Nonvisualization of a large cerebral aneurysm despite high-resolution magnetic resonance angiography

Case report

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The use of magnetic resonance (MR) angiography as a safe, accurate, and reliable substitute for invasive cerebral arteriography has been anticipated as refinements in this technique are introduced. We present the case of an unruptured, 11-mm pericallosal arterial aneurysm not visualized on high-resolution MR angiography. Although this case may be atypical, we caution against complete reliance on this test for exclusion of the presence of cerebral aneurysms.

KEY WORDS • magnetic resonance angiography • aneurysm • angiography • magnetic resonance imaging

The development of sophisticated software to enhance magnetic resonance (MR) imaging data will lead to the availability of superior noninvasive techniques for visualizing cerebrovascular anatomy; these enhancements will allow us to attain resolution that will be comparable to conventional arteriography. Studies are already beginning to appear suggesting that MR angiography is reliable enough to replace invasive angiography in certain clinical situations. We report the case of a sizable unruptured cerebral aneurysm that was missed using three-dimensional phase-contrast MR angiography. The danger of premature reliance on this computer-generated image in extremely demanding decision-making situations is obvious.

Case Report

This 69-year-old, otherwise healthy woman reported several episodes of transient vertigo unassociated with any other clinical signs or symptoms of localizing neurological dysfunction. As part of her workup, MR imaging was performed and revealed a discrete flow void consistent with a significant vascular lesion in the region of the genu of the corpus callosum (Fig. 1). Magnetic resonance angiography failed to further define the abnormality, whereas selective transfemoral angiography revealed an 11-mm saccular aneurysm, with a surgically accessible neck, at the pericallosal callosomarginal bifurcation (Fig. 2). The patient underwent a subfrontal, interhemispheric craniotomy with successful clipping of this incidental aneurysm.

Discussion

New methods for discovering unruptured aneurysms in appropriate surgical candidates are constantly being sought. Ross, et al.,\textsuperscript{4} report a 67% sensitivity rate in detecting cerebral aneurysms using a volume-gradient echo technique. The sensitivity rate increased to 86% when they added routine spin-echo images and the time-intensive inspection of the individual partitions. Blatter, et al.,\textsuperscript{1} in a nonblinded study, reported the detection of 18 of 19 cerebral aneurysms using the time-of-flight technique with multiple overlapping thin slab acquisitions. These
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studies, however, did not have proper controls against an angiographic standard. Despite the reported superiority of phase-contrast over time-of-flight techniques for demonstrating larger aneurysms,\(^2\) the aneurysm in our case remained undetected despite the use of a good quality three-dimensional phase-contrast paradigm. Pernicone, et al.,\(^3\) believe that phase-contrast MR angiography may not show aneurysm out-pouching because the flow-encoded signal immediately adjacent to the vessel wall is low. The velocity profile becomes more complicated when blood flow is pulsatile or the vessel bifurcates, or when both conditions are present. Time-of-flight MR angiography has less signal loss arising from complex and pulsatile flow; however, as the flow rate diminishes, the signal becomes less distinct from surrounding tissues. In addition, partially thrombosed aneurysms containing methemoglobin will brighten on the time-of-flight studies, making it difficult to distinguish the aneurysms from flowing blood.\(^2,3\)

Although MR angiography holds great promise, it has not yet reached the level of sensitivity required to rule out with confidence the presence of an intracranial aneurysm. The case presented highlights the shortcomings of MR angiography and underscores the need for conventional angiography for the definitive diagnosis of cerebral aneurysms.

Fig. 1. A: T\(_1\)-weighted sagittal magnetic resonance (MR) image demonstrating a mass lesion at the level of the genu of the corpus callosum. B: A T\(_2\)-weighted axial MR image showing the same lesion and revealing mixed signal intensities and flow void, in close association with the anterior cerebral circulation.

Fig. 2. A and B: Lateral three-dimensional phase-contrast magnetic resonance angiography images in which there is no visualization of the pericallosal arterial aneurysm. C and D: Conventional angiography obtained in the same patient demonstrating the presence of an aneurysm.

References

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