Hyponatremia predicts right heart failure and poor survival in pulmonary arterial hypertension

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Online supplement

Hemodynamics and echocardiography

Mean (end-expiratory) right atrial (RAP), pulmonary capillary wedge (PCWP) and pulmonary arterial pressures were recorded, and thermodilution cardiac output was obtained and reported as the average of at least three values with < 20% variation. Mixed venous oxygen saturation (SVO_2) was determined by measuring the oxygen saturation of blood drawn from the pulmonary artery. Heart rate and noninvasive blood pressure were recorded during the procedure. Stroke volume (SV; CO/HR), cardiac index (CI; CO/BSA), stroke volume index (SVI; CI/HR), pulmonary vascular resistance (PVR; (mPAP – PCWP)/CO), and RV stroke work index (RVSWI; mean pulmonary artery pressure-right atrial pressure x SVI) were calculated. The ratio of stroke volume to pulmonary artery pulse pressure reflects pulmonary artery compliance (1).

Echocardiography

Right ventricular systolic function was quantified by measuring the tricuspid annular plane systolic excursion (TAPSE), as well as RV fractional area change using methods described previously. Right heart size was expressed as right atrial (systolic) and RV (diastolic) dimensions indexed to patient height. The degree of tricuspid regurgitation was assessed semiquantitatively, graded 0-4. Right to left heart disproportion was reported as ratios of right to left atrial and ventricular dimensions. These methods have been described previously (2). Doppler assessment of RV systolic pressure was obtained in the standard manner.

Online Supplement References

E1. K. Dyer, C. Lanning, B. Das, P. F. Lee, D. D. Ivy, L. Valdes-Cruz, and R. Shandas. Noninvasive Doppler tissue measurement of pulmonary artery compliance in children with pulmonary hypertension. *J.Am.Soc.Echocardiogr.* 19 (4):403-412, 2006.

E2. P. R. Forfia, M. R. Fisher, S. C. Mathai, T. Housten-Harris, A. R. Hemnes, B. A. Borlaug, E. Chamera, M. C. Corretti, H. C. Champion, T. P. Abraham, R. E. Girgis, and P. M. Hassoun. Tricuspid annular displacement predicts survival in pulmonary hypertension. *Am.J.Respir.Crit Care Med.* 174 (9):1034-1041, 2006.