Assessment of Left Ventricular Diastolic Function by Echocardiography

We have read with interest the article by Winter et al., concerning the assessment of left ventricular diastolic function in clinical practice by echocardiography. The authors conclude that the flow propagation velocity (Vp) and the early diastolic M-mode slope of the left atrioven- tricular plane displacement (EDS) do not add significantly to traditional Doppler parameters in assessing left ventricular diastolic function. This conclusion is mainly based on the fact that neither Vp nor EDS could discriminate among the four groups of diastolic function and although there was a significant trend of diminishing values of these parameters with an increasing degree of diastolic dysfunc- tion, the differences between their values in the four groups were small. However, because of the design of the study, we believe this conclusion is questionable.

The authors did not use invasive measurements for left ventricular diastolic function assessment because of practical reasons, nor did they use clinical estimates of left ventricular diastolic function, although the well-accepted parameter of restrictive physiology is usually an E/A ratio > 2. In the moderate dysfunction group an E/dt > 150 ms (instead of <150 ms) and an E/A ratio between 1·0 and 2·0 (instead of E/A above age-adjusted reference interval) would have probably allowed a better discrimination, eliminating some of the scatter noted especially between the moderate and severe dysfunction groups. On the other hand, a control group with healthy subjects would have provided — by also including normal subjects with vigorous left ven- tricular elastic recoil — a higher mean Vp than the ‘normal diastolic function group’ used in the study, including relatively old patients, with heart dis- ease, and with E/A ratios as low as 0·75. A normal group would have fur- ther diminished the scatter at the other end of the spectrum. It would have been interesting to find out in the paper the characteristics of each of the four groups and the left ventricular end-diastolic pressures (LVEDPs), where available.

Thus, we think that the scatter noted for Vp and EDS could be explained at least in part by the methods used — overlap due to inclu- sion criteria. Even in these circum- stances, Vp diminished significantly with worsening diastolic function, and the fact that the differences between Vp values in the four groups were small could be explained by the above mentioned facts. Nevertheless, Vp has already been incorporated in the assessment of left ventricular diastolic function,[4] providing additional informa- tion to traditional Doppler param- eters mainly because of its relative preload-independence.[6] The authors did not analyse the ratio E/Vp, an index of left ventricular diastolic func- tion described by Garcia et al.[7], combining peak E-velocity with Vp. This index has been shown to perform better than Vp alone in assessing left ventricular filling pressures[7] and to yield important independent diagnostic and prognostic information in several clinical studies.[5,7,9] With worsening diastolic function Vp decreases while E-wave increases, so that E/Vp will increase directly with the severity of left ventricular dysfunc- tion.[5,8] It is thus surprising that this index was not discussed, since both parameters were available.

Therefore, we believe it would be difficult to conclude from this study that the tested parameters do not add significantly to traditional Doppler methods in assessing left ventricular diastolic function.

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References


ventricular filling that combined with pulsed Doppler peak E velocity may predict capillary wedge pressure. J Am Coll Cardiol 1997; 29: 448–454.


Author’s Reply

In a letter to the editor[1], Dr Bogdan A. Popescu raises some questions about the conclusions of our recent article ‘Left Ventricular Early Diastolic Inflow Velocity and Attrio-ventricular Plane Downward Velocity: Useful Parameters to test Diastolic Function in Clinical Practice? Diastolic Parameters Tested in a Clinical Setting’[2].

The main criticism of Dr Popescu is related to the classification of diastolic function. He argues that there is overlap of the diastolic function due to the definition used.

Indeed, there are two small errors in our paper that we believe to be responsible for Dr Popescu’s questioning of our conclusions.

We do agree with Dr Popescu that there may be some problems with the classification as it is presented in the article, but this is not the case with the classification actually used in our study.

In the severe diastolic dysfunction group there is a printing error; S>D. However, this is the modified clinical classification, based on the Canadian consensus recommendations and published in 1996[3] that we used at the time we included patients for the study in 1999.

We also agree with Dr Popescu that it would be more discriminating to use an E/A ratio of 2 as the cut-off between groups 3 and 4 (between pseudonormal to restrictive pattern). This would increase the positive predictive value at the cost of a decreased sensitivity for a restrictive pattern. While our classification might give a small overlap between groups 3 and 4, this would not have been the case using an E/A ratio of 2 as the lower limit. However, this does not significantly alter the results of the study.

Furthermore, Dr Popescu of course is right in that it would have been useful to have invasive measurements of the filling pressures and/or the AR to A ratio and a Valsalva manoeuvre. However, we used the standard clinical classification mainly for practical reasons. In our experience, AR is not as easily accessible as the S/D ratio and invasive measurements are expensive and therefore not practical in clinical practice. This is of course a limitation of our study, but does not significantly alter our conclusion.

We also agree with Dr Popescu in that the E/Vp ratio is a useful diastolic parameter with strong discriminating power between normal and pseudonormal filling patterns. However, the objectives of the study were to investigate the clinical value of EDS and Vp as single parameters as alternative diastolic parameters to assess diastolic function of the left ventricle.

Our aim was to find simple and feasible parameters to assess the diastolic function but Vp and EDS do not significantly add to the traditional Doppler indices for the assessment of left ventricular diastolic function. Vp and the E/Vp ratio can be used to complement the traditional evaluation of the diastolic function. However, tissue Doppler imaging seems to be a more feasible and accurate tool in this respect. The E/E’ ratio of the mitral inflow and early diastolic velocity of the basal septal or basal lateral portion of the left ventricle seems to be a more powerful tool for discriminating normal from pseudonormal pattern, which is one of the major problems in assessing diastolic function.

One major problem in this field is that we still lack larger prospective randomized studies to identify reliable parameters for identifying patients with diastolic dysfunction and guiding therapy. In other words, the clinical usefulness and therefore the cost/benefit ratio of excessive investigation of the diastolic function is still rather low. Thus, there is a great need for a fast, inexpensive and reasonably accurate tool for revealing the clinically most important patient group having diastolic dysfunction i.e. patients having elevated filling pressures.

In this respect we think the best tool is tissue Doppler imaging and not Vp, EDS or E/Vp ratio.

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References

[1] Popescu BA. Assessment of left ventricular diastolic function by echocardiography. Letter to the Editor