Right ventricular myocardial work by echocardiography: non-invasive assessment of right ventricle function in patients with pulmonary hypertension

B. Lacerda Teixeira¹, I. Neves¹, A R Santos¹, R. Carvalheiro¹, M. Antunes¹, F. Albuquerque¹, A. Ferreira¹, J. Reis¹, A. Galrinho¹, R. Cruz Ferreira¹

¹Hospital de Santa Marta, Lisbon, Portugal

Funding Acknowledgements: None.

Background: Right ventricular myocardial work (RVMW) assessed by transthoracic echocardiography allows to study and analyze the right ventricular (RV) function non-invasively, using RV pressure-strain loops. The association between these novel indexes of RVMW and invasive hemodynamic parameters has not yet been extensively studied, namely in precapillary pulmonary hypertension (PH) population. In right heart catheterization, stroke volume directly reflects right ventricular function in response to its load, and has prognostic implication in PH.

Objectives: To evaluate the relationship between RVMW and stroke volume index (SVi) measured invasively by right heart catheterization (RHC), in a cohort of patients with group I and group IV PH.

Methods: A prospective registry of pre-capillary PH patients evaluated in a single tertiary center was used. Echocardiography and RHC were performed in the same day. Dedicated software for left ventricle myocardial work was used for the RV. RV global myocardial work index (RVGWI) was calculated as the area of the RV pressure-strain loops. From RVGWI, RV global constructive work (RVGCW; work contributing to myocardial shortening during systole and lengthening during isovolumic relaxation), RV global wasted work (RVGWW; work contributing to myocardial lengthening during systole and shortening during isovolumic relaxation), and RV global work efficiency (RVGWE; relation between RVGCW and RVGWW) were estimated. Pearson’s correlation was applied to assess correlations between continuous variables.

Results: 17 pts (80% women, mean age 67 ± 10 years) were included. The average of mean pulmonary arterial pressure (mPAP) was 33 mmHg (± 9.5), of pulmonary vascular resistance (PVR) was 5.7 WU (± 5.1) and of SVi was 40.7 ml/m2 (± 10.8). Conventional echocardiographic parameters for the evaluation of RV systolic function, such as TAPSE, annular tricuspid s’ velocity and fractional area change (FAC), did not correlate with SVi. Moreover, right ventricle-pulmonary artery (RV-PA) coupling and RV GLS also did not correlate with this invasive parameter of right ventricle function. Of the RVMW indexes, RVGWW and RVGWE strongly correlated with SVi: as this invasive parameter decreases, RVGWW (r = -0.560, p = 0.019) increases significantly, whereas RVGWE (r = 0.539, p = 0.026) declines (Fig 1). In our population, RVGWI and RVGCW didn’t correlate significantly with SVi.

Conclusions: Finding non-invasive methods to evaluate RV function is essential in patients with RV hemodynamic overload, since conventional echocardiographic parameters do not perform well, and RV function is central in prognosis assessment in this population. Novel echocardiographic assessment of RVMW seems to provide a promising index of RV function in PH patients, as demonstrated with its correlation with SVi.

Figure 1: Correlation of RVMW with SVi.