

Stroke imaging: small vessel disease

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Abstract:

The difference between small vessel disease (SVD) and large vessel disease (LVD) in the brain is arbitrary: small vessels are arteries with a diameter that is smaller than 0.1 mm that penetrate the brain, whereas large vessels have a larger diameter and comprise the cervical cerebropetal arteries, the arteries of the circle of Willis and the arteries on the surface of the brain. Although the discrimination based on size is arbitrary, small and large arteries are affected by different pathologies. LVD accounts for two-third of symptomatic stroke and comprises atherosclerosis, subarachnoid hemorrhage, and thromboembolic events. SVD accounts for one-third of symptomatic strokes and is mostly based on conditions that specifically affect arterioles, such as arteriolosclerosis and cerebral amyloid angiopathy (CAA). Both arteriolosclerosis and CAA are characterized by selective destruction of the media of the arteriolar vessel wall, which harbours the smooth muscle cells that are responsible for the capacity of the brain to autoregulate its perfusion. In addition, these diseases are characterized by a decrease of the vascular lumen and increased fragility of the vessel wall. These changes give rise to hypoperfusion and a propensity for developing cerebral hemorrhages. Clinical signs and symptoms include: stroke (hemorrhagic and ischemic) and cognitive deterioration. Until recently, the diagnosis of SVD could only be made histologically, mostly at autopsy and sometimes during life, in patients in whom a cerebral hematoma was evacuated. The availability of susceptibility-weighted imaging (SWI) sequences has increased the detection rate of so-called cerebral microbleeds (CMBs) that are associated with SVD, and recently diagnostic criteria (Boston criteria) have been developed to assess the presence of CAA in vivo based on CMBs. SWI and the possibility to detect SVD in vivo has given rise to a rapid increase of our knowledge of SVD.