Right ventricular outflow tract reconstruction without conduit in neonates with tetralogy of Fallot: Comparison of pulmonary stenosis vs. pulmonary atresia

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Background & Objectives

Early primary repair has been applied in tetralogy of Fallot with pulmonary atresia and well-developed native intrapericardial pulmonary arteries supplied by a ductus arteriousus (TOF/PA). In this group of neonates, a valved conduit is extensively used for the right ventricular outflow tract (RVOT) reconstruction. Its use is considered as contributing factor to lower freedom from reintervention comparing to neonatal repair of tetralogy of Fallot with pulmonary stenosis (TOF/PS). Since 1997, our institutional approach was to perform primary RVOT reconstruction in TOF/PA with avoidance of conduit placement. We sought to determine early and long-term results of this strategy for TOF/PA and compared them with results of neonatal transannular patch repair in TOF/PS.

Methods

This is a retrospective review of 21 neonates with TOF undergoing RVOT reconstruction without use of conduit at a single centre between 1997 and 2013. Nine TOF/PS and 8 TOF/PA patients underwent transannular patch repair and 4 TOF/PA neonates without continuity between main pulmonary trunk and right ventricle received direct anastomosis of RVOT to main pulmonary artery supported by pericardial patch. During the same period, in 2 neonates with TOF/PA and 1 neonate with TOF/PS the primary conduit placement was needed and 9 neonates with birth weight ≤ 2.5kg underwent shunt palliation.

Time to extubation, maximum vasoactive-inotropic score and length of hospital stay were considered early outcome variables. Need for reintervention, echocardiographic and ECG parameters of right ventricle were selected as long-term outcome variables. Reintervention was defined as catheter based or surgical, with the intervention target being the RVOT and/or central pulmonary arteries.

Exclusion criteria

-TOF with absent pulmonary valve, AVSDC, DORV
- presence of significant aorto-pulmonary collaterals
- age at surgery > 30 days
- preservation of pulmonary valve annulus in TOF/PS
- use of conduit for primary RVOT reconstruction
- initial palliative intervention

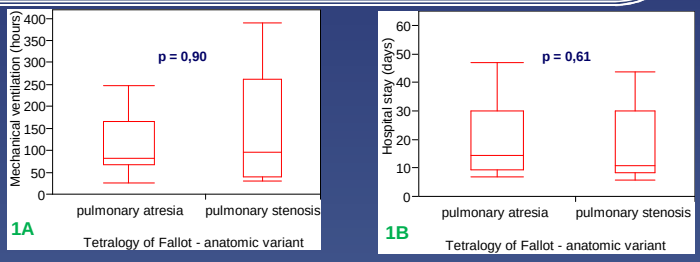

Figure 1 Medians, interquartile ranges (25th, 75th percentiles), minima and maxima of time to extubation (1A) and length of postoperative hospital stay (1B).

Table 1 Preoperative & operative variables

Baseline Characteristics	Pulmonary Stenosis	Pulmonary Atresia	p Value
Age, days, mean ± SD	17,5 ± 7	10,4 ± 6	0,025
Weight, kg, mean ± SD	3,04 ± 0,1	3,36 ± 0,1	0,04
Sex, male/female	6/3	7/5	0,70
Gestational week ≤ 36	0	0	-
Extracardiac anomaly	2	3	0,88
Anomalous coronary artery	2	2	0,75
Right aortic arch	4	1	0,055
Ductus arteriousus patency	5 (56 %)	12 (100 %)	0,005
Preoperative prostaglandin infusion, days, mean ± SD	5,3 ± 2,2	9,4 ±1,9	0,18
Preop. inotropic support	0	0	-
Preop. mechanical ventilation	0	1	0,38
RPA diameter adjusted to body weight, mm/kg, mean ± SD	1,16 ± 0,26	1,28 ± 0,24	0,32
LPA diameter adjusted to body weight, mm/kg, mean ± SD	1,18 ± 0,19	1,06± 0,21	0,20
Nakata index (mm^2/m^2)	421 ± 154	392 ± 113	0,64
Cardiopulmonary bypass time, min., mean ± SD	88 ± 13	103 ± 23	0,1
Aortic cross-clamp time, min., mean ± SD	45 ± 8	53± 12	0,13
Need for LPA/RPA plasty	3	1	0,15

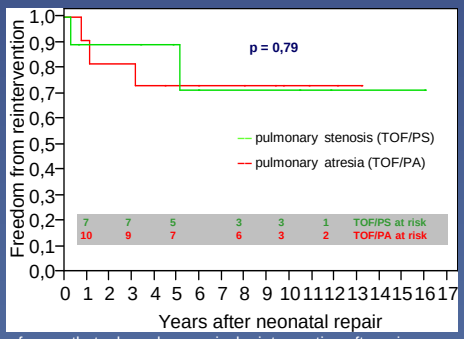

Figure 2 Freedom from catheter based or surgical reintervention after primary neonatal repair.

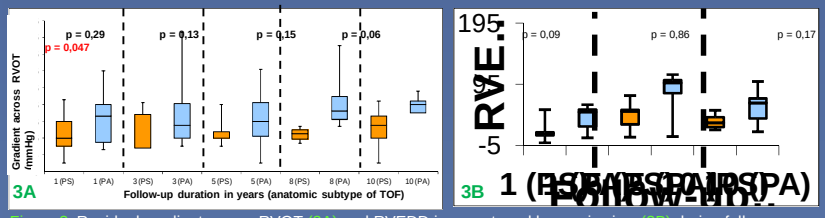

Figure 3 Residual gradient across RVOT (3A) and RVEDD in parasternal long axis view (3B) during follow-up.

both analyzed groups. TOF/PS and TOF/PA were comparable in duration of mechanical ventilation (96 vs. 84 hours; p=0,9), maximum vasoactive-inotropic score (10 vs. 9; p=0,78), intensive care unit stay (6 vs. 7 days; p=0.85) and hospital stay (11 vs.14 days; p=0,61). One patient with TOF/PA died suddenly at home 4 months after surgery. Overall freedom from RVOT reintervention during median follow-up of 9 years (0,3-16,3) was 77,8% in TOF/PS and 72,7% in TOF/PA group (p=0,79). There was no difference in right ventricular end-diastolic dimension (echocardiography), grade of tricuspid regurgitation and QRS duration at 1, 5 and 10 years. Gradient across RVOT tended to increase in TOF/PA comparing to TOF/PS. In the whole group, QRS duration increased from 0,097 s at 1 year to 0,122 s at 10 years after neonatal repair (p = 0,005) with no difference between TOF/PS and TOF/PA (p = 0,78). During follow-up, there was no secondary conduit implantation in both groups.

Conclusions

In our limited experience, RVOT reconstruction with avoidance of conduit placement can be safely accomplished in majority of term neonates with TOF/PA and duct-dependent pulmonary blood flow. Postoperative course and RVOT reintervention rate during follow-up are comparable to TOF/PS after neonatal transannular patch.