Case Report

Acute myocardial infarction complicated by severe left ventricle systolic dysfunction in a young patient after Covid 19 vaccination: a case report

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\textbf{A B S T R A C T}

We report the case of a 23 years old patient who developed an acute myocardial infarction one day after his second dose of COVID-19 BIBP vaccination, complicated by severe left ventricle systolic dysfunction with an ejection fraction measured at 32\%, associated with left ventricular wall motion abnormalities well evolved under treatment of heart failure with reduced EF combining angiotensin-converting enzyme inhibitor, beta blocker, mineralocorticoid receptor antagonists and sodium-glucose cotransporter 2 inhibitors. Coronary arteries were normal at angiography suggesting initially the diagnostic of myocarditis. Therefore, a cardiac magnetic resonance imaging was performed to confirm the latter, which showed an image consistent with a recent left ventricular subendocardial infarction, remarkably prominent in the left anterior descending artery territory and the absence of signs of myocarditis. The patient had no previous past medical history or other clinical features explaining this coronary event onset. Thus, the vaccine was potentially to be implicated in the pathophysiology of the event. Overall, complications associated with COVID-19 vaccines are extremely rare, and their benefit is well established. That’s why they continue to be recommended by public health experts despite of their rare side effects.

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Introduction

The relative incidence of acute myocardial infarction (AMI) in young patients is in continuous rise, which is explained by various factors; Smoking still be the most common risk factor among the young adults [1]. However, in the context of SARS-CoV-2 infection, which is responsible for 7 to 23\% of myocardial lesions [2,3], this incidence tends to increase further, especially in the post-vaccination period [4,5].
By the current paper, we illustrate a case of a 23-year-old patient who developed an acute myocardial infarction one day after his second vaccination dose with the BIBP COVID-19 vaccine. Data reviewed by WHO suggest that the known benefits of this COVID-19 vaccine outweigh the known or suspected risks [6].

**Patient and observation**

We report the case of a 23 years old patient with no pathologic history or inherited coronary artery disease, who presented to the emergency department with typical chest pain that began one day after his second dose of BIBP COVID-19 vaccine, and progressively worsened over the course of a week.

On admission, the physical exam didn’t show particular findings, with a blood pressure (BP) at 140/70 mm Hg, a heart rate (HR) at 112 bpm, and a spontaneous oxygen saturation level of 94%. The patient’s chest X-ray revealed no acute cardiopulmonary abnormalities. The initial electrocardiogram showed a QS aspect in V1-V2-V3 (Fig. 1).

Transthoracic echocardiography (TTE) revealed severe left ventricular systolic dysfunction with an EF of 32% (Fig. 2A), due to extended left ventricular wall motion abnormalities (Akinesia of the septal and inferior walls, and of the mid- and apical segments of the anterior and anterolateral walls). Initial troponin level was markedly elevated at 135969.1 | 14696.5 ng/mL (normal < 26 ng/mL).

Gathering all these findings, the diagnosis of acute coronary syndrome was made. Subsequently, the patient received 300 mg of aspirin and Clopidogrel and the curative dose of enoxaparin, with chest pain improvement and persistence of the electrical abnormalities. The patient was then admitted to the cardiology intensive care unit. A coronary angiography was performed showing normal coronary arteries (Fig. 3).

Taking into account the MINOCA (Myocardial infarction with nonobstructive coronary arteries) and the recent COVID 19 vaccination, Myocarditis was first suggested as explanation of the current coronary event. To confirm it, a cardiac magnetic resonance imaging was performed and showed contrary to what was expected a subendocardial ischemic enhancement in the right coronary artery territory, and importantly in the left anterior descending artery territory, with no-reflow on the anterior wall and a severe hypokinesia mainly of the apex and of the anterior wall. It showed also a reduced LVEF and no signs of myocarditis (Fig. 4). Left ventricular infarction diagnosis was then made.

Additionally, Biology showed no inflammatory syndrome with CRP at 6 mg/l, WBC: 8000 e/μL, HB: 15 g/dL, Platelets: 350,000 e/μL. Serologies were negative for hepatitis, HIV and syphilis, and Covid 19 PCR was negative, with positive IgG antibodies and negative IgM antibodies.

The patient was discharged 5 days later, after clinical and biological improvement. During hospitalization, a medical treatment has been started, consisting of ACE inhibitors, beta-blockers, MRA, and SGLT2 inhibitors.

An echocardiographic control was made 3 months after the coronary event, which confirmed the complete resolution of the initial echocardiographic abnormalities under medical treatment (Fig. 2 B).

