Novel anisotropic MRI diffusion phantom

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Diffusion MRI (DMRI) comprises a growing list of methods, and with that the need for a reliable and robust MRI phantom with which one can calibrate and validate them. In this study we developed a novel anisotropic diffusion MRI phantom and demonstrated its applicability by producing fractional anisotropy (FA) maps derived from DTI and average pore diameter maps using double Pulsed Field Gradient (d-PFG) filtered MRI.
The DMRI phantom consists of eight water-filled glass capillary arrays (GCA) (Photonis, USA). The nominal pore diameter of two wafers is 10 µm; other two is 25 µm and the remaining four is 5 µm. DWI acquisition was used for DTI parameter estimations while double PFG filtered MRI was used for average pore diameter estimations. The ROI analysis of the d-PFG experiments yielded the expected average pore diameters and FA map.
This phantom can be used to calibrate and validate various diffusion MRI methods. Furthermore, this work can provide a way to perform quality control or assurance tests in the clinic or in a biological research environment. By using a phantom with multiple pore diameters, methods developed to characterize cell size distributions such as AxCaliber MRI can also be validated.

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