

Myocarditis as a Manifestation of the New COVID-19

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Abstract

In the light of the ongoing pandemic, there is an alertness to cardiac manifestations of the coronavirus disease 2019 (COVID-19). This paper elucidates the current knowledge of myocarditis as part of the COVID-19 pandemic.

Keywords: COVID-19; Myocarditis; Pandemic

In view of the unprecedented circumstances of the COVID-19 pandemic, patients with underlying cardiovascular disease have been categorized as high risk and advised to take precautions. Potential cardiac implications of the novel virus are currently being reported and studied. Currently the clinical expression of the SARS-CoV2 is being elucidated including how the heart is affected.

As cardiac complications of COVID-19, a Chinese registry reported arrhythmia (17%), of unspecified type, and acute cardiac injury (7%), defined as elevation of serum levels of cardiac biomarkers (e.g. troponin I) above the 99th percentile upper reference limit or as new abnormalities in electrocardiography and echocardiography [1]. Furthermore, acute-onset heart failure and myocarditis have been reported. Ruan *et al.* reported myocarditis with circulatory collapse as a cause of death in 7% of COVID patients (n = 68). In 33% of the same cohort, myocarditis played a crucial role regarding the prognosis [2].

In San Raffaele, a referral hospital for cardiac complications in Milan, Italy, one incident of myocardial injury with normal coronary arteries in a 43-year-old female has been reported [3]. A 37-year-old male patient in China was reported to have been treated successfully for fulminant coronavirus-associated myocarditis and pulmonary infection with glucocorticoid anti-inflammatory and immunoglobulin therapy [4] despite reports that suggest this type of treatment is not beneficial for such patients [5].

The virus is suspected to occasionally cause fulminant myocarditis and it is suggested that patients with high troponin I levels and new-onset arrhythmias should be more closely monitored [6]. A not-yet-published registry study of 41 cases of myocardial injury in COVID-19 pneumonia patients evaluated epicardial adipose tissue using computed tomography imaging and found that cardiac injury was rare in patients with mild cases of COVID-19 but was more frequent in patients with severe COVID-19. The importance of close clinical monitoring in those cases must be emphasized, as critical patients can present atrial fibrillation and high heart rates [7].

It is not yet elucidated how the virus can affect the myocardium. Supporting the theory of inflammation-induced myocardial damage, a myocardial specimen in China showed no signs of direct viral infiltration of the heart [3], while interstitial mononuclear inflammatory

infiltrates were found in myocardial specimens in COVID-19 patients [8]. Pro-inflammatory cytokines can initiate systemic inflammatory response, i.e. cytokine storm, that can result in multi-organ failure, including the heart [9]. On the other hand, there may be direct viral myocardial involvement via the angiotensin converting enzyme 2, which is highly expressed on myocytes and a presumptive binding-site for the virus [10]. An oxygen-supply mismatch, due to lung infection, also seems to adversely affect the myocardium (type 2 myocardial infarction), especially in patients with underlying cardiac disease [11].

To this day, the majority of COVID-19 patients manifest with mild symptoms and without serious clinical implications [12]. Morbidity and mortality are not yet fully determined, with interim values ranging from 0.5% in Germany to over 10% in Italy and also depends on positive predictive values using the test [13,14]. Both morbidity and mortality appear to be related to older age and underlying comorbidities.

As many clinical studies regarding therapeutic strategies for the new virus have commenced, patients with underlying cardiac disease are strongly advised by the American College of Cardiology Foundation to take extreme precautions as well as remain current with all vaccinations, including pneumococcal and influenza vaccines [15].

As the situation and the available data evolve, indications as well as guidelines may change. Expert opinion will constantly attempt to elucidate as well as guide clinical practice world-wide during this dynamic pandemic. Until more is known the medical community should be aware of cardiac manifestations including myocarditis.

Bibliography

1. Wang D., *et al.* "Clinical Characteristics of 138 Hospitalized Patients with 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China". *Journal of the American Medical Association* (2020).
2. Ruan Q., *et al.* "Clinical predictors of mortality due to COVID-19 based on an analysis of data of 150 patients from Wuhan, China". *Intensive Care Medicine* (2020).
3. <https://www.tctmd.com/news/covid-19-and-heart-insights-front-lines>
4. Hu H., *et al.* "Coronavirus Fulminant Myocarditis Saved With Glucocorticoid and Human Immunoglobulin". *European Heart Journal* (2020).
5. Russell C., *et al.* "Clinical evidence does not support corticosteroid treatment for 2019-nCoV lung injury". *Lancet* 395.10223 (2020): 473-475.
6. Chen C., *et al.* "SARS-CoV-2: a potential novel etiology of fulminant myocarditis". *Herz* (2020).
7. Hui H., *et al.* "Clinical and radiographic features of cardiac injury in patients with 2019 novel coronavirus pneumonia". *medRxiv* (2020).
8. Xu Z., *et al.* "Pathological findings of COVID-19 associated with acute respiratory distress syndrome". *Lancet Respiratory Medicine* (2020).
9. Xiong TY., *et al.* "Coronaviruses and the cardiovascular system: acute and long-term implications". *European Heart Journal* (2020): ehaa231.
10. Gallagher PE., *et al.* "Regulation of ACE2 in cardiac myocytes and fibroblasts". *American Journal of Physiology - Heart and Circulatory Physiology* 295.6 (2008): H2373-H2379.
11. Driggin E., *et al.* "Cardiovascular Considerations for Patients, Health Care Workers, and Health Systems During the Coronavirus Disease 2019 (COVID-19) Pandemic". *Journal of the American College of Cardiology* (2020).

12. Guan WJ., *et al.* "Clinical Characteristics of Coronavirus Disease 2019 in China". *New England Journal of Medicine* (2020).
13. <https://www.worldometers.info/coronavirus/country/italy/>
14. <https://www.worldometers.info/coronavirus/country/germany/>
15. COVID-19 Clinical Guidance for the Cardiovascular Care Team. ACC News Story (2020).

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