

# Does SARS-CoV-2 cause viral myocarditis in COVID-19 patients?

Ruihai Zhou \*

Division of Cardiology, Department of Medicine, University of North Carolina at Chapel Hill, 160 Dental Circle, Chapel Hill, NC 27599-7075, USA

**This commentary refers to ‘Acute myocarditis presenting as a reverse Tako-Tsubo syndrome in a patient with SARS-CoV-2 respiratory infection’, by S. Sala et al., doi:10.1093/eurheartj/ehaa286.**

Since the first cases reported in Wuhan, China, coronavirus disease 2019 (COVID-19) has spread swiftly around the world, and is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The development of myocardial injury is associated with significantly worse clinical course and increased mortality. However, currently it is unclear whether cardiac injury observed in COVID-19 patients results directly from viral infection of the myocardium, i.e. SARS-CoV-2 viral myocarditis, or indirectly from the complications of COVID-19.

Several cases of acute myocarditis or, more appropriately, myocardial inflammation, associated with COVID-19 have been reported.<sup>1,2</sup> However, there are scant myocardial pathological data from COVID-19 patients. The only post-mortem pathological study in a COVID-19 patient thus far was on a 50-year-old male with COVID-19 who died from cardiac arrest, in China; the results showed significant lung damage, but no substantial damage in the myocardium was found except for a few interstitial mononuclear inflammatory infiltrates.<sup>3</sup>

In this issue, Sala et al. report the first direct evidence of myocardial inflammation by endomyocardial biopsy (EMB) in a COVID-19 patient.<sup>2</sup> EMB revealed diffuse T-lymphocytic inflammatory infiltrates with significant interstitial oedema and limited focal necrosis. However, no SARS-CoV-2 genome was detected within the myocardium.<sup>2</sup> On cardiac magnetic resonance (CMR), the patient had evidence of myocardial oedema and left ventricular systolic dysfunction

with basal–mid left ventricular hypokinesia and preserved apical motion, a pattern indicative of reverse Takotsubo cardiomyopathy.<sup>2</sup>

Takotsubo cardiomyopathy is known to have regional myocardial oedema on CMR,<sup>4</sup> and injury to myocytes and infiltration of lymphocytes and macrophages in the autopsied specimens.<sup>5</sup> Given the lack of evident myocardial SARS-CoV-2 viral genome and shared CMR features with Takotsubo cardiomyopathy, the cardiac manifestation in this reported COVID-19 patient could be that of reverse Takotsubo cardiomyopathy in the setting of COVID-19 stress.<sup>4</sup>

Nevertheless, EMB is limited by sampling error and usually only a portion of patients infected with a virus causing myocarditis develop viral myocarditis; therefore, it is possible that with more autopsy evidence of SARS-CoV-2, viral myocarditis will emerge.

**Conflict of interest:** none declared.

## References

1. Inciardi RM, Lupi L, Zaccone G, Italia L, Raffo M, Tomasoni D, Cani DS, Cerini M, Farina D, Gavazzi E, Maroldi R, Adamo M, Ammirati E, Sinagra G, Lombardi CM, Metra M. Cardiac involvement in a patient with coronavirus disease 2019 (COVID-19). *JAMA Cardiol* 2020;doi: 10.1001/jamacardio.2020.1096.
2. Sala S, Peretto G, Gramegna M, Palmisano A, Villatore A, Vignale D, De Cobelli F, Tresoldi M, Cappelletti AM, Basso C, Godino C. Acute myocarditis presenting as a reverse Tako-Tsubo syndrome in a patient with SARS-CoV-2 respiratory infection. *Eur Heart J* 2020;doi:10.1093/eurheartj/ehaa286.
3. Xu Z, Shi L, Wang Y, Zhang J, Huang L, Zhang C, Liu S, Zhao P, Liu H, Zhu L, Tai Y, Bai C, Gao T, Song J, Xia P, Dong J, Zhao J, Wang FS. Pathological findings of COVID-19 associated with acute respiratory distress syndrome. *Lancet Respir Med* 2020;8:420–422.
4. Bratis K. Cardiac magnetic resonance in Takotsubo syndrome. *Eur Cardiol* 2017;12:58–62.
5. Kawai S, Shimada T. Inflammation in takotsubo cardiomyopathy? Inquiry from ‘Guidelines for Diagnosis and Treatment of Myocarditis (JCS 2009)’. *J Cardiol* 2014;63:247–249.

\* Corresponding author. Tel: +1 610 203 2255, Email: [Ruihai\\_zhou@med.unc.edu](mailto:Ruihai_zhou@med.unc.edu)

Published on behalf of the European Society of Cardiology. All rights reserved. © The Author(s) 2020. For permissions, please email: [journals.permissions@oup.com](mailto:journals.permissions@oup.com).