Extracorporeal Membrane Oxygenation for Perioperative Cardiac Allograft Failure

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Background

- Use of mechanical support in pretransplant stabilization and postcardiomyotomy shock is well established.
- In perioperative cardiac allograft failure (PCGAF), donor shortage → extension of donor acceptance → ↑ incidence of PCGAF Kavarana MN.
- VAD in PCGAF is reported.
- ECMO in PCGAF??

Material and Methods

- PCGAF Dx by exclusion (possible anastomotic kinking, treatable pulmonary hypertension, and hypoxemia) Kavarana MN.
- ECMO for PCGAF refractory to meds and IABP (Rx for pul-HT initially), case total: 19.
- Immunosuppressive agents: triple regimen (CsA+MPA+AZ) immediate posttransplant, first 5 days w/ Rabbit antithymocyte globulin immunoinduction therapy.

Material and Methods

- ECMO: Medtronic Inc.
- Cannulation by modified Seldinger method.
- A perfusion cath inserted distally if femoral pressure < 50mmHg.
- Hct kept between 30-35%.
- No heparin till POD 1 or 2 and then ACT 160-180 sec.
- Maintained hemodynamics by reduced ECMO blood flow at 0.5l.min for 1hr → DC ECMO.

Data analysis

- Donor-, surgery-, ECMO-related variables.
- Continuous variables expressed as means and SD.
- Compared by independent-sample Student t test.
- Normal variables expressed as percentages.
- Analyzed by X2 test.
- P< 0.05 as significance.

Femoral cannulation

14 male + 5 female Weaning rate: 16/19=84.2% 30day survival: 11/19=57.8%
Results

<table>
<thead>
<tr>
<th></th>
<th>Donor Age</th>
<th>Recipient</th>
<th>Ischemic time</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCAGF</td>
<td>29.3</td>
<td>44.2</td>
<td>17.3</td>
</tr>
<tr>
<td>Non-PCAGF</td>
<td>30.5</td>
<td>37.6</td>
<td>22.5</td>
</tr>
</tbody>
</table>

Table 1: Comparison of Reperfusion and Proteinase 3 (catalytic) activity in PCAGF

Discussion

1. VAD vs. ECMO:
   - VAD longer support in pretransplant stabilization, fewer complications
   - Acute myocarditis and severe shock: ECMO better in NUTM
   - Etiologies of PCAGF
   - Poor myocardial protection → stunning → short term use of mechanical support = ECMO
   - Acute rejection ⇒ usual sudden hemodynamic collapse ⇒ for simplicity and feasibility = ECMO
   - Right heart failure = usually caused by poor pre-surgery status, massive bleeding/ transfusion, coagulopathy = ECMO better, VAD might not provide adequate O2 and hemostasis of direct RVotomy is concerned

Conclusion

- Long ischemic time → a major risk factor for PCAGF
- RVF and primary allograft failure are major etiologies for PCAGF
- ECMO rescue → higher weaning and survival rate than VADs
- ECMO than VAD is highly recommended

Reference


Results

<table>
<thead>
<tr>
<th></th>
<th>PCAGF</th>
<th>Non-PCAGF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retransplant Bl TID</td>
<td>10.1±6.6</td>
<td>13.2±10.3</td>
</tr>
<tr>
<td>Reperfusion O2</td>
<td>5.0±1.0</td>
<td>5.1±1.3</td>
</tr>
<tr>
<td>Non-PCAGF group</td>
<td>7.7±1.6</td>
<td>14.1±1.3</td>
</tr>
<tr>
<td>PCAGF group</td>
<td>9.1±1.6</td>
<td>13.0±1.3</td>
</tr>
</tbody>
</table>

Liver damage

Liver damage was significantly different between the two groups (P<0.001).

Table 3: Analysis of Different Types of Mechanical Support for PCAGF

<table>
<thead>
<tr>
<th></th>
<th>VAD</th>
<th>ECMO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Support</td>
<td>75%</td>
<td>50%</td>
</tr>
<tr>
<td>Gray rate</td>
<td>15%</td>
<td>10%</td>
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<tr>
<td>Survival</td>
<td>75%</td>
<td>50%</td>
</tr>
</tbody>
</table>

Table 4: Comparison of ECMO and VAD in Patients with PCAGF

- ECMO rescue → higher weaning and survival rate than VADs
- ECMO than VAD is highly recommended