COVID-19 Has Gone, But Not Its Cardiac Sequela: A Case Report

Masmahathir Mohamad[1], Sidhi Laksono[2,3*]

[1]Department of Emergency Medicine, Islamic Hospital A.Yani, Jl. Achmad Yani No.2-4, Wonokromo, Surabaya, 60243, Indonesia
[2]Department of Cardiology and Vascular Medicine, Siloam Heart Center, Cinere Depok, Indonesia
[3]Departement of Cardiology and Vascular Medicine, Faculty of Medicine, Prof. Dr. Hamka Muhammadiyah University, Jl. Raden Patah No.01, Tangerang City, Banten, 13460, Indonesia.

[*]*Corresponding Author: sidhilaksono@uhamka.ac.id*

Abstrak

Hampir 3 tahun telah berlalu sejak WHO menetapkan COVID-19 sebagai pandemi. Pandemi ini meninggalkan beberapa masalah, termasuk masalah jantung, bahkan setelah pandemi ini berlalu. Miokarditis adalah komplikasi jantung yang umum terjadi pada infeksi COVID-19. Kami menyajikan kasus menarik tentang seorang pria berusia 23 tahun yang menderita gagal jantung kronis setelah terinfeksi COVID-19. Seorang pasien Pria Berusia 23 Tahun datang ke unit gawat darurat (IGD) kami dengan gejala dan tanda Gagal Jantung (HF). Dia memiliki riwayat gejala seperti flu, dengan penanda positif COVID 3 minggu sebelum masuk. Pasien adalah seorang pelaut dengan riwayat gaya hidup sehat, tidak ada faktor risiko kardiovaskular dan hasil pemeriksaan kesehatan normal. Kardiomegali dengan konfigurasi LVH tampak pada rontgen dada. EKG 12 sadapan menunjukkan sinus bradikardia dengan multifokal PVC dan episode konversi otomatis Torsade de Pointes. Ekokardiografi menunjukkan penurunan Fraksi Ejeksi (EF). Pasien juga memiliki riwayat masuk rumah sakit berulang dengan ADHF dalam waktu 6 bulan. MRI jantung dilakukan untuk membedakan etiologi gagal jantung yang mendukung diagnosis kardiomiopati non-iskemia akibat miokarditis kronis. Dari data tersebut, kami menyimpulkan bahwa etiologi gagal jantung pada pasien ini disebabkan oleh infeksi Covid-19 miokarditis kronis. Miokarditis pada kondisi pasca COVID-19 merupakan kondisi yang jarang terjadi namun tetap mungkin terjadi dan perlu diperhatikan. Laporan kasus ini menekankan bahwa etiologi HF harus dicari pada semua kasus, karena pengenalannya dapat mengarahkan terapi dan mempengaruhi prognosis pasien tersebut.

Kata Kunci: miokarditis, gagal jantung, covid-19, komplikasi jantung, kardiomiopati non-iskemik

Abstract

Nearly 3 years have passed since the WHO declared COVID-19 as a pandemic. The pandemic left some problems, including cardiac, even after it has gone. Myocarditis is a common cardiac complication among COVID-19 infections. We present an interesting case of a 23-year-old male admitted with chronic heart failure after COVID-19 infections. A 23-Years Old Male patient came to our emergency department (ER) with Heart Failure (HF) symptoms and signs. He had history of flulike symptom, with positive COVID marker 3 weeks prior to admission. Patient was a sailor with history of healthy lifestyle, no cardiovascular risk factor and normal medical checkup result. Cardiomegaly with LVH configuration appeared in chest x-ray. The ECG 12-lead showed sinus bradycardia with PVC multifocal and episode of Torsade de Pointes auto convert. Echocardiography revealed reduced of Ejection Fraction (EF). Patient also had history of recurrent hospital admission with ADHF within 6 months. Cardiac MRI was done to distinguish the etiology of heart failure which support the diagnosis of non-ischemia cardiomyopathy caused by chronic myocarditis. From those data, we conclude that the etiology of heart failure in this patient was due to chronic myocarditis related Covid-19 infection. Myocarditis in post COVID-19 condition is an uncommon but still possible condition that needs to be considered. This case report emphasizes the etiology of HF must be sought in all cases, because its recognition can direct the therapy and influence the prognosis of these patients.

