International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Myocarditis and DNA-Based Anti-SARS-CoV-2 Vaccines: Report of Two Cases Cardiology Department A, IBN Sina University Hospital, Rabat

S. Laklalech M. D[1], Y. Lamghari M. D[1], S. Ouzzaouit M. D[1], H. Dahmani M.D[1], Pr N. Fellat Ph D[1], Pr R. Fellat Ph.D[1], Samia Laklalech (MD)[2]

[1]Cardiology Department A, Ibn Sina Hospital, Rabat

[2]Cardiology Department A, Ibn Sina Hospital, Mohammed V University, Rabat, Morocco samia.laklalech@gmail.com

ABSTRACT:

Since the availability of the vaccine against SARS-CoV-2, various side effects, including cardiovascular complications, have been observed with varying prevalences. These have been the subject of numerous studies in different countries, without confirming a direct causal link. Among these complications is acute myocarditis, predominantly observed in young males in the days following the administration of the first dose and more frequently with the second dose. A French case-control study over a period of 45 days identified 919 cases of post-vaccination myocarditis. In these conducted studies, acute myocarditis was primarily associated with mRNA vaccines. In this article, we report the cases of two patients from the Cardiology Department A of Ibn Sina University Hospital in Rabat, for whom acute myocarditis was diagnosed within a period ranging from one week to two months following vaccination against SARS-CoV-2 with two DNA-based vaccines.

Objective:

The aim of this study is to report and analyze two cases of acute myocarditis diagnosed within one week to two months following vaccination against SARS-CoV-2 with DNA-based vaccines at the Cardiology Department A of Ibn Sina University Hospital in Rabat. By presenting these cases, we seek to contribute to the existing literature on post-vaccination myocarditis, particularly in relation to non-mRNA vaccines, and to highlight the need for further investigations to better understand potential associations and underlying mechanisms.

Methods:

we report and analyze two cases of acute myocarditis diagnosed within one week to two months following vaccination against SARS-CoV-2 with DNA-based vaccines at the Cardiology Department A of Ibn Sina University Hospital in Rabat.

Conclusion:

Several arguments support a causal link between mRNA vaccines and the risk of myocarditis, particularly in young individuals. This article highlights the potential association between DNA-based vaccines and myocarditis through two reported cases. Although these cases are limited in number, they emphasize the need for enhanced post-vaccination surveillance to identify similar occurrences and to further investigate the risk of myocarditis associated with different vaccine types.

Keywords: Myocarditis, SARS-CoV-2, Vaccine

Consent: The authors confirm that written consent for the submission and publication of this case

Publication Ethics (COPE) guidance.

Conflict of interest: None declared.

Funding: None declared.

Consent: The authors confirm that written consent for the submission and publication of this case, including images, has been obtained from the patients in line with the Committee on Publication Ethics (COPE) guidance.

Availability of Data and Materials: Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

Conflict of interest: None declared.

Funding: None declared.

Figure Legend:

A. Electrocardiogram at admission.

B. Echocardiographic strain evaluation

C. TTE demonstrate the calculation of LVEF in 2-chamber view at end-systolic phase (ESP).

D. Electrocardiogram at admission.

E. TTE demonstrate the calculation of LVEF in 4-chamber view on SBP.

F. 4 chamber view on Cardiac MRI.

G. 3 chamber view on Cardiac MRI.

INTRODUCTION

Myocarditis is a condition characterized by the presence of inflammatory infiltrates in the myocardium with non-ischemic myocyte necrosis. **[1]**

The diagnosis relies on a combination of clinical, biological, and radiological evidence, as well as the use of myocardial biopsy in certain situations. **[2]** The etiologies of myocarditis are numerous, it can be of infectious origin, often viral, typically caused by cardiotropic microorganisms, or it can also be of toxic or drug-induced origin **[3-4].** Myocarditis can also be found in the context of some systemic diseases.

Some studies have reported cases of myocarditis occurring in children following vaccination against meningococcus and viral hepatitis C **[5].** In the context of the SARS-CoV-2 pandemic, a vaccination campaign launched in late 2020 with various types of DNA or mRNA vaccines. The discovery of acute myocarditis in young, healthy individuals following the administration of these vaccines **[6]** raises the belief that there may be a causal link, which has not yet been proved.

The progression to heart failure and the associated risk of mortality make it necessary to implement pharmacovigilance for myocarditis risk, as well as to report cases worldwide. Continued monitoring will allow a better assessment of any potential risk associated with a third dose of the vaccine.

