Special Issue: Rare Diseases in Neurology

Journal of INTERNATIONAL MEDICAL RESEARCH

Journal of International Medical Research
2017, Vol. 45(6) 1802–1804

DOI: 10.1177/0300060517706603
journals.sagepub.com/home/imr
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M2 segment dissection of middle cerebral artery diagnosed using high-resolution magnetic resonance imaging

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Abstract

Middle cerebral artery (MCA) dissection is a rare cause of ischemic stroke, especially in the M2 or M3 segments. Diagnosis of intracranial artery dissection remains challenging. We herein report a case of M2 segment dissection of the MCA with typical features of an intimal flap and intramural hematoma diagnosed using high-resolution 3T magnetic resonance imaging. This imaging technique might be a more effective noninvasive method by which to diagnose M2 segment dissection of the MCA than either computed tomography angiography or digital subtraction angiography.

Keywords

High-resolution magnetic resonance imaging, dissection

Date received: 19 November 2016; accepted: 3 April 2017

Middle cerebral artery (MCA) dissection is a rare cause of ischemic stroke, especially in the M2 or M3 segments.[1] High-resolution 3T magnetic resonance imaging (HR-MRI) can be used to assess the walls of intracranial blood vessels, helping to identify dissection.[2] We herein report a case of M2 segment dissection of the MCA with typical features of an intimal flap and intramural hematoma diagnosed using HR-MRI.

A 30-year-old man with an 8-year history of smoking was admitted due to headache and seizure. The patient reported no history of trauma. Brain MRI was performed on a 3T Achieva MRI system (Philips Healthcare, Cleveland, OH) using a body coil for transmission and an eight-channel head coil for reception. Acute multifocal infarcts were observed in the left MCA territory (Figure 1(a)). Three-dimensional time-of-flight magnetic resonance angiography revealed an occlusion of the posterior

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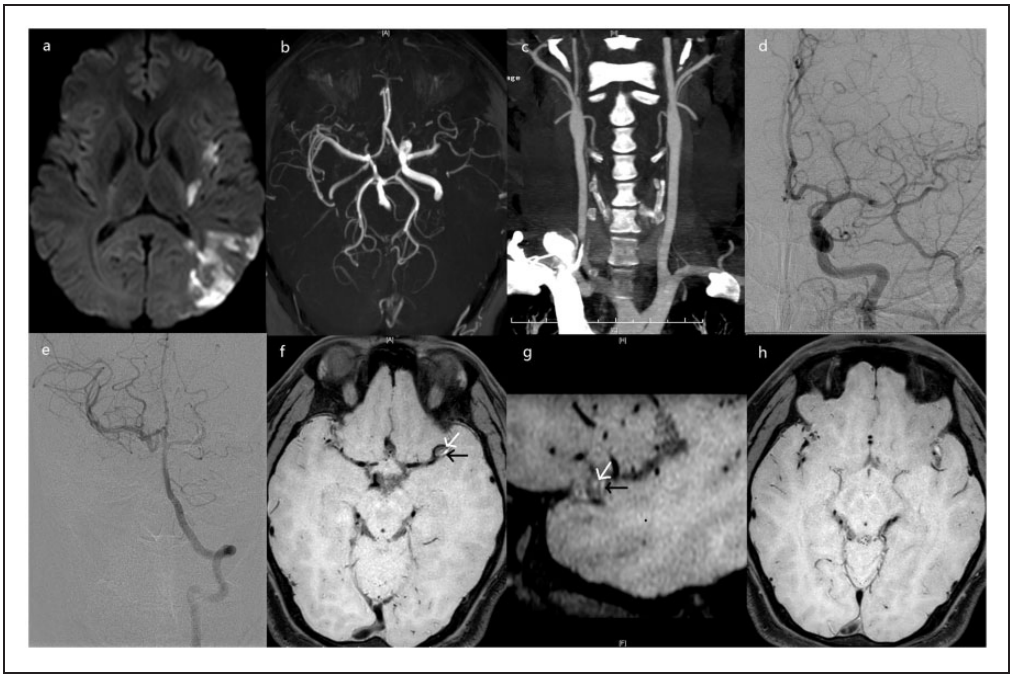

Figure 1. Radiographic images of the patient. (a) Axial diffusion-weighted imaging showed multifocal acute infarcts in the left middle cerebral artery territory. (b) Magnetic resonance angiography and (d) digital subtraction angiography showed partial occlusion of the left M2 segment. (c) Computed tomography angiography showed a tiny right internal carotid artery. (f, g) T1-weighted 3T magnetic resonance imaging revealed an intimal flap, (f, g) high signals in an intramural hematoma, and (h) distal thrombosis of the left M2 branch. (e) Digital subtraction angiography also showed that the posterior circulation supplied the right middle cerebral artery through the right posterior communicating artery. The magnetic resonance imaging parameters were as follows: field of view, $200 \times 167 \times 45\,mm^3$; acquired resolution, $0.6 \times 0.6 \times 1.0\,mm^3$; reconstructed resolution, $0.5 \times 0.5 \times 0.5\,mm^3$ using zero filling; repetition time, 1500 ms; echo time, 36 ms; and scan duration, 6:51 minutes.

trunk of the left M2 segment (Figure 1(b)). Computed tomography angiography showed that the right internal carotid artery was very small (Figure 1(c)). We further performed digital subtraction angiography and HR-MRI to evaluate the intracranial artery lesion. Digital subtraction angiography showed occlusion of the left M2, and the right posterior cerebral artery continued to form the right MCA through the right posterior communicating artery (Figure 1(d), (e)). A transverse three-dimensional T1-weighted volumetric isotropically reconstructed turbo spin-echo acquisition (VIRTA) images were then acquired in the coronal plane (50-mm-thick slab) to cover the major intracranial vessels as identified on time-of-flight magnetic resonance angiography; these images revealed a dissection with an intimal flap (white arrows, Figure 1(f), (g)), concurrent intramural hemorrhages (black arrows, Figure 1(f), (g)), and distal thrombosis (Figure 1(h)). Blood examination findings were unremarkable with the exception of hyperhomocysteinemia (44.4 μmol/L). No other underlying arteriopathies were found. The final diagnosis was a left MCA territory infarction caused by M2 segment dissection.

Discussion

Diagnosis of intracranial artery dissection is challenging. Catheter angiography is reliable for identification of occlusion or segmental stenosis of the involved artery, but it usually fails to display the structures of the vessel walls.[2] The present case shows that HR-MRI might be a more effective non-invasive technique with which to diagnose M2 segment dissection of the MCA by visualizing the fine arterial wall structures and lumens. Notably, the patient also had a rare arterial variation (tiny right carotid artery). Arterial variations might be associated with pathological lesions[3]; additionally, endothelial dysfunction, which can be found in many clinical situations including tobacco use, infection, irradiation, and hyperhomocysteinemia, could affect the initiation of cervicocerebral artery dissection.[4] We consider that the patient's smoking history, hyperhomocysteinemia, and congenital vascular variation may have all been involved in the pathogenesis of his condition.

Authors' contributions

Study concept and design: Q.W., X.S. Acquisition of data: Q.W., X.S., Q.Z., J.T., H.L. Drafting of the manuscript: X.S. Critical revision for important intellectual content: Q.W., X.S. Study supervision: Q.W.

Declaration of conflicting interests

The authors declare that there is no conflict of interest.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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