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Tissue Doppler imaging, volume responsiveness and impaired relaxation

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Dear Editor,

Diastolic dysfunction is a common finding in critically ill septic patients, but the condition may respond dynamically to changes in loading conditions during resuscitation. In their study of 83 mechanically ventilated septic patients with circulatory failure, Mahjoub et al. [1] demonstrated that amongst patients with left ventricular (LV) diastolic dysfunction (impaired relaxation) at baseline, volume responders (>15 % increase in LV stroke volume in response to volume expansion) showed an increase in tissue Doppler early diastolic velocity (E'), whereas volume non-responders showed no increase in E' . The authors attributed the increased E' to improved active LV relaxation from better myocardial perfusion. The authors dismiss the alternative explanation that E' may be preload dependent, citing previous studies that concluded that E' is less preload-dependent under conditions of impaired relaxation [2, 3]. However, there are numerous variables

that can influence load dependency of tissue Doppler parameters [4].

The authors also reported that E/E' ratio increased significantly in volume non-responders, but not in volume responders. To explain both the E' and E/E' ratio changes in the two groups, one needs to look more closely at the tissue Doppler features of patients with impaired relaxation.

Impaired relaxation pattern of LV diastolic dysfunction may be divided into two groups according to the E/E' ratio (>15 or <15) at rest, reflecting differences in passive LV compliance. Results of a study by Choi et al. [5] showed that patients with impaired relaxation and resting E/E' ratio <15 could be further subdivided according to the E/E' ratio response to a virtual fluid challenge (passive leg raise). Those with persistent E/E' ratio <15 (described by Choi et al. as 'stable relaxation abnormality') showed increased E' after leg raise, whereas those with an increase in E/E' ratio to a value >15 ('unstable relaxation abnormality') had minimal increase in E' . Incorporating these concepts into the interpretation of the study by Mahjoub et al., it may be argued that the E' and E/E' ratio response to volume expansion differentiates a state of 'stable relaxation abnormality' from 'unstable relaxation abnormality', where there are no distinguishing features at baseline. Taken a step further, patients with 'stable relaxation abnormality' would be preload responsive and those with 'unstable relaxation abnormality' would not be preload responsive. Unfortunately, a volume challenge (real or virtual) would be required to distinguish these two subgroups, as there are no baseline differences. Furthermore, as Mahjoub et al. demonstrated, the dynamics of E' and the E/E' ratio do not help predict volume responsiveness in those

without LV diastolic dysfunction; an alternative mechanism to limit volume responsiveness must be invoked in this group.

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