

MODERATED POSTER SESSION: DON'T LOOK ONLY AT THE LEFT VENTRICLE

Wednesday 3 December 2014, 09:00–16:00

Location: Moderated Poster area

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Assessing Right Ventricular-pulmonary circulation reserve during exercise challenge in patients with Heart Failure and severely depressed right heart function at rest

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Background: Right ventricular (RV) dysfunction at rest has a significant prognostic role in heart failure (HF) syndrome and its combination with pulmonary artery systolic pressure (PASP) is useful for risk stratification. Different response to exercise of echo-derived tricuspid annular systolic excursion (TAPSE) as RV function indicator may provide further clinical stratification in a HF population with advanced bi-ventricular disease.

Aim: We aimed to assess RV-pulmonary circulation response to exercise in HF patients with severe RV systolic impairment (TAPSE < 16 mm) and to explore the association between RV reserve and exercise capacity as evaluated by cardiopulmonary exercise testing (CPET) combined with echo.

Methods: 39 HFrEF patients (mean age 64 y, male 82%, ischemic etiology 64%, LVEF 33 ± 10%) underwent a maximal symptoms-limited CPET on a tilttable cycle ergometer (incremental personalized ramp protocol) and exercise echo.

Results: Population was divided in two groups according to RV functional reserve (increase of TAPSE at peak exercise > 20%). Despite similar bi-ventricular systolic function at rest, patients with impaired RV reserve (Group B) showed lower exercise capacity (peak workload and O₂ pulse), more advanced cardiac remodeling and more severe degree of mitral regurgitation (MR) both at rest and during exercise.

Conclusions: In HF patients an impaired RV function at rest may not invariably lead to an unfavorable RV adaptive response to exercise. Testing the degree of RV functional reserve and RV-pulmonary circulation coupling during exercise can be useful even in the most advanced stages of disease to unmask different clinical phenotypes and, very likely, different levels of risk.

Abstract P173 Table.

Variables	Group A (n=17)		Group B (n=22)		P	
	Rest	Peak	Rest	Peak	Rest	Peak
LV mass indexed, g/m ²	127 ± 29		148 ± 35		0.05	
LV ejection fraction, %	33 ± 10	39 ± 13	32 ± 10	33 ± 10	ns	ns
MR ≥ 3/4+, n (%)	4 (24)	5 (21)	13 (59)	14 (64)	0.015	0.007
TAPSE, mm	13 ± 2	18 ± 3	14 ± 2	14 ± 3	ns	0.000
TAPSE/PASP, mm/mmHg	0.43 ± 0.20	0.34 ± 0.13	0.33 ± 0.13	0.23 ± 0.08	0.09	0.008
Workload, Watt		67 ± 27		50 ± 17		0.03
Peak O ₂ pulse, ml/beat		10 ± 3		7.6 ± 2		0.01

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Early decline in tricuspid annular plane systolic excursion predicts outcome in children with pulmonary hypertension

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Purpose: Disease progression and response to therapy in pulmonary arterial hypertension (PAH) is assessed in part by serial echocardiographic assessment of RV function.

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The optimal measure for monitoring changes in RV function and predicting outcome in children with PAH is not known. We investigated serial changes in tricuspid annular plane systolic excursion (TAPSE) and RV fractional area change (FAC) in children with PAH to determine the time course of RV function decline and whether these measures are useful in predicting mortality or need for transplant.

Methods: Patients with idiopathic PAH or PAH associated with congenital heart disease or lung disease and at least 1 year of follow-up were reviewed for inclusion. TAPSE and FAC were measured at annual intervals in groups with and without the primary outcome of death/transplant. Kaplan-Meier analysis compared time to death based on echo measures of RV function.

Results: Forty-eight patients (age 5 months – 18 years) with PAH and median follow-up of 4 years (range 1–16 years) were analyzed. Eight patients (17%) died or were transplanted. At diagnosis, TAPSE and FAC did not differ between the groups. TAPSE z-score, more than FAC, worsened in early follow-up in patients with poor outcomes compared to transplant free survivors (Figure 1A). TAPSE z-score < -4 at 1 year was predictive of death or transplant (Figure 1B).

Conclusions: Although similar at presentation, TAPSE worsens over time in patients with PAH and poor outcomes much more rapidly than in survivors. A worsening TAPSE over time seems to predict death or transplant and may therefore be useful for serial evaluation in children with PAH.

