



Right ventricle in severe sepsis and septic shock



To the Editor,

We read with interest an article by Dr. Cirulis and colleagues recently published in this Journal [1]. They included 146 consecutive ICU patients admitted with septic shock or severe sepsis who have an echocardiogram within 48 h of admission. The authors admitted the ratio of right ventricular end-diastolic diameter (EDD) to left ventricular EDD (RV/LV) is a measure predictive of right ventricular failure. They found that an increased RV/LV does not predict mortality in severe sepsis or septic shock. However, there are considerable discrepancies between results of this study and other studies carried out in different countries. For example, Vallabhajosyula and colleagues evaluated 388 patients with sepsis and septic shock and detected right ventricular dysfunction in 214 (55.2%) of the patients [2]. They used American Society of Echocardiography criteria for echocardiographic assessment. New onset RV dysfunction was assessed using multimodality parameters including semiquantitative size and function, tricuspid annular plane systolic excursion (TAPSE) < 16 mm by M-mode tricuspid lateral annulus tissue Doppler systolic velocity < 0.15 cm/s and right ventricle fractional area change < 35%. The results of this study revealed that isolated right ventricular dysfunction was an independent predictor of worse 1-year survival. Therefore, we think that potential influence of echocardiographic results on clinical care and outcomes could not be assessed with Cirulis and colleagues' study due to underuse of different echocardiographic parameters such as TAPSE, and right ventricle fractional area for the assessment of right ventricular function in patients with sepsis and septic shock.

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RV/LV ratio in severe sepsis and septic shock: Response to Letter to the Editor



To the Editor,

Thank you for the opportunity to respond to the issues raised by Dr. Çil and colleagues regarding our recent publication in the *Journal of Critical Care* [1]. Dr. Çil and colleagues cite a recent publication by Vallabhajosyula et al. as a comparison [2]. There are substantial differences in exclusion criteria and baseline patient characteristics between our papers that might have led to major differences in findings. Nevertheless, there are many similarities between the investigations. Most striking was the common finding that no echocardiographic parameter assessing right ventricular (RV) function was able to identify patients at increased risk of early mortality. In our study, this was defined as 30-day mortality; Vallabhajosyula et al. used in-hospital mortality without further definition.

We specifically set out to assess the utility of RV/LV EDD ratio as a measure of RV dysfunction and predictor of mortality in sepsis and septic shock. An elevated RV/LV ratio predicts poor short- and long-term outcomes in patients with pulmonary hypertension and acute pulmonary embolism [3,4]; we investigated whether this parameter would perform similarly in a more heterogeneous population of sepsis patients with a focus on 30-day mortality. The potential benefit of finding a predictor of early mortality is a point on which we agree with Vallabhajosyula, but equally were unable to ascertain.

In our efforts to identify a specific predictor of early mortality using echocardiography, Vallabhajosyula et al. and we encountered difficulties in evaluating right ventricular dysfunction. In contrast to left ventricular dysfunction, there is a general lack of agreement on how to best quantify RV dysfunction using available echocardiographic measures (TAPSE, RV ejection fraction, RV size, RV diastolic dysfunction). Furthermore, prior studies of individual parameters (such as RV ejection fraction) in sepsis and septic shock have shown mixed results [5–9]. Our finding that RV/LV ratio has no predictive ability for 30-day mortality adds to the conclusion that more investigation is required to determine whether there exists a sensitive and specific combination of echocardiographic abnormalities associated with adverse outcomes. From some positive finding of an association, a more precise and standardized definition of clinically important RV failure might be derived.

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Reflecting the wide variation in defining RV dysfunction and in contrast to evaluation of single measurements, Vallabhajosyula and colleagues used “multimodal parameters.” However, the way RV dysfunction was determined is incompletely described in the methods and results (for example, how many echocardiographic parameters needed to be abnormal to make this diagnosis). Interestingly, visually estimated parameters of RV function (semi-quantitative size and function) did not predict in-hospital mortality and were no different between survivors and non-survivors at 1 year. Thus, the manuscript by Vallabhajosyula and colleagues is more similar than different to our work, as an observed increase in semi-quantitative RV size may be equivalent to increased RV/LV ratio (at least in the patients with isolated RV dysfunction). Both works imply that RV size seems to be an insensitive measure not associated with pertinent outcomes.

The primary conclusion of Vallabhajosyula and colleagues is that isolated RV dysfunction is associated with lower unadjusted 1-year survival. Our investigation differed the most on this point as we did not examine long-term outcomes, so it is possible that RV/LV ratio may have a similar association with mortality over this time interval. But we point out that in-hospital and 1-year mortality may reflect quite different pathophysiology. Without knowing cause of death, it is difficult to discern the significance and plausibility that isolated RV dysfunction leads to increased mortality at 1 year.

Right ventricular dysfunction is increasingly recognized in sepsis and septic shock but plays an unclear role in short- and long-term morbidity and mortality. We currently lack a clear echocardiographic definition of RV dysfunction by which to prognosticate for patients and caregivers. We need carefully designed studies looking at the acute and chronic effects of sepsis on the right ventricle to truly understand the complexity of this pathophysiology, and how to best identify it.

Disclosures

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Financial conflicts of interest

None.

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