Session 2 – Thoracic Aorta, Congenital Heart Diseases, Right Heart

Thursday May 28 – 10.00 – 11.00

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3D transthoracic echocardiography to assess ventricular septal defect anatomy and severity

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Objectives Our aim was to compare ventricular septal defect (VSD) size and morphology obtained by 2D-TTE with these obtained by three-dimensional transthoracic echocardiography (3D-TTE), and correlate morphological parameters with shunt severity.

Background VSD is assessed classically by bi-dimensional transthoracic echocardiography (2D-TTE) which seems underestimate the defect dimensions.

Methods 48 patients with muscular (22.9%) and membranous (77.1%) VSDs were included. Patients were classified according to shunt severity. Type 1 minor shunt, 2a moderate shunt, and 2b severe shunt. Minimal (min-2D) and maximal (max-2D) diameters were assessed using 2D-TTE. A 3D-TTE full volume dataset was acquired using matrix probes. Minimal (min-3D), maximal (max-3D) diameters, systolic (sVSDA) and diastolic (dVSDA) areas of the VSD were obtained. VSD asymmetry was expressed by max/min diameters ratio.

Results Median age was 21.4±29.3 month-old. There were 20 VSDs with minor shunt, 18 with moderate shunt, and 10 with severe shunt. Max-3D was higher than Max-2D diameter (11.3±3.3 vs. 7.3±2.4). The deference was less between min-3D and min-2D diameters (5.6±2.2 vs. 5.1±2 respectively). VSD were asymmetric with a mean asymmetry ratio of 2.3±1.4 by 3D-TTE. Asymmetry ratio was higher in muscular VSD than in membranous one by 3D-TTE. Mean systolo-diastolic VSD area variation was 32%. It was significantly higher in muscular than in membranous VSD (Median 54% versus 27%). VSD severity was not correlated with maximal diameter, but with minimal diameter. Better correlation was found using the defect area (sVSDA/BSA ratio, sVSDA/AVA ratio; r=0.60, p=0.0008; r=0.63, p=0.0002). Shunt severity was inversely correlated with the asymmetry ratio. The best parameter to predict the shunt severity was sVSDA/AVA ratio.

Conclusions 3D TTE allows a precise morphological and a quantitative assessment of VSD. sVSDA/AVA ratio is an accurate diagnostic tool to predict the shunt severity.

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Preoperative right dysfunction is a strong predictor of 3 years mortality after cardiac surgery

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Background Prognostic value of right ventricular (RV) systolic function is well established in cardiomyopathy or valvular disease, but few data are available in patients undergoing cardiac surgery and the predictive value of RV function before cardiac surgery in predicting mortality is not well established.

The aim of the present study was to evaluate the prognostic value of preoperative RV dysfunction carefully evaluated using a large set of echocardiographic parameters (S', RV fractional area change (RVFAC), right myocardial performance index (RMPI), isovolumic acceleration (IVA), RV dP/dt and 2D peak longitudinal strain) in a large population of unselected patient awaiting cardiac surgery.

Methods We prospectively studied 396 consecutive patients referred for cardiac surgery, in a single surgical center. Echocardiography was performed ≤24 hours before surgery and recalling assessed the survival status at 3-years after surgery.

Results Based on S'<10cm/s and/or RVFAC<35%, 93 patients had a preoperative RV dysfunction. At 3-years mortality was 42/396.

The univariate Cox analysis identified all RV function parameters excepted 2D strain as predictive factors of survival, with the strongest value for RVFAC<35% (HR 4.8), S'<10cm/s (HR 3.8) and IVA<1,8m/s2 (HR 3.2) (all p<0.0001).

In multivariate analysis, RVFAC, S', dP/dt and IVA were significantly associated to the 3-years survival: this result was found in the total population, as well as in all the quartile of population when stratified according to the Euroscore.

S'<10cm/s + RVFAC<35% + IVA<1,8m/s2 best predicted mortality at 3 years (HR 17).

Conclusions The presence of RV dysfunction before cardiac surgery estimated by echo is associated with a rise of postoperative mortality, and this is true whatever the Euroscore level. This result demonstrates the need of adding echographic RV function assessment using a multiparametric approach before cardiac surgery.

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Echocardiography as reproducible and relevant tool in PAH? Intermediate results of the multicentric EFORT echocardiographic substudy (Evaluation of prognostic factors and therapeutic targets in PAH)

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Background Right ventricular (RV) function is an important determinant of outcome in patients with pulmonary arterial hypertension (PAH). However contribution of echocardiography in predicting prognosis is poorly defined.

Purpose Aims of the study were to (1) describe main echocardiographic findings in an incident PAH population at baseline (2) analyze changes after a similar period of treatment and (3) determine parameters reproducibility in an independent echocardiography core laboratory.

Methods Incident idiopathic, familiar or anorectics PAH patients were included in the multicentric EFORT study. All patients were assessed conventionally and received specific therapy. A complete echocardiographic exam including RV longitudinal systolic strain (LSS) was performed at baseline and at four months. A systematic second reading was conducted blind for each exam in the Marseille La Timone echocardiography core laboratory. Inter and intra observer reproducibility was evaluated (intraclass correlation).

Results 49 patients were included in the echocardiographic substudy. At baseline estimated right atrial pressure (RAP) was 9 mmHg (8-11), systolic pulmonary artery pressure (sPAP) 76 mmHg (70-81), diastolic eccentricity index (EI) 1.44 (1.29-1.59), cardiac output (CO) 4,5l/mn (4.03-4.98), right atrial area (RAA) at 23 cm² (21-25), right ventricular fractional area shortening (RVFAS) 27% (25-30), tricuspide plane annular systolic excursion (TAPSE) 18,3mm (16.8-19.9), S tricuspid velocity (Stric) 11,1cm/s (10.0-12.2) and RV global LSS –13.5% (–15.3 – –11.7). Revaluation at 3 months (n=29) showed significant differences for the following parameters: RAP (p=0.006), sPAP (p 0.001), EI (p=0.03), CO (p=0.021), TAPSE (p=0.002), Stric (p=0.015) and RV global LSS (p=0.017); all towards improving. The more reproducible parameters were RV global LSS (0.861), TAPSE (0.851), Stric (0.839), RAA (0.82) and sPAP (0.79) (inter-observer inter-center analysis). Results were the same or better for inter or intra observer reproducibility within the core laboratory.

Conclusion Intermediate results of the EFORT substudy support that echocardiography is a simple, reproducible tool able to measure significant changes in follow up of PAH patients receiving specific therapy.