**Discussion**

Acute coronary syndromes in young patients have a specific profile. The usual cardiovascular disease risk factors such as hypertension or diabetes are rarely observed [7–10]. Indeed, male gender, active smoking, and/or inherited premature coronary artery disease are the main reported risk factors, besides other factors linked to the coronary dis-
Fig. 2 – (A) Apical view of TTE showing a reduced ejection fraction (32%). (B) Apical view of TTE showing LVEF improvement (63%).

Fig. 3 – Coronary images showing normal coronary arteries. (A) Left coronary artery. (B) Right coronary artery.
ease pathophysiology in young people, as low socioeconomic status, drug use (especially cocaine which causes coronary spasm), hemostasis disorders (like Factor V Leiden mutation), vascular diseases (like Kawasaki disease), and disorders of elastic tissue. Atypical symptoms are less frequent and coronary atheroma is less diffuse [7,11], with normal coronary arteries at angiography in 16% of men and 21% of women (compared with 2% and 11%, respectively, in older patients) [12].

In this particular context of the COVID-19 pandemic and in the post-vaccination period, thromboembolic events are now known, though rarely, to complicate the vaccination process. Coronary arteries are weakly affected by these thrombotic accidents with a percentage of 4% [11]. In the literature, many cases of ACS in young patients have been reported, that occurred after different types of COVID-19 vaccination [4,5].

In a recent case report [13], a man of 33 years old with unremarkable medical history, except obesity and mild hy-
perlipidemia, was diagnosed for acute STEMI occurring one day after the first COVID 19 vaccine dose. Coronary angiography revealed 83% stenosis with high thrombus burden in the middle segment of the circumflex artery that progressed well after repeated aspiration thrombectomy and Tirofiban administration.

Another case study including 2 patients at high risk for major cardiac events, reported two cases of myocardial infarction without ST-segment elevation who were admitted within 24 hours of CoronaVac COVID-19 administration [14]. According to this report, there is no direct causal relationship between the vaccine and the acute coronary events onset [15], as coronary heart disease is also more common in patients older than 65 years [16]. But taking into consideration the very recent vaccine administration, possible links relating the latter with the coronary disease could be established.

In fact, in the setting of the post vaccination period, the coronary events occurring could be explained by many suggested mechanisms. In some case reports, elevated blood pressure or tachycardia have been observed [17], which may be directly caused by the vaccine or by psychological factors related to the vaccine administration, leading to type 2 myocardial infarction by the mean of increasing myocardial oxygen demand.

Another mechanism that may be responsible for acute coronary syndrome (ACS) onset in this context is coronary spasm, which may explain the relatively short delay between vaccination and the onset of symptoms on one hand [17], and the normal aspect of the coronary arteries often found during coronary angiography, as in our case, in the other hand. Finally, the inflammatory process related to the immune system response to vaccination could increase the risk of atherosclerotic plaque rupture.

In addition to the coronary disease, numerous cases of vaccine-related myocarditis have been reported [18], which may imitate step by step the diagnosis of ACS. For example, in a published case report [19], a 17 years old patient developed focal myocarditis mimicking ST-segment elevation myocardial infarction (STEMI), occurring 3 days after administration of a COVID-19 mRNA vaccine. Subsequently, he progressed well under medical treatment.

In general, ACS of young subjects, compared to older patients, evolve favorably with better outcomes. The acute event resolves without severe sequels in most cases [20]. On the other hand, the long-term prognosis is much less favorable [5,10], especially in case of severe complications and high cardiovascular risk.

Even if the evolution is still variable, an early and efficient management improve the prognosis. In our case, the severe LV systolic dysfunction presented by our patient evolved well under optimal medical treatment associating ACE inhibitors, beta-blockers, MRA, and SGLT2 inhibitors, which are recommended in first intention at the same level of recommendations, because of their benefit on mortality. On the other hand, an early management allows us to avoid therapeutic inertia [21].

Finally, given its great impact on the evolution of SARS-CoV-2 infection, vaccination remains recommended, as it is possibly safer than the representative viral infection [2].

**Conclusion**

Covid 19 vaccine, may be associated with cardiac adverse events, the prognosis of which is variable and may be influenced by several factors including cardiovascular risk. This report suggests careful observation of symptoms and prompt treatment of complications to decrease mortality.

Further research is needed to clarify this suspected causal relation between the vaccine and these adverse events.

**Patient consent**

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

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