

Imaging markers of small vessel disease and brain frailty, and outcomes in acute stroke

Jason P. Appleton, MRCP (UK), Lisa J. Woodhouse, MSc, Alessandro Adami, MD, et al., for the ENOS Investigators

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Correspondence

Dr. Bath
Philip.bath@nottingham.ac.uk

Study objective and summary result

This study tested the hypothesis that neuroimaging markers of cerebral small vessel disease (SVD) and brain frailty at baseline are associated with worsened clinical outcomes after acute stroke. The results support the idea that these neuroimaging markers at baseline are associated with worsened outcomes.

What is known and what this paper adds

Cerebral SVD is a common cause of cerebrovascular events and cognitive impairment. Several SVD-related neuroimaging findings have been associated with poor outcomes. This investigation confirms that imaging markers of cerebral SVD and brain frailty are associated with worsened outcomes.

Participants and setting

The investigators analyzed data from 4,011 patients with acute stroke (57.3% male; mean age, 70.3 ± 12.2 years) who participated in the Efficacy of Nitric Oxide in Stroke (ENOS) trial (ISRCTN99414122), which assessed the safety and efficacy of transdermal glyceryl trinitrate. The ENOS trial was conducted through 173 centers in 23 countries.

Design, size, and duration

The ENOS participants underwent CT or MRI scans at baseline, and neuroradiologists and neurologists who were blinded to clinical data assessed the scans for leukoaraiosis, cerebral atrophy, and old vascular lesions/infarcts. These findings were used to calculate scores for cerebral SVD and brain frailty. At a 90-day follow-up timepoint, the ENOS participants' functional outcomes were assessed with the modified Rankin Scale (mRS), and their cognitive status was assessed with a telephone version of the Mini-Mental State Examination (t-MMSE). Ordinal logistic and linear regression models were

Table Associations between baseline neuroimaging findings and 90-day mRS scores

Score	Odds ratio (95% confidence interval) for worsened mRS score
SVD score	1.15 (1.07–1.24)
Brain frailty score	1.25 (1.17–1.34)

Abbreviations: mRS = modified Rankin Scale; SVD = small vessel disease.

used to determine whether baseline neuroimaging markers were associated with 90-day outcomes.

Main results and the role of chance

Markers of cerebral SVD and brain frailty were independently associated with worsened mRS scores at 90 days ($p < 0.001$), and brain frailty markers were associated with worsened t-MMSE scores ($p = 0.002$).

Bias, confounding, and other reasons for caution

The present study did not implement corrections for multiple comparisons.

Generalizability to other populations

The use of data from multiple countries favors the generalizability of the present study's results.

Study funding/potential competing interests

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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.

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