

Right Ventricular Myocardial Systolic Activation in children with Pulmonary Hypertension using Tissue Doppler Imaging

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Background: Tissue Doppler imaging (TDI) has provided an objective means to quantify global and regional ventricular functions with improved accuracy and greater reproducibility than conventional echocardiography. This study was conducted to assess right ventricular (RV) myocardial systolic activation by TDI in children with pulmonary arterial hypertension (PAH).

Methods: Forty pediatric patients with PAH and 20 healthy controls, underwent standard echocardiogram and TDI. In the apical 4 chamber view the following regional parameters were evaluated in three different myocardial segments (RV basal lateral, basal septal and LV basal lateral): systolic (Sm), early- and late-diastolic (Em and Am) peak velocities. RV myocardial systolic activation delay was defined as the difference in time to peak TDI systolic velocities between the RV basal lateral wall and basal septal. In addition, RV end-diastolic and end-systolic areas were measured to calculate RV fractional area change (FAC).

Results: Compared with the control group, pediatric patients with PAH showed reduced RV FAC; $37.6 \pm 14\%$ versus $48 \pm 5\%$ ($P < 0.0024$). The patients group showed lower myocardial peak velocities and a significant activation delay compared with controls ($P < 0.0001$). There was a significant negative correlation between RV myocardial systolic activation delay and RV FAC. RV myocardial systolic activation delay was even present in a subset of patients with normal FAC.

Conclusions: In PAH, RV myocardial systolic activation was markedly delayed and showed significant negative correlation with the RV FAC. RV myocardial systolic activation delay could offer a unique approach to predict early RV dysfunction before the decline in RV FAC is evident.