

Smaller brain volumes at two years of age in patients with hypoplastic left heart syndrome - Impact of surgical approach

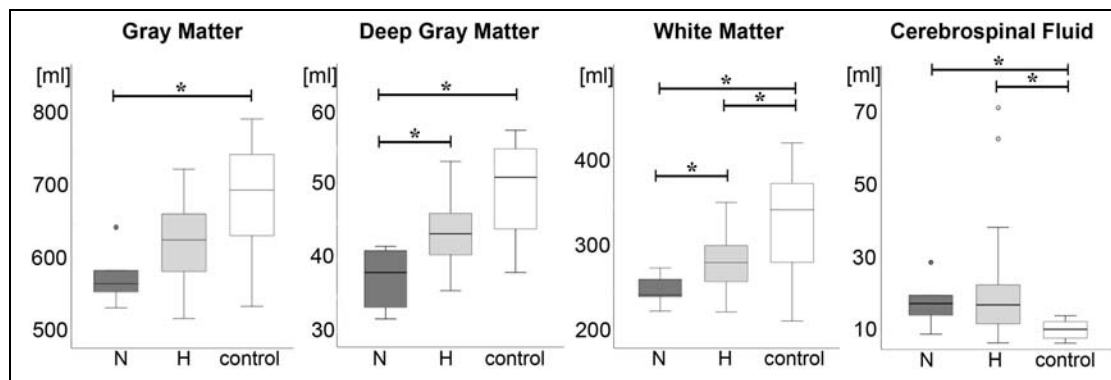
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Background: Brain growth in hypoplastic left heart syndrome (HLHS) might be reduced before and after birth. Little is known about further brain growth until two years of age before Fontan procedure and the potential impact of type of surgery.

Methods: In a prospective, two-center study 29 patients with HLHS and variants were treated by Norwood (n=5) or Hybrid procedure (n=24). At two years of age a cerebral MRI was performed and brain volumes (gray, deep gray, white matter) and cerebrospinal fluid were calculated using FreeSurfer image analysis suite and compared to a healthy control group (n=8).

Results: The total brain volumes in patients with HLHS were smaller compared to controls (HLHS: 893 ± 76 mL vs. controls: 1015 ± 148 mL, p=0.005). This difference was found in all three analyzed brain compartments after Norwood procedure, whereas patients after Hybrid procedure had comparable gray and deep gray volumes compared to controls. The reduction of brain matter was more pronounced for deep gray matter (Norwood: 38.4 ± 4.1 ml vs. Hybrid: 44.4 ± 3.9 ml, p=0.005), and white matter (Norwood: 255 ± 19 ml vs. Hybrid: 285 ± 31 ml, p=0.032) for Norwood patients compared to Hybrid.



Conclusions: Smaller total and regional brain volumes were found two years after stage I/II Norwood or Hybrid procedure in children with HLHS. The brain volume reduction was more distinct after Norwood than after Hybrid procedure. Longitudinal studies are needed to identify impact of early staged-surgeries on brain development and may become part of the decision making process in individual patients.