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Letter to the Editor
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Acute ST-Segment Elevation Myocardial Infarction Happened Within 2 Hours after First Dose of COVID-19 Vaccine

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INTRODUCTION

Coronavirus disease 2019 (COVID-19) is caused by the novel severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2). The Oxford-AstraZeneca COVID-19 vaccine is based on an adenovirus vector and has been extensively used to prevent the COVID-19 infection or complications. Severe thrombotic adverse reactions caused by the AstraZeneca COVID-19 vaccine have been reported in several countries.[1] Acute myocardial infarction (AMI) is an emergent cardiovascular disease and occurs mostly due to thrombus obstruction of the coronary artery caused by a rupture of atherosclerotic plaques. Herein, we report a case of a 60-year-old man with acute ST-segment elevation myocardial infarction (STEMI) who underwent primary percutaneous coronary intervention (PCI) after receiving his first dose of the AstraZeneca vaccine.

CASE

A 60-year-old man with a history of smoking and hypertension presented to our emergency department with chief concerns of chest pain and cold sweat for the preceding 2 hours. He had just received the first dose of the AstraZeneca COVID-19 vaccine and felt chest pain in the following hour. On examination, his hemodynamic status was stable, and a 12-lead electrocardiogram (ECG) revealed ST elevation in leads II, III, and aVF (Figure 1). Serum creatine kinase (CK), CK-MB, and troponin-I levels were 230 (U/L), 3.0 (ng/mL), and 0.0383 (ng/mL), respectively. Routine laboratory test (complete hemogram, coagulation time, liver function test, and renal function test) results were within normal limits, except for white blood cells count of 14770/μL with 79.9% neutrophils and 0.5% eosinophils. Dual-antiplatelet agents and heparin were administered. A rapid COVID-19 antigen (Ag) test and subsequent reverse transcriptase polymerase chain reaction (PCR) test both returned negative results. He was diagnosed as having inferior wall STEMI, Killip Class II and immediately taken to the catheterization laboratory. Emergent coronary angiography revealed total occlusion of the middle right coronary artery (RCA), chronic total occlusion of the proximal left circumflex artery, and 60% stenosis of the middle left anterior descending artery (Figure 2A). Thrombectomy was attempted using an aspiration catheter, and a thrombus was detected in the aspirates (Figure 2B). Successful coronary stenting was performed for the middle RCA lesion with a bare-metal stent (4.0 × 23 mm) (Figure 2C). Pathologic examination was not performed for the aspirated thrombus. The patient was transferred to the intensive care unit, and the symptoms subsided with resolution of ST elevation, as observed on an ECG. Echocardiography demonstrated that the left ventricular ejection fraction was 55%, with a slightly inferior wall hypokinesis. The patient recovered well after medical therapy and was discharged 5 days later.

DISCUSSION

The COVID-19 pandemic has had major effects on people's lives. The high transmission capacity of COVID-

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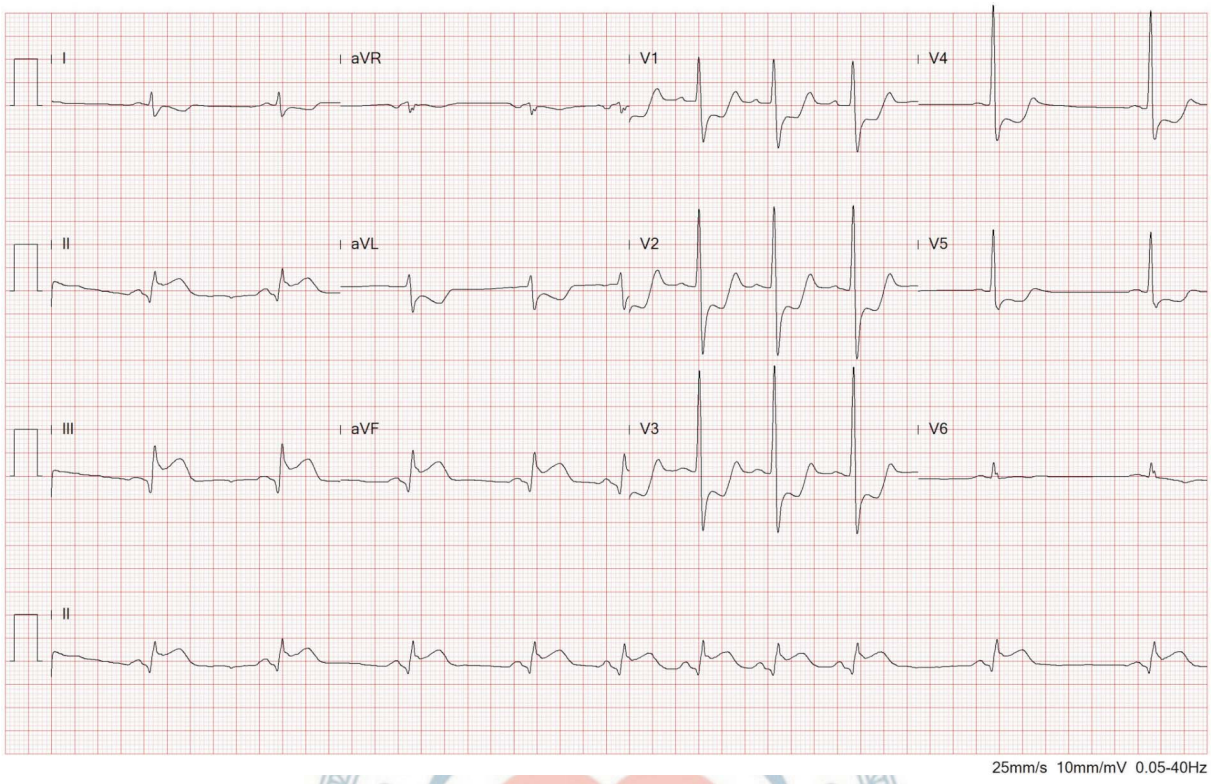

