Cortical cerebral microinfarcts on 3T MRI
A novel marker of cerebrovascular disease

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ABSTRACT
Objective: We examined the risk factors of cortical cerebral microinfarcts (CMIs) on 3T MRI and their association with cognitive impairment.

Methods: Participants (aged 60 years and older) from the multiethnic Epidemiology of Dementia In Singapore Study underwent detailed neuropsychological testing and 3T brain MRI. Cortical CMIs were graded using a previously validated protocol. Cognitive impairment was categorized into cognitive impairment, no dementia (CIND)-mild, CIND-moderate, and dementia. Cognitive function was summarized as composite and domain-specific \( z \) scores.

Results: Among 861 participants, 54 (6.3%) had \( \geq 1 \) cortical CMI. In multivariate-adjusted models, the risk factors of cortical CMIs were increasing age, Malay ethnicity, hypertension, diabetes, history of stroke, and markers of both large (cortical infarcts and intracranial stenosis) and small (lacunar infarcts, white matter hyperintensities, cerebral microbleeds) vessel disease. Presence of cortical CMIs was associated with CIND-moderate (odds ratio: 3.12; 95% confidence interval [CI]: 1.18–8.58), dementia (odds ratio: 16.92; 95% CI: 3.37–85.05), and poorer cognitive function (mean difference in composite \( z \) score: \(-0.42\); 95% CI: \(-0.62\) to \(-0.21\)). Additional adjustments for vascular risk factors and other MRI markers did not alter these associations.

Conclusions: Cortical CMIs are a novel MRI marker of cerebrovascular disease and are independently associated with cognitive impairment and dementia. These findings provide new insights into the burden of cerebrovascular disease in cognitive impairment. Future research is needed to establish the additional etiologic and prognostic significance of cortical CMIs.

GLOSSARY
AMT = Abbreviated Mental Test; CeVD = cerebrovascular disease; CI = confidence interval; CIND = cognitive impairment, no dementia; CMI = cerebral microinfarct; DSM-IV = Diagnostic and Statistical Manual of Mental Disorders (Fourth Edition); EDIS = Epidemiology of Dementia in Singapore; FLAIR = fluid-attenuated inversion recovery; MMSE = Mini-Mental State Examination; MoCA = Montreal Cognitive Assessment; WMH = white matter hyperintensity.

Cerebrovascular disease (CeVD) is a major cause and contributor to cognitive decline and dementia in older individuals.1,2 Although conventional MRI markers of CeVD, including infarcts, white matter hyperintensities (WMH), and cerebral microbleeds, are highly prevalent in elderly populations, they nevertheless do not fully encompass the burden of cerebrovascular pathology in dementia. Recent autopsy studies have shown that cerebral microinfarcts (CMIs) are highly prevalent not only in patients with dementia (43% in Alzheimer disease and 62% in vascular dementia) but also in elderly persons without dementia (up to 33%).3,4 These CMIs can be present in all brain regions, possibly more in the cerebral cortex, with reported sizes ranging from 50 \( \mu \)m to approximately 5 mm.4 Although small and previously held to be “invisible” lesions during life, it has been hypothesized that these CMIs, if present in sufficient numbers, may impair cognition and predict poor outcome in elderly persons with CeVD.5,6 Recently, it...