OBSERVATIONS:

- ***First observation:***

A 42-year-old patient with no cardiovascular risk factors or specific medical history, and no recent history of infectious episodes. The patient was admitted to the cardiology department for the management of precordial pain associated with palpitations that occurred four days after receiving the first dose of an anti SARS COV 2 DNA vaccine. The patient reported a constant retrosternal chest pain, occurring both at rest and during exertion, worsened by lying on the left side, without any specific radiation. This was associated with a sensation of added heartbeats, with no history of syncope or presyncope.

On clinical examination, the patient was in good general condition, tolerating the supine position, but with a persistent underlying pain. Blood pressure was measured at 134mmHg systolic and 80mmHg diastolic, with a heart rate of 71 beats per minute.

Cardiovascular and pleuropulmonary examinations revealed no particular findings.

The electrocardiogram showed (Figure A):

- Regular sinus rhythm at a rate of 69 bpm.
- Deviation of the heart axis to the left.
- First-degree atrio ventricular block (constant PR interval elongated to 300ms).
- Left anterior fascicular block.
- Presence of an isolated ventricular extra systole.
- QS Pattern in the inferior and anteroseptal territories with flat T-waves in the inferior leads.

On examination: Troponin and d-dimer levels did not reveal any abnormalities, with a negative inflammatory profile.

The patient underwent an echocardiography **(Figure B)** revealing:

-Non-dilated left ventricle (end-diastolic diameter = 53mm, end-systolic diameter = 38mm), with non-hypertrophied walls, exhibiting regional kinetic abnormalities characterized by hypokinesis in the basal and mid segments of the inferior, septal, and anterolateral walls, along with a granular hyper-echoic appearance in these segments.

-Global systolic function was moderately impaired with a left ventricular ejection fraction (LVEF) of 45% at rest.

-Impaired global strain at -12.7%, more pronounced in the hypokinetic basal and mid segments of the walls. **(Figure C)**

-Absence of pericardial effusion.

-Normal left ventricular filling pressures.

Due to conduction and rhythm disturbances, a 24-hour ECG Holter monitor was performed during hospitalization, revealing nighttime episodes of second-degree Mobitz II AV block, as well as multiple polymorphic ventricular extra systoles graded as III according to the Lown classification.

Given the suspicion of myocarditis, a cardiac MRI was conducted with cine True FISP in axial planes: 2-chamber view, short-axis view, 4-chamber view, and assessment of myocardial perfusion and late gadolinium enhancement after contrast agent injection.

The results were suggestive of septal myocarditis with the following findings:

- A non-dilated left ventricle (indexed diameter of 27 mm/m2), with non-hypertrophied walls and slightly impaired systolic function (left ventricular ejection fraction of 58%).
- Non-dilated right heart chambers with preserved systolic function of the right ventricle.
- Slightly dilated left atrium.
- Delayed enhancement study 10 minutes after Gadolinium injection revealed intra myocardial enhancement involving the infero septal wall at the basal and mid segments, suggestive of intra myocardial fibrosis, likely related to a squeal of myocarditis.
- No evidence of myocardial necrosis squeal.
- Excessive trabeculations in the apical segments of the left ventricle without meeting the criteria for non-compaction.

The patient was hospitalized for 4 days and started a medical treatment including an angiotensin-converting enzyme inhibitor, low-dose beta-blocker, aspirin for antiplatelet therapy, and vitamin supplementation. Strict rest and temporary cessation of sports activities were advised for a month. A follow-up clinical assessment was scheduled 15 days after discharge.

- ***Second observation:***

It concerns a 36-year-old patient with no cardiovascular risk factors or specific medical history, who received the second dose of the anti-SARS-CoV-2 vaccine a month before admission, using a DNA-based vaccine.

The history of illness dates back to four days before admission, with the onset of flu-like symptoms prompting the patient to seek emergency care. They were placed on medical treatment, and a SARS-CoV-2 RT-PCR test returned negative results. The course of disease was marked by the onset of fixed, constrictive retrosternal chest pain without radiation, prompting the patient to return to the emergency room 4 hours after the presumed onset of the pain. An ECG and further evaluation were performed, leading to admission in the cardiology service.

Upon admission, the patient was found to be eupneic, no longer experiencing distress, and tolerating supine position well, with a blood pressure of 120/70 mmHg and a heart rate of 70 bpm.

