Case Report of COVID-19 mRNA Vaccine-Associated Myocarditis

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ABSTRACT

Introduction: We present a case report highlighting a single patient out of 3 who developed myocarditis within days after receiving Pfizer and Moderna COVID-19 mRNA vaccines.

Case Presentation: A 19-year-old male was admitted to our hospitalist service with substernal chest pain that was sharp, constant, and varied with position. He had received his second dose of the Pfizer-BioNTech COVID-19 vaccine (Pfizer vaccine) 2 days prior. Electrocardiogram was consistent with pericarditis. He had persistently elevated troponins and globally reduced systolic function by echocardiogram, which was consistent with myocarditis. He received colchicine, ibuprofen, and proton pump inhibitors with a resolution of symptoms. After 32 days, follow-up echocardiogram had returned to normal, and his symptoms had resolved completely.

Discussion: Given the onset of symptoms after the second dose of vaccine and our review of similar cases in the literature, it seems likely the patient's myopericarditis was caused by the vaccine. Rare complications of new vaccines given to millions of people are rapidly identified by the Vaccine Adverse Event Reporting System.

Conclusions: The identification of myopericarditis as a complication of mRNA vaccines will need further study to understand the pathophysiology, incidence, and prevalence in specific age groups and biological sexes.

INTRODUCTION

COVID-19 is a worldwide pandemic with millions of known deaths, a large economic impact, and significant morbidity to surviving patients. Given its impact, there has been rapid development, authorization, and deployment of vaccines. The Pfizer vaccine demonstrated an initial efficacy rate of 95% and received an emergency use authorization on December 11, 2020. It was formally approved under the brand name Comirnaty on August 23, 2021.[1,2] By the end of October 2021, over 245 million doses of the vaccine were given in the United States alone.[3] Side effects of the vaccine were generally found to be mild, but some rare severe reactions have been identified by the Vaccine Adverse Event Reporting System and other monitoring systems.[4] Both myocarditis and pericarditis have been reported. Currently, the incidence of myocarditis is thought to be about 4.8 cases per million vaccines. The risk seems to be higher in young male patients, and some authors theorize the numbers may be higher than the 4.8/1 million.[5]

CASE PRESENTATION

A 19-year-old White male with a past medical history of mild intermittent asthma and autistic disorder presented to the emergency department following 2 days of symptoms after receiving his second dose of the Pfizer vaccine. He had no recent viral or bacterial illnesses, no known exposures to COVID-19, and an unremarkable past medical history. He was not taking prescription medications, over-the-counter medications, or supplements. Day 1 of symptoms included headache, myalgias, nausea, and cough. On day 2 of symptoms, he presented to the emergency department with constant substernal and sharp chest pain that improved with changes in position. Other pertinent review of systems included shortness of breath and palpitations. He had mild resolution of symptoms with administration of ibuprofen, acetaminophen, and leaning forward while sitting upright. He tested negative for COVID-19 polymerase chain reac-

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tion (PCR), influenza A and B antigen, and rapid testing for Streptococcus Group A.

The initial electrocardiogram (ECG) shown in Figure 1 demonstrates diffuse ST elevation without reciprocal depression. Initial labs were concerning for a troponin of 1,338 ng/L, elevated white blood cell count of 10.91K/ul, and aspartate aminotransferase (AST) 106 IU/L. A chest x-ray was negative for any acute process (Figure 2). Given his clinical presentation, labs, and ECG findings, a diagnosis of pericarditis was made and myocarditis was suspected. He was started initially on colchicine, ibuprofen, and pantoprazole. By the following day, his chest pain had significantly improved and his ECG had normalized. Throughout admission, he had short bursts of intense breakthrough substernal chest pain, anxiety, and nausea—usually while he was lying on his back at night, which was adequately controlled with low-dose lorazepam, morphine, and ondansetron.

The patient's echocardiogram was significant for a decreased left ventricular function with an ejection fraction estimated to be 45% to 50% and evidence of right heart strain consistent with myocarditis with no prior echocardiogram for comparison. Cardiology started him on metoprolol succinate 25 mg once daily; the combination of colchicine, ibuprofen, and metoprolol correlated with complete resolution of further breakthrough chest pain. A follow-up echocardiogram was recommended in 4 weeks for reevaluation. He had no breakthrough chest pain for over 24 hours prior to discharge and did not develop any arrhythmias during admission. He was discharged on colchicine, ibuprofen, pantoprazole, and metoprolol.

