Processing Speed Domain of Cognitive Function for Screening Early Cognitive Impairment Among Individuals With Atrial Fibrillation

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EDITORIAL

Processing Speed Domain of Cognitive Function for Screening Early Cognitive Impairment Among Individuals With Atrial Fibrillation

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The prevalence of both atrial fibrillation (AF) and cognitive impairment/dementia is highly expected to increase with population aging worldwide. In addition, AF and cognitive impairment/dementia are recognized as important public health problems because of the significant burden on health resources. The relationship between AF and cognitive impairment/dementia is complex because they share epidemiologic similarities and several risk factors such as advanced age, arterial hypertension, diabetes mellitus, dyslipidemia, sleep apnea, ischemic heart disease, heart failure, chronic kidney disease, obesity, physical inactivity, and excessive alcohol consumption. However, numerous observational studies over the past 10 years, including several meta-analyses, provide growing evidence that AF is associated with cognitive decline and dementia, even in the absence of clinically overt previous stroke.[1] Recently, individuals with AF have been recognized as at increased risk of cognitive decline and dementia, although whether the link is causal remains unanswered.[2,3] Because cognitive decline and dementia are the major cause of impaired activities of daily living (ADL) and quality of life, and given the association between AF and cognitive impairment/dementia, a recent consensus statement has recommended that all individuals with AF should be assessed for cognitive impairment.[4] However, no effective screening test for early detection and/or prediction of cognitive impairment associated with AF has been established. Cognitive impairment is defined as a decline from a previous level of performance in >1 domains: complex attention, executive function, processing function, learning and memory, language, perceptual motor, and social cognition. The characterization of domain-specific cognitive impairment in individuals with AF could provide clues to prevention, early detection, and intervention against AF-related cognitive impairment/dementia. There have been several cross-sectional studies that demonstrated the relationship between AF and cognitive decline in immediate and delayed memory, attention, executive function, abstract learning, visuospatial ability, and processing speed.[5–9] Moreover, longitudinal analyses of the Atherosclerosis Risk in Communities study and the Framingham cohort have suggested that AF is related to eroded executive function and processing speed.[10,11] However, a consistent conclusion about the domain-specific cognitive impairment in individuals with AF has not yet been established.

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In this issue of the Journal,[12] Zhao et al report that processing speed is the most prominent cognitive domain affected by AF, and that evaluating the processing speed in individuals with AF might be beneficial for early screening of cognitive dysfunction. In their study, they enrolled 2,844 participants from the Systolic Blood Pressure Intervention Trial and assessed cognitive function between those with and without AF at baseline and biennially during the follow-up. There were 252 participants with prevalent AF and 2,592 participants without AF. Among global cognitive function and 4 major cognitive domains including memory, processing speed, language, and executive function, the significant cognitive decline rate between participant with and without AF was found only in the processing speed domain: the participants with prevalent AF declined faster in processing speed with a distinct difference of −0.013 scores per year (95% confidence interval [CI] −0.024 to −0.001, P=0.02) than those without AF. Although there were marginally significant differences in annual decline of memory domain (0.013, 95% CI −0.002 to 0.026, P=0.06) and executive function domain (−0.012, 95% CI −0.027 to 0.001, P=0.09), there were no difference in annual decline of global cognitive function and language domain.

Processing speed is a cognitive ability that is related to the speed at which a person can understand and react to the information they receive, whether it be visual, auditory, or movement. In other words, processing speed is the time between receiving and responding to a stimulus. Slowed processing speed is an age-related phenomenon and has been reported to predict mild cognitive impairment and is longitudinally related to the incidence of functional dependence in ADL and instrumental ADL.[13,14] Zhao et al[12] show that AF was significantly associated with impaired processing speed even after adjusting for confounding fac-

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tors, including age, and suggest that AF possibly causes an extra decline in processing speed apart from age-related degeneration. Cumulatively, it seems reasonable to consider that, from a clinical perspective, evaluating the processing speed domain would be an effective screening to identify early cognitive deterioration among individuals with AF. However, we must keep in mind that slowed processing speed is related not only to cognitive impairment/dementia but also to learning disorders such as attention-deficit hyperactivity disorder, dyslexia, dyscalculia, and to an auditory processing disorder, autism spectrum disorders, and schizophrenia. Therefore, it is recommended to apply several neuropsycological battery tests to detect early cognitive impairment with high accuracy.

The pathophysiologic mechanisms underlying the AF-related cognitive impairment/dementia have not been fully elucidated. However, because impairment of processing speed could be a characteristic of AF-related cognitive impairment/dementia according to this study,[12] and because cerebral small vessel disease including lacunar infarction and subcortical white matter lesions is known to be associated with delayed processing speed,[15] cerebral small vessel disease would be one of the causes of AF-related cognitive impairment/dementia. Further investigation is needed to establish whether development of AF-related cognitive impairment/dementia could be prevented by suppressing the development and deterioration of cerebral small vessel disease through managing vascular risk factors, including atrial hypertension, alcohol consumption, and smoking. There is also a need for a standardized cognitive test battery including evaluation of the processing speed domain to stratify patients with AF most likely to develop cognitive impairment/dementia.

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