

Case Report

Transient posterior cerebral arteriopathy: An unusual case enterovirus-related

Benedetta Piccolo^{a,*}, Marina Barsacchi^b, Francesca Greco^b, Davide Cerasti^c
Francesca Ormitti^c, Francesco Pisani^{a,b}

^a Child Neuropsychiatry Unit, Mother and Child Department, University-Hospital of Parma, Parma, Italy

^b Child Neuropsychiatry Unit, Medicine and Surgery Department, University of Parma, Parma, Italy

^c Neuroradiology, Diagnostic Department, University-Hospital of Parma, Parma, Italy

Received 18 May 2018; received in revised form 28 August 2018; accepted 4 September 2018

Abstract

Transient Cerebral Arteriopathy (TCA) is one of the main causes of childhood stroke. Here we present an unusual case of Arterial Ischemic Stroke (AIS) caused by a TCA of posterior flow and originally located in the right thalamus. The detection of enterovirus in the cerebrospinal fluid allowed us to suppose a probable post infectious etiology. The course of symptoms was self-limited and the child had a complete clinical recovery after five days. A new ischemic lesion on the antero-inferior paravermian region of the left cerebellum was revealed by a following brain Magnetic Resonance Imaging (MRI) three months later and these findings were reported by further brain MRI control performed after 15 months. Comparing follow up Magnetic Resonance Angiography (MRA) with previous High Resolution Vessel Wall Magnetic Resonance Imaging (HRMI), we found a vessel narrowing at the level of the Posterior Inferior Cerebellar Artery that might explain the arteriopathy process. In conclusion, clinical and radiological course allow us to speculate that this multifocal cerebral arteriopathy might be a transient lesion due to enterovirus infection. To our knowledge, there are only three articles describing TCA enterovirus-related, and brain MRA was performed in only one case; in addition, no one with the involvement of the posterior circulation.

© 2018 The Japanese Society of Child Neurology. Published by Elsevier B.V. All rights reserved.

Keywords: Transient Cerebral Arteriopathy; Posterior circulation; Enterovirus; Thalamic stroke; Cerebellar stroke

1. Introduction

Childhood Arterial Ischemic Stroke (AIS) has incidence of 1.7–3 cases per 100,000 children per year [1]. About half of them are caused by an arteriopathy, of which one third shows an underlying Focal Cerebral Arteriopathy (FCA) [2]. Transient Cerebral Arteriopa-

thy (TCA) is a non-progressive, often reversible and unilateral arteriopathy that involves the distal part of internal carotid artery and the initial segments of the anterior and/or middle cerebral artery, resulting in basal ganglia and internal capsule infarction. Some cases of TCA can involve the posterior cerebral artery [3]. The course of TCA is dynamic, sometimes with initial worsening of stenosis, followed by stabilization or improvement in the longer term, increasingly considered an inflammatory arteriopathy, most likely triggered by infection in predisposed children [2,4].

* Corresponding author at: U.O. di Neuropsichiatria Infantile, Dipartimento Materno-Infantile, Azienda Ospedaliero-Universitaria di Parma, Via Gramsci 14, 43126 Parma (PR), Italy.

E-mail address: bpiccolo@ao.pr.it (B. Piccolo).

Here we present an unusual case of posterior circulation stroke enterovirus-related caused by multifocal transient arteriopathy.

2. Case report

A 4-year-old boy was admitted to the hospital for acute gait unsteadiness followed by fall with mild head injury. Few days earlier he had a history of tick-bite in the forehead without rash or erythema chronicum migrans, and some months earlier, he had a hand-foot-mouth disease. On admission, he presented hyperaemic pharynx, mucus discharge, a mild left peripheral facial nerve palsy, the balance was unsteady and the gait was pulling to the left side with the head slightly tilted on the same side. A brain MRI, performed 5 days later, revealed hyperintense T2/FLAIR signal within the right thalamus anterior nuclei and restricted diffusion by cytotoxic oedema in the same region (Fig. 1A–B). Moderate enhancement on the left geniculate tract and in mastoid area was also noted. Unfortunately, at first, MRA has not been added. The first supposed diagnosis was a stroke vasculitis-related, probably due to a *Borrelia burgdorferi* infection. A diagnostic work-up was performed including full blood count, haemoglobin, glucose, electrolytes, iron profile, sickle-cell screening, kidney and liver function tests, serum proteins electrophoresis and screening for acquired and hereditary prothrombotic conditions and for autoimmune vasculitis. Vascular risk factors of stroke were also excluded through electrocardiogram and echocardiogram, transcranial and the supra-aortic vessels doppler ultrasound study. No increase in the count of white blood cells in the liquor was found. Assessment for infections was performed on serum and cerebrospinal fluid, including *Borrelia burgdorferi*, *Enterovirus*, *Epstein-Barr virus*, *Varicella zoster virus*, *Cytomegalovirus*, *Herpes simplex virus 1* and *2*, *human Herpes virus 6*, *Parvovirus B19*, *Toxoplasma gondii*. The serology resulted positive on

