

6. Summary

Visualisation of atherosclerotic plaques in WHHL animals with Magnetic Resonance Imaging at 3 tesla using different contrast agents

The aim of this study was to examine and compare three MR-contrast agents with regard to their suitability for the detection of atherosclerotic plaques in an animal model to be able to make a statement, which agent would have the best potential for early diagnosis of atherosclerosis. Further objectives were to find a minimal effective dosage for the agents Gadofluorine M and USPIO (DDM 43/34) for the first time with 3 tesla and like in other studies to compare MR-images taken after USPIO administration with histological findings of the corresponding parts of the aortic wall, to demonstrate the uptake of iron in the aortic wall and the presence of macrophages as proof of an inflammatory character of the lesions.

It was shown for the first time with 3 tesla that it was possible to observe the pathologic regions of the aortic wall of the WHHL-rabbits with all three contrast agents in the MR-Scanner. The quality of the representation varied with the contrast agent and its dosage. In the MR examinations, Gadofluorine M induced a strong increase in signal intensity in the aortic wall like it was shown in other publications. The plaque was best depicted after injection of this contrast agent. For the first time a concentration of at least 25 μmol Gadofluorine M/kg was necessary to achieve this. Pathological changes in the vessel wall slices could also be identified with Magnevist®, but the signal increase in the aortic wall was much smaller than for Gadofluorine M.

Surprisingly it was only possible to demonstrate the presence of plaque with DDM 43/34 for a dose of 1000 μmol USPIO/kg. At this dose, the iron loading caused signal loss in the MR images in all but one case. In the histological preparations, this iron loading – as well as the presence of macrophages – was only visible in pathologically changed regions of the Aorta like it was shown before. A reduction of the dosages that were already examined in other studies with correlating positive findings could not be succeeded with 3 tesla.

All three contrast agents showed for the first time with 3 tesla the potential to detect plaque in an animal model. While DDM 43/34 showed no advantages at 3 tesla compared to the other two agents, the best results could be achieved with Gadofluorine M. Further examinations and modification of the pharmacological properties of this contrast agent, could allow them to be used for early diagnosis of atherosclerosis.