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Decreased global myocardial function in infants with hypoplastic left heart syndrome (HLHS) is associated with missed intrauterine diagnosis, longer operative times and lower postoperative systemic blood pressure values

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Introduction: Continuous improvements in surgical and perioperative care have led to increasing survival of infants with HLHS. However, the morbidity rates and hospitalisation times remain high especially when associated with poor cardiac function. We evaluated in uni-/multivariate analysis the clinical and operative factors (eg. type of shunt) association with detailed global functional analysis in HLHS infants before and after the Norwood procedure.

Methods: We retrospectively reviewed population based cohort of 55 HLHS infants who underwent the Norwood procedure between January 2003 and March 2010 in our institute. Global right ventricular fractional area change, ejection fraction, myocardial velocity and strain rate were analysed from apical 4-chamber view using Velocity-Vector- Imagining technique (Syngo USWP 3.0, Siemens) both before and after the procedure. Postoperative functional analysis was recorded during the pre-Glenn catheterisation. Intra- and interobserver correlations as well as the correlations between cardiac functional methods were good ($R>0.7$, $p<0.05$, respectively).

Results: Intrauterine diagnosis improved all myocardial functional parameters preoperatively in multivariate analysis ($p<0.05$). Postoperatively, lower systolic and diastolic blood pressures had negative impact on global myocardial function in multivariate analysis ($p<0.05$). Interestingly, although the systolic and diastolic blood pressures were significantly lower (82.0±12.8mmHg vs 93.5±11.9mmHg, $p=0.01$; 43.1±10.6mmHg vs 53.8±8.9mmHg, $p=0,003$) in the group of patients with BT-shunt (n=22), the type of the shunt did not have independent impact on global cardiac function. This was related to the fact that the aortic cross clamping and perfusion times were in turn longer in the RV-PA shunt (n=33) group (62.4±22.9min vs 44.3±25.6min, $p=0.01$; 174.9±37.5min vs 148.2±47.3min, $p=0.03$, respectively) and associated to the decreased function in univariate analysis ($p<0.05$).

Conclusions: Intrauterine diagnosis is associated with improved global cardiac function in newborn HLHS patients. Lower systemic blood pressure, risk increased especially in the group of BT-shunt patients, is associated with decreased global cardiac function after the Norwood procedure. Similarly, longer operative times, related more commonly to complex procedure of RV-PA shunt, have negative influence on postoperative myocardial function. The long-term impact of these cardiac functional risk factors needs to be defined.