

Diffusion Mapping with Ultra Fast Magnetic Resonance Imaging

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Diffusion coefficient is one of the most important physiological and physical parameters that can be measured by NMR techniques. By combining the NMR techniques with MR imaging, one can obtain diffusion coefficient map as a function of spatial coordinates. By extending the techniques to in-vivo imaging, a macroscopic dynamics can be monitored as a function of time as well. In order to obtain a time-series diffusion map, employment of an ultra fast MR imaging such as echo planar imaging (EPI) or spiral scan imaging (SSI) is essential to high temporal resolution imaging. Several diffusion mapping techniques including isotropic and anisotropic diffusion coefficient measurements are reviewed with related fast imaging techniques. Experimental aspects such as eddy currents induced during gradient switching and subject motion induced image artifact are discussed with suggested remedies. Some theoretical aspects of diffusion process in MR imaging are also addressed.