DTI Metrics for Multi-site/Multi-scanner Study of Adult Cervical Spinal Cord

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Background and Objective

A major variable in DTI spinal cord studies is the diversity in MRI scanner vendor and field strength. While there are several techniques proven to acquire DTI data, there are no standardized accepted methods for acquisition and processing. As more medical systems are utilizing this technology to evaluate the spinal cord, it is important to study the reproducibility of the DTI metrics among various scanner platforms, coil configurations and software implementations to determine the variance in obtaining normative spinal cord DTI data. This preliminary data for a multi-site DTI study examines the effects of these different MR vendors and field strengths on the DTI values of the adult cervical spinal cord.

Methods and Materials

Population

- Four subjects (age range 20 to 30 years) were scanned with 20 direction DTI protocols on four different scanners for a total of 16 scans

Scanning Equipment

- Siemens 3T Prisma
- Siemens 1.5T Avanto
- Philips 3T Ingenia
- Philips 1.5T Achieva

Data Acquisition and Processing

- All images were collected using a reduced field of view imaging sequences
  - Except 1.5T Avanto where the feature was unavailable and a full field of view sequence was used.
  - Diffusion weighted images of cervical spinal cord were acquired on each scanner.
  - Motion and eddy current correction algorithms were applied to reduce distortion effects.
  - Diffusion tensor maps fractional anisotropy (FA), mean diffusivity (MD), axial diffusivity (AD), and radial diffusivity (RD) maps were generated from the corrected images for the full cervical cord.
  - Manual ROIs were drawn on the axial maps to calculate the DTI parameters for the complete cervical cord through the C7-T1 disc.

Conclusion

DTI metrics can vary between scanner for the same subject for the spinal cord. Further examination of within subject differences has potential to provide important information on making DTI of the spinal cord more translatable between sites.

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