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Pattern of otolith dysfunction in posterior inferior cerebellar artery territory cerebellar infarction

Hyun-Ah Kim [a], Hyung Lee [a,b,*], Hyon-Ah Yi [a,b], Seong-Ryong Lee [b], Se-Youp Lee [c], Robert W. Baloh [d,e]

[a] Department of Neurology, Keimyung University School of Medicine, Daegu, South Korea
[b] Department of Brain Research Institute, Keimyung University School of Medicine, Daegu, South Korea
[c] Department of Ophthalmology, Keimyung University School of Medicine, Daegu, South Korea
[d] Department of Neurology, UCLA School of Medicine, Los Angeles, CA, USA
[e] Division of Surgery (Head and Neck), UCLA School of Medicine, Los Angeles, CA, USA

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ABSTRACT

Objectives: To document otolith dysfunction in patients with posterior inferior cerebellar artery (PICA) territory cerebellar infarction.
Methods: From March to October 2006, 14 consecutive patients with PICA territory cerebellar infarctions (brainstem spared) diagnosed by brain MRI from the acute stroke registry at the Keimyung University Dongsan Medical Center were enrolled within 12 days of onset (mean 4.0 days). Otolith function tests included ocular torsion (OT), skew deviation, and subjective visual vertical (SVV) were performed. The extent of the cerebellar infarction was determined by previously validated MR anatomical templates.
Results: All patients had an abnormal posture as a result of otolithic dysfunction. Eleven patients (79%) had at least one otolith-related test abnormality: abnormal tilt of SVV (79%), abnormal OT (29%), or skew deviation (21%). Two common patterns of otolith dysfunction were identified based on whether or not the nodulus was infarcted: 1) ipsilesional SVV tilt (mean 5.0° at binocular viewing) without accompanying abnormal OT or skew deviation (nodulus spared); 2) contralesional SVV tilt (mean 11.3° at binocular viewing) with concomitant abnormal OT and skew deviation (nodulus infarcted). Patients with type 1 infarcts (i.e., nodulus spared) fell toward the side of lesion while patients with type 2 infarcts (i.e., nodulus infracted) fell toward the opposite side.
Conclusion: Isolated PICA territory cerebellar infarction usually produces two distinct patterns of otolith dysfunction — Ipsilesional SVV tilt and falling without accompanying OT or skew deviation if the nodulus is spared and contralesional SVV tilt and falling with OT and skew deviation if nodulus is infarcted.

1. Introduction

Acute ischemic stroke in the distribution of the posterior inferior cerebellar artery (PICA) is known to be associated with vertigo, vomiting, nystagmus, and body lateropulsion. Previous reports [1–11] of isolated PICA territory cerebellar infarction have mostly focused on the pseudo-vestibular neuritis syndrome. Cerebellar ischemic stroke can mimic acute peripheral vestibulopathy [1–11].

The ocular tilt reaction (OTR), a sensitive clinical sign of a vestibular tone imbalance in the roll plane, is an eye–head postural reaction consisting of ipsilateral head and neck tilt, skew deviation, and ocular torsion (OT). OTR indicates either a unilateral peripheral vestibular deficit (inner ear or vestibular nerve) [12] or a unilateral lesion of brainstem pathways from the vestibular nuclei to the interstitial nucleus of Cajal in the rostral midbrain [13,14]. Brainstem lesion caudal to the vestibular nucleus in the medulla and peripheral vestibular lesion cause ipsiversive signs of OTR whereas lesion rostral to the pontine level affecting the interstitial nucleus of Cajal cause contraversive signs of OTR [13,14]. Of these components, the tilts of the perceived SVV are the most frequent [15]. Because it is well-known that Purkinje cells in the vestibulo-cerebellum with nodulus have strong connections to otolith-related neurons in the vestibular nucleus [16,17], it is reasonably assumed that cerebellar lesion also might be related to OTR or its component. Some prior reports have described the otolith dysfunction in patients with cerebellar lesions [10,11,18–20]. However, most were case reports [18–20], or did not focused on the patients with isolated PICA territory cerebellar infarction [10,11]. Until now, there has been no systematic study of a consecutive series of patients with PICA cerebellar infarction. Thus, we sought to assess the frequency, the characteristic patterns of otolith dysfunction associated with PICA territory cerebellar infarction, and to determine the crucial site that determines the direction of otolith dysfunction in PICA territory infarction.

* Corresponding author. Department of Neurology, Keimyung University School of Medicine, 194 Dongsan dong, Daegu, 700-712 South Korea. Tel.: +82 53 250 7835; fax: +82 53 250 7840.
E-mail address: hlee@dsmc.or.kr (H. Lee).

