

Covid-19 Spikevax vaccine-induced myocarditis – early suspicion for successful management: case report.

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Abstract

Introduction: Mass vaccination has been carried out worldwide to control the spread of COVID-19 infection, with the most commonly used vaccines being Pfizer-BioNTech and Moderna. Myocarditis after COVID-19 vaccination by Spikevax vaccine (previously known as Moderna vaccine) is an infrequent entity, and more is still known about the picture and its clinical features, and little is known about long-term follow-up beyond 90 days.

Case report: 21-year-old male, college student, with no known previous history, presented with acute onset of oppressive central thoracic pain. It had an abrupt onset, in-crescendo course, associated with dyspnea and chills. Anti-inflammatory treatment with colchicine 0.5mg every 12 hours was started, and symptoms resolved within 24 hours of starting anti-inflammatory treatment. The diagnosis of myocarditis was confirmed by cardiac magnetic resonance imaging and follow-up imaging showed resolution of the condition. The patient remained asymptomatic, and he was discharged early. No residual sequelae were observed at 90-day follow-up.

Conclusions: Myocarditis following COVID-19 vaccination is predominantly seen in young males within days after vaccination. The pathophysiology of myocarditis is not yet well understood. Cardiac troponin I kinetics in the case presented, associated with the initial symptoms and cardiac imaging confirmed the presence and subsequent resolution of myocarditis. The prognosis is good and early suspicion is required.

Keywords (MeSH): Myocarditis; COVID-19; Vaccines; Cardiac Imaging Techniques; Case Reports

Resumen

Introducción: la vacunación masiva se ha llevado a cabo a nivel mundial para controlar la propagación de infección por COVID-19, siendo las vacunas más utilizadas las de Pfizer-BioNTech y Moderna. La miocarditis post vacunación COVID-19 por vacuna Spikevax (previamente conocida como vacuna Moderna) es una entidad infrecuente, aún se sigue conociendo más acerca del cuadro y sus características clínicas, y poco se sabe acerca del seguimiento a largo plazo más allá de los 90 días.

Presentación de caso: hombre de 21 años, estudiante universitario, sin antecedentes previos conocidos, que presentó cuadro agudo de dolor opresivo centro-torácico. Tuvo un inicio abrupto, curso *in-crescendo*, asociado a disnea y escalofríos. Se instauró tratamiento antiinflamatorio con colchicina 0,5mg cada 12 horas, y los síntomas se resolvieron a las 24 horas de inicio de antiinflamatorio. El diagnóstico de miocarditis se confirmó mediante resonancia magnética cardíaca y las imágenes de seguimiento mostraron la resolución del cuadro. El paciente permaneció asintomático, y recibió alta temprana. En su seguimiento a 90 días no se observaron secuelas residuales.

Conclusiones: la miocarditis posterior a la vacunación COVID-19 se observa predominantemente en varones jóvenes a los pocos días de la vacunación. La fisiopatología de la miocarditis aún no es bien conocida. La cinética de la troponina I cardíaca en el caso presentado, asociado a los síntomas iniciales y las imágenes cardíacas confirmaron la presencia y posterior resolución de la miocarditis. El pronóstico es bueno y se requiere de sospecha temprana.

Palabras clave (DeCS): Miocarditis; COVID-19; Vacunas; Técnicas de Imagen Cardíaca; Informes de casos

Introduction

Myocarditis is the inflammation of the heart muscle, a product of pathological immune changes in the heart, caused by different infectious and non-infectious reasons (1). Although it is rare, it has been reported that myocarditis can occur after vaccination for COVID-19, especially in those who received messenger RNA (mRNA) vaccines, such as those from Pfizer-BioNTech (BNT162b2) and Moderna (mRNA-1273) (1,2).

According to the case statement proposed by the Brighton Collabora-

tion myocarditis/pericarditis working group (3), a definite case of myocarditis is determined if, on the one hand, histopathological evaluation of the myocardium showed the presence of inflammation in that tissue or the levels of at least one of the myocardial biomarkers (troponin T or troponin I) are elevated, and on the other hand, cardiac magnetic resonance imaging (CMR) or echocardiogram findings are abnormal. The evidence on management is limited, and nonsteroidal anti-inflammatory drugs (NSAIDs) are the most commonly reported drugs in its treatment (4). The prognosis is good, and more has been learned about it in the long term, beyond 90 days (5).

