

Multinodular and Vacuolating Neuronal Tumor Initially Misdiagnosed as Acute Cerebral Infarction Presenting With Thunderclap Headache

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Dear Editor,

A 62-year-old previously healthy female was transferred to the emergency room of our hospital from a local clinic, where she had been diagnosed with acute right occipital infarct presenting with thunderclap headache. Two days before admission she had experienced the first-and-worst splitting headache with transient visual dimness. The pain had its climax at onset (10/10 on a numeric rating scale) and was distributed throughout the head, and its severity subsequently waxed and waned. On the day of symptom onset she presented to the local hospital and underwent brain magnetic resonance imaging (MRI) and magnetic resonance angiography (MRA) using a 1.5-tesla scanner. T2-weighted images, fluid-attenuated inversion-recovery (FLAIR) images, and diffusion-weighted images (DWI) revealed small subcortical high-intensity lesions in the juxtacortical area of the right occipital lobe. However, there was no definite signal change on the apparent diffusion coefficient (ADC) map or T1-weighted image, and no significant arterial stenosis in head and neck MRA. The patient was thus diagnosed with acute-to-subacute infarct involving the right posterior cerebral artery territory, and was treated with oral aspirin at 100 mg/day and atorvastatin at 40 mg/day. The headache was treated with naproxen at 1,000 mg/day and acetaminophen at 1,950 mg/day. At our hospital she underwent carotid duplex ultrasonography, transcranial doppler ultrasonography, transthoracic echocardiography, and 24-hour Holter monitoring. All of these investigations produced unremarkable findings, and the patient's symptoms completely resolved during her admission at our hospital.

One year later the patient underwent follow-up contrast-enhanced MRI and MRA using a 3-tesla scanner. The T2-weighted and FLAIR images showed clustered high-intensity multinodular lesions at the previously confirmed location. The lesions were not enhanced by gadolinium. When the images were reviewed retrospectively, this characteristic multinodular, bubble-like lesion pattern was recognized to be definite on the previous and follow-up T2-weighted images. The size of the lesion was judged to have not changed over the 1-year interval, which typically corresponds to a multinodular and vacuolating neuronal tumor (MVNT) (Fig. 1).

MVNT was first described in 2013,¹ and was included in the 2016 World Health Organization classification of tumors of the central nervous system as a unique cytoarchitectural pattern of gangliocytoma.^{2,3} Before its description, many MVNT cases were initially diagnosed as enlarged perivascular spaces, focal cortical dysplasia, or dysembryoplastic neuroepithelial tumor.^{3,4} MVNT has been reported to have indolent biological behavior and a benign clinical course.³ Most of the cases are asymptomatic, while a few may experience seizure or nonfocal/nonspecific headache.^{4,5} Histologically, MVNT is known to consist of clustered nodules originating from dysplastic and vacuolated ganglion cells.⁶

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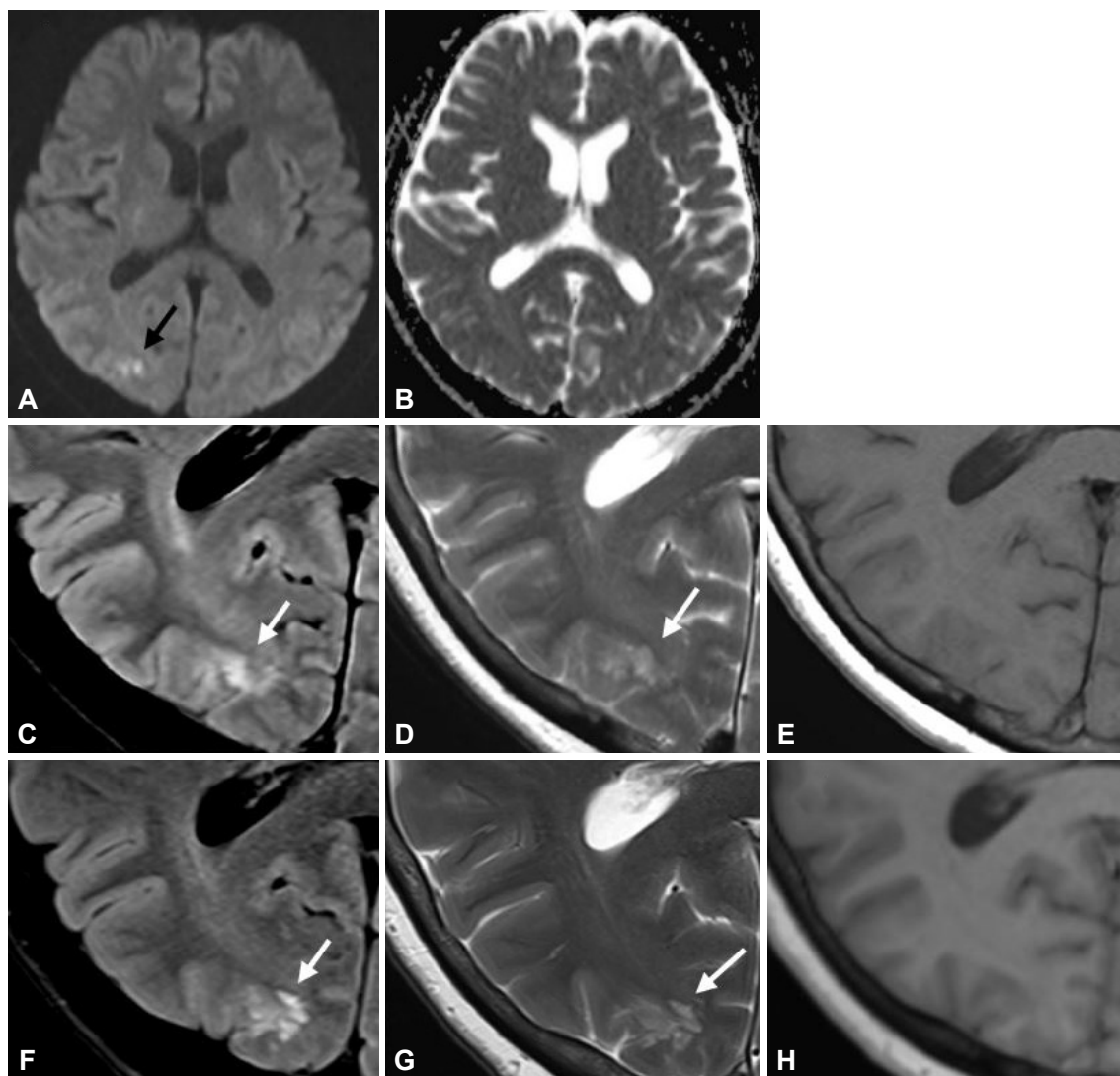


