Two case reports of acute ST-elevation myocardial infarction after COVID-19 vaccination: Co-incidence or causal-association?

Barun KUMAR[1*], Vikas SABBARWAL[2], Abhimanyu NIGAM[3], Pranay GORE[4], Gaurav CHAUHAN[5], Anshuman DARBARI[6]

Affiliations:

[1] M.D., D.M., Associate Professor, Department of Cardiology, All India Institute of Medical Sciences - Rishikesh, Uttarakhand, India.

[2] M.D., Senior Resident, Department of Cardiology, All India Institute of Medical Sciences - Rishikesh, Uttarakhand, India.

[3] M.D., Senior Resident, Department of Cardiology, All India Institute of Medical Sciences - Rishikesh, Uttarakhand, India.

[4] M.D., Senior Resident, Department of Cardiology, All India Institute of Medical Sciences - Rishikesh, Uttarakhand, India.

[5] M.D., Senior Resident, Department of Cardiology, All India Institute of Medical Sciences - Rishikesh, Uttarakhand, India.

[6] M.S., M.Ch., Associate Professor, Department of CTVS, All India Institute of Medical Sciences - Rishikesh, Uttarakhand, India.

Corresponding author:

Dr. Barun Kumar, Associate Professor, Department of Cardiology, All India Institute of Medical Sciences - Rishikesh, Uttarakhand, India. E-mail: drbarun79@gmail.com, barun.cardio@aiimsrishikesh.edu.in

Abstract

We describe two cases of presumed inflammatory and thrombotic response to vaccination with the Astra-Zeneca vaccine, COVISHIELD (ChAdOx1 nCoV- 19 Corona Virus Vaccine). The first case explained here is of a 76 old male who developed cardiac symptoms within 20 hours of receiving the vaccination. The second case is of a 60-year-old male admitted with retrosternal chest pain developing within 30 minutes of receiving the vaccine. The literature search was conducted to review reports of COVID-19 vaccination-related cardiac ischaemic events and thus emphasize the need for awareness of vaccine providers for such co-incidence to provide timely support to the patient.

INTRODUCTION

COVID-19 pandemic has become the leading cause of concern for the health and political systems worldwide. In less than a year, the COVID-19 vaccination program was introduced, which is landmark progress in research and development. Consequently, The Central Drugs Standard Control Organization (CDSCO) in India authorized two vaccines, i.e., Covishield ("ChAdOx1 nCoV-19 Corona Virus Vaccine": The AstraZeneca vaccine manufactured by Serum Institute of India) and Covaxin (manufactured by Bharat Biotech Limited), on January 03, 2021. The initial experience with vaccination revealed this to be a relatively safe and tolerable vaccine [1]. However, there are reports of haemorrhage, blood clots, and thrombocytopenia following the administration of COVID-19 vaccines that have raised some concerns. To elucidate whether a risk factor is present for myocardial infarction (MI) after this vaccination, we extracted data from the various health agencies and reviewed previous reports of COVID vaccination-related cardiac ischaemic events [2, 3].

This report describes two patients who suffered acute ST-elevation myocardial infarction following the first dose of the Covishield vaccine and was referred to our tertiary care setup for management.

CASE REPORTS

Case 1

A 76-year-old healthy male with no history of pre-existing cardiac disease has received the first dose of the Covishield vaccine after following all the protocols at a designated vaccination centre. After 20 hours post-vaccination, he developed acute severe chest pain radiating to the left arm associated with sweating, followed by a brief episode of loss of consciousness with spontaneous recovery. On presentation at our centre, the patient was conscious; his pulse rate was 58/min, blood pressure was 104/62 mm of Hg and SPO2 was 99% at room-air. He had no history of

TAKE-HOME MESSAGE

We encountered two cases of acute ST-elevated myocardial infarction within 24-hours after the first dose of the Covishield vaccine. We cannot say with certainty that this vaccine can make the population vulnerable to myocardial infarction (MI). Still, awareness of the vaccine providers and caregivers in the family about the scarce possibility of MI following COVID-19 vaccination is essential.

Author Contributions: Conceptualization, data curation, writing– original draft: BK. Writing – review & editing: VS, AN, PG, GC. Resources, supervision, validation, writing – review & editing: AD.

any cardiac illness, diabetes, hypertension, or traditional risk factors for cardiovascular diseases, including smoking. A 12-lead ECG revealed ST-segment elevation in the inferior leads with reciprocal ST-segment depression in the precordial leads with high-grade (2:1) Atrio-Ventricular block (Figure 1A). The echocardiogram showed inferior wall motion abnormality with a left ventricle ejection fraction of 50%. His coronary angiography revealed complete thrombotic occlusion of the mid-right coronary artery (RCA) (Figure 1B). The patient was successfully managed with angioplasty and stenting to mid-to distal-RCA with two overlapping drug-eluting stents.

