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A Case Report on COVID-19 Vaccination Induced Heart Failure

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Abstract: ***Heart failure following the COVID-19 vaccination has been documented as a rare side effect. In this report, we describe the case of a 61-year-old woman with a history of heart disease in her family and previously detected mild atherosclerotic coronary artery disease who, 4 months after receiving her third dose of COVISHIELD vaccination against the COVID-19 virus, developed heart failure with a significantly reduced ejection fraction. Laboratory tests showed increased levels of N-terminal pro-brain natriuretic peptide (NT-proBNP). An ECG was taken, which indicated sinus rhythm (SR) at 114, left bundle branch block (LBBB), and QRS-125. An echocardiogram (ECHO) was done, which revealed Left Ventricular global hypokinesia, LVEF 30% MOD MR RV dysfunction, and dilated LA/RA RV dysfunction. Hence, she was diagnosed with heart failure with reduced ejection fraction (LVEF of 32%) and dilated cardiomyopathy with severe LV dysfunction. She was successfully discharged with advice to follow up regularly and with appropriate medical management. Through this case report, we aim to raise awareness of the potential for the COVID-19 vaccination to trigger certain immunological reactions that could probably lead to heart failure in an already predisposed individual who is at risk of myocardial injury.***

Keywords: COVID-19, Heart failure, COVISHIELD, Vaccination

1. Introduction

The COVID-19 virus and its potentially fatal consequences can be prevented in large part by vaccination. However, immunisations might cause unfavourable reactions that, in rare instances, may have fatal outcomes, including myocarditis. [(1)] There have been rare reports of heart failure occurring after COVID-19 vaccinations, but it is important to note that the incidence of heart failure following vaccination is very low, and in most cases, the benefits of vaccination outweigh the risks. It is important to emphasize that the overall risk of severe illness, hospitalisation, and death from COVID – 19 is much higher than the risk of myocarditis or pericarditis from vaccination. These vaccines have been shown to be highly effective in preventing severe illness and death from COVID – 19 and widespread vaccination is a critical tool in controlling the pandemic. [(2)]

As the world continues to grapple with the COVID-19 pandemic, vaccines have emerged as a critical tool in the fight against the disease. While vaccines have been shown to be highly effective in preventing severe illness, hospitalisation, and death from COVID-19, there have been rare reports of adverse events associated with vaccination. One such event is heart failure, which has been reported in some individuals following COVID-19 vaccination.

The precise mechanism by which COVID-19 causes myocardial injury is still unknown. However, it is suspected that the main mechanisms involved in the myocardial lesions are direct damage to cardiomyocytes, caused by systemic inflammation, myocardial interstitial fibrosis, and exaggerated cytokine responses by type-1 and type-2 T-helper cells, destabilisation of coronary plaque, hypoxia, and interferon-mediated immune responses. [(3)]

However, it is important to note that the risk of heart failure as a result of vaccination is much lower than the risk of heart failure from the disease that the vaccine is designed to protect against. [(4)]

2. Case Report

A 61 year old female with a family history of heart disease consulted a physician as she had an episode of chest discomfort. She also had a similar episode of angina on the way to the hospital. Physician advised her to take ECG. In view of ECG changes, she presented to a cardiologist on 2nd December 2020. Upon history taking, it was found that she is diabetic for 10 years, on oral hypoglycemic agents (OHA) and s/p thyroidectomy due to multiple nodular goitre. The initial physical examination showed normal blood pressure and no apnea on exertion (AOE), with no signs of cardiac congestion. She was also found to have fair effort tolerance.

Also Echocardiography done on 2/12/2020 showed a Normal LV Systolic Function, no RWMA. Hence, cardiologist advised admission for performing CAG. On angiogram she was detected to have Minor Atherosclerotic Coronary Artery Disease.

Later, she got vaccinated against COVID-19 with COVISHIELD vaccine for all three doses, her first dose, second dose and third dose taken on 26th July 2021, 25th October 2021 and 21st July 2022 respectively.

