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Prognostic impact of pulmonary arterial wave reflection in heart failure

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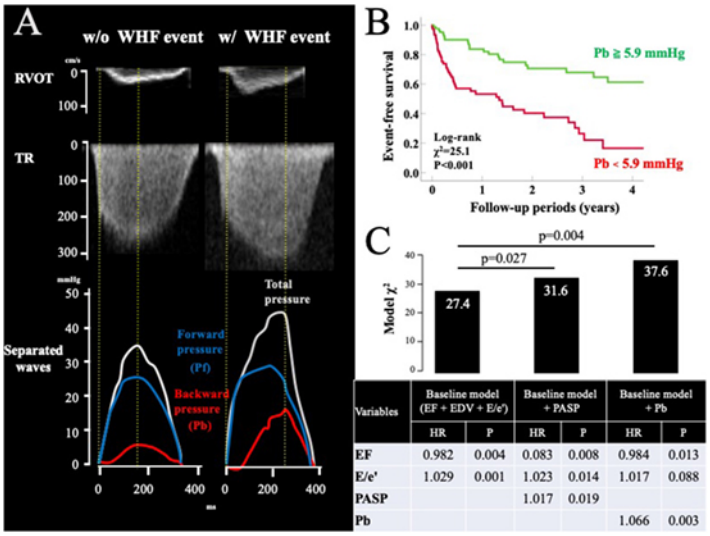
Background: Pulmonary hypertension (PH) is prevalent and is associated with adverse outcomes in heart failure. The pathophysiology of PH is heterogeneous, including pre-capillary PH and combined pre- and post-capillary PH. The latter PH has been reported in experimental studies to cause wave reflection in pulmonary circulation, putting additional burden on right ventricle. This study tested the hypothesis that separating wave reflection would enhance risk stratification in heart failure.

Methods: This study included 152 patients with clinical stable heart failure associated with PH who were referred to echocardiography for hemodynamic assessment (age = 72 ± 13 years old, ejection fraction = 49 ± 21%). Pulmonary arterial wave reflection was characterised by separating PA pressure waveform into forward (Pf) and backward pressure (Pb) waves, based on the concept of wave intensity. PA pressure waveform was estimated from continuous Doppler tracing of tricuspid regurgitation. Flow velocity was measured by pulse Doppler at right ventricular outflow tract. Outcome data was obtained by reviewing medical charts. The endpoint was hospitalization for worsening heart failure (WHF).

Results: Figure A compares PA pressure waveforms (total and separated waves) obtained from 2 patients with and without WHF event. The patient with event had higher total pressure associated with late peak than the patient without event. Pb appeared later than Pf; it was markedly higher in the patient with event than the patient without event, although Pf was similar between both patients. Kaplan-Meier analysis demonstrated a significant separation of survival curves stratified by Pb (chi-square = 25.1, p < 0.001, figure B). During follow-up period of 1.5 ± 1.8 years, 65 patients (43%) experienced the endpoint. Sequential Cox analysis revealed that PASP remained significant after adjusted for left ventricular ejection fraction and E/e' (hazard ratio = 1.017, p = 0.019). Pb also remained significant after the same adjustment (hazard ratio = 1.066, p = 0.003); the addition of Pb to a baseline model resulted in greater increase in predictive power than the addition of PASP (model chi-square: from 27.4 (baseline), to 37.6 (p = 0.004) for Pb, to 31.6 (p = 0.027) for PASP, figure C)

Conclusions: Pressure wave reflection in pulmonary artery is associated with early decompensation in heart failure.

Abstract P1528 Figure.



Variables	Baseline model (EF + EDV + E/e')		Baseline model + PASP		Baseline model + Pb	
	HR	P	HR	P	HR	P
EF	0.982	0.004	0.083	0.008	0.984	0.013
E/e'	1.029	0.001	1.023	0.014	1.017	0.088
PASP			1.017	0.019		
Pb					1.066	0.003