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Mechanical Synchrony And Contraction Efficiency In Left Ventricular Apical Pacing In Children: Comparison To Normal Controls

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Introduction: Left ventricular apical pacing (LVAP) has been reported to preserve LV function in chronically paced children with complete atrio-ventricular block (CAVB). We sought to evaluate the long-term effect of LVAP on LV mechanics as compared normal controls.

Methods: 36 paediatric patients with CAVB and LVAP in absence (N=22, group A) or presence of repaired structural heart disease (N=14, group B, systemic LV in all) and 25 age-matched normal controls (group C) were retrospectively studied. Echocardiography was performed after a median of 2.9 (IQR 1.9-6.2) years of pacing. LV function and synchrony were evaluated by M-mode, 2D echocardiography and speckle tracking analysis in standard apical 4-chamber (4CH), 2-chamber (2CH) and parasternal short axis (at the level of mitral valve) views. Data were analyzed using the ECHOPAC and MATLAB software.

Results: See table for LV function and mechanical dyssynchrony data. LV contraction inefficiency measured by systolic stretch fraction (proportion of myocardial stretch and shortening during systole) was higher in groups A and B than C in both the 4CH and 2CH views ($p<0.001$ and $=0.035$, resp.) and correlated significantly with the apical to basal mechanical delay ($p=0.001$ for both). There was no correlation between any of the dyssynchrony parameters and LVEF.

Group	LVEF [%]	GLS [%]	SPWMD [ms]	Apical to basal delay [ms]	Septal to lateral delay [ms]	Antero-septal to posterior delay [ms]	Anterior to inferior delay [ms]
A	68(63-70)	-20.4(3.1)	13(28)	67(18-87)	-1(-10-6)	1(-7-13)	0(-5-6)
B	61(56-69)	-20.1(2.7)	13(25)	82(43-128)	0(-3-12)	7(-8-15)	6(-8-35)
C	60(56-61)	-21.0(2.4)	47(22)	19(2-39)	3(-1-12)	4(-1-24)	13(1-24)
p	=0.004	=0.723	<0.001	<0.001	=0.419	=0.692	=0.044

Median (IQR) or mean (SD). GLS=global longitudinal strain. LVEF=left ventricular ejection fraction. SPWMD=septal to posterior wall motion delay.

Conclusions: LVAP maintains mechanical synchrony between LV septum and free wall at the price of a significant apical to basal mechanical delay associated with LV contraction inefficiency as compared to healthy controls. Global LV systolic function is, however, not negatively affected. Results are similar in both presence and absence of structural heart disease.