Case Report

Myocardial Scarring Post mRNA-Covid 19-vaccine Related Perimyocarditis

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One of the rare possible complications of mRNA-Covid 19-vaccines is acute myocarditis which usually completes clinical recovery, with residual myocardial damage among these patients being rarely reported. Late Gadolinium enhancement technique for cardiac MRI is a unique technique to detect myocardial scaring or focal fibrosis of the myocardium. This case report demonstrates the myocardial scaring detected by the late Gadolinium enhancement technique in a healthy 21-year-old man who was diagnosed with mRNA- Covid 19-vaccine related perimyocarditis and was treated symptomatically. Patient completed recovery and followed up in the 4th month post-recovery with a late Gadolinium enhancement technique cardiac MRI revealing positive Gadolinium enhancement which denoted myocardial scarring.

Keywords: *perimyocarditis ● myocardial late Gadolinium enhancement ● mRNA vaccine*

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รายงานผู้ป่วย

รายงานกรณีศึกษาการพบแผลเป็นในกล้ามเนื้อหัวใจภายหลังจากกล้ามเนื้อหัวใจอักเสบหลังได้รับการฉีดวัคซีนป้องกันโควิด 19 ชนิดเอ็มอาร์เอ็นเอ

หัสยา ประสิทธิ์ดำรง ศรัณย์ กรมชาลี ธนกฤต โรจน์ดำรงการ และ จิงโจ้ สายสอาด
แผนกโรคหัวใจและหลอดเลือด โรงพยาบาลพระมงกุฎเกล้า

วัคซีนป้องกันโควิด 19 ชนิดเอ็มอาร์เอ็นเอเป็นวัคซีนที่ถูกคิดค้นขึ้นมาใหม่และนำมาใช้กับมนุษย์เป็นครั้งแรกของโลก ภาวะแทรกซ้อนประการหนึ่งของวัคซีนนี้ได้แก่การเกิดกล้ามเนื้อหัวใจอักเสบเฉียบพลัน แต่ยังมีรายงานเกี่ยวกับการพบแผลเป็นหรือพังผืดในกล้ามเนื้อหัวใจค่อนข้างน้อย เทคนิค late Gadolinium enhancement จากการตรวจกล้ามเนื้อหัวใจด้วยเครื่องตรวจสนามแม่เหล็กไฟฟ้า เป็นวิธีจำเพาะที่สามารถตรวจพังผืดในกล้ามเนื้อหัวใจได้ รายงานเคสตัวอย่างนี้แสดงให้เห็นการตรวจพบพังผืดในกล้ามเนื้อหัวใจในผู้ป่วยชายอายุ 21 ปี ที่ได้รับการวินิจฉัยโรคกล้ามเนื้อและเยื่อหุ้มหัวใจอักเสบเฉียบพลันหลังได้รับการฉีดวัคซีนป้องกันโควิด 19 ชนิดเอ็มอาร์เอ็นเอ ผู้ป่วยได้รับการรักษาแบบประคับประคองจนอาการหายเป็นปกติ และผลตรวจหัวใจซ้ำด้วยเครื่องตรวจสนามแม่เหล็กไฟฟ้าที่ 4 เดือน ยังคงพบลักษณะการคงค้างของสาร Gadolinium ในกล้ามเนื้อหัวใจ เมื่อตรวจด้วยเทคนิค late Gadolinium enhancement อันหมายถึงการมีพังผืดในกล้ามเนื้อหัวใจ

คำสำคัญ: *กล้ามเนื้อหัวใจอักเสบ ● พังผืดในกล้ามเนื้อหัวใจ ● วัคซีนป้องกันโควิด 19 ชนิดเอ็มอาร์เอ็นเอ*
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Introduction

SARS-CoV-2 is an emerging virus that causes Coronavirus disease 2019 or COVID-19. The new mRNA-based vaccines, first utilized in humans, were developed to prevent serious complications associated with COVID-19 infection. One of the rare complications of mRNA vaccines is acute myocarditis, which can also occur following other viral vaccinations. The incidence of COVID-19 mRNA-vaccine-related myocarditis is estimated to be 0.3-5.0 cases per 100,000 vaccinated individuals[1,2,3.] Most of these cases were young adults with mild clinical presentations.