Case 2

A 60-year-old male presented in the Emergency Department at our tertiary care centre with severe, retrosternal chest pain. His chest pain started 30 minutes after the first dose of the Covishield vaccine. The patient had neither reported traditional risk factors of cardiovascular diseases or comorbidities, except being a chronic smoker. His pulse rate was 90/min, blood pressure was 120/80 mmHg, and SPO2 of 95% on room air. ECG showed ST-segment elevations in precordial leads suggestive of acute ST-elevated anterior wall myocardial infarction (Figure 1C). An echocardiogram showed hypokinesia of anterior, anteroseptal and anterolateral wall with left-ventricle ejection-fraction of 30%. He was thrombolysed with streptokinase as the cardiac-catheterization laboratory was occupied at that time. Thrombolysis was successful with reduction of chest pain and ST-elevation. But he required inotropic support to maintain blood pressure, and finally, after observing for 16-hours, he was taken to the cardiac catheterization laboratory. His coronary-angiography showed 70% stenosis of ostio-proximal left anterior descending coronary artery (LAD) (Figure 1D), which was fixed with one drug-eluting stent. The patient improved gradually.

DISCUSSION

To our knowledge, MI after COVID-19 vaccination is not a commonly reported association. Boivin et al. reported a case of a 96-year-old lady in the USA who suffered a MI one hour after her first dose of Moderna COVID-19 vaccination [2]. Chatterjee et al. from India reported a case of a 63-year-old male not having any traditional risk factors for coronary artery disease, who developed acute ST-elevated Inferior wall MI after two days of COVID-19 vaccination with Covishield [3]. There were few media reports of deaths due to cardiac arrest following vaccination in India. The first was reported in a 43-year-old patient [4], and the other two were in 75- and 65-year-old adults [5]. The district and state adverse events following immunization (AEFI) committee found that these patients had pre-existing cardiac diseases, and thus deaths were presumed coincidental to vaccination [6]. There is a lack of purely scientific reports to establish a definite causal relationship between COVID-19 vaccination and MI. The vaccination could be a contributing factor by placing increased demand on the heart and not a direct cause of MI. Vaccination can induce inflammatory and immunological responses and may trigger thrombosis superimposing a pre-existing prothrombotic state [7].

Greinacher et al. described 11 cases of unusual thrombotic events and thrombocytopenia, 5 to 16 days after vaccination with the Astrazeneca vaccine (ChAdOx1 nCov-19). Most (9 patients) of these were healthy females with a median age of 36 years. They developed one or more thrombotic events in the form of cerebral venous thrombosis, splanchnic-vein thrombosis, pulmonary embolism, and other thromboses. They observed that all these vaccinated people developed immune thrombotic thrombocytopenia (ITP) mediated by platelet-activating antibodies against platelet factor 4 (PF4), mimicking autoimmune heparin-induced thrombocytopenia clinically [7].

