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The vicious feedback in patients with heart failure: Technological and clinical implications

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Heart Failure (HF) is characterized by phases of de-compensation, but the mechanisms underlying the accelerated deterioration are not well understood. We suggest that an increase in the capillary wedge pressure increases the respiratory effort; on the other hand, an increase in respiratory effort causes further deterioration of heart failure and both constitute the vicious cardiopulmonary cycle. The study enrolled patients undergoing cardiac catheterization to clarify diagnosis of dyspnea. Pulmonary wedge pressure was separated into two waves: The respiratory wave (PRESP) and the capillary trans-mural pressure (PCT). Remarkably, PRESP values were very high - up to 40 mmHg in HF patients and there was a high correlation between PRESP (surrogate of dyspnea) and PCT. This raises the question of cause/consequence relationships. An increase in the wedge-pressure increases pulmonary capillary pressure, leading to capillary stiffness, resulting into decrease lung's compliance. The associated congestion increases lung's viscosity. These two mechanisms intensify the required respiratory work. As within the vicious feedback, elevated PRESP increases the LV afterload, while elevated PCT affects the RV afterload. In addition, the left and right atrial V-waves (filling) were significantly and oppositely modulated by respiration. An increase in PRESP in HF patients was associated with more pronounced RA filling and with lower LA filling possibly contributing to further lung congestion. The respiratory dynamics and PRESP may be used as a surrogate of the respiratory effort and allow quantification of dyspnea severity. The respiratory dynamics and presP may be used as a surrogate of cardiac de-compensation.

Biography

Amir Landesberg, MD DSc is a Staff Member and Former Dean of the Faculty of Biomedical Engineering at the Technion. He has completed his BSc in Electrical Engineering, MD and DSc (PhD) in Biomedical Engineering. He has received his Post-Doctoral Training in Libin Cardiovascular Institute of Alberta, at the University of Calgary. His work has been published in the highly esteemed journals. He is the Founder of several medical device companies and spin-outs in the fields of cardiology, pulmonology and intensive care.

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