



Presentation of a case of chest pain leading to coronary artery bypass grafting (CABG) following the third dose of COVID-19 vaccination and an overview of the possible causes of chest pain after COVID-19 vaccination

Manouchehr Hekmat¹, Hamid Ghaderi¹, Zahra Ansari Aval^{1*}, Naser Kachoueian², Mahya Hekmat³, Roshanak Tirdad⁴, Seyedeh Adeleh Mirjafari⁵

¹Department of Cardiovascular Surgery, Shahid Beheshti University of Medical Sciences, Tehran, Iran

²Department of Cardiac Surgery, Imam Hossein Educational Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran

³Shahid Beheshti University of Medical Sciences, Tehran, Iran

⁴Department of Neurology, Shahid Beheshti University of Medical Sciences, Tehran, Iran

⁵Department of Pediatrics, Shahid Beheshti University of Medical Sciences, Tehran, Iran

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ABSTRACT

In the wake of widespread COVID-19 vaccinations, a variety of complications have been reported. Among these, cardiac ischemia stands out as a rare, but significant and potentially dangerous complication, which can progress to myocardial infarction and pose a serious threat to one's life. Our patient was a 54-year-old man with no risk factors, who developed chest pain five days after the third dose of the COVID-19 vaccine. Notably, he exhibited no symptoms after the first and second doses. For four months, the patient's symptoms were attributed to inflammatory complications, such as pericarditis and myocarditis, as well as gastrointestinal problems. During this period, he received symptomatic treatment. Due to the persistence of symptoms, heart examinations were conducted, which revealed a constriction at the end of the left main coronary artery. Consequently, the patient underwent coronary artery bypass grafting (CABG). Following cardiac revascularization, the patient's symptoms were successfully alleviated. Furthermore, his cardiac symptoms were successfully resolved during a six-month follow-up period. The mechanism through which asymptomatic plaques in the coronary vessels are activated following the COVID-19 vaccination or infection remains unclear. Regardless of the cause, any chest discomfort experienced after COVID-19 vaccination or infection should be treated with utmost seriousness, and examinations for acute coronary syndrome should be conducted.

Implication for health policy/practice/research/medical education:

Although cardiac ischemia following COVID-19 vaccination is rare, it can be life-threatening. In instances of COVID-19 infection or post-vaccination, any chest discomfort should be taken seriously. It is recommended that heart examinations akin to those performed for acute coronary syndrome be conducted. Post-vaccination, any chest pain experienced should be treated with utmost seriousness. In addition to considering conditions, such as pericarditis or myocarditis, it is also important to check for reduced blood supply to the heart and ischemia, even if the ECG (electrocardiogram) results appear normal.

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Introduction

In the wake of the COVID-19 pandemic and given the proven effectiveness of vaccines against this disease,

vaccination has been implemented on a large scale. Following the confirmation of the effectiveness of the COVID-19 vaccination (1), different types of vaccines

*Corresponding author: Zahra Ansari Aval, Email: Z.ansari@sbm.ac.ir, zahraansariaval@gmail.com

have been approved for use in emergency situations (2,3). To date, more than 18 different vaccines have received approval and have been administered worldwide (4). Various complications have been reported following COVID-19 vaccination, including stroke, pulmonary embolism (5), and progressive arterial thrombosis (6). Kidney injury, dysfunction of renal disease (7,8).

Following COVID-19 vaccination, symptoms, such as chest pain (9), myocardial infarction (9), and acute myocardial injury (10), have been reported. Chest pain is often associated with myocardial or pericardial involvement. However, instances of myocardial infarction or myocardial ischemia after vaccination have not been widely reported. In this article, we present a case where a patient experienced chest discomfort after receiving the third dose of the COVID-19 vaccine, which ultimately necessitated coronary artery bypass grafting (CABG).

Case Presentation

The patient was a 54-year-old man, who felt chest discomfort five days after the third dose of the COVID-19 vaccine. Following the first and second doses of the COVID-19 vaccine, the patient did not experience any significant complications, and the initial examinations revealed no pulmonary symptoms. Given that the patient did not report any risk factors or family history, his condition was attributed to gastrointestinal symptoms, and he was prescribed pantoprazole tablets. Due to a lack of significant improvement, the patient revisited the doctor a week later, who suspected pericarditis or myocarditis and prescribed treatment with nonsteroidal anti-inflammatory drugs and aspirin (ASA) for a period of three weeks. However, this treatment regimen did not yield effective results.

