Association of White Matter Hyperintensity Markers on MRI and Long-term Risk of Mortality and Ischemic Stroke

The SMART-MR Study

Rashid Ghaznawi, MD, MSc, Mirjam I. Geerlings, PhD, Myriam Jaarsma-Coes, MSc, et al., on behalf of the UCC-Smart Study Group

Cite as: Neurology® 2021;96:e2172-e2183. doi:10.1212/WNL.0000000000011827

Study Question
Are different features of white matter hyperintensities (WMH) on MRI associated with the long-term risks of mortality and ischemic stroke (IS)?

What Is Known and What This Paper Adds
Features of WMH may provide clinically important information on cerebral small vessel disease severity. This investigation’s results indicate that WMH volume, type and shape are associated with long-term risk of mortality and ischemic stroke in patients with manifest arterial disease.

Methods
For this cohort study, the investigators analyzed data from 999 patients with manifest arterial disease (79% male; mean baseline age, 59 ± 10 years) who were recruited in the SMART-MR study between 2001 and 2005 and followed up for a median of 12.5 years (range, 0.2–16.0 years). WMH features including volume, type, and shape were determined using an automatic algorithm. Baseline vascular risk factors and outcome events (mortality, incident stroke) were collected prospectively. Cox regression analysis was used to look for associations between WMH features and IS and mortality.

Results and Study Limitations
Greater periventricular or confluent WMH volumes predicted greater risks of vascular death (hazard ratio [HR], 1.29 per 1-unit increase in natural log–transformed WMH volume; 95% confidence interval [CI], 1.13–1.47) and IS (HR, 1.53; 95% CI, 1.26–1.86). The presence of confluent WMH predicted greater risks of vascular death (HR, 1.89; 95% CI, 1.15–3.11), nonvascular death (HR, 1.65; 95% CI, 1.03–2.42), and IS (HR, 1.28; 95% CI, 1.05–1.55). Greater morphologic irregularity of periventricular or confluent WMH, as expressed by higher concavity index values, predicted greater risks of vascular death (HR, 1.20 per 1-SD increase; 95% CI, 1.05–1.38), nonvascular death (HR, 1.21; 95% CI, 1.03–1.42), and IS (HR, 1.28; 95% CI, 1.05–1.55). The present study’s limitations include relying on 1.5T MRI scans rather than 3T scans, relatively large slice thicknesses for MRI scans, and a reliance on single-center recruitment, which may limit generalizability.

Study Funding and Competing Interests
This study was funded by the European Research Council and the Netherlands Organization for Scientific Research—Medical Sciences (NWO-MW). The authors report no competing interests. Go to Neurology.org/N for full disclosures.

A draft of the short-form article was written by M. Dalefield, a writer with Editage, a division of Cactus Communications. The corresponding author(s) of the full-length article and the journal editors edited and approved the final version.

Copyright © 2021 American Academy of Neurology

Copyright © 2021 American Academy of Neurology. Unauthorized reproduction of this article is prohibited.