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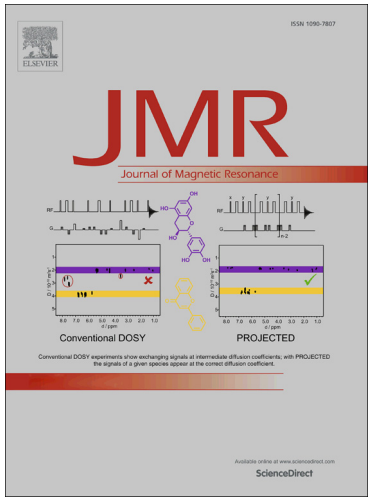

Comparative analysis of isotropic diffusion weighted imaging sequences

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Comparative analysis of isotropic diffusion weighted imaging sequences

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Abstract

Visualisation of living tissue structure and function is a challenging problem of modern imaging techniques. Diffusion MRI allows one to probe *in vivo* structures on a micrometer scale. However, conventional diffusion measurements are time-consuming procedures, because they require several measurements with different gradient directions. Considerable time savings are therefore possible by measurement schemes that generate an isotropic diffusion weighting in a single shot. Multiple approaches for generating isotropic diffusion weighting are known and have become very popular as useful tools in clinical research. Thus, there is a strong need for a comprehensive comparison of different isotropic weighting approaches. In the present work we introduce two new sequences based on simple (co)sine modulations and compare their performance to established q-space magic-angle spinning sequences and conventional DTI, using a diffusion phantom assembled from microcapillaries and *in vivo* experiments at 7T. The advantages and disadvantages of all compared schemes are demonstrated and discussed.

Keywords: diffusion MRI, isotropic diffusion weightings, microcapillary phantom, diffusion sequences

1. Introduction

Investigation of living tissue functions and structures *in vivo* is a challenging problem for non-invasive imaging techniques. One of the most powerful imaging modalities is diffusion MRI (dMRI) [1], which is used extensively in research and clinical practice. dMRI utilises random Brownian motion of water molecules to visualise the underlying microstructure of biological tissue with a pulsed gradient spin echo experiment [2]. The fact that motion of water molecules within tissue compartments is restricted and hindered in contrast to free water diffusion is used to mine structural information from dMRI

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