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LETTER TO THE EDITORS

Aperiodic alternating nystagmus in isolated vestibular nucleus infarction

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Dear Sirs,

In patients with an acute vestibular syndrome, it is sometimes challenging to make a differential diagnosis between acute peripheral vestibulopathy (APV) and central vestibular disorders [1]. Isolated acute vertigo has been reported in a tiny infarct involving caudal cerebellum [2–5] or vestibular nucleus (VN) [6, 7]. Patients with isolated VN infarction mostly presented with combined clinical features of peripheral and central vestibulopathy [6, 7]. However, aperiodic alternating nystagmus has not been described in isolated VN infarction. We report a patient with isolated VN infarction who initially presented with clinical manifestations of APV, and subsequently developed aperiodic alternating nystagmus.

A 57-year-old previously healthy woman developed acute spontaneous vertigo with nausea and vomiting. On examination, she showed right-beating spontaneous nystagmus (SN) with a torsional component, which was attenuated by visual fixation (Supplemental video 1). A bedside head impulse test was positive on the left side. There was no gaze-evoked nystagmus (GEN) or skew deviation. Direction of SN was not changed during horizontal head oscillation and positional maneuvers. Other neurological examinations were unremarkable. The patient was admitted to the hospital under the clinical impression of APV, but diffusion-weighted magnetic resonance imaging (MRI) demonstrated an acute infarction selectively involving the left VN (Fig. 1a). Video-oculography performed 40 h after symptom onset revealed aperiodic alternating nystagmus with an irregular interval (Fig. 1b, c; Supplemental video 2). Duration (15–75 s) and intensity (maximal slow-phase velocity (mSPV) = 17.3°/s) of right-beating nystagmus were longer and greater than those (2–8 s and mSPV = 3.0°/s) of left-beating nystagmus. A cervical vestibular-evoked myogenic potential test showed decreased amplitudes on the left side (inter-aural amplitude difference ratio of $\leq 17 \pm 14\%$ is normal [8]; Fig. 1c). A mean value of subjective visual vertical was 0.4° (a value of < 2.7° is normal [9]). The patient was treated with antiplatelet agent for several days, and then transferred to the rehabilitation department for further treatment.

Our patient developed aperiodic alternating nystagmus in isolated VN infarction, which has not been previously reported. While periodic alternating nystagmus has been usually described in focal lesions involving the cerebellar nodulus [2–4], aperiodic alternating nystagmus has been mostly reported in peripheral vestibular disorders including Meniere's disease and acute labyrinthitis [10–12]. Recently, two patients with lateral medullary infarction showed aperiodic alternating nystagmus with ipsilesional head-shaking nystagmus, GEN, and normal HITs suggesting that the nodulouvular disinhibition with the partially damaged VN may be a mechanism of aperiodic alternating nystagmus [13]. However, abnormal ipsilesional HITs without head-shaking nystagmus in our patient do not support the assumption.

Alternatively, aperiodic alternating nystagmus in our patient may be ascribed to resting right-beating nystagmus due to underactivity of the neurons in the infarcted VN and episodic reversal of resting nystagmus resulting from pathologic brief bursts of hyperactivity in the damaged neurons. Animal studies demonstrated the excitation of the type I neurons and inhibition of the type II neurons in the medial VN caused by acute hypotension [14].