Late Gadolinium enhancement technique for cardiac MRI is increasingly being used to detect myocardial injury and chronic myocardial scaring that occurs in some cases of myocarditis. The presence of late Gadolinium enhancement is associated with a high risk of arrhythmia, heart failure, cardiomyopathy, and even cardiac death.[4]

The objective of this case report is to demonstrate the presence of late Gadolinium enhancement, which denotes myocardial scarring in a healthy young man who was diagnosed with mRNA- Covid 19-vaccine related perimyocarditis and was treated symptomatically.

Case report

A healthy 21-year-old man presented with acute retrosternal chest pain for 2 hours prior to hospital arrival. He described a dull, aching pain that radiated to his left shoulder and reported a pain score of 5/10. He had been vaccinated with the second dose of COVID-19 mRNA, BNT162b2, vaccine 4 days before symptoms occurred, with the first dose administered 1 month earlier. His vital signs and O2 saturation were stable. Other physical examinations were within normal limits. Electrocardiogram revealed a sinus rhythm rate of 60 beats per minute with diffuse ST-segment elevation except in the aVR lead. Cardiac troponin T was 582 ng/L upon arrival then raised to 770 ng/L 3 hours later. NT-pro BNP was 79.9 pg/mL, hs-CRP 4.4 mg/L and Erythrocytes Sedimentation Rate 17 mm/hr. A completed blood count and chest X-ray were normal. RT-PCR test for Covid-19 infection and viral panel tests were confirmed negative. The echocardiogram showed normal biventricular size and good systolic function, with no regional wall motion abnormality, no significant valvular lesions, and no pericardial effusion.

Cardiac MRI (CMR) was performed on day 3 after symptoms occurred. The size of the cardiac chambers and wall thickness, including systolic function of both left and right ventricles, were normal. T2-Weighted imaging, a standard CMR technique for edema detection, showed high signal intensity on myocardium and pericardium at the mid-anterolateral and inferolateral walls, as shown in Figure 1A. Delayed enhancement imaging, following Gadolinium contrast injection, revealed a subepicardial delayed enhancement pattern, which represented non-ischemic related scarring, at the mid-anterolateral and inferolateral walls with pericardial involvement, as shown in Figure 1B. Acute perimyocarditis was diagnosed based on CMR findings according to the 2018 Lake Louise Criteria.[5]

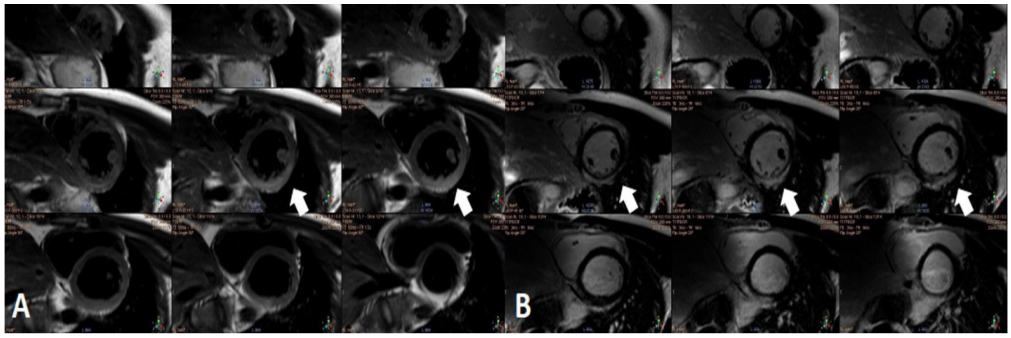

Figure 1: 1A T2-Weighted images show hypersignal intensity of the myocardium and pericardium (white arrow) at the mid-anterolateral and inferolateral walls. **1B** Late gadolinium enhancement images show subepicardial delayed enhancement (white arrow) at the mid-anterolateral and inferolateral walls with pericardial involvement.

