Multisystem Inflammatory Syndrome in a Previously Vaccinated Adolescent Female With Sickle Cell Disease

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Abstract: Multisystem inflammatory syndrome in children (MIS-C) is a serious complication that is observed most commonly in pediatric patients following severe acute respiratory syndrome coronavirus 2 infections. However, the mechanism and predictors of disease are poorly understood. There are no prior reports of MIS-C among patients who have been fully vaccinated, and only a single case of MIS in an adult patient who had received his second shot just 4 days prior to symptom onset. Here, we present an adolescent with sickle cell disease who was fully vaccinated against severe acute respiratory syndrome coronavirus 2 and had no prior history of known or suspected infection, who presented in shock and was ultimately diagnosed with MIS-C. This case highlights the importance of clinical suspicion for MIS-C even when patients are fully vaccinated.

Key Words: COVID, adolescent, sickle cell disease

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CASE PRESENTATION

A 14-year-old female with hemoglobin SS disease (HbSS), on hydroxyurea, presented to the hospital with 3 days of fevers, malaise, and abdominal symptoms. She was tachycardic and hypotensive with temperatures up to 40 °C. Her examination was notable for multiple tender and enlarged cervical lymph nodes, a maculopapular rash that extended over her face and trunk, and diffuse abdominal tenderness. Baseline labs and blood cultures were obtained. This patient had a documented severe allergy to beta lactam antibiotics and so ciprofloxacin was initiated. Her labs were significant for hyponatremia, elevated inflammatory markers, pancytopenia (to include neutropenia and lymphopenia), and transaminitis. Due to concerns for an enlarged cardiac silhouette on chest radiograph, as well as elevated troponin and brain natriuretic peptide, an echocardiogram was obtained that demonstrated mild right coronary artery enlargement with normal systolic function and ejection fraction. An electrocardiogram showed sinus tachycardia. This patient required multiple boluses of normal saline and was subsequently transfused with 2 units of packed red blood cells. Multisystem inflammatory syndrome in children (MIS-C) was considered in the initial workup but the patient had a negative severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) polymerase chain reaction, no prior history of known or suspected or exposures and had also completed the Pfizer vaccine series 2 months prior to presentation. Her antibiotic coverage was expanded. SARS-CoV-2 nucleocapsid antibody testing was sent, but result was delayed over 48 hours. Computed tomography of check, neck, abdomen, and pelvis revealed diffuse adenopathy as well as hepatosplenomegaly. Blood cultures remained negative at 24 hours and clinical status did not improve. Given evidence of a multisystemic inflammatory process concerning for MIS-C, she received intravenous immune globulin and methylprednisolone on hospital day 2. Over the following 12 to 24 hours, the patient defervesced with laboratory trends also improving posttreatment, as noted in Table 1. Her SARS-CoV-2 nucleocapsid antibody testing returned positive. Ultimately, an extensive work-up did not reveal another source to explain her presentation and she was discharged home in good condition after 7 days.

DISCUSSION

The SARS-CoV-2 vaccine is highly effective in preventing COVID-19 infection and reducing overall severity/mortality, as demonstrated by both phase 2 and 3 trials as well as ongoing investigations comparing vaccinated and unvaccinated individuals.[1,2] Furthermore, the incidence of multisystem inflammatory syndrome following vaccination is exceedingly rare with only a single published case series, all in patients ≥18 years.[3] This is the first report to document MIS-C in a fully vaccinated pediatric patient, although with many other notable similarities to those reported cases in adults (Table, Supplemental Digital Content 1, http://links.lww.com/INF/E636). This case was further complicated by our patient having HbSS, a disease with unique vulnerabilities for COVID-19 complications,

TABLE 1. Lab Results of Multisystem Inflammation and Initial Response to Intravenous Immune Globulin and Methylprednisolone

Lab (Reference Range)	Pre-IVIG and MP	Post-IVIG and MP (Next Day)*
Serum leukocytes × 1000/μL (4.5–14.5)	1.8	1.8
Lymphocytes (absolute) × 1000/μL (1.5–6.8)	0.4	0.6
Neutrophils (absolute) × 1000/μL (1.5–8.00)	1.4	1.1
Platelets, × 1000/μL (130–400)	106	112
Creatinine, mg/dL (<1.00)	0.68	0.41
C-reactive protein, mg/L (<7.4)	19	15.3
Procalcitonin, ng/mL (0.0–0.1)	5.73	2.2
Ferritin, ng/mL (17–168)	1729	1240
D-dimer, μg FEU/mL (<0.49)	1.73	1.06
Alanine aminotransferase, U/L (<63)	58	44
Aspartate aminotransferase, U/L (<34)	106	45
B-type natriuretic peptide, pg/mL (<99)	537	830
hsTroponin-T, ng/L (0–14)	85	29

*Inflammatory markers continued to improve towards normal range, with the exception of the brain natriuretic peptide (increased to 2946 over the next 4 days and then decreased to normal range over the next 7 days). Of note, the patient's lymphocytopenia and thrombocytopenia also resolved with symptom resolution.

IVIG indicates intravenous immune globulin; MP, methylprednisolone.

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including coagulopathy.[4] Fortunately, our patient was started on anticoagulants and had no known thrombotic complications. Vaccination status should not preclude suspicion for MIS-C. Additional surveillance is needed to determine whether HbSS is associated with increased vulnerability to MIS-C following vaccination.

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