

Double pulsed field gradient MR as a noninvasive marker of tissue microstructure

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Conventional magnetic resonance (MR) imaging scans suffer from limited resolution that prohibits the visualization of individual cells thus providing information at coarse length scales. To obtain information at smaller length scales, the MR signal can be sensitized to self-diffusion of water molecules whose motional history is influenced by the local microstructure. Starting from the fundamentals, I will discuss the essential features of a nascent method, the double pulsed field gradient (double-PFG) MR, and show its ability to probe the underlying microstructure of the tissue. Specifically, I will discuss how the double-PFG MR technique could be used to characterize the size, shape, and orientational distribution of cellular compartments without the need to apply strong magnetic field gradients—an exciting finding that could make the technique feasible in the clinical setting. Theoretical predictions as well as early experimental findings demonstrate that double-PFG MR could be a powerful technique for monitoring morphological changes in tissue, and, as such, a valuable diagnostic tool.

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