Cardiovascular and pleuropulmonary examination revealed no abnormalities. The electrocardiogram **(Figure D)** showed:

- Regular sinus rhythm with a heart rate of 79 bpm.
- Normal axis of the heart.
- Constant PR interval of 160 ms.
- ST segment elevation in the inferior-basal and lower lateral regions without a mirror image.

The assessment: was unremarkable except for a highly elevated troponin level at 660 times the normal range.

The coronary angiography performed via the right femoral route using a 5 French sheath, JL 3.5 catheter, and JR 4 catheter, showed angiographically normal coronary arteries.

The echocardiogram **(Figure E)** performed at admission showed:

- A non-dilated left ventricle (end-diastolic dimension: 42mm, end-systolic dimension: 25mm), with non-hypertrophied walls, normal overall systolic function, left ventricular ejection fraction (LVEF) of 74% by Simpson's biplane method, without obvious segmental contractility disorders.
- Absence of notable mitro-aortic valve disease.
- Normal left ventricular filling pressures.
- Normal-sized left atrium.

- Non-dilated right heart chambers with good right ventricular function.
- Absence of pericardial effusion.

Given the strong suspicion of myocarditis, cardiac MRI **(Figure F, G))** was performed and confirmed the diagnosis of acute-phase myocarditis (3 Lake Louise criteria) involving the inferior and anterolateral walls, with the following findings:

- Left ventricle not dilated (EDD = 53mm, ESD = 31mm), with non-hypertrophied walls, demonstrating good overall and segmental systolic function.
- Right cavities not dilated, with preserved systolic function of the right ventricle.
- Atrial chambers not dilated.
- On HASTE sequence: presence of hyper intensity in the anterolateral and inferior walls.
- On early enhancement: presence of areas of hyperemia in the anterolateral and inferior walls.
- On late enhancement 10 minutes after Gadolinium injection: presence of subepicardial enhancement in the inferior and anterolateral walls.
- Absence of myocardial necrosis squeal.

Patient was hospitalized for 5 days and placed on beta-blocker therapy, with strict bed rest for one month.

DISCUSSION

This study is based on the observation of 2 patients who presented cardiac symptoms following the administration of the anti-SARS-CoV-2 vaccine. Several cases of myocarditis were diagnosed in the Cardiology Department A, primarily related to mRNA vaccines, in contrast to these two patients who received DNA-based vaccines. This provides new insights into the side effects of these different types of vaccines.

The age of our patients ranges between 36 and 42 years, both being male, and they are not known carriers of cardiovascular risk factors or underlying pathologies.

The symptomatology began in the first week following the first dose of vaccination for the first patient, and after 2 months from the second dose for the second patient. These data are consistent with the literature confirming a particularly high risk of myocarditis in the weeks following vaccination. The Centers for Disease Control and Prevention (CDC) recently reported a possible association between mRNA Covid-19 vaccines and myocarditis, especially in males aged 16 to 45 in the days following the second dose, with an incidence of approximately 4.8 cases per million □**7- 8**□. The average age of onset is 27 years according to a large study conducted on 159 cases in Israel. □**9**□

In the short term, the first case was marked by typical complications of myocarditis, including conduction and rhythm disturbances, due to the septal localization of the myocardial involvement, justifying hospitalization in the intensive care units. .□□**10**□

As for the second case, the clinical course was characterized by clinical improvement with regression of precordial pain after rest and medical treatment. According to a study conducted in forty hospitals across the United States, the average hospitalization duration is 2.7 days with a favorable outcome in terms of symptom resolution in 95% of patients, with no readmissions or deaths. .□□**11**□

The medium and long-term risk to which these patients are exposed is still unknown due to the lack of long-term follow-up. The occurrence of myocarditis in our patients after a DNA vaccine also suggests a probable link between this type of vaccine and the risk of this condition.

The limitations of our study, represented by the small number of cases, as well as the absence of reported side effects by the population, make it difficult to confirm the causality despite the temporal association.

CONCLUSION:

Many arguments support a causal link between mRNA vaccine exposure and the risk of myocarditis, particularly in young individuals. This article sheds light on the likelihood of developing myocarditis also from DNA vaccines through the two reported cases. Indeed, the existence of these cases, though few in number, should prompt us to enhance post-vaccination surveillance to uncover similar cases and to study the risk of myocarditis associated with different types of vaccine.

