Ventricular stroke work indices to predict mortality after successful percutaneous edge-to-edge-repair for severe mitral valve regurgitation

P. Dierks, R. Osteresch, K. Diehl, A. Ben Ammar, A. Fach, J. Schmucker, O. Solyom, H. Wienbergen, R. Hambrecht

Bremer Institut für Herz- und Kreislaufforschung (BIHKF) am Klinikum Links der Weser, Bremen, Germany

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Background: Several studies identified predictors of worse clinical outcome despite successful transcatheter mitral valve repair (TMVR). The capability of invasively measured left and right ventricular stroke work indices (LVSWi, RVSWi) to predict mortality after successful TMVR is unclear.

Purpose: To assess the impact of LVSWi and RVSWi on mortality in patients with chronic heart failure (CHF) and severe mitral regurgitation (MR) undergoing TMVR.

Methods: Consecutive patients (pts.) with CHF (LV ejection fraction ≤50% from any cause) and severe MR who underwent successful TMVR (MR≤2+ at discharge) were included and followed prospectively. Primary endpoint was defined as all-cause mortality during a median follow-up period of 16±9 months. LVSWi was calculated as: Stroke volume index × (mean arterial pressure – postcapillary wedge pressure) × 0.0136 = g/m^{-1}/m^2. RVSWi was calculated as: Stroke volume index × (mean pulmonary artery pressure – right atrial pressure) × 0.0136 = g/m^{-1}/m^2. Receiver operator characteristic (ROC) analysis was used to determine discriminative capacity of LVSWi and RVSWi. Kaplan-Meier estimate was used for survival analysis. A multivariable Cox proportional-hazards regression analysis was performed to identify independent risk factors for all-cause mortality.

Results: 140 patients (median age 74±9.9 years, 67.9% male) at high operative risk (LogEuro-SCORE 34.6±14.1%) were enrolled. Mean LVSWi and RVSWi were 22.3±10.7 g/m^{-1}/m^2 and 8.9±4.1 g/m^{-1}/m^2, respectively. 46 pts. died (33.1%). Pts. who died presented higher LogEuroSCORE (27.8±16.6% vs. 20.1±13.7%; p=0.001), higher levels of NT-proBNP (12121±10602 ng/l vs. 6745±10820 ng/l; p=0.001), higher levels of creatinine (1.8±0.8 mg/dl vs. 1.4±0.8 mg/dl; p<0.001), lower LVSWi (18.9±8.1 g/m^{-1}/m^2 vs. 24.0±11.4 g/m^{-1}/m^2; p=0.01) and RVSWi (7.8±3.2 g/m^{-1}/m^2 vs. 9.4±4.4 g/m^{-1}/m^2; p=0.037), respectively. ROC curve analysis revealed that optimal sensitivity and specificity were achieved using a threshold of 24.8 g/m^{-1}/m^2 for LVSWi (sensitivity 80.4%, specificity 40.2%, area under the curve (AUC) 0.71 [0.60–0.81]; p=0.001) and 8.3 g/m^{-1}/m^2 for RVSWi (sensitivity 67.4%, specificity 57.0%, AUC 0.67 [0.56–0.78]; p=0.006), respectively. At long-term follow-up, a significantly lower survival rate was observed in pts. with LVSWi ≤24.8 g/m^{-1}/m^2 (20.0% vs. 39.4%; log-rank p=0.038) and in pts. with RVSWi ≤8.3 g/m^{-1}/m^2 (22.1% vs. 43.7%; log-rank p=0.026), respectively. In Cox regression analysis a LVSWi of ≤24.8 g/m^{-1}/m^2 and a RVSWi of ≤8.3 g/m^{-1}/m^2 were independent predictors for all-cause mortality (hazard ratio (HR) 2.83; 95% confidence interval (CI) 1.1 to 7.6; p=0.04; HR 2.52; 95% CI 1.04 to 6.1; p=0.041).

Conclusions: LVSWi and RVSWi are associated with mortality among pts. with CHF undergoing successful TMVR for severe MR. A LVSWi cut-off value of >24g/m^{-1}/m^2 and a RVSWi cut-off value of <8g/m^{-1}/m^2 seem to predict mortality independent of other clinical and echocardiographic factors.