Effect of biventricular pacing in young patients evaluated by Three-Dimensional Echocardiography

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Introduction: The aim of this study is to evaluate long-term results of Cardiac resynchronization therapy (CRT) in a pediatric and CHD (Congenital Heart Defect) population and utility of 3-D echocardiography (3DE) to optimize VV interval.

Methods: We retrospectively analyzed patients who underwent CRT between 2006 and 2012 in our institution. For individualized VV interval optimization 3DE full-volume datasets of the left ventricle were obtained and analyzed to derive a systolic dyssynchrony index (SDI). Response to CRT was predefined as a minimum 5% proportional increase in EF over baseline measurements. We performed a multiparametric echocardiographic assessment of LV dyssynchrony using standardized parameters: IVMD, M-mode Pitzalis index, Morphology of the pulsed Doppler mitral valve. Routine baseline 2DE and 3DE, were performed in all patient according to institutional guidelines. 3DE guided optimization of the CRT device was performed the day after implantation. The device was programmed for the VV interval with the lowest SDI. Follow-up was at 1 month, 3 months and 6 months.

Results: Twenty patients (12M- 8F), age at implantation 14 years (5 - 31 years), have been followed-up for 3.4 years (1.2 - 8.1 years). All patients had advanced or complete AV block (CAVB). Thirteen patients (65%) showed severe systolic LV dysfunction (LVD) without CHD and 7 patients (35%) with CHD and LVD. Individualized optimization significantly reduced SDI from 12.3% to 5.3%. Four patients (20%) with CHD and LVD were non-responders. Among the 16 responders (80%), 12 patients had CCAVB and previous RV pacing (67%), 3 had complex CHD and LVD and the last s/p ablate and pace. Partial results after 1 month: SDI significantly reduced in 4 patients (25%) and EF in 2 patients (12.5%). Partial results after 3 months: SDI significantly reduced in 7 patients (44%) and EF 3 patients (19%). Partial results after 6 month: SDI significantly reduced in 12 patients (75%) and EF 10 patients (62.5%).

Conclusions: CRT could improve the LV function in young patients with heart failure and SDI quantification could predict of LVEF after CRT. We can use in both acute and late phase to optimize the VV delay.