On 17/12/2022, i. e.4 months after her third dose of covid vaccination, she came for review due to shortness of breath and cough. Chest examination revealed crepitus which is more on left than right, Spo2-98% and X-ray detected cardiomegaly. One week later, i. e. on 27/12/2022, the laboratory tests showed increased levels of NT-pro B-type natriuretic peptide (NT-proBNP), An ECG was taken, which indicated SR AT 114, LBBB, and QRS-125. An ECHO was done, which revealed LV global hypokinesia, LVEF 34% MOD MR RV dysfunction, and dilated LA/RA RV dysfunction. She was diagnosed with Heart failure with reduced ejection fraction (LVEF-34%) and dilated cardiomyopathy with severe LV dysfunction. Hence, she was planned on performing CAG after stabilisation and medical management. Now she is on follow-up with Aspirin, Digoxin, Atorvastatin, Carvedilol, Furosemide and Spironolactone.

ECHO done on 06/02/2023 revealed mild LV systolic dysfunction [LVEF=44%] showing a mild increase in cardiac contractile function over a period of one month as she was put on cardiac glycoside. Follow up ECHO performed 2 months later revealed moderate LV systolic dysfunction [LVEF =34%] raising a suspicion of poor prognosis to current management. Patient is on regular follow up with periodic ECHO studies to determine further modifications in conservative management.

3. Discussion

Vaccination is an important aspect of preventive and public health care, but it is not without risks. [5] Myocarditis and pericarditis following COVID 19 vaccination are reported several times in literature. [1, 5, 6] Myocarditis is an inflammation of the heart muscle; when combined with pericarditis, an inflammation of the thin tissue surrounding the heart (the pericardium), the condition is known as myopericarditis. [7] Complications of myocarditis may lead to heart failure. [8] To our knowledge, this is one among the very few case reports to raise suspicion that COVID 19 vaccination may lead to the development of heart failure in an individual, similar findings being reported in an otherwise healthy young male following the BNT162b2 mRNA-PfizerBioNTech vaccine. [9] Despite the fact that the precise origin and mechanism of the myocardial injury remain unknown, there are some theories that imply post-vaccination lymphocytic infiltration may contribute to immune-mediated cardiac injury. [9]

In this case report, emphasis is on the possibility of post-vaccination systemic inflammatory responses and cytokine responses triggered by immune-mediated humoral and cellular mechanisms in inducing cardiac contractile dysfunction in genetically predisposed individuals or those who already have minor atherosclerotic coronary artery disease pre-vaccination.

However it is important to note that any suggestion of a link between the mRNA-COVID-19 vaccination and heart failure in this case is still just conjecture. Despite the timely correlation between the patient's onset of symptoms and the time of vaccination, it cannot be disputed that this case scenario could also be entirely coincidental.

4. Conclusion

Cardiac manifestations are common complications of COVID-19. [7] Among these the most commonly reported cases are acute myocarditis [8, 9], heart failure [10, 11], arrhythmias [12] and acute coronary syndrome [13]. As the primary step to prevent all these life-threatening complications arising from COVID-19 infection, the first and foremost strategy is to stop the virus from entering the body through social seclusion, virus eradication through medication or vaccination, or both. [13] However, the question that now emerges in light of instances like the one described in this case report, which cast doubt on the validity of the safety of the COVID vaccines, is whether or not the preventive measure itself becomes a bane for certain vulnerable, predisposed individuals. " This case report was primarily aimed to increase awareness regarding rare adverse effects of COVID-19 vaccine-associated myocardial injury, so that patients who present post-covid vaccinated with symptoms closely indicating a cardiac injury will not go overlooked but shall be assessed and managed appropriately and also well on time.

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Conflicts of Interest

There are no conflicts of interest.

Abbreviations

COVID-19: Coronavirus disease of 2019
ECG: Electrocardiogram
LVEF: Left ventricular ejection fraction
MOD: Method of discs
MR: Mitral regurgitation
RV: Right ventricular
LA: Left atrium
RA: Right atrium
CAG: Coronary angiogram

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