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COMMENTARY

Comparison of clinical and echocardiographic features of first and second waves of COVID-19 pandemic

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The World Health Organization officially declared in March 2020 the coronavirus disease 2019 (COVID-19) as a pandemic, which was caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) rapidly spreading from Wuhan, China to all over the world. By the beginning of September 2021, the cumulative number of COVID-19 cases and total number of deaths due to COVID-19 were detected as approximately 220 million and over 4.5 million, respectively [1]. This resulted in a huge socioeconomic and healthcare burden worldwide. Although COVID-19 mainly affects the respiratory system, growing evidence shows that it can also lead multi-organ damage by the systemic inflammation, cytokine storm and sepsis. Previous studies reported that COVID-19 caused the subclinical myocardial dysfunction without myocardial injury even in the mildly symptomatic patients [2] while it resulted in overt myocardial injury in the hospitalized patients by either direct toxic injury, or indirect ischemic or inflammatory injury [3, 4]. Although cardiac injury was not common (≈ 25 %) in COVID-19 [5], myocardial injury was associated with increased mortality in COVID-19 patients [5–7]. COVID-19-related right ventricular (RV) dilatation and systolic impairment (39 %) were observed more frequently than the pure left ventricular (LV) systolic dysfunction (10%) in hospitalized COVID-19 patients [8]. In addition to troponin positivity, RV dysfunction and/or dilatation could also occur due to ischemia, inflammation or pressure overload caused by either pneumonia or ARDS. In a meta-analysis, the pooled prevalence of RV dysfunction, a predictor of poor prognosis [7, 10] in COVID-19 patients, was reported as 20.4% in COVID-19 patients [9].

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In the current issue of *International Journal of Cardivascular Imaging*, hot-topic article by Karagodin et al. demonstrated the improved echocardiographic measures and mortality rates with better knowledge and medical treatment by comparing the first and second waves of COVID-19 in the susceptible African American patient population [11]. In the COVID era, routine echocardiographic examination could not be performed because of its allocation for high-risk patients. On the other hand, enrolled hospitalized patients (105 during the first wave and 125 during the second wave), were evaluated with 2D transthoracic echocardiography and their images were acquired for strain analysis and further evaluation in aforementioned study. In the first wave, all-cause mortality rate was found 35.2% whereas it was improved and detected as 14.7% in the second wave. In both waves, factors such as age, gender, race, clinical status, degree of hypoxemia, past medical history (other than pre-existing lung disease, it was higher in first wave) and the left ventricular ejection fraction (LVEF) of patients were not different. In the first wave, the levels of hs-Troponin and NT-proBNP and the rate of patients with pre-existing lung disease were higher compared to the second wave. These findings proposed that, in the second wave, the patients admitted to the hospital represented less severe cases with their lower biomarker levels. This could be attributed to the increased awareness of the patients for COVID-19 and thereby their early admission to the healthcare services. Additionally, the virus has evolved in less lethal but contagious variant. Both could be the reason for lower mortality rates detected in the second wave.

Another difference was observed in the treatment modalities. The implication rate of novel evidence-based treatment options was higher in the second wave. Furthermore, the prone positioning and therapy with remdesivir, antibotics, and steroids were more frequently applied to the patients in the second wave while the application of hydroxychloroquine and tocilizumab was decreased, eventually resulting the improvement of mortality rates. On the other hand, in this observational study, it is impossible to infer whether the aforementioned factors actually have an effect on the changes.

Detailed echocardiographic comparison of the study by Karagodin et al. also revealed that the markers such as left ventricular global longitudinal strain (LVGLS), right ventricular global longitudinal strain (RVGLS), and right ventricular free wall longitudinal strain (RVFWLS) were better and RV basal diameter was smaller in the second wave, consistent with the previous studies [12, 13]. LVEF was not improved in the second wave unlike other echocardiographic parameters. However, LVGLS deteriorated earlier than LVEF because of its high sensitivity. In sepsis, LVEF can be hyperdynamic in order to compensate the diminished cardiac output. Therefore, LVGLS was improved while LVEF was not. The functions of the right ventricle are much more affected than the left ventricle in COVID-19 and RV dysfunction determines the prognosis [9]. RV dysfunction was present in almost 20% of the patients and its presence resulted in three-fold increase in all-cause mortality [9]. Similarly, Karagodin et al. reported that factors of mechanical ventilation, RVFWLS and RVGLS were independently associated with mortality.

This study conducted by Karagodin et al. emphasized that clinical and echocardiographic characteristics of the COVID-19 patients demonstrated greater improvement in the second wave of the pandemic compared to the first wave. The most possible contributing factors were the implication of the novel treatment modalities and increased awareness of the COVID-19 patients. Among all echocardiographic parameters that could affect the prognosis of COVID-19, RVFWLS and RVGLS were independently associated with all-cause mortality rather than LVEF and LVGLS. Early detection of RV dysfunction by speckle tracking echocardiography may improve the prognosis of COVID-19 patients.

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Declarations

Conflict of interest None.

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