The following is the clinical case of a young man, without comorbidities, who was diagnosed with myocarditis after the application of the third dose of Spikevax vaccine. He achieved complete resolution of the condition after initiation of colchicine and carvedilol, without requiring supportive management, and remained asymptomatic until 90 days after the onset, and has resumed normal activities since then. This case emphasizes the importance of early suspicion in order to provide successful management.

Case description

21-year-old male patient, university student, with no known history. With previous history of immunization for COVID-19, first and second doses with Spikevax (formerly known as Moderna), without adverse reactions. He also has no previous history of COVID-19 infection. Following the vaccination program against COVID-19 at national level (Colombia), 36 hours after the administration of the third dose of the vaccine (booster) with Spikevax (INN: Elasmoran, mRNA-1273), he started with oppressive central-thoracic pain of severe intensity, irradiated to upper limb, associated with dyspnea and chills. These symptoms became persistent, and without relief with conventional analgesia, so he was admitted to the emergency room, in a situation of hemodynamic stability with occasional episodes of chest pain. The electrocardiogram on arrival showed sinus rhythm (Figure 1). Chest X-ray showed no relevant findings. Blood analysis showed elevated markers of myocardial damage, with a first determination of ultrasensitive troponin I (Tnlus) of 8,510 ng/l, and a control at 3 hours of 9,650 ng/l. COVID-19 antigen was negative, and inflammatory markers with C-reactive protein (CRP) of 2.98 mg/dl, and erythrocyte sedimentation rate (ESR) of 30 mm/hour.

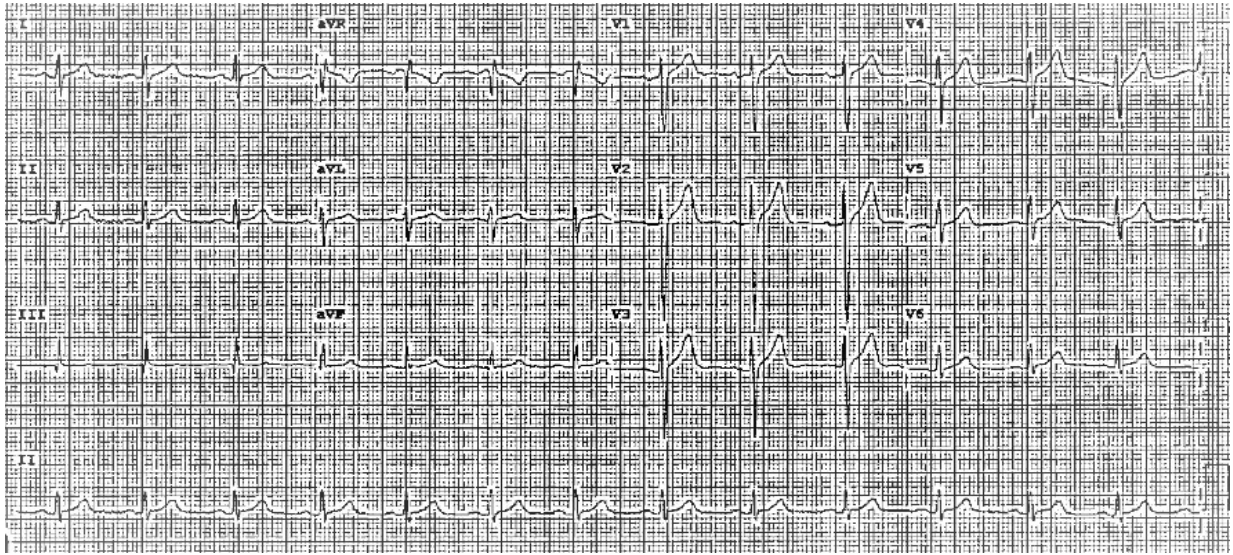


Figure 1: electrocardiogram showing sinus rhythm.

Source: image obtained during the study.

