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Abstract

Intervertebral disc degeneration is a common disease that is often related to impaired mechanical function, herniations and chronic back pain. The degenerative process induces alterations of the disc's shape, composition and structure that can be visualized *in vivo* using magnetic resonance imaging (MRI). Numerical tools such as finite element analysis (FEA) have the potential to relate MRI-based information to the altered mechanical behavior of the disc. However, in terms of geometry, composition and fiber architecture, current FE models rely on observations made on healthy discs and might therefore not be well suited to study the degeneration process. To address the issue, we propose a new, more realistic FE methodology based on diffusion tensor imaging (DTI). For this study, a human disc joint was imaged in a high-field MR scanner with proton-density weighted (PD) and DTI sequences. The PD image was segmented and an anatomy-specific mesh was generated. Assuming accordance between local principal diffusion direction and local mean collagen fiber alignment,

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