Similarly, Scully et al. reported 23 patients (median age 46 years) who developed thrombosis and thrombocytopenia 6 to 24 days
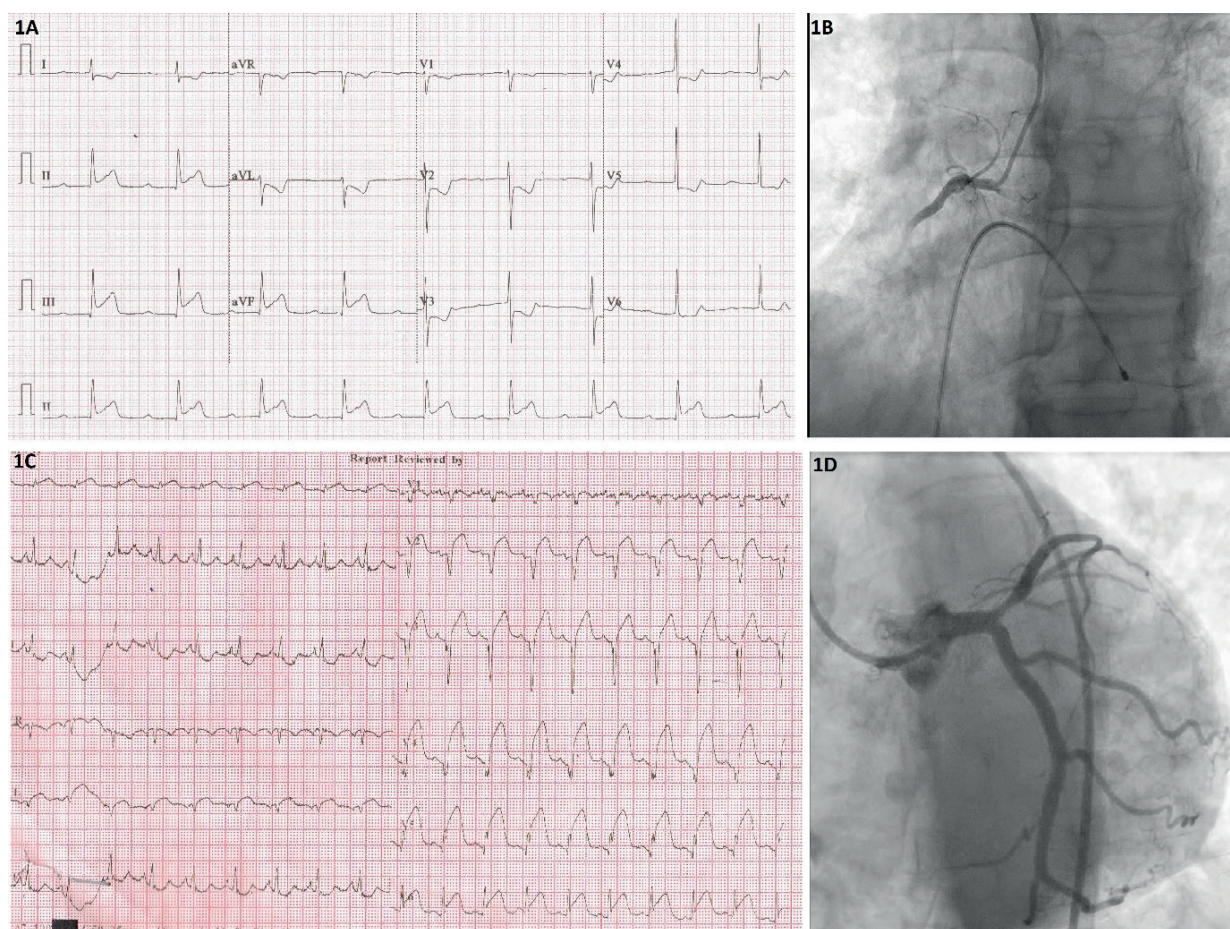
Figure 1A. A 12 lead ECG showing Acute ST-elevated Inferior Wall Myocardial Infarction with High-grade (2:1) AV Block. **Figure 1B.** Coronary angiogram showing complete occlusion of mid-RCA. **Figure 1C.** A 12 lead ECG showing Acute ST-elevated Anterior Wall Myocardial Infarction. **Figure 1D.** Coronary angiogram showing 70% stenosis of ostio-proximal LAD.

after receiving the first dose of the ChAdOx1 nCoV-19 vaccine (AstraZeneca). The majority were females (60%) and developed venous thrombosis. They also pointed out PF-4 dependent ITP, the reason behind thrombotic events [8].

One hundred sixty-nine cases of cerebral venous sinus thrombosis (CVST) and 53 cases of splanchnic vein thrombosis occurred among 34 million people vaccinated with COVID-19 Vaccine AstraZeneca till April 4 2021, in the European Economic Area (EEA) and United Kingdom (UK) [9]. In their analysis, the most common mechanism was Anti-PF4 antibodies induced thrombosis with thrombocytopenia syndrome.

Moreover, allergic reactions can occur during vaccination. These allergic responses caused by vaccines can be due to mast and immuno-globulin E (IgE) antibodies and occur within minutes or up to a few hours [10]. The ischaemic stroke has also been described along with other thrombotic events following COVID-19 vaccination [11].

However, the benefits of vaccination outweigh these adverse events. The EMA's Pharmacovigilance risk assessment committee concluded that unusual thromboses with low blood platelets should be listed as very rare side effects of the AstraZeneca vaccine. The benefits of the AstraZeneca vaccine in preventing COVID-19 continue to outweigh the risks [12]. A health advisory has also been issued by the government of India highlighting the possibility of prothrombotic events after COVID-19 vaccination with Covishield [13].

We also believe that MI following vaccination could be a coincidental occurrence thou-

gh awareness of such an event is vital for the scientific community. As a precautionary measure, the post-vaccination observation rooms should have staff capable of doing ECG and interpreting it, providing basic life support, and the vaccination centre should have accessible communication with the tertiary health care setup. The importance of filling out the pre-vaccination screening questionnaire cannot be underestimated. The COVID -19 vaccination is a significant effort to halt the pandemic, with a large vulnerable population and limited resources. It is prudent for the healthcare workforce to be aware that cardiac events should be considered if there are any suggestive symptoms. Similarly, this gives an added burden of responsibility to diffuse the false or overstated reports of danger from the COVID-19 vaccine.

This is important to avoid vaccination hesitancy and tackle anti-vaccination movements that could compromise the success of the mass campaign vaccination against COVID-19 [14–16]. This balance of judgment is also critical for medical professionals to avoid unrest by the general public.

