Carotid Cannulation in Aortic Surgery

Paul Urbanski
Carotid Cannulation in Aortic Surgery

I do not have any potential conflict of interest

Paul Urbanski
Factors impacting choice of arterial cannulation

- arterial wall pathology (arteriosclerosis, dissection etc.)
- flow direction (antegrade, retrograde)
- efficiency of perfusion
- technical challenge of surgical approach
- usefulness for cerebral perfusion
- risk of local injury (arterial wall, adjoining nerves and vessels)
- risk of infection
Cannulation of arch artery

- offers choice of several arteries
- provides antegrade perfusion during CPB
- no need of any interruption of cerebral perfusion
- no need of additional manipulation on arch arteries, at least on one side

## Supra-aortic cannulation

<table>
<thead>
<tr>
<th>Cannulation Strategy</th>
<th>Brachiocephalic A.</th>
<th>Axillary A.</th>
<th>Carotid A.</th>
</tr>
</thead>
<tbody>
<tr>
<td>• one side limitation</td>
<td>• one side limitation</td>
<td>• no side limitation</td>
<td></td>
</tr>
<tr>
<td>• approach through sternotomy</td>
<td>• approach time consuming</td>
<td>• fast approach</td>
<td></td>
</tr>
<tr>
<td>• very good efficiency of perfusion</td>
<td>• limited efficiency of perfusion</td>
<td>• good efficiency of perfusion</td>
<td></td>
</tr>
<tr>
<td>• frequently involved into pathology with increased risk of vulnerability and embolism</td>
<td>• fragile vessel with increased risk of vulnerability</td>
<td>• very low vulnerability</td>
<td></td>
</tr>
</tbody>
</table>
## Arterial cannulation


\[ n = 1000 \]

<table>
<thead>
<tr>
<th>Condition</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aneurysm/atherosclerosis</td>
<td>798</td>
<td>(80%)</td>
</tr>
<tr>
<td>Aortic dissection</td>
<td>184</td>
<td>(18%)</td>
</tr>
<tr>
<td>Others (e.g.: inflammatory)</td>
<td>18</td>
<td>(2%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Artery Cannulated</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right carotid</td>
<td>685</td>
<td>(68.5%)</td>
</tr>
<tr>
<td>Left carotid</td>
<td>180</td>
<td>(18.0%)</td>
</tr>
<tr>
<td><strong>Innominate artery</strong></td>
<td>94</td>
<td>(9.4%)</td>
</tr>
<tr>
<td><strong>Carotid + femoral</strong></td>
<td>37</td>
<td>(3.7%)</td>
</tr>
<tr>
<td>Innominate + left carotid</td>
<td>1</td>
<td>(0.1%)</td>
</tr>
<tr>
<td>Innominate + femoral</td>
<td>1</td>
<td>(0.1%)</td>
</tr>
<tr>
<td>Distal arch</td>
<td>2</td>
<td>(0.2%)</td>
</tr>
</tbody>
</table>

| Flow (L/min)                             | 4.7±0.5 (3.0-6.7) |
| Injury of artery cannulated              | 0 |
Double cannulation in aortic dissection with cerebral malperfusion

Cerebral malperfusion

Perfusion strategy

Surgical result

Carotid Cannulation
P. Urbanski, Bad Neustadt, Germany
Carotid Cannulation
P. Urbanski, Bad Neustadt, Germany
Cannulation strategy in complex aortic pathologies
Choice of cannulation site in acute aortic dissection involving arch arteries

Dissection of innominate, right axillary, and left carotid arteries

Surgical result
Choice of cannulation site in acute aortic dissection involving arch arteries

Dissection of both carotid arteries

Surgical result
Acute dissection involving brachiocephalic artery

Dissection involving brachiocephalic artery

Resulting in subtotal occlusion

Aorto-carotid bypass using cannulation graft

Cannulation strategy
P. Urbanski, Bad Neustadt, Germany
Cannulation strategy in aneurysms contacting sternum

Carotid artery and jugular vein cannulation
Cannulation strategy in aneurysms contacting sternum

False aneurysm

True aneurysm
Conclusions

• CCA almost completely fulfills all requirements that an artery should offer for optimal arterial cannulation

• CCA cannulation is a very fast, safe, and efficient method of arterial cannulation, even in very obese patients

• CCA cannulation facilitates application of cerebral perfusion and enables dealing with several pathologies and/or unexpected surgical problems

• I am convinced that experience with CCA cannulation will increasingly grow and the results achieved by others will prove that this cannulation method should be a preferred option in all cases of hostile aorta
Well-considered surgical strategy includes choice of cannulation site and is key to successful aortic surgery.

Thank you for your attention.
Carotid artery cannulation

Right

Before CPB

Flow

F = 0.26 L/min

Pressure

P = 122 mmHg

During CPB

Flow

F̅ = 0.6 L/min (13 %)
F = 4.6 L/min (range 3.5-5.8)
F = 4.0 L/min (87 %)

Pressure

P = 112 mmHg (range 90-140)
P = 198 mmHg (range 155-220)
P = 45 mmHg (range 37-67)

Carotid artery cannulation

Before CPB

Flow

\[ F = 0.26 \text{ L/min} \]

Pressure

\[ P = 130 \text{ mmHg} \]

Left

During CPB

Flow

\[ F = 0.6 \text{ L/min (13\%)} \]

\[ F = 4.7 \text{ L/min (range 4.1-5.0)} \]

\[ F = 4.1 \text{ L/min (87\%)} \]

Pressure

\[ P = 156 \text{ mmHg (range 130-190)} \]

\[ P = 237 \text{ mmHg (range 210-270)} \]

\[ P = 48 \text{ mmHg (range 36-80)} \]