Revista Portuguesa de Cardiologia 41 (2022) 463–464

Revista Portuguesa de
Cardiologia
Portuguese Journal of Cardiology
www.revportcardiol.org

EDITORIAL COMMENT

Myocardial performance index: Is it time to revisit this old parameter in COVID-19 patients?

Índice de Performance Miocárdica: Será tempo de revisitar este parâmetro em doentes com COVID-19?

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Available online 18 February 2022

In 2020, coronavirus disease 19 (COVID-19) emerged as a severe pandemic disease and a public health crisis that imposed significant pressure on healthcare services across the world. Respiratory manifestations are the most frequent and severe. However, cardiac manifestations have also been described. Early reports showed that in patients with confirmed COVID-19 in the hospital setting, 55% had an abnormal echocardiogram, in similar proportions (around 35%) in the right and left heart, with severe findings in 15%.[1] Despite this significant number, new myocardial infarction, myocarditis and takotsubo cardiomyopathy were each only identified in around 3% of patients.[1] Cardiac troponin and the severity of COVID-19 symptoms were independent predictors of right and left ventricular abnormalities.[1]

Echocardiography has the advantage of being widely accessible and portable and can be performed at the patient's bedside in the intensive care unit or emergency room in critically ill patients or in ward rooms for less critical patients, always with personal protective equipment. In COVID-19 patients, a focused cardiac ultrasound study was recommended to reduce the time of exposure with the patient and to reduce the risk of contamination, preferably with hand-held or smaller laptop-based scanners.[2]

The myocardial performance index (MPI) was described by Tei almost two decades ago, in 1995, and includes both systolic and diastolic time intervals to assess global cardiac function.[3] Conventional Doppler-derived parameters were used initially, but measurements of time intervals are based on flow-velocity curves that are performed in different cardiac cycles and this can be a limitation. At that time, they demonstrated prognostic value in several heart conditions. MPI calculations can now be performed with pulsed-wave tissue Doppler imaging, allowing for simultaneous measurements of both diastolic and systolic intervals in the same cardiac cycle. However, recent studies have challenged this method, because it showed poor clinical agreement and was not a reliable parameter for the assessment of left ventricular function.[4] Nonetheless, MPI is very easy to obtain and record, is reproducible, and also has the advantage of being independent of arterial pressure, heart rate, afterload and preload. For this reason, its use in the context of COVID-19 infection is appropriate, because it can be obtained with a brief acquisition time in a fast acquisition protocol at the patient's bedside.

In the current issue of the *Journal*, Kaya et al. sought to assess the cardiovascular effects of SARS-CoV-2 infec-

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https://doi.org/10.1016/j.repc.2022.02.005

tion, particularly on systolic and diastolic function, with tissue Doppler-derived MPI.[5] They included 40 COVID-19 patients with mild pneumonia, whose clinical, laboratory, and echocardiographic parameters were compared with a control population of healthy individuals and also after clinical recovery. They observed that in the acute phase, MPI, isovolumic relaxation time, deceleration time and E/A ratio were reduced and ejection time increased compared to controls. After clinical recovery, these parameters returned to normal values. Left ventricular ejection fraction was unchanged and they concluded that diastolic function is the most compromised phase of the cardiac cycle, in general reversibly. Regarding laboratory parameters, there were also slight increases in cardiac troponin I and inflammatory parameters.

Although the study clearly showed that MPI and other conventional parameters of diastolic dysfunction can be easily obtained and are abnormal in most COVID-19 patients, with improvement after disease recovery, there are some important limitations in this study. Firstly, the results cannot be generalized to all patients with COVID-19 because only hospitalized patients with mild disease were included; patients with more severe disease, in whom some form of cardiac involvement would be more likely to be found, were excluded. Secondly, they only assessed conventional cardiac troponin I (cTnI). If high-sensitivity cTnI had been used, they would certainly have had more patients with increased troponins. Lastly, they cannot unequivocally conclude that systolic function is not affected. Other published papers have shown that global longitudinal strain is abnormal in patients with COVID-19, confirming that even in patients with mild disease, there is subclinical left ventricular systolic dysfunction.[6,7] Left ventricular ejection fraction is not a sensitive method to assess systolic function and more sensitive methods can be used, such as global longitudinal strain. Changes in MPI may also reflect abnormal systolic function because the index combines both parts of the cardiac cycle. Conventional two-dimensional and Doppler flow images can be acquired rapidly and additional advanced measurements can be made offline without the need to prolong contact with the patient. In general, it is possible to acquire a large quantity of basic information in a quick scan that can be processed later, for both systolic and diastolic function. For this reason, although MPI is a very simple parameter, it does not add to the information that can be obtained from a focused echocardiogram. However, we can acknowledge that in more remote places of the world, access to this advanced post-processing technology may not be available and older methods can still be useful.

Conflicts of interest

The author has no conflicts of interest to declare.

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