Cerebrovasc Dis 2013;36:243–244
DOI: 10.1159/000353873

Spontaneous Middle Cerebral Artery Dissection Demonstrated by High-Resolution T1-Weighted 3D Image

Masahiro Uemura^a, Yasuhisa Akaiwa^a, Masafumi Toriyabe^a, Takuya Mashima^a, Kenshi Terajima^a, Takayoshi Shimohata^a, Hironaka Igarashi^b, Tsutomu Nakada^b, Masatoyo Nishizawa^a

^aDepartment of Neurology, Brain Research Institute, Niigata University, and ^bCenter for Integrated Human Brain Science, Niigata University, Niigata, Japan

Spontaneous cervicocephalic arterial dissection is an uncommon cause of stroke [1]. Segments of the middle cerebral artery (MCA) are rarely involved, and the incidence of MCA dissection (MCAD) is reported to be 4% of the spontaneous cervicocephalic arterial dissections in Japan [2]. A previous report suggests that magnetic resonance imaging (MRI) may be useful for detecting intracranial vertebrobasilar artery dissection [3], although the applicability in MCAD patients is unknown. Here, we report a patient who had MCAD with characteristic lesions, which was demonstrated by high-resolution T1-weighted 3D images obtained using a 3-tesla MRI (3T MRI) system.

Case Report

A 39-year-old, right-handed man was admitted to our hospital because of sudden onset of right hemiparesis and aphasia. His medical history included atopic dermatitis, and included no episodes of trauma. He was alert on admission; however, his speech and comprehension were impaired, and was assessed a National Institutes of Health Stroke Scale score of 15. Brain computed tomography showed obscuration of the lentiform nucleus on the left side. Computed tomography angiography (CTA) demonstrated an occlusion of the left MCA at the horizontal segment. Laboratory examination yielded unremarkable results. Administration of intravenous recombinant tissue plasminogen activator (IV rt-PA) was started at 164 min after symptom onset (alteplase, 0.6 mg/kg). However, no neurological improvement was observed. Transcranial color-coded flow velocity measurements demonstrated reperfusion of the left MCA just after IV rt-PA administration, and 1.5T MRI detected an acute infarction in the left putamen, insular cortex, and corona radiata (fig. 1a). Magnetic resonance angiography results could not be evaluated because of motion artifacts. On day 4, CTA showed dilatation of the left MCA (fig. 1b) and the double lumen sign (fig. 1c), on the basis of which spontaneous MCAD was strongly suggested. However, atherothrombotic occlusion, while unlikely given the circumstances, could not be completely ruled out at the time, since the fat-saturated T1-weighted imaging [4] needed to make an unambiguous diagnosis of MCAD was not performed. On day 17, fast spoiled gradient-echo images

Fig. 1. **a** MRI and CTA. Diffusion-weighted MRI detected the area of hyperintensity in the left putamen, insular and corona radiata. **b** Reconstruction of CTA demonstrated dilatation of the horizontal segment in the left MCA. **c** Axial view of the CTA showed the double lumen sign, although it is not obvious. **d** Axial view of FSPGR in 3T MRI. **e** Sagittal FSPGR view in 3T MRI. The narrowed true lumen was located in front of the dilated pseudolumen.

acquired on a General Electric (Waukesha, Wisc., USA) Signa 3.0T system demonstrated that the narrowed true lumen was located in front of a dilated pseudolumen, which was indistinguishable by CTA (fig. 1d, e). Neurological symptoms gradually improved, although mild hemiparesis and aphasia remained. On day 24, the patient was transferred to a different facility to continue rehabilitation.

Discussion

We consider this report notable for the following reasons: first, compared to clinical routine magnetic resonance angiography that sometimes misses MCAD, high-resolution 3D morphological MRI, such as spoiled gradient echo, can visualize fine arterial wall structures. With high-field 3T MRI, noninvasive high-resolution volume images can be obtained within a suitable time frame to inform the initial diagnosis [5, 6]. We recommend utilizing high-resolution 3D morphological MRI for suspected MCAD cases. Second, recent reports have suggested that the safety and outcome of IV rt-PA is not affected by the relationship between the dissection and stroke [7, 8]. Doijiri et al. [9] reported an MCAD case similar to that described herein, which was uneventfully treated with rt-PA. Although the possibility of subarachnoid hemorrhage must also be considered [10], it might be safe to perform IV rt-PA.

Acknowledgement

We would like to thank Associate Professor Vincent J. Huber (Center for Integrated Human Brain Science, Niigata University) for the proofreading of the manuscript.

Disclosure Statement

We report no disclosure associated with this report.

References

- 1 Debette S, Leys D: Cervical-artery dissections: predisposing factors, diagnosis, and outcome. *Lancet Neurol* 2009;8:668–678.
- 2 Tsukahara T, Minematsu K: Overview of spontaneous cervicocephalic arterial dissection in Japan. *Acta Neurochir Suppl* 2010;107:35–40.
- 3 Hosoya T, Watanabe N, Yamaguchi K, Kubota H, Onodera Y: Intracranial vertebral artery dissection in Wallenberg syndrome. *AJNR Am J Neuroradiol* 1994;15:1161–1165.
- 4 Oppenheim C, Naggara O, Touze E, Lacour JC, Schmitt E, Bonneville F, Crozier S, Guegan-Massardier E, Gerardin E, Leclerc X, Neau JP, Sirol M, Toussaint JF, Mas JL, Meder JF: High-resolution MR imaging of the cervical arterial wall: what the radiologist needs to know. *Radiographics* 2009;29:1413–1431.
- 5 Ryu CW, Jahng GH, Kim EJ, Choi WS, Yang DM: High resolution wall and lumen MRI of the middle cerebral arteries at 3 tesla. *Cerebrovasc Dis* 2009;27:433–442.
- 6 Swartz RH, Bhuta SS, Farb RI, Agid R, Willinsky RA, Terbrugge KG, Butany J, Wasserman BA, Johnstone DM, Silver FL, Mikulis DJ: Intracranial arterial wall imaging using high-resolution 3-tesla contrast-enhanced MRI. *Neurology* 2009;72:627–634.
- 7 Georgiadis D, Lanczik O, Schwab S, Engelter S, Sztajzel R, Arnold M, Siebler M, Schwarz S, Lyrer P, Baumgartner RW: IV thrombolysis in patients with acute stroke due to spontaneous carotid dissection. *Neurology* 2005;64:1612–1614.
- 8 Zinkstok SM, Vergouwen MD, Engelter ST, Lyrer PA, Bonati LH, Arnold M, Mattle HP, Fischer U, Sarikaya H, Baumgartner RW, Georgiadis D, Odier C, Michel P, Putaala J, Griebbe M, Wahlgren N, Ahmed N, van Geeloven N, de Haan RJ, Nederkoorn PJ: Safety and functional outcome of thrombolysis in dissection-related ischemic stroke: a meta-analysis of individual patient data. *Stroke* 2011;42:2515–2520.
- 9 Doijiri R, Yokota C, Suzuki R, Toyoda K, Minematsu K: Intravenous recombinant tissue plasminogen activator thrombolysis in acute ischemic stroke due to middle cerebral artery dissection. *J Stroke Cerebrovasc Dis* 2012;21:915e7–e9.
- 10 Caplan LR, Baquis GD, Pessin MS, D'Alton J, Adelman LS, DeWitt LD, Ho K, Izukawa D, Kwan ES: Dissection of the intracranial vertebral artery. *Neurology* 1988;38:868–877.