Predictive value of right ventricular geometry and function evaluated in AI-computed tomography in patients undergoing transcatheter tricuspid valve repair

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Background: The role of cardiac geometry and function for outcome after transcatheter tricuspid valve repair is poorly understood. This study sought to investigate whether right ventricular geometry and function are predictors for clinical outcome in patients undergoing transcatheter tricuspid valve repair (TTVR).

Methods and results: 60 Patients (mean age 79 ± 6 years, 53% female) suffering from severe tricuspid regurgitation underwent full cardiac cycle computed tomography (CT) for TTVR procedure planning. In comparison to conventional CT-measuring of left and right ventricle, AI-based data showed excellent correlation of cardiac volumes in diastole and systole (R-value for Pearson’s correlation ranging from 0.926 – 0.991; each P-value for correlation < 0.001).

We tested whether patients with reduced right ventricle function are associated with worse outcome regarding mortality and re-hospitalization after one year. The mean follow-up was 198 ± 143 days. After 1 year the combined endpoint of death and re-hospitalization occurred in significantly fewer patients with >50% RV-EF (12.1% vs. 37%; X²=5.2; P=0.023). Furthermore, enlarged right ventricle with ≥220 ml end diastolic volume (RVEDV) was associated with poor outcome (0% vs. 33.4%; X²=6.842; P=0.009). The right ventricle was classified as “dysfunctional” with RVEDV ≥200 ml and RV-EF <55% or “functional” with RVEDV < 200 ml or RV-EF > 55%. Patients with “dysfunctional” right ventricle showed poorer outcome in comparison to patients with “functional” right ventricle. (11.1% vs. 32.3%; X²=4.916; P=0.027).

Conclusions: AI-based 3D-reconstruction of right ventricular geometry in full cycle cardiac CT shows excellent correlation with conventional cardiac CT-reconstruction. Patients with enlarged ventricle > 220 ml RVEDV or RV-EF ≤ 50 % and patients who have ≥ 200 ml RVEDV and < 55 % were associated with poor outcome after TTVR.
Outcome based on RVEDV after TTVR

Outcome based on RVEDV after TTVR
Outcome based on RV-EF after TTVR

Death or Hospitalization

RV-EF > 50%

RV-EF ≤ 50%

Days of Follow-up

No. At Risk

| RV-EF > 50% | 33 | 25 | 16 | 15 | 13 |
| RV-EF ≤ 50% | 27 | 17 | 11 | 8  | 5  |

Outcome based on RV-EF after TTVR