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Brief Report

Is the mRNA COVID-19 Vaccine Safe in Patients With a Prior History of Myocarditis?

RIDA SHAHID, MD,¹ W.H. WILSON TANG, MD,² ALLAN L. KLEIN, MD,³ DEBORAH KWON, MD,² AND SHAHNAWAZ AMDANI, MD, FACC¹

Cleveland, Ohio

ABSTRACT

Background: Numerous studies have reported myocarditis resulting from messenger RNA (mRNA) coronavirus disease 2019 (COVID-19) vaccination. However, to date, there have been no reports highlighting the safety of mRNA COVID-19 vaccines in children and adults with a prior history of myocarditis, which was the intent of this study.

Methods and Results: Children and adults cared for at the Cleveland Clinic were identified through the electronic health records, who had a history of myocarditis before the COVID-19 pandemic and had subsequently received at least 2 doses of the mRNA COVID-19 vaccines ($n = 34$). Only 1 patient in this series had recurrence of myocarditis confirmed by cardiac magnetic resonance imaging after receiving the second dose. He was a White man who had his first episode of myocarditis at age 20 and was 27 years of age at the time of recurrence. He was hospitalized for 2 days with no need for cardiac support or reported arrhythmias and was stable at outpatient follow-up.

Conclusions: In patients with an old history of non-COVID-19 myocarditis, the risk of recurrent myocarditis after receipt of mRNA COVID-19 vaccination is low, and when it occurs it seems to be self-limiting. Our study will be valuable to clinicians while discussing the risk-benefit ratio of vaccinations in patients with a prior history of myocarditis. (*J Cardiac Fail* 2022;00:1-4)

Key Words: Myocarditis history, mRNA COVID-19 vaccine, Vaccine safety.

The messenger RNA (mRNA) coronavirus disease 2019 (COVID-19) vaccines BNT162b2 and mRNA-1273 have both demonstrated efficacy in decreasing COVID-19 hospitalizations and deaths.^{1,2} There have been numerous reports linking these vaccines to

subsequent development of myocarditis.³⁻⁵ However, given the relatively benign course of patients with vaccine-induced myocarditis and the clear benefits of vaccination in preventing COVID-19 hospitalizations and deaths, the Centers for Disease Control and Prevention has recommended the continued use of these vaccines.⁶ To date, there have been no reports highlighting the safety of mRNA COVID-19 vaccines in children and adults with a prior history of myocarditis, which was the intent of this study.

From the ¹Department of Cardiology, Cleveland Clinic Children's Hospital, Cleveland, Ohio; ²Department of Cardiovascular Medicine, Heart, Vascular and Thoracic Institute, Cleveland Clinic, Cleveland, Ohio and ³Center for the Diagnosis and Treatment of Pericardial Diseases, Section of Cardiovascular Imaging, Department of Cardiovascular Medicine, Heart, Vascular, and Thoracic Institute, Cleveland Clinic, Cleveland, Ohio.

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Reprint requests: Shahnawaz Amdani, Pediatric Cardiology, Cleveland Clinic Children's Hospital, 9500 Euclid Ave, M41 (Department of Pediatric Cardiology), Cleveland, OH 44195. Tel: 216-445-0376; Fax: 216-445-3692. E-mail: amdanis@ccf.org

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Methods

All children and adults cared for at the Cleveland Clinic were consecutively identified through the electronic health records, who had a history of myocarditis (clinical or confirmed by cardiac magnetic resonance imaging [MRI] or endomyocardial biopsy) before the COVID-19 pandemic (before 2020) and

had subsequently received at least 2 doses of the mRNA COVID-19 vaccines (BNT162b2 or mRNA-1273) with follow-up until February 4, 2022. The study was approved by the Cleveland Clinic Institutional Review Board.

Patient charts were reviewed to obtain demographic information (age, sex, and race), date, and clinical information at the time of their original myocarditis diagnosis, dates of mRNA vaccine administration, and subsequent medical encounter after vaccination (if completed). In addition, all participants were contacted by the author (R.S.) to confirm their prior myocarditis history and dates of mRNA vaccination, as well as their postvaccine clinical course.

Results

Thirty-four patients had a past history of myocarditis and received at least 2 doses of the mRNA COVID-19 vaccine. Details about their initial myocarditis episode are presented in Supplementary Table 1. The median age of our study participants was 41 years, with the majority being male (23 [67.6%]) and White (29 [85.3%]). Most had their initial episode of myocarditis diagnosed clinically (20 [58.8%]); as adults (30 [88.2%]); majority (27 [79.4%]) received the BNT162b2 vaccine; 26 patients (76.5%) had received 3 doses of vaccine. Of 34 patients, most had a subsequent medical encounter (31 [91.2%]) and 23 (67.6%) had both a medical and a phone encounter (Table 1). Only 3 patients in this series did not have a postvaccine medical encounter, but they all had a subsequent phone encounter. The median follow-up (medical and phone) time (months) of patients after their second COVID-19 vaccine was 9 months (range, 7–9 months).

