

TITLE: Diffusion-tensor imaging in vascular cognitive impairment and mild cognitive impairment: relationship with executive functioning

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ABSTRACT:

Objectives: (1) To examine the microstructural integrity of normal-appearing white matter (NAWM) using diffusion-tensor imaging (DTI) in non-demented patients with vascular cognitive impairment (VCI), mild cognitive impairment (MCI), and normal controls (NC). (2) To examine the association between DTI parameters in NAWM and executive function and psychomotor processing speed.

Participants and Methods: Participants were 6 subjects with VCI, 6 subjects with MCI, and 6 NC. Assignment to VCI or MCI groups was based on multi-disciplinary consensus diagnosis including neurological exam, MRI, and neuropsychological testing. Normal controls performed normally on cognitive screening measures. All participants had DTI and completed a battery of cognitive tests. DTI parameters [trace (Tr) and fractional anisotropy (FA)] were measured in regions-of interest in NAWM in anterior and posterior periventricular and centrum semiovale regions.

Results: The MCI group was older than the VCI or NC groups (72 vs. 62 vs. 65 years, respectively) but this was not statistically significant ($p=.158$). Repeated measures ANOVA covaried for age revealed that FA was lower ($p=.001$) and Tr was higher ($p=.006$) in the VCI vs. the MCI and NC groups. There was a significant group x location interaction such that FA was lower ($p<.001$) and Tr was higher ($p=.03$) in posterior but not anterior regions in the VCI group relative to the MCI and NC groups. Exploratory correlational analyses in the VCI and NC groups combined showed that FA in NAWM (but not in lesioned white matter) correlated significantly ($p\leq.01$) with performance on tests of executive function and psychomotor processing speed.

Conclusions: Patients with VCI have changes in the microstructural integrity of NAWM vs. patients with MCI and NC, particularly in posterior regions. These changes appear to be related to psychomotor processing speed and executive function. The results are limited by the small sample size and region-of-interest placement.