The journey of cardiac resynchronization therapy in congenital heart disease: From immediate hemodynamic improvement to long-term benefit

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Cardiac resynchronization therapy (CRT) is an established treatment option for adult patients suffering from heart failure due to idiopathic or ischemic cardiomyopathy associated with electromechanical dyssynchrony. A limited evidence exists suggests efficacy of CRT in patients with congenital heart disease (CHD). Such evidence has been initially derived from the use of temporary CRT to improve cardiac output during early postoperative course through both atrio-ventricular and intra/inter-ventricular resynchronization using temporary pacing wires. It was evident that the heterogeneity of structural and functional substrates for electromechanical dyssynchrony requires an individualized approach for both acute and permanent CRT application. Specific implantation techniques using transvenous, thoracotomy or hybrid approaches have evolved. Efficacy of CRT in CHD seems to depend on the anatomy of the systemic ventricle with best results achieved in systemic left ventricular patients upgraded to CRT from conventional pacing. Indications for CRT in patients with CHD have been recently reviewed in several consensus statements. They include patients with systemic left, right and single ventricular failure associated with electromechanical dyssynchrony caused by bundle branch block or conventional ventricular pacing. Due to lack of randomized prospective studies the recommendations are based mostly on C level of evidence. Recent data also suggest potential utility of CRT in the treatment of pulmonary right ventricular dysfunction. Such indication may be applicable to selected patients with post-repair tetralogy of Fallot and similar lesions bearing right bundle branch block and not responding to pulmonary re-valvulation. Despite many differences CRT in CHD seems to offer a similar benefit as to adult patients with idiopathic or ischemic cardiomyopathy and should be considered whenever electromechanical dyssynchrony is encountered along with ventricular dysfunction and failure. Also, every heart transplantation candidate should be specifically assessed regarding the potential for CRT.