Right Ventricle: The Increasing Importance of Half Brother of the Left Ventricle

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The right ventricle is a difficult chamber to assess both structurally and functionally because of its complex 3-dimensional anatomy and limited echocardiographic windows. Thus, relative to the left ventricle, there is less literature on how right ventricle dysfunction affects cardiac and non-cardiac outcomes. The American Society of Echocardiography published guidelines recently on right ventricular assessment to affirm its increasing recognition and importance in cardiovascular practice.[1] The association of right ventricular dysfunction with aortic valve disease[2] and its effects on outcomes of surgical aortic valve replacement (SAVR) are well described in the literature.[3]

Transcatheter aortic valve implantation (TAVI) is a new technique that holds promise in changing the management of aortic valve disease by providing a relatively safe alternative to SAVR in inoperable or high-risk patients.[4] The work published in *the Journal of Invasive Cardiology* by Poliacikova et al[5] describing mortality outcomes of TAVI with pre-existing right ventricular dysfunction addresses an important, clinically relevant, and thus far undescribed topic.

In this study, right ventricular systolic function was defined using tricuspid annular plane systolic excursion (TAPSE) and annular systolic velocity. Both these techniques, according to recently published American Society of Echocardiography guidelines, are simple, relatively easy to obtain, and have good reproducibility, and thus provide consistency in data.[1] While both these techniques have been validated against radionuclide angiography with good correlation, these do carry the inherent limitation of estimating global function from single-segment analysis especially in a population with coronary artery disease (two-thirds in the present study). Another limitation of TAPSE is that a cut-off value <17 mm has high specificity but low sensitivity to differentiate abnormal from normal subjects.[6] In addition, TAPSE as a measure of right ventricular function has limited data and standardization in the elderly.[7]

In the PARTNER trial cohort,[8] the incidence of pulmonary hypertension (PH) was 42%, which is close to 50% as seen in the patient population described in this study, but the study falls short of providing invasive/non-invasive assessment of pulmonary vascular resistance (PVR). PH is a well-known precipitant of right ventricular dysfunction.[9] It should be emphasized here that PH as identified by systolic pulmonary artery pressure >35 mm Hg is a measure of flow x resistance. PVR distinguishes elevated pulmonary pressure due to high flow from that due to pulmonary vascular disease (resistance) and PVR is well established to play an important role in cardiac outcomes including various valvular diseases and heart transplant.

Poliacikova et al's article, which showed no significant effect of right ventricular dysfunction on mortality outcomes with TAVI, is noteworthy. This is especially important since right ventricular dysfunction in patients undergoing SAVR leads to adverse outcomes.[3] This finding of neutral effect of right ventricular dysfunction on TAVI outcomes is in contrast to the effect of right ventricular dysfunction on balloon mitral valvotomy outcomes for mitral stenosis.[10] Pathophysiologically, while mitral and aortic obstruction both represent left heart disease, the differential effect of right ventricular dysfunction on outcomes may reflect a largely reversible component in mitral stenosis where patients are relatively young and free of any primary pulmonary pathology, in contrast to aortic stenosis patients, where chronic obstructive pulmonary disease and other lung diseases are relatively common. However, we cannot make the assumption that poorer outcomes in patients with right ventricular dysfunction undergoing SAVR automatically translates that these patients would be better served with TAVI; future studies to develop risk models for TAVI outcomes need not use a prespecified right ventricular dysfunction variable in their predictive risk models, and may thus limit prospective sample size and maintain power for other important risk variables.

While the authors have done a commendable work in reassuring us about the likely neutral effect of right ventricular dysfunction on mortality outcomes with TAVI, it is still to be seen how right ventricular dysfunction affects morbidity outcomes such as duration of hospital stay and inotrope requirement. Furthermore, as studies of balloon mitral valvotomy in mitral stenosis demonstrate improvement in right ventricular function post valvotomy,[11] it will be important to assess the effect of TAVI on right ventricle function because regardless of etiology, right ventricle dysfunction is an independent prognostic marker for adverse cardiac outcomes.

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