

Echocardiographic evaluation of hemodynamics in patients with systolic heart failure supported by a continuous-flow LVAD

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BACKGROUND: Hemodynamics assessment is important for detecting and treating post-implant residual heart failure, but its accuracy is unverified in patients with continuous-flow left ventricular assist devices (CF-LVADs).

OBJECTIVES: We determined whether Doppler and 2-dimensional transthoracic echocardiography reliably assess hemodynamics in patients supported with CF-LVADs.

METHODS: Simultaneous echocardiography and right heart catheterization were prospectively performed in 50 consecutive patients supported by using the HeartMate II CF-LVAD at baseline pump speeds. The first 40 patients were assessed to determine the accuracy of Doppler and 2-dimensional echocardiography parameters to estimate hemodynamics and to derive a diagnostic algorithm for discrimination between mean pulmonary capillary wedge pressure ≤ 15 versus >15 mm Hg. Ten patients served as a validation cohort.

RESULTS: Doppler echocardiographic and invasive measures of mean right atrial pressure (RAP) ($r = 0.863$; $p < 0.0001$), systolic pulmonary artery pressure (sPAP) ($r=0.880$; $p<0.0001$), right ventricular outflow tract stroke volume ($r=0.660$; $p < 0.0001$), and pulmonary vascular resistance ($r = 0.643$; $p = 0.001$) correlated significantly. Several parameters, including mitral ratio of the early to late ventricular filling velocities >2 , RAP >10 mm Hg, sPAP >40 mm Hg, left atrial volume index >33 ml/m², ratio of mitral inflow early diastolic filling peak velocity to early diastolic mitral annular velocity >14 , and pulmonary vascular resistance >2.5 Wood units, accurately identified patients with pulmonary capillary wedge pressure >15 mm Hg (area under the curve: 0.73 to 0.98). An algorithm integrating mitral inflow velocities, RAP, sPAP, and left atrial volume index was 90% accurate in distinguishing normal from elevated left ventricular filling pressures.

CONCLUSIONS: Doppler echocardiography accurately estimated intracardiac hemodynamics in these patients supported with CF-LVAD. Our algorithm reliably distinguished normal from elevated left ventricular filling pressures. © 2014 by the American College of Cardiology Foundation.

SciVal Topic Prominence

Topic: [Heart-Assist Devices](#) | [Heart Failure](#) | [pump thrombosis](#)

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