Cardiology in the Young

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Acute myocarditis following COVID-19 mRNA vaccination: a paediatric case

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Brief Report

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Abstract

Myocarditis is an inflammation of the heart muscle. In this case, a previously healthy, 17-year-old adolescent with myocarditis after BNT162b2 mRNA vaccination was reported. He was admitted to the hospital with severe chest pain, changes in electrocardiography, and elevation in serum troponin level after fourth day of receiving first dose of vaccine. There was no coronary arterial disease in coronary angiogram. A diagnosis of vaccine-induced myocarditis was made, and supportive treatment was initiated.

Since the beginning of 2020, the world has been battling a pandemic caused by the SARS-CoV-2.[1] It is known that the virus causes disease in a variable spectrum and causes involvement of multiple systems, especially the respiratory system. It is known that the most effective way to protect against viral infections is to follow the rules of hygiene and get vaccinated. The mRNA vaccine has been used in our country since April, 2021. The virus as well as the vaccine is reported to cause acute myocardial injury.[2,3] This report presents the characteristics of an adolescent who developed COVID-19 vaccine-induced myocarditis.

Case report

A 17-year-old male patient applied to our emergency outpatient clinic with the complaint of severe chest pain. He was previously healthy and had no significant medical history, recent infection, and known exposure to COVID-19 or drug use. He had the COVID-19 mRNA vaccine 4 days ago, and there was mild sensitivity at the injection site. In his physical examination, body temperature was 38.1 °C, respiratory rate was 16 breaths/minute, resting heart rate was 75 beats/minute, blood pressure was 120/75 mmHg, and oxygen saturation was 98% on room air. His initial electrocardiogram was normal and had no ST changes. In his laboratory evaluation, serum troponin level was 6.9 ng/mL (normal < 0.160 ng/mL), creatine kinase was 383 U/l (normal < 170 U/l), C-reactive protein was 5.7 mg\L (normal <5.0 mg\L), white blood cell count was 9.68×10^3/μL, haemoglobin level was 17.6 g/dL, and brain natriuretic peptide was 105 (normal <125 pg/ml). His blood gases showed a pH of 7.42, HCO3 of 23 mmol/L, and PaCO2 of 39.9 mmHg, and lactate level 1.9 mmol/L. His nasopharyngeal SARS-CoV-2 PCR was negative, and the patient also denied any history of infection with COVID-19. In his chest X-ray, there was not any pulmonary infiltration or cardiomegaly. Transthoracic echocardiogram showed normal myocardial contraction with an ejection fraction of 69%, there was no pericardial effusion or other major cardiac abnormality.

Patient was hospitalised and cardiac catheterisation were performed. He had normal hemodynamic catheter findings, there was no coronary abnormality. His physical activity was restricted, he was monitored. There was no specific rhythm abnormality in 24-hour Holter electrocardiography monitorization, mean heart rate 67 beat/minute (minimum heart rate was 48 beat/minute – maximum heart rate was 124 beat/minute) and he started nonspecific treatment with oral nonsteroidal anti-inflammatory drug (naproxen at 250 mg every 12 hours) and colchicine (1 mg/day). In the second day there was diffuse ST elevation in all derivations in his electrocardiography which supported the diagnosis of vaccine induced myocarditis (Fig 1). On the third day of follow-up, he symptomatically improved, and his serum troponin level started to decrease. On the fifth day, his troponin level was within normal limits, and the patient was discharged. At the second week, normalised cardiac activity was observed in the electrocardiogram performed in the outpatient clinic control (Fig 2). The patient's activity restriction and drug treatment were planned to continue for 4 weeks.

Discussion

In this report, we presented a 17-year-old male with vaccine-induced myocarditis after receiving the first dose of BNT162b2 mRNA vaccine who had no acute SARS-CoV- 2 infection and did not fulfill criteria for multisystemic inflammatory syndrome in children.