Keywords: myocarditis, heart failure, covid-19, cardiac complications, non-ischemic cardiomyopathy

Introduction

Nearly three years have elapsed since the World Health Organization (WHO) declared COVID-19 a pandemic. The pandemic has left a legacy of residual health complications, including significant cardiac issues that persist even after the acute phase of the infection has resolved. The cardiac manifestations associated with COVID-19 are diverse and encompass a range of conditions, such as arrhythmias, acute coronary syndrome, decompensated heart failure, and myocarditis.(1)Among these, post-COVID-19 myocarditis emerges as the predominant cardiovascular complication, with a prevalence ranging from 7% to 23% of cases. This rate is notably 2 to 3 times higher than individuals without COVID-19.(2) Research conducted in the United States has demonstrated that the correlation between COVID-19 and myocarditis is less pronounced among individuals aged 25–39 years, with higher incidence rates observed in both younger (<16 years) and older (≥50 years) age groups.(3) This study aims to highlight an uncommon occurrence of myocarditis associated with COVID-19 infection in a young male individual.

A 23-year-old male patient presented to our emergency department (ER) reporting symptoms of exertional dyspnea, orthopnea, and frequent palpitations persisting for the past two weeks, with a recent exacerbation noted over the last three days. The patient has a history of flu-like symptoms and tested positive for COVID-19 three weeks prior. Despite being declared recovered from COVID-19 within a week, his symptoms persisted and worsened. The patient, a sailor with a previously healthy lifestyle and no cardiac risk factors, had a normal medical examination seven months earlier. Upon admission, the patient's vital signs were as follows: body temperature 37.2°C, blood pressure 92/64 mmHg, heart rate 54 beats per minute, respiratory rate 24 breaths per minute, and oxygen saturation 92% on room air. Physical examination revealed bradycardia, basal pulmonary rales, bilateral pedal edema, and increased jugular venous pressure. Initial laboratory tests indicated elevated levels of D-dimer (8660 ng/mL, normal ≤ 500), C-Reactive Protein (2.49 mg/dL, normal <0.3 mg/dL), AST (1362 U/L, normal <31), ALT (1491 U/L, normal <34), NT-proBNP (4689 pg/mL, normal <92.6) and hs Troponin T (21.2 ng/L, normal <14; observational zone 14-51; AMI >51). PCR for SARS-CoV-2 and HbsAg for Hepatitis B infection was negative. The chest X-ray demonstrated cardiomegaly with right ventricular hypertrophy (RVH), left ventricular hypertrophy (LVH),

and initial pulmonary edema, highlighting significant deviations from the patient's chest X-ray findings recorded seven months prior to his sailing activities (figure 1).

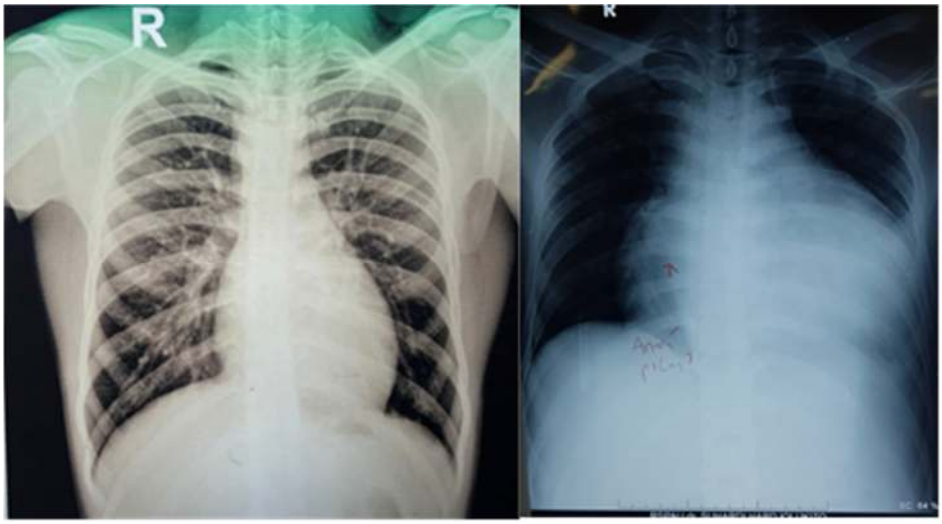

Figure 1. Chest X-ray showed significance difference between before and after COVID-19 infection