References

1. Srivastava R, Ish P. COVID-19 Vaccination group *Safdarjung. The initial experience of COVID-19 vaccination from a tertiary care centre of India. Monaldi Archives for Chest Disease [Internet]. 2021 Mar 31 [cited 2021 Apr 13]. Available from: https://monaldi-archives.org/index.php/macd/article/view/1816.

2. Boivin Z, Martin J. Untimely Myocardial Infarction or COVID-19 Vaccine Side Effect. Cureus. 2021 March 02;13(3).

3. Chatterjee S, Ojha UK, Vardhan B, Tiwari A. Myocardial infarction after COVID-19 vaccination-casual or causal? Diabetes Metab Syndr. 2021 Apr 14:S1871-4021(21)00118-1. doi: 10.1016/j.dsx.2021.04.006. Epub ahead of print.

4. First death of COVID-19 vaccine recipient in Karnataka, 43-year-old suffers heart attack- The New Indian Express [Internet] [cited 2021 April 14]. Available from: https://www.newindianexpress.com/states/karnataka/2021/jan/18/first-death-of-covid-19-vaccine-recipient-in-karnataka-43-year-old-suffers-heart-attack-2251785.html.

5. Two cardiac patients die after Covid shots | Cities News. The Indian Express [Internet] [cited 2021 Apr 14]. Available from: https://indianexpress.com/article/cities/kolkata/two-cardiac-patients-die-after-covid-shots/.

6. Telangana COVID-19 vaccine recipient dies; govt says no link to immunization [Internet] [cited 2021 April 14]. Available from: https://www.downtoearth.org.in/news/health/telangana-covid-19-vaccine-recipient-dies-govt-says-no-link-to-immunisation-75146.

7. Greinacher A, Thiele T, Warkentin TE, Weisser K, Kyrle PA, Eichinger S. Thrombotic Thrombocytopenia after ChAdOx1 nCov-19 Vaccination. N Engl J Med. 2021;384:2092–2101. doi: 10.1056/NEJMoa2104840.

8. Scully M, Singh D, Lown R, Poles A, Solomon T, Levi M, et al. Pathologic Antibodies to Platelet Factor 4 after ChAdOx1 nCoV-19 Vaccination. N Engl J Med. 2021 Apr 16:NEJMoa2105385. doi: 10.1056/NEJMoa2105385. Epub ahead of print.

9. Douxfils J, Favresse J, Dogné JM, Lecompte T, Susen S, Cordonnier C, et al. Hypotheses behind the very rare cases of thrombosis with thrombocytopenia syndrome after SARS-CoV-2 vaccination. Thromb Res. 2021 May 15;203:163–171. doi: 10.1016/j.thromres.2021.05.010. Epub ahead of print.

10. Kounis NG, Koniari I, de Gregorio C, Velissaris D, Petalas K, Brinia A, et al. Allergic Reactions to Current Available COVID-19 Vaccinations: Pathophysiology, Causality, and Therapeutic Considerations. Vaccines (Basel). 2021 March 05;9(3):221. doi: 10.3390/vaccines9030221.

11. Smadja DM, Yue QY, Chocron R, Sanchez O, Lillo-Le Louet A. Vaccination against COVID-19: insight from arterial and venous thrombosis occurrence using data from VigiBase. Eur Respir J. 2021 Apr 16:2100956. doi: 10.1183/13993003.00956-2021. Epub ahead of print.

12. European Medicines Agency, COVID-19 vaccine safety update - 29 March 2021 – VAXZEVRIA [cited 2021 Apr 14]. Available from: https://www.ema.europa.eu/en/documents/covid-19-vaccine-sa fety-upda-te/covid-19-vaccine-safety-update-vaxzevria-previously-covid-19-vacc ine-astrazeneca-29-march-2021_en.pdf, 2021.

13. Centre issues advisory for Covishield beneficiaries highlighting blood clot symptoms to look out for - Coronavirus Outbreak News [Internet] [cited 2021 June 4]. Available from: https://www.indiatoday.in/coronavirus-outbreak/vaccine-updates/story/health-ministry-covishield-beneficiaries-alert-clotting-symp-toms-vaccination-1803605-2021-05-17.

14. Dror AA, Eisenbach N, Taiber S, Morozov NG, Mizrachi M, Zigron A, et al. Vaccine hesitancy: the next challenge in the fight against COVID-19. Eur J Epidemiol. 2020 Aug;35(8):775–779. doi: 10.1007/s10654-020-00671-y. Epub 2020 August 12.

15. Chirico F. Vaccinations and media: An on-going challenge for policy makers. J Health Soc Sci. 2017;2(1):9–18. Doi: 10.19204/2017/vccn1.

16. Chirico F. The new Italian mandatory vaccine Law as a health policy instrument against the anti-vaccination movement. Ann Ig. 2018 May-Jun;30(3):251–256. doi: 10.7416/ai.2018.2217.