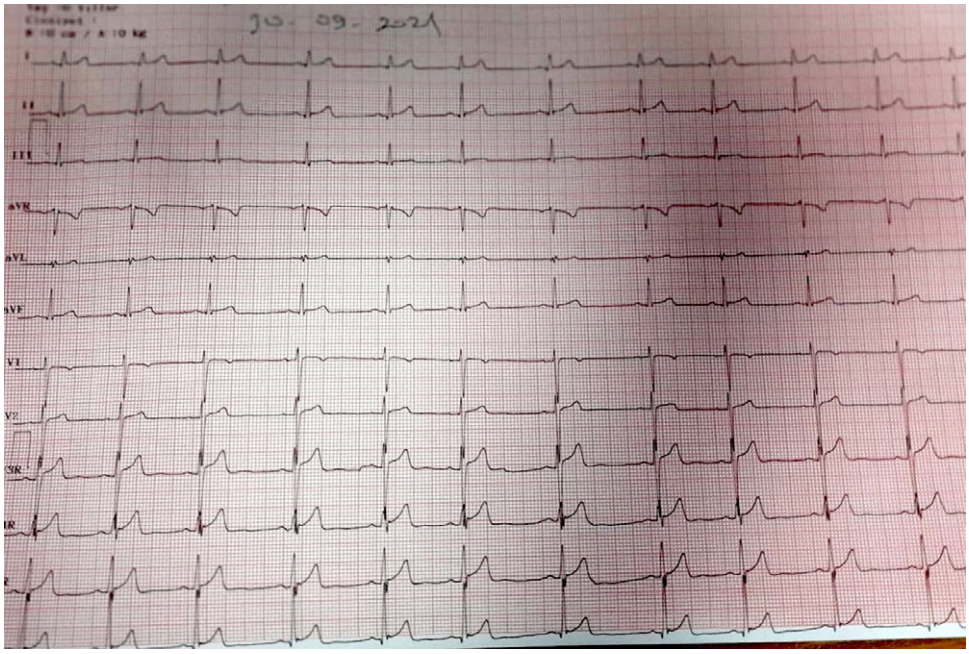

Figure 1. The electrocardiography of the patient after hospitalisation showing diffuse ST elevations.