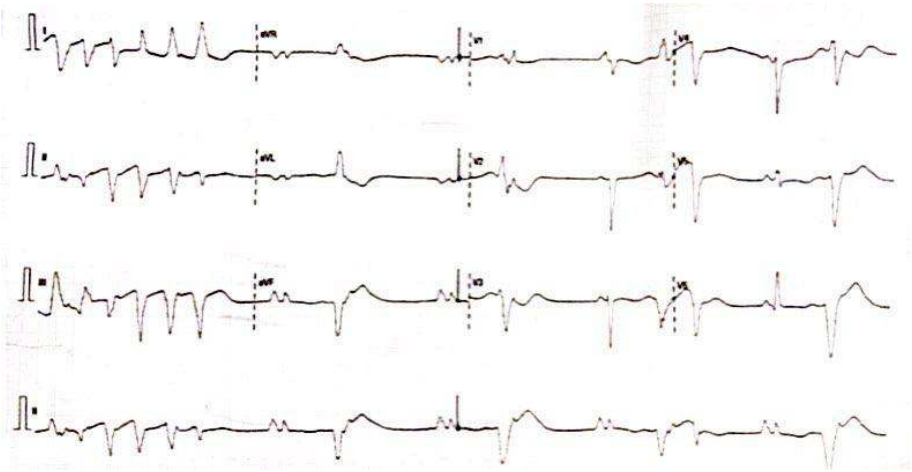

Figure 2. Sinus bradycardia with auto-converted Torsade de Pointes

Results

The patient was subsequently admitted to the Intensive Cardiac Care Unit (ICCU). He underwent a transthoracic echocardiogram (TTE), which demonstrated dilation of all chambers, decreased left ventricular (LV) function with an ejection fraction of 20%, global hypokinesis, grade III diastolic dysfunction, reduced right ventricular (RV) systolic function, TAPSE of 1.2

cm, and mild mitral regurgitation (MR), pulmonary regurgitation (PR), and tricuspid regurgitation (TR). There was also a high probability of pulmonary hypertension. During his ICCU admission, the patient experienced multiple episodes of ventricular tachycardia (VT), which spontaneously converted to sinus rhythm. Electrocardiogram (ECG) findings varied from sinus bradycardia to Torsade de Pointes (figure 2). To further elucidate the etiology of his heart failure, the patient was referred to perform a cardiac MRI. The MRI revealed a reduced left ventricular ejection fraction (LVEF) of 23.26%, global hypokinesis of the LV, mid-wall hyperenhancement pattern from basal to apical LV, apical LV thrombus, pericardial effusion, which support the diagnosis of non-ischemia cardiomyopathy caused by chronic myocarditis (figure 3). For almost 6 months of treatment, the patient had received the optimal medical treatment such as, furosemide, spironolactone, sacubitril-valsartan, carvedilol, dapagliflozin and digoxin. But, since the presence of multiple episodes of VT, several times of re-admission with dobutamine support, and involvement of liver dysfunction, the patient was planned to performed mechanical circulatory support.

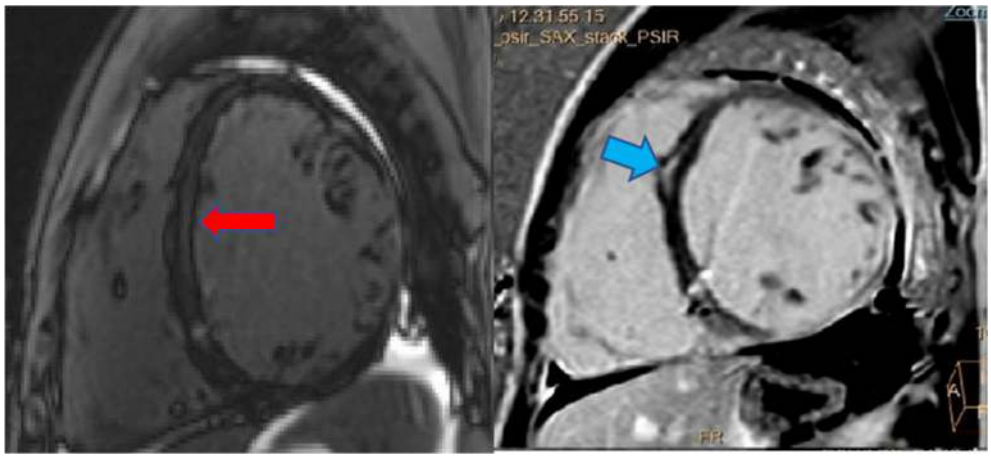

Figure 3. Myocardial fibrosis and Midwall hyperenhancement pattern of Late Gadolinium Enhancement

