Analysis of the Influence by Visualized Direction on the Right Ventricular Outflow Doppler Waveform in Patients with Pulmonary Hypertension

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Abstract

Background: In evaluating pulmonary hypertension by echocardiography, the biphasic waveform and shortening of acceleration time of the right ventricular outflow tract Doppler flow (RVOF) are frequently seen in accordance with increasing of pulmonary artery pressure. In addition, it has been reported that the biphasic waveform of RVOF relates to the highly elevated pulmonary vascular resistance (PVR). Therefore, it is important to analyze the RVOF waveform in evaluation of pulmonary hypertension. However, the RVOF waveform often varies, depending on the visualized direction. The purpose of this study was to analyze the influence by the visualized direction on the RVOF Doppler waveform in patients with pulmonary hypertension.

Subjects and Methods: Sixty-nine consecutive patients (12 males, 57 females, average age 59±15 years) who underwent echocardiographic examination for evaluation of pulmonary hypertension were in the study. RVOF was acquired by the pulsed wave Doppler method from three directions: the aortic valve short-axis view, the right ventricular outflow tract view, and the epigastrium view. In 40 patients who underwent right heart catheterization (RHC), the RVOF was compared with the PVR calculated by the RHC.

Results and Discussion: Impossible evaluation rate of RVOF and was significantly high for the epigastric view ($p<0.01$). The detection rate of the biphasic waveform reflecting the increasing PVR was significantly low for the epigastric view ($p<0.05$). In patients with the biphasic waveform of the RVOF from all directions except the epigastric view, PVR significantly increased compared to the patients without the biphasic waveform of the RVOF ($p<0.05$). Therefore, it was difficult to estimate the increasing of PVR by the RVOF from the epigastric view. On the other hand, the velocity time integral (VTI) of the RVOF reflecting the flow volume from all three directions correlated with the PVR calculated by the RHC (aortic valve short-axis view $r=-0.47$, right ventricular outflow tract view $r=-0.52$, epigastric view $r=-0.56$). Therefore, independent of the visualized direction, the VTI of the RVOF was considered to be useful for an index to reflect PVR.

Conclusion: In RVOF from the epigastric view, the VTI reflecting the flow volume was shown to have a good correlation with the PVR, but there was a limitation to detect the biphasic waveform reflecting the increasing PVR.

Vol.43 No. 4 (2018) 440-449

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Received on January 10, 2018; Revision accepted on April 13, 2018