Cardiology in the Young

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COVID vaccine-associated myocarditis in an 8-year-old patient

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Brief Report

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*The online version of this article has been updated since original publication. A notice detailing the change has also been published

Abstract

COVID vaccine-associated myocarditis was first identified in March 2021. There have been numerous case reports that detail the clinical course of paediatric patients older than age 12 with COVID vaccine-associated myocarditis. There are still very few reports of children between the ages of 5 and 11 with COVID vaccine-associated myocarditis. We present an 8 year- old with COVID vaccine-associated myocarditis after his second vaccination against SARS-CoV-2.

The COVID-19 vaccination has been a public health cornerstone in the mitigation of the SARS-CoV-2 pandemic since December 2020, when the Pfizer-BioNTech (BNT162b2) and Moderna (mRNA-1273) mRNA-based vaccines were approved for emergency use authorisation by the Food and Drug Administration.[1] These vaccinations have been an effective and crucial method in protecting against life threatening, severe disease with SARS-CoV-2.

A temporal association between myocarditis and COVID vaccination was first described in adults in March 2021.[2] COVID vaccine-associated myocarditis occurs in approximately 1/10,000 males aged 16–19 years, a rate that is much higher than the background incidence of myocarditis.[3] The Pfizer-BioNTech mRNA vaccination received an emergency use authorisation for patients aged 12–15 years in May and for patients aged 5–11 years in December 2021.[4] In June 2021, the first case series detailing COVID vaccine-associated myocarditis in the paediatric population was published, although this only included children older than 12 years of age.[5] We present a case report of an 8-year-old child with COVID vaccine-associated myocarditis.

Case description

A previously healthy 8-year-old male presented to his paediatrician's office with chest pain and palpitations 2 days after receiving the second dose of the BNT162b2-mRNA (Pfizer-BioNTech) COVID vaccine. He had no prior medical conditions or surgeries, was on no medications, and had no pertinent cardiac family history. He had no known history of prior COVID infection. Electrocardiogram and chest X-ray were obtained at this visit and were within normal limits. However, a troponin was obtained and elevated to 7.94 (normal < 0.03 ng/mL), prompting referral to the Emergency Department for further evaluation.

There, the patient had normal vital signs and an unremarkable physical exam. His biochemistry revealed an elevated high sensitivity troponin-I (6770, 6890, and 7094 ng/L at 0, 1, and 3 hours, respectively; normal < 59 ng/L) and an elevated NT-pro brain-natriuretic peptide to 396 pg/mL (normal < 125 pg/mL). His electrocardiogram remained normal without ST segment changes, and a bedside echocardiogram showed normal biventricular function and no pericardial effusion. The patient was started on ibuprofen and admitted to the hospital for observation with a clinical diagnosis of myocarditis.[6] An extensive workup for an infectious aetiology of myocarditis

was negative (including influenza, adenovirus, human herpesvirus 6, cytomegalovirus, Ebstein-Barr virus, enterovirus, parvovirus, and tuberculosis). He did not have any rhythm abnormalities on telemetry during this hospitalisation and did not require ICU-level care or inotropic support. He was discharged on hospital day three following resolution of chest pain and with down-trending high-sensitivity troponin-I (690 ng/L at discharge).

The patient re-presented to the Emergency Department 5 days after discharge for recurrent and substernal chest pain. Troponin at that time was normal; his pain had resolved at one-month follow-up visit. His electrocardiogram remained normal, as well as his function by echocardiography. He was instructed to forego any further mRNA COVID-19 vaccinations and to self-limit physical activity for a period of 3 months until his next follow-up visit.

Discussion

COVID vaccine-associated myocarditis was first described in March 2021 and has subsequently been established in all age groups above 12 years of age.[2,5] We present this case of an 8-year-old patient with COVID vaccine-associated myocarditis after the second dose of his Pfizer-BioNTech mRNA vaccine.

Our patient was only mildly symptomatic and was stable for discharge within 3 days of hospitalisation with down-trending troponins and resolution of symptoms using only ibuprofen. This disease course and rapid recovery seen in our patient parallels additional case reports detailing COVID vaccine-associated myocarditis in other paediatric and adult age groups. Myocarditis in the young has a bimodal age distribution, with peaks during infancy and adolescence, and an incidence gradually rising starting in preschool age children. According to currently available data, the age distribution for COVID vaccine-associated myocarditis in children older than five appears to follow the same trend as that of viral myocarditis.[7–9] Whether the age distribution of COVID vaccine-associated myocarditis continues to follow that of viral myocarditis, with lower incidence in younger children as compared to adolescents, remains to be investigated. These similarities indicate the possibility that host factors, in addition to a viral or immunological insult, play a role in the development of myocarditis.

It should also be noted that patients in the 5–11 age group receive only half of the adult dose of the Pfizer-BioNTech COVID-19 vaccination, and one report raised concerns about possible decreased efficacy of this lower dose in preventing disease in the 5–11 year age group.[10] It remains to be seen if the risk of myocarditis is reduced in this age group owing to the lower dose of the vaccine. Similarly, the long-term effects of COVID vaccine-associated myocarditis are still unknown. We recently reported a high prevalence of myocardial injury and scarring in adolescents with COVID vaccine-associated myocarditis as evidenced by cardiac magnetic resonance imaging with late gadolinium enhancement, which is in contrast to the relative mild disease course.[7] This patient did not undergo cardiac MRI as the history, serological data, and lack of other associated symptoms were indicative of myocarditis per the most recent American Heart Association guidelines. Despite the clinical diagnosis, it would have been interesting to know whether there was any myocardial scarring on cardiac MRI.[6]

The current case suggests that children less than 12 years of age can also be affected by COVID vaccine-associated myocarditis. The COVID vaccine is a crucial intervention in mitigating the SARS-CoV-2 pandemic. Further studies are needed to determine the safety profile of vaccinations in any age group. The information regarding the long-term effects of COVID vaccine-associated myocarditis in the paediatric and young-adult population is critical to the ongoing efforts to mitigate the COVID-19 pandemic, as vaccinations are a cornerstone to the prevention of disease spread and alleviation of disease burden on the healthcare system.

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