Qp/Qs in ostium secundum atrial septal defect mitigates right ventricular dysfunction in patients with secondary pulmonary hypertension

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Background: Ostium-secundum atrial septal defect (OS-ASD) can potentially lead to pulmonary hypertension (PH) and associated right ventricle (RV) - pulmonary artery (PA) uncoupling. This, in turn, may eventually result in RV systolic dysfunction. Notwithstanding, whether the characteristics of the OS-ASD could mitigate this relationship is unclear.

Purpose: To evaluate a potential interaction of the OS-ASD shunt (Qp/Qs ratio) on the relationship with RV–PA coupling and RV systolic function in patients with secondary PH.

Methods: We designed a cross-sectional study of 63 adult patients with OS-ASD in which we performed a conventional transthoracic echocardiogram using Vivid 9X-clear equipment (GE Vingmed Ultrasound, Horten, Norway). We evaluated the OS-ASD shunt and other echocardiographic parameters, including the tricuspid annular plane systolic excursion (TAPSE), the systolic pulmonary artery pressure (sPAP) ratio and the right ventricular free wall longitudinal strain (RVFWLS). Polynomic adjusted correlations were performed to model the relationship between the TAPSE/sPAP ratio and the RVFWLS; then we evaluated an interaction effect of the OS-ASD shunt (Qp/Qs ratio), respectively adjusted for age, sex, body mass index, body surface area and right atrial area.

Results: In our study, 49 (78%) subjects were male, with a mean age of 41.8 (±15) years; 7.94% (n=5) had mild PH, 42.9% (n=27) had moderate PH and 49.2% (n=31) had severe PH. Mean echocardiographic parameters were: TAPSE 24.5 (±5.1) mm, sPAP of 55.9 (±20.7) mmHg, TAPSE/sPAP 0.49 (±0.2) mm/mmhg, RVFWLS -25.6 (±6.6) % and Qp/Qs 2.9 (±0.9). We observed a quadratic relationship between the TAPSE/sPAP ratio and the RVFWLS (r=0.691, p < 0.001; Figure 1). OS-ASD shunt had a positive interaction effect (β=10.9, 95% CI: 2.09-19.6, p=0.018) on the relationship between TAPSE/sPAP and RVFWLS after adjusting for covariates (Figure 2).

Conclusions: In conclusion, in patients with OS-ASD, the RV systolic function decreases as the RV-PA uncoupling increases, as reflected in the quadratic regression between the TAPSE/sPAP and the RVFWLS. Moreover, the increase in OS-ASD shunt decreases RVFWLS values in relationship to the TAPSE/sPAP ratio as observed in the interaction model. These results could suggest that the OS-ASD characteristics could potentially mitigate RV dysfunction in patients with secondary PH.
Figure 1. Quadratic regression
Figure 2. Interaction model