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The first report of myocarditis followed by AstraZeneca vaccination in Iran

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Case Report

Abstract

BACKGROUND: Coronavirus disease 2019 (COVID-19) is an emerging disease caused by the coronavirus. The initiation of vaccination significantly reduced the incidence and mortality of these patients. Some studies reported myocarditis as a rare complication after messenger ribonucleic acid (mRNA)-based vaccines (such as Pfizer).

CASE REPORT: The patient was a 26-year-old man without any history of the underlying disease with typical chest pain which spread to the back and left arm; he was diagnosed with myocarditis after the second dose of the AstraZeneca vaccine. The mechanism of myocarditis after AstraZeneca is not known precisely. It seems to be due to the AstraZeneca vaccine using adenovirus as a vector of the spike (S) protein of the virus, and it causes the production of antibodies in the body, while adenovirus can be one of the causes of myocarditis. On the other hand, it may be due to spike protein-mediated toxicity, which causes an inflammatory reaction such as myocarditis after the virus protein enters the bloodstream and eventually accumulates in various tissues, including the heart.

CONCLUSION: Myocarditis is a rare complication of the AstraZeneca vaccine, and this study could not recommend neglecting this vaccine.

KEYWORDS: AstraZeneca; Vaccination; Myocarditis; COVID-19; Iran

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Introduction

Coronavirus disease 2019 (COVID-19) is an emerging disease caused by the coronavirus, which spread rapidly worldwide and led to a global pandemic.[1] The most common symptoms in patients with COVID-19 include fever, cough, fatigue, dyspnea, and the sputum.[2] Due to the lack of therapeutic drugs, the mortality rates in these patients were high. At present, vaccination and full observance of health protocols are the best measures to prevent this disease.[3] A vaccine is one of the great discoveries in medicine and has significantly reduced the burden of infectious diseases.[4] Some countries of the world started to make vaccines against this virus, and some of them were able to take the necessary use licenses.[4] Vaccines are not completely safe, despite proven safety and approval by relevant organizations.[4] For example, COVID-19 vaccinations often cause minor side effects, such as pain, swelling, redness at the injection site, and systemic symptoms of fatigue, headache, muscle pain, fever, and chills. Side effects after the second dose may be more severe than the first dose.[5] On the other hand, myocarditis has been reported as a rare complication after vaccination, especially smallpox, influenza, hepatitis B vaccination, or

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other vaccinations.[6] Myocarditis (inflammation of the heart muscle) after messenger ribonucleic acid (mRNA)-based vaccine (such as Pfizer) has been reported in a study.[7] To assess the safety and security of the Pfizer vaccine, the Israeli government conducted a study of 884828 vaccine recipients and the same number of control groups and found that vaccination increased the risk of myocarditis. Moreover, in the analysis of the COVID-19 group, which included 173106 patients and the same number of control group, it was found that COVID-19 infection also increased the risk of myocarditis. It has been one of the most important possible complications after the myocarditis vaccine (2.7 cases per 100000 people). They eventually concluded that it probably increased the risk of myocarditis (11 cases per 100000 people), which is higher than vaccine-induced cases. Finally, the risk ratio for myocarditis after vaccination and after COVID-19 infection was 2.3 and 2.18, respectively.[7] Myocarditis can cause a range of manifestations, from mild asymptomatic inflammation of the heart to severe heart failure and heart death.[8] Our study was the first report of myocarditis after the AstraZeneca vaccine in Iran.

Case Report

The patient was a 26-year-old man with no history of underlying disease, no history of smoking, and no family history of any disease (including heart disease, psychological disease) who had been injected with the second dose of AstraZeneca vaccine 4 days before hospitalization. He had no history of smoking, drug, or alcohol use. The patient was referred to the hospital with typical chest pain, which spread to the back and left arm. He did not have shortness of breath, sweating, nausea, and vomiting. The polymerase chain reaction (PCR) test of COVID-19 was negative for the patient. A chest computed tomography (CT) scan did not show COVID-19 involvement. Two-step troponin was positive in the patient but coronavirus reverse transcription-PCR (RT-PCR) test was negative. Echocardiography and electrocardiography (ECG) were requested for the patient. He was admitted to the cardiac care unit (CCU) with a diagnosis of post-vaccination myocarditis, and the necessary treatments were performed for the patient. The patient was hospitalized for 8 days and finally underwent outpatient treatment and regular follow-up with echocardiography for 6 months. Due to the patient's stable condition, supportive treatment was performed for him, which included aspirin (80 mg/daily/for 6 months), captopril (12.5 mg/twice-daily/for 6 months), carvedilol (3.125 mg/twice-daily/for 6 months), atorvastatin (40 mg/daily/for 3 months), Nitrocontin (2.6 mg/twice-daily/for 6 months), and heparin [5000 mg/intravenous (IV)/four times a day].

