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Echocardiograhic prediction of pulmonary arterial capacitance in patients with heart failure with preserved ejection fraction

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Background: Pulmonary arterial capacitance (PAC) has emerged as one of the strongest hemodynamic predictors of adverse outcomes in a wide spectrum of cardiovascular diseases, including pulmonary hypertension in heart failure with preserved ejection fraction (HFpEF-PH). We aimed to study non-invasive surrogates for PAC using transthoracic echocardiography in this population.

Methods: We retrospectively evaluated consecutive patients referred to an expert tertiary care referral centre from December 2016 to November 2018. Transthoracic echocardiography (TTE) was performed within 1 year of right heart catheterization (RHC). Echo-Pac software from GE Healthcare® was used to perform echocardiographic analysis. PAC was calculated dividing right ventricular stroke volume by pulmonary arterial pulse (systolic – diastolic) pressure, measured by RHC.

Results: Of the 105 enrolled patients, 43 were had HFpEF-PH. Among these, 72% were female and mean age was 68.9 ± 11.2 years. Median time between TTE and RHC was 68 (IQR 34 - 191) days. Most patients were in NYHA class II (60.5%) and class III (34.9%). Fifty eight percent of the patients had history of paroxysmal or permanent atrial fibrillation. This population presented borderline parameters of right ventricle (RV) systolic dysfunction: fractional area change (FAC) $35.3 \pm 9.2\%$, tricuspid annular plane systolic excursion (TAPSE) 18.3 ± 5.1 mm, tricuspid S' wave 10.4 ± 2.9 and RV global longitudinal strain -15.5 ± 4.0 . Regarding invasive assessment, this population presented mean pulmonary artery pressures of 38.8 ± 13.9 mmHg, pulmonary artery wedge pressure of 21.6 ± 6.4 mmHg, pulmonary vascular resistance of 3.9 ± 2.7 Wood and median PAC of 0.13 (IQR 0.09 - 0.19) ml/mmHg. The TAPSE / Pulmonary arterial systolic pressure (PASP) ratio and the Right ventricular outflow track velocity time integral (RVOT VTI) / PASP ratio were the parameters that best correlated with PAC (r = 0.69, p = 0.002 for both parameters) (table 1). These parameters were obtainable in the majority of patients (31/43). Blant-Altman analysis revealed good agreement between these measures and PAC with a mean difference of -0.17 (CI -0.21 - -0.13) for RVOT VTI / PASP ratio and -0.23 (CI -0.28 - -0.18) for TAPSE /PASP ratio.

Conclusion: In a HFpEF – PH population, TAPSE / PASP and RVOT VTI / PASP are easily obtainable in most patients and significantly correlate with PAC.



