Improved Spatial Regression Analysis of Diffusion Tensor Imaging for Lesion Detection during Longitudinal Progression of Neurodegenerative Disease in Individual Subjects

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Abstract

Diffusion tensor Imaging (DTI) enables accurate description of the degree and direction of water dynamics in biological tissues, which provides detailed information about white matter microstructure, and has been widely used in the field of neuroscience and medicine. However, DTI is susceptible to numerous detrimental artifacts that may impair the reliability and validity of the obtained data. Image quality of DTI is therefore critical. In Chapter 3, the effectiveness of three popular QC tools including DTI studio, DTIprep and TORTOISE are quantitatively compared. Both synthetic and *in vivo* human brain data were used to quantify adverse effects of major DTI artifacts to tensor calculation as well as the effectiveness of different QC tools in identifying and correcting these artifacts. The technical basis of each tool was studied; the different functions and I/O formats that three QC tools provide were also discussed.

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