

First Experimental Evidence on Feasibility of Molecular Magnetic Particle Imaging of Tumor Marker Alpha-1-Fetoprotein Using Antibody Conjugated Nanoparticles

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Abstract : Purpose: The purpose of this work is to examine possibilities for noninvasive imaging and identification of tumor markers for cancer diagnosis. The proposed method uses antibody conjugated iron oxide nanoparticles and multicolor Magnetic Particle Imaging (mMPI). The method has the potential for radiation exposure free real-time estimation of local tumor marker concentrations in vivo. In this study, the method is applied to human Alpha-1-Fetoprotein. Materials and Methods: As tracer material AFP antibody-conjugated Dendrimer-Fe₃O₄ nanoparticles were used. The nanoparticle bioconjugates were then incubated with bovine serum albumin (BSA) to block any possible nonspecific binding sites. Parts of the resulting solution were then incubated with AFP antigen. MPI measurements were done using the preclinical MPI scanner (Bruker Biospin MRI GmbH) and the multicolor method was used for image reconstruction. Results: In multicolor MPI images the nanoparticles incubated only with BSA were clearly distinguished from nanoparticles incubated with BSA and AFP antigens. Conclusion: Tomographic imaging of human tumor marker Alpha-1-Fetoprotein is possible using AFP antibody conjugated iron oxide nanoparticles in presence of BSA. This opens interesting perspectives for cancer diagnosis.

Keywords : noninvasive imaging, tumor antigens, antibody conjugated iron oxide nanoparticles, multicolor magnetic particle imaging, cancer diagnosis

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