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Clinical Letter

Stroke Following Acute Chest Syndrome in a Child With Sickle Cell Disease: A Possible Novel Mechanism

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Introduction

We present a child with hemoglobin SC-type sickle cell disease (SCD-SC) who developed a large posterior circulation stroke following an episode of acute chest syndrome (ACS). This case demonstrates that large infarcts can occur in sickle cell genotypes typically associated with less severe phenotypes.

Patient Description

This two-year-old male with SCD-SC living in Ghana was admitted for ACS. At discharge, he developed obtundation, left-sided extremity weakness, and difficulty speaking. Head computed tomography demonstrated an infarct involving the left cerebellar hemisphere and vermis with fourth ventricle compression and moderate dilatation of the third and lateral ventricles. He was mechanically ventilated for multiple weeks while undergoing a slow recovery. With time, his speech returned to baseline and his left-sided weakness improved, but he continued to have impaired coordination with an unsteady gait.

Brain magnetic resonance imaging three months after the acute stroke demonstrated encephalomalacia of most of the left cerebellar hemisphere (Fig). Brain magnetic resonance angiography demonstrated small caliber of the left anterior inferior and posterior inferior cerebellar arteries but was otherwise unremarkable. These changes were thought to be secondary to vascular remodeling following initial injury. Neck magnetic resonance angiography demonstrated no evidence of a vertebral artery dissection.

Given the unusually large size and location of his stroke, other causes were investigated. Saline-bubble transthoracic echocardiogram and thrombophilia workup were normal. Computed tomography angiogram of the head and neck confirmed no carotid or vertebral artery dissection or other vasculopathy. With no known risk factors for cerebral infarction, we believe his neurologic injury was likely caused by a previously unreported mechanism for patients recovering from ACS.

Discussion

Pediatric patients with hemoglobin SS-type sickle cell disease are at a high risk for cerebral infarctions. By 18 years old, symptomatic strokes occur with an incidence rate of 11% and typically involve the anterior and middle cerebral arteries.[1,2] Overt strokes often span multiple areas of the brain, most commonly involving frontal and parietal lobes.[3] Current literature regarding stroke in sickle cell disease (SCD) predominantly addresses patients with

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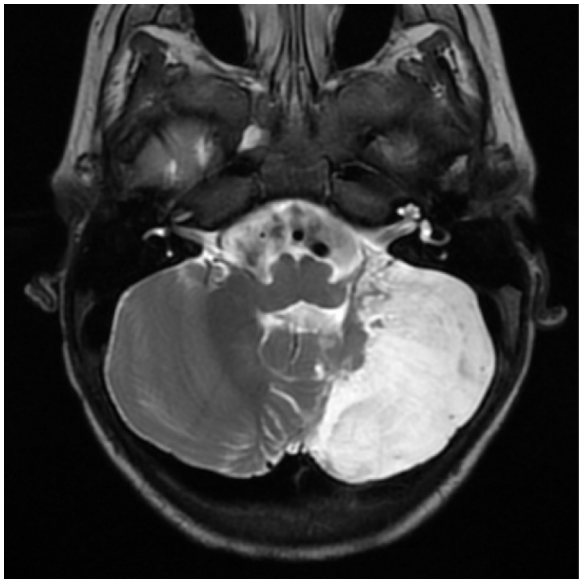

FIGURE 1. Axial T2 image through the posterior fossa demonstrates encephalomalacia of the left cerebellar hemisphere.

SS-type SCD, and stroke guidelines are subsequently based on patients with this genotype.[2]

Central nervous system vasculopathy, a common phenomenon in this population, increases the risk of cerebral infarction.[3] Paradoxical embolization should be considered as a potentially treatable cause, given the increased prevalence of right-to-left shunts in patients with SCD.[3] Neither of these were found in our patient. ACS and fevers are also considered risk factors owing to increased metabolic demands; however, our patient's acute illness had resolved at the time of neurological injury.[2] Given the negative thrombophilia workup and an unremarkable family history, one possible explanation is that pulmonary vascular thromboses formed during ACS and embolized to the brain following resolution of the acute illness. The incidence of pulmonary artery thrombosis in a small cohort of adult patients with ACS was found to be 17%; there have been no similar studies in pediatric patients and no studies evaluating this proposed mechanism of injury.[4]

Limited evidence exists regarding the risk of cerebral infarction in patients with non-SS genotypes. In children with SCD-SC, there have been few case reports describing strokes and only one published case where authors excluded alternative etiologies.[5,6] Infarction in patients with SCD involving areas other than those perfused by the anterior and middle cerebral arteries are also not well reported. There are few prior published cases of posterior circulation strokes in patients with SCD-SC. This patient is remarkable given the patient's genotype, the posterior location of the infarct, and the potential for a new mechanism for stroke in patients with SCD.

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