Feasibility and reproducibility of peak left ventricular twist in children with and without heart disease

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Objectives. — New parameters of systolic left ventricular (LV) function using speckle tracking echocardiography (STE) are available. Little is known about the accuracy of these parameters in children. The aim of this study was to define the feasibility (F) and reproducibility (R) of systolic peak left ventricular twist (pLVT) in healthy children (HC) and in children with heart disease (HD). We also aimed to assess the correlations between left ventricular twist pLVT and usual SLVF parameters.

Methods. — We included in this prospective study 22 children with HD (13 boys, mean age 104 months) and 22 HC (12 boys, mean age 116 months). pLVT (difference between maximal apical rotation and maximal basal rotation on para-sternal views) was measured offline workstation (Qlab® 9, Philips). F were compared within the two groups.

Results. — pLVT F was 77% (C195% 59.4—94.6%) in patients and 64% (C195% 43.9—84.1%) in HC. F of pLVT was not significantly different between children with or without cardiopathy. Intraobserver variability (V) of pLVT was 43% in patients and 41% in HC. Interobserver V of pLVT was 39% in patients and 36% in HC. pLVT was correlated to body surface area (r = 0.631, P = 0.0229). Indexed pLVT was significantly correlated to Simpson’s LV ejection fraction (r = 0.678, P = 0.0146) and conversely correlated with indexed end-systolic LV volume (r = −0.604, P = 0.0293) in HC unlike non-indexed pLVT. pLVT V were not correlated to mitral annular mean maximal tissular Doppler imaging velocity.

Conclusion. — Despite a promising concept to assess systolic LV function, F of pLVT is currently low in child with HD and also in HC. Intra and inter observer V are high. The high heart rate V and the difficulty to acquire echo loops without any movement in children may be the limiting factors. Therefore, it seems too early to extend the use of these parameters in clinical practice. The improvement of STE and a thorough formation of operators are probably necessary before using this new promising parameter in clinical practice.

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TAPSE is correlated with right ventricle ejection fraction in children with native congenital heart disease but not after cardiac surgery

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Background and aim. — In congenital heart disease, assessment of right ventricular (RV) function is determinant for patient’s follow-up and therapeutic strategy. However, only few data of RV systolic function parameters measured by echocardiography in children are available, and their usual change in different types of RV loading condition. We investigated the feasibility, reproducibility and correlation to 3D RV ejection fraction (RVEF) of each parameter of RV systolic function in children with congenital heart defect affecting the right ventricle.

Methods and results. — We performed echocardiography in 143 consecutive children aged 0 to 18 years with different pathological RV loading condition. We classified them in three groups: dominant volume overload, dominant barometric overload, and mixed overload. We measured RV systolic function parameters described in the pediatric and adult literature: tricuspid annulus posterior systolic excursion (TAPSE), tricuspid annulus maximal systolic velocity in Doppler tissue imaging (Sa), fractional area change (FAC), 2D RVEF, 3D RVEF, isovolumic acceleration (IVA) and Tei index. 3D RVEF was measured using a new system of 2D echography with knowledge-based 3D reconstruction allowing to reconstruct volumes from sections of right ventricle with standard sonograph (Ventricpoint, USA). This system has been already validated by MRI volumes measurements.

We found that TAPSE was the most feasible (n = 137/143; 97.08%), reproducible (ICC = 0.986; P < 0.001) (coefficient of variation = 2.1%) parameter and was significantly correlated to 2D RVEF (r = 0.301; P = 0.0014) and 3D RVEF (r = 0.337; P = 0.0014). Z-score TAPSE age-adjusted is significantly different in each type of loading condition (pressure/volume P = 0.0089; mixed/pressure P = 0.365; mixed/volume P = 0.0004). Mixed overload had the worse TAPSE Z-score value (−5) and volume overload had the best TAPSE Z-score value (−1.5). TAPSE is not correlated to RVEF in patients who had previous cardiac surgery with pericardotomy (P = 0.78).

Conclusion. — We recommend using TAPSE Z-score to assess RV function in children with native CHD. TAPSE cannot be used to assess RV function in children after cardiac surgery with pericardotomy.

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