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Toxic shock-like syndrome and COVID-19: Multisystem inflammatory syndrome in children (MIS-C)



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ABSTRACT

Early reports of COVID-19 in pediatric populations emphasized a mild course of disease with severe cases disproportionately affecting infant and comorbid pediatric patients. After the peak of the epidemic in New York City, in late April to early May, cases of severe illness associated with COVID-19 were reported among mostly previously healthy children ages 5–19. Many of these cases feature a toxic shock-like syndrome or Kawasaki-like syndrome in the setting of SARS-CoV-2 positive diagnostic testing and the CDC has termed this presentation Multisystem Inflammatory Syndrome (MIS-C). It is essential to disseminate information among the medical community regarding severe and atypical presentations of COVID-19 as prior knowledge can help communities with increasing caseloads prepare to quickly identify and treat these patients as they present in the emergency department. We describe a case of MIS-C in a child who presented to our Emergency Department (ED) twice and on the second visit was found to have signs of distributive shock, multi-organ injury and systemic inflammation associated with COVID-19. The case describes two ED visits by an 11-year-old SARS-CoV-2-positive female who initially presented with fever, rash and pharyngitis and returned within 48 hours with evidence of cardiac and renal dysfunction and fluid-refractory hypotension requiring vasopressors and PICU admission.

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1. Introduction

The coronavirus disease 2019 (COVID-19) pandemic has caused a total of nearly 300,000 deaths worldwide [1]. Pediatric patients PCR positive for SARS-CoV-2 present differently than adults with 40% either asymptomatic or with URI symptoms and commonly have pharyngeal erythema [2]. A recent systematic review article on COVID-19 reports a low pediatric prevalence [3]. On May 14, the CDC released a Health Advisory on a severe life-threatening complication of pediatric COVID-19 termed Multisystem Inflammatory Syndrome in Children (MIS-C) [4]. We describe a case of MIS-C in a child who presented to our Emergency Department (ED) twice and on the second visit was found to have signs of distributive shock, multi-organ injury and systemic inflammation associated with COVID-19.

2. Case description

Our patient is an 11-year-old fully immunized female with no past medical history who presented with 4 days of sore throat, malaise,

poor appetite, generalized abdominal pain, leg pain, fever and an itchy rash starting on her palms that quickly spread to the trunk and back.

On initial presentation to our ED the patient was alert, non-toxic and in no acute distress. Vitals: febrile (39.3 °C) and tachycardic (126). Respiration and blood pressure were within normal limits. Physical exam: mild pharyngeal erythema, no exudates or palatal petechiae, no lymphadenopathy, mild dehydration, and a diffuse reticular, non-blanching papular rash on the bilateral upper extremities and abdomen (sandpaper) with palmar erythema. After a normal chest X-ray the patient's fever resolved, she felt better, and was discharged with precautions to return if fever persisted or for worsening symptoms.

A follow-up phone call was made the day after discharge with patient and mother reporting minimal improvement and she returned to our ED. Two hours after ED arrival, Vitals: hypotensive (80/38 mmHg), tachypneic (34 b/min), febrile (39.1 °C) and tachycardic (113). Fluid boluses of 2 L failed to normalize BP or HR. EKG: sinus tachycardia and S1Q3T3 without acute ischemia. Troponin and BNP were elevated to 0.112 (≤ 0.010 ng/mL) and 8718 (≤ 125 pg/mL), respectively. An elevated white blood cell count of 14.18 (4.00–10.50 K/uL) with left shift and lymphopenia, normal platelets and increased PT/INR of 21.4 (9.4–12.5 s) and 1.9 (0.8–1.2 ratio), c-reactive protein >300 (0.10–2.80 mg/L), D-dimer 1207 (0–243 ng/mL D-DU), ferritin 1789 (13.00–150.00 ng/mL), lactate dehydrogenase 301 (120–300 U/L), procalcitonin 16.28 (0.00–0.50 ng/mL), and fibrinogen 597

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(200–393 mg/dL). BUN 28.0 (5.0–18.0 mg/dL) and creatinine 2.06 (0.53–0.79 mg/dL). The patient tested PCR positive for SARS-CoV-2. The differential diagnosis was toxic shock syndrome, cytokine storm, hemophagocytic lymphohistiocytosis, septic shock, atypical Kawasaki disease, or cardiogenic shock secondary to myocarditis vs. pulmonary embolism.

The patient was transferred to PICU already on milrinone and norepinephrine, an official echocardiogram: “LV systolic function mildly decreased based on decreased shortening fraction.” Furosemide was given. Empiric antibiotic coverage included ceftaroline, clindamycin and piperacillin-tazobactam. Full-dose anticoagulation with enoxaparin was initiated and the patient was also given Vitamin K to correct elevated PT and INR. IL-6 was elevated to 1449 (0.0–15.5 pg/mL) and tocilizumab, an IL-6 inhibitor, was started along with convalescent plasma and remdesivir. The patient received steroids and IVIG for possible incomplete Kawasaki. She improved dramatically; within <24 h, she no longer required pressors and was afebrile without tachycardia.

Prior to discharge, EKG and echo were repeated. S1Q3T3 from the initial EKG had resolved. Repeat echo was performed on 5/5/20: “Normal study. LV function improved from previous study. Normal biventricular function. No aneurysms noted in the proximal coronary artery network.” D-dimer was downtrending, troponemia had resolved and BNP was at baseline on discharge. The patient was sent home with instructions to continue with enoxaparin injections for two weeks followed by an appointment with pediatric hematology and pediatric cardiology.

3. Discussion

This is the first case report in our ED of MIS-C. A case report from India reported a similar presentation of an eight-year-old with sore throat, fever, abdominal pain and rash who was found to have fluid-refractory hypotension requiring pressors [5]. At the time of writing, multiple case reports on COVID-19 and atypical or incomplete Kawasaki disease have been published [6,7]. At least one case report has described a mixed picture of possible Kawasaki with features of MIS-C [5]. Our case described features more consistent with a toxic shock syndrome, but incomplete Kawasaki disease could not be excluded by the patient's overall clinical picture. It is important to keep Kawasaki disease in mind for potential MIS-C patients because prompt treatment is low risk and may be beneficial [8]. Finally, earlier reports from China and the United States described infants as the most vulnerable pediatric population for severe COVID-19 [9,10]. This case occurred in an 11-year-old

and it appears that thus far, MIS-C is more likely to affect children beyond infancy [4].

4. Conclusion

Emergency Department physicians should consider close follow-up for any pediatric patient presenting with fever >3 days during the COVID-19 pandemic who is stable for discharge and lacks other associated signs and symptoms of MIS-C.

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