PURPOSE: To map the distribution of an iron oxide label in the central nervous system with in vivo magnetic resonance (MR) imaging.

MATERIALS AND METHODS: Unilateral osmotic disruption of the blood-brain barrier (BBB) in rats (n = 40) was followed by injection of monocry stalline iron oxide nanoparticles (MION) into the carotid artery. MR images (1.5 T) were obtained in and ex vivo, and results were correlated with histologic section-matched iron maps.

RESULTS: A mean of 0.2% of the injected MION was found in the brain 24 hours after unilateral osmotic disruption of the BBB. The spatial distribution of iron oxide within the brain correlated with areas known to have high relative perfusion. Iron was found in cell bodies and dendrites of cortical neurons and astrocytes and in the interstitial space. The threshold in concentration for detection of MION in the brain was 62.2 ng Fe/mm².

CONCLUSION: MR imaging is well suited to noninvasive in vivo mapping of the intracerebral iron oxide distribution.
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