Informed consent was obtained from the patient. The National Committee has approved this project on Ethics in Research and Deputy of Research and Technology of Kurdistan University of Medical Sciences, Sanandaj, Iran, with Code IR.MUK.REC.1399.325.

The laboratory tests, echocardiography, and ECG results can be seen in table 1 and figures 1 and 2, respectively.

Figure 1. Normal left ventricular (LV) size, normal heart valves, and normal LV ejection fraction (LVEF) (LVEF: 60%)

Table 1. Laboratory test results

Laboratory investigations	Results	Laboratory investigations	Results
Hematological			
Hemoglobin	14.0 g/dl	MCV	76.4 fl
Total leukocyte count	4100 /mm^3	Neutrophils	60%
Platelet count	199 × 10^9/l	Lymphocytes	30%
RBC count	5.46 million /mm^3	ESR	8 mm at 1 hour
Biochemical			
BUN	14 mg/dl	Random blood sugar	90 mg/d
Serum creatinine	1 mg/dl	LDH	620 U/l
Serum sodium	140 mmol/l	CPK	310 U/l
Serum potassium	3.8 mmol/l	Serum phosphorus	5 mg/dl
Serum calcium	10 mg/dl	TGs	173 mg/dl
Serum ALT	35 U/l	LDL	75.4 mg/dl
Serum AST	19 U/l	HDL	29 mg/dl
Serology			
CRP	Negative	Troponin	Positive

MCV: Mean corpuscular volume; RBC: Red blood cell; ESR: Erythrocyte sedimentation rate; BUN: Blood urea nitrogen; TG: Triglyceride; LDH: Lactate dehydrogenase; CPK: Creatine phosphokinase; ALT: Alanine transaminase; AST: Aspartate transaminase; LDL: Low-density lipoprotein; HDL: High-density lipoprotein; CRP: C-reactive protein

According to table 1, the laboratory test was normal, and troponin was positive. On the other hand, according to figure 1, heart valves and left ventricular ejection fraction (LVEF) were normal in echocardiography. The ECG was normal as well (Figure 2).

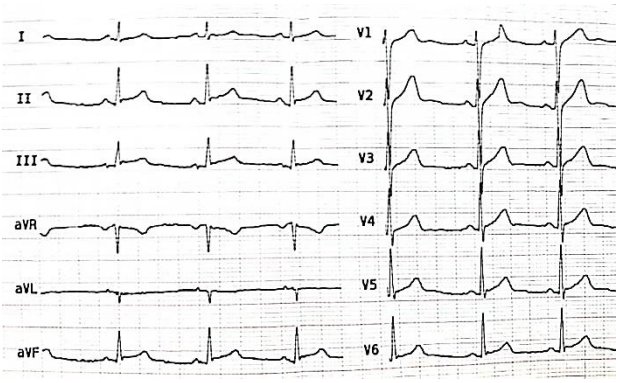

Figure 2. Normal and regular sinus rhythm, normal axis, and heart rate of 65 beats per minute (BPM)

Finally, the patient was followed up for six months; the treatment was successful, and all patient symptoms and imaging findings improved.

Discussion

Myocarditis is one of the rare complications of COVID-19 vaccination that has been reported in some limited studies. This is the first official report of myocarditis following the AstraZeneca vaccine in Iran. Due to the negative tests for COVID-19 and standard laboratory and imaging tests, it is possible that myocarditis in this patient was due to vaccination; however, to prove this, more studies and an understanding of its mechanism are needed. Israel Ministry of Health reported that the incidence of post-vaccination myocarditis was 1 in 3000 to 1 in 6000 after vaccination, but most cases resolved within a few weeks.[9] Different types of viruses are one of the causes of myocarditis.[10-12] For example, adenoviruses can cause infections in cardiomyocytes, fibroblasts, and endothelial cells of the heart.[10,12] The mechanism of myocarditis after AstraZeneca is not known precisely. It seems to be because the AstraZeneca vaccine uses adenovirus as a vector of the spike (S) protein of the virus, and it causes the production of antibodies in the body, while adenovirus can be one of the causes of myocarditis.[10] On the other hand, it may be due to spike protein-mediated, which causes an inflammatory reaction such as myocarditis after the virus

protein enters the bloodstream and eventually accumulates in various tissues, including the heart.[13] The rare side effects of vaccination against COVID-19 should not make us doubt. As a recommendation from scientific communities, the benefits of COVID-19 vaccines are more than the rare side effects; therefore, COVID-19 vaccination is strongly recommended.[14]

Conclusion

Myocarditis is a rare complication of the AstraZeneca vaccine, but it is more common in patients with COVID-19.[7] This study could not recommend neglecting it. This rare side effect should not be suspected in vaccination against this disease, and COVID-19 vaccination is recommended.

Conflict of Interests

Authors have no conflict of interests.

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