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(G*) (POS-46) Inferring axon diameters in white matter tracts of the live mouse brain

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Tissue microstructure, such as axon diameters, can be inferred from MRI diffusion measurements either through relating models of the geometry of the tissue and MR parameters, or through directly relating MR measurements to tissue parameters. Some have implemented geometric models to infer axon diameters using temporal diffusion spectroscopy. In order to target smaller diameter axons, we have replaced the pulsed gradient spin echo pulse sequence used in most temporal diffusion spectroscopy measurements with oscillating gradient spin echo sequence (OGSE). Here we use OGSE temporal diffusion spectroscopy to infer axon diameters is white matter tracts of the live mouse brain.

Axon diameters in the live mouse brain were inferred using oscillating gradient spin echo temporal diffusion spectroscopy. Two sets of five images were collected in less than 11 minutes from which the measurements were made. Diameters ranged from 4 to 12 μm in various white matter regions including the optic tract, corpus callosum, external capsule, dorsal hippocampal commissure and fasciculus retroflexus. Confirmation of axon diameters using electron microscopy is planned and the collection of more MRI data is planned. The short imaging time suggests this is the first step toward a feasible imaging method for live animals and eventually for clinical applications.

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