

MAGNETIC RESONANCE IMAGING OF RABBIT ATHEROSCLEROTIC LESIONS WITH MS-325

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Introduction – MS-325 (Vasovist[®], Schering AG, Germany) is an albumin-binding contrast agent, currently used for MR angiography studies. However, research has demonstrated uptake of MS-325 in the vessel wall at atherosclerosis-prone sites.¹ In the present study, we hypothesized that MS-325 can be used as a contrast agent to detect atherosclerotic lesions in rabbit abdominal aortas. Therefore, we compared the performance of MS-325 for contrast-enhanced plaque imaging with Gd-DTPA (Magnevist[®], Schering AG, Germany).

Methods and materials – In 7 out of 13 male New Zealand White (NZW) rabbits, atherosclerotic plaque development was induced by balloon denudation. For this purpose, a small, 3F Fogarty embolectomy catheter was introduced into the abdominal aorta via the carotid artery. At approximately one centimeter from the bifurcation, the balloon of the embolectomy catheter was inflated and withdrawn three centimeters, causing an endothelial denudation. Starting from two weeks prior to balloon denudation, these rabbits were fed a cholesterol-enriched diet (1.0%) for ten weeks. The remaining 6 rabbits were sham-operated and received regular rabbit chow (controls). The diseased groups and controls were then subdivided into groups of 3-4 rabbits each: an MS-325 and a Gd-DTPA group. Subsequently, pre- and post-contrast MR imaging was performed with a whole-body 1.5 Tesla MRI system (Philips Intera, Philips Medical Systems, Netherlands) using a synergy cardiac coil using a dose of 50 $\mu\text{mol/kg}$ MS-325 or 500 $\mu\text{mol/kg}$ Gd-DTPA.

Post-contrast imaging was performed at 5 times the half-life of the contrast agents (11 hours for MS-325, 90 minutes for Gd-DTPA). A 3D, double inversion recovery (black blood) turbo spin echo sequence was used with the following scan parameters: 9 transversal slices (thickness 3 mm), TR 570 ms, TE 14 ms, echo train length 5, field-of-view 90x90 mm, matrix 304x304, resulting in an in-plane resolution of 0.3x0.3 mm². Signal-to-noise ratios (SNR) were determined. Signal enhancement was calculated by dividing the post-contrast SNR by the pre-contrast SNR. Clustered analysis was used to test differences in enhancement between groups.

Results – All animals tolerated the experiments well. Mean signal enhancement for the MS-325 group was significantly higher for the atherosclerotic rabbits than for controls (2.5 \pm 1.1 and 1.3 \pm 0.4, respectively, $p=0.04$). No significant signal enhancement differences between atherosclerotic and control rabbits were seen in the Gd-DTPA group (2.7 \pm 0.9 and 3.1 \pm 1.0, respectively ($p=0.28$, Figure 1)). However, additional animals need to be included to verify these preliminary results.

Conclusions – Post-MS-325 signal enhancement of atherosclerotic vessel wall is significantly larger than that of normal vessel wall. In contrast, Gd-DTPA enhanced MRI does not seem to be able to distinguish between atherosclerotic and normal arterial vessel walls of NZW rabbits.

References:

- (1) Lin W, et al. Contrast-enhanced magnetic resonance angiography of carotid arterial wall in pigs. *JMRI*. 1997;7:183-190

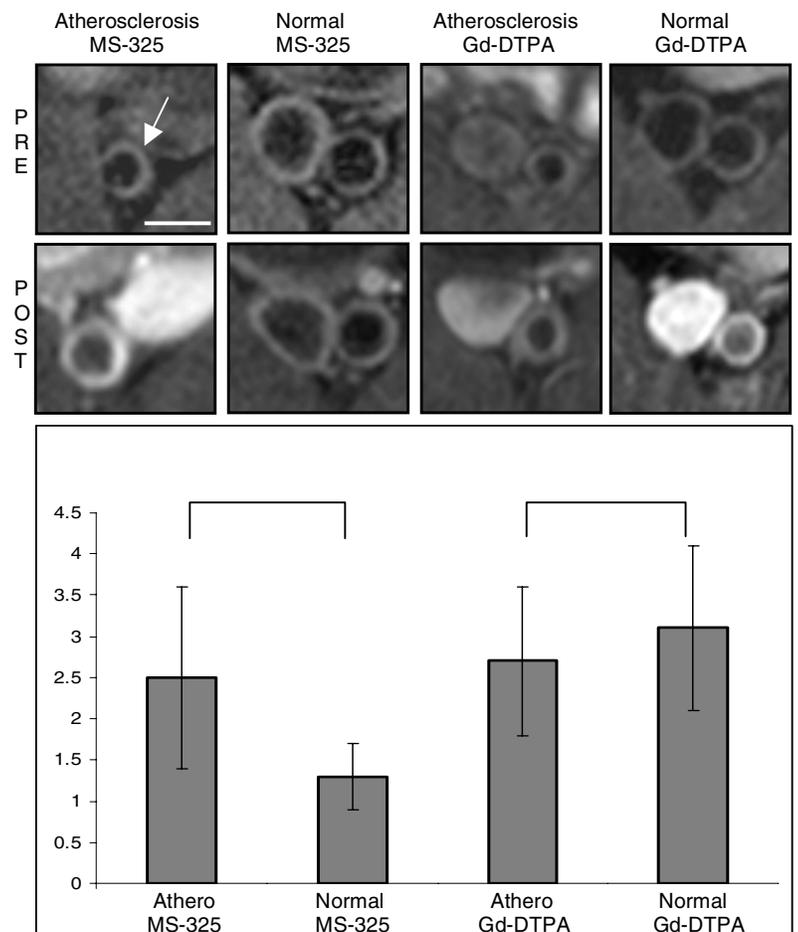


Figure 1. (a) Pre- and post-contrast images of the rabbit aortas. (b) Signal enhancement per group