High-Resolution Vessel-Wall Imaging for Analysis of Intracranial Aneurysm Daughter-Sac Vulnerability

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A 58-year-old man was found incidentally to have an aneurysm of the right middle cerebral artery on a magnetic resonance imaging scan of the head, obtained for evaluation of trigeminal neuralgia. A computed tomography angiogram confirmed the presence of the aneurysm (Figure A). No treatment was recommended at that time, and he was followed with serial imaging studies. Seven years later, postcontrast proton density high-resolution vessel-wall imaging performed 7 years later shows enhancement limited to the daughter sac and the immediate surrounding portion of the main aneurysm (arrows). D, Subsequent digital subtraction angiography shows the aneurysm (black arrow) with a daughter sac (white arrow).

FIGURE. A, Original CT angiogram shows the aneurysm. B, Pre- and (C) postcontrast proton density high-resolution vessel-wall imaging performed 7 years later shows enhancement limited to the daughter sac and the immediate surrounding portion of the main aneurysm (arrows). D, Subsequent digital subtraction angiography shows the aneurysm (black arrow) with a daughter sac (white arrow).
years later, a new daughter sac had developed that demonstrated enhancement on high-resolution vessel-wall imaging (HR-VWI) (Figure B and C). This prompted evaluation with digital subtraction angiography (Figure D), along with endovascular embolization of the aneurysm.

High-resolution vessel-wall imaging is a technique with submillimeter spatial resolution and suppression of signal from adjacent blood and cerebrospinal fluid, facilitating assessment of walls of intracranial arteries. Aneurysm-wall enhancement, as seen on HR-VWI, may demonstrate the presence of vessel-wall inflammation, thereby further compromising the integrity of the aneurysm wall and predisposing to growth or rupture.1 The presence of aneurysm daughter sacs are thought to implicate a higher risk of rupture.2 Wall enhancement has been associated with developing daughter sacs, although previous work suggests this is more common in the main portion of the aneurysm rather than the daughter sac itself.3 However, in some cases, wall enhancement can be limited to the daughter sac; therefore, HR-VWI may be a useful tool in identifying aneurysms that are at risk for progression, thereby justifying intervention. This may be particularly useful in cases of equipoise. However, the precise role of HR-VWI in identifying aneurysms at risk for rupture requires further prospective longitudinal evaluation.4

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