Dynamic Magnetic Resonance Appearance of the Vertebral Dissecting Aneurysm

—Case Report—

Jun-ichiro HAMADA, Kyoichi SATO, Shinji NAGAHIRO
and Yukitaka USHIO

Department of Neurosurgery, Kumamoto University Medical School, Kumamoto

Abstract

A dissecting aneurysm of the vertebral artery occurred in a 38-year-old male presenting with ischemic attacks. Vertebral angiography revealed irregular narrowing and dilatation of the right vertebral artery, and retention of the contrast medium. Routine T₁-weighted magnetic resonance (MR) imaging demonstrated signal voids compatible with a patent but narrowed vertebral lumen surrounded by three intensity components at the abnormality location identified on the vertebral angiograms. Dynamic MR imaging demonstrated strong enhancement of these components on the early images. These findings were consistent with the false lumen of the dissecting aneurysm. The different signal intensities were thought to reflect the blood flow rate.

Key words: dissecting aneurysm, magnetic resonance imaging, vertebral artery

Introduction

Spontaneous dissecting aneurysms of cerebral arteries, especially in the vertebrobasilar system, are rather rare.^{2,9)} However, the incidence is increasing with greater knowledge of this condition. Such aneurysms are difficult to diagnose, even with angiographic data, and are easily misdiagnosed as fusiform aneurysms or intraluminal thrombus associated with vasospasm of the parent artery and/or ischemic attacks. The angiographic diagnosis and surgical treatment of dissecting aneurysms have been discussed recently, but the magnetic resonance (MR) appearance has been little reported.

We describe the appearance on T₁-weighted and dynamic MR images of an angiographically confirmed dissecting aneurysm of the vertebral artery.

Case Report

Two weeks prior to admission, a 38-year-old male experienced sudden onset of nuchal pain, hoarseness,

and difficulty in swallowing. On admission to another hospital, computed tomographic scans showed no subarachnoid hemorrhage, but T₂-

Fig. 1 T₂-weighted MR image, showing a hyperintense area in the right lateral medulla (arrow).

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Author's present address: J. Hamada, M.D., Department of Cerebrovascular Surgery, National Cardiovascular Center, Suita, Osaka, Japan.

Fig. 2 Right vertebral angiograms, anteroposterior (*left*) and lateral (*right*) views. *upper*: The arterial phase, showing irregular narrowing (*arrow*) and dilatation (*arrowhead*). *lower*: The venous phase, showing retention of the contrast medium (*arrow*).

weighted SE sequence MR images demonstrated a hyperintense area in the right lateral medulla (Fig. 1). He received no anticoagulant therapy and was transferred to our department 2 weeks after admission.

Neurological examination found persistent nuchal pain and paralyses of the right IXth, Xth, and XIth cranial nerves. Incomplete right Horner's syndrome, left sensory disturbance of the whole body, right facial sensory disturbance, right Wallenberg's syndrome, and cerebellar ataxia were also noted. He denied recent trauma or neck manipulation. His blood pressure was 128/80 mmHg. Right vertebral angiograms revealed irregular narrowing and dilatation of the right vertebral artery in the arterial phase and retention of the contrast medium in the venous phase (Fig. 2). The right posterior inferior cerebellar artery could not be detected.

Routine T₁-weighted MR images 4 weeks after onset demonstrated a signal void compatible with a

patent but narrowed vertebral lumen. This area was surrounded by hyper-, relatively hyper-, and relatively hypointensity structures in the region of the abnormality identified by vertebral angiography (Fig. 3). Dynamic MR imaging was then performed using T₁-weighted sequence. The T₁-weighted sequence was carried out immediately after a bolus injection of gadolinium-diethylenetriaminepenta-acetic acid (0.1 mmol/kg body weight) and serial images were obtained every minute for 9 minutes. Immediately afterwards, sagittal T₁-weighted images were obtained. Dynamic MR images 1 minute after the injection demonstrated strong enhancement of the three structures (Fig. 4), which persisted in later images.

A balloon occlusion test confirmed that proximal right vertebral artery clipping was possible without

Fig. 3 Routine T₁-weighted MR image 4 weeks after onset, showing a signal void (*thick arrow*) surrounded by three variable intensity components (*double arrowhead*, *arrow*, and *arrowhead*).

Fig. 4 Dynamic MR images, demonstrating strong enhancement of the three intensity components (*arrow*).

producing neurological deficits. The right vertebral artery was clipped just proximal to the dissecting aneurysm *via* a right inferior suboccipital craniectomy 6 weeks after admission.

The postoperative course was uneventful. The preoperative symptoms gradually improved and had almost disappeared in 4 weeks.

Discussion

The angiographic appearance of intracranial dissecting aneurysms may be string sign, occlusion, rosette, intimal flap, proximal and/or distal dilatation, double lumen, retention of contrast medium, or intramural pooling.^{1,4,5,7)} However, the diagnosis is not easy because the sole pathognomonic sign of a dissecting aneurysm is a double lumen, confirmed radiologically in only a few cases. In our case, irregular narrowing and dilatation in the arterial phase and retention of the contrast medium in the venous phase were observed.

MR imaging demonstrates intracranial vascular lesions excellently. The MR appearance of a dissecting aneurysm of the extracranial carotid artery has been reported previously. T₁-weighted imaging revealed increased signal intensity in the wall of both internal carotid arteries at the base of the skull where the vessels enter the canal of the petrous bone, the location of a dissecting aneurysm demonstrated by angiography.⁸⁾ A vertebral artery dissection confirmed by angiography appeared on both T₁- and T₂-weighted SE sequences as a patent but narrowed vertebral lumen surrounded by increased intensity structures.⁶⁾ Iwama *et al.*³⁾ reported the MR appearance of three dissecting and two fusiform aneurysms in the vertebrobasilar system. No abnormalities, except dilatation of a signal-void area corresponding to the arterial blood flow, occurred on images of the fusiform aneurysms. However, the dissecting aneurysms demonstrated a double lumen, an intimal flap, an intramural hematoma, and a hematoma adjacent to the artery on both T₁- and T₂-weighted images.

In our study, T₁-weighted MR imaging 4 weeks after the ictus demonstrated a high-velocity signal-void sign consistent with a patent but narrowed true lumen surrounded by three variable intensity structures at the abnormality location identified by vertebral angiography. Dynamic MR imaging showed the signal intensity of the three structures on the T₁-weighted image increased markedly and

homogeneously. This indicated that the right vertebral artery lesion was not a subacute or chronic intramural hematoma nor a flow-related enhancement. We suggest that this appearance is consistent with the false lumen of a dissecting aneurysm. The hyper-, relatively hyper-, and relatively hypointensity signals corresponded to the blood flow rate.

MR imaging, especially dynamic imaging, is one of the most helpful methods for detecting intracranial dissecting aneurysms. Dynamic MR imaging is more sensitive than routine T₁-weighted imaging in identifying the false lumen of a dissecting aneurysm.

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Address reprint requests to: J. Hamada, M.D., Department of Cerebrovascular Surgery, National Cardiovascular Center, 5-7-1 Fujishirodai, Suita, Osaka 565, Japan.