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Clinical Letter

Cerebral Infarctions in an Infant With COVID-19 Delta Variant Infection and Disseminated Tuberculosis



To The Editor:

The severe acute respiratory syndrome coronavirus 2 pandemic continues to cause significant morbidity and mortality worldwide despite the availability of effective vaccines. The increasing prevalence of the delta variant raises new concerns about potential complications in nonvaccinated populations, including infants and those with preexisting health conditions. We describe a six-month-old infant diagnosed with coronavirus disease 2019 (COVID-19) infection with the delta variant who developed pneumonia, respiratory failure, shock, disseminated intravascular coagulation, and ischemic strokes and ultimately died. Postmortem sputum cultures grew *Mycobacterium tuberculosis*.

In July 2021, a six-month-old infant with unremarkable birth history was brought to the emergency department with four days of worsening cough, congestion, and one day of labored breathing and decreased oral intake. His caregiver endorsed a one-month history of cough, but there was no other known medical history. The infant was bottle fed since birth, and the mother had no prior history of COVID-19 infection or vaccination and denied sick contacts. Upon arrival, the patient was hypotensive, hypothermic, in respiratory distress, and was intubated and admitted to the pediatric intensive care unit. COVID-19 nasal polymerase chain reaction was positive. Chest X-ray showed multifocal pneumonia; laboratory evaluation showed elevated procalcitonin (13.25 ng/mL), ferritin (1691 ng/mL), and D-dimer (7.66 μg/dL); and coagulation parameters were consistent with disseminated intravascular coagulation. Blood, urine cultures, and respiratory viral panel were negative. Respiratory cultures grew *Moraxella catarrhalis*. The patient received broad-spectrum antibiotics, intravenous dexamethasone, and remdesivir. Magnetic resonance imaging of the brain was obtained the day after admission for anisocoria and decreased left-sided movement. Imaging demonstrated a right middle cerebral artery and right posterior cerebral artery territory ischemic stroke, punctate left thalamic ischemic stroke, and proximal occlusion of the right middle cerebral artery and right posterior cerebral artery (Fig). Transthoracic echocardiography did not reveal an intracardiac thrombus. The patient's hospital course was complicated by splenic and renal infarctions, hypotension refractory to multiple pressors, and lactic acidosis. Owing to the ongoing coagulopathy, lumbar puncture, hemicraniectomy, and extracorporeal membrane oxygenation were not performed. Anticoagulation was considered but not given due to the risk of hemorrhagic transformation of

the cerebral infarcts. Owing to continuing hypotension refractory to multiple pressors and multiorgan failure, the patient died on hospital day four despite aggressive medical management.

COVID-19 molecular analysis revealed that the patient was infected with the delta variant. In addition, sputum cultures later grew *M. tuberculosis*, and acid-fast stains were also positive in the lungs, liver, and subarachnoid space postmortem, consistent with disseminated tuberculosis with tuberculous meningitis.

Data published by the International Pediatric Stroke Study has found no population-wide increase in stroke in children from COVID-19,¹ but there are case reports of stroke in children with COVID-19 infection.^{2,3} An asymptomatic COVID-19-positive neonate was reported with acute ischemic thalamocapsular stroke,¹ but a causal relationship was unclear. In adult patients with COVID-19, arterial ischemic infarcts are reported in about 1% of hospitalized cases, with hypertension, obesity, and other comorbidities found to be significant risk factors.⁴ Proposed mechanisms of stroke in COVID-19 include hypercoagulable state and thromboinflammatory response from endothelial cells within cerebral arteries.⁵

Tuberculous meningitis has been associated with cerebral infarction in up to 40% of cases.^{6,7} In addition, there has been one reported case of a toddler who developed cerebral venous sinus thrombosis in the setting of tuberculous meningitis and superimposed COVID-19 infection.⁸ The authors' impression is that this infant with disseminated tuberculosis had rapid progression to cerebral infarctions, pneumonia, and septic shock due to exacerbation of disseminated tuberculosis by superimposed COVID-19 infection; this may be indicative of the predilection toward endothelial damage, coagulopathy, and ischemic stroke of the novel severe acute respiratory syndrome coronavirus 2 delta variant in the non-vaccinated population.

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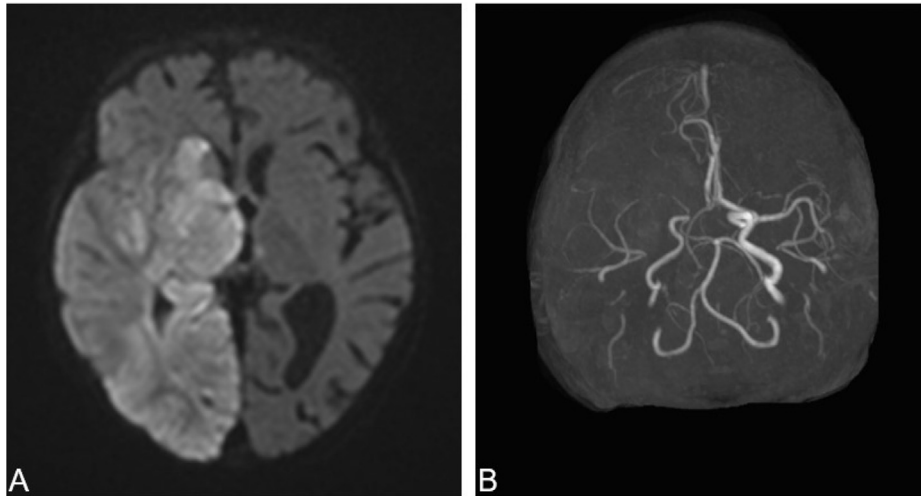


FIGURE. (A) Diffusion-weighted imaging magnetic resonance imaging demonstrating right middle cerebral artery, right posterior cerebral artery, and punctate left thalamic ischemic infarction. (B) Time-of-flight magnetic resonance angiography demonstrating occlusion of the proximal right middle cerebral artery and proximal right posterior cerebral artery.

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Stuart Fraser, MD
Division of Vascular Neurology
Department of Neurology
University of Texas Health Science Center
Houston, Texas
E-mail address: stuart.m.fraser@uth.tmc.edu.

Misti Ellsworth, DO
Norma Perez, DO
Division of Infectious Disease, Department of Pediatrics
University of Texas Health Science Center
Houston, Texas

Hunter Hamilton, MD
Division of Critical Care, Department of Pediatrics
University of Texas Health Science Center
Houston, Texas

Stephen Fletcher, DO
Division of Pediatric Neurosurgery
Department of Pediatric Surgery
University of Texas Health Science Center
Houston, Texas

Deborah Brown, MD
Lakshmi Srivaths, MD
Division of Hematology
Department of Pediatrics
University of Texas Health Science Center
Houston, Texas

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