Prognostic impact of different parameters of right ventricular systolic function in patients with significant tricuspid regurgitation. A cardiac magnetic resonance study

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Background: Right ventricle (RV) dysfunction represent an established criteria for intervention in patients with significant tricuspid regurgitation (TR). RV ejection fraction (RVEF) by Cardiac Magnetic Resonance (CMR) is considered the gold standard of RV function; however it is influenced by changes of preload conditions and may remain unaffected until late stages in severe TR. Novel measures of RV function such as RV longitudinal shortening (RV-LS) and effective RV ejection fraction (eRVEF) may be earlier markers of RV dysfunction.

Purpose: To compare the prognostic impact of conventional and novel parameters of RV systolic function.

Methods: Consecutive patients in stable clinical condition evaluated in the Heart Valve Clinic with significant TR (severe, massive or torrential TR) undergoing a CMR study were included. In addition to conventional parameters of biventricular volume and function, RV-LS and eRVEF were assessed as novel parameters of RV function. RV-LS was assessed in the 4-chamber view by measuring the displacement of the tricuspid annulus during the cardiac cycle. The length between the epicardial border of the LV apex and the middle of a line connecting the origins of the tricuspid valve leaflets was measured in both end-systole and end-diastole. Effective RVEF (eRVEF) is a measure of RV global systolic function but corrected by TR volume. Both formulas are represented in figure 1. A combined endpoint of hospital admission due to right heart failure and cardiovascular mortality was defined

Results: 75 patients were included in this study (age 75±8 years, 75% female, 91% functional TR) During a median follow-up of 3 years (IQR: 1.4–3.9 years), 39% of the patients (n=29) experienced the combined endpoint. RV-LS and eRVEF identified higher rates of RV dysfunction than RVEF. RV-LS of ≥−14% and eRVEF of ≤34% were associated with impaired prognosis (figure 2). After adjustment of age and LVEF, both eRVEF (adjusted HR per abnormal value: 5.29 95% CI, [2.25–12.4]) and RV-LS (adjusted HR per abnormal value: 3.46, 95% CI, [1.13–9.17]) were significantly associated with outcomes. Among all parameters of RV function, eRVEF was the strongest predictor of outcomes, incremental to RVEF (Δ C-statistic 0.139 [0.040–0.237], p=0.005).

Conclusion: RV function is crucial for determining optimal timing for TR intervention. RV-LS and eRVEF identify higher rates of RV dysfunction beyond RVEF. Among all measures of RV function, eRVEF held the strongest association with outcome, incremental to RVEF.

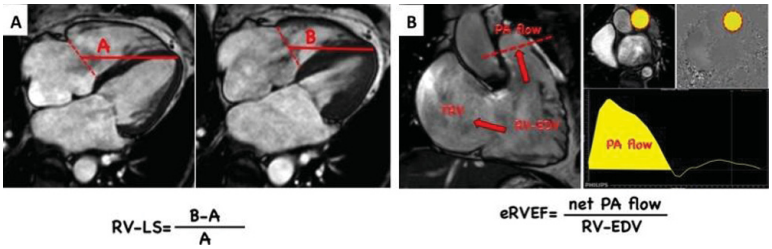

Figure 1. RV-LS and eRVEF calculation

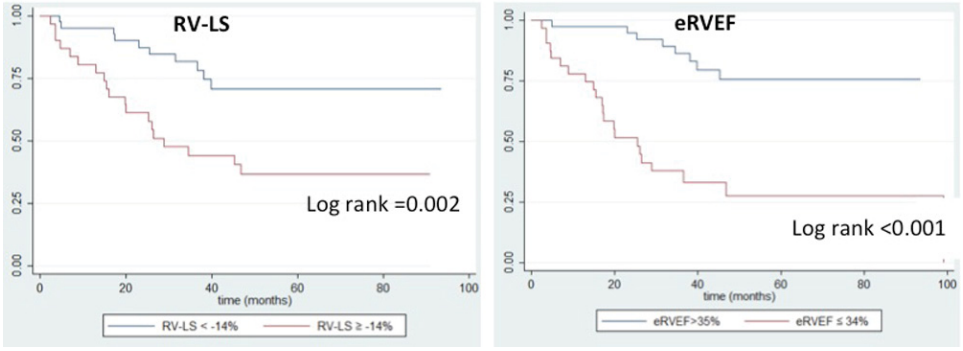

Figure 2. Kaplan Meier Curves