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Progressive morphometric and cognitive changes in vascular dementia

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Abstract

Evidence for progressive cognitive decline in vascular dementia (VaD) is mixed, with some studies showing little or no decline over time. One possible explanation for these inconsistent findings is the heterogeneity of pathology encompassed by the VaD diagnosis. It is possible that subtypes of VaD (i.e. those resulting from different lesion distributions) show different patterns of cognitive decline. In the present study, a heterogeneous VaD group demonstrated cognitive decline from baseline to 12-month follow-up. Although this decline was coincident to morphometric changes (i.e. increased subcortical hyperintensities (SH), decreased whole brain volume (WBV)), no relationship emerged between cognitive decline and morphometric changes. Preliminary examination of VaD subtypes revealed patients with subcortical infarct or SH-only exhibited greater decline than VaD patients with cortical lesions. Further research is needed to determine whether this observed decline is attributable to differential lesion distribution or statistical artifact.

Keywords: Vascular dementia; Neuropsychology; MRI

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Vascular dementia (VaD) is believed to be the second most prevalent form of dementia (Leys et al., 1999), accounting for 10–20% of all dementia cases (Geldmacher & Whitehouse, 1996). However, cross-cultural rates vary widely (Liu et al., 1998; White et al., 1996), and some researchers speculate VaD is more prevalent than Alzheimer's disease (AD) when including persons with stroke-related and cardiogenic VaD (Roman, 2002).

Persons with VaD exhibit disproportionately impaired attention, executive functioning, and psychomotor speed performance, but relatively preserved memory function when compared to AD patients (Looi & Sachdev, 1999; Lukatela et al., 2000; Traykov et al., 2002). However, it is unclear whether this pattern holds when patients are followed longitudinally. Some researchers posit that VaD patients exhibit a progressive deterioration in cognition, with decline associated with exacerbation of cerebrovascular pathology (Hachinski, Lassen, & Marshall, 1974). This notion is supported by the decline exhibited in some longitudinal studies in global cognitive abilities (Ballard et al., 2001; Bowler et al., 1997; Meyer, Chowdhury, Xu, Li, & Quach, 2002) and domain specific tasks (Nyenhuis, Gorelick, Freels, & Garron, 2002; Paul et al., 2003), particularly in the oldest VaD patients (Mungas, Reed, Ellis, & Jagust, 2001). However, support for progressive cognitive decline in VaD patients is far from universal, with many studies showing little or no decline over time (e.g. Moretti, Torre, Antonello, & Cazzato, 2001; Orgogozo, Rigaud, Stoffler, Mobius, & Forette, 2002; Pratt, 2002).

Given these inconsistent findings, the present study had two primary goals. First, to document the natural history of persons with VaD on neuropsychological and neuroimaging measures over a 12-month period. Few studies have examined cognitive decline in VaD using a comprehensive battery of standardized neuropsychological measures or performed repeat magnetic resonance imaging (MRI) to identify structural changes that may account for decline.

A second goal of the present study was to provide a preliminary examination of differential decline across VaD subtypes. VaD is known to result from a number of mechanisms, including multiple infarction, strategic single infarction, microvascular disease, hypoperfusion, hemorrhage, or some combination thereof (Roman et al., 1993). Given the differing physiological consequences of these mechanisms, it is possible that subtypes of VaD (i.e. those resulting from different lesion distributions) show different patterns or degree of cognitive decline (Nyenhuis & Gorelick, 1998).

1. Method

1.1. Participants

Data presented in the current paper are part of a larger study examining the efficacy of citicoline in the treatment of VaD (Cohen et al., 2003). As part of the parent study, patients were randomized into either an active citicoline treatment condition or into a placebo control arm for the 12-month duration of the study. Results from the parent study indicated no effect of drug (Cohen et al., 2003). Thus, all participants' data were pooled for the current analyses.

Data from twenty-five patients who participated in the parent study were included in the current study. All patients met both NINDS-AIREN (Roman et al., 1993) and DSM-IV