The patient was treated with conservative treatment and discharged with complete clinical resolution on day 6. He was asymptomatic at followed up, and CMR was repeated in the 4th months after discharge. Follow-up CMR at 4th month did not show evidence of myocardial edema on T2-weighted imaging, however, non-ischemic related scarring, which was seen as a subepicardial delayed enhancement at mid-anterolateral and inferolateral walls, was persisted on the delayed enhancement technique as shown in **Figure 2.**

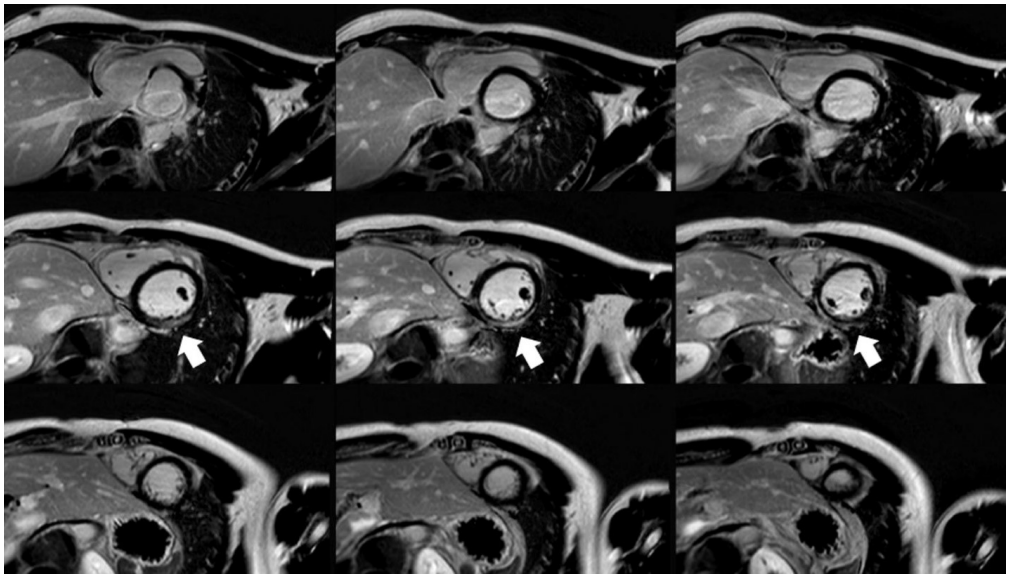

Figure 2: Late gadolinium enhancement images at the 4th month follow-up of a patient with perimyocarditis post mRNA-Covid 19-vaccine show persistent subepicardial delayed enhancement (white arrow) at the mid-anterolateral and inferolateral walls.

Discussion

Incidence of mRNA-vaccine-related myocarditis is reported to be scarce and mostly occurs in young men after the second dose of vaccination.[2] The presenting symptoms are usually mild and occur within the first week after vaccination.[3] Vaccine-associated myocarditis as detected by CMR was reported as high as 82 percent during initial presentation.[6] Most of the patients have complete clinical recovery as in our case, but myocardial scarring which can cause future arrhythmia cannot be evaluated by the clinical symptoms. Diagnosis of vaccine-associated myocarditis is based on clinical symptoms, abnormal biomarkers, cardiac imaging while excluding any possible alternative causes for myocarditis such as systemic inflammation as demonstrates in this patient. CMR is an emerging non-invasive cardiac imaging technique for detection of myocardial edema, necrosis and scarring which are the important finding criteria for myocarditis diagnosis according to the 2018 Lake Louise criteria.[5] Persistence of myocardial scarring on follow-up CMR was rarely reported. As of present data, myocardial scarring detected as late Gadolinium enhancement from CMR was reported 60-70 percent of the time up to 6 months into the follow-up period.[6,7] Kravchenko D, et al. demonstrated that, of the nine patients who were diagnosed with COVID-19 vaccine associated acute myocarditis, 80% of the patients reported a resolution of clinical symptoms and all patients showed a complete resolution of visual myocardial edema from follow-up CMR at 5.8 months on average. Although visual late Gadolinium enhancement was seen in all patients, a reduction in overall late Gadolinium enhancement extent was noted.[8]

Conclusion

Our case presents the advantages of CMR as a useful non-invasive cardiac imaging for the definitive diagnosis of acute perimyocarditis among vaccine-associated myocarditis patients and demonstrates myocardial scarring detected by the late Gadolinium enhancement technique for CMR at the 4th month follow-up, despite complete symptoms recovery.

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