Right ventricular dysfunction in COVID-19

Dear Editor,

The COVID-19 pandemic has emerged as a global health emergency. Evidence has emerged regarding the affinity of the SARS CoV-2 virus for myocardial tissue and its propensity to cause myocardial damage. COVID-19 patients seem to be at increased risk of right heart dysfunction because of a) direct myocardial damage by the virus; and b) uncoupling of right ventricular-pulmonary arterial circulation as a result of hypoxia and altered lung mechanics.

In a series of 74 COVID-19 patients, Elsayed *et al*. found right ventricle (RV) dilatation in 41% and RV dysfunction in 27% of patients. In contrast, they found the left ventricle (LV) to be normal or hyperdynamic in the majority of patients.[1] Dweck *et al*.[2] performed a prospective survey on a large multi-center cohort of 1,216 patients and found evidence of LV dysfunction in 39% of the patients and RV dysfunction in 33% of the patients. In a study of 100 patients, Mahmoud-Szekely reported that the most common cardiac pathology detected on echocardiography was RV dilatation and dysfunction followed by LV dysfunction.[3]

From the available data, it is evident that RV dysfunction is as common as or more than LV dysfunction in these patients. Whether the RV dysfunction in COVID-19 patients is related to COVID-acute respiratory distress syndrome (ARDS) or a reflection of the viral disease process remains to be understood. However, as in non-COVID ARDS, the presence of RV dysfunction is associated with poor prognosis in COVID-19 too. Yuman Li and colleagues[4] in their study of 120 patients found that RV longitudinal strain as determined by RV speckle tracking echocardiography is an independent predictor of mortality. Similarly, Antonello D'Andrea and colleagues[5] found RV dysfunction and raised pulmonary pressures independently correlated with a worse prognosis.

Trans-thoracic echocardiography (TTE) is a simple, easily available, and effective modality to detect and monitor RV dysfunction. Pulmonary artery catheters may be considered only in highly selected patients. RV protective strategies of mechanical ventilation like low driving pressure, limited hypercapnia, and optimum positive end-expiratory pressure (PEEP) may be helpful. Huette *et al*. have reported improvement in RV dysfunction in a patient with COVID-19 ARDS with almitrine infusion @4 mcg/kg/min, which facilitates hypoxic pulmonary vasoconstriction.[6] Significant improvement was observed within few hours, and it was continued for 4 days. However, almitrine may cause hepatic dysfunction and lactic acidosis. The FDA has recently granted emergency authorization to the right heart mechanical-assistive device Impella RP® system.[7] Extracorporeal membrane oxygenation (ECMO) remains the treatment option for nonresponding cases. The use of VV-ECMO is fraught with concerns regarding increased recirculation due to the decreased RV output and tricuspid regurgitation. Memon *et al*.[8] have reported the use of specialized Protek Duo cannula in association with VV-ECMO to reduce recirculation in a series of five patients. However, the availability of such specialized cannula remains an issue in this pandemic setting, and VA-ECMO may be preferred.

RV dysfunction is common but often under-recognized in COVID-19 patients. Early recognition with the help of TTE may help to titrate RV preload and afterload management with appropriate fluid and mechanical ventilation strategies.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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References

1. Mahmoud-Elsayed HM, Moody WE, Bradlow WM, Khan-Kheil AM, Hudsmith LE, Steeds RP. Echocardiographic findings in Covid-19 pneumonia. Can J Cardiol 2020;36:1203-7.
2. Dweck MR, Bularga A, Hahn RT, Bing R, Lee KK, Chapman AR, *et al*. Global evaluation of echocardiography in patients with COVID-19. Eur Heart J-Cardiovasc Imaging 2020;21:949-58.
3. Szekely Y, Lichter Y, Taieb P, Banai A, Hochstadt A, Merdler I, *et al*. Spectrum of cardiac manifestations in COVID-19: A systematic echocardiographic study. Circulation 2020;142:342-53.
4. Li Y, Li H, Zhu S, Xie Y, Wang B, He L, *et al*. Prognostic value of right ventricular longitudinal strain in patients with COVID-19. JACC Cardiovasc Imaging 2020;13:2287-99.
5. D'Andrea A, Scarafile R, Riegler L, Liccardo B, Crescibene F, Cocchia R, *et al*. Right ventricular function and pulmonary pressures as independent predictors of survival in patients with COVID-19 pneumonia. JACC Cardiovasc Imaging 2020;13:2467-8.
6. Huette P, Beyls C, Guilbart M, Haye G, Najid F-Z, Mestan B, *et al*. Acute cor pulmonale in COVID-19-related ARDS: Improvement with almitrine infusion. JACC Case Rep 2020;2:1311-4.

7. Health C for D and R. Other Medical Device EUAs. FDA. 2020 Jul 8; Available from: https://www.fda.gov/medical-devices/coronavirus-disease-2019-covid-19-emergency-use-authorizations-medical-devices/other-medical-device-euas.
8. Memon HA, Ratnani I, Masud F. Extracorporeal Membrane Oxygenation Support Through Protek Duo Cannula: A Case Series. American Thoracic Society; 2018. p. A5115. (American Thoracic Society International Conference Abstracts).

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Quick Response Code:

Website: https://journals.lww.com/joacp

DOI: 10.4103/joacp.JOACP_486_20

How to cite this article: Bhattacharyya A, Bhattacharjee A, Pande A, Baidya DK. Right ventricular dysfunction in COVID-19. J Anaesthesiol Clin Pharmacol 2022;38:S142-43.

Submitted: 06-Aug-2020 **Revised:** 14-Apr-2021
Accepted: 17-Apr-2021 **Published:** 30-Jun-2022