

LETTER

# Echographic evaluation of ICU patients with tissue Doppler imaging: more studies and more consensus are still needed

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See related research by Moschietto *et al.*, <http://ccforum.com/content/16/3/R81>, and related research by Weng *et al.*, <http://ccforum.com/content/16/3/R71>

In many intensive care units (ICUs), cardiac transthoracic echocardiography (TTE) has replaced invasive monitoring in routine evaluation of acutely ill patients. Since the mid '80s, there have been many studies of ICU patients, most of whom were receiving mechanical ventilation (MV). With the emergence of new TTE modalities such as tissue Doppler imaging (TDI) and strain rate or three-dimensional imaging, new studies are currently available. TDI is now widely used in cardiology and is a powerful tool in the assessment of left ventricular filling pressures (LVFPs), relaxation, or right ventricular function. It was suggested that the ratio of pulsed Doppler mitral flow in early diastole (E wave) over early diastolic mitral annulus velocity ( $E_a$  with TDI), known as  $E/E_a$ , was closely related to LVFP. However, in many clinical situations, a lack of correlation between  $E/E_a$  and LVFP was observed, even in patients with spontaneous breathing [1]. Three studies focusing on TDI and left ventricular function in ICU patients were recently published [2-4], two of them in *Critical Care* [2,4]. These studies provide new approaches in the assessment of systolic or diastolic function during septic shock and weaning from MV. In all studies, patients were mechanically ventilated, adding complexity to the TTE examination. For years, invasive pressure measurements in patients under MV have been performed at the end-expiratory time, when intra-thoracic pressure is closer to atmospheric pressure in most cases. For TTE study, things are slightly different. Doppler study (such as E wave) aims to determine direction and velocity of blood flow. That flow, as intra-cardiac pressure, depends of the respiratory cycle. By contrast, TDI determines the velocity of the myocardium and is considered relatively load-independent. So the necessity to perform

measurements ( $E_a$ ) at a certain time of the respiratory cycle may be questioned. Moreover, methodological differences between studies may be confusing (Table 1). These differences may lead to a loss of information in some cases and eventually may explain the differences observed between TTE and invasive monitoring. At the bedside, the clinician may be tempted to use a simple beat measurement and disregard the respiratory time. Further studies focusing on the feasibility and influence of MV on TDI parameters are needed [5]. Guidelines regarding the methods and designs of future trials in the ICU will be valuable, as these studies demonstrate that a quantitative assessment of cardiovascular parameters over a simple qualitative approach is possible with TTE in patients on MV. As in the study by Moschietto and colleagues [2], evolution of these values may provide crucial information for the clinician.

## Abbreviations

$E/E_a$ , pulsed Doppler mitral flow in early diastole/early diastolic mitral annulus velocity; ICU, intensive care unit; LVFP, left ventricular filling pressure; MV, mechanical ventilation; TDI, tissue Doppler imaging; TTE, transthoracic echocardiography.

## Competing interests

The authors declare that they have no competing interests.

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**Table 1. Methodological differences among recent studies**

Authors and study	Number of patients	Site of the tissue Doppler analysis	Simple beat or averaged beats	Respiratory cycle
Weng <i>et al.</i> [4]	61	Septal + lateral wall averaged	Three consecutive beats averaged	Not specified
Moschietto <i>et al.</i> [2]	68	Lateral wall	Three beats averaged	End-expiratory
Landesberg <i>et al.</i> [3]	262	Septal and lateral (septal value used for $E/E_a$ calculation)	Not specified	Not specified

$E/E_a$ , pulsed Doppler mitral flow in early diastole/early diastolic mitral annulus velocity.

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