

GD-EOB-DTPA ENHANCED MR IMAGING: EVALUATION OF ENHANCEMENT EFFECTS AND ENHANCEMENT PATTERNS IN HEPATIC HEMANGIOMA

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Purpose: To assess quantitatively and qualitatively the enhancement effects and the enhancement patterns of hepatic hemangioma and normal liver tissue on contrast-enhanced MR imaging (CE-MRI) obtained with gadolinium ethoxybenzyl diethylenetriamine pentaacetic acid (Gd-EOB-DTPA).

Methods and Materials: A total of 22 patients with 32 hepatic hemangiomas (high flow type=23, low flow type=9) in normal liver underwent Gd-EOB-DTPA enhanced MR imaging using a 1.5-T scanner. CE images were obtained before contrast injection, in the arterial phase (AP) at 25 s or , in the portal phase (PP) at 70 s, in the equilibrium phase (EP) at 3 min, and in the hepatobiliary phase (HP) at 3 times (10, 15 and 20 min). In the quantitatively evaluation, signal-to-phantom ratios (SPRs) of liver parenchyma, liver-to-lesion contrast-to-phantom ratios (CPRs) and relative enhancement (RE) of lesion were evaluated at all phases and plotted overtime. In the qualitatively evaluation, signal intensity of lesion relative to surrounding liver parenchyma (0=hypointense, 1=slight hypo-, 2= iso-, 3=slight hyper-, 4=hyper-) and enhancement patterns of hepatic hemangioma (1=arterial enhancement with early washout (within the first 3 min), 2=arterial enhancement with late washout (at the 10 min), 3=arterial enhancement with some contrast persistent until 10 min) were characterized qualitatively by two reviewers in consensus.

Results: On qualitative evaluation, mean SPR of liver parenchyma increased significantly ($p=0.002$ - $p<0.001$) with time until 15-min HP after Gd-EOB-DTPA administration, except for pairwise comparison of 15-min HP vs. 20-min HP. Mean RE of lesion decreased with time course. These differences were significant ($p<0.01$), except for pairwise comparison of AP vs. PP and 15-min HP vs. 20-min HP. Hepatic hemangioma showed positive CPR during the AP and increasingly negative CPR during the further time course ($p<0.005$). On qualitative evaluation, during the AP, 72% (23/32) of the tumors were hyperintense (13% (4/32) as grade 3 and 59% (19/32) as grade 4). During the PP, 59% (19/32) of the tumors were isointense. During the EP, 31% (10/32) of the tumors were isointense and 63% (20/32) were hypointense (25% (8/32) as grade 0 and 38% (12/32) as grade 1). During the HP (10, 15 and 20-min, n=96), 99% (95/96) a of the tumors were hypointense (93% (89/96) as grade 0 and 6% (6/96) as grade 1). 23 hepatic hemangiomas showed arterial enhancement with early washout (Grade 1), and seven showed arterial enhancement with late washout (Grade 2). In the remaining two hepatic hemangiomas, enhancement persisted until 10 minutes (Grade 3). Furthermore, Grade 1 was demonstrated in all (9/9) of the tumors of high flow type while it was seen in 61% (14/23) of the tumors of low flow type.

Conclusions: After Gd-EOB-DTPA injection, most hepatic hemangioma showed arterial enhancement with early washout similar to the enhancement pattern of HCC, suggesting the difference from the established enhancement pattern of hepatic hemangioma on CE images obtained using nonspecific extracellular contrast agents.