How to perform an invasive pulmonary angiogram in chronic thrombo-embolic pulmonary disease work up

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Disclosures

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Catheter options:

• 8 Fr Berman catheter.

• 7 Fr High flow angled pigtail.

• 7 Fr APC or other shaped pulmonary catheters.
Procedural Access:

• Internal Jugular approach is preferred.

• Common femoral vein and brachial vein are other alternative options.

• 7 or 8 Fr sheath is placed depending on choice of catheter used.
Catheter positioning:

Orthogonal images are taken in an ipsilateral and a contra-lateral projection each lung.

<table>
<thead>
<tr>
<th></th>
<th>Right Lung</th>
<th>Left Lung</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frontal</td>
<td>AP or RAO 20</td>
<td>AP or LAO 20</td>
</tr>
<tr>
<td>Lateral</td>
<td>LAO 60-90</td>
<td>RAO 60-90</td>
</tr>
</tbody>
</table>
Catheter positioning:

Right Lung: Frontal
Catheter positioning:

Right Lung: lateral
Catheter positioning:

Left Lung: Frontal
Catheter positioning:

Left Lung: Lateral
Image Acquisition
# Contrast Dose

<table>
<thead>
<tr>
<th>Patient Height</th>
<th>Basic Flow Rate</th>
<th>Expected Disease Severity</th>
<th>Cardiac Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;6.5 feet</td>
<td>22 mL/sec</td>
<td>Mild: No change</td>
<td>&gt;3.5 L/min/m²: +2 mL/sec, 2.5 sec duration</td>
</tr>
<tr>
<td>6.0-6.5 feet</td>
<td>20 mL/sec</td>
<td>Moderate: -1 ml/sec</td>
<td>3.0-3.5 L/min/m²: +1 mL/sec, 2.5 sec duration</td>
</tr>
<tr>
<td>5.5-6.0 feet</td>
<td>18 mL/sec</td>
<td>Severe: -2 ml/sec</td>
<td>2.5-3.0 L/min/m²: no change, 2.0-2.5 sec duration</td>
</tr>
<tr>
<td>5.0-5.5 feet</td>
<td>16 mL/sec</td>
<td>Extremely severe: ½ reduction*</td>
<td>2.0-2.5 L/min/m²: -1 mL/sec, 2.0-2.5 sec duration</td>
</tr>
<tr>
<td>&lt;5.0 feet</td>
<td>14 mL/sec</td>
<td></td>
<td>1.5-2.0 L/min/m²: -2 mL/sec, 2.0 sec duration</td>
</tr>
</tbody>
</table>

Total contrast volume is the product of final injection flow rate and duration. Vessels with extremely severe disease burden (e.g., multiple lobar arteries occluded) can be imaged using significantly reduced contrast flow rates (e.g., 5-10 mL/sec) or manual injections with small volume (e.g., 10 mL).

Next Steps

• How to interpret and report your PA gram findings.