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BRAIN & DEVELOPMENT Official Journal of the Japanese Society of Child Neurology

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Reversible cerebral vasoconstriction syndrome manifesting as focal seizures without a thunderclap headache: A pediatric case report

Case Report

Brain & Development xxx (2016) xxx-xxx

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Received 29 January 2016; received in revised form 30 March 2016; accepted 12 April 2016

Abstract

We report a pediatric case of reversible cerebral vasoconstriction syndrome with focal seizures without a thunderclap headache. A 7-year-old girl had a mild acute headache with nausea after swimming. She subsequently developed hemi-convulsions followed by right hemiplegia. Brain magnetic resonance angiography revealed generalized vasoconstriction of the main cerebral peripheral arteries. Her hemiplegia was spontaneously resolved within 6 h. Over the next 24 h she suffered from recurrent and transient headaches, which recurred on days 3 and 5. Follow-up magnetic resonance angiography on day 3 documented the multifocal narrowing of the main cerebral arteries, which was observed to have diminished at 12 weeks after her initial presentation. She did not have any headaches or neurological deficits after day 5. This case indicates that reversible cerebral vasoconstriction syndrome should be considered in children with focal seizures even when they do not present with thunderclap headaches. The timely and appropriate evaluation by magnetic resonance angiography and imaging is essential for diagnosing reversible cerebral vasoconstriction syndrome. © 2016 The Japanese Society of Child Neurology. Published by Elsevier B.V. All rights reserved.

Keywords: Reversible cerebral vasoconstriction syndrome; Focal seizure; Hemiplegia

1. Introduction

Reversible cerebral vasoconstriction syndrome (RCVS) is a clinical and radiographic syndrome that is characterized by thunderclap headache due to reversible cerebral vasoconstriction. In adulthood, the prevalence of RCVS increases with aging; the mean age of the RCVS patients in the literature is 42–43 years (range: 4 months–65 years) [1–4]. The syndrome rarely affects infants or children [5–11] (Table 1). RCVS is diagnosed based on the observation of multifocal

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narrowing of the cerebral arteries on cerebrovascular imaging; this usually diminishes within 12 weeks after the onset of symptoms. We herein report a pediatric case of RCVS in a patient with focal seizures without thunderclap headache, which was probably triggered by the physical stress of swimming.

2. Case report

A 7-year-old girl suffered an acute mild headache and nausea after undergoing extensive physical stress from 2-h of swimming. She subsequently experienced a hemi-convulsion which spontaneously resolved within 5 min. She was transferred to our hospital after experiencing another hemi-convulsion followed by rightsided hemiplegia, which spontaneously resolved within

http://dx.doi.org/10.1016/j.braindev.2016.04.006

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3	gers	TCH	Clinical symptom	BP	Underlying disease	Migraine patient/family	Brain bleeding
13 M [5] Dee	p diving	YES	Vomiting Photophobia	N.D.	None	NO/YES	NO
10 M [6] Nas	al spray	YES	Vomiting	130/92	None	NO/YES	NO
16 M [6] Def	ecation	YES	None	152/87	None	NO/N.D.	NO
10 M [6] Hea	vd banging	YES	Phonophobia	Normal	None	NO/N.D.	NO
15 M [7] Hyr	bertension	YES	Photophobia Phonophobia	210/140	None	NO/N.D.	NO
12 M [8] Elet	riptan	YES	Paralysis of lower extremities	N.D.	None	NO/YES	YES SAH
7 F [9] Cyc	losporine	YES	Blurred lower right vision	150/100	Aplastic anemia	NO/N.D.	YES IPH
13 M [10] Swii	mming Sumatriptan	YES	None	N.D.	None	YES/NO	NO
9 M [11] Sub	clavian artery dissection	YES	Vomiting/seizure visual disturbance	154/101	LDS	N.D./N.D.	YES SAH
7 F (this case) Swi:	mming	NO	Vomiting	Normal	None	NO/YES	NO

count, electrolytes, liver and renal function tests) and cerebrospinal fluid examination revealed no abnormalities, and immunological analysis in serum were all negative such as rheumatoid factor, or anti-nuclear. anti-cardiolipin and anti-neutrophil-cytoplasmic antibodies. Electroencephalography demonstrated low amplitude of background activity in the left hemisphere without apparent paroxysmal discharges. Brain magnetic resonance imaging (MRI) revealed several trivial ischemic lesions, none of those seemed to be responsible for the patient's right-sided hemiplegia. The abnormal findings by DWI were almost correlated to FLAIR signals and showed a relationship with the clinical symptoms. The constant modality of MRI applied was 1.5T every time in the serial studies. Brain magnetic resonance angiography (MRA) revealed generalized vasoconstriction of the left cerebral arteries (Fig. 1). She had recurrent headaches that spontaneously resolved three times within the 5 days after the first attack. An MRA study on day 3 revealed multifocal and tapered narrowing of the main cerebral arteries and abnormal dilated segments of the peripheral arteries. The generalized vasoconstriction of the left cerebral arteries was not apparent at this time (Fig. 2A). On day 6, she was neurologically intact and was discharged from our hospital. An MRA study at 12 weeks after this episode showed no cerebral vasoconstriction or ischemic changes in the brain (Fig. 2B), and the abnormal signals in FLAIR almost disappeared at 12 weeks after the onset. She was doing well without any neurologic deficits or seizures.

