Analysis of the right ventricle–pulmonary circulation unit in patients submited to transcatheter aortic valve implantation at two tertiary centers in Uruguay

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Background and objectives:

Transcatheter aortic valve implantation (TAVI) is the best therapeutic option for most patients with severe symptomatic aortic stenosis. Pulmonary hypertension is frequently present in this population and is associated with adverse outcomes. Additionally, right ventricular (RV) dysfunction has emerged as a significant predictor of poor prognosis following TAVI. Since RV systolic performance is closely linked to afterload, a more comprehensive approach may involve assessing RV–pulmonary artery (RV–PA) coupling, which integrates the function of the right heart unit. In this context, our objective was to analyze the incidence and prognostic value of pulmonary hypertension, RV dysfunction, and RV–PA coupling in patients who underwent TAVI at two tertiary centers in Uruguay between January 2023 and December 2024.

Methods:

All consecutive patients who underwent TAVI in 2023 and 2024 at two tertiary centers in Uruguay were included in our TAVI registry and analyzed retrospectively. Pulmonary artery systolic pressure (PASP), used as a non-invasive surrogate of pulmonary pressure, was calculated using the maximum tricuspid regurgitant jet velocity obtained from continuous wave Doppler, integrated into the modified Bernoulli equation, plus the estimated right atrial pressure. RV function was assessed by tricuspid annular plane systolic excursion (TAPSE), measured in the apical four-chamber view as the longitudinal systolic excursion of the tricuspid annulus. RV–PA coupling was assessed using the TAPSE/PASP ratio. Patients with missing TAPSE or PASP data were excluded. Based on PASP values, patients were categorized into three groups: normal (PASP <34 mmHg), mild-to-moderate elevation (PASP ≥34 mmHg and <46 mmHg), and severe elevation (PASP ≥46 mmHg). RV dysfunction was defined as a TAPSE ≤16 mm, and RV–PA uncoupling was defined as a TAPSE/PASP ratio ≤0.55 mm/mmHg. The primary endpoint was all-cause mortality.

Results:

A total of 129 patients (53% female, mean age: 82 ± 5.9 years) were included. Over a median follow-up of 444 days (IQR: 309–682 days), 18 patients (14%) died. Severely elevated PASP was observed in 45 patients (35%), mild-to-moderate elevation in 63 (49%), and normal PASP in 21 (16%). RV dysfunction was present in 17 patients (13%), while 112 (87%) had preserved RV function. RV–PA uncoupling was found in 87 patients (67%), with 42 (33%) showing preserved coupling. Patients with PASP ≥46 mmHg had significantly higher all-cause mortality compared to those with PASP <46 mmHg (27% vs 7%; p<0.05) (figure 1). Patients with right ventricular dysfunction tended to have higher all-cause mortality, although not statistically significant, compared to those with normal right ventricular function (29% vs 12%; p=0.06) (figure 2). Although numerically higher, mortality rates were not significantly different between uncoupled and coupled RV–PA groups (16% vs. 10%; p=0.42) (figure 3).

Conclusions:

In this cohort of patients undergoing TAVI, severely elevated PASP was common and associated with increased all-cause mortality during follow-up. Although RV dysfunction showed a trend toward worse outcomes, it did not reach statistical significance, and RV–PA uncoupling was not significantly associated with mortality. These findings underscore the prognostic importance of