

# COVID-19 Vaccine–Induced Multisystem Inflammatory Syndrome With Polyserositis Detected by FDG PET/CT

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**Abstract:** Of the various adverse reactions to COVID-19 vaccines, fever is a common systemic symptom that often resolves spontaneously without treatment. However, rare vaccine-induced conditions that present with fever and systemic inflammation have been reported. In this case, a 65-year-old man with BNT162b2 mRNA COVID-19 vaccination underwent  $^{18}\text{F}$ -FDG PET/CT to evaluate prolonged fever and elevated serum C-reactive protein. PET/CT showed hypermetabolic infiltration in the pericardium and peritoneum suggesting immune-mediated pericarditis and peritonitis. After administration of high-dose corticosteroids, the patient's symptom resolved. This case suggests that multisystem inflammatory syndrome and polyserositis can be induced by the COVID-19 vaccine.

**Key Words:** COVID-19, FDG PET, multisystem inflammatory syndrome, serositis, vaccine

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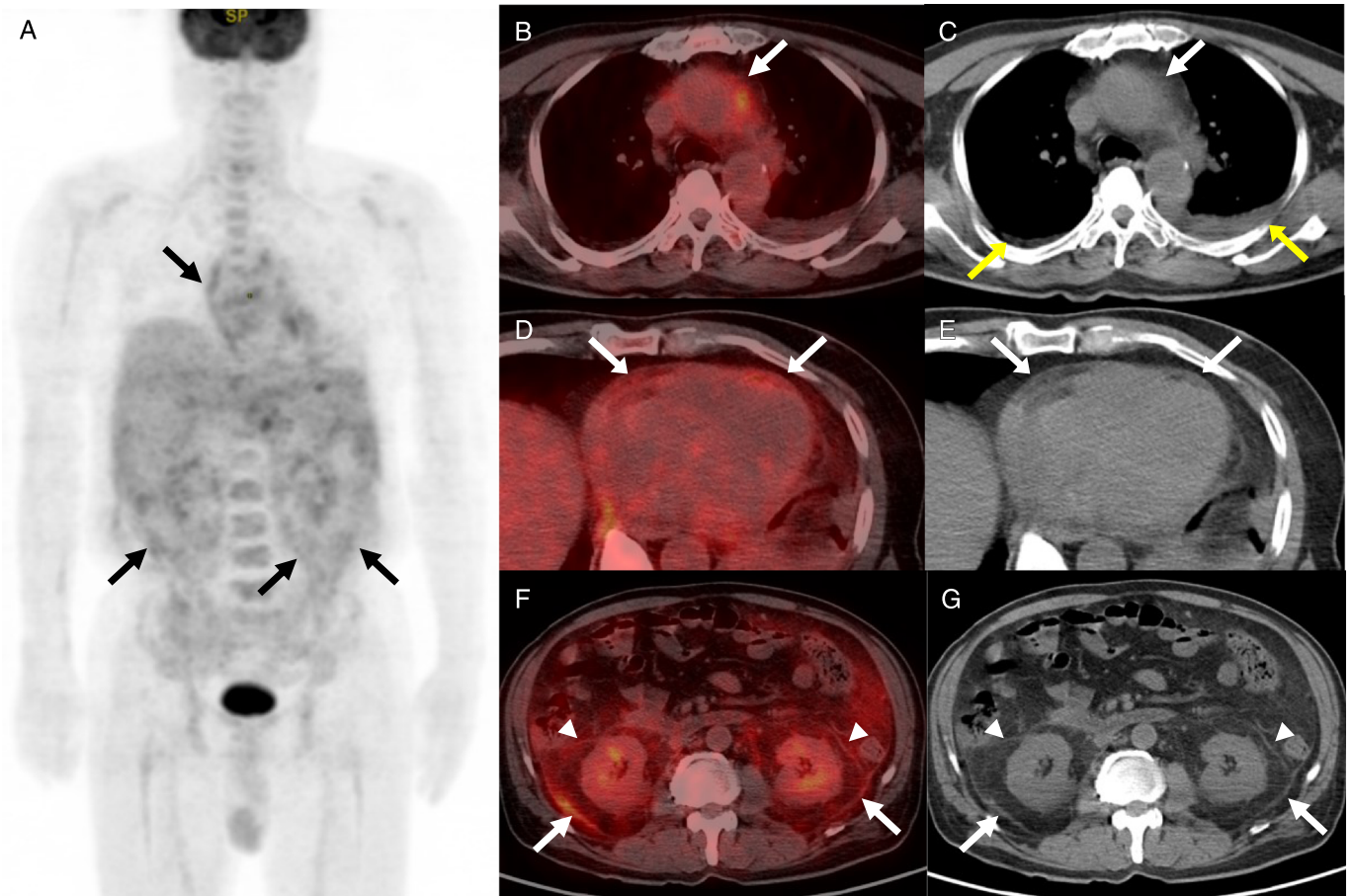
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**FIGURE 1.** A 65-year-old man with 5 days of fever. The fever developed 1 day after vaccination with the first dose of the BNT162b2 mRNA COVID-19 vaccine and persisted despite intermittent use of antipyretics. He felt mild shortness of breath when experiencing febrile sensations. On admission, his vital signs showed a temperature of 39.4°C, blood pressure of 119/70 mm Hg, pulse rate of 79 beats/min, respiratory rate of 20 breaths/min, and oxygen saturation of 96%. Polymerase chain reaction tests for COVID-19 via a nasopharyngeal swab were negative three times. Laboratory results documented mild leukocytosis (11,700 cells/ $\mu$ L) with an absolute lymphocyte count of 670 cells/ $\mu$ L. Serum C-reactive protein (27.7 mg/dL), erythrocyte sedimentation rate (58 mm/h), ferritin (899 ng/mL), D-dimer (4.45 mg/L), lactate dehydrogenase (337 U/L), aspartate aminotransferase (149 U/L), and alanine aminotransferase (302 U/L) concentrations were all markedly elevated, suggesting severe inflammation and acute liver injury.  $^{18}$ F-FDG PET/CT was then performed for further evaluation. The image of MIP (A, arrows) revealed suspicious mild hypermetabolic activity in mediastinum and abdominal cavity. On axial PET/CT and CT images, mild diffuse hypermetabolic activity is localized in the mediastinal line (B and C) and pericardial thickening with fat infiltration (D and E, white arrows). CT image shows bilateral pleural effusion (C, yellow arrows). These findings were indicative of mediastinitis, pericarditis, and pleuritis. Abdominal PET/CT and CT images (F and G) demonstrated hypermetabolic activity along perinephric (arrow heads) and peritoneal thickening (arrows), suggestive of peritonitis. Consultation with the infection specialist and rheumatology specialist revealed little evidence of infectious disease or connective tissue diseases, even after vigorous examinations, laboratory, and imaging tests. Based on these findings, the patient was diagnosed with COVID-19 vaccine-induced multisystem inflammatory syndrome (MIS) with polyserositis. After the administration of high-dose oral corticosteroids, the patient's fever, pleural effusions, and biomarkers of systemic inflammation resolved gradually without sequelae. The patient did not receive any kind of COVID-19 vaccine after that. Some patients with COVID-19 show systemic hyperinflammation by increased cytokine production, the so-called cytokine storm.<sup>1</sup> Multisystem inflammatory syndrome associated with COVID-19 has been observed both in children and in adults.<sup>2,3</sup> Mimicking these conditions, a few cases that manifest with fever and multisystem inflammatory responses after COVID-19 vaccinations have been previously reported.<sup>4-7</sup> Our patient showed fever, laboratory evidence of severe systemic inflammation, acute liver injury, imaging evidence of mediastinitis, pleuritis, pericarditis, and peritonitis, without evidence of severe respiratory illness. These findings met the criteria for MIS in adults, except for negative test results for SARS-CoV-2 infection.<sup>8</sup> Interestingly, our patient had mild bilateral pleural effusions, whereas there was no evidence of pneumonia, pulmonary embolism, or heart failure. Analysis of the pleural effusion was not performed because the pleural effusion was small. The PET/CT findings altogether illustrated multisystem inflammation in multiple serosae including the pleural, pericardium, and peritoneum. Although this case had several features suggesting adult-onset Still disease, it did not meet the diagnostic criteria.<sup>9</sup> FDG PET/CT is helpful in evaluating these possible systemic manifestations of COVID-19 vaccine adverse reactions, especially in patients with persistent fever after vaccination.