6 h. On admission, a blood analysis (complete-blood-

3. Discussion

The present case highlights two important clinical issues. First, children with RCVS might present with focal seizures without a thunderclap headache. Second, an MRA study is especially important for making a proper diagnosis of RCVS.

According to the recent review articles [1-4], thunderclap headache occurs in almost all patients with RCVS. For this reason, it is considered to be a key symptom for the diagnosis of RCVS. RCVS is usually triggered by specific conditions or events, including pregnancy, orgasm, acute stressful or emotional situations, bathing, physical exertion, or the intake of vasoactive drugs. Generalized convulsions are less common at the time of presentation [1-4]; it is estimated that convulsion is caused by ischemia in the motor cortex due to decreased blood flow, which is caused by a spasm of the cerebral arteries. Although the present case did not present with a thunderclap headache, serial MRI and MRA studies demonstrated findings characteristic to RCVS. About 30-70% of patients with RCVS initially showed no abnormal findings by brain imaging soon after the

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Fig. 1. Magnetic resonance angiography (MRA) of the brain on day 1 showing left predominantly generalized vasoconstriction of the cerebral arteries (A). A fluid-attenuated inversion recovery (FLAIR) image of the brain on day 1 reveals a restricted high signal area (arrow) of in the left parietal cortex and hyper-intense regions (arrow heads) in both of the frontal–occipital lobes (B).



Fig. 2. (A) MRA of the brain on day 3 shows multifocal stenosis in the proximal internal arteries, middle and posterior cerebral arteries (arrows). (B) Repeat MRA 12 weeks after the onset of symptoms shows the normalization of the multifocal stenosis.

presence of clinical symptoms. Nevertheless, the MRA examination would be essentially to detect spasms of the cerebral arteries, which are specific findings to RCVS [1–4]. Sporadic signals of small ischemic changes and the white matter of the cerebral cortex are also characteristic, but are not specific, to RCVS. We therefore assume that substantial numbers of pediatric RCVS might be under-recognized. We emphasize the importance of repeated MRA examinations for suspected cases for the diagnosis of RCVS.

There is no established therapy for RCVS. Most patients make a full recovery with time; however, rare cases may develop a progressive clinical course. It is therefore important to care for the patients for the first few days after the onset of symptom. Calcium channel blockers, brief courses of glucocorticoids, magnesium sulfate, serotonin antagonists, and dantrolene are indicated to relieve the vasoconstriction in the acute phase [1–4]. An early diagnosis is therefore crucial to the care of patients, as it allows for the administration of disease-specific treatment and minimizes the risk of complications and sequelae. Avoiding the risk factors for attacks is also important for the patients.

The principal differential diagnosis of RCVS without thunderclap headache includes 5 types of diseases: epilepsy with hemiparesis (also called Todd's paralysis), hemiplegic migraine, reversible posterior leukoencephalopathy syndrome (RPLS), moyamoya disease, and childhood primary angiitis of the central nervous system (cPACNS). Todd's paralysis mimics the clinical symptom of RCVS with hemiplegia after seizure. We speculate that transient postictal hypoperfusion due to a reduction in the cerebral blood flow might underlay the same pathophysiology in both diseases [12]. Todd's paralysis follows a transient course within several hours, whereas RCVS is typically complicated with recurrent headaches within a few days. Sequential follow-up MRA is crucial to detect characteristic abnormalities, such as narrowing of the cerebral arteries and reversibility of abnormal vascular findings. Second, hemiplegic migraine is caused by spreading depression of cortical neurons that results in motor aura, such as unilateral muscle weakness, and is occasionally accompanied by seizure. The diagnosis of hemiplegic migraine is based on the clinical symptoms that are defined in the International Classification of Headache Disorders, 3rd edition [13]. Taking past medical and family history into

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consideration and performing follow-up MRA are essential to distinguish hemiplegic migraine from RCVS. Third, brain MRI of RPLS patients typically shows symmetrical white matter edema in the posterior cerebral hemispheres, suggesting a similar underlying pathophysiological mechanism to RCVS, whereas RPLS is usually caused by hypertension [1]. Fourth, moyamoya disease is one of the most important diseases to be distinguished from pediatric RCVS with hemiparesis. Vascular imaging (e.g., MRA) of movamova disease is highly specific. Nevertheless, all pediatricians should remember that avoiding hyperventilation or hyper-exercise is extremely important to prevent further deterioration. Finally, one of the angiographic differential diagnoses of RCVS is childhood PACNS (cPACNS) that have many overlap clinical symptoms, such as headache, seizures, and focal deficits. The diagnosis of cPACNS is usually straightforward according to the clinical course and laboratory data. Patients with cPACNS show typically subacute to chronic disease, insidious and progressive course, with pleocytosis and protein elevation in the CSF, and irreversible neurovascular abnormalities, whereas patients with RCVS demonstrate sudden onset, with normal or near-normal CSF analysis, and reversible neurovascular abnormalities. From the histopathological point of view, elective brain biopsy samples might aid in the definitive diagnosis, although the clinical indications would be reasonably limited [14].

In summary, we presented the case of a pediatric patient who was diagnosed with RCVS. At the onset of symptoms, the patient experienced generalized focal seizures without a thunderclap headache. The incidence of RCVS may be under-recognized in children who only present with generalized focal seizures with transient palsy. MRA and MRI studies that focus on the signs of this syndrome are indispensable for its diagnosis, and early intervention and prophylactic management are important for the long-term prognosis of pediatric patients with RCVS.

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