Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

https://doi.org/10.1016/j.jpeds.2021.12.026

The authors declare no conflicts of interest.

References

1. Minocha PK, Better D, Singh RK, Hoque T. Recurrence of acute myocarditis temporally associated with receipt of the mRNA coronavirus disease 2019 (COVID-19) vaccine in a male adolescent. J Pediatr 2021;238:321-3.
2. Kim HW, Jenista ER, Wendell DC, Azevedo CF, Campbell MJ, Darty SN, et al. Patients with acute myocarditis following mRNA COVID-19 vaccination. JAMA Cardiol 2021;6:1196-201.
3. Puntmann VO, Carerj ML, Wieters I, Fahim M, Arendt C, Hoffmann J, et al. Outcomes of cardiovascular magnetic resonance imaging in patients recently recovered from coronavirus disease 2019 (COVID-19). JAMA Cardiol 2020;5:1265-73.
4. von Knobelsdorff-Brenkenhoff F, Schüler J, Dogangüzel S, Dieringer MA, Rudolph A, Greiser A, et al. Detection and monitoring of acute myocarditis applying quantitative cardiovascular magnetic resonance. Circ Cardiovasc Imaging 2017;10:e005242.

Reply

To the Editor:

Thank you for your comment. The second episode began 48 hours after the patient received the Pfizer-BioNTech coronavirus disease 2019 mRNA vaccine. In addition to clinical symptoms of myocarditis, troponin elevation, and abnormalities on electrocardiogram, cardiac magnetic resonance imaging showed low normal left ventricular ejection fraction (53%), trivial pericardial effusion, and subepicardial late gadolinium enhancement in the left ventricular mid-lateral and apical regions. The distribution of late gadolinium enhancement was identical to that seen on the previous episode of myocarditis (**Figure 1**).

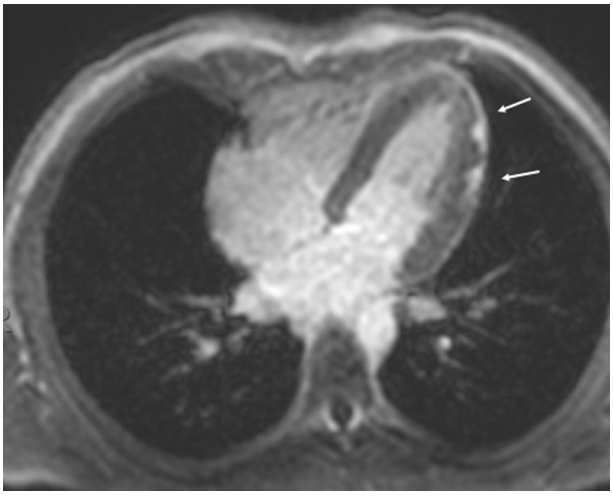

Figure 1. Cardiac magnetic resonance imaging, horizontal long-axis view, showing late gadolinium enhancement in the mid lateral and apical regions (annotated by *arrows*) with interval increased late gadolinium enhancement during the second episode.

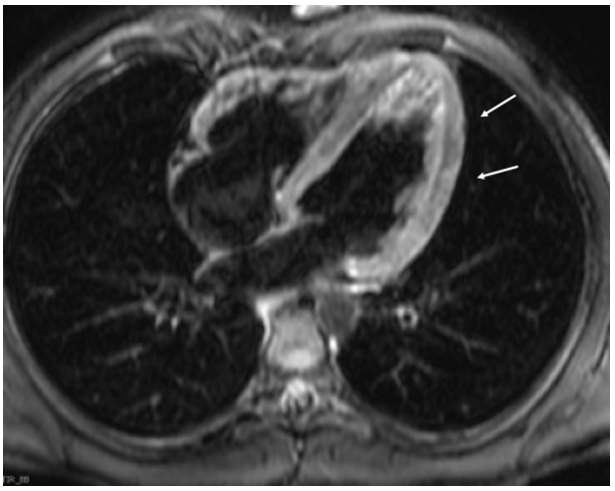

Figure 2. Horizontal long-axis T2 short tau inversion recovery image showing enhancement in the same distribution of late gadolinium enhancement indicating acute edema.

