

Discordance between conventional functional parameters and 3D echocardiography-derived ejection fraction in the detection of right ventricular systolic dysfunction

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Background. The conventional echocardiographic parameters of the right ventricular (RV) systolic function (e.g., tricuspid annular plane systolic excursion - TAPSE, fractional area change – FAC, free wall longitudinal strain – FWLS) only partially portray the complex functional characteristics of the RV; therefore, they may fail to capture the full spectrum of RV dysfunction and associated adverse clinical outcomes. 3D echocardiography-derived RV ejection fraction (RVEF) is a well-validated and reproducible parameter that overcomes these limitations.

Purpose. We aimed to investigate the discordance between TAPSE, FAC, FWLS and RVEF in RV systolic function grading and associated outcomes.

Methods. Two retrospective databases from different centers including consecutive patients with various cardiac diseases who underwent clinically indicated 2D and 3D echocardiography (n=750) were analysed. Patients were followed up for the occurrence of all-cause mortality. RVEF was measured by a single, commercially available 3D software package. Guideline-recommended cut-off values were used to indicate RV systolic dysfunction (TAPSE<17 mm, FAC<35%, FWLS>-20%). RVEF <45% served as the “ground truth” of RV dysfunction.

Results. Among patients with normal RVEF (n=511), 109 (21%) had reduced TAPSE, 168 (33%) had reduced FAC, and 49 (10%) had both reduced TAPSE and FAC. Among patients with reduced RVEF (n=239), 109 (46%) had normal TAPSE, 61 (26%) had normal FAC, and 40 (17%) had both normal TAPSE and FAC. Correspondingly, sensitivity and specificity for discrimination of RV systolic dysfunction (RVEF<45%) were 66% and 70% for TAPSE, and 71% and 76% for FAC on ROC analysis, respectively (Figure 1).

During the median follow-up time of 3.7 years, 112 patients (15%) died. Using univariable Cox regression, TAPSE (HR [95% CI]: 0.911 [0.881 - 0.942]), FAC (0.940 [0.924 - 0.957]), and RVEF (0.928 [0.913 - 0.944]) were all significant predictors of mortality (p<0.001).

Interestingly, combination of the functional assessments based on either TAPSE or FAC with

RVEF separates four risk groups that differ significantly in terms of all-cause mortality (Kaplan-Meier curves, Figure 2, log-rank $p < 0.05$).

Conclusion. Guideline-recommended cut-off values of conventional echocardiographic parameters of RV systolic function are only modestly associated with RVEF-based assessment. This phenomenon may hinder the proper risk stratification of patients with RV systolic dysfunction.

Figure 1

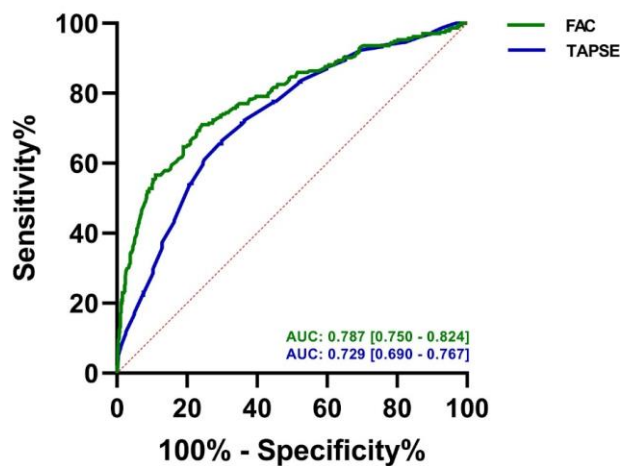


Figure 2