Upon the patient's return visit, an electrocardiogram (ECG) was performed, which yielded normal results. An echocardiography was also conducted, reporting an ejection fraction of 50% and mid and anterolateral hypokinesia. Subsequently, a thallium gated single-photon emission computerized tomography scan was performed in both the stress and rest phases. This scan revealed moderate ischemia in the apex and lateral wall of the heart. An angiography was then conducted, which revealed moderate stenosis at the end of the left main coronary artery. This condition could not be addressed with stenting; hence, the patient was recommended for on-pump CABG surgery. During the procedure, three grafts were performed on the patient. The left internal mammary artery was grafted to the left anterior descending artery, and saphenous vein grafts were performed on the obtuse marginal 1 and 2 arteries (OM1 and OM2). The surgery was successful, and the patient was discharged six days postoperatively without any complications. Follow-ups conducted at one month, six months, and one year after surgery revealed that the patient did not experience any cardiac symptoms.

Discussion

While COVID-19 vaccinations have proven effective, they have been also associated with a variety of cardiac and inflammatory complications, such as infarction, pericarditis, myocarditis, thrombosis, and ischemia (5-7,11). Cardiac symptoms have been observed following each dose of vaccination and have been associated with various types of vaccines (4,9-11). A study involving 207 patients who experienced chest pain after receiving the COVID-19 vaccine and sought emergency care revealed that a significant majority of them (95.65%) had normal ECG results. This suggests that the origin of the pain was non-cardiac. The most common cardiac findings in these patients were myocarditis and pericarditis (11).

In this regard, a systemic review study was conducted on 577 articles over a span of two years. The study found that 20 patients experienced myocardial infarction post-vaccination. These cases were reported with various types of vaccines and typically occurred within two days of vaccination (the time window ranged from 0-10 days). The gender distribution was fairly balanced, with 55% of the patients being men and 45% women. The average age of these patients was 63.5 years, ranging from 33 to 96 years. These instances of myocardial infarction were observed following both the first and second doses of the vaccine. It should be noted that at the time the article was published, the third and subsequent doses were still recommended (12).

Several hypotheses have been put forth to explain the occurrence of ischemia following COVID-19 vaccination or infection. One such theory suggests that prothrombotic conditions arising from autoimmune responses could be a potential cause (5-7,13,14). Several other hypotheses have also been proposed to explain the occurrence of ischemia following COVID-19 vaccination or disease. These include increased cardiac demand due to heightened pressure on the heart (15) and allergenic vasospasm, also known as Kounis syndrome, which involves an increase in the level of immunoglobulin E antibodies (16). Additionally, the heightened psychological stress experienced during the COVID-19 era could potentially transform chronic stable plaques into susceptible plaques, thereby leading to a coronary syndrome (17).

Based on a study conducted on the United States Vaccine Adverse Event Reporting System (VAERS) and the European database (EudraVigilance), it has been observed that COVID-19 vaccination can cause an expressive response in some individuals. This response can lead to autoimmune cardiac injuries, which can result in hypercoagulability in the blood and myocarditis (18); these conditions can exert additional pressure on the heart (13). An increase in autoimmune reactions, coupled with heightened blood hypercoagulability, can lead to an increase in cardiac workload and a greater need for oxygen in cardiac tissues. These factors can potentially trigger symptoms in previously asymptomatic plaques (12).

A recent analytical article published in 2023 (19) suggests that SARS-CoV-2 can directly infect and damage coronary arteries, contributing to the formation of plaques in these arteries. Until now, the role of SARS-CoV-2 infection in increasing cardiovascular attacks has been attributed to inflammation and coagulation issues. In both of these pathways, vascular blockage through clot formation has been proposed. A third pathway has now been proposed, which involves the facilitation of plaque formation in the coronary arteries. The findings of this research have been surprising for researchers, as SARS-CoV-2 is the only known respiratory infection virus with documented evidence of its ability to directly damage the walls of blood vessels(19).

Conclusion

While myocardial infarction following COVID-19 vaccination is a rare occurrence, it can pose a serious threat to one's life. Any chest discomfort experienced should be treated with utmost seriousness, and an investigation for acute coronary syndrome should be conducted. This holds true even if the discomfort manifests several months after vaccination.

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Authors' contribution

Conceptualization: Manouchehr Hekmat.

Data curation: Seyedeh Adeleh Mirjafari.

Formal analysis: Seyedeh Adeleh Mirjafari.

Funding acquisition: Mahya Hekmat.

Investigation: Roshanak Tirdad.

Methodology: Hamid Ghaderi.

Project administration: Hamid Ghaderi.

Resources: Roshanak Tirdad.

Supervision: Hamid Ghaderi.

Validation: Naser Kachoueian.

Visualization: Manouchehr Hekmat.

Writing—original draft: Hamid Ghaderi.

Writing—review and editing: Zahra Ansari Aval.

Conflicts of interest

The authors declare that they have no competing interests.

Ethical issues

This case report was conducted in accordance with the principles outlined in the World Medical Association Declaration of Helsinki. Written informed consent was obtained from the patient for the publication of this case report. The authors have observed ethical issues, including no plagiarism, no data fabrication, and no double publication.

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