Cardiac magnetic resonance assessment of right ventricular performance after stage 2 palliation for hypoplastic left heart syndrome: a dual center study comparing the Norwood and Hybrid approach


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Objectives: Stage 1 palliation of hypoplastic left heart syndrome (HLHS) can be achieved either by the Norwood (NW) procedure or the Hybrid (HY) approach. These procedures result in different hemodynamic profiles that may have an impact on ventricular performance in the long term. Accordingly, the aim of this study was to compare CMR data of HLHS patients after stage 2 who underwent either a NW or the HY strategy in two European centres.

Methods: HLHS patients after stage 2 palliation who underwent an initial classic NW operation using a BT shunt (n=38, mean age 2.4 ± 0.7 years) or the HY approach consisting of bilateral pulmonary artery banding and arterial duct stenting (n=38, mean age 2.1 ± 1.0 years, p=0.12) were included. The CMR protocol consisted of cine assessment of right ventricular (RV) size and function. Feature tracking analysis was performed to quantify RV strain and intraventricular synchrony parameters.

Results: NW patients had significantly larger RV enddiastolic volumes (91 ± 24 vs 84 ± 33 ml/m2; p=0.03) and higher indexed stroke volumes (53 ± 12 vs 47 ± 12 ml/m2, p=0.01) compared to the HY group whereas global pump function (ejection fraction 59 ± 10 vs 58 ± 9 %; p=0.71) and cardiac output (4.8 ± 1.2 vs 4.9 ± 1.2 l/min/m2, p=0.27) did not differ between the two groups. In the HY group RV circumferential (-15.1 ± 6.2 vs -18.4 ± 5.8 %, p=0.01) and radial strain (13.1 ± 7.8 vs 21.1 ± 9.7 %, p=0.001) was lower and intraventricular dysynchrony significantly increased (88 ± 48 vs 51 ± 24 ms, p<0.001 and 97 ± 59 vs 59 ± 49 ms, p<0.001). No difference was found in longitudinal strain (-14.3 ± 5.4 vs -16.5 ± 5.7 %, p=0.08) and dysynchrony (85.4 ± 31.9 vs 81.6 ± 38.1 ms, p=0.78).

Conclusions: The initial palliative strategy in HLHS patients has significant effects on ventricular size and performance at mid-term follow-up. Future studies comparing the two approaches are necessary to assess whether the observed differences determine functional outcome in the long-term.