Subsequently, a transthoracic echocardiogram was performed, showing mild systolic function compromise with left ventricular ejection fraction of 51%, without significant valvular heart disease or pericardial effusion (Figure 2). With the suspected diagnosis of acute myocarditis, anti-inflammatory treatment was started with colchicine 0.5 mg every 12 hours 3 hours after admission, and beta-blocker with carvedilol 3.12 mg every 12 hours.

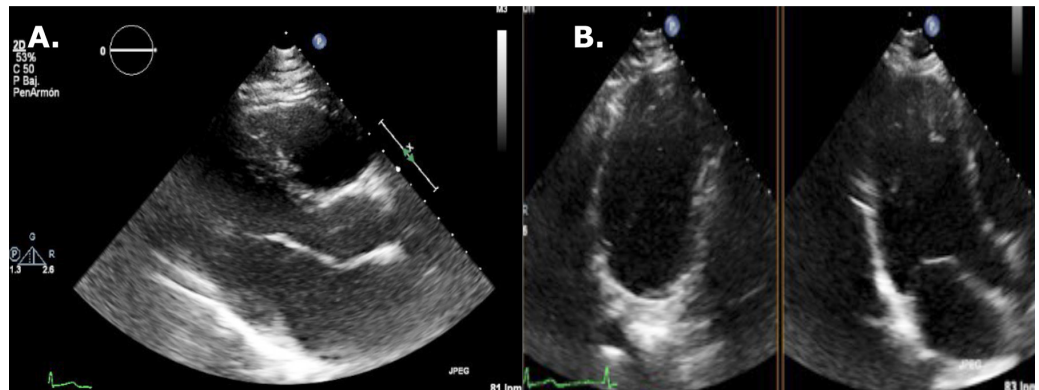


Figure 2: transthoracic echocardiogram: **A.** 2-D transverse four-chamber view showing left ventricle with hypokinesia of all its walls. **B** Longitudinal plane with segmental disorders in the left ventricle, without mitral valve involvement.

Source: image obtained during the study.

In the first 72 hours CMR was performed, which showed late inferior medial enhancement and apical medial edema; fibrosis or infarction was ruled out, and changes were considered compatible with acute myocarditis (Figure 3). Subsequent electrocardiograms were normal. 48 hours later, the enzyme curve was decreasing, with Tnlus of 2,300 ng/l. The study was completed with plasma viral serology for the main cardiotropic viruses, with negative results. Holter monitoring of cardiac rhythm with intraventricular conduction disorder, normal variability and normal QTc. Due to optimal evolution, it was decided to discharge the patient to continue outpatient management. Normal control electrocardiograms were performed, last Tnlus in frank decrease, 96 ng/l, and discharge was given 6 days after admission. He was advised to avoid heavy activity for three months.

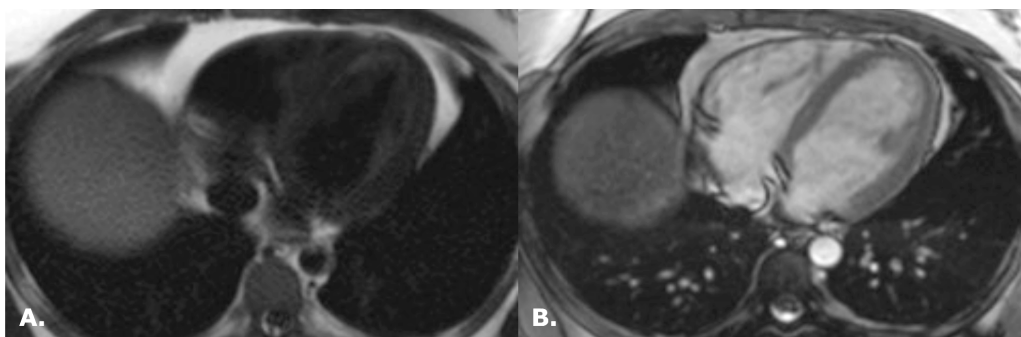


Figure 3: Cardiac magnetic resonance imaging. A. Axial T2 view with early and late linear intramyocardial enhancement in the medial inferior septum. B. Axial T1 view with intramyocardial patching in the apical medial lateral wall.

Source: image obtained during the study.

