

Magnetic Resonance Analysis of Right Ventricular Volumetric Function for the Noninvasive Diagnosis of Pulmonary Hypertension

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Background: The symptoms of pulmonary hypertension (PH) are predominantly caused by right ventricular (RV) dysfunction. Kuehne et al. generated RV volume-pressure loops and showed a reduced RV pump function in the setting of PH.

Purpose: To assess RV volumetric patterns measured with CMR that allow noninvasive diagnosis of pulmonary hypertension

Materials and Methods: 17 patients (5 male, 12 female, mean age 51.9 ± 14.5 , range 30-79 years) with confirmed PH and 10 healthy volunteers (3 male, 7 female, mean age 32.7 ± 11.8 , range 25-65 years) were scanned and 2D cine short-axis SSFP images were acquired. Volumetric parameters of RV function including end-diastolic volume (EDV), end-systolic volume (ESV) and ejection fraction (EF) were measured. Patients underwent right-sided heart catheterization (RHC) and mean pulmonary arterial pressure (mPAP) and pulmonary vascular resistance (PVR) were measured. Based on RV pressure-volume loops, EDV/EF ratio was calculated as an indirect estimate of RV function and correlated with indices of pressure and resistance. Statistical tests included Pearson's correlation coefficients, independent samples t-test and receiver operating characteristic curve analysis.

Results: RV EDV/EF showed a strong direct correlation with pulmonary pressure (mPAP) and resistance (PVR) ($r=0.61$, 0.83 , respectively). Patients had higher values of RV EDV/EF compared to controls. RV EDV/EF at cutoff value of 3.92 revealed PH with sensitivity of 70.1% and specificity of 81.0% (All, $p<0.05$).

Conclusion: RV volumetric parameters of decompensation are useful for differentiating patients with PH and can be used to noninvasively detect pulmonary hypertension.

