Pediatric Neurology 50 (2014) 518–521

Contents lists available at ScienceDirect

Pediatric Neurology

journal homepage: www.elsevier.com/locate/pnu

Clinical Observations

Posterior Reversible Encephalopathy and Cerebral Vasoconstriction in a Patient With Hemolytic Uremic Syndrome

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ABSTRACT

BACKGROUND: We report a patient with hemolytic uremic syndrome who presented with radiological manifestations suggestive of posterior reversible encephalopathy syndrome and reversible cerebral vasoconstriction syndrome. **PATIENT:** A 13-year-old girl presented with fever and bloody diarrhea and progressed to develop hemolytic uremic syndrome. She subsequently developed encephalopathy, aphasia, and right-sided weakness. **RESULTS:** Brain magnetic resonance imaging showed presence of vasogenic edema in the left frontal lobe, in addition to T2 and fluid-attenuated inversion recovery changes in white matter bilaterally, compatible with posterior reversible encephalopathy syndrome. Magnetic resonance angiography showed beading of the cerebral vessels. Neurological deficits reversed 8 days after symptom onset, with resolution of the beading pattern on follow-up magnetic resonance angiography after 3 weeks, suggesting reversible cerebral vasoconstriction syndrome. **CONCLUSIONS:** Both posterior reversible encephalopathy syndrome and reversible cerebral vasoconstriction syndrome may represent manifestations of similar underlying pathophysiologic mechanisms. Recognition of the co-existence of these processes in patients with hemolytic uremic syndrome may aid in judicious management of these patients and avoidance of inappropriate therapeutic interventions.

Keywords: hemolytic-uremic syndrome, PRES, RCVS, vasospasm

Pediatr Neurol 2014; 50: 518-521

Introduction

Neurological involvement is the most common extrarenal manifestation of hemolytic uremic syndrome (HUS).[1] The clinical presentation in these patients could range from seizures to mental status alteration and focal neurological deficits.[2]

Case Report

A previously healthy 13-year-old right-handed Caucasian girl was admitted to the hospital with a 3-day history of fever, abdominal pain, and bloody diarrhea. During the course of her admission, she developed oliguria, azotemia, thrombocytopenia, and acute renal failure. Laboratory studies revealed escalating creatinine levels (up to 8.3 mg/dL), necessitating initiation of peritoneal dialysis after a week of hospitalization. Soon after initiation of dialysis, she started to have intermittent elevations in her blood pressure, with systolic blood pressure reaching as high as 155 mg Hg (>95th percentile). She had fluctuations in her mental status with periods of agitation and confusion. On day 4 of dialysis, she developed global aphasia, right-sided facial droop, and right hemiparesis. Her blood pressure in the 12 hours before these symptoms was consistently elevated with systolic blood pressure ranging between 148 mm Hg and 188 mg Hg.

A computed tomography of her head revealed a hypodensity in the left frontal region. Magnetic resonance imaging (MRI) of the brain (Fig 1) showed multiple patchy areas of increased T2 and fluid-attenuated inversion recovery signal abnormalities in bilateral frontal and parietal subcortical white matter. The most prominent lesion was seen in the left frontal lobe. There was no diffusion restriction on diffusion-weighted images, but an elevated apparent diffusion coefficient was noted in the lesion. In addition, there were punctate hemorrhagic foci in the left frontal region. Magnetic resonance spectroscopy lacked a lactate or

Article History:
Received November 19, 2013; Accepted in final form January 5, 2014
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0887-8994/$ - see front matter © 2014 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.pediatrneurol.2014.01.024