Figure 1. *Recorded 12-lead electrocardiogram at the emergency department revealed ST elevation in inferior leads.*

19 has led to the rapid research and development of vaccines.[1] Thromboembolic complications have not been unusual in patients with severe COVID-19 infection; therefore, anticoagulation therapy has become the standard therapy for patients with elevated D-dimer levels or thromboembolic events.[2] In addition, unexpected adverse effects of COVID-19 vaccines have been reported after worldwide population inoculation.[3] The AstraZeneca vaccine is a chimpanzee adenovirus-based viral vector vaccine expressing the spike protein of SARS-CoV-2.[1] Adenovirus injection-induced thrombosis was reported by Ewer et al.[4] AMI is a rare complication after COVID-19 vaccination. The literature includes a few case reports of AMI after COVID-19 vaccination.[5,6] As of 27 October 2021, the Yellow Card report in United Kingdom has shown that 84 AMI cases happened among 24.9 million people who received first dose and 24.1 million people who received second dose of Oxford-AstraZeneca vaccines.[7] The incidence of vaccine associated with AMI is quite low in the report. A previous study revealed an association of the AstraZeneca COVID-19 vaccine with prothrombotic thrombocytopenia.[8] Testing for anti-platelet factor 4 is essential to the diagnosis of vaccine-induced thrombotic thrombocytopenia, but it is lack in our first AMI case after COVID-19 vaccination. Additionally, a vaccination-related vasospastic allergic reaction, known as Kounis syndrome, was reported to be the possible mechanism underlying AMI.[9]

During the COVID-19 pandemic, choosing between thrombolysis and PCI for treating patients with STEMI has been a difficult decision. Thrombolysis might be a more favorable choice for reducing the transmission of COVID-19 and preventing the infection of health-care workers with COVID-19.[10] Moreover, confirming a patient's infection with COVID-19 before making a decision about the appropriate management strategy requires a COVID-19 Ag or PCR test, which may delay the door-to-balloon time.[10] By contrast, primary PCI is more favorable than thrombolysis for treating STEMI and is always the first choice for management of STEMI in Taiwan. Therefore, to achieve a more favorable clinical outcome for patients with COVID-19 with STEMI, PCI is recommended if the catheterization laboratory has appropriate facilities to prevent the transmission of COVID-19.[10]

