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MRI in aqueduct compression and obstructive hydrocephalus due to an ectatic basilar artery

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Abstract. We describe a patient with an ectatic basilar artery in whom MRI showed marked indentation of the floor of the third ventricle and backward displacement of the midbrain, probably causing aqueduct stenosis. It appeared likely that the associated hydrocephalus was due not only to any "water-hammer" effect, but also to occlusion of the aqueduct.

Key words: Ectasia – Basilar artery – Obstructive hydrocephalus – Aqueduct compression

Ectasia of the basilar artery can be an incidental finding or can cause neurological disturbances due to compression of the cranial nerves and brain stem, to ischaemia or rarely to haemorrhage, and by causing hydrocephalus. MRI can contribute to an understanding of the pathophysiology.

Case report

A 58-year-old man was referred with a 1-year history of lack of initiative, problems with memory and unsteadiness of gait. He also mentioned two nocturnal episodes of bifrontal headache and vomiting. His blood pressure was 160/100 mm Hg. He appeared depressed but examination was otherwise normal, except for his mental status: digit span forwards was 5, and he showed decreased verbal initiative and difficulty in recalling recent events.

Cranial MRI was then performed, at 1.5 T, with spin echo T1- (620/10 ms) and T2- (2600/31,90 ms) weighted images, reconstructed in a 256 × 192 matrix, and volume phase-contrast angio-MRI (25/8.7 ms, 20°). This revealed an S-shaped ectatic basilar artery, about 11 mm in diameter at the level of the pons. The artery originated on the left, then ran upwards and to the right causing marked compression of the pons and midbrain. A short final horizontal segment indented the tuber cinereum and separated the third ventricle into two compartments (Fig. 1). A narrow communication between the two compartments could be detected in the coronal plane (Fig. 2). There was moderate dilatation of the lateral ventricles. Flow void was absent in the upper aqueduct on both T1- and T2-weighted images, probably due to severe distortion of the right cerebral peduncle (Figs. 1 and 3).

The intraluminal signal was hypointense on T1 and hyperintense on T2 weighting, probably due to slow, turbulent flow. No intraluminal blood clot was seen [1]. The patients mood and memory improved with antidepressant treatment. His condition remained stable over 6 months of follow-up.

Discussion

The association of basilar artery ectasia with hydrocephalus was first demonstrated by Greitz and Löfstedt in 1954 [2] and subsequently reported by several authors [3–11].

Two theories as to why hydrocephalus may accompany an ectatic basilar artery have been proposed: impairment of outward CSF flow from the foramen of Monro, caused by the dilated artery pulsating against the third ventricle, producing a "water-hammer" effect [3, 4, 12] and true obstructive hydrocephalus [4, 7, 13].

In the literature, obstructive hydrocephalus is invariably attributed to compression of the third ventricle or foramen of Monro, shown by pneumoencephalography, angiography or CT; it has also been stated that posterior third ventricular obstruction could simulate aqueduct compression [10].

In a recent MRI study, two cases of dolichoectatic basilar artery associated with ventricular enlargement were reported, but a "water-hammer" effect was the only proposed explanation [14].

MRI in our patient showed indentation of the floor of the third ventricle. However, there was also marked compression of the right cerebral peduncle and flow void was absent in the upper aqueduct, suggesting aqueduct compression, a finding not previously reported, to our knowledge.

Aqueduct stenosis could explain obstructive hydrocephalus; direct pressure measurements or intraventricular contrast medium would be necessary to prove this hypothesis, but these invasive procedures were clinically unjustifiable.

