

AbstractID: 3401 Title: Evaluation of Glass Capillary Material for Suitability of Use in a DTI Quality Assurance Phantom

Purpose:

To evaluate whether glass fiber capillaries, having inside diameters (~50 microns) somewhat similar to cellular dimensions, are a suitable candidate for use in a quality assurance (QA) phantom to characterize MR diffusion tensor imaging techniques.

Method and Materials:

Two phantoms containing glass capillary arrays were constructed. The first was designed to examine the success of injecting water into capillaries, and to show scanning characteristics in a high SNR/high-resolution scan series. This phantom was imaged in a 7T Bruker PharmaScan MRI scanner, and signal intensities in the capillary arrays were examined for uniformity of water injection. Diffusion anisotropy and eigenvectors were also calculated. The second phantom was designed to test the performance of capillary arrays in a clinical magnet, as per a QA phantom. Images from a 1.5T GE scanner were acquired, and processed to determine fractional anisotropy and principle diffusion eigenvectors.

Results:

Based on the methods above, water can be successfully injected into the capillaries based on the uniformity of signal after injection. Eigenvectors show diffusion primarily along the axis of the capillary array. Images from the clinical series also show diffusion along the axis of the array, even at the SNR and resolution typical of a clinical protocol.

Conclusion:

The work performed in this study suggests that glass capillary arrays could be used successfully in a QA phantom, in principle. Future investigations will determine the allowable range of capillary fiber inner- and outer-diameters, based on SNR constraints. Flexible arrays will also be investigated.

Conflict of Interest (only if applicable):