Improving screening for vascular cognitive impairment at three to six months after mild ischemic stroke and transient ischemic attack

YanHong Dong,1,2,3 Melissa Jane Slavin,2,3 Bernard Poon-Lap Chan,4 Narayanaswamy Venketasubramanian,1,4,5 Vijay Kumar Sharma,4 Simon Lowes Collinson,6 Perminder Singh Sachdev2,3 and Christopher Li-Hsian Chen1

1Memory Aging and Cognition Centre, Department of Pharmacology, Yong Loo Lin School of Medicine, National University Health System, Singapore
2Centre for Healthy Brain Ageing, School of Psychiatry, UNSW Medicine, The University of New South Wales, Australia
3Dementia Collaborative Research Centre, School of Psychiatry, UNSW Medicine, The University of New South Wales, Australia
4Department of Medicine, National University Health System, Singapore
5Neuroscience Clinic, Raffles Hospital, Singapore
6Department of Psychology, National University of Singapore, Singapore

ABSTRACT

Background: The Montreal Cognitive Assessment (MoCA) and Mini-Mental State Examination (MMSE) were compared with and without the addition of a brief processing speed test, the symbol digit modalities test (SDMT), for vascular cognitive impairment (VCI) screening at three to six months after stroke.

Methods: Patients with ischemic stroke and transient ischemic attack were assessed with MoCA and MMSE, as well as a formal neuropsychological battery three to six months after stroke. VCI was defined by impairment in any cognitive domain on neuropsychological testing. The area under the receiver operating characteristic curve (AUC) was used to compare test discriminatory ability.

Results: One hundred and eighty-nine patients out of 327 (58%) had VCI, of whom 180 (95%) had vascular mild cognitive impairment (VaMCI), and nine (5%) had dementia. The overall AUCs of the MoCA and MMSE scores and performance at their respective cut-off points were equivalent in detecting VCI (AUCs: 0.87 (95% CI 0.83–0.91) vs. 0.84 (95% CI 0.80–0.88), p = 0.13; cut-offs: MoCA (<23) vs. MMSE (<26), sensitivity: 0.78 vs. 0.71; specificity: 0.80 vs. 0.82; positive predictive value: 0.84 vs. 0.84; negative predictive value: 0.72 vs. 0.67; and correctly classified 78.6% vs. 75.5%; p = 0.42). The AUCs of MMSE and MoCA were improved significantly by the SDMT (AUCs: MMSE+SDMT 0.90 (95% CI 0.87–0.93), p < 0.001; MoCA+SDMT 0.91 (95% CI 0.88–0.94), p < 0.02).

Conclusions: The MoCA and MMSE are equivalent and moderately sensitive, and can be supplemented with the SDMT to improve their accuracy in VCI screening.

Key words: cognitive screening, mini-mental state examination (MMSE), montreal cognitive assessment (MoCA), symbol digit modalities test (SDMT), vascular cognitive impairment (VCI), mild cognitive impairment (MCI), stroke

Introduction

Post-stroke vascular cognitive impairment (VCI) is a syndrome that includes a spectrum of cognitive severity ranging from post-stroke vascular mild cognitive impairment (VaMCI) to dementia (Hachinski et al., 2006). Post-stroke VaMCI is defined by impairment in at least one cognitive domain with intact or mildly impaired instrumental activities of living (Gorelick et al., 2011). More than half of patients with VCI (57%) are VaMCI (Rockwood et al., 2000), while 40% with non-disabling ischemic stroke had VaMCI (Tham et al., 2002). Post-stroke VaMCI can be further classified into four subtypes in line with the MCI diagnostic algorithm proposed by Petersen (2004): (i) amnestic single-domain (amnestic sd-MCI); (ii) non-amnestic single-domain (non-amnestic sd-MCI); (iii) amnestic multiple-domain (amnestic md-MCI); and (iv) non-amnestic multiple-domain.