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Pulmonary transit time is a better predictor of cardiovascular mortality and HF hospitalization in HF-rEF patients than left and right ventricular ejection fraction or feature tracking GLS

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Background: Right ventricular (RV) ejection fraction and hemodynamic congestion are known as powerful predictor of mortality in HF-rEF. Pulmonary transit time (PTT) assessed by cMR is a novel parameter, which reflects multiple indicators of cardiopulmonary status, including not only left ventricular(LV) and RV function but also hemodynamic congestion.

Purpose: We sought to explore the prognostic value of the PTT above well-known risk factor for predicting outcomes in HF-rEF in direct comparison with cardiac function assessed either by the conventional cMR-systolic parameters or by cMR-feature tracking (FT).

Methods: 401 patients in sinus rhythm with a LVEF< 35% (age 61 ± 13 years; 25% female) underwent a cMR and an echocardiography. Patients were followed for a composite endpoint of CV death and HF hospitalization.

Results: Average cMR-LVEF was 23% ± 7%, average cMR-RVEF was 43 ± 15%, average cMR-FT-RVGLS was -12±4.4%, average cMR-FT-LVGLS was-6.5±2.5% average estimated systolic pulmonary pressure (eSPAP) was 33 ± 12mmHg and PTT was 11± 6s. After a median follow-up of 6 years, 191 (48%) patients reached the composite endpoint. In univariate cox regression, age, female sex, ischemic cardiomyopathy, diabetes, NYHA class III-IV, eSPAP> 40mmHg, E/A ratio, e/e’ratio, cMR-RVEF, LVEF, LV scar, PTT, GFR, beta blockers and diuretics were associated with the composite endpoint. For the multivariate analysis, a baseline model was created where age, female sex, ischemic etiology, diabetes, eSPAP>40mmHg, diuretics, beta blockers were found to be significantly associated with the endpoint. PTT (X2 to improve = 9.41, HR: 1.04; 95%CI: [1.02; 1.06]; P=0.002) showed a significantly higher additional prognostic value over the baseline model than cMR-LVEF (X2 to improve = 1.15, HR: 0.99; 95%CI: [0.97; 1.01]; P=0.28), cMR-RVEF (X2 to improve = 7.36, HR: 0.99; 95%CI: [0.97; 0.99]; P=0.007), LV-FT-cMR(X2 to improve = 1.36, HR: 1.03; 95%CI: [0.98; 1.08]; P=0.24) and RV-FT-cMR (X2 to improve = 2.32, HR: 1.03; 95%CI: [0.99; 1.06]; P=0.28).

Conclusion: Pulmonary transit time provides higher prognostic information than cardiac function assessed by cMR or by cMR feature tracking over well-known risk factors with high power to stratify prognosis in HF-rEF and might be promising tools to identify patients at higher risk among HF patients.
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The additional value of the pulmonary transit time (PTT), left ventricular ejection fraction (LVEF), left ventricular feature tracking cardiac magnetic resonance (LVFT-cMR), right ventricular ejection fraction (RVEF) and right ventricular feature tracking (RVFT) over a baseline model (BM) including age, female sex, ischemic etiology, diabetes, estimated systolic pulmonary pressure >40mmHg, diuretics and beta blockers in predicting cardiovascular death and heart failure hospitalization. LV and RV indicate left ventricle and right ventricle respectively.