

Key Points in Estimating Pulmonary Vascular Hemodynamic Parameters

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Dear Editor,

I have read the manuscript comparing the hemodynamic measurements of pulmonary vascular bed obtained from transthoracic echocardiography and invasive right heart catheterization with great interest. The authors reported that although the results of both diagnostic interventions correlate with each other, nearly half of echocardiographic measurements of systolic pulmonary artery pressure and right atrial pressure are accurate.¹

Volume status is crucial in the assessment of pulmonary vascular hemodynamic parameters. Echocardiographic measurement is performed in an outpatient clinic; however,

heart catheterization is performed in a catheter unit. Patients undergoing heart catheterization are usually advised not to eat or drink anything a few hours before the procedure. Moreover, patients with volume overload might have been treated with diuretics in order to tolerate lying down during the procedure. Hemodynamic parameters such as pulmonary capillary wedge pressure, pulmonary artery pressure, and right atrial pressure are affected by volume status.² Volume status might have changed during the three-month interval between echocardiographic assessment and heart catheterization.

Hemoglobin level has an impact on pulmonary artery pressure. Severe anemia causes pulmonary vasoconstriction and high-output heart failure.³ On the other hand, iron deficiency resulting in anemia develops on the basis of several mechanisms in pulmonary hypertension.⁴ Therefore, the vicious cycle between pulmonary hypertension and anemia should be taken into account in the assessment of pulmonary vascular hemodynamic parameters.

To conclude, although it was reported that the three-month interval between the two diagnostic modalities was a limitation, it should be noted that volume status and hemoglobin levels might have been different and possibly affected the results during the two distinct measurements.

Keywords

Pulmonary Wedge Pressure; Anemia; Echocardiography; Cardiac Catheterization

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Reply

Dear Editor,

We would like to thank you for the very pertinent and enlightening comments from the reader about the variables that have the potential to explain disagreements between echocardiographic (ECHO) estimates of right atrial (RAP) and pulmonary artery systolic pressures (PASP) and those obtained by direct catheterization of the right heart chambers and pulmonary artery (RHC).

We agree with the comments. The status of intravascular volume can vary over a three-month interval, especially in

outpatients. It is well known that this assessment by ECHO is complex, depending on the parameters of the inferior vena cava and even invasive measurement of central venous pressure, which is not routinely done in clinical practice. Although this is a limitation of the study, in clinical practice, plasma volume can vary, and the assessment of volume overload is usually verified by the presence of peripheral edema and body weight. On the other hand, we also wanted to demonstrate that the echocardiogram, even subject to these circumstances, had a high power to discriminate who actually had a confirmed diagnosis of

pulmonary hypertension, despite the disagreements in the direct measurements.

With regard to the interval between the initial echocardiogram and the right heart catheterization in the present study – performed under the conditions of usual clinical practice – it is worth noticing that disagreements between these measurements were also reported by Fisher et al. in their study carried out under conditions in which the procedures were done with an interval of just one hour.¹ On the other hand, Farber et al. reported similar results when they analyzed data from the large North American pulmonary hypertension registry – REVEAL, where the interval between tests was even longer, with a maximum of 12 months. In this study, using RHC as the reference, ECHO was considered inaccurate in 57.4% of PASP estimates (>10 mm Hg higher or lower than RHC) and in 36.5% of mean RAP estimates (>5 mm Hg higher or lower than RHC). It is noteworthy that the correlation between initial RHC and initial ECHO parameters was similar whether the tests were performed on the same day, within the same month, or 1 to 3 months, 3 to 6 months, or 6 to 12 months.²

We also agree on the effect of anemia and iron deficiency on pulmonary hypertension. It should be noted that the mean hemoglobin level of the series presented was 13.3 g/dL \pm SD=0.9 (data not presented in the article), suggesting that in the present study, this effect was probably not significant.

In conclusion, we would like to re-emphasize that, despite the disagreements observed in absolute terms of the measurements of right atrial pressure and pulmonary artery systolic pressure, the indication for hemodynamic measurements and the final diagnosis of pulmonary hypertension were not affected once other criteria relevant to diagnostic management were adopted, alerting us to the fact that the absolute echocardiographic estimate of pulmonary artery systolic pressure is often not enough to reduce the probability of diagnosing this condition. The patient's volume and hemoglobin level must be properly assessed in the context of the diagnosis of pulmonary hypertension.

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