

SARS-CoV-2 Infection in a 2-Week-Old Male With Neutropenia

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Introduction

The novel coronavirus, SARS-CoV-2, has caused a global outbreak of coronavirus disease 2019 (COVID-19), which began in Wuhan, Hubei Province, China, in December 2019, and it has rapidly spread to involve 170 countries and regions with 304 528 confirmed cases and 12 973 deaths as of March 21, 2020.¹ The spectrum of clinical presentation is varied and nonspecific in adults ranging from mild flu-like illness to florid respiratory failure including acute respiratory distress syndrome.² Recent data out of China have evaluated the epidemiology of children with COVID-19 and found that children of all ages are affected by the virus and tend to have a milder course of disease compared with adults, though there remains subpopulations of pediatric patients at higher risk for significant disease.^{2–4} Recognition of disease in this patient population remains critical in both management of disease and for quarantine to limit further transmission.

This case report focuses on a 2-week-old male infant who presented to the pediatric emergency department with fever and fussiness. Globally, China has published 2 case reports of neonatal COVID-19 infection, and to the best of our knowledge, there has been no published case reports in the United States of COVID-19 in a patient as young as 2 weeks.⁵

The Case

A 2-week-old Caucasian male infant born to a 32-year-old G3P2012 GBS-positive mother at 39 weeks gestation via elective cesarean section presented to the emergency center with 1 day of fever, measured 38.0°C temporally. During the 3 days prior to admission, mother noted a progressively worsening erythema of the right thumb and fourth digit. Additionally, the patient had been having increased somnolence over the past day and decreased breast milk feeds, prompting mother to bring infant to the emergency center for evaluation. Pertinent negatives in review of systems include no nasal congestion, cough, increased work of breathing, vomiting, nor

diarrhea. Mother endorsed feelings of congestion and cough for the past several days and sibling sick with viral symptoms. There is a maternal history of recurrent oral herpetic lesions.

Physical examination revealed a well-appearing 2-week-old infant who was alert and able to breastfeed with mother in the emergency center. Patient had a non-focal physical examination except for small erosions of the right thumb and right fourth finger with thin rim of erythema without subcutaneous fluctuance or drainage. During the emergency department visit, patient developed a temperature of 38°C, rectally. Initial laboratory studies included a complete blood count with differential: white blood count 9.2 bil/L, hemoglobin 17.7 g/dL, platelets 244 bil/L, neutrophils 0.3 bil/L, lymphocytes 5.0 bil/L, monocytes 3.7 bil/L, and immature granulocytes 0.06 bil/L. Comprehensive metabolic panel was notable only for aspartate aminotransferase 64 U/L and alanine aminotransferase 40 U/L. Cerebrospinal fluid (CSF) studies showed glucose 51 mg/dL, protein 45 mg/dL, white blood count 6/μL, and red blood cell count 360/μL. Patient was started on empiric antibiotic therapy as well as acyclovir, given his elevated liver enzymes and suspicious finger lesions. Shortly after lumbar puncture, patient became hypoxic to 85% while resting in mother's arms which improved with stimulation and supplemental oxygen. Chest radiograph was notable for bilateral perihilar streaking without focal consolidation. Patient was admitted to the pediatric intensive care unit given hypoxic respiratory failure. Prior to transport, patient was nasopharyngeal swabbed for SARS-CoV-2. Patient required modest nasal cannula oxygen support over the first 24 hours of admission but was progressively weaned to room air without need for escalation of therapy. On day 1 of admission,

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SARS-CoV-2 polymerase chain reaction returned positive. Additional workup included herpes simplex virus surface cultures and wound cultures from right hand that ultimately returned positive for methicillin-sensitive *Staphylococcus aureus*. Blood and CSF cultures yielded no growth, and CSF meningitis/encephalitis panel returned negative. Respiratory viral panel was obtained and was negative. Serial complete blood count revealed improving neutropenia from 0.3 bil/L to 0.7 bil/L. Given patient's improving clinical status, neither hydroxychloroquine nor azithromycin was initiated. On hospital day 4, patient discharged home with oral antibiotic therapy for soft tissue infection.

Discussion

To the best of our knowledge, this is the youngest reported case of SARS-CoV-2 in the United States. Globally, there have been very few reports of infants younger than 1 month of age, with most data coming from China.^{4,6} Infection from SARS-CoV-2 appears to cause similar clinical and laboratory findings with infections by other novel coronaviruses such as SARS-CoV and MERS-CoV, which caused the outbreak in China in 2002 and the Middle East in 2012, respectively.⁶ Our patient presented with fever and fussiness, which prompted the septic workup. Given his young age, the patient was admitted to the inpatient unit, and per our institutional policy, the patient was tested for SARS-CoV-2, which ultimately returned positive. Apart from fever, our patient exhibited no other symptoms of COVID-19, though given the patient's age, it was not possible to elicit subjective symptoms such as shortness of breath or chest pain, for example, which strengthens the hypothesis that young children may represent a substantial portion of the population who are asymptomatic carriers or are affected with mild symptoms. Additionally, our patient had a skin and soft tissue infection of the hand, possibly confounding the presenting symptoms. Interestingly, while initially well appearing, our patient did develop a physician-witnessed desaturation to 85% on foot pulse oximeter, which responded to stimulation and supplemental oxygen while waiting bed placement. Given the patient's young age and SARS-CoV-2 infection, which typically affects the lungs, the virus may act similar to other respiratory viruses in very young pediatric patients causing respiratory virus-induced apnea.⁷

The laboratory findings typically associated with coronavirus infections are normal or reduced white blood cell count with decreased neutrophil and/or lymphocyte counts as well as thrombocytopenia, elevated liver

enzymes, lactate dehydrogenase, and D-dimer levels.^{6,8} Hematological studies in our patient demonstrated an isolated neutropenia with granulocytosis and monocytosis, normal white blood cell, and lymphocyte count, which is atypical when comparing with prior novel coronavirus strains. As we are so early in the pandemic stages, it is difficult to elucidate the significance of the neutropenia and may simply be secondary to viral suppression as we have seen in other pediatric viral illnesses.⁶

At least 2 cases of neonatal coronavirus have been documented in China with the youngest known patient being 36 hours old. These studies describe the most common presentations and symptomatology of neonatal COVID-19, many of which were observed in the case described here. Symptoms and history that should raise concern in the neonatal population include prematurity, known sick contacts, temperature instability, respiratory symptoms (including congestion, tachypnea, grunting, nasal flaring, apnea), lethargy, poor feeding, vomiting, and diarrhea.⁹ In all febrile neonates, full septic workup should be performed, and empiric antibiotics should be initiated.

This report highlights the importance of clinical suspicion of disease in neonates with fever. Many of the findings present may be nonspecific, and thorough evaluation should be performed to rule out other causes infection as was done in this patient. Little is known about possible vertical transmission and spread through breast milk to the neonatal population. These patients should be admitted to a quarantine ward to limit further transmission. There is currently no anti-coronavirus drug, and these patients are currently being treated supportively. More research is needed regarding management and treatment of neonatal COVID-19 as patients are at increased risk of morbidity and mortality.

Author Contributions

PP, JC, LA, PK equally contributed to the conception, drafting and final version of the whole manuscript. All authors read and approved the final manuscript.

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