



COVID-19–Associated Pediatric Multisystem Inflammatory Syndrome

To the Editor—A recent press release on 28 April 2020 discussed the possible link of coronavirus disease 2019 (COVID-19) with a Kawasaki-like illness and shock in Europe [1].

We report the case of a previously healthy 6-year-old female who developed sore throat, fever, and reduced oral intake 6 days prior to her admission. After a syncopal episode on illness day 3, she was taken to the emergency department (ED) and found to be group A *Streptococcus* nasopharyngeal rapid test positive and was started on amoxicillin therapy and discharged. Concurrently, a blanchable maculopapular rash was noted over all extremities. She developed increased respiratory distress with persistent fevers. On the second ED presentation, illness day 6, she was hypotensive (blood pressure, 70s/40s mm Hg) and required normal saline bolus and epinephrine drip. Inflammatory/cytokine release markers were markedly elevated (C-reactive protein (CRP), 450 mg/L; lactate dehydrogenase, 794 units/L; and ferritin, 699.5 ng/mL) as were troponins (114 ng/L), D-dimer (4.21 mg/L), and fibrinogen (834 mg/dL). Hyponatremia (118 mmol/L), hyperkalemia (5.8 mmol/L), and azotemia (blood urea nitrogen, 33 mg/dL; creatinine, 1.09 mg/dL) were noted as well as a white blood cell count of $13.3 \times 10^3/\text{mm}^3$ (74% neutrophils, 15% lymphocytes, 2% monocytes, 9% bands); hemoglobin, 10.9 gm/dL; hematocrit, 31.4 %; and platelet count, $225 \times 10^3/\text{mm}^3$. Chest radiograph demonstrated a prominent cardiac silhouette with clear lung fields, and a point-of-care cardiac ultrasound revealed mildly decreased left ventricular (LV) function. Vancomycin, clindamycin, and ceftriaxone were initiated, and she was

transferred to the pediatric intensive care unit (PICU).

In the PICU, the patient was febrile (38°C – 39°C), hypotensive with signs of cardiogenic shock, and had a junctional cardiac rhythm. A dopamine drip was started, and she required up to 10 L of oxygen by high-flow nasal cannula for increased work of breathing. Repeat chest X ray demonstrated diffuse patchy pulmonary opacities. Her 2-dimension echocardiogram demonstrated mildly decreased LV function, mild mitral valve insufficiency, no pericardial effusion, and normal coronaries. She met criteria for incomplete Kawasaki disease (KD), including fever for more than 7 days with conjunctivitis, rash, edema of the hands and feet, and supportive supplemental laboratory results, including elevated CRP and erythrocyte sedimentation rate (56 mm/h), hypoalbuminemia (2.8 g/dL), anemia for age, and 2-D echocardiogram (ECHO) findings suggestive of myocarditis. She was given intravenous immunoglobulins (IVIG) at 2 g/kg and aspirin on illness day 6. Despite interventions, she had a hypoxic event that required intubation, resuscitation, and placement on venous arterial extra corporeal membrane oxygenation (ECMO) on illness day 7. Aspirin was discontinued after ECMO cannulation due to heparin use. COVID-19 polymerase chain reaction of a nasopharyngeal swab was positive.

The day after ECMO was initiated, she clinically and radiologically improved, required decreased support, and returned to a normal sinus rhythm. Blood cultures revealed no growth. She completed 6 days of ECMO therapy with a downtrend in her inflammatory markers, which was noted with no further signs of end organ damage by illness day 12 (CRP, 166 mg/L; ferritin, 678.9 ng/mL; troponin, 50 ng/L;

D-dimer, 2.76 mg/L). Similar but less severe incomplete KD-like illness was noted recently in 2 other COVID-19–positive pediatric patients at our hospital; both improved with IVIG treatment.

COVID-19 infection in children has been typically milder than in adults [2]. Pediatric COVID-19 presentations have been diverse; however, infrequent severe cases have been reported [3–6]. The absence of presentations similar to our case in recent publications from China may indicate a genetic predisposition for cardiac complications or a previously unrecognized inflammatory response to COVID-19. We urge an increased vigilance for cardiovascular complications including KD-like illness, myocarditis, and shock in febrile children with COVID-19.

Note

Potential conflicts of interest. All authors: No reported conflicts of interest. All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

Maria Paz Deza Leon,¹ Ajla Redzeqi,¹ Eric McGrath,^{1,2} Nahed Abdel-Haq,^{1,2} Ahmed Shawaqfeh,¹ Usha Sethuraman,^{1,2} Bradley Tilford,^{1,3} Teena Chopra,⁴ Harbir Arora,^{1,2} Jocelyn Ang,^{1,2} and Basim Asmar^{1,2}

¹Children's Hospital of Michigan, Detroit, Michigan, USA; ²Wayne State University School of Medicine, Department of Pediatrics, Detroit, Michigan, USA; ³Central Michigan University College of Medicine, Department of Pediatrics, Mount Pleasant, Michigan, USA; and ⁴Wayne State University School of Medicine, Department of Internal Medicine, Detroit, Michigan, USA

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Correspondence: Eric McGrath, Children's Hospital of Michigan, 3901 Beaubien, Blvd.; Division of Infectious Diseases; Detroit, MI 48201 (emcgrath@med.wayne.edu).

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