

Diffusion-Tensor MRI Tractography Methods For Assessing White Matter Health And Its Relationship To Cognitive Functioning.

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**Objective:** To examine differences in new DTI metrics and their relationship to executive function in normal and cognitively impaired elderly.

**Methods:** Participants were healthy controls (HC, n=9), and patients with vascular cognitive impairment (VCI, n=6), mild cognitive impairment (MCI, n=5), and Alzheimer's disease (AD, n=7). Subjects received DTI and cognitive testing. Models of whole-brain white matter were derived in which fibers are represented as streamtubes in accordance with Zhang et al. (2003). Streamtube models were then thresholded for linear anisotropy. Metrics were calculated for each model based on the number and total length of streamtubes normalized for linear anisotropy and intracranial volume (ICV).

**Results:** After controlling for age, streamtube length metrics in the VCI group were significantly lower vs. the HC and AD groups ( $p < .05$ ), and approached significance vs. the MCI group ( $.05 < p < .10$ ). The HC, AD, and MCI groups did not differ significantly from each other. Partial correlations (controlled for age) were significant between all length metrics and measures of executive function and psychomotor processing speed (Trail Making Test parts A & B) but not confrontational naming (Boston Naming Test) in the HC and VCI groups combined. Correlations between length metrics and all three cognitive tests were non-significant in the AD and MCI groups.

**Conclusions:** These new DTI tractography metrics may serve as robust markers of overall white matter health. The metrics correlate with executive cognitive functions in patients with VCI.