serum and liquor for *Enterovirus*, CSF culture for enterovirus unfortunately was not further classified and quantified. All symptoms disappeared four days after the admission. We can speculate that the enteroviral infection could be recent and it could be started from mouth and/or upper respiratory tract. The final diagnosis was an AIS probably caused by a TCA associated to the enterovirus and a treatment with Acetylsalicylic Acid (5 mg/kg once a day), according to the Italian guidelines for acute paediatric stroke, was started. Three months later, a brain MRI showed a further limited chronic infarction/ischemic lesion on the left hemispheric cerebellum in addition to the known thalamic lesion (Fig. 2A–B). In the acute phase left V4 tract of vertebral artery and Posterior Inferior Cerebellar Artery was normal in both 3D Maximum Intensity Projection algorithm and post contrast High-Resolution Magnetic Resonance Imaging images (Fig. 2C–E). In the follow-up on coronal 3D reformatted TOF MRA, there was a luminal narrowing of V4 and also of V3 and V2 segment (Fig. 2D, F–G). Although at first MRA was not performed, perforating branches of tuberothalamic artery would have not been analyzed because of limited exam sensitivity. The same unchanged findings were reported 15 months later.

3. Discussion

We describe a boy with an acute focal ischemia of the posterior circulation, followed by a silent second lesion, in the same vascular territory, few months later. A positive liquor and serum serology for *Enterovirus* and a self-limited course of signs and symptoms were suggestive of a monophasic enterovirus infective/inflammatory process of the central nervous system. We hypothesized that the enterovirus caused a transient multifocal arteriopathy of the right tuberothalamic artery and then has migrated, through the vertebral and the posterior inferior cerebellar arteries, to the cerebellum. The lack of progression at the last follow-up imaging was compatible with a diagnosis of a TCA.

To our knowledge, there are only three papers describing TCA enterovirus-related, and MRA was performed in only one case [5–7], but without involvement of the posterior circulation.

Arteriopathy is the main cause of childhood stroke and includes primary angiitis and secondary vasculitis which can be transient or progressive. The diagnosis requires that angiography performed within 3 months of the acute stroke demonstrates unilateral segmental stenosis or occlusion involving the distal carotid artery, the A1 segment of the anterior cerebral artery, or the M1 segment of the middle cerebral artery. A further imaging after 6 months must confirm a lack of progression of the arteriopathy [8]. Only in 15–22% of childhood AIS the posterior circulation is involved [1].

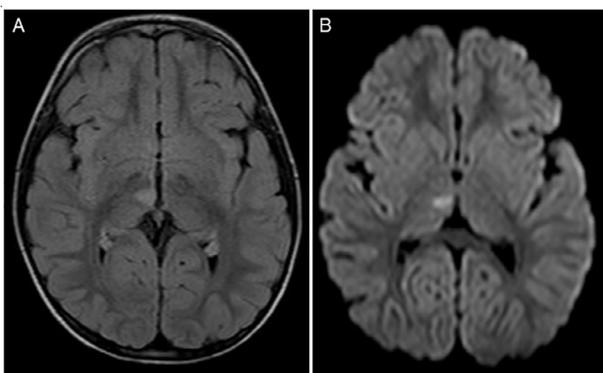


Fig. 1. (A) (Axial FLAIR) MRI demonstrate an acute infarction, as increased signal intensity, within the right thalamus; (B) DWI (b1000) shows restricted motion of water as high signal intensity.

