Interventional Options for Pulmonary Embolism

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• Massive PE (5-10%) : Sustained hypotension, pulselessness, or persistent bradycardia.
• Submassive PE (20-25%) : RV dysfunction or myocardial necrosis without hypotension.
• Low Risk PE (70%) : No markers of adverse prognosis.

(Circulation 2011; 123:1788-1830)
If the pulmonary vascular tree is obstructed by more than 75% the Right ventricle needs to generate a SBP > 50 mm hg to maintain perfusion. Often a normal RV can not do this for long and fails.
PE Mortality (ICOPER)

Kurcher et al, Massive PE, circulation 2006
CTEPH - 44% Pulmonary HTN at 1 Year in those with Unresolved RV Dilatation at D/C

RV dysfunction on echo +/- troponin elevation in stable patients

Why treat PE with Thrombolytics?

• Save Lives
• Reduce morbidity and costs
• Reduce long term sequelae of PE-CTEPH
• Up to 44% have rvsp >40 long term post submassive PE!
Pulmonary Embolism Thrombolysis Study (PEITHO)

• Full dose weight adjusted tenectaplaste and heparin vs standard anticoagulation.
• Normotensive patients with RV dilation and Troponin elevation.
• Primary outcome-All cause mortality or hemodynamic collapse at 7 days.
• Mort/HC 2.6% thrombolytic, 5.6% usual care
• Bleeding 6.3% vs 1.2%
• Stroke 2.4% vs 0.2%
Dreaded Complication

Intra cerebral hemorrhage: 0.7 - 6.4%
After the dose reduction [by 50%] of tenecteplase in patients 75 years of age or older, there were no cases of intracranial hemorrhage (0 of 97) as opposed to 8.1% (3 of 37) before protocol amendment.

Table 3. Strokes and Nonintracranial Bleeding Events within 30 Days.

<table>
<thead>
<tr>
<th>Event</th>
<th>Fibrinolysis (N = 944)</th>
<th>Primary PCI (N = 948)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total strokes</td>
<td>15/939 (1.6)</td>
<td>5/946 (0.5)</td>
<td>0.03</td>
</tr>
<tr>
<td>Intracranial hemorrhage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any</td>
<td>9/939 (1.0)</td>
<td>2/946 (0.2)</td>
<td>0.04</td>
</tr>
<tr>
<td>After protocol amendment*</td>
<td>4/747 (0.5)</td>
<td>2/758 (0.3)</td>
<td>0.45</td>
</tr>
<tr>
<td>Primary ischemic stroke</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without hemorrhagic conversion</td>
<td>5/939 (0.5)</td>
<td>3/946 (0.3)</td>
<td>0.51</td>
</tr>
<tr>
<td>With hemorrhagic conversion</td>
<td>1/939 (0.1)</td>
<td>0/946</td>
<td>0.50</td>
</tr>
<tr>
<td>Nonintracranial bleeding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td>61/939 (6.5)</td>
<td>45/944 (4.8)</td>
<td>0.11</td>
</tr>
<tr>
<td>Minor</td>
<td>205/939 (21.8)</td>
<td>191/944 (20.2)</td>
<td>0.40</td>
</tr>
<tr>
<td>Blood transfusion</td>
<td>27/937 (2.9)</td>
<td>22/943 (2.3)</td>
<td>0.47</td>
</tr>
</tbody>
</table>
Moppett Trial

• 121 patients “safe dose” Thrombolytics vs usual care. Peripheral IV delivery.

• 10 mg TPA bolus followed by 40 mg over 2 hours with adjusted heparin protocol.

• Endpoints of Pulmonary HTN (RVSP >40) and Recurrent PE at 28 months.

• Pulm HTN 16% TH 32% UC
• Hospital stay 2.2 D 4.9 D
• Mortality 0 3
• Bleeding 0 0
Seattle II (EKOS) lower dose lytic in massive and submassive PE, N=149

- 30 d mortality 2.7%
- Gusto moderate bleeding 10.7%
- Gusto severe bleeding 0.7%
- ICH-0
Stanford Protocol

- Massive PE - 8 fr sheath, bury pigtail into clot, 10 mg TPA per lung. Pigtail fragmentation
- End procedure when clinically improved, regardless of angiogram results
- Submassive PE
- CDT if RV strain or severe hypoxia
- No fragmentation or bolus but low dose infusion.
- Perfect Registry
Personal Tips/Usual Protocol

• Go in from the side you think clot is NOT on.
• Important to do inferior venacavagram to determine if IVC thrombus exists. If it does I generally will place filter before placing catheter.
• 5Fr angled pigtail usually crosses easily.
• Do a quick hand injection pulmonary angiogram and measure pressures.
• Redirect pigtail to each lung and bolus with 10 mg TPA
• Leave pigtail on side with most thrombus.
32 Y o female with submassive PE post bunion surgery
In Conclusion

• Pulmonary Embolism is a diverse disease that requires multiple modalities to treat.
• The risk of death and permanent impairment due to CTEPH is higher than most clinicians appreciate.
• RV dilation >.9 RV/LV ratio on CTA or echo and troponin elevation are useful markers to identify high risk patients.
• Catheter directed thrombectomy and even peripheral IV TPA protocols are effective and generally safe.
Thank You

GEAUX
SAINTS