First-Pass Whole-Body MRA using the Blood Pool Contrast Medium Gadofosveset Trisodium: Comparison to Gadopentetate Dimeglumine

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Purpose:

The protein-binding blood pool contrast medium gadofosveset trisodium (high affinity to serum albumin) which has recently been approved by the health authorities for magnetic resonance angiography (MRA) differs from non-specific gadolinium-based contrast media in two ways: (1) its relaxivity in vivo is distinctly higher (approximately five times at 1.5 Tesla in the protein bound condition) and (2) its intravascular lifetime is prolonged. This allows an extended imaging window (equilibrium MRA) for improving spatial resolution.[1]. Initial results of phase-II and phase-III clinical trials indicate that gadofosveset trisodium enhanced first-pass MRA of specific vascular regions can be performed with a technique similar to MRA with conventional non-specific gadolinium-based contrast media with one exception: due to the smaller total volume of the contrast medium the flow rate of contrast injection has to be reduced to about 1/3 to 1/2 of the flow rate that is used for non-specific gadolinium-based contrast media [2,3]. The aim of this study was to quantitatively and qualitatively evaluate the potential of gadofosveset trisodium for first-pass arterial imaging in the setting of whole-body MRA (WB-MRA) with respect to image quality and contrast.

Materials and Methods:

Forty patients with suspected significant arterial stenosis were examined at 1.5 Tesla (Magnetom Avanto, Siemens Medical Solutions, Erlangen, Germany) using a single bolus injection of either 10 ml gadofosveset trisodium (Vasovist, Bayer-Schering, Berlin, Germany) or 30 ml of gadopentetate dimeglumine (Magnevist, Bayer-Schering, Berlin, Germany) followed by arterial-phase imaging (sequence parameters are given in table 1) of the following consecutive anatomic vascular regions: supra-aortic/thoracic (I), abdominal/pelvic (II), upper legs (III), and lower legs (IV) at 4 table positions. For quantitative evaluation signal intensity (SI) measurements were performed in 2 different vessels and muscles in each of the four vascular regions. Relative contrast values (RC) were calculated in relation to the SI of the reference muscles. Image sets were evaluated qualitatively by 2 radiologists rating arterial contrast, venous overlay and overall image quality on a 5-point scale. The Mann-Whitney-U test was used to test for statistically significant differences.

Table 1 Sequence parameters

Vascular region	Sequence	TR (ms)	TE (ms)	Flip (°)	BW Hz/Px	Voxel Size	iPAT Factor	TA (s)
Test bolus	Turbo-FLASH	1000	1.58	8	380	3.3x1.6x8.5	2	199
I –III:	FLASH-3D	3.11	1,14	25	420	1.6x1.0x1.5	2	13
IV:	FLASH-3D	3.11	1.14	25	420	1.6x1.0x1.5	-	23

(TR: time to repeat; TE: time to echo; Flip: flip-angle; BW: bandwith; Hz: Hertz; Px: pixel; iPAT: integrated parallel acquisition techniques; TA: acquisition time)

Results:

Gadofosveset trisodium enhanced imaging achieved significantly higher RC values in both vessels of region I and in one vessel of region II and significantly lower RC values in one vessel of regions III and IV in comparison to gadopentetate dimeglumine enhanced imaging ($p < .05$). Qualitative evaluation revealed significantly higher ratings for gadfosveset trisodium enhanced imaging in regions I and II regarding arterial contrast, venous overlay, and image quality ($p < .05$). The ratings for regions III and IV were not significantly different ($p > .05$).

Conclusions:

Our findings in 40 patients suggest that the protein-binding blood pool contrast medium gadofosveset trisodium is well suited for first-pass arterial imaging in the setting of whole-body magnetic resonance angiography. Regarding arterial contrast and image quality, the results are comparable to those achieved with gadopentetate dimeglumine as a non-specific contrast medium.

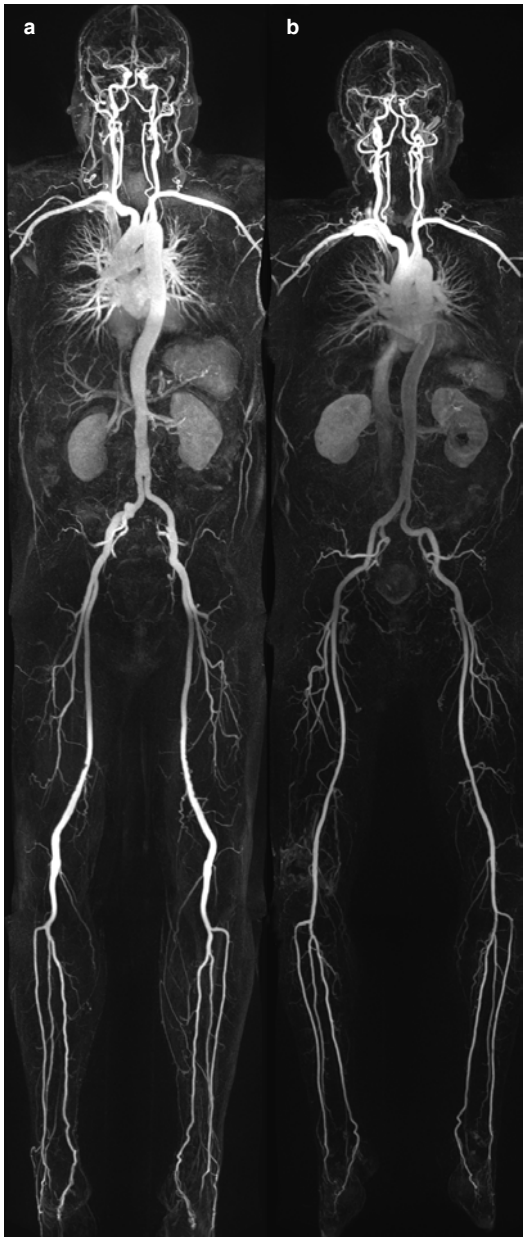

Figure 1, a-b: WB-MRA (representative coronary maximum-intensity projections) after single bolus injection of 10 ml gadofosveset trisodium (a) and 30 ml of gadopentetate dimeglumine (b). A higher arterial contrast in the supraaortic/thoracic and in the abdominal/pelvic region is evident.

References:

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