

Echocardiographic effects of pulmonary right ventricular resynchronization in congenital heart disease

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Introduction: Right ventricular (RV) electromechanical dyssynchrony may contribute to long-term pulmonary RV dysfunction in patients after surgery for congenital heart disease. We sought to evaluate immediate changes in RV mechanics after RV resynchronization (RVCRT).

Methods: 22 consecutive patients aged median 11.7 years with tetralogy of Fallot (N=14), pulmonary atresia (N=6), double outlet RV (N=1) and arterial trunc (N=1), resp., were echocardiographically studied following surgical RV revalvulation. RV-CRT was applied in the presence of complete right bundle branch block (RBBB) by atrial-triggered RV free wall pacing in complete fusion with spontaneous activation using temporary postoperative pacing wires.

Results: RV-CRT carried significant decrease in QRS duration ($P<0.001$) along with elimination of the RBBB pattern, increase in RV filling time ($P=0.009$), pulmonary artery velocity time integral ($P=0.015$) and RV max. $+dP/dt$ as estimated from the tricuspid regurgitation jet ($P=0.011$). RV mechanical synchrony improved: Septal to lateral RV mechanical delay decreased from median 65 to 28 ms ($P<0.001$). RV internal stretch fraction (ISF) reflecting the ratio of myocardial stretching and contraction during systole diminished from mean (SD) 0.18 (0.09) to 0.09 (0.04) ($P=0.001$, Figure). The q-RV interval at the pacing site (mean 77.1 % of baseline QRS duration) confirmed pacing from a late-activated RV area.

Conclusions: RV-CRT carried multiple positive effects on RV mechanics including improvement in filling, systolic function and mechanical synchrony and efficiency.

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