Migraine-like Symptoms and Transient Occipital Hemodynamic Change Associated with Bilateral Vertebral Artery Dissections

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Abstract

A 47-year old man showed recurrent headache attacks associated with fortification spectrum on left visual field, which were different from his past episodes as migraine without aura. He eventually developed left cerebellar ataxia and dysarthria. Brain MRI disclosed multiple acute cerebellar infarcts, and angiography indicated arterial dissection in the bilateral vertebral arteries. Single photon emission computed tomography (SPECT) using $^{123}$I-isopropyl-p-iodoamphetamine ($^{123}$I-IMP) displayed focal hypoperfusion in the right occipital cortex, in which no infarction was noted on MRI. His headache and fortification spectrum disappeared by several days after anti-thrombotic treatment. The right occipital hypoperfusion was recovered on follow-up $^{123}$I-IMP-SPECT, indicating transient hemodynamic change within the lesion. The present observation suggests an association with migrainous aura and occipital hypoperfusion, which might result from bilateral VADs. Arterial dissections should be considered in patients with migraine, when migrainous symptoms are different from previously appeared ones.

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Key words: migraine, aura, vertebral artery dissection, hypoperfusion, ischemic stroke

Introduction

Cervical artery dissections, such as carotid and vertebral arterial dissections, cause ischemic stroke at high frequency as well as headache and/or neck pain. Bilateral arterial dissections are relatively rare, but are more frequent in the vertebral arteries than in the carotid arteries, based on the previous analysis. Ischemic stroke associated with arterial dissections is believed to reflect either artery to artery embolism from the site of dissection or hypoperfusion due to arterial narrowing. Migraine is reportedly more frequent in patients with cervical artery dissections, and the disorder is also a risk factor for cervical artery dissection. The authors described a patient with bilateral vertebral artery dissections (VADs), who developed migraine-like symptoms followed by multiple acute ischemic stroke in the cerebellum. In this paper, migraine-like symptoms and transient occipital hemodynamic change associated with bilateral VADs are discussed.

Case Report

A 47-year old man had complained of daily headache with nausea, dizziness and left-side mild numbness persisting several hours, following a fortification spectrum with less than one hour duration on left visual field, although he had been suffered from migraine without aura during his adolescence. A physician in previous hospital prescribed sumatriptan, a 5-hydroxytryptamine 1B/1D agonist, for his headache, after confirming negative findings on routine magnetic resonance imaging (MRI) of the brain. However
the medication did not relieve him of the symptoms, and he discontinued to take it. He consulted to our hospital about his headache and posterior neck pain occurred several days before consultation, and the second MRI evaluation, including MR angiography (MRA), was planned because of unremarkable neurological examination and negative findings on the previous MRI. Several days after the second MRI study, he was admitted to our hospital because of dysarthria, which happened one month after the onset of initial symptoms. Neurological examinations revealed cerebellar ataxia predominantly in the left lower extremity as well as dysarthria. Routine blood and cerebrospinal fluid examinations were unremarkable except for elevated plasma D-dimer level (1.1 μg/ml). Emergent brain MRI on admission demonstrated multiple acute brain infarcts in the bilateral cerebellum on diffusion weighted images (Fig. 1-A) and severe flow signal reduction in the bilateral vertebral arteries on MRA (Fig. 1-B, C), although the second MRI disclosed negative findings except for the bilateral vertebral artery stenosis. Angiography showed "string sign" of the bilateral vertebral arteries (Fig. 2-A, B), and the clinical diagnosis of VADs was made. Single photon emission computed tomography (SPECT) using 123I-N-isopropyl-p-iodoamphetamine (123I-IMP) on admission displayed focal hypoperfusion in the right occipital cortex, in which no infarction was noted on MRI (Fig. 3-A, B). He was treated with sodium ozagrel, edaravone and glycerol, followed by oral aspirin and warfarin pottassium. His headache and fortification spectrum disappeared several days after admission and his score of modified Rankin Scale on discharge was grade-1. He had not complained of the migrane-like symptoms thereafter, and the right occipital hypoperfusion was recovered on follow-up 123I-IMP-SPECT (Fig. 3-C). The bilateral vertebral artery stenosis remained unchanged on the follow-up MRA (Fig. 1-D, E).

