone (ablation margin, blue arrow) suggesting ablation margin. We found incomplete ablation margin at anterior border of tumor margin, especially well visualized at sagittal scan (red arrow). We performed second ablation for acquisition of complete ablation margin.

Conclusions: Gadoxetic acid (Gd-EOB-DTPA)-enhanced MRI showed better diagnostic performance than four-phase MDCT for conspicuity of treated tumor margin, detection of residual or remnant tumor, and evaluation of another satellite tumors after RF ablation for malignant hepatic tumors.