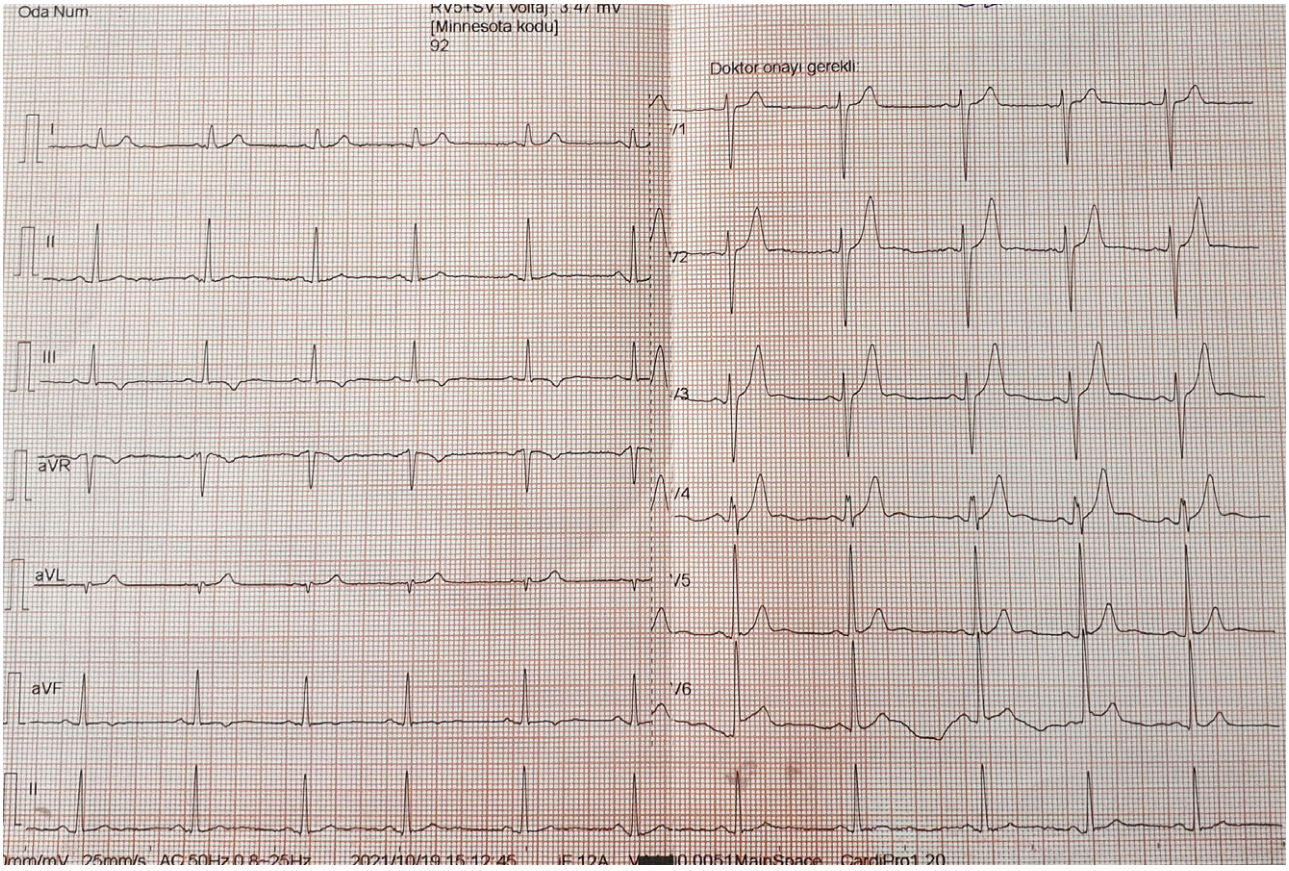

Figure 2. The electrocardiography of the patient at second week of the follow-up.

Although myocarditis often develops due to viral infections or autoimmune mechanisms, it has rarely been associated with vaccination. It has been reported to develop as a side effect soon after some vaccines such as smallpox, Hemophilus influenzae type b, and hepatitis B.[4–6] Post-vaccine myocarditis has been reported frequently in young adults, and it was emphasised that it developed 1 to 5 days after the second dose of the vaccination.[7] Since our case was a young adult male, it can be said that the immune response was stronger in this group, and this situation

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contributed to the development of side effects in a similar way. It is thought that cardiac involvement may develop by immune mechanisms even in mild disease without severe lung involvement in those who have had COVID-19 disease.[8] However, unlike the literature, it is important in terms of showing that myocarditis may develop after the first dose of vaccination in our patient who does not have a history of COVID-19 or contact. Vaccine adverse reactions have been reported for BNT162b2 mRNA vaccine, including injection site pain, fatigue, myalgia, chills, arthralgia, fever, injection site swelling or redness, nausea, malaise, and lymphadenopathy.[9] Although, a causal relationship between vaccination and myocarditis has not been proven due to this case, we think that it should be considered that an additional adverse reaction such as myocarditis/myopericarditis may develop after the first dose of vaccination.

In addition, we would like to emphasise that vaccination is our most important weapon in getting rid of the COVID-19 pandemic and that vaccination should not be abandoned due to such rare risks. Our recommendation is to inform healthcare professionals about the risk of myocarditis as a potential side effect that may develop even after the first dose and to diagnose myocarditis without unnecessary invasive procedures.

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Conflicts of interest. None.

Author contribution. The authors confirm contribution to the paper as follows: Conception and design, data collection, interpretation of data, draft manuscript preparation: DG and SE.

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