Fig. 1. Patient images. A-H: The first images obtained using MRI (A-E) with a 1.5-tesla scanner (MAGNETOM ESSENZA, Siemens, Erlangen, Germany) revealed a hyperintense right occipital lesion on diffusion-weighted images, FLAIR images, and T2WIs (arrow in A, C, and D; slice thickness/gap: 5 mm/2 mm in A, 5 mm/1 mm in C and D). No remarkable signal change was noted on the apparent diffusion coefficient map or T1WIs (B and E). Follow-up MRI performed using a 3.0-tesla scanner (MAGNETOM SKYRA, Siemens) 1 year later demonstrated no significant change in lesion size (F-H). The FLAIR and T2WIs show more definitely the characteristic lesion pattern of a multinodular and vacuolating neuronal tumor, with clustered nodular bubble-like lesions (arrow in F and G; slice thickness/gap: 4 mm/1 mm). The lesion was not remarkable on a T1WI (H). FLAIR, fluid-attenuated inversion-recovery; MRI, magnetic resonance imaging; WI, weighted image.

Our case has two key implications for clinical practice. First, MVNT can be misdiagnosed as acute or subacute cerebral infarct because the lesions can be hyperintense on DWI and on FLAIR and T2-weighted images. In addition, T1-weighted signal changes can be unremarkable, similar to those for an acute infarct. In particular, brain infarct in the subacute stage could be isointense or present equivocal signal changes on an ADC map despite remaining hyperintense on DWI. Low-resolution MRI might not reveal the typical clustered multiple nodular or bubble-like lesion pattern of MVNT. Therefore, a high degree of suspicion is needed to detect the characteristic

lesion pattern of MVNT, and thus MVNT should be included in the differential diagnosis of cerebral infarct or brain ischemic lesions. Second, our case suggests that MVNT can present with thunderclap headache. Previous reports have described non-specific or nonfocal headache as a symptom of MVNT.^{4,5} To our knowledge, the present case is the first presenting with thunderclap headache. However, the underlying mechanism remains unclear.

Besides headache and visual symptoms, various symptoms have been reported in MVNT cases, including seizure, paresthesia, dysarthria, gaze limitation, vertigo, and cognitive diffi-

culties.^{4,5,7,8} Most such symptoms do not fully localize to the lesion, and so the symptoms might be coincidental.⁷ However, a report suggested that the symptoms could be caused by an immune-mediated response from antibodies produced by the dysplastic cells.⁸

A definite diagnosis of MVNT can be based on pathological confirmation by biopsy. However, there are significant risks with this invasive procedure, and thus surgical resection is usually not recommended except when intractable seizures are definitely linked to the MVNT.⁷ Nearly all MVNT cases have reportedly not changed over many years.⁹ Therefore, follow-up surveillance imaging for the pattern and size of the lesion seems to be sufficient for the diagnosis and management of MVNT.^{7,9}

In conclusion, the present case shows that MVNT can be misdiagnosed as acute ischemic infarct and present with thunderclap headache. A high degree of suspicion for MVNT is required to correctly interpret imaging results for patients with headache.

Ethics Statement

Written informed consent was obtained from the patient for the procedures.

Availability of Data and Material

The datasets generated or analyzed during the study are available from the corresponding author on reasonable request.

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Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

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