

## Bi-ventricular Diastolic Function by Tissue Doppler Imaging Correlates with Severity of Pulmonary Arterial Hypertension in Children

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**INTRODUCTION:** Pulmonary arterial hypertension (PAH) is a progressive disease resulting in a rise in pulmonary vascular resistance (PVR) and pulmonary artery pressure (PAP), and subsequently in right ventricular failure. While evidence of left ventricular diastolic dysfunction has been linked with PAH in adults, this association remains unclear in the pediatric population. The purpose of this study was to determine the association of tissue Doppler imaging (TDI) measures of bi-ventricular diastolic dysfunction when compared to invasive measurements of PAH in pediatric patients.

**METHODS:** 43 children with PAH (median age 11.6yr, range 1mo - 21yr) had echocardiograms and cardiac catheterizations within 7 days. Measures of myocardial longitudinal velocities by TDI included early diastole (E') and the ratio of early to late diastole (E'/A') at the lateral tricuspid, septal, and mitral valve annuli from 4-chamber view. Catheterization data included: mean PAP, PVR, pulmonary capillary wedge pressure (PCWP), right atrial pressure (RAP), and cardiac output. TDI measures were correlated against all hemodynamic measures and then evaluated for their predictive value using Receiver Operating Characteristic (ROC) analysis of E'/A' to identify patients with  $\geq$  moderate PAH as defined by mean PAP  $\geq$ 35mmHg.

### RESULTS:

PAP and PVR, but not RAP, PCWP, or cardiac output, correlated with E'/A' ratio at the lateral tricuspid, septal, and mitral valve annuli (see Table). There was no significant correlation of the E' velocity alone. Filling pressures at catheterization were not significantly elevated (RAP 2-10 mmHg, PCWP 1-14 mmHg). ROC analysis demonstrated that tricuspid E'/A' was the best predictor of moderate PAH (AUC 0.75).

Table

	Tricuspid E'/A'	Septal E'/A'	Mitral E'/A'
mean PAP	p<0.001, r =0.52	p< 0.01, r =0.4	p< 0.001, r =0.47
PVR	p<0.001, r=0.62	p<0.01, r=0.42	p<0.001, r=0.49
RAP	p<0.14, r=0.22	p<0.11, r=0.25	p<0.08, r=0.27
PCWP	p<0.34, r=0.15	p<0.59, r=0.08	p<0.63, r=0.07
Cardiac Output	p<0.44, r=0.16	p<0.83, r=0.04	p<0.13, r=0.29

**CONCLUSIONS:** TDI-derived E'/A' ratio correlated with direct catheterization measurement of PAH compared to E' velocity alone, suggesting the presence of compensatory atrial contraction in PAH. Bi-ventricular diastolic dysfunction significantly correlated with severity of PAH, suggesting that TDI measures may be an early sensitive marker for subclinical changes in PAH disease severity. Tricuspid E'/A' was a strong predictor of moderate or greater than moderate PAH.