Only 1 patient in this series had recurrence of myocarditis confirmed by cardiac MRI after receiving the second dose. He was a White male who had his first episode of myocarditis at age 20 and was 27 years of age at the time of recurrence. He developed chest pain 2 days after receiving the mRNA-1273 vaccine. He had elevated troponin (peak troponin 0.268 ng/mL, normal value ≤ 0.029 ng/mL) and on cardiac MRI was found to have normal biventricular size and function, but with subepicardial delayed enhancement involving the basal inferolateral and inferior wall and distal lateral segment. He had no increased myocardial signal intensity on T2 imaging. On side-by-side comparison, the enhancement in the distal lateral segment was new in comparison to the cardiac MRI at the time of the first myocarditis episode (Supplementary Figure 1). He was hospitalized for 2 days and during this time did not require any cardiac support or had any reported

Table 1. Demographic and Clinical Characteristics of the Study Cohort

	Median (Q1–Q3) or n (%) (N = 34)
Current age	41 (27–63)
Sex	
Male	23 (67.6)
Female	11 (32.4)
Race	
White	29 (85.3)
Black	4 (11.8)
Other	1 (2.9)
Age at first episode of myocarditis	
Median (range)	29 (20–44)
≤ 18 years	4 (35.3)
> 18 years	30 (88.2)
Myocarditis diagnosis confirmation	
Clinical	20 (58.8)
Cardiac MRI	12 (33.3)
Cardiac MRI and endomyocardial biopsy	1 (2.9)
Endomyocardial biopsy	1 (2.9)
COVID-19 vaccine doses	
Two completed	34 (100)
Three completed	26 (76.5)
COVID-19 vaccine type	
BNT162b2	27 (79.4)
mRNA-1273	7 (20.6)
Time interval (months) between initial myocarditis episode and date of first COVID-19 vaccine	78.5 (65–106)
Encounters after second dose	
Medical	31 (91.2)
Phone	26 (76.5)
Medical and phone	23 (67.6)
Time interval (months) between second COVID-19 vaccine and medical encounter*	6 (4–8)

COVID-19, coronavirus disease 2019; MRI, magnetic resonance imaging.

*Medical encounter was available for 31 patients (91.2%) after their second COVID-19 vaccine.

arrhythmias. The patient was stable at the postdischarge follow-up at 6 weeks.

Discussion

Although there have now been numerous reports of myocarditis after mRNA vaccination, none of these studies have specifically looked at the safety of this vaccine in patients with a previous history of myocarditis.^{3–5} To our knowledge, this is the first report of mRNA COVID-19 vaccines in children and adults with a prior history of myocarditis. The strength of our study is the fact that all patients in our study had a postvaccine encounter identified in our medical system, by phone or both. Of all the patients who received 2 doses of the COVID-19 vaccine, only 1 patient had myocarditis recurrence and in this particular patient, the course was relatively benign.

Myocarditis after mRNA vaccination has been the subject of intense scrutiny by the medical

community and the public at large.^{3–5,7} Some potential mechanisms suggested to cause myocarditis are secondary to cross reactivity between spike glycoproteins on the mRNA vaccine and the myocardial contractile proteins and molecular mimicry between spike proteins and cardiac self-antigens.⁸ In some individuals with autoimmune and genetic predisposition, mRNA vaccination can lead to dysregulated activation of our immunologic memory cells that potentially causes systemic inflammation leading to myocarditis.^{9,10} Similar to our patient that experienced recurrence, it has been reported in other series that myocarditis after vaccination seems to be more frequently seen in White males less than 30 years of age.^{3,4} It is important to continue to emphasize that the risk of developing myocarditis from the COVID-19 infection is significantly higher than from mRNA vaccination.^{6,11} We also want to highlight that most of our patients had their initial myocarditis episode approximately 5 to 6 years before receiving the COVID-19 vaccine; hence, further studies are needed to assess safety of the mRNA COVID-19 vaccine in those with a recent history of myocarditis (<6–12 months before vaccination).

Limitations of our study are that it is a single-center review, hence limiting generalizability; a review of patients with myocarditis episode occurring before the pandemic, thereby not allowing us to comment on recurrence risk for patients with myocarditis due to COVID-19 infection or induced by mRNA COVID-19 vaccination; the possibility that we missed patients with myocarditis who received 2 doses of the COVID-19 vaccine given electronic data abstraction; the possibility of misclassification of their initial diagnosis; our cohort includes patients with a documented history of myocarditis and COVID-19 vaccine status and likely under-represents patients with undiagnosed or subclinical myocarditis or those with under-reported vaccination status; and finally the possibility that we missed subclinical myocarditis postvaccination given the lack of protocol medical and diagnostic testing for all patients at set intervals after completion of their COVID-19 vaccination series.

Conclusions

In this cohort, in patients with an old history of non-COVID-19 myocarditis, the risk of recurrent myocarditis after receipt of mRNA COVID-19 vaccination was low, and when it occurred, it seemed to be self-limiting. Although large-scale studies are needed to confirm our findings, our study will be valuable to clinicians in the interim while discussing the risk–benefit ratio of vaccinations in those with an old history of myocarditis and supports the

current opinion by the Centers for Disease Control and Prevention, which is to consider mRNA vaccination in those with resolved myocarditis or pericarditis.¹²

Declaration of Competing Interest

None.

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Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.cardfail.2022.06.011.

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