Editorial

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Transthoracic echocardiography findings in critically ill COVID-19 patients

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In this issue of Critical Care and Shock, Gerhardy and colleagues present a study that utilized transthoracic echocardiography (TTE) and the Yorkshire rehabilitation scale (C19-YRS) in order to examine the correlation between severe coronavirus disease 2019 (COVID-19) illness and post-discharge cardiac function and symptoms. (1) They found that, with time, the cardiac parameters appreciable by TTE improve with the persistence of cardiopulmonary symptoms characteristic of post-COVID-19 syndrome (PCS) after hospital discharge.

The use of echocardiography for the assessment of cardiac function in COVID-19 patients has garnered significant attention in the past couple of years, with numerous studies highlighting its potential impact during the pandemic. (2-7) Access to commonly used imaging tools, like computed tomography (CT) scan or magnetic resonance imaging (MRI) scan, was severely restricted because of decontamination clean-ups during the COVID-19 pandemic. (8) As a result, many institutions reduced the number of unnecessary imaging due to the associated scheduling, risks of contamination, and financial obstacles. In response, the American Society of Echocardiography (ASE) adapted its guidelines for COVID-19 patients in 2020, placing emphasis on protective measures and equipment decontamination, highlighting the benefits of minimizing transport of patients to the imaging room in favor of bedside exams reducing contact with healthcare workers and other patients. (9) For this reason, the use of bedside echocardiogram provided an alternative method of evaluating cardiac abnormalities in COVID-19 patients.

Although a bedside echocardiogram is a promising alternative, it still necessitates prolonged close contact between the device operator and the patient, increasing the risk of viral transmission. To further minimize unnecessary contact, both the ASE and the European Association of Echocardiography and Cardiovascular Imaging (EACVI) have recommended that echocardiography not be routinely conducted in patients exhibiting typical signs and symptoms of COVID-19 but rather be reserved for those patients whose management is likely to be impacted by the results (e.g., those with pre-existing cardiovascular disease or deteriorating cardiac function). (9,10) Additionally, they recommended that eligible patients should undergo an abbreviated bedside exam to reduce contact time with the patient. (9) Reports on the abbreviated echocardiographic exam have demonstrated a reduction in exam time by 37.2% (from 18 minutes to 6.7 minutes) with a decrease in image quality but no effect on diagnostic accuracy. (11) Apart from meeting the necessary requirements to qualify for an echocardiogram exam, the challenge of obtaining a clear window of view for the imaging procedure can add to the complexity. This is especially true in mechanically ventilated patients in a prone position as the lung forms a curtain effect over the heart, obstructing the view. (12)

A survey conducted on 1216 patients with acute COVID-19 disease globally revealed that among those with abnormal echocardiographic findings, 39% had left ventricular abnormalities such as myocarditis, myocardial infarctions, and Takotsubo cardiomyopathy, while 33% had varying degrees of right ventricular impairment. (13) Additionally, 8% had high pulmonary artery pressure, and 15% had

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dilation of the right ventricle. However, only 1% of all cases had cardiac tamponade, and 15% showed signs of severe cardiac disease. (13) Other studies also reported different results, with the most common finding being right ventricular dysfunction (39%), followed by left ventricular diastolic dysfunction (16%), left ventricular systolic dysfunction (10%), and valvular heart disease (3%). (14) These changes in cardiac function and architecture were found to persist for up to 6 months after the resolution of the acute phase of COVID-19 in patients that were hospitalized, especially if the patients had concomitant elevated cardiac biomarkers during hospital admission. (15)

The results of Gerhardy and colleagues show a more optimistic disease progression pattern, with an improvement of all cardiac markers detected on echocardiogram during follow-up (median follow-up time was around 8 months). These investigators found that the proportion of patients who had right ventricular dilation on their first echocardiogram in the hospital dropped by half during follow-up in the outpatient clinic, and the pulmonary artery acceleration time (PAAT), which was pathologically low in their hospitalized critically ill patient population increased during follow-up demonstrating a trend towards recovery. While the study by Gerhardy and colleagues provides useful original observations into the topic, there are some confounders that need to be addressed. The primary confounder in this study was the heterogeneity of the study groups at the time of admission, which could impact the disease progression. Specifically, the groups differed significantly in terms of the number of participants, age, and severity of admission (as shown by the Sequential Organ Failure Assessment [SOFA] score, Acute Physiology and Chronic Health Evaluation [APACHE]-III score, and Carrico index), which consequently, had an effect on the likelihood of receiving invasive mechanical ventilation (IMV) and length of intensive care unit (ICU) stay, which were also significantly different between groups. Moreover, age has been shown multiple times to have a strong association with morbidity and mortality in ICU patients and COVID-19 patients. (16-18)

Standardization of severity scores among study groups is crucial as they provide important indicators of the function of different organ systems which may be affected by COVID-19. The standardization of severity scores is especially important when echocardiographic reports prior to hospital admission are unavailable. (19,20)

The second confounder that we found was the type of patients being studied. All the patients reviewed in this study were those referred to the outpatient clinic for symptoms of post-COVID-19 syndrome while excluding hospitalized patients who were not referred. It is imperative to include all hospitalized patients in the study to obtain an unbiased and comprehensive representation of the target population. The exclusion of patients that did not complain of PCS symptoms may introduce selection bias, which may limit the generalizability of the study results. Additionally, a thorough review of a patient's comorbidities, particularly cardiovascular conditions, is crucial in interpreting the results of an echocardiography study. The presence of comorbidities can have an effect on the structure and function of the heart and may therefore impact the accuracy and reliability of the echocardiographic measurements. (21) For instance, comorbidities such as hypertension, coronary artery disease, and heart failure can cause changes in the left ventricular mass, chamber size, and ejection fraction, which can influence the interpretation of the study results. (22,23) While this study provides some information about diabetes and chronic cardiac disease, it is important to consider more specific cardiovascular conditions as well, as they may have a significant impact on the echocardiographic findings. Additionally, the small sample size reported in the study further underscores the need for a thorough and comprehensive review of patients' comorbidities in order to ensure the validity and reliability of the results.

Similarly, in the context of COVID-19, it is crucial to gather the vaccination status of patients when conducting studies related to the cardiovascular system, as there have been reports of myocarditis and pericarditis following vaccination, as well as multiple other serious adverse effects. (24-27)

We applaud the efforts of Gerhardy and collaborators as they provide useful original observations on the topic, demonstrating that cardiac parameters improve with time, despite the persistence of PCS symptoms after hospital discharge.

Conflicts of interest

The authors have no conflict of interest in the preparation of this manuscript.

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