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Association of Myocarditis with Pfizer's BNT162b2 Messenger RNA COVID-19 Vaccine in a Case Series of Children

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Key Points

Question: *What are the findings on cardiac imaging in children with myocarditis after COVID-19 vaccination?*

Findings: In this case series of 15 children who were hospitalized with myocarditis after receipt of the BNT162b2 messenger RNA COVID-19 vaccine for 1 to 5 days, boys were most often affected after the second vaccine dose, 3 patients had ventricular systolic dysfunction, and 12 patients had late gadolinium enhancement on cardiac magnetic resonance imaging. There was no mortality, and all but 1 patient had normal echocardiogram results on follow-up 1 to 13 days after discharge.

Meaning: COVID-19 vaccine-associated myocarditis may have a benign short-term course in children; however, the long-term risks remain unknown.

Abstract

Importance: The BNT162b2 (Pfizer-BioNTech) messenger RNA COVID-19 vaccine was authorized on May 10, 2021, for emergency use in children aged 12 years and older. Initial reports showed that the vaccine was well tolerated without serious adverse events; however, cases of myocarditis have been reported since approval.

Objective: To review results of comprehensive cardiac imaging in children with myocarditis after COVID-19 vaccine.

Design, Setting, and Participants: This study was a case series of children younger than 19 years hospitalized with myocarditis within 30 days of BNT162b2 messenger RNA COVID-19 vaccine. The setting was a single-center pediatric referral facility, and admissions occurred between May 1 and July 15, 2021.

Main Outcomes and Measures: All patients underwent cardiac evaluation including an electrocardiogram, echocardiogram, and cardiac magnetic resonance imaging.

Results: Fifteen patients (14 male patients [93%]; median age, 15 years [range, 12-18 years]) were hospitalized for management of myocarditis after receiving the BNT162b2 (Pfizer) vaccine. Symptoms started 1 to 6 days after receipt of the vaccine and included chest pain in 15 patients (100%), fever in 10 patients (67%), myalgia in 8 patients (53%), and headache in 6 patients (40%). Troponin levels were elevated in all patients at admission (median, 0.25 ng/mL [range, 0.08-3.15 ng/mL]) and peaked 0.1 to 2.3 days after admission. By echocardiographic examination, decreased left ventricular (LV) ejection fraction (EF) was present in 3 patients (20%), and abnormal global longitudinal or circumferential strain was present in 5 patients (33%). No patient had a pericardial effusion. Cardiac magnetic resonance imaging findings were consistent with myocarditis in 13 patients (87%) including late gadolinium enhancement in 12 patients (80%), regional hyperintensity on T2-weighted imaging in 2 patients (13%), elevated extracellular volume fraction in 3 patients (20%), and elevated LV global native T1 in 2 patients (20%). No patient required intensive care unit admission, and median hospital length of stay was 2 days (range 1-5). At follow-up 1 to 13 days after hospital discharge, 11 patients (73%) had resolution of symptoms. One patient (7%) had persistent borderline low LV systolic function on echocardiogram (EF 54%). Troponin levels remained mildly elevated in 3 patients (20%). One patient (7%) had nonsustained ventricular tachycardia on ambulatory monitor.

Conclusions and Relevance: In this small case series study, myocarditis was diagnosed in children after COVID-19 vaccination, most commonly in boys after the second dose. In this case series, in short-term follow-up, patients were mildly affected. The long-term risks associated with postvaccination myocarditis remain unknown. Larger studies with longer follow-up are needed to inform recommendations for COVID-19 vaccination in this population.

Introduction

SARS-CoV-2 was first identified in China and evolved rapidly to a global pandemic. Vaccines to prevent SARS-CoV-2 infection are the current standard approach for curbing the pandemic. In the US, the BNT162b2 messenger RNA (mRNA) (Pfizer-BioNTech), mRNA-1273 (Moderna), and Ad26.COV2.S (Janssen) vaccines were granted emergency use authorization for adults. On May 10, 2021, the emergency use authorization for the BNT162b2 vaccine was extended to children aged 12 years and older.[1]

Myocarditis has been reported as a rare complication of vaccination against other viruses.[2] It was not reported in the initial messenger RNA COVID-19 vaccine trials, although the ability to detect rare events was limited by sample size. Since the emergency use authorization, myocarditis in adolescents and young adults after COVID-19 vaccine has been reported.[3-5] In this series, we detail the occurrence of myocarditis after COVID-19 vaccination in an adolescent population, including comprehensive cardiac imaging evaluation and follow-up.

Read the full article here.

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Featured image: A hand holding an mRNA vaccine vial. (Spencer Davis / Unsplash)

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