The respondents point out that T2-weighted images would help differentiate between old scarring from previous myocarditis and new myocardial injury. T2-weighted imaging was in fact performed in our case and showed edema in the involved region consistent with acute injury (**Figure 2**).

In 2018, the Lake Louise criteria for cardiac magnetic resonance imaging diagnosis of myocarditis was updated to include T1, T2, and extracellular volume quantitation to increase diagnostic accuracy.[1,2] Specifically, it is necessary to have a positive T2-based marker and a T1-based marker to diagnose acute myocardial inflammation. We do agree that T2-weighted imaging is necessary to differentiate between acute inflammation and chronic scarring in the setting of recurrent myocarditis.

Prashant K. Minocha, MD
Division of Pediatric Cardiology, Hassenfeld Children's Hospital at NYU Langone

New York University Grossman School of Medicine

Puneet Bhatla, MD
Division of Pediatric Cardiology, Hassenfeld Children's Hospital at NYU Langone

New York University Grossman School of Medicine
Department of Radiology, NYU Langone Medical Center

Rakesh K. Singh, MD
Division of Pediatric Cardiology, Hassenfeld Children's Hospital at NYU Langone

New York University Grossman School of Medicine
New York, New York

https://doi.org/10.1016/j.jpeds.2021.12.027

The authors declare no conflicts of interest.

References

1. Ferreira V, Schulz-Menger J, Holmvang G, Kramer C, Carbone I, Sechtem U, et al. Cardiovascular magnetic resonance in nonischemic myocardial inflammation: Expert Recommendations. J Am Coll Cardiol 2018;72:3158-76.

2. Law YM, Lal AK, Chen S, Čiháková D, Cooper LT, Deshpande S, et al. Diagnosis and management of myocarditis in children: a scientific statement from the American Heart Association. Circulation 2021;144:E123-35.

50 Years Ago in *The Journal of Pediatrics*

The Development of the Rubella Vaccine and Joint Adverse Events

Spruance SL, Klock LE, Bailey A, Ward JR, Smith CB. Recurrent joint symptoms in children vaccinated with HPV-77DK12 rubella vaccine. J Pediatr 1972;80:413-7.

Many viruses, including rubella, are associated with the development of arthritis, either from direct viral invasion or as an immune reactive arthropathy. The rubella vaccine is a live attenuated virus and was developed in the 1960s in response to epidemics resulting in birth defects among fetuses of women infected during the first trimester of pregnancy. The first successful strain developed was the HPV-77 strain, incubated in various animal cells such as dog kidney cells used in this paper. Joint adverse events were frequent after these vaccines (~10%), usually lasting several weeks. The authors of this report contacted 225 patients who had developed joint symptoms following a vaccination campaign in Utah in 1970. They found 11 patients with persistent or recurrent episodes of joint symptoms 8 months after vaccination. All were between 2 and 10 years of age, and 6 were boys. The symptoms consisted of recurrent knee stiffness and pain. Episodes lasted 1-7 days, weekly to every 3 months. Those who were examined had clinical signs of arthritis. There were no predictors among those with joint symptoms who would develop persistent or recurrent symptoms, including the rubella titer. From our knowledge today, it is possible that some of these children, particularly the male ones, had the enthesitis-related form of juvenile idiopathic arthritis, often associated with HLAB27.

The rubella vaccine strain used today is the RA 27/3 strain prepared in WI-38 human diploid cells. It is given together with measles, mumps, and varicella (MMRV) at much younger ages. It is very rare to observe joint adverse events following the MMRV vaccine and they are more likely to occur in adults than in children.

The safety of coronavirus disease 2019 (COVID-19) vaccines often are intensely debated among the public; thus, it is important to remember that newer vaccines developed with modern technology are associated with fewer rheumatic immune adverse events than those reported by Spruance et al, which were associated with the initial types of the rubella vaccine developed more than 50 years ago.

Limor Ashkenazi, MD
Philip J. Hashkes, MD, MSc
Pediatric Rheumatology Unit
Shaare Zedek Medical Center
Jerusalem, Israel