Giant Fusiform Basilar Artery Aneurysm Causing Obstructive Hydrocephalus

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ABSTRACT

A 58-year-old man presented with a sudden onset gait disturbance and urinary incontinence. Magnetic resonance (MR) imaging and MR angiography showed a fusiform basilar artery aneurysm, 2 cm in diameter and 5 cm long. The aneurysm was thrombosed except the ectatic basilar artery flowing through it. Compression of the cerebrospinal fluid (CSF) pathways caused obstructive hydrocephalus with resultant transependymal CSF leakage. Conventional angiography missed the aneurysm. A one-sided ventriculoperitoneal shunt was placed to treat the patient's hydrocephalus. The patient's symptoms improved after surgery. MR imaging and MR angiography were useful noninvasive methods of detecting the aneurysm, defining its relationship with surrounding structures, and determining the cause of the hydrocephalus.

KEYWORDS: Aneurysm, basilar artery, hydrocephalus, MR angiography

Giant fusiform aneurysms are uncommon but most frequently involve the supraclinoid segment of internal carotid artery and M₁ segment of middle cerebral artery.¹ Atherosclerosis plays an important role in their etiology.² Giant fusiform aneurysms of the basilar artery are even more rare.

Hydrocephalus caused by an ectatic basilar artery was first described in 1954.³ In such cases, hydrocephalus is produced either by compression of

the cerebrospinal fluid (CSF) pathways or by transmission of the ectatic artery pulsations, which exert a water-hammer effect that impedes the outflow of CSF from the lateral ventricles.⁴ Conventional angiography is considered to be the gold standard for imaging an ectatic basilar artery. Nonetheless, this modality is invasive and associated with the risk of missing thrombotic aneurysms when used alone. We report a patient with a giant fusiform basilar artery

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aneurysm that caused obstructive hydrocephalus. The aneurysm was diagnosed by magnetic resonance (MR) imaging and MR angiography, the first report of the latter aiding in such a diagnosis.

CASE REPORT

A 58-year-old man experienced the sudden onset of gait disturbance and urinary incontinence. A neurological examination showed increased deep tendon reflexes and bilateral Hoffman's, clonus, and Babinski signs. Cerebellar function was impaired and ataxia was present. Computed tomography (CT) showed a contrast-enhancing suprasellar mass protruding into the third ventricle (Fig. 1A). Magnetic resonance (MR) imaging and MR angiography showed a fusiform basilar artery aneurysm, 2 cm in diameter and 5 cm long (Figs. 1 B–E). The aneurysm surrounding the basilar artery was thrombosed, except for the flow through the ectatic portion of the basilar artery. The medulla oblongata, pons, and mesencephalon were deformed by compression from the aneurysm. Compression of the brainstem and mesencephalon caused stenosis of the fourth ventricle and aqueduct, which was most severe in the latter. The aneurysm also compressed the posterior portion of the floor of the third ventricle. The mass effect of the aneurysm caused obstructive hydrocephalus of the supratentorial ventricles, with resultant transependymal CSF leakage related to an

increase in intraventricular pressure. Conventional angiography (Fig. 1F) revealed only slight ectasia of the basilar artery and the aneurysm was not visible. MR angiography showed that the aneurysm was thrombosed with a lumen that allowed normal bloodflow. On conventional angiography, a 2-cm incidental saccular aneurysm of the extracranial left vertebral artery was discovered. The aneurysms were unsuitable for embolization. A one-sided ventriculoperitoneal shunt was placed to treat the hydrocephalus. The patient's symptoms improved after the operation.