Discussion

Heart failure (HF) represents the terminal phase of various cardiac disorders, with myocardial ischemia being the predominant cause in elderly patients. Conversely, among younger patients, non-ischemic etiologies of HF, such as congenital heart disease, myocarditis, various cardiomyopathies, and toxin-induced myocardial damage, are more commonly

observed.(4) COVID-19 infection has been associated with the onset of HF through mechanisms such as myocardial infarction, myocarditis, microthrombi formation, and stress-induced cardiomyopathy. (5–7)

In this case, a young male patient presented with symptoms of heart failure. He maintained a previously healthy lifestyle and had no history of congenital heart disease. A chest X-ray conducted before his sailing activities yielded normal results. However, the onset of symptoms occurred following a COVID-19 infection, and subsequent chest X-ray findings revealed significant abnormalities compared to the prior imaging.

Blood tests in myocarditis patients often show elevated levels of lactate and inflammatory markers such as C-reactive protein, erythrocyte sedimentation rate, and procalcitonin, reflecting the infection. Differentiating fulminant myocarditis from sepsis is essential, as fluid resuscitation for sepsis can exacerbate myocarditis due to fluid overload. Baseline cardiac enzyme testing (e.g., troponin, NT-proBNP) at hospital admission is recommended, as levels of cTnI, cTnT, NT-proBNP, and BNP are typically elevated in myocarditis due to acute myocardial injury and possible ventricular dilation. Elevated troponin and NT-proBNP levels have been observed in COVID-19-related myocarditis cases. (8,9)

In this case, the elevated inflammation markers such as D-dimer (8660 ng/mL, normal ≤ 500), and C-Reactive Protein (2.49 mg/dL, normal <0.3 mg/dL) happened. The cardiac marker also shows significant elevation of NT-proBNP (4689 pg/mL, normal <92.6) and hs Troponin T (21.2 ng/L, normal <14; observational zone 14-51; AMI >51). The elevation of AST (1362 U/L, normal <31) and ALT (1491 U/L, normal <34) could suggest additional potential differential diagnoses, such as hepatitis B. However, the HbsAg test was non-reactive, making SARS-CoV-2 the most likely cause of myocarditis. The elevation of liver enzyme values may indicate liver dysfunction, which can lead to advanced heart failure.(10)

Non-invasive imaging techniques, such as cardiac magnetic resonance imaging, can be valuable for diagnosing myocarditis and monitoring disease progression. However, we strongly suggest for endomyocardial biopsy (EMB) to be considered the gold standard for the definitive diagnosis of myocarditis.(11) The JACC Scientific Expert Panel offers consensus recommendations for updating the cardiovascular magnetic resonance (CMR) diagnostic criteria for myocardial inflammation in patients with suspected acute or active myocardial inflammation, known as the Lake Louise Criteria.(12)

In this case, the CMR demonstrated two of the three Lake Louise criteria: midwall hyperenhancement from the basal to apical LV, late gadolinium enhancement (blue arrow in Figure 3), and increased regional myocardial signal intensity in T2-weighted edema images (red arrow in figure 3). The presence of these two criteria confirms that the patient meets the Lake Louise criteria and is diagnosed with non-ischemic cardiomyopathy.(12)

Based on ESC guidelines, modulating the RAAS and sympathetic nervous systems with ACE-I or ARNI, beta-blockers, and MRA improves survival, reduces hospitalizations, and alleviates symptoms in HFrEF patients, forming the cornerstone of their treatment. Additionally, SGLT2 inhibitors like dapagliflozin and empagliflozin are recommended for all HFrEF patients already on these therapies, regardless of diabetes status.(13)

The patient has received optimal medical treatment. However, his condition has not improved over nearly six months, with multiple readmissions and dependence on inotropes (digoxin and dobutamine).(14,15) Given various considerations, including multiple episodes of ventricular tachycardia, repeated readmissions requiring dobutamine support, and the involvement of liver dysfunction, the patient has been diagnosed with advanced heart failure and is being planned for mechanical circulatory support.(16)

Conclusions and Suggestions

This case illustrates the importance of evaluating heart failure symptoms in patients following COVID-19 infection. Despite a healthy lifestyle and no previous cardiovascular risk factors, the 23-year-old patient developed chronic myocarditis, leading to advanced heart failure. Diagnostic tests confirmed non-ischemic cardiomyopathy caused by chronic myocarditis. The persistence of symptoms and repeated hospital admissions, despite optimal medical treatment, highlight the complexity of post-COVID-19 cardiac complications. This case emphasizes the need to consider myocarditis as a potential cause of heart failure in post-COVID-19 patients. Recognizing the underlying cause is essential for guiding treatment and improving outcomes, and in this case, led to the consideration of mechanical circulatory support.

