CONTEGRA BOVINE JUGULAR VEIN AND MATRIX DECELLULARIZED PORCINE PULMONARY VALVE CONDUITS FOR RIGHT VENTRICULAR OUTFLOW TRACT RECONSTRUCTION IN PEDIATRIC PATIENTS

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THE IDEAL CONDUIT..

Does the ideal conduit exist?

- Easy to implant
- Easy to replace
- Biocompatible
- Not Calcify
- Durable
- Maintain Good Valve function
- Adaptable
- Available in wide range of diameters
- Growth potential
FIRST: A WORD OF CAUTION!

Right ventricular outflow tract reconstruction using Contegra® valved conduit: natural history and conduit performance under pressure

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The conduits explanted for dilatation showed neointimal proliferation, thrombosis, calcification and chronic inflammation. Conclusions: The Contegra conduit is widely applicable to RVOT reconstruction with satisfactory mid-term results. However, there is a significant incidence of conduit-related complications, particularly with the smaller conduits. Adverse performance was strongly associated with high RV/LV pressure ratio at completion of surgery. We would recommend cautious use of the conduits in patients with predicted high RV/LV pressure ratios, where careful monitoring of conduit performance is crucial. There is some element of unpredictability, which adds to the importance of close follow-up. Further studies are needed to explore the issues of thrombogenicity, degeneration, possible ‘rejection’, and the potential role of anti-platelet and anti-inflammatory modulation.
FIRST: A WORD OF CAUTION!

Early failure of xenogenous de-cellularised pulmonary valve conduits — a word of caution!

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Abstract

Objective: The longevity of valved right ventricle to pulmonary artery (RV-PA) conduits is limited due to calcification and degeneration of non-viable structures. Xenografts are commonly used because of the restricted availability of cryopreserved homografts. Tissue-engineered (de-cellularised) pulmonary valves (TEPVs) were thought to be a valuable alternative to cryopreserved pulmonary homografts due to postoperative seeding with viable autologous vascular endothelial cells. Methods: From July 2007 to December 2008, xenogenous TEPV (Matrix P plus®) were implanted in 16 patients in the right ventricular outflow tract for different indications, related to congenital heart disease. Mean age at operation was 14 ± 11 years, including three patients younger than 1 year. The median conduit size was 22 mm (range: 13–26 mm). Results: The early and late survival rates were 100%. At a median follow-up of 10 months (range: 2–17 months), six patients (38%) had to be re-operated upon due to obstructed grafts. Five of these patients were older than 13 years (range: 13–26 years); one patient was younger than 1 year. On echocardiography before re-operation, mean systolic gradient in the main PA was 66 ± 18 mmHg. In explanted conduits, we found a predominantly peripheral conduit narrowing without leaflet calcification. Histological examination revealed stenosis formation, due to inflammatory infiltration and severely fibrogenic pseudo-intimal reaction. Conclusions: On the basis of our short-term results, the Matrix P plus® de-cellularised tissue-engineered pulmonary valve cannot be regarded as an ideal conduit for right ventricular outflow tract reconstruction, as the widespread use of these grafts may increase the possibility of frequent early conduit failures.

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**Aim of the study**: to evaluate the outcome of the reconstruction of the right ventricular outflow tract in paediatric patients

**Methods**: comparing to two different biological conduits the Contegra bovine jugular vein and the Matrix decellularized porcine pulmonary conduits
April 2000 to October 2010
- 38 patients (mean age, 18±29 months) underwent Contegra conduit implants

December 2005 to October 2010
- 30 patients (mean age 33±34 months) underwent Matrix conduit implants

<table>
<thead>
<tr>
<th>Pathology</th>
<th>Matrix</th>
<th>Contegra</th>
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<tbody>
<tr>
<td>AI (Ross procedure)</td>
<td>2</td>
<td>-</td>
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<tr>
<td>ToF</td>
<td>6</td>
<td>2</td>
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<tr>
<td>ToF/PA</td>
<td>3</td>
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</tr>
<tr>
<td>PA+VSD</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>PA+VSD+MAPCA’s</td>
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<tr>
<td>DORV</td>
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<td>-</td>
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<tr>
<td>TGA+VSD+PS</td>
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<td>-</td>
</tr>
<tr>
<td>MI (Ross II procedure)</td>
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<td>-</td>
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<tr>
<td>PAIVS</td>
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<tr>
<td>Truncus</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>PS</td>
<td>-</td>
<td>2</td>
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</tbody>
</table>
Contegra: 38 conduits were implanted on 38 pts

Matrix: 32 conduits were implanted on 30 pts

Previous surgery:
- Contegra 31%
- Matrix 60%
## RESULTS

### Mean follow up time

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<table>
<thead>
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<tbody>
<tr>
<td>Contegra</td>
<td>58±49 months</td>
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<tr>
<td>Matrix</td>
<td>39±17 months</td>
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### Early mortality

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<tbody>
<tr>
<td>Contegra</td>
<td>4/38 (10.5%)</td>
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<tr>
<td>Matrix</td>
<td>0</td>
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</table>

### Late mortality

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<tbody>
<tr>
<td>Contegra</td>
<td>1/34 (3%)</td>
</tr>
<tr>
<td>Matrix</td>
<td>1/30 (3%)</td>
</tr>
</tbody>
</table>
FOLLOW UP PROTOCOL

Non invasive evaluation 6-12-24 months after surgery:
  - Clinical
  - Electrocardiographic
  - Echocardiographic

- Cardiac catheterization
- CT scan in Matrix group
Interventional procedure were required respectively:

- 17/34 patients in Contegra patients
  - 9/17 on the conduit after 24±15 mos

- 9/30 patients in Matrix patients
  - 2/9 on the conduit after 20±17 mos
Truncus repair w contegra 12
INTERVENTIONAL PROCEDURES

ToF/PA MAPCA’s

2007 Unifocalization and total repar w Matrix P plus 16mm
   April 2008  TC scan and balloon dilatation
Conduit Matrix dilatation

TC scan ECG-GATED
Five years freedom from dysfunction

Log rank: $p = 0.838$

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<thead>
<tr>
<th>Severe IP</th>
<th>CONTEGRA</th>
<th>MATRIX</th>
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<tbody>
<tr>
<td>Size</td>
<td>12</td>
<td>13</td>
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<td>14</td>
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Contegra 47±10%
Matrix 38±16% ($p=0.83$)
Mean time at conduit replacement:
- Matrix 34±10 mos
- Contegra 50±31 mos
Five years freedom from replacement: 90±5% and 77±14% (p=0.58)
Truncus 6 years old
Contegra 12 at birth, endocarditis.
CONDUIT REPLACEMENT
THE IDEAL CONDUIT

Homograft implantation
Homograft is still considered the conduit of choice for the right ventricular outflow tract reconstruction. Nevertheless, its lack of availability, particularly in pediatric patients, encourages surgeons to look for some alternatives.
Stent implantation