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Myocarditis after BNT162b2 vaccination in a healthy male

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A 20-year-old male with no prior medical history presented to the emergency department (ED) with a chief complaint of midternal chest pain that radiated to the left side. The pain started in the morning and remained while resting. The patient also complained of mild shortness of breath secondary to pain. Upon examination, pain worsened with sitting and improved while lying flat. The patient had received his second dose of the Pfizer-BioNTech (BNT 162b2) vaccine two days prior to the onset of chest pain. The patient denied history of venous thromboembolism or family history of cardiovascular disease. The patient had a history of tobacco use and recovered with no sequelae.

In the ED, his initial troponin was 89 ng/L and increased to a maximum of 108 ng/L. The patient tested negative for SARS CoV-2 by PCR. Vital signs revealed blood pressure 121/54 mmHg, heart rate 113 beats per minute, temperature 98.4 °F orally, respiration 20 breaths per minute, SpO2 100% on room air. The patient’s electrocardiogram showed diffuse concave ST segment elevations with PR depressions. (Fig. 1). Myocarditis was suspected and bedside ultrasound revealed a small pericardial effusion without evidence of tamponade, which supported the diagnosis. The patient was subsequently given a dose of colchicine 0.6 mg and then admitted to the hospital for further evaluation.

Myocarditis has also been reported following live viral vaccinations, most notably the smallpox vaccine. From the early 1950s until 2003, six cases of cardiac complications following smallpox vaccination were reported in the United States [4]. A campaign to vaccinate U.S. military personnel against smallpox with the DryVax vaccine between 2002 and 2003 resulted in 67 cases of myocarditis or pericarditis out of the 540,824 personnel vaccinated [5]. Due to concern for cardiac...
complications following smallpox vaccination, a study was conducted to evaluate risk of myocarditis and pericarditis in live viral vaccinations [4]. Of the 416,629 vaccinated adults studied, only one case of pericarditis and zero cases of myocarditis were identified following vaccination [4]. The authors concluded there was no increased risk of myopericarditis following live viral vaccination [4].

There have been several cases of myocarditis following mRNA COVID-19 vaccination reported to authorities in the United States and Israel [6,7]. The U.S. Department of Defense (DoD) reported 14 military personnel were diagnosed with myocarditis following vaccination with either Moderna (mRNA-1273) or Pfizer-BioNTech COVID-19 vaccines [6]. The majority of cases received the mRNA-1273 vaccine, and most instances of myocarditis appeared following the second vaccination. With 2.7 million military personnel vaccinated, the rate of myocarditis in this population was 0.52 per 100,000 individuals [6]. The Israeli Ministry of Health reported 62 cases of myocarditis following mRNA COVID-19 vaccination [7]. Most cases occurred after the second dose and the prevalence of myocarditis was higher in men under 30 years old (1 per 20,000 in males aged 16–30 vs. 1 per 100,000 in the general population) [7].

The Advisory Committee on Immunization Practices (ACIP) COVID-19 Vaccine Safety Technical (VaST) session on May 17, 2021 reviewed presentations on myocarditis following mRNA vaccines from representatives of the DoD, the Vaccine Adverse Event Reporting System (VAERS), the Vaccine Safety Datalink, and the Veteran’s Administration [8]. They concluded cases predominately occurred in adolescents and young adult males following the second dose and within four days after vaccination [8]. Although the Centers for Disease Control and Prevention claims reports of myocarditis cases following COVID-19 vaccination are within the expected baseline number, the members of VaST recommended that information should be provided to clinicians about the potential relationship between myocarditis and COVID-19 vaccination [8].

Despite news reports as well as a few cases reported to VAERS, only one case report of myocarditis following COVID-19 vaccination has been published to date [9]. That report detailed a case of myocarditis that developed four days after receiving a second dose of the mRNA-1273 vaccine in a 24-year-old male with no prior history of cardiovascular disease [9]. While our case demonstrates a clear temporal association of vaccine-related myocarditis and other potential causes of myocarditis are unlikely, a true cause-and-effect relationship could not be established nor determined. We hope this case provides emergency medicine physicians additional information on evaluating potential post COVID-19 vaccination myocarditis.

**COI statement**

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**Prior presentations**

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**Author contribution statement**

AY conceived the case report. AY contributed to the medical management of the patient in the emergency department. ELS drafted the manuscript, and all authors contributed substantially to its revision. AY takes responsibility for the paper as a whole.

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