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Is It Fair to Use the Current Estimation of Myocardial Work in Patients with Significant Aortic Stenosis?

Arnaud Hubert, MD ; Virginie Le Rolle, PhD ; Elena Galli, MD, PhD ; Alfredo Hernandez, PhD ; Erwan Donal, MD, PhD

Fortuni *et al.*¹ have presented an interesting work in which they explored the potential use of myocardial work to better risk stratify patients with severe aortic stenosis (AS). This is a very interesting question with a real clinical impact. Indeed, the classical analysis of left ventricular (LV) function does not allow an optimal identification of asymptomatic AS patients who are at risk for development of heart failure or death if left untreated. Although global longitudinal strain has shown promising results,² strain, by definition, is afterload dependent. Thus, strain provides information on the intrinsic myocardial deformation as a function of afterload imposed by the stenotic aortic valve. As myocardial work is afterload independent, this tool could have an added value in risk stratification of patients with severe AS. Fortuni *et al.*¹ proposed in this study to use the original and commercial algorithm developed by Russell *et al.*³ The original motivation for the development of this tool was to better analyze LV mechanical dyssynchrony in order to improve prediction of CRT response.⁴ In the initial study, Russell *et al.*³ used a canine model (dogs with normal heart, left bundle branch block, myocardial ischemia) and then a pool of patients. An average curve of LV pressure was calculated from this pool of patients with an invasive LV pressure measurement. This predefined LV pressure curve template was temporally adjusted and scaled in amplitude in order to fit the observed valvular timings and noninvasive systolic pressure value of a given patient. This template-based estimate is essential to the algorithm, and all measures are then derived from this curve.

To the best of our knowledge, none of the patients used to establish this curve had severe AS. Consequently, the application of the commercial algorithm in patients with severe AS raises concerns. Moreover, a second degree of imprecision is that only the mean transaortic gradient is added to the systolic arterial pressure. The ventricular pressure, obtained from the method proposed by the authors, is not tested against invasive LV pressure curves. Although the results of this study are interesting and could correlate with invasive measures, it is worth pointing out the potential imprecision of the myocardial work estimation derived from an algorithm that was not originally developed for this purpose. We think that caution is needed when extrapolating the proposed algorithm to patients with severe AS and that readers should understand potential limitations of the conclusions. Of note, our team has proposed a model that has been developed with a group of patients having severe AS to estimate myocardial work noninvasively.⁵

References

- 1 Fortuni F., Butcher S.C., Van der Kley F., Lustosa R.P., Karalis I., de Weger A. et al. Left ventricular myocardial work in patients with severe aortic stenosis. *J Am Soc Echocardiogr.* 2020;
- 2 Magne J., Cosyns B., Popescu B.A, Carstensen H.G., Dahl J., Desai M.Y. et al. Distribution and prognostic significance of left ventricular global longitudinal strain in asymptomatic significant aortic stenosis: an individual participant data meta-analysis. *JACC Cardiovasc Imaging.* 2019; 12: 84-92
- 3 Russell K., Eriksen M., Aaberge L., Wilhelmsen N., Skulstad H., Remme E.W. et al. A novel clinical method for quantification of regional left ventricular pressure-strain loop area: a non-invasive index of myocardial work. *Eur Heart J.* 2012; 33: 724-733
- 4 Hubert A., Le Rolle V., Leclercq C., Galli E., Samset E., Casset C. et al. Estimation of myocardial work from pressure-strain loops analysis: an experimental evaluation. *Eur Heart J Cardiovasc Imaging.* 2018; 19: 1372-1379
- 5 Owashi K.P., Hubert A., Galli E., Donal E., Hernandez A.I., Le Rolle V. Model-based estimation of left ventricular pressure and myocardial work in aortic stenosis. *PLoS One.* 2020; 15: e0229609