Strain Echocardiography and Cardiac MRI Evaluation of a Symptomatic Myopericarditis after the Pfizer-BioNTech mRNA COVID-19 Vaccine

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Abstract

Background: The COVID-19 pandemic and the accompanying new generation vaccines have entered our lives with many unknown effects. Method and result: This is a case report of myopericarditis diagnosed with fever and chest pain 3 days after the 2nd dose of Pfizer-BioNTech COVID-19 mRNA Vaccine in an 18-year-old man. The diagnosis was confirmed by cardiac MRI(CMR), but we presented that this diagnosis and follow-up could be made accurately with strain echocardiography(SE). Conclusion: It would be beneficial for the cardiologists who perform the primary follow-up of these patients to know that it is possible with SE to support the diagnosis and follow-up of these patients, even if CMR is not accesible.

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COVID-19 Vaccine Myopericarditis and Strain Echo

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Method and result:

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Conclusion:

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Key Words: COVID-19 vaccine; myocarditis; pericarditis; strain echocardiography

Introduction:

The Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) causes Coronavirus disease 2019 (COVID-19). While this disease is considered as respiratory tract disease in first days of pandemic, now we know that it can present with a wide variety of complications which include cardiovascular system(1).

After pandemic, the searchs for the vaccines for the disease began and a significant decline in COVID-19 mortality occured after these COVID-19 vaccines(2).

Because of both, COVID-19 itself and mRNA vaccines, are new developed and their spectrum of effects are unknown, some new questions raises. There are some reports about the myocarditis related to different types of COVID-19 vaccines, but there are limited datas(3).

Here we will present an adolscent who developed symptomatic myopericarditis after the Pfizer-BioNTech mRNA COVID-19 vaccine, and the diagnosis process evaluation with Strain Echocardiography (SE) and Cardiac MRI(CMR.)

Case:

An 18-year-old male patient suffered from persistent fever and chest pain 3 days after the second dose of the Pfizer-BioNTech mRNA COVID-19 vaccine. His electrocardiograpy (ECG) and hemogram were normal. Peak cardiac troponinI/CRP was 44.1 ng/L/44.1 mg/L. No lymphocytosis, neutrophilia, monocytosis, eosinophilia were observed.

There was a minimal pericardial effusion on echocardiography with the normal systolic and diastolic functions.

COVID-19 PCR test, EBV, CMV, Toxoplasma, Rubella, HIV, AntiHCV, HbsAg, Rubeola and Mumps serological tests were negative.

The patient was considered as myopericarditis. Metoprolol-perindopril-colchicine and non-steroidal anti-inflammatory treatment were started.

The SE and CMR examinations were performed during the patient's first hospitalization and control SE was performed just before discharge.

CMR showed on T2-weighted imaging, increased bright signal intensity as myocardial edema and increased global early gadolinium enhancement ratio between myocardium and skeletal muscle as myocardial injury, especially on anterior wall, minimal pericardial effusion and depressed sytolic function as left ventriculer ejection fraction (LVEF) 44.3%. These findings were in favor of acute myocarditis(Figure 1).

Although traditional-2D and doppler echocardiographic(TE) findings were normal, depressed circumflexian and longitudinal strain values were observed in the SE on anterior wall (Figure 2).

In the follow-up of the patient, TE findings were still normal, while a moderate increase in strain values was observed before discharge(Figure 3).

The patient was discharged on the 7th day with recovery after treatment. All examinations performed during the treatment process were performed with the informed consent of the patient.

Discussion:

Because of the most of the myopericarditis are asymptomatic, the incidence and prevalence of this disease is not known exactly. But it is suspected to be in the range of 1-10 cases per 100.000 persons and had a variable autopsy prevalence(2–42%). The causes of myocarditis include infectious and autoimmune etiologies(4).

In literatüre review in myocarditis cases after COVID-19 vaccination, nearly all of them had high TI, most of them had abnormal ECG. Only a half of them had abnormal echocardiographic findings. There were late gadolinium enhancement and myocardial edema on cardiac MRI as a suggestion for myocarditis on patients(1).

Although myopericarditis can be seen in the current immunization process after many vaccines(3).

In recent studies, presented patients were male and aged between 14-19 years-old. All of the myopericarditis occured after second dose of vaccine. And approximately 60% of myocarditis developed especially after the Pfizer-BioNTech mRNA vaccine (5).

The mechanism of the COVID-19 vaccine associated myocarditis can be due to cross-reaction between the antibodies against SARS-CoV-2 spike glycoproteins and α-myosin(6).

CMR became the primary non-invasive test to assess the myocardial inflammation in patients with suspected myocarditis (7).

SE is a technique of echocardiograhy which allows assessing left ventricular contractility better than TE, especially in individuals with normal systolic functions (8).

CMR and SE have been compared in the diagnosis and follow-up of myocarditis in several studies, these studies presented the inflammation detection as wall motion abnormalities are correlated between the SE and CMR (9). According with this data, although CMR had a certain place for the diagnosis and follow-up of myocarditis, we think that SE is an effective method to diagnose and follow these patients in case of CMR cannot accessible.

As in our case, Beata et al. prensented that myocarditis can successfully diagnosed with SE(10). In our patient, similar data with CMR and SE were obtained and these values in SE improved before discharge. While it is a more practical and cost-effective on follow-up with SE than CMR , also SE can be used for accuracy of diagnosis in cases where CMR is not available.

Management of these patients vary due to the patient's age as similiar with non-vaccine myopericarditis; clinical presentation-comorbidities-hemodynamic stability are importent for patients' management, Nonsteroidal anti-inflammators(NSAI), steroids, colchicine are the main treatments .beta-blockers and renin-angiotensin-aldosterone system inhibitors can use(6).

Conclusion:

Although it is a confusing question which patients are at risk of myocarditis after the COVID-19 vaccines, given the protective role of these vaccines against COVID-19 mortality, it is certain that this limited and curative side effect is not a cause for hessitation in vaccination. And it would be beneficial for the cardiologists who perform the primary follow-up of these patients to know that it is possible with SE to support the diagnosis and follow these patients, even if CMR is not accesible.

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Figure 1 – Myocardial edema and pericardial effusion were observed in cardiac MRI, consistent with acute myocarditis.(LV:left-ventircule, RV: right ventricule, white arrow: pericardium)

Figure 2 - While the ejection fraction is normal in echocardiography, low global longitudinal and circumflexial strain were observed. In a patient with normal systolic function, this supports the diagnosis as much as cardiac MRI. The low strain value was observed that this strain reduction is especially in the anterior wall.

Figure 3 - The improvement in the strain value of the patient before discharge is remarkable, the area with decreased in strain on the anterior wall was observed getting smaller. In the follow-up and also for a supportive to diagnosis of these patients, strain echocardiography is more accessible than cardiac MRI.