The patient followed up with cardiology approximately 1 week after discharge. At that time, he noted that he did not have breakthrough chest pain or shortness of breath and was well controlled on his colchicine regimen. Thirty-two days after his initial echocardiogram, there was no evidence of reduced ejection fraction or right heart strain. The plan per cardiology was to discontinue colchicine, ibuprofen, pantoprazole, and metoprolol 2 months following discharge.

Figure 1. Electrocardiogram of Case Report Patient Consistent with Pericarditis

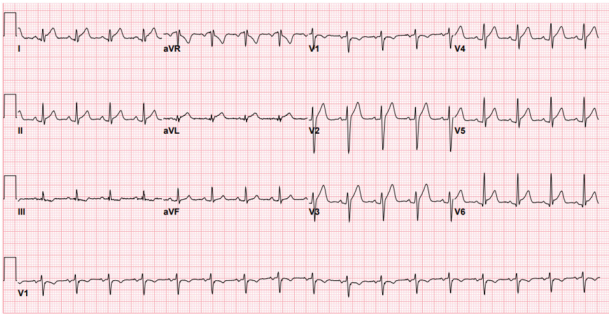

Figure 2. Chest X-ray of Case Report Patient

Table. Clinical Information Relating to Patients Diagnosed With Myocarditis Associated With Second Dose of mRNA Vaccine

Biological Sex	Age (Years)	Vaccine	Vaccine to Symptom No. of Days	Dose No.	Diagnosis
Male	19	Pfizer	2	2	Myocarditis, pericarditis
Male	25	Moderna	2	2	Myocarditis
Male	22	Pfizer	3	2	Myocarditis

DISCUSSION

Within a few weeks of this case, our inpatient cardiology service had 2 other cases of myocarditis that occurred within 2 days following the second doses of mRNA COVID-19 vaccines. Myocarditis developed within 2 days of the second dose, and the 3 patients tolerated the first doses of mRNA vaccination well, with arm soreness being the only notable symptom. All 3 patients were young males with an average age of 22, the youngest being 19 years old (Table).

Our hospital has about 225 inpatient beds in a city of 40,000 and a metro area of about 160,000 people. These 3 cases occurred within a relatively small geographical area within a week, but there were no additional cases reported 6 weeks after our case study patient. This suggests that the cluster of 3 cases was a random event. Acute pericarditis is typically self-limited and potentially could be ignored or considered a typical side effect by otherwise young healthy patients. Those patients would be unlikely to present to their primary care clinician or emergency department for evaluation.

Several case series have been published describing myocarditis and pericarditis following COVID-19 vaccination.[5,6] The

case series by Simone et al describes 15 patients in the Kaiser Permanente health system who developed myocarditis soon after mRNA vaccination. All were men, most cases happened after the second dose, and the median age was 25 (range 20-32 years). They found an incidence of 5.8 cases per million patients vaccinated with at least 1 dose of mRNA vaccine.[6] Diaz et al describes a case series from the Providence health system of 20 cases of myocarditis and 37 cases of pericarditis without myocarditis.[5] Similar to our series and the series by Simone, myocarditis was much more common after the second dose—16 out of the 20 cases. Diagnosis was made a median of 3.5 days after vaccination, and 75% were men. The median age was somewhat higher at 36. The report also included adverse events following the adenovirus vector vaccine from Johnson and Johnson, and no cases of myocarditis were seen.

CONCLUSIONS

Myocarditis is a rare pathology associated with mRNA vaccines that appears to be more prevalent in younger males compared to the general population. These instances of myocarditis are responsive to the current standard of care, including high-dose nonsteroidal anti-inflammatory drugs and colchicine for treatment and proton pump inhibitors to reduce the risk of gastrointestinal bleed. Long-term follow-up of these patients is required to identify any late or persistent effects. Increasing the awareness of myopericarditis associated with mRNA vaccines will allow for more accurate diagnoses and help determine the true prevalence and incidence of this pathology. Understanding which patients are at risk for it will help decide which type of vaccine is most appropriate for which patient.

The intent of this case report for primary care clinicians and public health practitioners is to provide a memorable clinical description of a patient regarding potential side effects and medical management to facilitate more thorough and knowledgeable discussions with patients to encourage vaccination against COVID-19.

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