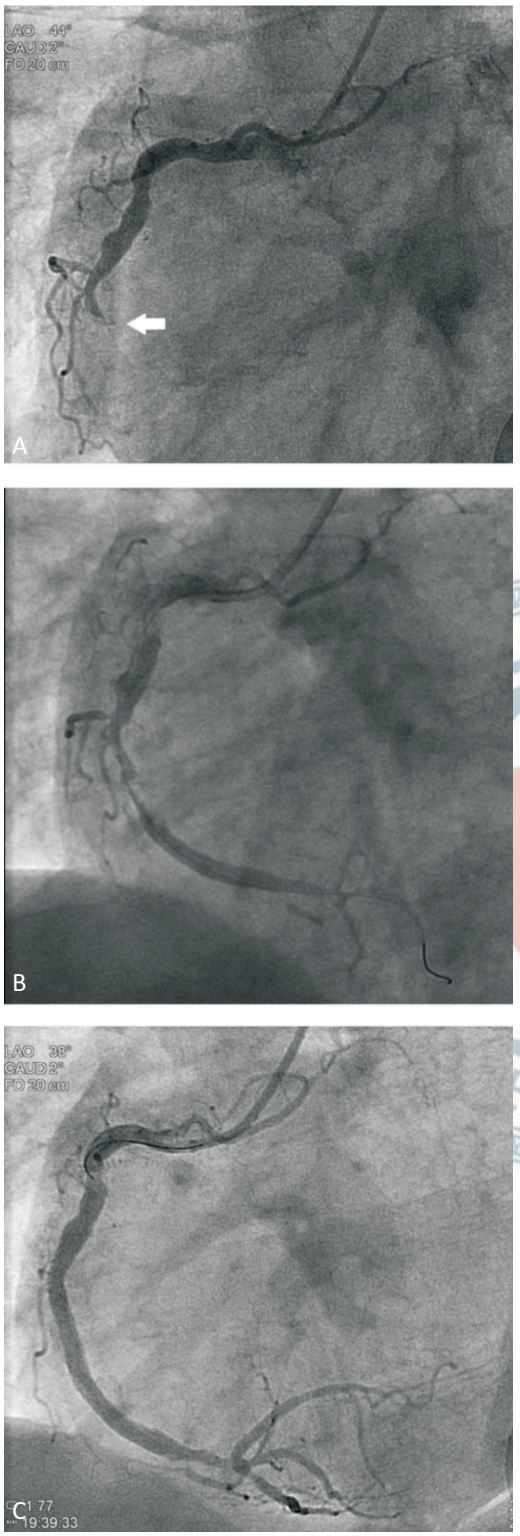

Figure 2. *(A) First coronary angiogram showed total occlusion of the middle right coronary artery (RCA; arrow). (B) Subsequent angiogram obtained after aspiration of the thrombus. (C) Final angiogram showed restoration of blood flow to the RCA after stenting.*

However, before the COVID-19 pandemic, no catheterization rooms were established for such infective patients. Executing primary PCI in a conventional catheterization room would expose health-care workers and the environment to a high-risk of infection with COVID-19.

For our patient, we decided to perform PCI when his COVID-19 Ag test of was negative (the later PCR was also negative). A thrombus was aspirated, and coronary stenting was successfully performed on the infarct-related artery. We could not conclude that the thrombus in the infarct-related artery was directly caused by the AstraZeneca vaccine. Nevertheless, we could speculate the existence of some relationship between the heart attack and the vaccine inoculation because the patient had his anginal symptoms 1 hour after vaccination. The patient had severe coronary artery disease with triple-vessel occlusion. Atherosclerosis is a chronic, insidious, and progressive condition and is not directly caused by vaccination. The AstraZeneca vaccine may have induced an acute inflammatory response, thus resulting in acute thrombus formation in such severe atherosclerotic disease. In the literature and real word report, thromboembolic events are rare complications after COVID-19 vaccination.[5-7] Several reported cases of AMI have occurred a few hours or days after vaccination.[5,6] AMI postvaccination may be an adverse vaccine reaction or only a coincidence. Establishing the relationship between COVID-19 vaccines and AMI may require more data. Despite the risk of thromboembolic complications related to the COVID-19 vaccine, we still encourage people to get vaccinated for effective protection from COVID-19 infection.

LEARNING POINTS

1. COVID-19 vaccine was developed rapidly after outbreak of COVID-19 pandemic and unexpected adverse events were reported post-marketing.
2. Thromboembolic event is a serious adverse event of AstraZeneca COVID-19 vaccine. Acute myocardial infarction occurs mostly due to thrombus obstruction of the coronary artery. We present this case to remind that acute myocardial infarction could happen within 2 hours following COVID-19 vaccination.

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DECLARATION OF CONFLICT OF INTEREST

All the authors declare no conflict of interest.

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REFERENCES

1. Folegatti PM, Ewer KJ, Aley PK, et al. Safety and immunogenicity of the ChAdOx1 nCoV-19 vaccine against SARS-CoV-2: a preliminary report of a phase 1/2, single-blind, randomised controlled trial. *Lancet* 2020;396:467-78.
2. Lopes RD, de Barros E Silva PGM, Furtado RHM, et al. Therapeutic versus prophylactic anticoagulation for patients admitted to hospital with COVID-19 and elevated D-dimer concentration (ACTION): an open-label, multicentre, randomised, controlled trial. *Lancet* 2021;397:2253-63.
3. Voysey M, Clemens SAC, Madhi SA, et al. Safety and efficacy of the ChAdOx1 nCoV-19 vaccine (AZD1222) against SARS-CoV-2: an interim analysis of four randomised controlled trials in Brazil, South Africa, and the UK. *Lancet* 2021;397:99-111.
4. Ewer K, Rampling T, Venkatraman N, et al. A monovalent chimpanzee adenovirus Ebola vaccine boosted with MVA. *N Engl J Med* 2016;374:1635-46.
5. Chatterjee S, Ojha UK, Vardhan B, Tiwari A. Myocardial infarction after COVID-19 vaccination-casual or causal? *Diabetes Metab Syndr* 2021;15:1055-6.
6. Boivin Z, Martin J. Untimely myocardial infarction or COVID-19 vaccine side effect. *Cureus* 2021;13:e13651.
7. https://www.gov.uk/government/publications/coronavirus-covid-19-vaccine-adverse-reactions/coronavirus-vaccine-summary-of-yellow-card-reporting.
8. Greinacher A, Thiele T, Warkentin TE, et al. Thrombotic thrombocytopenia after ChAdOx1 nCov-19 vaccination. *N Engl J Med* 2021;384:2092-101.
9. Kounis NG, Koniari I, de Gregorio C, et al. Allergic reactions to current available COVID-19 vaccinations: pathophysiology, causality, and therapeutic considerations. *Vaccines* 2021;9:221.
10. Li YH, Wang MT, Huang WC, Hwang JJ. Management of acute coronary syndrome in patients with suspected or confirmed coronavirus disease 2019: consensus from Taiwan Society of Cardiology. *J Formos Med Assoc* 2021;1:78-82.