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A 10-year single-centre experience in percutaneous interventions for multistage treatment of hypoplastic left heart syndrome

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Introduction: Constant progress in surgical treatment of congenital heart defects in the last decade has significantly improved the prognosis for children with hypoplastic left heart syndrome (HLHS). However, due to specific anatomy and hemodynamics, complications still pose serious challenge. Interventional procedures complement or occasionally replace surgical treatment. The purpose of this paper is to report our 10 years of experience of interventional treatment of patients with HLHS.
Methods: Between 01/2001 and 10/2010, 161 percutaneous interventions were performed in 88 patients with HLHS between different stages of surgery. Ten interventions were performed as **initial treatment** of HLHS: isolated balloon atrial septostomy (5) or hybrid procedure (5). **After stage** I operation, 38 patients underwent 47 interventions. Stenosis of the aortic arch and isthmus was treated in 20 patients, stenosis of right ventricle-to-pulmonary artery shunt in 8 and proximal stenosis of the left (4) or the right (2) pulmonary artery in 6, secondary restriction of interatrial communication in 4. **After second stage** of surgical treatment 64 patients received 85 interventions: balloon angioplasty and stent implantation of stenosed pulmonary arteries (38 patients), balloon angioplasty of stenosed bidirectional Glenn shunt (14), closure of veno-venous collaterals (9), of systemic-to-pulmonary artery shunt (2) and of Sano shunt (1). In patients **after Fontan** operation closure of extracardiac fenestration was performed in 14, widening of stenosed extracardiac tunnel in 3 and self-expandable stent implantation in a stenosed left pulmonary artery in 1. One patient, with signs of failing Fontan, required interventional widening of extracardiac fenestration.
Results: See Table. All but 2 (*) results were statistically significant.
Conclusions: Patients with HLHS require additional percutaneous interventions between different stages of surgery, with the largest number of interventions being performed in those patients after bidirectional Glenn shunt and before Fontan operation. Percutaneous interventions result in haemodynamic stability, reduction in the number of operations and significant changes in pulmonary artery pressures, vessel diameters, O2 saturation.

Stage of treatment / Indication		Before	After
Prior to surgical treatment / Restriction on IAS	Sat. O2 /%/	53% ± 9,4%	77% ± 9,3%
	Diameter of communication /mm/	1,75 ± 0,289	3,63 ± 0,479
	Pressure gradient /mmHg/	25,50 ± 5,802	9,75 ± 2,986
After I stage / Restriction on IAS	Diameter of communication /mm/	4,2 ± 1,15;	9,9 ± 3,17
	Pressure in the LA /mmHg/	19,4 ± 4,1	13,8 ± 2,4
Stenosis of Sano shunt	Sat. O2 /%/	52 ± 12	75 ± 4
	Diameter /mm/	2,28 ± 0,48;	4,14 ± 0,69
Stenosis of aortic arch/isthmus	Diameter /mm/	2,87 ± 0,82	5,15 ± 0,82
	Pressure gradient /mmHg/	29,38 ± 15,40	7,14 ± 4,28;
Stenosis of pulmonary arteries	Diameter /mm/	2,33 ± 0,51	3,58 ± 0,49
	Pressure gradient /mmHg/*	3,33 ± 1,633	2,5 ± 1,049
After II stage / Stenosis of BDG	Sat. O2 /%/	71% ± 7,2%	77% ± 4,9%
	Diameter /mm/	4,70 ± 1,38	7,32 ± 1,73
	Pressure gradient/mmHg/	3,29 ± 2,785	0,57 ± 0,646
Stenosis of pulmonary arteries	Sat. O2 /%/	75 ± 9	77 ± 6
	Diameter /mm/	3,6 ± 1,33	8,65 ± 1,62
	Mean pressure /mmHg/	17,82 ± 4,73	15,18 ± 3,18
Closure of Veno-venous collaterals	Sat. O2 /%/	74% ± 8%	79% ± 5%
	Mean pressure in VCS /mmHg/*	17,08 ± 3,87	15,92 ± 3,42
After III stage / Closure of fenestration	Sat. O2 /%/	81 ± 5	96 ± 2
	Mean pressure in tunnel /mmHg/	13,85 ± 1,91	15,62 ± 1,26