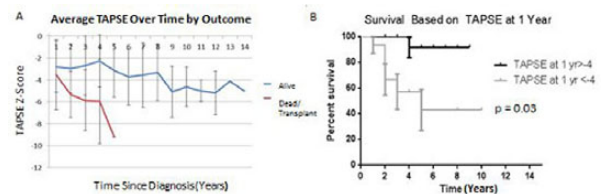


Figure 1: (A) Rapid decline in TAPSE following diagnosis of PAH in patients with poor outcomes compared to transplant free survivors (B) Kaplan-Meier curve showing time to death in patients based on TAPSE z-score at 1 year of follow-up

Abstract P174 Figure. TAPSE and Survival in Pediatric PAH

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The prognostic role of right ventricular function in patients with newly diagnosed heart failure

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Background: Right ventricular systolic function has been recognized as a prognostic factor in end-stage heart failure patients. We sought to determine the effect of right ventricular systolic dysfunction, on the prognosis in newly diagnosed systolic heart failure patients.

Methods and Results: 180 consecutive patients with newly diagnosed systolic heart failure (ischemic or dilated cardiomyopathy) were enrolled. Echocardiographic evaluation was performed for assessment of biventricular function. Pulse-wave tissue Doppler imaging readings were obtained from the lateral tricuspid annulus and peak systolic annular velocity (Stv) was recorded. Patients were followed-up for a two-year period and events (death or heart failure hospitalization) were recorded. During the follow-up, 79 patients (44%) had an adverse event. An inverse relationship was observed between the height of Stv and the probability of an event (OR=0.716, 95%CI 0.583-0.880, P=0.001), after controlling for potential confounders. Furthermore, creatinine clearance was inversely associated with the outcome; 1-unit increase in creatinine clearance rate was

associated with 0.98-times lower likelihood of having an event. When the analysis was stratified by CrCl <60 ml/min or \geq 60ml/min, Stv predicted adverse events in both groups (CrCl <60 ml/min: OR=0.62, 95%CI: 0.39-0.98, P=0.04, CrCl \geq 60ml/min: OR=0.78, 95%CI: 0.61-1.01, P=0.06).

Conclusions: Pulse-wave TDI readings of peak systolic velocity at the lateral tricuspid annulus, reflecting right ventricular systolic function, bear prognostic significance in newly-diagnosed systolic heart failure patients.

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Assessment of Right Ventricular radial deformation by 2D speckle imaging in patients with pulmonary arterial hypertension

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Purpose: The RV wall is mainly composed of superficial oblique and deep longitudinal muscle layers.

Most of the echocardiographic parameters of right ventricular (RV) function take into account only its longitudinal component and not its radial / circumferential one which is responsible for the inward movement of the free wall and contributes to RV ejection.

Methods: In order to assess RV radial strain (RS), specific 2D short axis views centered on the RV at the reference level of LV papillary muscles were acquired (GE Vivid 9) between 30 normal patients (NI group, 55.4 \pm 12.2 yrs) and 30 stable patients with group 1 pulmonary arterial hypertension (PAH group, 59.7 \pm 15.1 yrs, ns for age, mean systolic pulmonary artery pressure 62 \pm 18 mm Hg). Mean RV RS values were averaged for the 2 septal segments, the 2 anterior segments and the 2 inferior segments. Furthermore, RV longitudinal strain (LS) was measured from 4C lateral (lat) wall and 2C inferior (inf) wall and classical parameters of RV function were measured.

Results: RV short axis strain measurements were easy to perform with poorer quality of tracking in the inferolateral RV segment. Parameters of RV function were altered in PAH pts as compared to NI pts (TAPSE 17 \pm 9 vs 20 \pm 9 mm, ns; tricuspid lateral S wave velocity 12.6 \pm 2.1 vs 15.1 \pm 2.6 cm/s, p<0.001; RVLS lat -20.9 \pm 7.7 vs -29.9 \pm 6.9%, p<0.001; RVLS inf -18.9 \pm 6.6 vs -25.9 \pm 6.4%, p<0.001; RV fractional area change (RVAFC) 0.34 \pm 0.10 vs 0.44 \pm 0.13%, p=0.002). Global RVRS was significantly lower in PAH pts than in NI pts (20.3 \pm 13.4 vs 26.7 \pm 10.7%, p<0.05) but mostly because of significant decrease in the septal segments (18.5 \pm 11.9 vs 25.3 \pm 10.1%, p=0.02), with moderate and non-significant decrease of radial strain in anterior (21.1 \pm 14.7 vs 27.3 \pm 11.6%, p=0.07) and inferior (21.3 \pm 15.4 vs 27.3 \pm 12.0%, p=0.10) segments. Global RVRS was modestly correlated to RVFAC (r=0.33, p=0.01), S velocity (R=0.32, p=0.01) and SPAP (r=0.36, p=0.01)

Conclusion: Global RV radial deformation is moderately altered in patients with PAH as compared to NI patients. This finding suggests a relative preservation of RV radial function despite a severe alteration of longitudinal function in the presence of elevated afterload which could contribute to the maintenance of cardiac output in the early stages of evolution of PAH. Ventricular interdependence and septal shift towards LV probably explain the more marked alteration of radial strain in the septum than in the RV free walls.