Massive PE and Submassive PE: The Case for Multi-disciplinary Collaboration

Akhilesh Sista, MD
Assistant Professor of Radiology
Division of Interventional Radiology

Disclosures
- None

Massive
- 25-65% mortality (ICOPER, MAPPET)

Submassive
- 3% mortality (Jaff Circ 2011)
- 5% decompensation (PEITHO)

Low-risk
- <1% mortality (Jaff, Cir 2011)

2014 European Society of Cardiology (ESC) guidelines

<table>
<thead>
<tr>
<th>Risk category</th>
<th>Thrombolysis</th>
<th>Echocardiography</th>
<th>Clinical instability</th>
<th>Therapeutic Anticoagulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Intermediate</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Low</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
</tbody>
</table>

Massive PE

Intravenous thrombolysis

Massive PE

Catheter Directed Therapy

Surgical Embolectomy

The case that launched our PERT

• 30+ year old man s/p transcranial resection of a pituitary tumor
• Developed post-op seizures, found to have intracranial frontal lobe hemorrhage
• Several days after operation, developed hypotension and hypoxia
• CT chest, PE protocol was ordered

Initial pulmonary angiogram

The clot in transit (IVC) and large pulmonary embolus in right main PA

Further history

• Had systolics of ~90 mm Hg x 1 hour
• Progressively more altered and tachycardic
• Had our first “huddle”
• Brought to IR suite, was started on pressors

Spot images of the Cleaner device
Post Cleaner pictures

Our initial team

- Interventional Radiology
- Pulmonary/Critical Care
- Cardi thoracic Surgery
- Cardiology

Massive
- Rescue

Submassive
- Prevent mortality and hemodynamic decompensation (?)

Low-risk
- Prevent progression to above (AC)

ICOPER (1999) alerted the world to RV dysfunction

PEITHO – the trial to answer all uncertainty?

Table 6. Efficacy Outcomes.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Tenecteplase (n=106)</th>
<th>Placebo (n=109)</th>
<th>Odds Ratio (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary outcome - no. (%)</td>
<td>1.5 (0.5)</td>
<td>28 (1.0)</td>
<td>0.64 (0.25-1.57)</td>
<td>0.02</td>
</tr>
<tr>
<td>Death from any cause</td>
<td>6 (0.3)</td>
<td>9 (0.1)</td>
<td>0.65 (0.22-1.85)</td>
<td>0.42</td>
</tr>
<tr>
<td>Hemodynamic deterioration</td>
<td>9 (0.3)</td>
<td>23 (0.5)</td>
<td>0.26 (0.16-0.45)</td>
<td>0.002</td>
</tr>
</tbody>
</table>

Table 7. Efficacy Outcomes.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Tenecteplase (n=456)</th>
<th>Placebo (n=498)</th>
<th>Odds Ratio (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bleeding between randomization and day 1</td>
<td>10 (2.2)</td>
<td>6 (1.2)</td>
<td>1.83 (0.82-4.08)</td>
<td>0.15</td>
</tr>
<tr>
<td>Minor bleeding</td>
<td>16 (1.8)</td>
<td>49 (5.0)</td>
<td>0.28 (0.18-0.43)</td>
<td>0.002</td>
</tr>
<tr>
<td>Major bleeding</td>
<td>14 (1.5)</td>
<td>32 (3.2)</td>
<td>0.45 (0.23-0.87)</td>
<td>0.02</td>
</tr>
<tr>
<td>Stroke between randomization and day 1</td>
<td>12 (2.4)</td>
<td>1 (0.2)</td>
<td>11.62 (2.55-52.72)</td>
<td>0.0008</td>
</tr>
<tr>
<td>Ischemic stroke</td>
<td>2 (0.4)</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hemorrhagic stroke</td>
<td>10 (2.2)</td>
<td>1 (0.2)</td>
<td>7.77 (1.78-32.78)</td>
<td>0.007</td>
</tr>
</tbody>
</table>
Case 2

