Vascular complications after extracorporeal membrane oxygenation (ECMO)

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Chief: Prof. R. Chiesa
Disclosure

Speaker name:
Alessandro Grandi

I have the following potential conflicts of interest to report:

- Consulting
- Employment in industry
- Stockholder of a healthcare company
- Owner of a healthcare company
- Other(s)

☑️ I do not have any potential conflict of interest
### Vascular complications of ECMO

<table>
<thead>
<tr>
<th>Author (year)</th>
<th>N</th>
<th>Vasc. Surg.%</th>
<th>Ischaemia %</th>
<th>Amputation %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheng (2014)</td>
<td>1866</td>
<td>17</td>
<td>nr</td>
<td>4.3</td>
</tr>
<tr>
<td>Aziz (2014)</td>
<td>101</td>
<td>16</td>
<td>18</td>
<td>1</td>
</tr>
<tr>
<td>Bisdas (2011)</td>
<td>143</td>
<td>nr</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>Foley (2010)</td>
<td>43</td>
<td>4</td>
<td>16.2</td>
<td>1</td>
</tr>
</tbody>
</table>

*review

Vascular complications account for 11-18% of patients.
Vascular complications risk factors

- Anatomical issues
- PAD
- Multiple cannulation
- Emergency

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Emergency scenario
How to face vascular injuries
Percutaneous cannulation

DUS guidance

Needle

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Percutaneous cannulation

Avoid **WRONG** cannulations

Arterial cannula in CFV
Percutaneous closure device
Surgical cannulation

1. Multiple failed attempt of percutaneous cannulation
2. Previous surgery
Early diagnosis

Lower limb ischemia diagnosis may be an issue:

- Peripheral vasoconstriction
- ECMO laminar flow
- ↑↑ CPK and lactate in cardiac arrest
Antegrade perfusion

Selective perfusion of the SFA in case of CFA extensive disease
Antegrade perfusion

The major limitation is the introducer side-branch: NO more than 6Fr introducers
Post-cannulation DUS monitoring

Without antegrade perfusion

With antegrade perfusion

Popliteal art.

laminar flow: 8 cm/sec

laminar flow: 25 cm/sec

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Fate of the contralateral limb

Impella (12 Fr)  
Counterpulsation dev. (7 Fr)
Fate of the contralateral limb

Bilateral antegrade perfusion

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Surgical removal

- Prefer longitudinal incision (better vessels control)
- Direct suture always when possible
- Prefer GSV patch (↓ risk of infection)
OSR experience

ECMO 2008-2016: 503 pts

Respiratory 93
Cardiac 211
Extracorp. Resusc. 199
OSR experience

Extracorporeal resuscitation
Other indications


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## OSR results

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Overall N= 503 (%)</th>
<th>Cardiac resuscitation N= 199 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peripheral cannulation</td>
<td>464 (92,2)</td>
<td>187 (94)</td>
</tr>
<tr>
<td>Vascular complications</td>
<td>48 (9,5)</td>
<td>28 (14)</td>
</tr>
<tr>
<td>Elective surgical removal</td>
<td>26 (5,1)</td>
<td>12 (6)</td>
</tr>
<tr>
<td>Mortality</td>
<td>268 (53,2)</td>
<td>151 (75,8)</td>
</tr>
</tbody>
</table>
# OSR results

<table>
<thead>
<tr>
<th>Vascular complications</th>
<th>Overall N= 48 (%)</th>
<th>Cardiac resuscitation N= 28 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bleeding</td>
<td>29 (5.7)</td>
<td>17 (8.5)</td>
</tr>
<tr>
<td>Lower limb ischemia</td>
<td>19 (3.7)</td>
<td>11 (5)</td>
</tr>
<tr>
<td>Compartment syndrome</td>
<td>12 (2.3)</td>
<td>8 (4)</td>
</tr>
<tr>
<td>Amputation</td>
<td>4 (0.7)</td>
<td>3 (1.5)</td>
</tr>
</tbody>
</table>
Conclusion

Vascular complications after ECMO are not negligible

- Percutaneous DUS-guided cannulation
- Aggressive tailored antegrade perfusion
  - Early diagnosis
- Early surgical revision in case of complications

Crucial to improve results
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