

## Septic cardiomyopathy - improving diagnosis and treatment



Septic cardiomyopathy is a key feature of sepsis-associated cardiovascular failure. However, the lack of a clear and consistent definition of septic cardiomyopathy complicates not only the diagnosis but also the investigations of the prevalence of septic cardiomyopathy, according to a review to appear in the journal CHEST.

Septic cardiomyopathy, the review authors explain, is an acute syndrome of cardiac dysfunction on the basis of systemic infection and inflammation and lacks the ischaemic component of coronary artery disease.

Despite the lack of consistent diagnostic criteria for sepsis-associated myocardial dysfunction to date, septic cardiomyopathy is known to have three characteristics: (i) left ventricular dilatation with normal- or low-filling pressure, (ii) reduced ventricular contractility, and (iii) right ventricular dysfunction or left ventricular (systolic and/or diastolic) dysfunction with a reduced response to volume infusion.

Several mechanisms have also been proposed to explain the pathophysiology of septic cardiomyopathy, including excessive formation of nitric oxide, reactive oxygen species or nitrogen radicals, and transcriptional and metabolic changes.

The authors note: "It is essential to realise, however, that alterations in any of the above (or other) signalling pathways can only induce a decrease in cardiac contractility by either affecting the transient rise in cytosolic calcium (Ca<sup>2+</sup>) or myofilament function, which represents the final integrating step of a myriad of signalling pathways and which may cause the decrease in cardiac contractile force that defines septic cardiomyopathy."

Afterload-related cardiac performance (ACP), together with speckle-tracking echocardiography, could provide methods to improve the diagnostic accuracy and guide therapeutic strategies in patients with septic cardiomyopathy, according to the authors.

Speckle tracking comprises a semi-automatic algorithm that detects discrete greyscale alterations (speckle patterns) caused by a diffuse reflection of the ultrasound beam within the examined tissue. These unique patterns are then used to identify, track, and thereby quantify two- and three-dimensional myocardial tissue deformation and motion. This technique allows for the detection of a complex tissue deformation in vital myocardium in opposition to measuring the simple displacement of a tissue segment that may also occur from scar tissue. Hence, the strain measurements resulting from speckle tracking are considered to be better correlated with myocardial function than are traditional measurements.

Compared to the left ventricular ejection fraction (LVEF), speckle tracking is considerably less susceptible to changes in pre- or afterload or, indeed, myocardial compliance. Further evidence for the potential diagnostic significance for the use of speckle tracking is provided by the more recent SPECKS trial. Ng et al. demonstrated that global and segmental longitudinal strains are significantly worse in septic shock patients than in patients with sepsis alone. Thus, longitudinal strain may be a promising measure; however, there is not yet sufficient data to inform a diagnostic measure for septic cardiomyopathy.

ACP has been proposed as an option for a more relevant continuous monitoring of cardiac performance than is currently available. Although ACP still does not account for preload, a recent investigation conducted in 141 patients reveals its potential benefits for patients with septic cardiomyopathy. In that investigation, in contrast to cardiac output or cardiac power index, ACP correlated well with 30-day mortality when calculated on admission.

The authors conclude: "As there are no specific/causal therapeutics for the treatment of septic cardiomyopathy, the current guidelines for the treatment of septic shock therefore represent the cornerstone of septic cardiomyopathy therapy. Experimental and clinical investigations to improve the diagnosis and to identify new, innovative therapeutic approaches in septic cardiomyopathy are urgently needed."

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