REFERENCES:

1. Richardson P, McKenna W, Bristow M, Maisch B, Mautner B, O'Connell J, Olsen E, Thiene G, Goodwin J, Gyarfas I, Martin I, Nordet P, (1996) Report of the 1995 World Health Organization/International Society and Federation of Cardiology Task Force on the Definition and Classification of cardiomyopathies. Circulation 93: 841–842
2. Diagnosis and Management of Myocarditis ; G. Hékimian · G. Franchineau · N. Bréchot · M. Schmidt · A. Nieszkowska · S. Besset · C.-E. Luyt · A. Combes Reçu le 19 janvier 2017 ; accepté le 14 mars 2017 © SRLF et Lavoisier SAS 2017

3. Bock CT, Klingel K, Kandolf R, (2010) Human parvovirus B19- associated myocarditis. N Engl J Med 362: 1248–1249
4. Kühl U, Pauschinger M, Seeberg B, Lassner D, Noutsias M, Poller W, Schultheiss HP, (2005) Viral persistence in the myocardium is associated with progressive cardiac dysfunction. Circulation 112: 1965–1970
5. Yaron Finkelstein, MD, Divisions of Emergency Medicine and Clinical Pharmacology and Toxicology, Department of Pediatrics, the Hospital for Sick Children, 555 University Ave., Toronto, Ontario M5G 1X8, Canada. E-mail: yfinkel@yahoo.com. Copyright © 2008 by Lippincott Williams & Wilkins
6. M. Kerneis, K. Bihan and J.-E. Salem, COVID-19 vaccines and myocarditis, Arch Cardiovasc Dis,
7. Stéphane Le Vu, Marion Bertrand, Marie- Joëlle Jabagi, Jérémie Botton, Jérôme Drouin, Bérangère Baricault, Kim Bouillon, Laura Semenzato, Alain Weill, Rosemary Dray-Spira, Mahmoud Zureik EPI-PHARE -Groupement d'intérêt scientifique (GIS) ANSM-CNAM 8novembre 2021
8. Wallace M, Oliver S. Vaccins à ARNm contre le COVID-19 chez les adolescents et les jeunes adultes : discussion avantages- risques. Diapositive 28.
9. Myocarditis after Covid-19 Vaccination in a Large Health Care Organization Guy Witberg, M.D., and al. October 6, 2021
10. Myocardite et péricardite après vaccination contre le COVID-19, George A. Diaz, MD[1]; Guilford T. Parsons, MD, MS2; Sara K. Gering, BS, BSN3; et al 4 août 2021
11. Wise J. Covid-19: Should we be worried about reports of myocarditis and pericarditis after mRNA vaccines? BMJ 2021 Jun 4; 373:n1635. doi: 10.1136/bmj.n1635.

ILLUSTRATION:

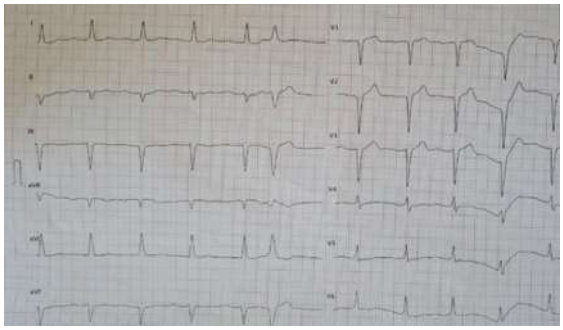

Figure A: Electrocardiogram at admission.

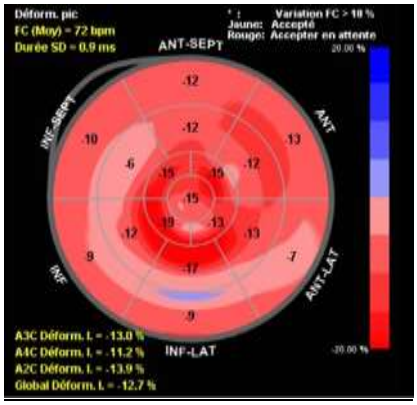

Figure B: Echocardiographic strain evaluation

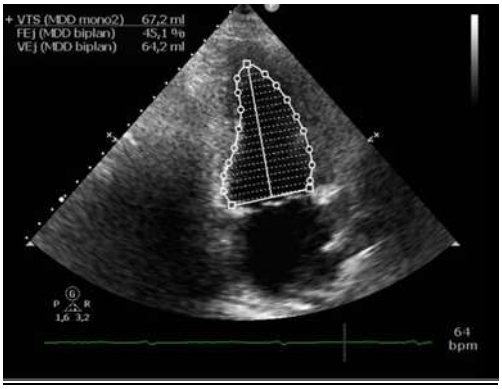

Figure C:TTE demonstrate the calculation of LVEF in 2-chamber view at end-systolic phase.

