Outcomes Following Prolonged Extra Corporeal Membrane Oxygenation Support in Children with Cardiac Disease Extracorporeal Life Support Organization Registry Study

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Background
Optimal timing for discontinuation of Extra Corporeal Membrane Oxygenation (ECMO) in children with cardiac insufficiency who are unable to wean from ECMO is ill-defined.

Objective
Outcomes following prolonged ECMO support (≥14 days) for cardiac insufficiency in children <18 years of age were examined to determine survival and potential predictors for survival.

Methods

Results
Total cardiac ECMO runs: 10,293 - Survival: 45%
784 prolonged ECMO runs in 777 children - Survival: 23%
• Survivors were older (0.64 vs. 0.10, p<0.01).
• Weighed more (7.0 kg vs 4.0 kg, p<0.01).
• Fewer organ system complications (median 4 vs. 3, p<0.01).
• Those with congenital heart disease had a lower survival compared to cardiomyopathy and myocarditis (15% vs. 42% and 52%, p<0.01).
• One ventricle physiology having a worse survival compared to two ventricle physiology(10% vs. 18%, p<0.01).

Eleven percent (n=86) received cardiac transplant, their survival was better compared to those not transplanted (22% vs. 19%, p=0.01).

Pre-ECMO arrest and emergent ECMO placement were not predictors of outcome.

Conclusions
• There is significant attention following prolonged ECMO support for cardiac insufficiency in children.
• Cardiac transplantation in this cohort is also associated with a high mortality.
• In children on ECMO for prolonged cardiac insufficiency, early conversion to other modes of mechanical support may be beneficial.

Bibliography

Survival by Duration

Survival Post-Cardiac Transplantation

Survival by Diagnosis

Multivariate Analysis

With SAS analysis

<table>
<thead>
<tr>
<th></th>
<th>p-value</th>
<th>Odds Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myocarditis vs. Congenital</td>
<td>&lt;0.01</td>
<td>0.7 (2.5 – 8.7)</td>
</tr>
<tr>
<td>Cardiomyopathy vs. Congenital</td>
<td>&lt;0.01</td>
<td>3.0 (1.8 – 5.1)</td>
</tr>
<tr>
<td>Days of ECMO (per 3 day increase)</td>
<td>&lt;0.01</td>
<td>1.02 (1.01-1.03)</td>
</tr>
<tr>
<td>Weight (per 1 kg increase)</td>
<td>&lt;0.01</td>
<td>0.94 (0.91-0.97)</td>
</tr>
<tr>
<td>Renal Complications</td>
<td>&lt;0.01</td>
<td>1.45 (1.03-2.07)</td>
</tr>
<tr>
<td>Neurologic Complications</td>
<td>0.03</td>
<td>1.57 (1.20-2.05)</td>
</tr>
<tr>
<td>Metabolic Complications</td>
<td>0.03</td>
<td>1.63 (0.40-5.98)</td>
</tr>
</tbody>
</table>

Of System Complications (mean ± SD)

<table>
<thead>
<tr>
<th></th>
<th>All 777</th>
<th>Survivors 176</th>
<th>Non-Survivors 601</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart</td>
<td>3.4 ± 1.7</td>
<td>2.8 ± 1.7</td>
<td>3.6 ± 1.6</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Respiratory</td>
<td>3.6 ± 1.8</td>
<td>3.0 ± 1.6</td>
<td>4.0 ± 2.0</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Neurologic</td>
<td>2.0 ± 1.5</td>
<td>1.4 ± 1.1</td>
<td>2.6 ± 1.7</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Renal</td>
<td>1.4 ± 1.0</td>
<td>1.0 ± 0.8</td>
<td>1.8 ± 1.3</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>All</td>
<td>10.9 ± 3.0</td>
<td>8.7 ± 2.3</td>
<td>13.1 ± 4.2</td>
<td>&lt; 0.01</td>
</tr>
</tbody>
</table>

Diagnosis

- Congenital Heart Disease: 18%
- Cardiomyopathy: 42%
- Myocarditis: 52%
- Other: 10%
- One Ventricle Physiology: 18%
- Two Ventricle Physiology: 52%

Complications

- Heart: 3.4 ± 1.7
- Respiratory: 3.6 ± 1.6
- Neurologic: 2.0 ± 1.5
- Renal: 1.4 ± 1.0
- All: 10.9 ± 3.0

130/601: 19%

Of System Complications (mean ± SD)

- Heart: 3.4 ± 1.7
- Respiratory: 3.6 ± 1.6
- Neurologic: 2.0 ± 1.5
- Renal: 1.4 ± 1.0
- All: 10.9 ± 3.0

130/601: 19%