DISCUSSION

Giant fusiform aneurysms are defined as marked concentric dilatations of the vessels, 2.5 cm or more in length.¹ They are often seen in more than one artery, and the basilar artery is rarely involved. Intracranial aneurysms related to atherosclerotic vessel disease are encountered either as a slight fusiform dilatation of a single vessel or as a giant dolichoectatic aneurysm that is mostly thrombosed.² The latter type lacks a definable neck, and fusiform aneurysmal dilatation surrounds the affected vessel. We believe that our patient's aneurysm was this type and that it formed as a result of atherosclerotic changes in the vessel wall. In addition to atherosclerosis, giant fusiform aneurysms have also been associated with Marfan's syndrome and various vessel wall infections.¹

Figure 1 Giant fusiform aneurysm of the basilar artery. (A) Contrast-enhanced axial CT scan shows a suprasellar hyperdense mass protruding into the third ventricle. (B) TSE T2-weighted axial MR shows the partially thrombosed basilar artery aneurysm in the interpeduncular cistern. (C) TSE FLAIR T2-weighted coronal MR shows the fusiform aneurysm of the basilar artery, supratentorial obstructive hydrocephalus, and transependymal CSF leakage. (D) 3D time of flight MR angiography MIP reconstruction shows a slightly ectatic basilar artery (arrows) surrounded by thrombus (curved arrows), which is less intense than the portion of the artery with normal blood flow. The aneurysm is 5 cm long. (E) Curved coronal reformation obtained using source images of 3D time of flight MR angiography shows the whole length of the aneurysm. The thrombus is brought to the same imaging plane by drawing a curve throughout the aneurysm. The aneurysm terminates immediately before the basilar bifurcation. (F) Digital subtraction angiogram is normal except for the slight ectasia of the basilar artery (arrow). An incidental saccular aneurysm is noted in the extracranial segment of left vertebral artery (curved arrow).

Aneurysms larger than 2.5 cm in diameter are defined as giant aneurysms.⁵ They constitute about 5% of all aneurysms, and only a few are located in the basilar artery. They usually act as space-occupying lesions and can lead to obstructive hydrocephalus by compressing CSF pathways.⁵⁻⁹ Giant aneurysms sometimes protrude into the third ventricle, presenting as a third ventricular mass.^{6,7,9} Most giant aneurysms are saccular.¹ Our patient's aneurysm differs from most other giant aneurysms by being fusiform. His CT findings suggested a third ventricular mass; this finding may justify the inclusion of aneurysms in the differential diagnosis of third ventricular masses.

In our patient, supratentorial hydrocephalus was caused by mechanical obstruction of the CSF pathways at the level of the fourth ventricle and aqueduct. Compression of the posterior portion of third ventricular floor probably also contributed to the hydrocephalus. The presence of hydrocephalus and periventricular CSF leakage explain our patient's clinical findings, which regressed after shunting.

Although conventional angiography is the method of choice in diagnosing aneurysms, it has limitations. First, it is invasive. Especially in the posterior fossa, where invasive surgical treatment is less often considered, less invasive diagnostic methods may be preferred. In conventional angiography, only the patent lumen is visualized; thus, the thrombosed lumen and the aneurysm may be missed. Catheter angiography in our patient was normal except for the slight ectasia of the basilar artery. The aneurysm was detected only by MR angiography, which revealed the fusiform thrombosed aneurysm surrounding the patent lumen of the basilar artery. Source images of the MR angiography, as well as maximum intensity projection (MIP) and curved coronal reconstructions, helped demonstrate the aneurysm and the thrombus. In conclusion, MR imaging and MR angiography are useful noninvasive methods for detecting these aneurysms, for defining their relationship with surrounding structures, and for determining the cause of hydrocephalus.

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Commentary

The authors describe a patient with acute hydrocephalus caused by the compressive effects of a giant fusiform basilar artery aneurysm. Hydrocephalus was caused by compression of the aqueduct of Sylvius and the fourth ventricle. The patient's symptoms and signs improved after shunting.

Although fusiform aneurysms of the dolichoectatic basilar artery are relatively common, the patient's presentation is unusual. It is also unusual that the patient had no brain stem findings. It is well known that a catheter arteriogram may not show the true size of an aneurysm. In this case, however, the procedure did not even hint at the existence of the fusiform aneurysm. Although MRI and MRA gave an accurate picture of this lesion, a catheter angiogram is still needed to evaluate these