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Non invasive evaluation of pulmonary vascular resistances by echocardiography doppler

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Introduction Invasive haemodynamic procedures are still necessary to appreciate pulmonary hypertension (PH) characteristics. A few studies have addressed the issue of echocardiographic evaluation, but lack an external validation of their results in different settings and patients. The aim of our study was to appreciate the value of 2 published echocardiographic evaluations of pulmonary vascular resistances (PVR) based on tricuspid regurgitation maximal velocity (TRV) and right ventricular outflow tract systolic time velocity integral (RVOTTVI).

Methods All of the patients presenting during 2013 for invasive haemodynamic evaluation with a suspected PH were prospectively included, with echocardiography being done within 24 hours of catheterization. The TRV/RVOTTVI and TRV2/RVOTTVI and echographic estimations of PVR were compared with catheter values; predictive values to detect elevated PVR were assessed. We also defined a new formula for calculating PVR using Left Ventricular Outflow Tract TVI (LVOTTVI), defined according to linear regression analysis.

Results 63 patients were included. Mean pulmonary pressure was 41 ± 11 mmHg. TRV/RVOTTVI and TRV2/RVOTTVI were correlated with PVR ($r=0.62$ and $r=0.71$ respectively, $p<0.01$). Using TRV2/RVOTTVI, a cutpoint value of 0.99 had a specificity of 79% and a sensitivity of 84% to predict PVR over 6UW. Estimation of PVR with the previously published formula $5,19 \text{ TRV2/RVOTTVI} - 0,4$ was 88% correct to predict an PVR over 3UW and 91% correct to predict an PVR under 6UW. In the subgroup of pulmonary origin PH, we found an excellent correlation with TRV/RVOTTVI ($r=0,73$), TRV2/RVOTTVI ($r=0,78$) and especially TRV2/LVOTTVI ($r=0.79$).

Conclusion Our results are in accordance with published results and assess the interest of echocardiographic measurements of TRV2/RVOTTVI to evaluate PVR in a routine fashion for a non-selected population with PH. TRV2/LVOTTVI is an interesting alternative in case of PH with pulmonary etiology.

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Right ventricular systolic strain evolution during peri-operative management of congenital heart diseases

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Right ventricular (RV) function is a prognostic determinant of cardiovascular pathologies in children. RV systolic strain evolution during peri-operative management of congenital heart diseases is unknown.

Methods In this prospective, mono-center study, RV peak systolic strain (PSS) was measured using 2D speckle tracking echocardiography in children undergoing surgery of a CHD (Qlab10.0, Philips). Measures were performed the day before surgery, few hours after the surgery and before discharge and compared to conventional echocardiographic parameters. The relationships between the evolution of RV-PSS, peri-operative parameters and the type of CHD were assessed.

Results 39 children were consecutively included. Surgeries were mainly atrial (ASD) or ventricular (VSD) septal defect closure ($n=17$), Fallot complete repair ($n=7$), Craaford surgery ($n=6$). Median age was 17 months. Mean RV-PSS at baseline was -19.5 ± 4.8 . RV-PSS was moderately correlated with the weight ($r=-0.54$), with the heart rate ($r=0.49$), the LV Tmad ($r=-0.48$), the TAPSE ($r=-0.54$) and the tricuspid S? wave ($r=-0.44$). PSS was decreased in cyanotic CHD ($p<0.05$) and in children with congestive symptoms ($p=0.01$) and increased in ASD ($p=0.02$). RV-PSS decreased after surgery ($p<0.0001$). Mean difference between pre – and post-operative RV-PSS was 7.5 ± 4.4 . The difference was correlated with initial RV-PSS ($r=-0.8$), the weight ($r=0.54$), the ultra-filtration rate ($r=0.43$) but not with the duration of extracorporeal circulation, the troponin peak level nor the lactates peak level. A higher difference was associated with a shorter duration of ventilation ($p=0.04$) and a shorter stay in intensive care unit ($P=0.03$). RV-PSS was better at discharge ($p=0.0009$) but remained lesser than at the initial exam ($p<0.0001$).

Conclusion RV-PSS decrease after surgery of CHD. This decrease seems mainly related to loading condition rather than to RV contractility given its relationship with a faster post-operative evolution.