

Exercise Right Heart Catheterization for Pulmonary Hypertension Identified on Screening Echocardiography in Adult Survivors of Childhood Cancer: A report from the St. Jude Lifetime Cohort

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Introduction: A significant lifetime risk for cardiotoxicity and cardiac mortality exists in adult survivors of childhood cancer who were exposed to chest-directed radiotherapy. In our previous studies, we used 2-dimensional Doppler echocardiography (2d-Echo) to estimate pulmonary hypertension (PHTN) by tricuspid regurgitation jet velocity [(TRV)] >2.8 m/s). PHTN was estimated in 25% of survivors who received chest radiotherapy. We aimed to validate TRV defined PHTN with assessment by right heart catheterization (RHC) and to determine whether cardiopulmonary exercise testing (CPEX) during catheterization further elucidated the etiology of PHTN.

Methods: Our study includes ten survivors in the St. Jude Lifetime Cohort, who were exposed to chest-directed radiotherapy, had a TRV >2.8 m/s confirmed on repeat 2D-Echo and had a significant exercise limitation with dyspnea during six-minute walk and <600 meters exercise tolerance. Participants underwent RHC with simultaneous cardiopulmonary exercise (CPEX) testing. Pressures were obtained in the radial artery, right atrium, pulmonary artery and pulmonary capillary wedge, with cardiac outputs determined using standard thermodilution and Fick methods.

Results: Seven participants had an elevated mean pulmonary artery pressure, at rest (>25 mm Hg) or with subsequent exercise (>30 mm Hg). Five of these were identified by routine supine RHC, and two through additional challenge. Among six participants who were able to complete CPEX testing, all had substantial primary cardiac-based limitations, with two having a mixed pulmonary and cardiac source for their exercise limitation. Additionally, three participants had a marked systemic hypertensive response to exercise challenge that led to impaired left ventricular diastolic filling and subsequent cardiac limitations.

Conclusions: 75% of childhood cancer survivors exposed to chest radiation who had 2D-Echo evidence for PHTN had evidence of hemodynamically confirmed PHTN by RHC. The addition of CPEX testing allowed for the delineation of the etiology of PHTN, thus helping guide therapeutic decision-making.