Brain Microbleeds, Amyloid Plaques, Intellectual Deterioration, and Arterial Stiffness

To the Editor:

The article by Henskens et al on brain microbleeds supports a view that cerebral microvascular disease in hypertensive patients is responsible for intellectual deterioration and is caused by abnormal flow pulsations extending into the small cerebral vessels as a consequence of aortic stiffening. The relationship between cognitive decline and aortic stiffness and pulse pressure, suspected previously on mechanistic grounds, has been confirmed by Waldstein et al for the Baltimore Longitudinal Study of Aging in the same issue of Hypertension. MRI studies have confirmed an association between cerebral white matter hyperintensities and high-flow pulsations in the cerebral vasculature and have referred to the former as caused by “pulse wave encephalopathy.”

Histological studies have shown that the amyloid deposits characteristic of Alzheimer’s dementia can be attributed to previous microbleeds. Our own work suggests that microbleeds, white matter hyperintensities, and lacunar infarcts are caused by the damaging forces of high pulsatile pressure and flow in cerebral microvessels, as first pointed out by Byrom in Sydney, and by a similar mechanism in the pulmonary circulation of children with congenital left to right shunts, as pointed out by Edwards from the Mayo Clinic 50 years ago.

These mechanisms may help explain other recent findings. Increased circulating endothelial cell fragments in persons with aortic stiffening may be caused by such microvascular damage in brain and kidney. High C-reactive protein levels in older persons may be a consequence of inflammation caused by small vessel damage rather than a cause of large artery damage. Even the findings of highest value of nocturnal blood pressure in outcomes by Henskens et al and by Fagard et al in the same issue of Hypertension may be due in part to cerebral arteries being exposed to the highest blood pressure during sleep when persons are recumbent and the brain less protected from hydrostatic (gravitational) forces than when a person is erect or sitting.

The article by Henskens et al and others in the same issue of Hypertension provide more evidence to support a cerebral microvascular mechanism for intellectual deterioration in older persons with arterial stiffening.

Disclosures

M.F.O. is a founding director of AtCor Medical Pty Ltd, manufacturer of systems for analyzing the arterial pulse.

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