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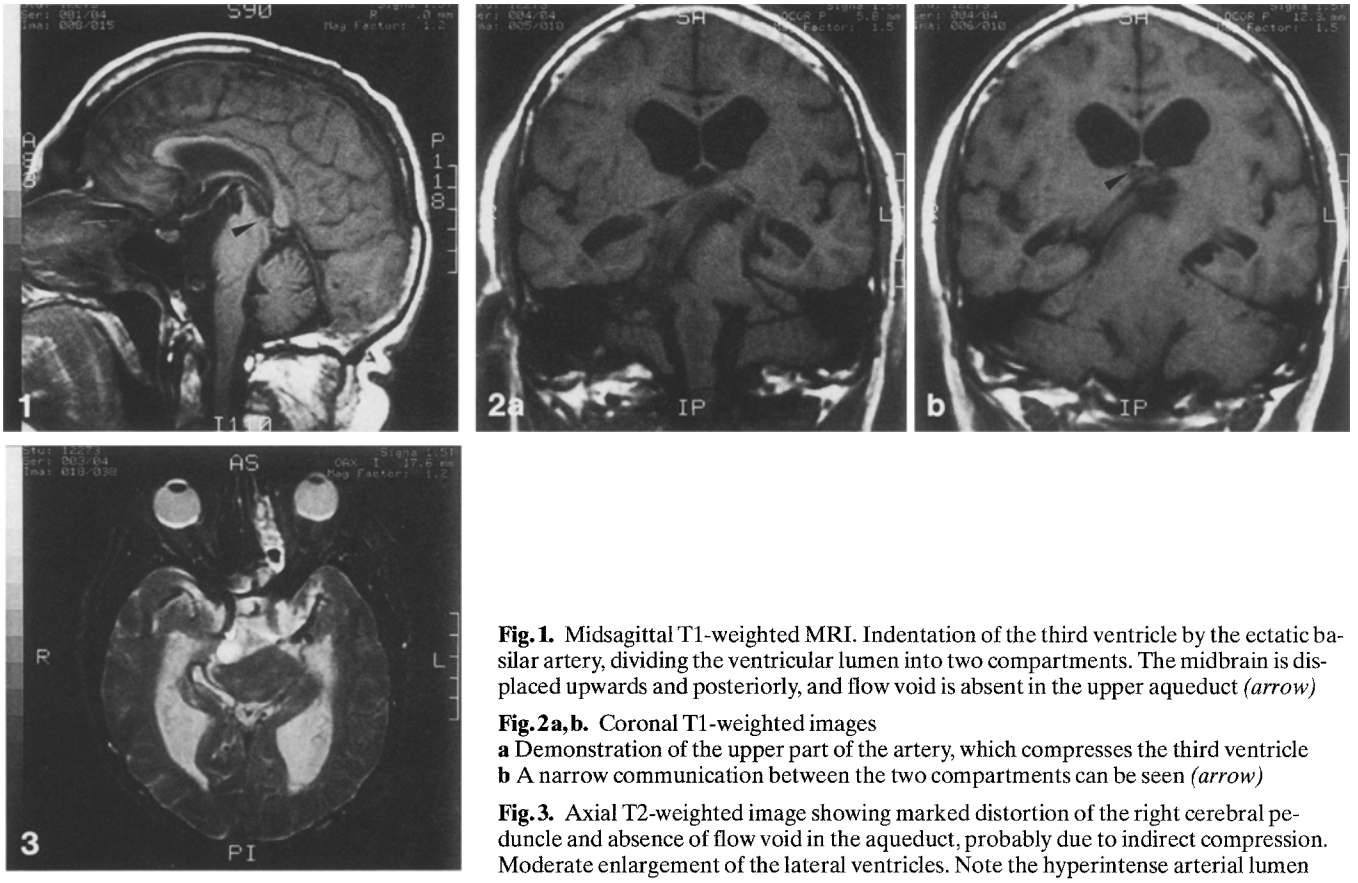

Fig. 1. Midsagittal T1-weighted MRI. Indentation of the third ventricle by the ectatic basilar artery, dividing the ventricular lumen into two compartments. The midbrain is displaced upwards and posteriorly, and flow void is absent in the upper aqueduct *(arrow)*

Fig. 2a, b. Coronal T1-weighted images
a Demonstration of the upper part of the artery, which compresses the third ventricle
b A narrow communication between the two compartments can be seen *(arrow)*

Fig. 3. Axial T2-weighted image showing marked distortion of the right cerebral peduncle and absence of flow void in the aqueduct, probably due to indirect compression. Moderate enlargement of the lateral ventricles. Note the hyperintense arterial lumen

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