Microvascular network alterations in retina of subjects with cerebral small vessel disease

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**HIGHLIGHTS**

- Retinal microvascular network changes were linked previously to stroke and AD.
- Sparser and more tortuous retinal vascular network was associated with CMB.
- No significant association was found with lacunar infarcts and WML volume.

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**ABSTRACT**

Novel retinal imaging techniques have enabled the assessment of quantitative vascular parameters, which provide information on the microvasculature before the appearance of retinopathy signs. Advances in neuroimaging have revealed that cerebral microbleeds (CMB) – besides lacunar infarcts and white matter lesions (WML) – may be a novel marker of cerebral small vessel disease. We examine whether quantitative retinal vascular parameters are related to cerebral small vessel disease in a Chinese population. Participants from Epidemiology of Dementia in Singapore Study underwent comprehensive examinations, including 3-Tesla cranial magnetic resonance imaging and retinal-photography. Retinal vascular parameters (caliber, tortuosity, fractal dimension) were measured from photographs using a semi-automated computer-assisted program. Lacunar infarcts and CMB were visually graded. Total brain and WML volume were obtained using a validated segmentation tool.

A total of 261 subjects were included, of whom 36 had lacunar infarcts, 29 had severe WML, and 83 had CMB. In age-sex-adjusted models, narrower retinal arteriolar caliber, wider venular caliber and smaller arteriolar fractal dimension were associated with presence of multiple CMB. In contrast, no association was found with lacunar infarcts and WML volume. After multivariate adjustments, associations of venular caliber, arteriolar fractal dimensions and arteriolar tortuosity with CMB remained statistically significant. In conclusion, subjects with early structural changes in retinal microvasculature were more likely to have CMBs, supporting hypothesis that CMB may be an early manifestation of cerebral small vessel disease.

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