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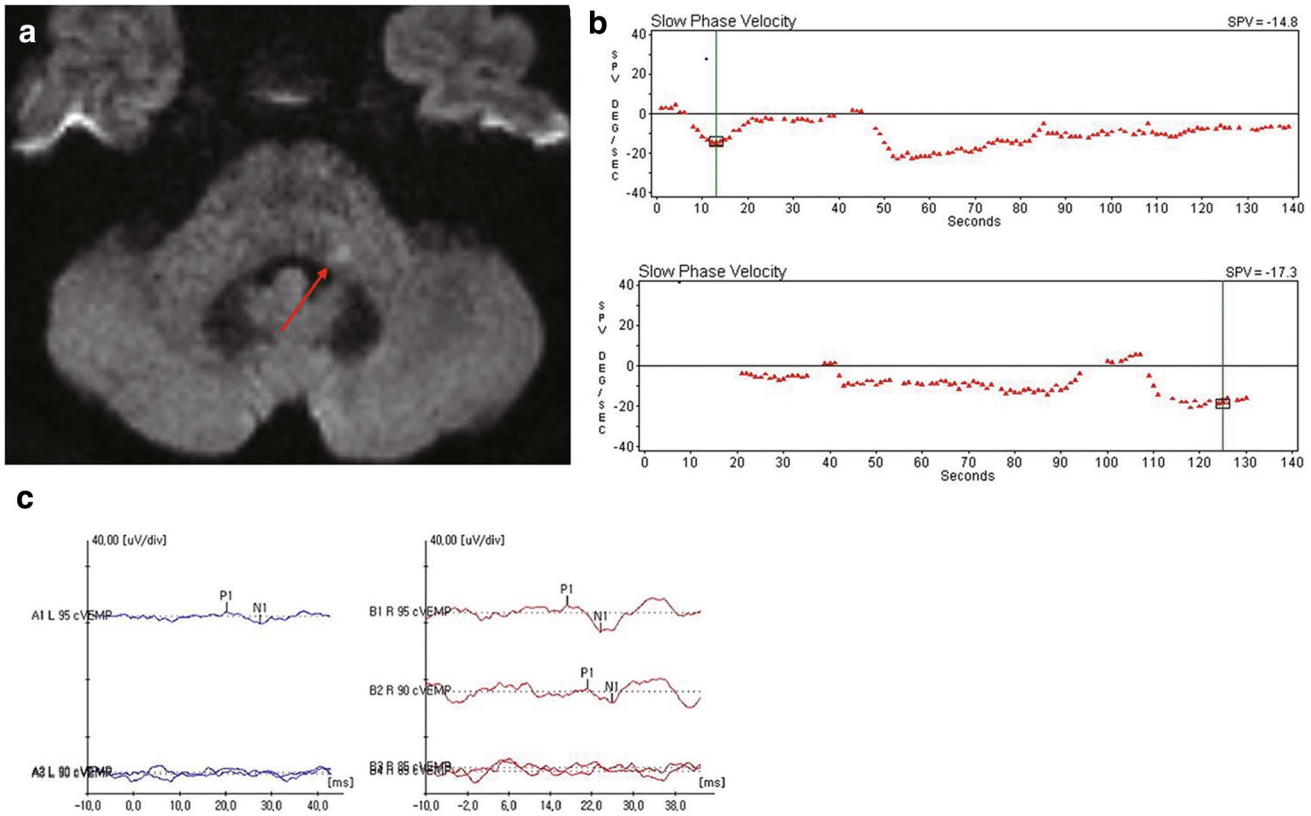

Fig. 1 **a** Diffusion-weighted axial magnetic resonance imaging shows a tiny infarct involving the left vestibular nucleus (red arrow). **b** The plotting of slow-phase velocity of spontaneous nystagmus discloses aperiodic alternating nystagmus comprising predominantly right-beating nystagmus with episodic reversal of the nystagmus (note that red dots below the zero line indicate that the slow-phase of nystagmus directs to the left side.). **c** A cervical vestibular-evoked myogenic potentials demonstrate decreased responses on the left side with interaural amplitude difference ratio of 57%

Possibility of isolated VN infarction should be considered as a cause of acute vestibular syndrome, even in patients who show clinical features of APV at the initial presentation.

Compliance with ethical standards

Conflicts of interest We have no disclosure of any competing interest.

Ethical approval for research involving human participants and/or animals All experiments followed the tenets of the Declaration of Helsinki, and this study was approved by the institutional review board.

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