Gd-EOB-DTPA enhanced-MRI of the liver: dynamic enhancement compared with Gd-DTPA, preliminary experience

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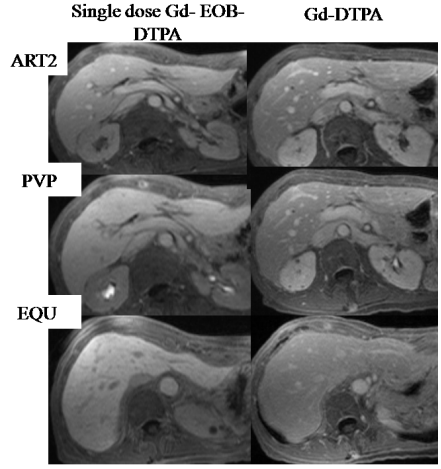
Background: Gd-EOB-DTPA is a paramagnetic contrast agent that can be used as a dynamic and hepatobiliary agent, approved to be used at a lower dose compared to extracellular agents (0.025 vs. 0.1 mmol/kg) (1-2). Initial studies demonstrated improved lesion conspicuity using Gd-EOB-DTPA in liver parenchyma, especially with delayed images (3-4). There is however limited data on the comparison between Gd-EOB-DTPA and Gd-DTPA (3). A recent study in volunteers (5) showed lower arterial vascular and parenchymal enhancement with Gd-EOB-DTPA compared with Gd-DTPA.

Purpose: To quantify hepatic vessel conspicuity (used as a surrogate for lesion enhancement) at the dynamic phase of enhancement using Gd-EOB-DTPA vs. Gd-DTPA-enhanced MRI of the liver in the same patients.

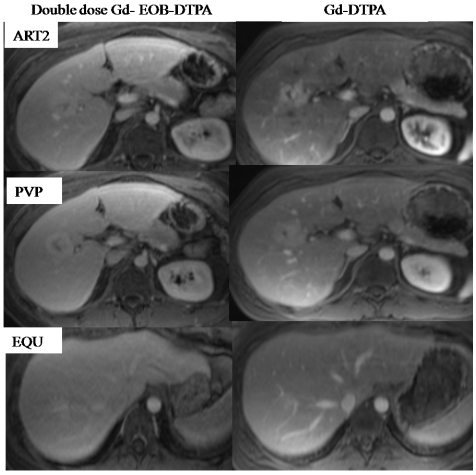
Patients and Methods: This was an IRB approved retrospective study. Out of 45 patients who underwent 1.5T liver MRI with Gd-EOB-DTPA (Eovist, Bayer HealthCare) from 10/2008 to 04/2009, 17 (M/F 4/13, mean age 54 y) had prior/follow-up MRI using GD-DTPA (Magnevist, Bayer HealthCare). 11 patients received a single dose and 6 received a double dose of Gd-EOB-DTPA. The mean delay between MRIs using Gd-DTPA and Gd-EOB-DTPA was 9.5 months (range, 1-25 m). A routine liver protocol was obtained, with the use of fat-suppressed Gd-enhanced 3D GRE T1 (VIBE 2-2.5 mm), with acquisition of 2 arterial phases (ART1 and ART2, using a timing bolus), portal venous phase (PVP) and equilibrium phases (EQU), plus delayed phases (20 min) for Gd-EOB-DTPA. A single observer placed ROIs to measure signal intensity (SI) of aorta (used as surrogate of hepatic artery), portal vein, largest hepatic vein, and liver parenchyma (mean of 6 ROIs). SI was measured at early arterial (ART1), late arterial (ART2), portal venous (PVP), and equilibrium (EQU) phases for both contrast agents. The liver-to-vessel contrast ratio was measured as: $(SI_{vessel} - SI_{liver})/(SI_{vessel} + SI_{liver})$ (value close to 1 representing higher contrast), and compared between Gd-EOB-DTPA (single and double dose) vs. GD-DTPA using a paired Wilcoxon test.

Aorta	ART1	ART2	PVP	Aorta	ART1	ART2	PVP
Gd-EOB single dose	0.29 ± 0.10	0.03 ± 0.15	-0.03 ± 0.14	**Gd-EOB double dose**	0.42 ± 0.10	0.11 ± 0.06	0.04 ± 0.08
GD-DTPA	0.34 ± 0.15	0.19 ± 0.08	0.15 ± 0.07	**GD-DTPA**	0.42 ± 0.11	0.24 ± 0.14	0.18 ± 0.16
p*	0.142	**0.023**	**0.005**	**p***	1	0.142	0.142
Portal vein	**ART2**	**PVP**	**EQU**	**Portal vein**	**ART2**	**PVP**	**EQU**
Gd-EOB single dose	0.07 ± 0.14	-0.07 ± 0.16	-0.24 ± 0.34	**Gd-EOB double dose**	-0.14 ± 0.14	0.11 ± 0.12	-0.04 ± 0.10
GD-DTPA	0.16 ± 0.12	0.12 ± 0.10	0.00 ± 0.58	**GD-DTPA**	0.00 ± 0.16	0.17 ± 0.10	0.06 ± 0.06
p*	0.12	**0.014**	0.343	**p***	0.142	0.295	0.059
Hepatic vein	**PVP**	**EQU**		**Hepatic vein**	**PVP**	**EQU**	
Gd-EOB single dose	-0.07 ± 0.16	-0.29 ± 0.31		**Gd-EOB double dose**	-0.11 ± 0.08	-0.11 ± 0.08	
GD-DTPA	0.12 ± 0.10	0.03 ± 0.54		**GD-DTPA**	0.12 ± 0.09	0.24 ± 0.42	
p*	**0.014**	0.193		**p***	0.142	**0.036**	

Results: The liver-to-vessel contrast ratios observed for Gd-EOB-DTPA (single and double dose) and GD-DTPA for the aorta, portal vein and hepatic veins are given in the Table. Vessel conspicuity was significantly higher for aorta at ART2, portal vein at PVP, and hepatic veins for PVP when comparing single dose Gd-EOB vs. GD-DTPA. When comparing double dose Gd-EOB-DTPA to Gd-DTPA, none of the ratios showed significant differences, except for hepatic veins at EQU phase.



Comparison of single dose Gd-EOB vs. Gd-DTPA in the same patient. Better vascular conspicuity is observed with Gd-DTPA.



Comparison of double dose Gd-EOB vs. Gd-DTPA in the same patient (with FNH). Improved vascular conspicuity is observed with double dose Gd-DTPA.

Conclusion: Because of hepatic enhancement with Gd-EOB-DTPA, the liver-to-vessel contrast is reduced compared to Gd-DTPA at the dynamic phase. A possible solution is to optimize the dose of Gd-EOB-DTPA. Future studies assessing lesion enhancement and conspicuity with Gd-EOB-DTPA vs. Gd-DTPA at the dynamic phase are necessary.

References:

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