

Ventricular function is impaired shortly after corrective surgery of a congenital heart defect

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Introduction: Although survival rates are high for corrective surgery in patients with a congenital heart defect (CHD), long term studies demonstrate a varying degree of cardiac dysfunction. Thus far the time course and influencing factors of ventricular adaptation after surgery of a CHD are mostly unknown. Tissue Doppler Imaging (TDI) enables sensitive assessment of ventricular function. In this study we evaluated the adaptation of ventricular function shortly after surgical CHD correction.

Methods: We included 141 CHD patients (0-17 years) undergoing biventricular surgical correction. Left and right ventricular function was assessed using echocardiography. Systolic function was assessed using conventional echocardiographic measurements (ejection fraction (EF) and Tricuspid Annular Plane Systolic Excursion (TAPSE)) and systolic TDI (S'). Diastolic function was assessed using diastolic TDI parameters (E', A' and E/E'). Studies were performed preoperatively, one day postoperatively and at discharge (9±5days after surgery) in patients and in 41 age-matched controls.

Table 1.

TDI velocities (cm/s)	Controls	Patients at discharge	P-value
LV S'	6.5 ± 1.6	5.7 ± 2.0	0.018
E'	14.5 ± 3.8	9.8 ± 3.9	0.001
A'	5.7 ± 1.7	5.0 ± 2.2	0.078
E/E'	8.1 ± 2.7	12.2 ± 6.4	0.001
RV S'	13.1 ± 2.7	5.2 ± 1.7	0.001
E'	17.7 ± 3.7	7.3 ± 2.5	0.001
A'	10.5 ± 1.9	4.2 ± 1.9	0.001
E/E'	6.4 ± 1.7	12.5 ± 6.8	0.001

Results: In the left ventricle (LV), EF was slightly enhanced preoperatively but decreased after surgery. EF was normal in patients compared to controls at discharge (52±9% versus 51±5%; NS). LV free wall S', E' and E/E', were comparable to controls preoperatively and deteriorated one day after surgery. These parameters remained impaired at discharge (table1).

In the right ventricle (RV), TAPSE was slightly impaired preoperatively and deteriorated after surgery. At discharge TAPSE remained impaired (patients versus controls 9±3mm versus 19±4mm; p<0.001). RV basal free wall TDI S', E', A' and E/E' were comparable to controls preoperatively and deteriorated one day after surgery. At discharge these parameters remained impaired (table1). Additionally, a longer aortic cross clamp time was associated with a larger reduction in the S' and E' velocity of the LV and RV at discharge (p<0.05).

Conclusions: TAPSE and TDI measurements suggest systolic and diastolic right and left ventricular function are impaired directly after corrective surgery of a CHD and remain impaired up to discharge. Both techniques were more sensitive than other conventional parameters. A negative association was shown between several TDI velocities and aortic cross clamp time. Persistence of these changes in long term follow up has to be evaluated in future research.