

Ventricular-ventricular interaction in children with pulmonary hypertension: echocardiographic, hemodynamic, and disease severity (functional class) variables

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Basics: Determination of ventricular-ventricular interaction (VVI) is an essential part of the echocardiographic examination in adults with pulmonary hypertension (PH), however, data from according pediatric studies is rare. We hypothesized that VVI variables in combination with left and right heart dimensions/function variables might indicate disease severity and progression in children with PH.

Methods: VVI variables as well as left heart, and right heart parameters were echocardiographically determined and correlated with NYHA functional class (FC), with N-terminal-pro brain natriuretic peptide (NT-proBNP), and invasive hemodynamic variables [i.e. pulmonary vascular resistance index (PVRi), ratio of systolic pulmonary arterial pressure divided by systolic pulmonary arterial pressure (sPAP/sSAP ratio)] in 57 children with PH (1-17 years; 7-84 kg, 24 female).

Results: The ratio of sPAP/sSAP and the PVRi correlated well with the left ventricular eccentricity index (LVEI), a marker of VVI, in our PH children ($p < 0.001$). With increasing sPAP/sSAP ratio and increasing PVRi the left ventricular ejection fraction (LVEF) of our PH children significantly decreased ($p = 0.001$). Patients with higher NYHA FC had lower LVEF and higher LVEI values ($p < 0.001$). The sPAP/sSAP ratio and PVRi paralleled the increasing right ventricular (RV)/LV and right atrial (RA)/left atrial (LA) dimension ratios ($p < 0.01$) of our PH patients. When stratified by NYHA-FC, with more severe exercise intolerance, RV and right atrial (RA) dimensions increased, and the systolic RV function variable tricuspid annular plane systolic excursion (TAPSE) decreased in our patients. Furthermore, the NT-proBNP values positively correlated with both, sPAP/sSAP ratio and NYHA FC ($p < 0.01$).

Conclusions: The VVI variables LVEI and RV/LV dimension ratio were associated with clinical worsening, detrimental hemodynamics and increased NT-proBNP levels of our patients, thus emphasizing the importance of VVI in clinical management of pediatric PH.