Targeting of hematopoietic progenitor cells with MR contrast agents.

Abstract:
PURPOSE: To label human hematopoietic progenitor cells with various magnetic resonance (MR) imaging contrast agents and to obtain 1.5-T MR images of them.
MATERIALS AND METHODS: Hematopoietic progenitor cells, labeled with ferumoxides, ferumoxtran, magnetic polysaccharide nanoparticles-transferrin, P7228 liposomes, and gadopentetate dimeglumine liposomes underwent MR imaging with T1- and T2-weighted spin-echo and fast field-echo sequences. Data were analyzed by measuring MR signal intensities and R1 and R2* relaxation rates of labeled cells and nonlabeled control cells. Mean quantitative data for the various contrast agent groups were assessed for significant differences compared with control cells by means of the Scheffe test. As a standard of reference, MR imaging data were compared with electron microscopic and spectrometric data. RESULTS: For all contrast agents, intracellular cytoplasm uptake was demonstrated with electron microscopy and was quantified with spectrometry. When compared with nonlabeled control cells, progenitor cells labeled with iron oxides showed significantly (P<.05) increased R2*. Cells labeled with gadopentetate dimeglumine liposomes showed significantly increased R1. Detection thresholds were 5 x 10^5 cells for gadopentetate dimeglumine liposomes and ferumoxtran, 2.5 x
10(5) cells for ferumoxides and P7228 liposomes, and 1 x 10(5) cells for magnetic polysaccharide nanoparticles-transferrin. CONCLUSION: Hematopoietic progenitor cells can be labeled with MR contrast agents and can be depicted with a standard 1.5-T MR imager.