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To The Editor:
The SARS-CoV-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 non-vaccinated populations, including infants and those with pre-existing health conditions. We report a case of a 6-month-old infant diagnosed with COVID-19 infection with the delta variant, who developed pneumonia, respiratory failure, shock, disseminated intravascular coagulation, ischemic strokes and ultimately died. Post-mortem, sputum cultures grew *Mycobacterium tuberculosis*.

In July 2021, a 6-month-old infant with unremarkable birth history was brought to the emergency department with 4 days of worsening cough, congestion, and 1 day of labored breathing and decreased oral intake. His caregiver endorsed a 1-month history of cough, but there was no other known medical history. The infant was bottle fed since birth, and 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 (13.25ng/mL), ferritin (1,691ng/mL), D-Dimer (7.66ug/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, IV 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 (Figure 1). 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. Due 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. Due to continuing hypotension refractory to multiple pressors and multi-organ failure, the patient died on hospital day 4 despite aggressive medical management.

COVID-19 molecular analysis revealed the patient was infected with the Delta variant. Additionally, sputum cultures later grew *Mycobacterium tuberculosis*, and acid-fast stains were also positive in the lungs, liver, and subarachnoid space post mortem, 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, but there are case reports of stroke in children with COVID-19 infection. 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 co-morbidities found to be significant risk factors\(^4\). Proposed mechanisms of stroke in COVID-19 include hypercoagulable state and thrombo-inflammatory response from endothelial cells within cerebral arteries\(^5\).

Tuberculous meningitis has been associated with cerebral infarction in up to 40% of cases\(^6,7\). Additionally, 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 towards endothelial damage, coagulopathy, and ischemic stroke of the novel SARS-CoV-2 delta variant in the non-vaccinated population.

Figure 1
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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Declaration of interests

☒ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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