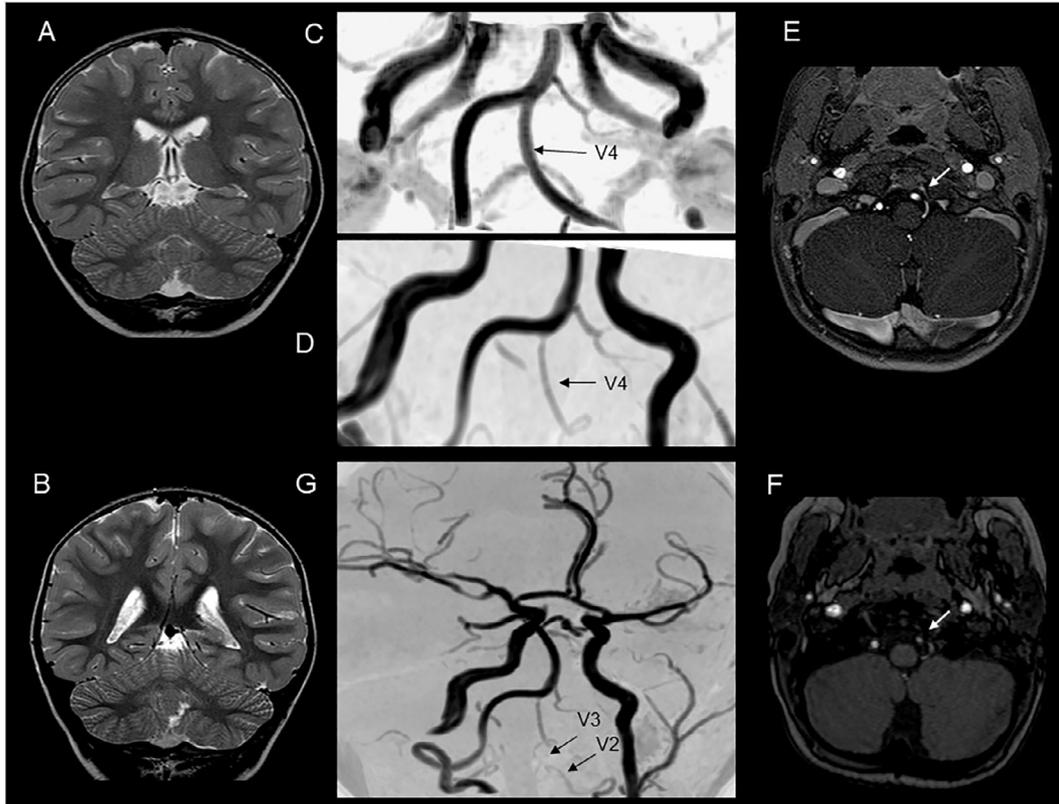


Fig. 2. (Coronal T2-weighted image) in the acute phase, (A) cerebellum is completely normal however a following MRI (three months later); (B) demonstrate a further chronic infarct in the left antero-inferior paravermian region. In the acute phase left V4 and PICA are normal in both MIP, (C) and axial post-contrast HRMR, (E) images. In the follow-up on coronal 3D reformatted TOF MRA, (D) and axial partition, (F) there is a luminal narrowing of V4 segment and, (G) of V3–V2 (arrows).

Tuberothalamic infarction appeared to be more frequently localized on the left side and a right tuberothalamic infarction might produce subtle clinical symptoms that could be ignored [9] as in our patient. He presented evocative symptoms of cerebellar pathology at the onset, even though cerebellar ischemic involvement appeared later. Infection has been implicated as an etiology of focal cerebral arteriopathy of childhood and a common inflammatory lesion of the arterial wall is the presumed underlying mechanism hypothesized [4], as suggested by the angiographic findings [5]. The inflammation may produce a vessel focal stenosis or segmental narrowing that increases only within the first few months, with a typical monophasic course [4].

Our child has had a history of hand-mouth-foot disease and the enterovirus persistence in specific cell types is described but there are no data that suggest a possibly reactivation of enterovirus in liquor [10]. Furthermore, the International Pediatric Stroke Study has described that recent upper respiratory infections could be the main predictor of arteriopathies in childhood [4], as in our case.

In conclusion, our case represents a transient focal cerebral arteriopathy of the posterior circulation likely due to an enterovirus infection.

References

- [1] Carey S, Wrogemann J, Booth FA, Rafay MF. Epidemiology, clinical presentation, and prognosis of posterior circulation ischemic stroke in children. *Pediatr Neurol* 2017;74:41–50.
- [2] Steinlin M, Bigi S, Stojanovski B, Gajera J, Regényi M, El-Koussy M, et al. Focal cerebral arteriopathy do steroids improve outcome? *Stroke* 2017;48:2375–82.
- [3] Sébire G, Fullerton H, Riou E, deVeber GA. Toward the definition of cerebral arteriopathy of childhood. *Curr Opin Pediatr* 2004;16:617–22.
- [4] Fullerton HJ, Barkovich JA, Glaser C, Glidden D, Hills NK, Leiva-Salinas C, et al. The vascular effects of infection in pediatric stroke (VIPS) study. *J Child Neurol* 2011;26:1101–10.
- [5] Ribai P, Liesnard C, Rodesch G, et al. Transient cerebral arteriopathy in infancy associated with enteroviral infection. *Eur J Paediatr Neurol* 2003;7:735.
- [6] Wakamoto H, Ohya M, Nakano N, Kunisue K. SPECT in focal enterovirus encephalitis: evidence for local cerebral vasculitis. *Pediatr Neurol* 2000;23:429–31.
- [7] Roden VJ, Cantor HE, O'Connor DM, Schmidt RR, Cherry JD. Acute hemiplegia of childhood associated with Coxsackie A9 viral infection. *J Pediatr* 1975;86:56–8.
- [8] Mineyko A, Kirton A. Mechanisms of pediatric cerebral arteriopathy: an inflammatory debate. *Pediatr Neurol* 2013;48:14–23.
- [9] Powell R, Hughes T. A chamber of secrets. The neurology of the thalamus: lessons from acute stroke. *Pract Neurol* 2014;14:440–5.
- [10] Huang H, Shih SR. neurotropic enterovirus infections in the central nervous system. *Viruses* 2015;7:6051–66.