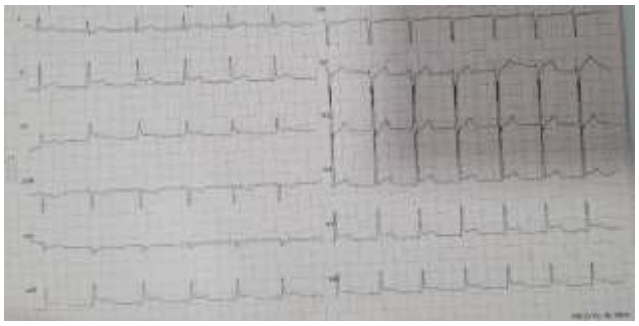

Figure D: Electrocardiogram at admission.

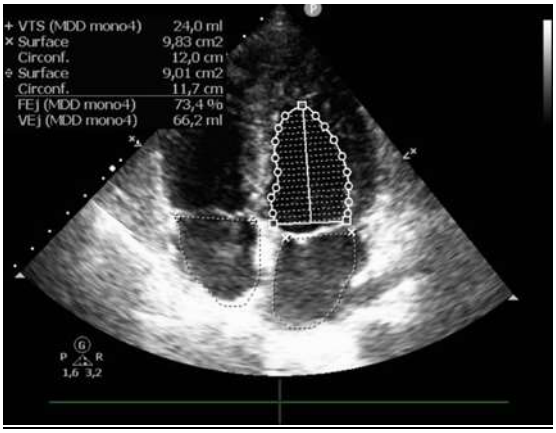

Figure E: ETT demonstrate the calculation of LVEF in 4-chamber view on SBP.

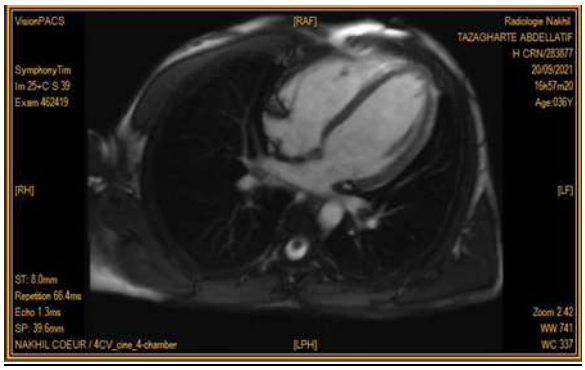

Figure F: 4 chamber view on Cardiac MRI

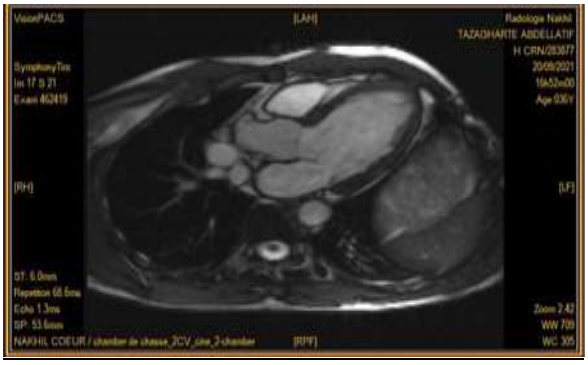

Figure G : 3 chamber view on Cardiac MRI.

Acknowledgments:

Not applicable.

Author contribution:

MB: Study concept, Data collection, Data analysis, writing the paper.

RL: Study concept, Data collection, Data analysis.

RF: Study concept, Data analysis, writing the paper.

NM: Supervision and data validation

IA: Supervision and data validation

AB: Supervision and data validation

All authors reviewed the final manuscript.

Funding Sources:

There are no funding sources to declare.

Availability of supporting data

Not applicable.

Ethics approval and consent to participate:

Not applicable.

Consent for publication:

Written informed consent was obtained from the patients for publication of this cases report.

Competing interests:

None.

Provenance and peer review

Not commissioned, externally peer-reviewed