

Univentricular heart and body growth: are we timing the Fontan stages properly?

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Objective

The staged Fontan procedure for univentricular heart palliation is designed to gradually reduce volume overload and cyanosis during infancy and early childhood. The optimal timing of this staging and its impact on somatic growth is still a matter of debate. We explored the trends in body growth related to subsequent surgical and interventional procedures and the need for heart failure treatment.

Methods

We reviewed 64 consecutive patients that ultimately underwent a total cavopulmonary connection (TCPC) in our centre since 1992. Serial anthropometric parameters (weight, height) were recorded from birth to latest follow-up (mean patient FU 7, 8 ± 5 years) and at each intervention (neonatal surgery, bidirectional cavopulmonary anastomosis (BCPA), TCPC, catheter treatment), and converted to z-scores. The influence of oxygen saturation, heart failure treatment and interval between surgeries on body growth were determined.

Results

Median age at BCPA and TCPC was 0.9 (0.4-6.4) and 3.2 (2.2-18.3) years, 8 patients underwent unstaged TCPC after previous neonatal surgery. Median z-scores for weight changed significantly after each surgical stage (-0.4 at birth, -0.8 at neonatal surgery, -2.2 at BCPA, -1.1 at TCPC, and -0.6 at latest FU; $p < 0.05$ for change between surgeries), with the largest decline awaiting BCPA, and the most marked improvement before and moderate increase after TCPC. Z-scores for height showed the same pattern up to the TCPC stage (median 0 at birth, -0.4 at neonatal surgery, -1.5 before BCPA, -0.6 at TCPC; $p < 0.05$ for each interval), but did not any more improve after TCPC (median -0.5 at latest FU). Somatic growth at latest FU was negatively influenced by the use of heart failure treatment ($p < 0.05$), but not by age at TCPC, ventricular morphology or cyanosis.

Conclusion

Body growth is decreased in all patients with univentricular heart palliated with a Fontan circulation. The severe growth impairment occurring before BCPA would suggest advancing this stage where possible, allowing an earlier start of catch-up growth before TCPC. Insidious heart failure after Fontan completion should be treated promptly, in view of its negative impact on somatic growth.