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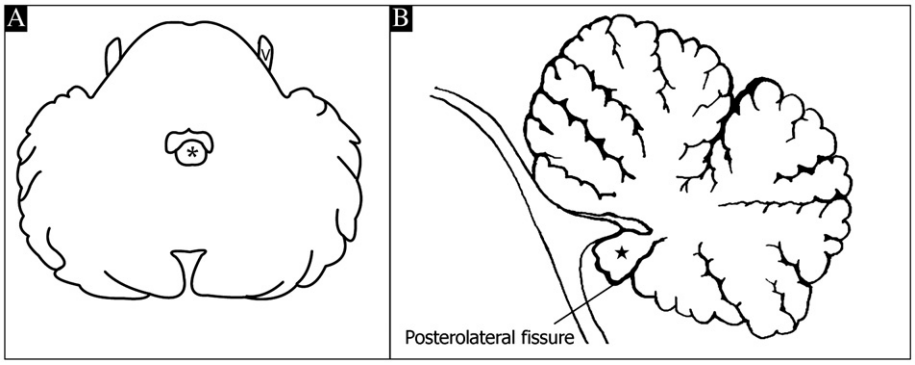

Fig. 1. The anatomic drawing of the nodulus. A. Based on bi-commissural plane passing through the center of the anterior and posterior commissures, the nodulus (*) is localized to the caudal vermis just dorsal to the 4th ventricle at the section of the mid-pontine level. Note that the trigeminal nerve (V) is visualized at this level. B. On the mid-sagittal section, the nodulus (★) is localized to the area just caudal to the 4th ventricle.

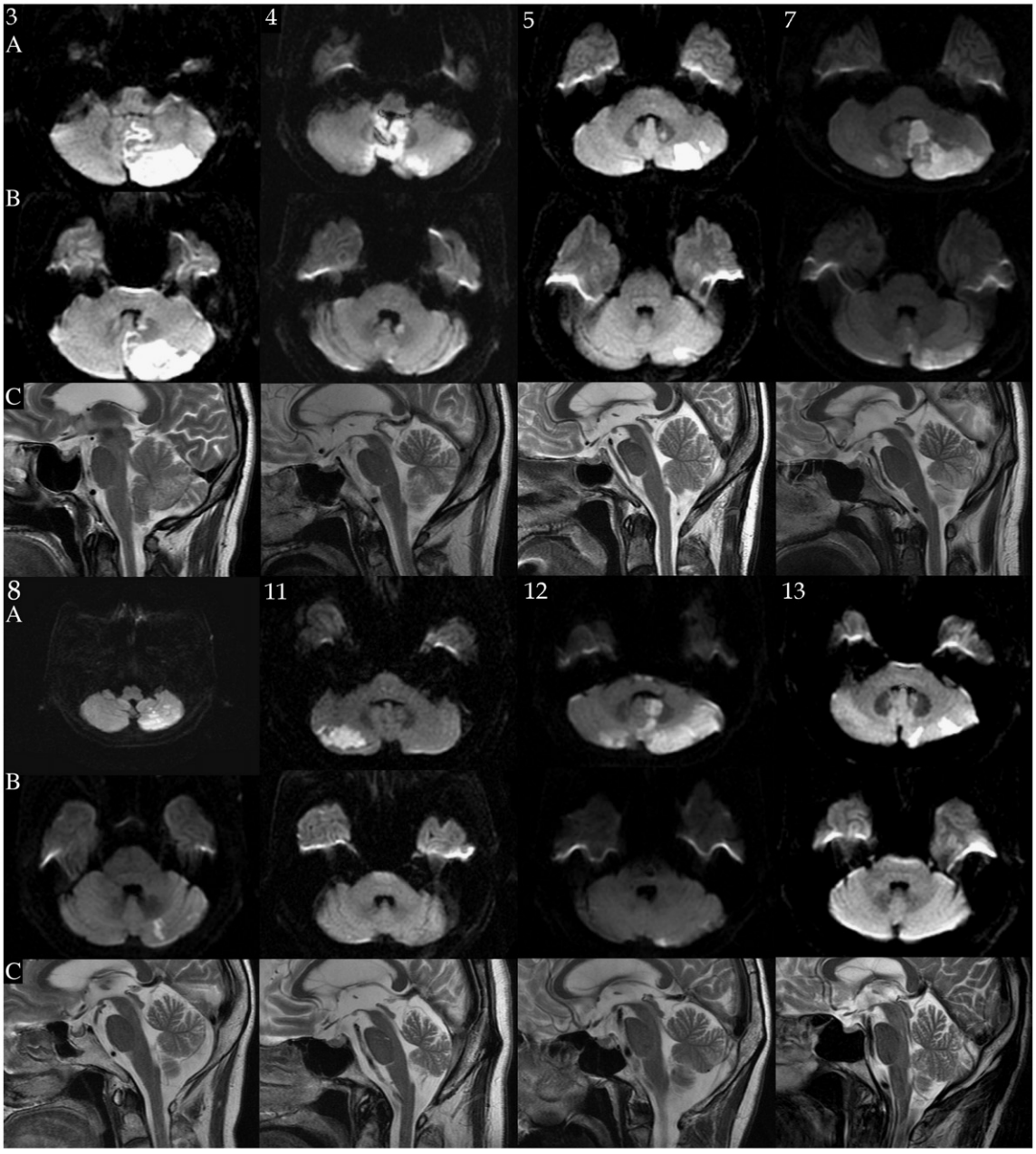

Fig. 2. MRI findings in patients with ipsilesional SVV tilt without concomitant OT or skew deviation. Axial diffusion-weighted (A) MRI of the brain showed acute infarcts in the caudal cerebellum in the territory of the PICA. Axial diffusion-weighted brain MRI image (B) at the level of mid-pontine section, and mid-sagittal T2-weighted brain MRI images (C) showed that the nodulus was spared. The numbers on the figure correspond with the patients numbers assigned in Table 1. SVV: subjective visual vertical, OT: ocular torsion.