![Fig. 1. MR imaging and MR angiography.](image)

Axial diffusion weighted MR images on admission show multiple acute lesions in the bilateral cerebellum (A). MR angiography indicates reduced flow signal (arrow) in the bilateral vertebral arteries on admission (B, C), which remains unchanged on the follow-up examination (D, E).
Discussion

The migraine-ischemia relationship has been recognized in the context of the migrainous pathophysiology. Potential mechanisms of migrainous infarction (ischemic stroke occurring during migraine) include vasospasm, hypercoagulability, and vascular changes related to cortical spreading depression. In the present case, pseudo-lumen has not been demonstrated on either MRI/MRA or angiography, despite the string sign of the bilateral vertebral arteries. Previous literature demonstrated vasospasm related to migrainous infarction improved within several days\(^7\). Thus vasospasm was not likely for the pathogenesis of the present case, since the bilateral vertebral artery stenosis remained unchanged in a series of repeated MRA. The sudden-onset repeated neurologic symptoms associated with posterior neck pain in the case indicated VADs rather than atherosclerotic stenosis.

The present patient showed recurrent headache attacks associated with aura-like episodes, which were different from his past episodes as migraine without aura. Ferrari, et al reported that different symptoms from previously appeared ones might suggest secondary headache in migraine patients\(^8\). According to the international classification of headache disorders 2nd edition (ICHD-II)\(^9\), his present symptoms did not fulfill the criteria of migraine, because his headache persisted several hours. In contrast, the transient visual field loss with “lightning bolts”, improving within one hour, was not different from aura of migraine. Focal hypoperfusion in the occipital cortex may be causative for fortification spectrum of migraine\(^11\). Olesen, et al. described focal hypoperfusion as referred to “spreading oligemia” during aura of migraine, and suggested similarity between spreading oligemia and spreading depression\(^10\). Furthermore spreading depression is also reportedly involved in the pathogenesis of migraine without aura\(^12\). The transient hypoperfusion without any visible infarcts in the right occipital cortex in the present case might reflect “oligemia” like condition, since the area corresponded to the fortification spectrum in left visual field. In addition, hemodynamic change due to the bilateral VADs might explain the right occipital hypoperfusion on admission, because the repeated symptoms, including fortification spectrum and numbness, always occurred in the left side. The disappearance of aura-like symptoms and the recovery of hypoperfusion after antithrombotic treatment might also support the influence of hemodynamic change due to dissections.

The present observation suggests an association with migrainous aura and occipital hypoperfusion, which might result from bilateral VADs. Physicians should pay attention to stroke, especially to arterial
Fig. 3. Cerebral blood flow images on acute and chronic phases.
Axial FLAIR images display no ischemic lesions in the right occipital cortex on admission (A). Axial $^{123}$I-IMP-SPECT images disclose focal hypoperfusion in the right occipital cortex (arrow) on admission (B). Follow-up $^{123}$I-IMP-SPECT examination reveals improvement of the right occipital “oligemia” observed on admission (C).

Dissections, in patients with migraine, when migrainous symptoms are different from previously appeared ones.

References
両側椎骨動脈解離による一過性後頭葉血流低下に伴い片頭痛様症状を呈した脳梗塞の一例

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症例は 47 歳男性。既往症の前兆を伴わない片頭痛とは異なる性状である左視野閾値暗点様発作を前兆とする頭痛に引き続き、左小脳症状と構音障害が出現した。脳 MRI で両側小脳に多発性の急性期脳梗塞を認め、血管造影検査では両側椎骨動脈解離が示唆された。脳血流 SPECT では、MRI で異常所見を認めない右後頭葉皮質の血流低下を認めた。抗血栓療法施行後には頭痛と閾値暗点様症状は消失した。その後の脳血流 SPECT では右後頭葉の血流改善を認めたことから、同領域における一過性の血行力学的変化が示唆された。これらにより、おそらく両側椎骨動脈解離によると思われる後頭葉血流の低下と片頭痛前兆様の発作との関連が示唆された。片頭痛患者において、従来の片頭痛の性状とは異なる頭痛発作の場合には、動脈解離なども考慮する必要があると考えられた。

キーワード: 片頭痛, 前兆, 椎骨動脈解離, 血流低下, 虚血性脳血管障害