Massive DVT and Pulmonary Embolism: Early Institution of ECMO and Aggressive Anticoagulant Improves Survival

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SOUTH TEXAS CENTER FOR VASCULAR CARE

Disclosures

- Specific Disclosures
  - None

- General Disclosures
  - None

Pulmonary Embolism Categories

- Massive (5% of PE patients)
  - Patients present in hemodynamics collapse with cardiogenic shock (SBP < 90)
  - 58% 90-day mortality rate
  - High early mortality rate due in part to RV failure

Pathophysiology

Obstruction

Decreased RV CPP

Ischemia

Increased RV Volume

Decrease RV Output

RV Pressure

Decompensation

Ischemia

RV Decompensation

Decrease LV Distensibility

Decreased LV Preload

RV Pressure Load

Neuro-hormonal

↑ VO2

↑ Wall stress

↑ CVP / MAP

↑ Septal Shift

↑ Pericardial Restriction

↓ LV Deformation
PE: Indicators of Poor Outcome

<table>
<thead>
<tr>
<th>Criteria</th>
<th>ESC criteria (based on consensus; lack of validation)</th>
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<tbody>
<tr>
<td>High risk</td>
<td>Cardiovascular shock or persistent hypotension</td>
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<tr>
<td>Intermediate risk</td>
<td>Lab (troponin, BNP) or RV dysfunction</td>
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<tr>
<td>Low risk</td>
<td>normal labs (troponin, BNP); normal RV function</td>
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Indications for ECMO

- **Acute Respiratory Distress Syndrome**
  - Severe hypoxemia with a ratio of PaO₂ to FIO₂ less than 80 despite the application of high levels of PEEP (typically 15-20 cm of water) and salvage therapies as appropriate, for at least 6 hours in patients with potentially reversible respiratory failure.
  - ECMO may be considered after a shorter time interval if the ratio of PaO₂ to FIO₂ is less than 50.
  - Uncompensated hypercapnia (pH less than 7.15) or excessively high plateau airway pressures, despite the best accepted standard of care for management with a ventilator.

- **Hypercapnic Respiratory Failure**
  - Hypercapnic respiratory failure due to acute exacerbation of asthma, COPD, or other chronic lung disease as a bridge-to-recovery may occasionally be considered on a case-by-case basis.

- **Lung Transplant Candidates**
  - Patients already listed for lung transplantation may be placed on ECMO, when necessary, as a bridge-to-transplant.

Potential Roles for ECMO

- ECMO is a means of unloading the right ventricle and supporting systemic circulation in massive PE
  - Stabilization
  - Bridging / Temporizing
  - Recovery
- Progressive right ventricular failure associated with pulmonary arterial hypertension, unresponsive to medical treatment

Literature Review

- **Period between 1995 and 2014**
  - 271 patients
  - 73% survival
Potential Roles for ECMO

- In massive pulmonary embolism leading to cardiac arrest or cardiogenic shock, fast institution of ECMO can be lifesaving, buying time for diagnostic and therapeutic measures.