Intracranial Stenosis, Cerebrovascular Diseases, and Cognitive Impairment in Chinese

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Abstract: Extracranial carotid artery disease has been shown to be related to cognitive deficits. However, limited data are available on intracranial stenosis (ICS) and cognitive impairment. We investigated the association between ICS and cognitive impairment in Chinese. Subjects (n = 278), recruited from the Epidemiology of Dementia in Singapore Study, underwent comprehensive clinical evaluation, neuropsychological testing, and brain magnetic resonance imaging (MRI), including 3-dimensional-time-of-flight magnetic resonance angiography (MRA). Cognitive function was expressed as composite and domain-specific Z-scores. Cognitive impairment was defined by dementia and depression diagnosed according to internationally accepted diagnostic criteria. Linear and logistic regression models were adjusted for age, sex, education, vascular risk factors, and other MRI markers. A total of 29 (10.4%) persons had ICS on MRA, which was significantly associated with both composite cognitive Z-scores [mean difference in Z-score, presence vs. absence of ICS: −0.37 (95% confidence interval: −0.63, −0.12)] and specific domains including executive function, language, visuomotor speed, verbal memory, and visual memory. ICS was also related to significant cognitive impairment (odds ratio: 5.10 [1.24 to 21.02]). With respect to other MRI markers, adjusted for the presence of lacunar infarcts, the associations of ICS with both composite and domain-specific Z-scores, and significant cognitive impairment became nonsignificant; however, adjustment for other MRI markers did not alter these associations. In this Chinese population, presence of ICS was associated with cognitive impairment independent of vascular risk factors. These associations may be mediated through the presence of infarcts.

Keywords: intracranial stenosis, magnetic resonance imaging, magnetic resonance angiography, cerebrovascular diseases, cognitive impairment, dementia, Chinese

Intracranial stenosis (ICS) in stroke patients has been suggested to vary among different ethnicities with higher prevalence (40% to 50%) reported in Chinese, Africans, and Hispanics as compared with whites (8% to 10%).1–3 This difference in the prevalence figures may, next to differences in study populations, be influenced by the imaging modalities [transcranial Doppler ultrasound (TCD) vs. magnetic resonance angiography (MRA)] and criteria used to define ICS. Furthermore, data on ICS from asymptomatic and community-based subjects—especially Asian populations—are largely lacking. One study using TCD among asymptomatic subjects from rural China (mean age, 53.5 y) reported a prevalence of ICS of 6.9%. Another study in asymptomatic predominantly white US subjects, ICS was identified in 12.9% using TCD. However, this was a relatively older population with a mean age of 71.4 years.4 The use of TCD may limit the ability to diagnose ICS, as this is not feasible in patients with poor bone windows and is also rater dependent with high interobserver and intraobserver variability.5 More recently, with the application of higher resolution imaging with flow enhancement, investigators have started to use MRA in population-based research settings, thereby creating opportunities to examine the determinants and consequences of ICS.5–8

With respect to cognitive impairment, studies have suggested that extracranial carotid artery disease is associated with impaired neuropsychological test performance, probably as a consequence of cerebral ischemic damage.7 As these studies have mainly focused on extracranial carotid artery stenosis,8–12 the association between ICS and cognitive impairment has not been investigated thoroughly. We, therefore, examined the association of ICS with cognitive impairment in a Chinese population, and whether this association is mediated by the presence of other markers of neurodegeneration or cerebrovascular diseases on magnetic resonance imaging (MRI).

METHODS

Study Population

The ongoing Epidemiology of Dementia in Singapore (EDIS) study drew subjects from the population-based...