Adult Outcomes After Double Patch Closure of Ventricular Septal Defects for Children with Pulmonary Hypertension and Elevated Pulmonary Vascular Resistance


University of Tennessee Health Science Center, Memphis, USA; Amosov Institute of Cardiac Surgery, Kyiv, Ukraine; National Children’s Hospital, Washington DC, USA; University of Cincinnati, Cincinnati, USA; Rebro Hospital, Zagreb, Croatia; William Novick Global Cardiac Alliance, Memphis, USA
Disclosures
Nothing to Disclose
Pulmonary hypertension in children with Ventricular Septal Defects: Concerns Regarding Operation

*Delays in diagnosis and/or treatment of children with ventricular septal defects (VSD) results in patients presenting late with pulmonary hypertension (PHT) and elevated pulmonary vascular resistance (PVR).

*Historically, those children with PHT and elevated PVR have been considered “HIGH RISK” for mortality following surgical correction because of pulmonary hypertensive crisis in the post-operative period.

*In North America, Europe, some Latin American countries and the industrialized Pacific Rim countries children receive operation mostly in infancy thus preventing elevated PVR.
*The absence of costly sophisticated medications to treat PHT or equipment for rescue therapy for PHT crises (ECMO) resulted in children frequently being denied corrective operations in many countries.

*We introduced (1996) a modification to the uni-directional flow concept with the double patch flap valved VSD closure technique, allowing operations to be carried out safely without the need for these sophisticated medications or equipment (Ann Thor Surg 1998, 2005).
PTFE double flap valve VSD closure patch
Double Flap Valve in PHT Crisis

Jet from TV Regurgitation

RV

LA

RA

LV

R-L Shunt on the Flap Valve

Vel A
PG A

-557.2 cm/s
124.2 mmHg
Methods

• Database queries were made at 3 sites known to have reliable follow-up on double patch patients: Kyiv, Nizhny Novgorod, and Zagreb.

• Only those patients with double patch VSD closure who were or would have been ≥ 18 years of age on 12/31/2016 were extracted for analysis.

• Pre-operative catheterization data, echocardiographic evaluation, and post-operative echocardiographic evaluations were retrieved.

• Follow-up was conducted between 1/2016 to 12/2016.
• 35 patients were identified, 19 females.
• Median age at operation 7.3 years, IQR (3.8;12.9).
• Median baseline PVR 9.6 WU, IQR (7.6;12.6).
• Median sPAp/sSAp 1.00, IQR (0.89;1.00).
• Operative Mortality 0%, all 35 discharged home.
• Median follow-up period 17.4 years, IQR (11.9;19.3).
• Median age at follow-up 23.7 years, IQR (20.5;25.9).
• Lost to follow-up, 1 patient.
• Late deaths, 3/34 (8.6%) at 4.5, 8 and 9 years post-operatively.
Late Pulmonary Hypertension

<table>
<thead>
<tr>
<th>Systolic PA pressure at last follow-up (median 17.4 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;40 mmHg</td>
</tr>
<tr>
<td>13</td>
</tr>
</tbody>
</table>

PVR/SVR ≥ 0.67, p=0.004, OR 16.5

Median PAp/SAp @ last f/u = 0.41; p < 0.001 vs. pre-op
Kaplan-Meier Survival Curve

Cumulative Survival – 90.7%
Inferences

• Late closure of VSD in patients with PHT and elevated PVR does not predispose to earlier death.
• PVR/SVR at baseline catheterization is predictive of late severe PHT if $\geq 0.67$.
• Children with elevated PVR and PHT should not be denied operation because of potential “High Risk” for mortality.
• Most patients will survive to adulthood with mild or no PHT.
Thank You.