

Pulmonary artery growth in congenital heart disease with duct-dependent pulmonary circulation: role of arterial duct stenting in hypoplastic pulmonary artery tree

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Background: Arterial duct (AD) stenting is increasingly deemed a reliable alternative to surgical shunt in congenital heart disease with duct-dependent pulmonary circulation (CHD-DPC). Allowing stent to conform to pulmonary artery (PA) anatomy might promote significant and uniform growth of the pulmonary vascular tree. Aim of this study was to assess the PA growth resulting from AD stenting in CHD-DPC with very hypoplastic PAs at the time of initial palliation.

Methods: Thirty-six of the 111 neonates submitted to AD stenting as palliation of CHD-DPC at our Institution between 04/2003 and 12/2013, underwent control catheterization in view of surgical repair. Global PA growth was evaluated as Nakata Index increase, while left and right PA growth was assessed as individual z-score changes. Finally, left-to-right PA diameter ratio was considered indicative of balanced PA growth. All data were assessed both in the whole population and in two subgroups identified on the basis of the PA size at the time of duct stabilization (Group I, n=12, Nakata Index <100 mm²/m²) and (Group II, n=24, Nakata Index >100 mm²/m²).

Results: AD stenting was performed using coronary stents dilated to 3.6±1.3 mm (median 3.4). Control angiography was performed 6.2±3.4 months (median 5) after stenting, showing significant and balanced PA growth (Nakata Index increase from 148.6±76.2 to 273.0±92.4 mm²/m², +113±99%, p<0.0001; LPA z-score from -0.57±1.5 to 1.23±1.47; RPA z-score from -0.61±1.3 to 1.19±1.3, p<0.001 for both comparisons), without significant changes of the left-to-right PA diameter ratio (from 0.99±0.18 to 0.92±0.31, p=NS). The Group I showed a greater increase of both global PA growth (Nakata Index increase 194±115 vs 75±61%, p<0.001) and individual PA z-scores (LPA z-score 106±51% vs 78±51%, p=NS; RPA z-score 99±44 vs 95±57%, p<0.05) compared to the Group II. At control angiography, final PA size did not significantly differ between groups (241.6±106.5 vs 285.2±84.5 mm²/m², p=NS).

Conclusions: Percutaneous AD stenting is highly effective in promoting significant and balanced PA growth in CHD-DPC. This approach seems to be even more effective in neonates with severe PA hypoplasia at the time of duct stabilization, thereby being highly advisable in this subset of patients compared to surgical palliation.