Technical aspects of hybrid procedure in hypoplastic left heart syndrome – the “true hybrid”


Divisions of (1) Pediatric Cardiology, (2) Congenital Cardiovascular Surgery, and (3) Anesthesia, University Children's Hospital Zurich, Switzerland

Objectives. Hypoplastic left heart syndrome (HLHS) may be treated by hybrid procedure combining surgical bilateral pulmonary artery banding (PAB) with interventional stenting of patent arterial duct (PDA) and balloon dilatation resp. stenting of the atrial septum defect (ASD). The aim of the study was to analyze our results of hybrid procedure performed as a one step single procedure using median sternotomy for PAB and right atrial access for PDA and ASD interventions.

Methods. We analyzed hybrid procedures for HLHS and its variants regarding feasibility, safety and immediate periprocedural outcome.

Results. Between March 2006 and February 2012 hybrid procedure was performed in 31 infants (19 male) at median (range) age of 4 days (0-17) and body weight of 3 kg (1.9-3.8) within classical HLHS (n=22) and its functional variants (n=9). After median sternotomy and surgical bilateral PAB (3.5mm, if body weight > 3.0kg, otherwise 3.0mm) we performed interventional PDA stenting resp. ASD enlargement using a right atrial (n=15) or pulmonary artery access (n=1) with surgical insertion of 5F sheath or in a separate second procedure using a femoral access (n=15). The hybrid procedure could be performed safely in all patients without mortality. Due to maximal size of PDA with 7.9 mm (4.9-9.5) and minimal part with 6.9 mm (1.9-12.0) we used median 2 (1-4) self expanding stents (sinus Repo, OptiMed, Germany) with diameters ranging between 7 and 10 mm. For ASD interventions, we either used Tyshak Balloon (NuMed, USA) with diameters between 10-12mm (n=20), or transseptal perforation via radio frequency energy (n=1). Additional interventions included balloon dilatation of coarctation of aortic arch (CoA) (n=2) via a femoral arterial access. Periprocedural complications included rhythm disorders (n=3), and dislocation of sheath (n=1).

Conclusions. The one step single procedure (“true hybrid”) with median sternotomy and right atrial access can be performed safely and offers the opportunity to treat ASD and PDA simultaneously in one session to spare infants from further procedures requiring longer hospital stay. Limitations of the “true hybrid” are restrictive ASD possibly requiring more stable catheter position, and stenotic PDA or additional interventions for CoA with a preferred retrograde approach.