References

1. Bielecka-Dabrowa A, Cichocka-Radwan A, Lewek J, Pawliczak F, Maciejewski M, Banach M. Cardiac manifestations of COVID-19. Rev Cardiovasc Med. 2021;22(2):365.

2. Priyadarshni S, Westra J, Yong-Fang K, Baillargeon JG, Khalife W, Raji M. COVID-19 Infection and Incident of Myocarditis: A Multi-Site Population-Based Propensity Score-Matched Analysis. Cureus. 2022 Feb 3;
3. Boehmer TK, Kompaniyets L, Lavery AM, Hsu J, Ko JY, Yusuf H, et al. Association Between COVID-19 and Myocarditis Using Hospital-Based Administrative Data — United States, March 2020–January 2021. MMWR Morb Mortal Wkly Rep. 2021 Sep 3;70(35):1228–32.
4. Ziaeian B, Fonarow GC. Epidemiology and aetiology of heart failure. Nat Rev Cardiol. 2016 Jun 3;13(6):368–78.
5. Italia L, Tomasoni D, Bisegna S, Pancaldi E, Stretti L, Adamo M, et al. COVID-19 and Heart Failure: From Epidemiology During the Pandemic to Myocardial Injury, Myocarditis, and Heart Failure Sequelae. Front Cardiovasc Med. 2021 Aug 10;8.
6. den Hoogen P van, den Akker F van, Deddens JC, Sluijter JPG. Heart Failure in Chronic Myocarditis: A Role for microRNAs? Curr Genomics. 2015 Mar 2;16(2):88–94.
7. Laksono S, Setianto B, Philip Surya S. Angiotensin converting enzyme 2 (ACE2), COVID-19 and cardiac injury: what cardiologist should know. Journal of thee Medical Sciences (Berkala Ilmu Kedokteran). 2020 Jul 15;52(03).
8. Zeng JH, Liu YX, Yuan J, Wang FX, Wu WB, Li JX, et al. First case of COVID-19 complicated with fulminant myocarditis: a case report and insights. Infection. 2020 Oct 10;48(5):773–7.
9. Inciardi RM, Lupi L, Zaccone G, Italia L, Raffo M, Tomasoni D, et al. Cardiac Involvement in a Patient With Coronavirus Disease 2019 (COVID-19). JAMA Cardiol. 2020 Jul 1;5(7):819.
10. Abdeldayem EH, Raief Mosaad BM, Yassin A, Abdelrahman AS. Cardiac MRI in patients with COVID-19 infection. Eur Radiol. 2022 Dec 13;33(6):3867–77.
11. Martens P, Cooper LT, Tang WHW. Diagnostic Approach for Suspected Acute Myocarditis: Considerations for Standardization and Broadening Clinical Spectrum. J Am Heart Assoc. 2023 Sep 5;12(17).
12. Ferreira VM, Schulz-Menger J, Holmvang G, Kramer CM, Carbone I, Sechtem U, et al. Cardiovascular Magnetic Resonance in Nonischemic Myocardial Inflammation. J Am Coll Cardiol. 2018 Dec;72(24):3158–76.
13. McDonagh TA, Metra M, Adamo M, Gardner RS, Baumbach A, Böhm M, et al. 2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure. Eur Heart J. 2021 Sep 21;42(36):3599–726.
14. Maddox TM, Januzzi JL, Allen LA, Breathett K, Brouse S, Butler J, et al. 2024 ACC Expert Consensus Decision Pathway for Treatment of Heart Failure With Reduced Ejection Fraction. J Am Coll Cardiol. 2024 Apr;83(15):1444–88.
15. Heidenreich PA, Bozkurt B, Aguilar D, Allen LA, Byun JJ, Colvin MM, et al. 2022 AHA/ACC/HFSA Guideline for the Management of Heart Failure: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Circulation. 2022 May 3;145(18).
16. Vieira JL, Ventura HO, Mehra MR. Mechanical circulatory support devices in advanced heart failure: 2020 and beyond. Prog Cardiovasc Dis. 2020 Sep;63(5):630–9.