

Prospective Validation of the Venous Excess Ultrasound (VExUS) Score

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BACKGROUND

Venous congestion is an under-appreciated contributor to mortality in critically ill patients and is difficult to quantify. **Right heart catheterization (RHC)** is the gold standard for assessing venous congestion. RHC is invasive, costly, and is not universally available. The **VExUS Score** is a novel noninvasive means of **determining venous congestion** using ultrasound measurement of the inferior vena cava (IVC) and of the hepatic vein, portal vein, and intra-renal venous Doppler waveforms¹. While VExUS was validated retrospectively against RHC, it was not validated prospectively. We performed a **prospective analysis of VExUS against RHC measurements**: right atrial pressure (RAP), mean pulmonary artery pressure (mPAP), and pulmonary capillary wedge pressure (PCWP).

METHODS

81 patients undergoing RHC for a wide variety of indications at Denver Health Medical Center underwent VExUS examination. Investigators were blinded to RHC data during VExUS scoring. We manually abstracted past medical history, demographic information, and echocardiogram data from patient charts. Multivariable linear regression was used to assess the relationship between VExUS and RAP, mPAP, PCWP and NT-ProBNP, controlling for age, sex, and Charlson Comorbidity Index.

RESULTS

After controlling for age, sex, and Charlson Comorbidity Index, there was a linear association between VExUS Grade and: Right Atrial Pressure (RAP), Pulmonary Capillary Wedge Pressure (PCWP), and Mean Pulmonary Artery Pressure (mPAP). After controlling for age, sex, and common comorbidities, we observed a **significant positive association between RAP and VExUS grade** ($P < 0.001$, $R^2 = .68$). VExUS had a favorable AUC for prediction of a RAP ≥ 12 mmHg (0.99, 95% CI 0.96-1) compared to IVC diameter (0.79, 95% CI 0.65-0.92).

CONCLUSIONS

VExUS is a promising noninvasive tool for **accurately assessing venous congestion**. A safer and more accessible alternative to right heart catheterization for assessing venous congestion.