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Editorial

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Cardiac Resynchronization Therapy in Pediatric Patients and Congenital Heart Disease: What Issues Remain to Solve?

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▸ See the article "Late Outcomes of Pediatric and Congenital Heart Disease Patients Following Cardiac Resynchronization Therapy" in volume 52 on page 865.

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Cardiac resynchronization therapy (CRT) is currently accepted as a good option for patients with heart failure associated with left ventricular (LV) dysfunction and intraventricular conduction delay. Based on the large data of adult patients with heart failure, CRT is now being applied to pediatric patients whose etiology of heart failure is various. However, CRT in pediatric patients with or without congenital heart disease (CHD) has to solve several issues.

Advancement of surgical outcome in CHDs has led us to new field such as complex CHD in very small children and adult CHD in Korea.[1] With improving survival of patients with complex CHD, proportion of heart failure is dominating as a critical complication of extended life expectancy.[2] Therefore, CRT is also considered as one of the important treatment options for CHD with heart failure.

Ahn et al.[3] reported that CRT has resulted in positive outcomes in 75% of the total patients with the improvement of systemic ventricle function or New York Heart Association (NYHA) functional class based on pediatric patients and CHD in a single-center experience. Because of the limitations of its retrospective design and the small number of patients in this study, interpretation of the results and risk factor analysis may be inconclusive. But this study showed promising outcome even in those pediatric heart failure with heterogenous etiology. Therefore, pediatric cardiologist could be encouraged to accept CRT for heart failure in small children and complex CHD.

Even though outcome of CRT in congenital heart diseases are still debatable, CRT is a good treatment option for CHD with heart failure related to ventricle dyssynchrony.[4]

What is known or not for CRT in pediatrics and CHD?

First, optimal timing of CRT implantation is not established in children by large scale randomized studies but by extrapolation from the adult data. Basic requirements for CRT implantation criteria include QRS duration, left ventricular ejection fraction (LVEF), and clinical symptoms. In children, QRS duration is usually not so wide even in severe heart failure with large ventricle dimension. QRS morphology is also different from common adult left bundle-branch block type which is one of the important predictor of responder.[5] But

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Data Sharing Statement
The data generated in this study are available from the corresponding author upon reasonable request.

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right bundle-branch block morphology is more common in CHD with heart failure which may be related to surgical injury or underlying heart defect. This study showed excellent outcome of CRT upgrade in children with congenital heart block who were managed with long term right ventricular (RV) pacing. Chronic RV pacing could result in systemic ventricle dysfunction related to dyssynchrony. Pacing lead position at LV pacing could be a possible protective option in epicardial pacing children. This study implies reversibility of this type of dyssynchrony related heart failure.

Second, location of pacing site is another important issue in children and CHD considering growth and heterogenous conduction problem. CRT in small children has a limitation of pacing site selection which may cause progressive change of geometrical pacing site due to the heart size growth. CHD has various complex congenital heart malformation accompanied by conduction system problem. So careful evaluation for conduction system and dyssynchrony in complex CHD should be done before CRT implantation. Miyazaki et al.[6] showed the importance of understanding of various dyssynchrony pattern in complex CHD showing 88% of good response rate to the CRT with a new ventricular morphology-based strategy for CHD.

Third, CRT criteria in CHD cannot be simply applied according to the criteria of adult heart failure with anatomically normal heart because complex congenital heart disease have heterogenous morphology of systemic ventricle. So, it should be taken into account to decide the optimal timing and type of CRT not only based on QRS duration, morphology, LVEF and symptoms. In single ventricle physiology or RV failure, all parameters (clinical symptoms, systemic ventricle function, QRS duration) may progress very insidiously.

Therefore, more aggressive but meticulous approach for CRT is needed in small children with complex congenital heart disease such as single ventricle physiology.

We need more data for establishing the guideline of CRT for children and complex congenital heart disease.

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