Unilateral Transient Watershed Cerebral Infarct in a 6-year-old Girl with Frequently Relapsing Nephrotic Syndrome

Kapil Bhalla, Deepali Garg, Mahima Rajan, Jaya Shankar Kaushik, Geeta Gathwala
Department of Pediatrics, Pt B D Sharma Postgraduate Institute of Medical Sciences, Rohtak, Haryana, India

Abstract

Nephrotic syndrome is a prothrombotic state with predisposition to venous sinus thrombosis and arterial vascular stroke. Watershed infarcts in junction of arterial territory develop in hypotensive hypovolemic state. These border zone infarcts are usually bilateral in the absence of unilateral arterial stenosis or microembolism. We report a 6-year-girl of frequently relapsing nephrotic syndrome who developed sudden onset hemiparesis with aphasia. Magnetic resonance (MR) imaging brain revealed unilateral watershed infarct in territory between the major cerebral arterial vessels with evidence of restricted diffusion and normal vessel anatomy on MR angiography. This could possibly reflect asymmetric variant of posterior reversible encephalopathy syndrome that resolved with remission on steroids.

Keywords: Nephrotic syndrome, posterior reversible encephalopathy syndrome, watershed infarct

Introduction

Watershed cerebral infarct occurs at border between tissue supplied by anterior cerebral artery (ACA) and middle cerebral artery (MCA) and that between MCA and posterior cerebral artery (PCA). These vascular events are precipitated by hemodynamic impairment that induce hypotension-hypovolemia.[1] Common hypotensive hypovolemic states in children include cardiac arrest, status epilepticus, and cardiac surgery. These watershed zones are prone to reduction in perfusion, especially with systemic hypotension, arterial stenosis, and microemboli.[2] Most of watershed infarcts are bilateral in the absence of arterial stenosis and microembolism. Unilateral watershed infarct in the absence of stenosis is uncommon among children.

Nephrotic syndrome is one of the hypercoagulable states that results from changes in platelet activation and aggregation, impaired fibrinolysis resulting from urinary loss of plasminogen, and hypoalbuminemia-induced increased synthesis of clotting factor.[3] Hence, children with nephrotic syndrome are prone to both venous sinus thrombosis as well as arterial thrombosis. However, unilateral watershed infarcts are uncommon among children with nephrotic syndrome, especially in the absence of hypotensive hypovolemic state and arterial stenosis. We report a case of unilateral watershed infarct in a child with frequently relapsing nephrotic syndrome.

Case Report

A 6-year-girl, known case of frequently relapsing steroid-sensitive nephrotic syndrome, presented with swelling all over the body for 6 days and insidious onset of inability to move right half of the body and inability to speak for 3 days. There were no loss of consciousness and no history suggestive of cranial nerve, sensory, or autonomic involvement. The child had four previous relapses in the past 1 year since onset and was off steroids for 2 months before onset of current illness. Urine output was adequate and there was no history of reddish urine.

On examination, she was conscious, well alert with evidence of facial puffiness, pedal edema, and abdominal distention. Vitals were stable and blood pressure at the time of admission was 130/94 mmHg (>95th centile for age and height). She was conscious, well alert with marked...
reduction in speech output although comprehension was well preserved. She had flaccid hemiparesis with brisk deep tendon reflexes and bilateral extensor plantar response. Sensory system was tested normal. There were no cerebellar or meningeal signs.

Her coagulation profile including prothrombin time and international normalized ratio was within normal range. Her serum creatinine was 0.8 mg/dl. Her urine examination revealed albumin of 3+ with no microscopic pus cells or red blood cells. Cholesterol levels were 340 mg/dl and serum albumin was 2.1 g/dl. Her antinuclear antibody and antiphospholipid antibody levels were normal. Magnetic resonance (MR) imaging brain revealed watershed infarcts in the left cerebral hemisphere with normal cerebral vessels on MR angiography (MRA) [Figure 1]. Carotid Doppler study was normal.

The patient was started on oral steroids along with enalapril with subsequent reduction in blood pressure, swelling, and albuminuria. There was a remarkable improvement in speech output and hemiparesis started improving. At 3-month follow-up, hemiparesis has nearly resolved with remarkable improvement in speech output. Repeat neuroimaging shows complete resolution of lesion.

**DISCUSSION**

The present case highlights the transient unilateral cerebral watershed infarct in a child with relapse of nephrotic syndrome. Thrombotic complications in children with nephrotic syndrome are attributable to hypercoagulable state leading to both venous and arterial stroke. Transient ischemic attacks as initial manifestation of nephrotic syndrome have been reported previously with nephrotic syndrome. Cerebral arterial thrombosis has been reported by many authors in adults with nephrotic syndrome. Pattern of unilateral watershed infarct in junction of arterial territory of ACA/MCA and MCA/PCA along with restricted diffusion and normal MRA is uncommon, especially in context of thrombotic state of nephrotic syndrome. The presence of restricted diffusion often points to underlying pathophysiology of cytotoxic edema. This finding is in contrast to posterior reversible encephalopathy syndrome (PRES) which results in vasogenic edema where restricted diffusion is rare. In a study by Bartynski and Boardman, 73 out of 82 patients did not show any restricted diffusion among patients with PRES. Although, by convention, PRES is bilateral, asymmetric pattern with unilateral involvement has been reported. Holohemispheric watershed infarct pattern is a recognized pattern of PRES characterized by vasogenic edema across the junction of medial and lateral hemispheric cortical branches. This again is in contrast to index case where cytotoxic edema affects the watershed zone between arterial territory of ACA/MCA and MCA/PCA. Moreover, index case showed resolution of symptoms without antithrombotics which could possibly indicate transient vascular event that resolved with relapse of nephrotic syndrome.

The presence of unilateral watershed infarct in the absence of arterial stenosis as observed by normal MRA is uncommon. This can probably be explained by transient prothrombotic state associated with nephrotic syndrome. Although venous and arterial thrombosis has been reported widely among children with nephrotic syndrome. Another postulate of this transient watershed infarction could be hypertension associated with nephrotic syndrome, especially on treatment with antihypertensives. It is well known that such transient cerebral vessel abnormalities among hypertensive patients are clubbed under PRES. Hence, our case could possibly also represent asymmetric watershed infarct variant of PRES with restricted diffusion. However, we acknowledge that digital subtraction angiography was not performed in our case owing to lack of facility which could have possibly detected obstruction at distal cortical branches.

Transient unilateral watershed infarcts in children with prothrombotic state like nephrotic syndrome in clear absence of stenotic lesion or hypoperfusion state are not known.

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**Figure 1:** Magnetic resonance imaging brain T2 fluid-attenuated inversion recovery (a) showing cortical ribbon sign along the border zone between anterior cerebral artery/middle cerebral artery and middle cerebral artery/ posterior cerebral artery territory with diffusion-weighted images (b) and apparent diffusion coefficient map (c) showing restricted diffusion with normal magnetic resonance angiography (d)
among medical literature to the best of our review. Hence, the present case highlights this unique transient radiological abnormality in a child with frequently relapsing nephrotic syndrome. Recognition of this radiological entity may prevent unwarranted use of antithrombotics among such patients with transient vascular phenomena.

Declaration of patient consent
The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest
There are no conflicts of interest.

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