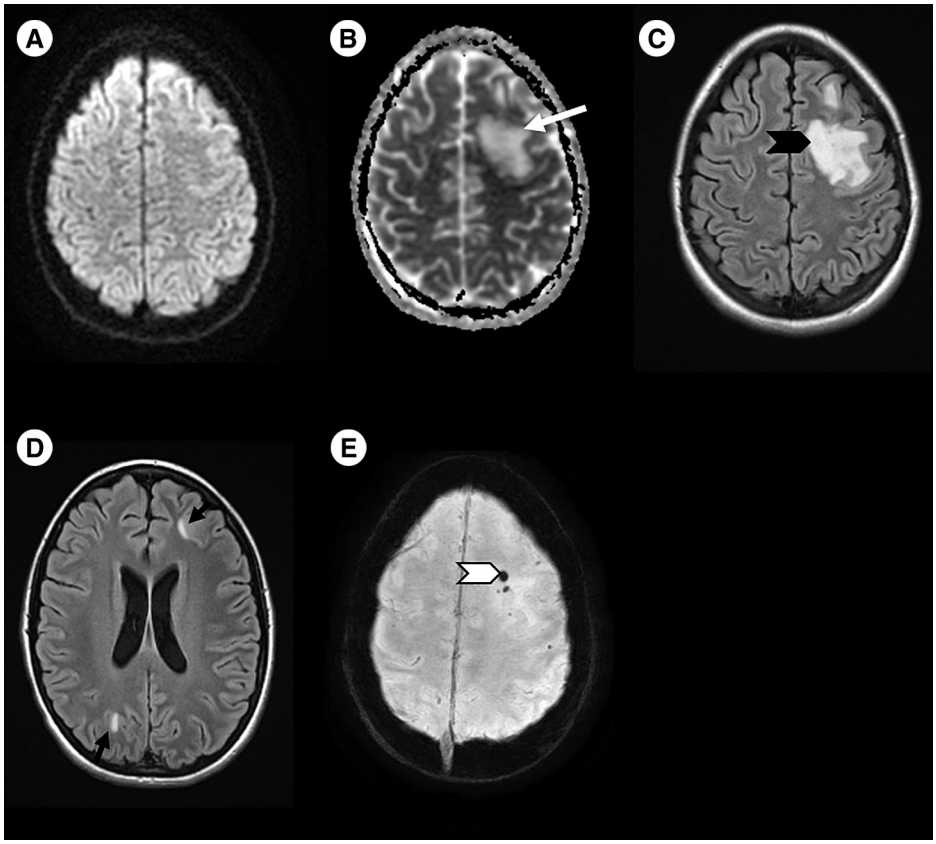

FIGURE 1.
Magnetic resonance imaging of the brain at the onset of right-sided weakness, demonstrating changes suggestive of posterior reversible encephalopathy syndrome. (A) Diffusion-weighted image showing no diffusion restriction. (B) Elevated apparent diffusion coefficient seen in the left frontal region (white arrow). (C) Axial fluid-attenuated inversion recovery image showing large hyperintense region in the left frontal white matter (black arrowhead). (D) Axial fluid-attenuated inversion recovery image showing hyperintensities in the left frontal and right parieto-occipital subcortical regions (black arrows). (E) Susceptibility-weighted images suggestive of petechial hemorrhages in the left frontal lobe (white arrowhead).

choline peak. Magnetic resonance angiography (MRA) showed a smaller than expected caliber of the posterior cerebral arteries. "Beading" was noted in the right posterior cerebral artery and distal branches of right middle cerebral artery (Fig 2). Magnetic resonance venography was normal. Serological tests for HIV, antinuclear antibodies, anti–double-stranded DNA antibodies, cardiolipin antibodies, and anti-neutrophil cytoplasmic antibodies were negative. Complement levels (C3 and C4) were normal. Cerebrospinal fluid studies were unremarkable, including absence of oligoclonal bands.

Hypertension was controlled with nicardipine drip followed by use of oral antihypertensive agents. The radiological abnormalities seen on MRA raised a concern for vasculitis. Hence, she received a course of intravenous immunoglobulin followed by high-dose methylprednisolone. Eight days after she developed hemiparesis, her neurological deficits resolved. Oral prednisone was continued after discharge. Three weeks after the onset of her symptoms, her brain MRI demonstrated marked improvement in the subcortical hyperintensities with no beading or focal narrowing (Fig 3).

Discussion

HUS is characterized by a triad of clinical features consisting of microangiopathic hemolytic anemia, thrombocytopenia, and uremia. The most common cause of HUS in children is infection with verotoxin producing enteric pathogens.[2] Neurological symptoms may be seen in 20% to 50% of patients with HUS.[1] A commonly implicated factor in neurological injury is a direct verotoxin-induced damage to the endothelium.[1] An alternative hypothesis is neuro-inflammation resulting from massive cytokine release by the endothelial cells to which the toxin attaches.[2] There are other metabolic changes such as hyponatremia, azotemia, and fluid imbalance that may complicate the course of HUS and can affect the neural homeostasis directly or indirectly. Hypertension may also be a manifestation of HUS and could lead to disturbances in cerebral autoregulation. All these factors in isolation or in combination can lead to diverse neurological manifestations in a given patient.[2]

Neuroimaging in patients with HUS most frequently reveals involvement of the basal ganglia in the form of edema, infarction or hemorrhage.[3] Other manifestations include cortical edema or infarcts and changes in the white matter consistent with posterior reversible encephalopathy syndrome (PRES).[3-5] The symptomatic lesion in our patient was present in the left frontal lobe. It did not show diffusion restriction, making it unlikely to be cytotoxic edema or infarction. The absence of lactate peak on magnetic resonance spectroscopy and the eventual complete resolution of the lesion on follow-up imaging argue against a thromboembolic or vasculitic infarct. Elevated apparent diffusion coefficient was suggestive of vasogenic edema, which is seen in PRES.[6]