- 60 year old man, no significant past medical history
- Near syncope at home, tachypneic, came to the ED
- Vitals in the ED: BP: 160/80, HR: 120, RR: 35, O2 sat: 93% on full face mask
- CT PE protocol: thrombus in main right pulmonary artery and left lower lobe PA
- Troponin: elevated, BNP: 220
- Echo: right heart strain

Main PA systolic pressure = 60mmHg.
Main PA systolic pressure = 41 mm Hg

Prospective data for CDT in the last 2 years

SEATTLE II confirmed efficacy of CDT

SEATTLE II: CDT is not risk free, but there were no intracranial bleeds*

Clinical outcomes*  N = 150

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean length of stay ± SD, days</td>
<td>8.8 ± 5</td>
</tr>
<tr>
<td>In-hospital death, n (%)</td>
<td>3 (2)</td>
</tr>
<tr>
<td>30-day mortality**, n (%)</td>
<td>4 (2.7)</td>
</tr>
<tr>
<td>Serious adverse events due to device, n (%)</td>
<td>2 (1.3)</td>
</tr>
<tr>
<td>Serious adverse events due to t-PA, n (%)</td>
<td>2 (1.3)</td>
</tr>
<tr>
<td>IVC filter placed, n (%)</td>
<td>24 (16)</td>
</tr>
<tr>
<td>Major bleeding within 30 days**, n (%)</td>
<td>17 (11.4)</td>
</tr>
<tr>
<td>GUSTO moderate**</td>
<td>16 (10.7)</td>
</tr>
<tr>
<td>GUSTO severe**</td>
<td>1 (0.7)</td>
</tr>
<tr>
<td>Intracranial hemorrhage, n (%)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

*Courtesy of Gregory Piazza, M.D.

PE Advanced Care: Protocol
MULTIDISCIPLINARY APPROACH
Aggressive Triage

24/7 PAGER X12568
@clotSNAT
@jameshorowitzmd
@akhileshsistaMD
@orenfriedman
Peadvancedcare.com (soon)

PERFECT registry
RESPECT registry

The post-PE syndrome in submassive PE

<table>
<thead>
<tr>
<th>Trial</th>
<th>Endpoint</th>
<th>N</th>
<th>Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOPPETT</td>
<td>Echocardiographic (low RI)</td>
<td>60</td>
<td>57%</td>
</tr>
<tr>
<td>Elke et al.</td>
<td>Echocardiographic (low RI)</td>
<td>144</td>
<td>27%</td>
</tr>
<tr>
<td>Gravissan et al.</td>
<td>NIVHCO or NIVHCO or RVD</td>
<td>254</td>
<td>28%</td>
</tr>
<tr>
<td>TOPCOAT</td>
<td>Exercise intolerance or low perception of wellness</td>
<td>43</td>
<td>28%</td>
</tr>
<tr>
<td>Sanchez et al.</td>
<td>NYHA &gt; 1</td>
<td>254</td>
<td>43%</td>
</tr>
</tbody>
</table>

Closing Comments
• Treatment rationale for massive PE is to rapidly restore left sided filling pressures and resolve hypotension, downward spiral
• Treatment rationale for submassive PE is more controversial; currently focused on short-term outcomes
• A multidisciplinary team can be very helpful in the acute management of submassive and massive PE
• That same approach should be used to ensure the long-term health of PE patients

THANK YOU

aks9010@med.cornell.edu
A 70 year old woman 14 days after hip surgery has an acute PE with occlusive thrombus in both lower lobe pulmonary arteries and a straddling non-occlusive clot in her main pulmonary artery. Her blood pressure is 135/77, and her heart rate is 112 beats/minute. CT demonstrates an R/LV ratio of >1. Her troponin is abnormally elevated. Data indicates that which of the following is most correct?

a) Systemic thrombolysis will reduce her 30 day mortality risk compared with anticoagulation alone.
b) Catheter-directed thrombolysis will reduce her 1 year mortality compared with anticoagulation alone.
c) Thrombolysis, whether catheter-directed or systemic, will not increase her bleeding risk compared with anticoagulation alone.
d) Systemic thrombolysis will reduce the likelihood that she will clinically deteriorate while in the hospital compared with anticoagulation alone.
e) No intervention beyond anticoagulation should be performed because she falls in the low-risk PE category.