

News Release

Title

Clinical Impact of Visually Assessed Right Ventricular Dysfunction in Patients With Septic Shock

Key Points

- This study used the MIMIC-III critical care database to determine the clinical significance and prognostic impact of visually assessed right ventricular (RV) function in patients with septic shock.
- RV dysfunction was associated with in-hospital mortality, lethal arrhythmia, and circulatory insufficiency independently of LV systolic function in these patients.
- Simple, non-invasive visual assessment of RV dysfunction using echocardiography may be useful to identify the short-term prognosis of patients with septic shock.

Summary

For heart patients with septic shock, every second counts. A new study from the Graduate School of Medicine at Nagoya University shows that quick, non-invasive visual assessment of right ventricular (RV) dysfunction may be as effective as traditional methods in determining a patient's prognosis.

A full transthoracic echocardiogram (TTE) evaluation is complex and takes time. Cardiology practice guidelines recommend measuring or calculating specific parameters of RV function, including tricuspid annular plane systolic excursion (TAPSE), Doppler imaging of the wall of the ventricle, or fractional area change (FAC). It's not surprising, then, that cardiologists sometimes simply look at the right ventricle on the echocardiogram as the heart beats and make an on-the-spot assessment—when they identify a problem, this is known as visually assessed RV dysfunction.

Researchers from Nagoya University sought to determine whether visual assessment of RV function can be clinically accurate and useful in determining prognosis in patients with septic shock, a significant drop in blood pressure caused by an inflammatory reaction that can lead to respiratory or heart failure, stroke, organ failure, and death. In their study, published in *Scientific Reports*, they used the Medical Information Mart for Intensive Care III (MIMIC-III) critical care database, a large database of health-related information from more than 40,000 intensive care patients at Beth Israel Deaconess Medical Center in Boston.

Identifying 1563 of these patients with septic shock, they performed a multivariate regression analysis of those 544 patients who had a TTE in the first 24 hours in the hospital, and found that RV dysfunction predicted in-hospital mortality, lethal arrhythmia, and circulatory

insufficiency independently of left ventricular (LV) function. They also determined that visual assessment of RV dysfunction was well correlated with hemodynamic status, and effectively identified the risk of in-hospital mortality.

This relationship between RV dysfunction and mortality is consistent with several previous reports, as well as with another study that showed that LV systolic dysfunction was not associated with prognosis. The team speculates that RV dysfunction may cause secondary cardiogenic shock accompanied by septic shock; this in turn could exacerbate systemic perfusion and make potentially deadly ventricular arrhythmias more likely.

The authors caution that the study findings may have been affected by the analysis being done in sicker patients who were more likely to have had an echocardiogram ordered. Also, it is possible that the patients' RV dysfunction could have been caused by factors other than sepsis in some cases. Nonetheless, with further research to confirm their results, visual assessment of RV function could become an important and clinically useful tool for doctors treating patients with septic shock.

The results of this research were published in the international scientific journal "*Scientific Reports*" (published online on September 22, 2021).

Research Background

Septic cardiomyopathy is common and associated with increased mortality of patients with sepsis or septic shock. Left ventricular (LV) function has long been used as a prognostic indicator for heart patients, but more recently the effect of right ventricular (RV) dysfunction on the prognosis of patients with sepsis or septic shock has begun to receive scientific attention. However, the clinical effect of RV dysfunction remains unclear. Previous studies have shown that visual estimation of RV function can be a consistent and useful screening tool as a point-of-care evaluation for RV dysfunction, but its usefulness in septic shock patients has not been explored.

Research Results

This retrospective study of 544 septic shock patients who underwent TTE found that patients with RV dysfunction had a higher heart rate, and a lower pulse pressure and cardiac index (a measure of a patient's cardiac output relative to their size) than did patients without RV dysfunction, although the fluid administration did not differ between the groups. Patients without RV dysfunction had a higher RV stroke work index and pulmonary artery pulsatility index than did patients with RV dysfunction. RV dysfunction was associated with in-hospital mortality, lethal arrhythmia, and circulatory insufficiency independently of LV systolic function in patients with septic shock. Further, visual assessment of RV dysfunction effectively identified the risk of mortality in these patients.

Research Summary and Future Perspective

This study reveals that visual assessment of RV dysfunction using echocardiography can accurately reflect hemodynamic status, and these findings provide a rationale for further assessment of visually assessing RV dysfunction as a prognostic tool. This simple, non-invasive echocardiographic assessment may be useful to effectively identify the short-term prognosis of patients with septic shock.

Publication

Hiroaki Hiraiwa, Daisuke Kasugai, Masayuki Ozaki, Yukari Goto, Naruhiro Jingushi, Michiko Higashi, Kazuki Nishida, Toru Kondo, Kenji Furusawa, Ryota Morimoto, Takahiro Okumura, Naoyuki Matsuda, Shigeyuki Matsui, Toyoaki Murohara

Clinical Impact of Visually Assessed Right Ventricular Dysfunction in Patients With Septic Shock. *Scientific Reports*, published online on September 22, 2021.

DOI: 10.1038/s41598-021-98397-8

Japanese Ver. https://www.med.nagoya-u.ac.jp/medical_J/research/pdf/Sci_Rep_210922.pdf