

Non-invasive estimation of right atrial pressure by IVC measurement differently predicts long-term prognoses in acute heart failure patients with reduced and preserved LVEF

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Introduction: Inferior vena cava (IVC) measurement by bed-side echocardiography is a non-invasive, reproducible and feasible estimation of right atrial pressure (RAP). However, the effect of left ventricular systolic functions on the clinical efficacy of estimation of RAP using IVC parameters in hospitalized patients with acute heart failure (AHF) has not been fully discussed.

Purpose: We aimed to investigate the prognostic impact of RAP evaluation by IVC measurement in AHF patients, focusing on left ventricular ejection fraction (LVEF).

Methods: This observational study initially included 1,350 consecutive patients who were urgently hospitalized due to AHF. After the exclusion of patients receiving hemodialysis, those died in hospital, and those without full information of echocardiography during the index hospitalization, 507 patients with reduced (<40%; HFrEF) and 482 patients with preserved (\geq 40%; HFpEF) LVEF who discharged alive were respectively analyzed. In accordance with ESC guidelines, HFrEF and HFpEF patients were respectively divided into three groups depending on maximum IVC diameter and collapse; Normal-RAP group (IVC diameter \leq 2.1cm and collapse >50%), High-RAP group (IVC diameter >2.1cm and collapse <50%), and Intermediate-RAP group (others). The endpoints of this study were cardio-

vascular (CV) death after the discharge, and hospitalization due to heart failure recurrence (HHF).

Results: During the observation period, 70 HFrEF patients (13.8%) and 51 HFpEF patients (10.5%) died by CV cause, and 223 HFrEF patients (43.9%) and 158 HFpEF patients (32.8%) were rehospitalized due to HF. In HFrEF patients, Kaplan-Meier analysis showed a low CV mortality rate only in the Normal-RAP group (Log-rank trend: $P=0.001$, Figure), but no significant difference in HHF rate among RAP groups ($p=0.35$, Figure). In multivariate Cox regression analysis, RAP classification was an independent predictor of CV mortality in HFrEF patients (adjusted hazard ratio (AHR) 1.90 [95% confidence interval (CI) 1.12–3.21]), even after the adjustment of diverse covariants. On the other hand, in HFpEF patients, Kaplan-Meier analysis showed the high mortality rate and HHF rate only in the High-RAP group (Log-rank trend: both $p<0.001$, Figure). Multivariate Cox regression analysis revealed that RAP classification independently predicted both prognoses (CV mortality: AHR 2.23 [95% CI 1.10–4.52]; HHF: AHR 1.34 [95% CI 1.03–1.74]) in HFpEF patients.

Conclusion: Non-invasive and easy classification of AHF patients by maximum IVC size and collapse may predict CV mortality after the discharge in HFrEF and HFpEF; while, it failed in HHF of HFrEF patients.

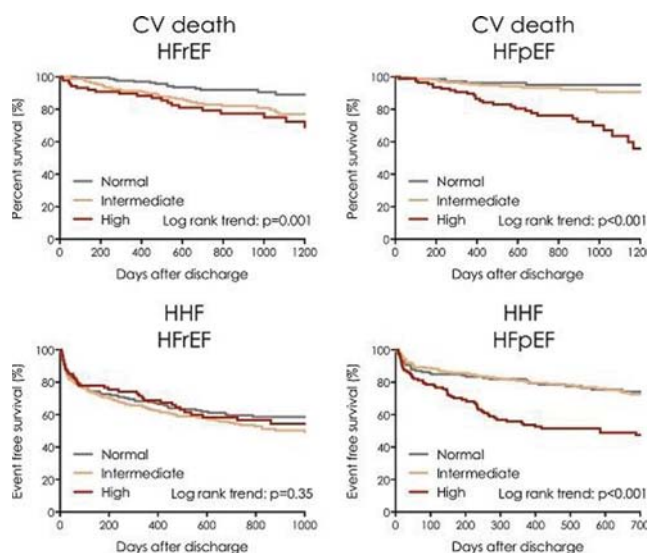


Figure 1