Pattern of somatic growth and neurodevelopmental outcome in children with congenital heart disease undergoing cardiovascular surgery during first year of life

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Background: Children undergoing cardiovascular (CVS) surgery for congenital heart disease (CHD) are at risk for growth retardation of multifactorial etiology including failure to thrive and chronic heart failure. Standard growth charts have not yet been established for this population.

Objective: To determine pattern of growth for children with CHD and to relate it to cognitive outcome based on long-term follow up data until six years of age.

Methods: We prospectively assessed growth indices for body weight (BW), body length (BL) and head circumference (HC) of 167 children (106 male) with CHD undergoing CVS within the first year of life at time of surgery, at one, four and six years of life. Growth curves were compared with normative growth charts. Children with a genetic comorbidity were excluded. Growth was expressed as z-scores.

Results: Median gestational age at birth was 39.4 weeks (34.0-42.0) and median age at bypass surgery was 1.97 months (0.07-10.7). 111 children (66.5%) had a cyanotic CHD, including 18 with univentricular CHD. There was a large interindividual variability in growth pattern, but all growth parameters were below expected percentiles at the time of surgery, which was followed by a catchup growth of BW and BL, but not of HC until 4 years of age. Median HC remained at – 0.674 standard deviations below the expected median (25th percentile instead of 50th percentile) for both girls and boys. HC at six years of age significantly correlated with IQ at six years of age (r 0.24, p=0.01) whereas BW and BL did not. D-transposition of great arteries was associated with better growth until the age of six years (BW, p=0.003, BL, p<0.001, HC, p=0.15), whereas univentricular CHD was associated with poorer growth in BL and HC (p=0.05, resp. p=0.03). Other diagnoses of CHD, male sex, lower gestational age and higher surgical risk category were not associated with poorer growth.

Conclusions: Children with CHD undergoing CVS within the first year of life show a catchup growth of BW and BL, whereas HC remains more than half a standard deviation below normal, correlating also with intellectual performance at that age.