MIS-terious Presentation of Multi-Organ Failure

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Supplemental Video

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Introduction
Multi-system Inflammatory Syndrome in Children (MIS-C) is a post-inflammatory syndrome related to SARS-CoV-2 (COVID-19) infection that has been well documented. It refers to patients under 21 years who present with fever and laboratory evidence of inflammation who develop clinically severe illness requiring hospitalization, with involvement of two or more organ systems and with laboratory results positive for current or recent SARS-CoV-2 infection. As more is learned about COVID-19 infection, a similar syndrome has been identified in adults.

Case Presentation
A 32- year-old Hispanic male presented with fever and shortness of breath for 4 days. Prior to admission, COVID-19 PCR testing was negative twice. On initial evaluation, he was febrile to 39.7C, hypoxic to 70% on room air, improved with supplemental oxygen via nasal cannula, and was tachypneic to 50 breaths per minute. A CT of the chest was negative for pulmonary embolus, but demonstrated right hilar opacities in upper and lower lobes. He was admitted for pneumonia and was treated with antibiotics. Within 24 hours, the patient developed shock and multisystem organ failure (renal, liver and biventricular heart failure with 20% ejection fraction) and was transferred to the intensive care unit. Laboratory findings were notable for LDH of 10,354, CRP of 428, ferritin of 23,778, fibrinogen of 958, d-dimer of 3154, respiratory viral panel and EBV and CMV titers were negative. He was evaluated by numerous specialists including Infectious Disease, Pulmonary, Cardiology, Heart Failure, Nephrology and Hematology and after lengthy discussions, the unifying diagnosis was myocarditis causing cardiogenic shock. On hospital day 5, the patient developed right foot pain with skin discoloration, and was found to have a right peripheral external iliac and common femoral vein deep vein thrombosis. Given this finding, in addition to his multiorgan failure and marked elevation of inflammatory markers, consideration for COVID-19 infection was the cause of his condition. SARS-CoV-2 IgG testing was positive.

Discussion
As more is learned about COVID-19, cases suggest that adult patients with current or previous SARS-CoV-2 infection can develop a hyperinflammatory syndrome resembling MIS-C. The pathophysiology of MIS in both children and adults is currently unknown. As of October 2020, MIS-A is diagnosed when the following five criteria are met: 1) a severe illness requiring hospitalization in a person aged =21 years; 2) a positive test result for current or previous SARS-CoV-2 infection during admission or in the previous 12 weeks; 3) severe dysfunction of one or more extrapulmonary organ systems; 4) laboratory evidence of severe inflammation (e.g., elevated CRP, ferritin, D-dimer, or interleukin-6); and 5) absence of severe respiratory illness. In pediatric patients, MIS-C has been treated similarly to Kawasaki's disease with IVIG, and cardiovascular support with vasoactive agents and ECMO for refractory shock. Glucocorticoids are recommended in the setting of severe shock and rising inflammatory markers. As it seems that this post-inflammatory syndrome is present in children and adults, it is important that multidisciplinary care be considered to ensure optimal treatment. Further research is needed to understand the pathogenesis and long-term effects of this newly described condition.

References
Morris, Sapna Bamrah, et al. "Case Series of Multisystem Inflammatory Syndrome in Adults Associated with SARS-CoV-2 Infection — United Kingdom and United States, March–August 2020." MMWR. Morbidity and Mortality Weekly Report, vol. 69, no. 40, 2020, pp. 1450–1456., doi:10.15585/mmwr.mm6940e1. "Multisystem Inflammatory Syndrome in Children (MIS-C) Interim Guidance ." Services.aap.org, 1 Sept. 2020,

services.aap.org/en/pages/2019-novel-coronavirus-covid-19-infections/clinical-guidance/multisystem-inflammatory-syndrome-in-children-mis-c-interim-guidance/.

Learning Objectives
Upon completion of this lecture, learners should be better prepared to:
Consider Multi-system Inflammatory Syndrome in Adults (MIS-A) related to previous COVID-19 infection in their differential for multi-organ failure