

Systemic ventricular-arterial coupling and interventricular interaction in isolated post-capillary and combined pre- and post-capillary pulmonary hypertension in severe mitral stenosis

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Background: Patients with secondary pulmonary hypertension (PH) can be further classified based on the degree of increase in pulmonary arterial mean pressure relative to pulmonary artery occlusion pressure. In isolated post-capillary PH (Ipc-PH) elevated left atrial pressure (LAP) is passively transmitted to the pulmonary venous system, whereas in combined pre- and post-capillary PH (Cpc-PH) additional reactive changes of the pulmonary vasculature lead to further increase of the pulmonary vascular resistance. A detectable secondary disruption of the LV performance has been related to increased mortality in this latter cohort.

Purpose: Despite the prognostic relevance of distinguishing Ipc-PH from Cpc-PH, the haemodynamic profiles of these distinct PH cohorts have not been described. Using rheumatic mitral stenosis (MS) as a model we aimed to investigate the differential alterations in inter-ventricular interaction and ventriculo-arterial coupling in these two distinct forms of PH.

Methods: Invasive haemodynamic and echocardiographic data of 94 patients with PH secondary to MS, before and immediately after percutaneous valvulotomy, along with echocardiograms of 40 age-matched healthy controls were analyzed.

Results: At baseline, Cpc-PH patients displayed greater elevation in right ventricular (RV) pressures and more pronounced RV dysfunction compared to the Ipc-PH group. Interestingly, PH patients demonstrated increased left ventricular (LV) and arterial elastance along with ventriculo-arterial (VA) uncoupling, and these derangements were more evident in the Cpc-PH group. PH patients also displayed abnormal LV deformation, the degree of which was determined by the RV haemodynamic load in the septal region, however, was independent of RV pressure

or function and associated with systemic afterload in case of the lateral free wall.

Conclusions: Detailed hemodynamic and echocardiographic profiles distinguishing Ipc-PH from Cpc-PH are presented. Our results provide novel insight into the pathophysiology of altered LV and RV mechanics in PH suggesting that additionally to a direct interaction between the two ventricles, an abnormal VA coupling contributes to the altered LV mechanics that has been associated with adverse prognosis in Cpc-PH.