Cannulation for ECMO

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Cannulation

• The establishment and maintenance of adequate vascular access is essential for ECMO
• For each modality, different kinds and sizes of cannulae can be used
## Guidelines for Cannula size

<table>
<thead>
<tr>
<th>Weight (Kg)</th>
<th>Venous cannula</th>
<th>Arterial cannula</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-4</td>
<td>8-14</td>
<td>8-10</td>
</tr>
<tr>
<td>5-15</td>
<td>15-19</td>
<td>12-15</td>
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<tr>
<td>16-20</td>
<td>19-21</td>
<td>15-17</td>
</tr>
<tr>
<td>21-35</td>
<td>21-23</td>
<td>17-19</td>
</tr>
<tr>
<td>35-60</td>
<td>23</td>
<td>19-21</td>
</tr>
<tr>
<td>&gt;60</td>
<td>23</td>
<td>21</td>
</tr>
</tbody>
</table>
Veno-Arterial vs Veno-Venous ECMO
Veno-Arterial ECMO

- **Peripheral cannulation**
  - Femoral vein – femoral artery
  - Femoral vein-axillary artery
  - Internal jugular vein - carotid artery
  - Internal jugular vein – axillary artery

- **Central cannulation**
  - Aorta-right atrium
  - Aorta-bicaval
Peripheral cannulation

- Percutaneous technique
- Semi open technique
- Open technique
Percutaneous cannulation
Percutaneous technique

• Seldinger technique
• Emergency situation
• Risk of vascular complication
Percutaneous cannulas
Femoral vessels
Outcomes of percutaneous femoral cannulation for venoarterial extracorporeal membrane oxygenation support

- N=15 in 2 years
- Cardiac arrest (n=9, 60%)
- Cardiogenic shock (n=4, 27%)
- Acute respiratory failure (n=2, 13%)
- Mean support 4.9 days
- Wean of 53%
- 53% 30 days mortality
- 47% Complication (2 infection, 5 vascular)

Vascular complications in patients undergoing femoral cannulation for extracorporeal membrane oxygenation support

- January 2005 to December 2009
- 174 patients 143 VA (82%) 31 VV (18%)
- 17 (10%) vascular complication

Ultrasound Guided Femoral Cannulation and Percutaneous Perfusion of the Distal Limb for VA ECMO

- Ultrasound to locate superficial femoral artery
- Seldinger technique with U/S guided
- Distal limb perfusion catheter inserted
Late vascular complications after extracorporeal membrane oxygenation support.

- 1998-2004
- 174 patients
- Hospital survival was 57.3%.
- 12 survivors (12.2%) experienced late vascular complications
- local stenosis at the former arterial cannulation site

Pediatric VA ECMO
Algorhytm for pediatric ECMO cannulation

1. **Age < 2 years?**
   - **Yes**: Carotid Ligation
   - **No**: Femoral artery Cannulation

2. **Femoral artery Cannulation**
   - **Limb Ischemia?**
     - **Yes**: Re-assess
     - **No**: Monitor

3. **Re-assess**
   - **Ischemia?**
     - **Yes**: Distal Perfusion
     - **No**: Monitor
Semi-open technique

Figure 9. Cannula, dilator, and guidewire inserted into vein under direct vision.
Open Technique

25F venous cannula inserted via the saphenofemoral junction

8mm graft sewn to common femoral artery
Side arm graft for fem ECMO
Axillary artery cannulation
Axillary artery cannulation
Carotid artery – Internal jugular vein cannulation
Central cannulation

• Better drainage
• Oxygenated blood perfuse ascending aorta
• Post cardiotomy
• Peripheral vascular disease
LV vent
## Overall Outcomes

<table>
<thead>
<tr>
<th></th>
<th>Total Patients</th>
<th>Survived ECLS</th>
<th>Survived to DC or Transfer</th>
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</thead>
<tbody>
<tr>
<td><strong>Neonatal</strong></td>
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<tr>
<td>Respiratory</td>
<td>593</td>
<td>523</td>
<td>498</td>
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<tr>
<td>Cardiac</td>
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<td>37</td>
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<tr>
<td><strong>Adult</strong></td>
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<tr>
<td>Respiratory</td>
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<td>466</td>
<td>435</td>
</tr>
<tr>
<td>Cardiac</td>
<td>28</td>
<td>18</td>
<td>5</td>
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<tr>
<td><strong>Total</strong></td>
<td>1,698</td>
<td>1,343</td>
<td>1,251</td>
</tr>
</tbody>
</table>
Veno-venous ECMO cannulation
Veno-venous ECMO

• Femero-femoral
• Internal jugular – femoral
• Internal jugular (Dual lumen catheter)
Fem-fem venovenous ECMO
IJ-Fem VV ECMO
Dual lumen venovenous catheter
Optimum positioning

From Hirose, et al. 2012
Badness
Dual lumen VV ECMO
Thank You