Patterns of neuropsychological impairment in Alzheimer's disease and mixed dementia

YanHong Dong a,b,c, Daniel Zheng Qiang Gan a,b, Stephen Ziyang Tay a,b, Way Inn Koay a,b, Simon Lowes Collinson d, Saima Hilal a,b, Narayanaswamy Venketasubramanian a,b,e, Christopher Chen a,b,*

* Corresponding author at: Department of Pharmacology, National University Health System, Singapore.

**E-mail address:** phcilb@nus.edu.sg (C. Chen).

**Abstract**

**Background:** Mixed dementia (MD), i.e., the coexistence of Alzheimer's disease (AD) and cerebrovascular disease (CVD), is a common dementia subtype. Few studies have attempted to establish the cognitive profiles of mild–moderate MD and compare it to the profiles of AD using a comprehensive neuropsychological test battery. We aimed to establish the neuropsychological profile of mild–moderate MD in relation to mild–moderate AD.

**Methods:** Patients with consensus diagnoses of MD and AD of mild–moderate severity (Clinical Dementia Rating score of 1–2) were recruited from a memory clinic. Cognitive performance was measured by a formal neuropsychological battery covering domains of attention, language, verbal and visual memory, visuoconstruction, visuomotor speed and executive function. Cognitive domain scores are z-scores calculated using the mean and SDs of the AD group. ANCOVAs with age and education as covariates were employed to examine differences in mean score difference of cognitive domains and subtests between patients with MD and AD.

**Results:** 151 patients were recruited with the majority of AD (n = 96, 63.6%) and a minority of MD (n = 55, 36.4%). There were no significant differences in the demographic characteristics of patients with MD and AD. However, patients with MD were significantly more impaired than patients with AD in global cognitive composite, attention and visuoconstruction (global cognitive composite: −0.32 ± 0.98 vs 0 ± 1, p = 0.011; attention: −0.32 ± 0.90 vs 0 ± 1, p = 0.013; visuoconstruction: −0.27 ± 0.99 vs 0 ± 1, p = 0.024, respectively).

**Conclusion:** The neuropsychological profile of patients with MD of mild–moderate severity is characterized by a poorer global performance, as well as attention and visuoconstruction than those with AD of mild–moderate severity.

© 2013 Elsevier B.V. All rights reserved.

1. Introduction

Mixed dementia (MD)—defined as the coexistence of Alzheimer's disease (AD) and cerebrovascular disease (CVD) [1]—has been identified as one of the most common subtypes of dementia by autopsy-based epidemiological studies [2,3]. However, MD has not been studied as extensively compared to other subtypes due to the lack of consensus on its diagnostic criteria and its heterogeneous neuropathological features [4,5]. Establishing the cognitive profile of MD relative to AD would be useful in elucidating the contribution of CVD to cognitive deficits in dementia, which in turn would facilitate optimization of clinical management and therapeutic strategies for individuals with MD [5], through the management of cerebrovascular risk factors.

There is strong evidence that the CVD exacerbates cognitive deficits associated with dementia. The Nun study reported that among participants with autopsy-defined AD, those with cerebral infarcts exhibited poorer abilities in memory, naming, verbal fluency and constructional praxis compared to their counterparts without infarcts [3]. Moreover, in a study conducted at a memory clinic, AD patients with silent cerebral infarction had poorer performance than those with AD in language and memory [6]. However, in another autopsy-based study, individuals with MD had slightly poorer but non-significant different performance in global cognitive composite scores and greater impairments in executive function than those with AD [7]. Furthermore, a clinical study which examined neuropsychological differences between patients with early AD and MD discovered their profiles to be closely similar except for poorer semantic fluency in the latter group [8].

These differences may be attributed to the following: 1) undifferentiated small vessel and large vessel etiology in patients with MD which is the key problem in previous studies [7,8]. Bowler and colleagues attributed this to the lack of a set of well-established diagnostic criteria...