After one month, he remained asymptomatic in his outpatient follow-up and was being treated with colchicine and carvedilol. The electrocardiogram showed isolated supraventricular ectopy and the echocardiogram showed normal systolic function, with an ejection fraction of 63%; he completed treatment with colchicine for one month, with progressive titration of carvedilol.

At the third month, a new control showed that he remained asymptomatic, the electrocardiogram was normal, and he was recommended to resume normal activities.

Discussion

Some features of this case are noteworthy, for example, the infrequent acute onset after administration of the third dose of Spikevax, the history of

previous vaccination for COVID-19, and that the documented electrocardiographic changes were not significant. All of the above shows that typical findings in this entity are not always to be expected and a high index of clinical suspicion should prevail.

From a systematic review of reports and case series it is known that post-vaccination myocarditis COVID-19 is a condition that predominates in men, with a mean age of 21 years, in 81.2% with no known previous medical history, with a mean duration of onset of symptoms after vaccination of 2 days, 100% of cases with chest pain and troponin elevation in acute mode, and less frequently (23-92%), elevation of inflammatory markers (6).

The use of CMR is important when myocarditis is suspected, since it is a non-invasive method with good diagnostic accuracy (7), it allows visualization of the contrast accumulated in the myocardium as a consequence of myocyte membrane destructing caused by the inflammatory process. From follow-up studies, the long-term persistence of late gadolinium enhancement is a prognostic factor for cardiac mortality and sudden death (8). In the case presented, a definitive diagnosis of acute post-vaccination myocarditis COVID-19 was considered, since it met the Brighton Collaboration Criteria (3).

Study results for non-COVID-19 vaccine scenarios have been considered in the therapeutics of these patients. There have been no randomized controlled clinical trials of NSAIDs or colchicine in post COVID-19 vaccination induced myocarditis or COVID-19 myocardial injury, and there are no standardized management guidelines on treatment. The evidence of colchicine is known from a systematic review in patients with acute pericarditis of non-vaccination etiologies, which showed that it reduces recurrence at 18 months (HR0.40; 95%CI:0.27-0.61) (9), while the evidence of beta-blockers in post COVID-19 myocarditis is from case series (10). Regarding physical activity, guidelines come from recommendations for competitive athletes with cardiovascular abnormalities, and expert opinion is to restrict strenuous physical activity for at least three months after the episode of myocarditis (11).

The patient had an adequate prognosis at 90 days with early resolution of the condition. The prognosis of post-vaccination COVID-19 myocarditis with mRNA vaccines is usually favorable, with mortality of 1.1%. Compared with Pfizer BNT162b2 vaccine-induced myocarditis, Spikevax vaccine-induced myocarditis has been associated with longer hospital stay and higher

troponin levels (12). Information about long-term prognosis in COVID-19 vaccine-associated myocarditis is scarce.

Conclusion

Acute post-vaccination myocarditis is an important differential diagnosis in patients with acute post-vaccination chest pain. The clinical history is key and should guide early suspicion regardless of the patient's age and comorbidities. CMR is important for definitive diagnosis and prognosis. Early suspicion allows the patient to be treated more effectively, as documented in this case report. Further studies are needed to better characterize the benefits of the different drugs commonly used in these cases.

Abbreviations

2D: two-dimensional

ASA: acetylsalicylic acid

NSAIDs: non-steroidal anti-inflammatory drugs.

mRNA: messenger ribonucleic acid.

COVID-19: coronavirus disease 2019.

ICD: international nonproprietary name.

LVEF: left ventricular ejection fraction.

HR: Hazard ratio.

CI95%: 95% confidence interval.

BPM: beats per minute.

CMR: cardiac magnetic resonance imaging.

SARS-CoV-2: severe acute respiratory syndrome coronavirus 2.

Tnlus: troponin I ultrasensitive.

Statements

Ethical approval and consent to participate

Informed consent was obtained from the patient for both the preparation of the case report and its publication. This case report was approved by the ethics committee of Clínica Marly by minute number CEICM 008-2022 of October 11, 2022.

Consent for publication

Consent for publication was obtained.

Availability of data and material

The data and material available for publication are in the manuscript and no information is omitted.

Conflicts of interest

None declared by the authors.

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None declared by the authors.

Author contributions

ASP and JSFO collected the data and drafted the manuscript. Both authors approved the final version of the manuscript.

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